Hengyi Industries Sdn Bhd
恒逸实业（文莱）有限公司

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FLEXICOKING UNIT TECHNICAL & OPERATION PROCESS SPECIFICATION

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Hengyi Industries Sdn Bhd
恒逸实业（文莱）有限公司

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Flexicoking Unit Technical & Operation Process Specification

灵活焦化装置工艺技术操作规程

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1.1 Overview of the plant 装置概况

The Flexicoking unit of Zhejiang Hengyi (Brunei) PMB petrochemical project is a new project with a design scale of 100×10^4t/a and an annual operating time of 8,400 hours. The operational flexibility is from 66 to 110% of the design scale.

浙江恒逸(文莱)PMB 石油化工项目灵活焦化装置为新建项目，设计规模为 100×10^4t/a，年开工时数为 8400 小时。操作弹性为设计规模的 66-110%。

1.1.1 Introduction to the plant 装置简介

The feedstock for Flexicoker is the vacuum residue coming from vacuum atmospheric distillation unit and produces coker gas which is routed to coker gas desulfurization unit; coker liquefied gas is sent to liquefied gas refining unit; coker naphtha is sent to hydrotreating unit; HKGO and HHKGO is pumped to Hydrocracking unit; treated Flexigas to aromatics unit and powerstation as fuel, and a small amount of coke is transferred to CFB boilers of the plant.

原料来自常减压装置减压渣油，生产焦化干气至干气脱硫单元；焦化液化气至液化气精制单元；焦化石脑油至加氢处理装置；焦化轻蜡油和重蜡油至加氢裂化装置；净化灵活气至芳烃和电厂做燃料，少量焦炭去工厂 CFB 锅炉。

1.1.1.1 Plant composition 装置组成

The plant consists of five sections: reaction gasification section, fractionation and absorption stabilization section, flexigas treatment section, coke powder loading section and flexigas flare section. The design principles are as follows:

本装置由反应气化部分、分馏和吸收稳定部分、灵活气处理部分、焦粉装车部分及灵活气火炬等五个部分组成。设计原则如下：

(1) Process route: A full set of ExxonMobil patented Flexicoking process technology package was introduced .Flexicoker is the extention of Fluid coking which was designed and developed by the Exxon Mobil Corporation. It is a combined process which integrates coke gasification with conventional Fluid coking.

工艺路线：引进全套 ExxonMobil 专利 Flexicoking 工艺包。Flexicoking 是在流化焦化技术的基础上发展起来的，它是由渣油流化焦化与焦炭气化组成的联合工艺

(2) According to the property of raw materials and the requirements for product scheme, advanced and reasonable engineering technology is adopted to make the design of the plant more advanced.

根据原料特性和产品方案的要求，采用先进且合理的工程技术，使装置设计更为先进。

(3) The simplest operation scheme was adopted under the premise of ensuring safe and smooth operation of the plant to achieve the simplest process procedures and operation control scheme

采用能实现目标的最简单的工艺流程和操作控制方案，在保证装置安全、平稳运行的前提下，装置操作最简单。

(4) Adopt centralized control to create conditions for safe and optimal operation of the plant.

采用集中控制，为装置安全、优化地运行创造条件。

(5) Appropriate consideration of the necessary margins to enhance the flexibility, stability and safety of the plant.

适当考虑必要的裕度，增强装置运行弹性、稳定性和安全性。

1.1.1.2 Operating cases 操作工况

The Hengyi flexicoking unit has a variety of operating cases. The ExxonMobil process technology specification only provides material balance data based on the Reference condition, but its equipment selection calculation covers various cases:

恒逸灵活焦化装置有多种操作工况，ExxonMobil 工艺包仅基于基准工况提供了物料平衡数据，但其设备选型计算覆盖了各种工况：

(1) Base case: Corresponding to the 110% duty of the plant, Feed with 23.6w CCR%; the maximum coke gasification of 95% consistent with 5% coke withdrawal

基准工况：对应的是本装置的 110%负荷，进料残炭 23.6w%。其中焦炭气化率最大 95%，外排 5%焦炭。

(2) Gasification case: Under gasification case, the coke gasification rate is decreased to 75%. At this time, the coke dicharged is the largest, and design case refer coke handling.

低焦炭气化率工况：低焦炭气化量工况下，焦炭气化率降低至 75%，此时排焦炭量最大，焦粉系统按此工况设计。

(3) At the end of the operation (reactor coking conditions): during normal operation, a wall coke growth of 76.7mm per year is assumed. In addition, higher pressure drop caused by longterm

fouling of gas flow path from reactor dilute phase to the gas compressor suction,so the reactor operation needs to be pressurized . At the same time, Reactor operating temperature is increased to compensate for the loss of dense bed volume due to wall coke accumulation.
Two sets of COS (carbonyl sulfide) reactors are arranged, and a single one was continuously operating for 6 months, and then switched to another one. The catalyst of standby COS reactor is replaced. The fouling on the catalyst will result in an increase in pressure drop during operation of the COS conversion reactor, and the heater and gasifier will need to man-made rise pressure to accommodate the pressure Flexigas .
运行末期(反应器结焦工况)：正常运行时焦炭在反应器内壁及反应器旋分内壁以每年 76.7mm 的速度结焦，结焦导致反应器顶至气压机入口压降增加，反应器因此需提压操作。同时由于结焦占用了密相藏量空间，反应温度也需随之提高。COS(羰基硫)反应器设置两台，单台连续运行 6 个月，之后进行切换。切出的 COS 反应器需进行催化剂置换，然后进入备用状态。催化剂上的结垢会导致 COS 反应器运行中压降增加，加热器和气化器需要进行针对性的提压操作，以满足出装置灵活气的压力不变。
(4) Fresh feed turndown case: 60% based on the base case, corresponding to 100% of the operating conditions of the plant, with a lower limit of 66%.
负荷低限工况：基于基准工况的 60%，对应本装置 100%工况，低限为 66%。

1.1.1.3 Process technology characteristic 工艺技术特点

The plant is designed by ExxonMobil in Flexicoker technology, which has the following technical chracteristics compared to conventional delayed coking coke column technology:
本装置设计采用 ExxonMobil 公司的灵活焦化技术，跟常规延迟焦化焦炭塔技术相比，该技术具有以下技术特点：
(1) TheFlexicoker adopts fluidized coking technology, and the coke is generated and taken out in the reactor to realize continuous operation, which avoids the periodic fluctuation of the processing amount and risk for opeartion caused by the delayed coking cycle switching , as well as reduce the decoking work.
反应采用流态化焦化技术，反应器中焦炭的生成和取出实现连续操作，避免了延迟焦化循环切换造成的处理量周期性波动和操作风险，减少了除焦工作的劳动强度。
(2) The generated coke is used to generate flexigas, which solves the problem of low-value coke routing to. The generated flexigas can partially replace the use of fuel gas to make up for the shortage of the fuel gas of the whole plant. However, the generated flexigas heat value is

low, and it is not suitable for use in a separate combustion furnace, and the combustion furnace also needs to undergo a certain renovation.

生成的焦炭用来发生灵活气，解决了低价值焦炭的去向问题。生成的灵活气可以部分替换燃料气使用，弥补全厂燃料气的缺口。但生成的灵活气热值低，不适合单独给燃烧炉使用，燃烧炉需要经过一定的改造。

(3) The circulating fluidized coke is used as a heat carrier to directly contact with the reaction feed to provide reaction heat for the coke formation. Therefore, the temperature of the feed entering the reactor does not need to reach the coking reaction temperature, which avoids the shutdown of the plant caused by the blocked coils and pipelines due to coking of the high-temperature raw material before entering the reactor.

利用循环流化的焦粉作为热载体与反应进料直接接触，为生焦反应提供反应热。因此进反应器的原料温度不需要达到焦化反应温度，可避免高温原料在进反应器前发生结焦堵塞炉管和管道引起的装置停工。

(4) Flexicoker has strong flexibility and process any feedstock that can be pupmed for feedstock due to without furnace compared to delated coking.

没有进料加热炉的限制，因此相比延迟焦化装置，灵活焦化对原料的适应性更强，可加工的原料范围更广。

(5) The feed atomizing nozzle are spaced in multi-layer arrangement so that the feed are fully contacted sufficently with fludized coke to make the coke particles grow as uniformly as possible. The reactor bottom is provided with steam for strengthening the agitation and friction to control the particle size distribution and particle morphology of the coke.

进料雾化喷嘴采用多层布置，使进料与流化的焦粉逐段充分接触，使焦粉颗粒尽可能均匀地生长。反应器下部设置破碎蒸汽，用来增加焦粉颗粒间的搅动和摩擦，控制焦粉的粒径分布和颗粒形态。

(6) The cold coke outlet is provided with a screen to prevent large coke from entering the cold coke transfer line that would lead to jam in it. The bulk of the coke settles down to the cone at the bottom of the reactor and is discharged at the right time.

冷焦抽出口设置筛网，防止大块焦进入输送管影响焦粉在反应器和加热器之间的传输。大块焦则下沉到反应器最底部的锥段并适时排出。

(7) In order to prevent the high temperature reaction vapor from abnormally coking in the equipment, the reduced diameter dilute phase tube is directly connected to the reactor cyclones, and the scrubber is placed directly above the reactor, and the oil and gas pipeline from the top of preactor to the scrubber is eliminated. And other measures to reduce the residence time of high temperature oil and gas in the head space of the reactor. At the same

time, it has introduced a stream of scrubbng coke to the reactor cyclone inlet to prevent high temperature oil and gas from coking at the inlet of cyclone.

为了防止高温反应油气在设备内非正常结焦，采用了缩径的稀相管与反应器旋分直接相连，以及将洗涤塔直接放置在反应器上方，取消了反应器顶至洗涤塔的油气管线等措施来降低高温油气在反应器顶部空间的停留时间。同时引了一股冲刷焦到反应器旋分入口，防止高温油气在旋分入口结焦。

(8) The temperature inside the gasifier is as high as 900 °C. Except for the air and steam distributor, there are no other internal parts, which reduces the material requirements of the equipment.

气化器内温度高达 900℃，除了主风及蒸汽分布器，不设其他内件，从而降低设备对材质的要求。

(9) The heater is a gas-solid direct contact heat exchanger, and good gas-solid contact conditions are necessary for ensuring heat transfer. A grid gas distributor is provided in the heater, which has a good distribution effect on a large flux of gas-solid mixture. At the same time, in order to reduce the material requirements of the distributor, the heater adopts a two-stage structure. The high-temperature Flexigas from the gasifier is firstly cooled in contact with the cold coke from the dense phase of the heater in the quenching section, and the flexigas coke after cooling. The Flexigas mixed with coke is then in contact with the cold coke of the dense phase bed of the heater through a mesh format distributor to complete the heat exchange.

加热器作为气固直接接触式热交换器，良好的气固接触条件是保证换热效果的必要条件。加热器内设置了网格式气体分布器，该分布器对大通量的气固混合物具有良好的分布效果。同时为了降低分布器的材质要求，加热器采用两段式结构，来自气化器的高温灵活气首先在急冷段与从加热器密相来的冷焦粉接触快速降温，降温后的灵活气焦粉混合物再通过网格式分布器与加热器密相床的冷焦充分接触完成换热。

1.1.2 Process principle 工艺原理

1.1.2.1 Flexicoker process 灵活焦化工艺过程

The flexicoker process is developed on the basis of fluid coking technology. It is a combined process consisting of fluidized coking and coke gasification. It adopts fluidized coking technology, and the circulating fluidized coke is used as a heat carrier to directly contact the reaction feed to provide reaction heat for the coke formation. The reacton vapor produced by the coking process flows from the top of the scrubber to the fractionationator and is splited into

coker gas, naphtha, diesel and gas oil products; the coke is gasified and converted into Flexigas, which solve coke outlet problem. The generated flexigas can partially replace the use of fuel gas to meet the requirements for fule gas.

灵活焦化工艺是在流化焦化技术的基础上发展起来的，它是由渣油流化焦化与焦炭气化组成的联合工艺过程。反应采用流态化焦化技术，利用循环流化的焦粉作为热载体与反应进料直接接触，为生焦反应提供反应热。焦化过程产生的油气从洗涤塔顶部出来到分馏塔中进行分馏，可获得焦化干气、石脑油、柴油和蜡油产品；生成的焦炭用来发生灵活气，解决了低价值的焦炭的去向问题。生成的灵活气可以部分替换燃料气使用，弥补全厂燃料气的缺口。

1.1.2.2 Flexicoking reaction mechanism 灵活焦化反应机理

The residue mainly undergoes two types of reactions under the action of heat: one is a thermal cracking reaction, which is an endothermic reaction; the other is a condensation reaction, which is an exothermic reaction. In general, the coking reaction appears to be an endothermic reaction at a macroscopic level, while the isomerization reaction hardly occurs. The thermal reaction of the residue can be explained by the mechanism of the free radical chain reaction. It is generally believed that the radical chain reaction of the hydrocarbon thermal reaction generally has the following three stages: chain initiation, chain growth and chain termination.

渣油在热的作用下主要发生两类反应：一类是热裂解反应，它是吸热反应；另一类是缩合反应，它是放热反应。总体来讲，焦化反应在宏观上表现为吸热反应，而异构化反应几乎不发生。渣油的热反应可以用自由基链反应机理来解释，一般认为烃类热反应的自由基链反应大体有如下三个阶段：链的引发，链的增长和链的终止。

(1) Chain initiation 链的引发

The decomposition of hydrocarbon molecules into free radicals is due to the homogenization of the bond C-C, rather than the C-H bond, which has a larger bond energy and is mainly broken in the middle of the carbon chain, such as:

烃分子分解为自由基是由于键 C—C 的均裂，而不是 C—H 键，因后者的键能较大，并且主要断裂在碳链的中部，如：

$$C_{16}H_{34} \longrightarrow 2CH_3(CH_2)_6\dot{C}H_2$$

(2) Chain growth 链的增长

This is a process in which a free radical is converted into another free radical, allowing the free valenceto continue. In this process, smaller free radicals such as H·, CH3·, C2H5· can exist independently in a short time; while larger free radicals are more active and unstable, and can only exist in an instant, so it will continue Splitting into olefins and small free radicals; these

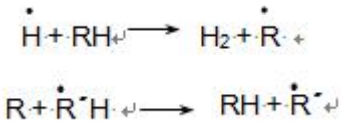
small free radicals continue to attack other hydrocarbon molecules, creating new free radicals, and new free radicals continue to split, thus forming a growing chain of reactions. The growth of the chain does not end until the reaction product leaves the reaction system. This is done through the following specific reactions:

这是一种由一个自由基转化为另一个自由基，使自由价继续传递下去的过程。在此过程中，较小的自由基如 H·、CH3·、C2H5·能在短时间内独立存在；而较大的自由基则比较活泼和不稳定，只能在瞬间存在，因此它会继续分裂，成为烯烃和小的自由基；这些小的自由基会继续攻击其它烃分子，产生新的自由基，新的自由基继续分裂，这样就形成了一个不断增长的反应链。直到反应产物离开反应系统，链的增长才会结束。具体通过如下反应：

1) Free radical hydrogen scavenging reaction 自由基的夺氢反应

Its general formula is:

其通式为:



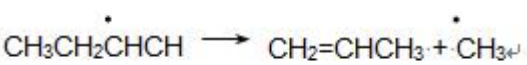
The order of difficulty in capturing hydrogen from carbon atoms in a hydrocarbon molecule from easy to difficult is tertiary carbon > secondary carbon > primary carbon. The relative speed at which they react with free radicals is also in this order, and the higher the temperature, the smaller the difference between them.

烃分子中碳原子上的氢被夺取的难易程度由易到难的次序是叔碳>仲碳>伯碳。它们与自由基反应的相对速度也是按照这个次序进行的，而且温度越高，它们之间的差别也越小。

2) Decomposition of free radicals 自由基的分解反应

The free radical itself can be decomposed to form an olefin molecule and a new free radical with a lower carbon number so that its free valence is passed on. The decomposition of free radicals mainly takes place at the β-bond position with unpaired electron carbon, which is known as β-fracture rule. Such as:

自由基本身可以分解，生成一个烯烃分子和一个含碳数较少的新自由基，从而使其自由价传递下去。自由基的分解主要发生在具有未成对电子碳的β-键位置上，这也就是所谓的β-断裂规则。如：



3) Free radical addition reaction 自由基的加成反应

This is a reverse reaction of the above-mentioned radical decomposition reaction, and a radical with a small carbon number can be added into an olefin to form a radical with a larger carbon number.

这是上述自由基分解反应的逆反应，含碳数较少的自由基可与烯烃加成而生成含碳数更多的自由基。

(3)Termination of the chain 链的终止

Free radicals can combine with each other to form stable molecules leading to disrupting the chain reaction, such as:

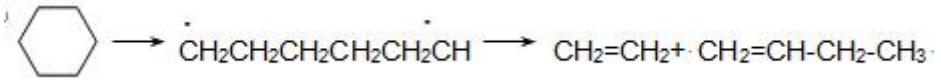
自由基可相互结合成为稳定的分子而使链反应中断，如：

According to the above process, even a simple hydrocarbon molecule such as ethane has a relatively complicated thermal reaction. The step needed to be controlled is the initiation of the chain (this step requires the highest activation energy).

根据上述历程，即使像乙烷这样简单的烃分子，它的热反应也是相当复杂的。其控制步骤是链的引发（此步骤所需活化能最高）。

It shall be noted that not all hydrocarbon pyrolysis reactions are free-radical chain reactions, Some hydrocarbons, such as cycloalkanes, generate free radicals by breaking rings in the reaction, but then decompose into stable products without forming chain reactions.As a result, cycloalkanes are slow to pyrolyze alone, about one-eighth of normal hexane.

值得注意的是，并不是所有烃类的热解反应都是自由基链反应，有的烃类如环基烷虽然在反应中也断环而生成自由基，但随即分解而为稳定的产物，并不形成链反应。因此，环基烷单独进行热解时反应速度较慢，约为正几烷的八分之一。



1.1.2.3 Thermal reaction of hydrocarbons 烃类的热反应

The thermal transformation reaction of hydrocarbon first is the breaking of molecular chain. The fracture of the chain is an endothermic reaction, so the weaker part of the molecular chain, that is, the part where the bond energy is small and the energy required to break is small, is more likely to break than the part where the bond energy is stronger. Table 1 lists the bond energy data of several different forms of bonds in hydrocarbon molecules. It can be seen that the c-c bond of alkanes is the weakest, while that of aromatic, olefin and alkyne is the strongest.

Therefore, most of the fracture reactions occur at the c-c bonds of paraffin, cycloalkane and aromatic side chains.

烃类热转化反应首先是分子链的断裂。链的断裂是吸热反应，因而分子链较弱的部位，即键能小，断裂时需要的能量较小的部位，比键能较强的部位容易发生断裂。表 1 列出了烃类分子中几种不同形式化学键的键能数据。从中可以看出，链烷烃的 C-C 键最弱，而芳烃、烯烃、炔烃的 C-C 键最强。因此断裂反应多半先在链烷烃、环烷烃侧链和芳烃侧链的 C-C 键发生。

Table 1: Bond energy of different forms of chemical bonds

表 1：不同形式化学键的键能

Chemical bond 化学键	Bond energy 键能, kJ/mol
H-H	436.26
C-H(1)	412.27～413.91
$C_{链烷}$-$C_{链烷}$(2)	347.80～354.41
$C_{芳}$-$C_{芳}$	512.30
$C_{烯}$=$C_{烯}$	620.27
$C_{炔}$≡$C_{炔}$	842.09

(1) It includes the chemical bonds formed from the carbon atoms of primary, secondary, tertiary, cycloalkanes, alkenes, alkynes and aromatics with hydrogen atoms.

包括伯、仲、叔、环烷、烯、炔和芳碳原子与氢原子构成的化学键。

(2) It includes saturated bonds formed from the carbon atoms of linear, side chains and cycloalkane chains with carbon atoms.

包括直链、侧链和环烷链中碳原子与碳原子构成的饱和键。

1.1.2.4 Characteristics of Residue thermal reaction 渣油热反应的特征

Residue is an extremely complex mixture with various hydrocarbon compounds, and the thermal reaction behavior of its components naturally follows the thermal reaction rules of various hydrocarbons. However, as a complex mixture, the thermal reaction behavior of the residue is not a simple addition of that of various hydrocarbons, and it has its own characteristics.

渣油是多种烃类化合物组成的极为复杂的混合物，其组分的热反应行为自然遵循各族烃类的热反应规律。但作为一种复杂的混合物，渣油的热反应行为不是各族烃类热反应行为的简单相加，它具有自己的特点。

(1) Parallel-sequence reaticon characteristics 平行-顺序反应特征

The residue thermal reaction exhibits a more parallel-sequence characteristic than the monomeric hydrocarbon. Figures 1 and 2 show this feature.

渣油热反应比单体烃更明显地表现出平行-顺序特征。图 1 和图 2 表示出了这个特征。

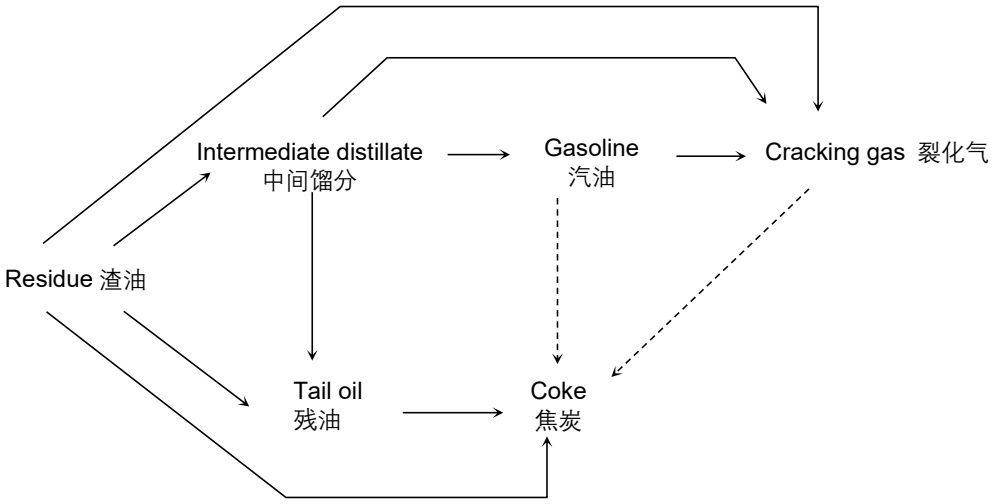


Figure 1: Parallel-sequential reaction features of residue

图 1：渣油的平行-顺序反应特征

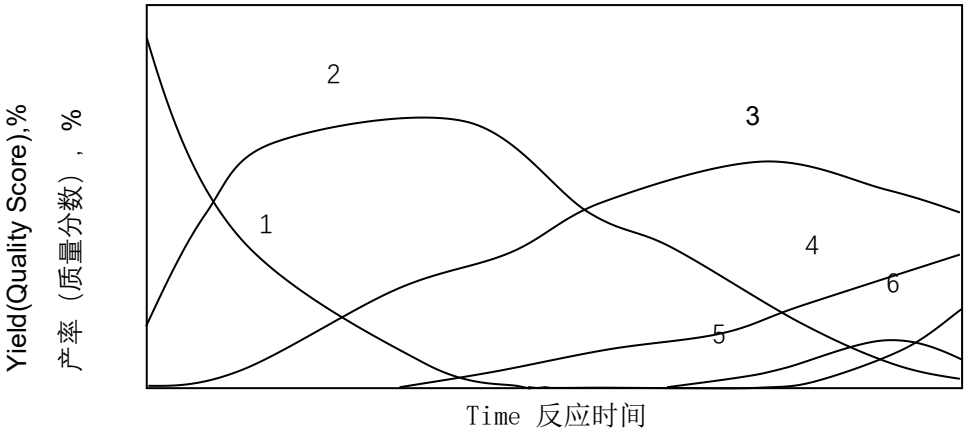


Figure 2: Distribution of thermal reaction product of residue over time
1—Feedstock; 2—Middle fraction; 3—Gasoline; 4—Cracking gas; 5—Residue; 6—Coke

图 2：渣油热反应产物分布随时间的变化
1—原料；2—中间馏分；3—汽油；4—裂化气；5—残油；6—焦炭

As can be seen from the figure, the distribution of reaction products changes with the reaction depth increases. The yield of gasoline as the intermediate product and the intermediate distillate oil will reach a maximum when the reaction goes to a certain depth, while the gas and

coke as the final product start to produce at a certain depth and increase monotonously as the reaction depth increases.

由图可见，随着反应深度的增大，反应产物的分布也在变化。作为中间产物的汽油和中间馏分油的产率，在反应进行到某个深度时会出现最大值，而作为最终产物的气体和焦炭则在某个反应深度时开始产生，并随着反应深度的增大而单调地增大。

(1) Features with high tendency to coking 生焦倾向性高的特征

In addition to the high content of colloids and asphaltenes, residues are easy to coke during thermal reaction. Futhermore, the interaction between different families of hydrocarbons accelerates the coke reaction. The aromatic hydrocarbon has high thermal stability, and when the reaction is taken place alone, not only the cracking reaction rate is low, but also the coke formation speed is low. For example, the reaction is taking place under 450°C to produce 1% coke, the alkane ($C_{25}H_{52}$) is 144 minutes, the decalin is 1650 minutes, and the naphthalene is 670000 minutes. However, if the naphthalene is mixed with an alkane or an olefin and then subjected to a thermal reaction, the production rate is remarkably improved.

渣油热反应时容易生焦，除了由于渣油自身含有较多的胶质和沥青质外，还因为不同族的烃类之间的相互作用促进了生焦反应。芳香烃的热稳定性高，在单独进行反应时，不仅裂解反应速度低，而且生焦速度也低。例如在 450℃下进行反应，要生成 1%的焦炭，烷烃（$C_{25}H_{52}$）要 144 分钟，十氢萘要 1650 分钟，而萘则需 670000 分钟。但是如果将萘与烷烃或烯烃混合后进行热反应，则生成速度显著提高。

The crude oil with a lot of colloid, if it is diluted with oil without colloid and stable to heat, the amount of coke can be reduced. Therefore, it can be seen that when two crude oil with different chemical compositions are mixed for thermal reaction, more or less coke is generated than when they are separately reacted. Attention should be paid to the blending of crude oil.

含胶质较多的原料油，如将它用不含胶质且对热很稳定的油品稀释，可以使生焦量减少。由此可见，当两种化学组成不同的原料油混合进行热反应时，所生成的焦炭可能比它们单独反应时更多，也可能减少。在进行原料油的混合时应予以注意。

According to many experimental results, the process of coke formation can be roughly described as follows:

根据许多实验结果，焦炭生成的过程大致可以描述如下：

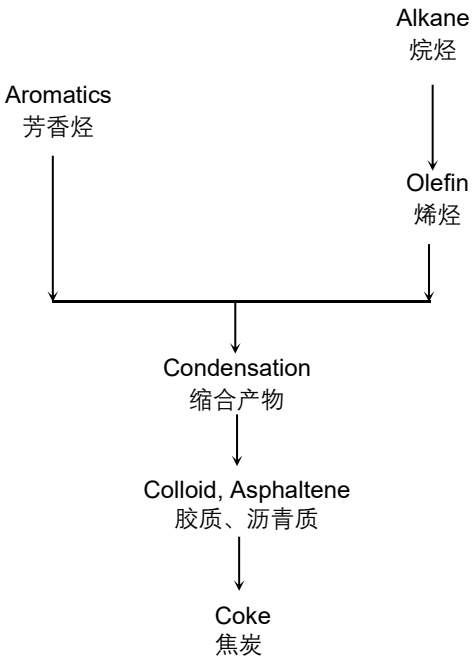


Figure 3: Coke production process

图 3：焦炭生成过程

气化炉、加热器内的焦炭气化反应方程式如下：

$C+H_2O=CO+H_2$-131KJ/mol

$CO+ H_2O =CO_2+H_2$+42KJ/mol

C+0.5 O2=CO+111KJ/mol

$C+O_2=CO_2$+394KJ/mol

$CO+2H_2=CH_4$+74KJ/mol

$C+CO_2=2CO$-172KJ/mol

CokeS+CO=COS+CokeS

$COS+ H_2O =H_2S+ CO_2$+heat

(1) Phase separation characteristics 相分离特征

The vacuum residue is a colloidal dispersion system in which the dispersed phase is based on asphaltenes and adsorbs micelles formed of colloid. Due to the peptization of the gum, the residue colloid system is relatively stable before being heated. During the thermal conversion process, the colloidal properties of the residue are destroyed when the reaction proceeds to a

certain depth due to changes in the chemical composition of the system. Due to the condensation reaction, the content of asphaltenes as a dispersed phase in the residue gradually increases. The cracking reaction not only makes the viscosity of the dispersion medium decrease, but also makes the aromaticity weaken. At the same time, the colloidal content as the colloidal component decreases gradually. These changes will result in poor compatibility between dispersed phase and dispersed medium. When this change trend develops to a certain extent, the asphaltene can not be completely dissolved in the stable colloid in the system, but some of the asphaltene aggregates, and a second phase (liquid phase) appears in the residue.The high concentration of bituminous in the second phase promotes the condensation coke reaction.

减压渣油是一种胶体分散体系，其分散相是以沥青质为核心并吸附以胶质形成的胶束。由于胶质的胶溶作用，在受热之前渣油胶体体系是比较稳定的。在热转化过程中，由于体系的化学组成发生变化，当反应进行到一定深度后，渣油的胶体性质就会受到破坏。由于缩合反应，渣油中作为分散相的沥青质的含量逐渐增多，而裂解反应不仅使分散介质的粘度变小，还使其芳香性减弱，同时，作为胶溶组分的胶质含量则逐渐减少。这些变化都会导致分散相和分散介质之间的相容性变差。这种变化趋势发展到一定程度后，就会导致沥青质不能全部在体系中稳定地胶溶而发生部分沥青质聚集，在渣油中出现了第二相（液相）。第二相中的沥青质浓度很高，促进了缩合生焦反应。

1.1.3 Brief description of the process flow 工艺流程简要说明

1.1.3.1 Reaction gasification section 反应气化部分

155℃ vacuum residuum (VR) from refinery, after flowing through coking gas oil/light vacuum residuum heat exchanger(E-231), middle circulating oil/vacuum residuum heat exchanger (E-230),fractionator bottom circulating oil/vacuum residuum heat exchanger (E-209) and coking heavy oil/vacuum residuum heat exchanger (E-206), is heated up to about 270 ℃ and entering into the vaccume residue feed drum (D-107). After being pressurized by the vacuum residue feed pump (P-107A/B), it enters the bottom of the reactor scrubber (C-101).

155℃的减压渣油(VR)自装置外来，经过焦化轻蜡油/减压渣油换热器(E-231)、中段循环油/减压渣油换热器(E-230) 、分馏塔底循环油/减压渣油换热器(E-209)及焦化重蜡油/减压渣油换热器(E-206)换热后升温至约 270℃进入减渣原料缓冲罐(D-107)。经减压渣油进料泵(P-107A/B)升压后，进入反应器洗涤塔(C-101) 塔底。

The vacuum residue entering the bottom of the scrubber is mixed with the heavy components from the circulating condenses. The circulating oil at the bottom of the scrubber is withdrawn and divided into two streams. One stream is boosted by slurry pumparound pump (P-102A-D) at the bottom of the scrubber and cooled by the slurry pumparound steam generator (E-101) at the bottom of the scrubber and returned to the she row on the top of the scrubber; the other stream is pressurized by the reactor feed pump (P-101A/B), and enters the reactor (R-101) in 6 layers from different heights. If the refinery sludge needs to be recycled and refined again, a stream of sludge enters the middle of reactor and react with coke

进入洗涤塔底的减压渣油与循环油冷凝下来的重组分混合。洗涤塔底循环油从洗涤塔底部抽出后分为两路，一路经洗涤塔底循环油泵(P-102A-D)升压并经洗涤塔底循环油蒸汽发生器(E-101)降温后打回洗涤塔人字挡板上方（部分返回至洗涤塔底）；另一路经反应进料泵(P-101A/B)升压，分 6 层从不同的高度段进入反应器(R-101)反应。如果回炼炼厂污泥，则有一股污泥从中部进入反应器反应。

The vacuum residue feed first passes through the bottom of the scrubber(C-101) before entering the nozzle, and because the vacuum residue feed and the circulating oil at the bottom of the scrubber are used as a cold source,the heavy components in the oil and gas are condensed .This procedure is used to control the recycle cut point (RCP) of the recycled HKGO The RCP specification for this unit is 489℃.

减渣进料在进喷嘴之前首先经过洗涤塔(C-101)底，这股减渣进料与洗涤塔底循环油作为冷源，将油气中的重组分冷凝下来。该流程用于控制循环焦化重蜡油的干点(RCP)，本装置的 RCP 指标为 489℃。

A section of the packing is set at the top of the scrubber(C-101), and the reaction vapor is further washed with the wash oil from the bottom of fractionation bottom, where the coke is substantially washed. The packing section can also collect the droplets carried by reaction vapor. After being washed, the reaction vapor enters the bottom of the fractionationor (C-201).

在洗涤塔(C-101)顶部设置有一段填料，用分馏塔底油进一步洗涤反应油气，在此将焦粉基本洗净。该填料段也可回收上升油气携带的的液滴。经洗涤后，油气进入主分馏塔(C-201)底部。

The mixed feed is sprayed into the reactor by high-pressure steam atomization through a nozzle distributed along the circumference of the reactor (R-101) ,which contacts with the circulating hot coke and undergoes thermal cracking reaction. The nozzle adopts stratified feed, and the crude oil can penetrate into the coke bed through high pressure drop to avoid the tendency of "humidification" of coke production, so as to prevent the coke from forming into large chunks and causing poor fluidization.

混合进料通过沿反应器(R-101)圆周分布的喷嘴经高压蒸汽雾化后喷入反应器，与循环热焦粉接触并发生热裂化反应。喷嘴采用分层进料，通过高压降使原料有力地渗透进入焦粉床层，避免产生生焦“潮湿化”倾向，以防焦粉结成大块导致流化不畅。

A continuous coke cycle is established between the reactor and the heater. The cold coke is sent to the heater (R-102) through the cold coke transfer line; the hot coke is transported to the reactor from the heater. Hot coke is used as a heat carrier that provides heat for thermal cracking reactions and feed gasification. The reaction vapor is taken up through the reactor cyclone (CY-101A-C) to collect the coke carried therein and then enters the scrubber. The coke carried with reactor vapor is recycled to the reactor bed through cyclone.

在反应器与加热器之间建立连续的焦粉循环。冷焦通过冷焦线送至加热器(R-102)；热焦则从加热器压送至反应器。热焦粉同时也是热载体，为热裂化反应及进料气化提供热量。反应油气上行通过反应器旋风分离器(CY-101A-C)回收其中携带的焦粉后进入洗涤塔。油气中携带的焦粉被旋分回收至反应器床层。

Another stream of hot coke is introduced to the cyclone inlet as a scouringcoke, which not only helps to improve the superheat of the reaction vapor, but also suppresses the coking tendency of heavy components at the top of the reactor. At the same time, part of the coke chunks that has been on the inner wall of the cyclone can be washed away.

另一路热焦作为冲刷焦引至旋分入口，不仅有利于提高反应油气的过热度，还可抑制重组分在反应器顶的结焦倾向。同时可冲刷掉旋分内壁已结的部分焦块。

The reaction vapor, atomizing steam and stripping steam keep the coke fluidization in the reactor, and the stripping steam is injected at the bottom of the reactor to strip the hydrocarbon entrained by the coke to reduce product loss. If the hydrocarbons are carried into the heater, they will condense in the heater and the following system, which is easy to scale.

反应油气、雾化蒸汽及汽提蒸汽使焦粉在反应器内保持流化状态，在反应器底部注入的汽提蒸汽可将焦粉夹带的烃类汽提出来，减少产品损失。未被汽提出的烃类如果进入加热器，将在加热器及后路系统冷凝，易结垢

The reactor temperature is adjusted by controlling the amount of hot coke entering the reactor and the circulating amount of scouring coke. The reactor level is adjusted by controlling the circulating amount of cold coke returned to the heater. The control of the circulation amount is realized by adjusting the openings of the slide valve.

通过控制进入反应器的热焦及冲刷焦的循环量，调节反应器温度。通过控制返回至加热器的冷焦循环量，调节反应器料位。循环量的控制由调整滑阀开度实现。

The exothermic reaction occurring in the gasifier transfers heat to the reactor via a heater ,providing heat for the thermal cracking reaction. After the cold coke returns to the heater, it is reheated by the high temperature gas at the outlet of the gasifier and the circulating coke. The change in the flowrate of the coke between the heater and the gasifier causes the temperature of the heater change. The temperature control means of the heater is to change the flowrate of the trim air.

在气化器发生的放热反应经加热器将热量传递给反应器，为热裂化反应提供热量。冷焦返回加热器后被气化器出口高温气体及循环焦粉重新加热。加热器与气化器之间来往的焦粉流量变化会引起加热器的温度变化，加热器的控温手段是改变调温主风的流量。

Since the level of the heater is allowed to fluctuate within a certain range, the heater can be used to absorb fluctuation in the inventory of the other two of the three heaters . When the level needs to be controlled, the air ratre of the gasifier can be adjusted; the level can also be adjusted slightly by changing the discharge amount of the coke bed.

由于加热器的料位允许在一内范围内波动，加热器可用于吸收三器中其他两器的藏量变化。当其料位需要控制时，可调整进气化器的主风量；也可通过改变床层焦的卸出量对料位进行小幅调整。

The Flexigas is extracted from the top of the heater after collecting the carried coke through the two-stage cyclones on the top of the heater(CY-102/CY-103A-H).The coke fines which is not recovered by two-stage cyclones, enters the following system. This part of the coke fines carries a certain proportion of metal, and most of the metal content in the feedstock can be discharged through this channel.

灵活气通过加热器顶的两级旋风分离器(CY-102/CY-103A-H)回收携带的焦粉后从加热器顶部引出。未被两级旋分回收的细焦粉进入后部系统，这部分细焦粉携带一定比例的金属，原料中的大部分金属含量可通过该渠道排出。

The air from the air blower(K-101)enters the gasifier(R-103) and takes place incomplete combustion with the coke. Heat is released to gasify most cokes. The addition of steam drives both gasification and transformation reactions to produce a mixture of N2, CO2, CO, H2, CH4 and water, and some hydrogen sulfide. The temperature of the gasifier is determined by the balance between the endothermic reaction and the exothermic reaction of coke combustion. There is no cyclone on the top of the gasifier. The Flexigas carrying coke on the top of the gasifier is cooled by coke in the quench section to protect the internals of the heater before entering the heater.

从主风机(K-101)来的主风进入气化器(R-103)，与焦炭发生不完全燃烧。放出热量使绝大多数的焦炭气化。加入蒸汽的作用可同时驱动“气化”和“变换”反应。生成含有 N_2、CO_2、CO、H_2、CH_4

和水的混合物，还含有一定的硫化氢。吸热反应和焦炭燃烧的放热反应之间的平衡决定了气化器的温度。气化器顶部未设置旋分，气化器顶部携带焦粉的气体在进入加热器之前，在急冷段被焦粉冷却以保护加热器的内件。

Most of the metals in the feedstock leave the capacity of compressor/ heater /reactor system through fine coke. In order to restrain the metal accumulation in the gasifier to form slag, it is necessary to discharge some bed coke. This part of the bed coke first enters the coke quench drum, which is cooled and then sent to the bed coke silo by pneumatic conveying.

原料中大部分金属通过细焦粉离开三器系统藏量，为抑制金属在气化器积聚形成熔渣，还需外排部分床层焦。这部分床层焦先进入焦炭急冷罐，被冷却后用气力输送方式送至床层焦料仓。

The Flexigas leaves the top of the heater and enters the following system to be used as refinery fuel gas after purification and desulphurization. The coke fines collected by the purification process will be sent to outside of the plant in the form of product coke. The desulphurization process produces an sour gas which is sent to the sulphur plant.

灵活气离开加热器顶，进入后部系统，通过净化、脱硫处理去作炼厂燃料气。净化过程回收下来的细焦粉，将以产品焦的形式送出装置。脱硫过程产生酸性气送至硫磺装置。

Since the desulfurization reaction needs to be carried out at a lower temperature, the Flexigas first needs to be cooled after leaving the heater, and the medium pressure steam generated by the E-102/E-103 is used to cool it. The saturated steam generated by E-102 and the slurry pumparound and the fractionators bottom oil are sent to the medium pressure steam superheating furnace (F-102) to superheater and the superheated medium pressure steam is used for consumption of inside the plant.

由于脱硫反应需要在较低温度下进行，灵活气离开加热器后首先需要降温，通过 E-102/E-103 发生中压蒸汽使其降温。E-102 及洗涤塔循环油及分馏塔底油发生的饱和蒸汽至中压蒸汽过热炉(F-102)进行过热，过热的中压蒸汽用于装置内部使用。

The sludge enters the reactor to refine in a discontinuous mode, which can only enter the sludge-specific nozzle.There are 2 special nozzles for sludge, one is in service and one is in standby, which are not allowed to be used at the same time. The feed volume of a single nozzle for sludge is generally 3.3 m^3/h.

污泥进入反应器回炼为间断模式，只能进入污泥专用喷嘴。设有 2 台污泥专用喷嘴，1 开 1 备，不允许同时投用。单支喷嘴污泥进料量一般为 3.3m^3/h。

The sludge feed has a large heat absorption, which will affect the reaction heat balance. When sludge refining is put into service, it is necessary to increase the amount of hot coke circulation to maintain the reactor temperature unchanged. The composition of the sludge also has a great

influence on the reaction. When the water content in sludge is too high, in order to maintain the same heat balance, when one part sludge are fed,3 parts of the vacuum residue crude oil need to be withdrawn. If the solids content of the sludge is too high, it is also possible to block the feed nozzle.

污泥进料吸热较大，会影响到反应热平衡。投用污泥回炼时，需加大热焦循环量以维持反应器温度不变。污泥的组成也对反应有较大影响，含水较多时，为维持同样的热平衡，进 1 份污泥进料需退掉 3 份减渣原料。若污泥中固体含量过多时，还有可能堵塞进料喷嘴。

Based on the above reasons, a sludge back-refining tank (D-102) and two sludge back-refining pumps (P-103A/B) were installed in the sludge feed system.The designed capacity of the sludge back-refining tank is 15m^3, and the capacity of the sludge back-refining pump is 23 m^3/h. The flowrate through the minimum flow line is 20 m^3/h.Such an arrangement provides sufficient agitation of the sludge system to prevent solids from settling within the tank.

基于以上原因，污泥进料系统设置了 1 台污泥回炼罐(D-102)和 2 台污泥回炼泵(P-103A/B)。其中污泥回炼罐设计容量 15m^3，污泥回炼泵的能力为 23 m^3/h。通过最小流量线的流量为 20 m^3/h。这样的设置可以为污泥系统提供充分的搅拌，以防固体在罐内沉降。

1.1.3.2 Fractionationor and Light End section 分馏和吸收稳定部分

The reaction vapor(at 386℃) from the scrubber overhead enters the bottom of the fractionator (C-201). The vapor are fed into the fractionator from the two inlets opposite to the fractionation. A 1700 mm high washing grid is placed at the bottom of the fractionator. The section of the grid is required to meet the high efficiency requirements of gas-liquid contact, and also to reduce the tendency of the coking there.

386℃的反应油气自反应器洗涤塔顶进入主分馏塔(C-201)底部，油气分两路从分馏塔正对的两个入口进塔，在分馏塔底部设置了一段 1700mm 高的洗涤格栅。该段格栅既要满足气液接触的高效需求，也需降低焦粉在该处的结垢倾向。

Controlling the temperature of the reaction vapor under the coking heavy oil collecting tank can control the recycle cut point of the HKGO, which is also the basis for establishing the circulation between the scrubber and the reactor.In general, the higher the control RCP (cyclic cut point), the better it is, so that the circulation ratio is minimized and the total liquid yield is maximized. When the HKGO is sent to the hydrocracking unit, the control index needs to preferentially meet the requirements of the downstream unit. For this plant, it is necessary to control the temperature of the top of the scrubber to be no more than 386℃.

控制焦化重蜡油集油箱下方油气温度，可控制焦化重蜡油的切割点，该切割点也是建立洗涤塔与反应器之间循环的基础。一般来讲，控制 RCP（循环切割点）越高越好，这样可使循环比最小同时总液收最大。当焦化重蜡油去加氢裂化装置时，该控制指标则需优先满足下游装置要求。对于本装置而言，需要控制洗涤塔顶温度不大于 386℃。

The fractionator bottom oil is collected into the bottom diameter reduction section, and liquid level control is set in this section.The fractionator bottom oil generates steam through E-210, and the bottom oil flowrate of the fractionator is controlled to achieve a diameter reduction section of 343℃ and a temperature range from 329 to 368℃. The purpose of temperature control is to reduce the tendency of olefin polymerization and inhibit column bottom coking. The E-210 produces a steam-water mixture into the common steam drum (D-103), which is naturally circulated.

分馏塔底油汇集到塔底缩径段，在该段设置液位控制。分馏塔底油通过 E-210 发生蒸汽，控制分馏塔底油流量以实现缩径段温度为 343℃，温度范围为 329-368℃。控温的目的是降低烯烃聚合倾向，抑制塔底结焦。E-210 产生汽水混合物进入共用汽包(D-103)，汽水循环采用自然循环方式。

The bottom oil of the fractionator that is recycled to the other side of the scrubber is provided with a filter (STR-204A/B) before entering the column C-101, and the coke is filtered out to avoid coke formation the washing nozzle.

循环至洗涤塔另一路的分馏塔底油，在进塔 C-101 前设置过滤器(STR-204A/B)，滤掉其中焦粉以免堵塞洗涤喷头。

The HKGO collecting tank is arranged above the bottom washing grid section and is used for collecting and providing BPA Wash Oil and herringbone washing oil (BPA). The HKOG products are also carried out from here.The three streams of HKGO are pressurized by P-206A/B, and the coking heavy gas oil product is sent to the coking heavy gas oil stripper (C-203).

焦化重蜡油集油箱设置在塔底洗涤格栅段的上方，负责收集并提供格栅洗涤用油(BPA Wash Oil)及人字挡板洗涤用油(BPA)，焦化重蜡油产品也从该处引出。这三路焦化重蜡油均通过 P-206A/B 升压，焦化重蜡油产品被送至焦化重蜡油汽提塔(C-203)。

BPA Wash Oil is equipped with a filter (STR-203A/B) before returning to the washing grid section so that the coke is filtered out to avoid coking the washing nozzle.The BPA Wash Oil needs to maintain a constant flow rate and cannot be interrupted to prevent the grid section from fouling. Therefore, one stream of the HKGO used for BPA Wash Oil and the circulating oil from fractionator bottom for recycling to the scrubber need to be set in the DCS so that the flowrate cannot be lowered than the minimum flow requirement.

BPA Wash Oil 在返回洗涤格栅段之前，设置过滤器(STR-203A/B)，目的也是滤掉其中焦粉以免堵塞洗涤喷头。该 BPA Wash Oil 需保持持续稳定流量，不能中断，以防格栅段结垢。因此，作 BPA Wash Oil 的这股焦化重蜡油以及循环至洗涤塔的分馏塔底循环油都需要在 DCS 进行设定，使其流量不能低于最小流量要求。

Another stream of HKGO as BPA is also pressurized by P-206A/B. After the exchanger with vacuum residue through E-209,the temperature of BPA is reduced to 290℃ and returned to the fractionator. BPA above the herringbone baffle is distributed through six branch pipes to ensure that they are distributed as evenly as possible above the herringbone baffle. The herringbone baffle is set to 16 layers. Before the BPA returns to the column, a filter (STR-202A/B) is provided for filtering out the coke to avoid coking the branch pipe.

作为 BPA 的另一路焦化重蜡油也经 P-206A/B 升压，通过(E-209)与减压渣油换热温度降低至 290℃后返回分馏塔，BPA 在人字挡板上方采用 6 个分支管进行分配，保证其进入人字挡板上方尽可能均布。人字挡板共设置 16 层。BPA 返塔前，为滤掉其中焦粉以免堵塞分支管，设置过滤器(STR-202A/B)。

The third stream of the P-206A/B outlet is a HKGO product. After being discharged from the pump, it first enters the HKGO stripper (C-203).The 12-layer baffle tray is set inside the stripper. The amount of stripping steam and the HKGO product are controlled by ratio, and the light components in the HKGO can be stripped out. The position of the C-203 overhead oil and gas returning to the column is above the herringbone baffle.

P-206A/B 出口的第三股物流为焦化重蜡油产品，出泵后首先进入焦化重蜡油汽提塔(C-203)。汽提塔内件设置 12 层折流塔盘。汽提蒸汽用量与焦化重蜡油产品采用比值控制，可汽提出焦化重蜡油中的轻组分，C-203 塔顶油气返塔位置在人字挡板上方。

The HKGO at the bottom of C-203 column continues to be pressurized by pump P-205 to meet the pressure requirements for coming out of the plant.The HKGO is first exchanged the heat with the crude oil through E-206, then low-pressure steam is generated in E-207, and finally cooled down to 120℃ through the air-cooled A-208.

C-203 塔底的焦化重蜡油产品继续用泵 P-205 升压，满足出装置压力要求。焦化重蜡油先经 E-206 与减渣原料换热，接着在 E-207 发生低压蒸汽，最后经空冷 A-208 冷却至 120℃出装置。

The HKGO product goes to the normal downstream unit namely the hydrocracking unit, and there is also another process flow directly entering the tank. Flow control is set on both of these two routes, and the flow rate of coming out of the plant is also used to control the liquid level of the column C-203. The pressure of coming out of the plant is 1.0 MPa (G).

焦化重蜡油产品去向正常去下游加氢裂化装置，另有流程直接进罐。这两路上均设置流量控制，出装置流量也用于控制塔 C-203 液位。出装置压力 1.0MPa(G)。

An oil collection tank is arranged above the light/heavy gas oil separation packing section to collect and supply the inside reflux and product in the coking light gas oil. The internal reflux is pressurized by P-22A/B and filtered through a filter of (STR-205A/B),and then returns to the column. The coking light gas oil product flows into the coking light gas oil stripper (C-210) by gravity.

在轻/重蜡油分离填料段上方设置集油箱，收集并提供焦化轻蜡油内回流及产品。其中内回流经 P-22A/B 升压经过滤器(STR-205A/B)过滤后返塔。焦化轻蜡油产品自流进入焦化轻蜡油汽提塔(C-210)。

The stripped LKGO is pressurized by pump P-227 to meet the pressure requirements of coming out of the plant. The coking light gas oil is first exchanged the heat with the vacuum residue raw material through E-231, and then cooled down to 120℃ through the air-cooled A-233.

经汽提后的焦化轻蜡油用泵 P-227 升压，满足出装置压力要求。焦化轻蜡油先经 E-231 与减渣原料换热，然后经空冷 A-233 冷却至 120℃出装置。

The stripped LKGO through C-210 can be used as instrument flushing oil and equipment purging oil. The flushing oil system is equipped with flushing oil tank (D-210), flushing oil pump (P-218A/B) and three flushing Oil heads. FLOH is high pressure flushing oil with a pressure of 1.86 MPa; FLOLI is a low pressure flushing oil with a pressure of 1.05 MPa. There is also another stream of FLOH introduced from the FLOL in front of the filter for equipment maintenance and flushing.The last one is used for pump flushing.The temperature is controlled through E236.

经 C-210 汽提后的焦化轻蜡油可用作仪表冲洗油及设备置换油，冲洗油系统设有冲洗油罐(D-210)、冲洗油泵(P-218A/B)、三个冲洗油总管和一个机泵密封冲洗油总管。分别为 FLOH 为高压冲洗油，压力 1.86MPa；FLOLI 为低压冲洗油，压力 1.05MPa。还有一路 FLOL 在过滤器前引出，用于设备检修冲洗。最后一路是机泵密封冲洗油，通过 E236 控制温度。

In the middle section of the fractionator, the reflux MPA section is provided with four layers of directional fixed trays. The main function of this section is heat transfer, and the heat taken up in the middle section accounts for 15-20% of the total heat load of the column. The heat of middle section can be used as the heat source of the reboiler of desorption bottom. The reflux from the middle section is 251℃and is pumped out from oil collecting tank at the middle section. It is divided into two streams by the pump P-204, one large stream of the reflux is sent to the

absorption and stabilizer as the heat source; a small stream of is used as the medium section reflux (MPA Reflux), after being filtered through the filter (STR-201A / B) and it returns to the column. The purpose of the filtration is also to filter out the coke powder, so that clogging the washing nozzle can be avoided. After returning to the column, the medium section reflux (MPA Reflux) is sent to the diesel/light gas oil separation packing section which is located below the oil collection tank at the middle section .

分馏塔中段回流 MPA 段设置 4 层固舌塔盘，该段主要功能是传热，中段回流的取热占总塔热负荷的 15-20%。中段热量可用作解吸塔底重沸器热源，中段回流 251℃自中段集油箱抽出，经泵 P-204 升压分为两股。一股大量至吸收稳定作热源；一股小量为中段内回流(MPA Reflux)，经过滤器(STR-201A/B)过滤后返塔。过滤的目的同样是滤掉其中焦粉以免堵塞洗涤喷头。中段内回流(MPA Reflux)返塔后进入柴油/轻蜡油分离填料段，该填料段位于中段集油箱下方。

The heat source of the reboiler (E-216) at the bottom of desorption column is supplied by the middle section refulx,and the desorption effect is used to control the heat load. A middle section circulating oil/vacuum Residue heat exchanger (E-230) is arranged in parallel with the E-216. The function of the E-230 is to adjust the temperature of returning to the column at the middle section. The middle section after heat exchange returns to the fourth layer of tray from the bottom.

解吸塔底重沸器(E-216)的热源由中段回流提供，用解吸效果来控制取热负荷。与 E-216 并联设置了中段循环油/减压渣油换热器(E-230)，E-230 的作用是调整中段返塔温度。换热后的中段回流返回下数第 4 层塔盘。

A portion extraction hopper is placed in the fourth layer tray, from which the diesel is withdrawn. When the downstream unit adjusts the diesel feed rate, the distillation range of the diesel will be affected accordingly. Part of the diesel fuel is also sent to the sponge absorber (C-205) as lean sponge oil. Diesel is self-flowing from the 4th tray to the diesel stripper (C-202), and the C-202 is equipped with 6 layers of sieve trays.

在第 4 层塔盘设置了部分抽出斗，柴油从此处抽出。下游装置在调整柴油进料量时，柴油的馏程会受到相应影响。部分柴油还用作贫吸收油送至再吸收塔(C-205)。柴油自第 4 层塔盘自流至柴油汽提塔(C-202)，C-202 设置 6 层筛孔塔盘。

The stripped diesel oil is extracted from C-202 and pressurized by pump P-203 to meet the requirements of coming out of the plant with a pressure of 0.85 MPa (G).After being discharged from the pump,the diesel first exchanges heat with the rich sponge oil in E-203. After the heat exchange, the temperature of the diesel is cooled by 100℃. The purpose of heating the rich sponge oil is to completely vaporize the free water in it, and the heated rich sponge oil is returned to the sixth layer tray from the bottom.

经汽提的柴油自 C-202 抽出，经泵 P-203 升压，满足出装置压力 0.85MPa(G)的要求。出泵后，柴油首先在 E-203 与富吸收油换热。换热后柴油温度为 100℃，加热富吸收油的目的是使其所含的游离水完全气化，加热后的富吸收油返回下数第 6 层塔盘。

The 100℃diesel can be sent directly to the downstream unit via a hot material discharge process procedure. The temperature of hot diesel discharge is 100℃ and the pressure is 0.85 MPa (G).Diesel needs further is cooled when choosen to be pumped to the tank process.

100℃的柴油可以通过热出料流程直送至下游装置。柴油热出料温度为 100℃压力为 0.85MPa(G)。在选择走去罐流程时，柴油还需进一步冷却。

The diesel used as lean sponge oil required further cooled, and then cooled with air through A-204 and finally cooled down to 40℃ with circulating water via E-205. The cold diesel discharge can be taken from there, and the temperature is 40℃ and the pressure is 0.6 MPa (G).Diesel continues to be as lean sponge oil, which needs to be pressurized by pump P-225 before entering the column C-205, and flow control is set before entering the column.

用作贫吸收油的柴油需要进一步冷却，接下来经 A-204 用空气冷却后再经 E-205 用循环水冷却至 40℃。柴油冷出料可从该处引出，温度为 40℃压力为 0.6MPa(G)。继续作贫吸收油的柴油在进塔 C-205 前，还需经泵 P-225 升压，进塔前设置流控。

The pressure of the fractionator overhead is 0.061 MPa (G), which is controlled by the rotation speed of the compressor (K-201).When Fractionator overhead vapor leaves the overhead 16th tray, the temperature of it is 106℃, and a sufficient temperature difference is left to prevent the water from condensing from the top of the fractionator.The top of the column is equipped with two stages of condensation, the first stage air cooler A-201 is cooled by air, and the second stage E-202 is water cooled. After two-stage condensation, the vapor and condensate whose temperature has dropped to 44℃ enter the fractionator overhead reflux tank (D-201) , and the operating pressure of D-201 is 0.03 MPa (G), where three-phase fractionation is carried out to separate vapor, crude gasoline and sour water.

分馏塔顶压为 0.061MPa(G)，通过气压机(K-201)转速进行控制。油气离开塔顶第 16 块塔盘时，温度为 106℃，距离分馏塔顶析出冷凝水留有足够温差。塔顶油气设置两级冷凝，第一级进空冷器 A-201 用空气冷却，第二级 E-202 为水冷。两级冷凝后温度降至 44℃的油气及凝液进入分馏塔顶回流罐(D-201)，D-201 操作压力为 0.03MPa(G)，在该处进行三相分馏，分出油气、粗汽油及酸性水。

The untreated naphtha separated from D-201 is returned to the fractionator through a cold reflux pump (P-201) as a cold reflux to control the fractionator overhead temperature. Another steam of untreated naphtha is also pressurized by P-201 and introduced,and then sent to the inlet of the compressor first-stage water cooler (E-211) .Flow control for this stream is set to control the liquid level of D-201. The sour water separated from D-201 is pressurized by pump P-202, and a small amount of sour water is returned to the E-201 inlet to wash the vapor from the top of the fractionators to prevent salt formation. Most of the remaining sour water is

incorporated into the one stream of untreated gasoline pipeline of E-211. Flow control for this stream of sour water is set to control the liquid level of D-201.

自 D-201 分出的粗汽油经冷回流泵(P-201)返塔作为冷回流控制塔顶温度。另有一股粗汽油也经 P-201 升压后引出，送至压缩机一级水冷器(E-211)入口，为该股物流设置流控来控制 D-201 的液位。

Sour water from D-201flows through P-202 pump where it is pressurized. A little of sour water turns back to E-201 inlet washing overhead oil vapor, and is used for salt scaling prevention. Most of sour water merges into crude gasoline piping of one circuit of E-211. This sour water circuit is provided with flow control to control the interface level in D-201.

自 D-201 分出的酸性水经泵 P-202 升压，少量酸性水返回 E-201 入口洗涤分顶油气，用于防止结盐。其余多数酸性水并入至 E-211 一路的粗汽油管线上。该路酸性水设置流控用于控制 D-201 界位。

At the inlet of the sour water pump P-202, an ammonium polysulfide solution needs to be injected to remove the HCN (cyanide) carried in the oil and gas from the top of the fractionators.

在酸性水泵 P-202 入口需注入多硫化铵溶液，用于去除分顶油气中携带的 HCN（氰化物）。

When it is judged that salt formation may occur on the top of the fractionator, the water washing process needs to be activated.In order to corporate with this operation, the treatment amount of the fractionator should be appropriately reduced, and the overhead temperature of the fractionator is lowered due to water injection to the overhead. A water hopper is provided at the 11-layer tray for collecting the wash water, and then returns to the overhead oil and gas pipeline of the fractionator by gravity flow.

当判断分馏塔顶可能出现结盐时，需启用水洗流程。为配合该操作，塔的处理量需适当降低，由于塔顶注水，塔顶的温度会降低。在 11 层塔盘处设置有水斗，用于收集洗涤水，之后通过重力流返回分馏塔顶油气管线。

The absorption and stabilization section receive the untreated gasoline and compressed the rich gas. The coker gas, the coking liquefied gas and the coker naphtha product are separated .This section consists of a compressor, an absorption desorption column.

吸收稳定系统出焦化干气、焦化液化气及焦化石脑油产品。该部分由气压机、吸收解吸塔、再吸收塔及稳定塔组成。

From the perspective of improving the yield of the target product, the lower the inlet pressure of D-201, the better it is , but it is also necessary to maintain a positive pressure to prevent air from entering the rich gas system.The centrifugal compressor is equipped with three-stage compression, the discharge pressure meets the requirements of the absorption desorption column, and the outlet temperature is controlled below 120 °C to prevent polymerization at high temperature.The compressor is driven by a back pressure steam turbine.

从提高目的产品收率角度出发，D-201 的入口压力越低越好，但还需维持正压，以防空气进入富气系统。离心压缩机设置了三段压缩，出口压力满足吸收解吸塔的要求，出口温度控制在 120℃以下，以防高温下产生聚合。气压机由背压蒸汽透平驱动。

The first-stage compression of the compressor increases the rich gas pressure from 0.02 to 0.245 MPa (G), and incorporates crude gasoline and acidic water at the first-stage compression outlet, which has the double purpose of energy saving and salt formation prevention.After the mixture was condensed by E-211, the temperature was lowered to 40°C and then sent to D-202 for separation. The pressure of D-202 is 0.201 MPa (G), and the crude gasoline separated by D-202 is pressurized by pump P-209 and sent to the 45th tray of the absorption desorption column; the acidic water separated by D-202 is pressurized by the P-210 and sent to the second-stage outlet of the compressor as washing water and then enters the compressor second-stage water cooler (E-212); the oil and gas separated by D-202 enters the second-stage inlet of the compressor for compression, and the second-stage outlet pressure is 0.726 MPa (G).

气压机一级压缩将富气压力从 0.02 提高至 0.245MPa(G)，在一级压缩出口并入粗汽油及酸性水，有节能和防止结盐的双重目的。混合物经 E-211 冷凝后温度降低至 40℃后进入 D-202 进行分离。D-202 压力为 0.201MPa(G)，经 D-202 分出的粗汽油经泵 P-209 升压后送至吸收解吸塔第 45 层塔盘；经 D-202 分出的酸性水经泵 P-210 升压后至气压机二级出口作洗涤水后进入压缩机二级水冷器(E-212)；经 D-202 分出的油气进入压缩机二级入口进行压缩，二级出口压力为 0.726MPa(G)。

The oil and water from the second-stage outlet are mixed with washing water entering into E-212 and cooled to 40℃ by circulating water, and then enter to D-203 for separation.The pressure of D-203 is 0.682MPa(G), and the crude gasoline separated by D-203 is pressurized by pump P-211 and sent to the 18th tray of the absorption desorption column; the acidic water separated by D-203 by the P-212 and sent to the third-stage outlet of the compressor as washing water, and then enters the compressor three-stage water cooler (E-213); the oil and gas separated by D-203 enters the three-stage inlet of the compressor for compression, and the compressor outlet pressure is 2.207 MPa (G).

二段出口油气与洗涤水混合进入 E-212，被循环水冷却至 40℃后进入 D-203 进行分离。D-203 压力为 0.682MPa(G)，经 D-203 分出的粗汽油经泵 P-211 升压后送至吸收解吸塔第 18 层塔盘；经 D-203 分出的酸性水经泵 P-212 升压后至气压机三级出口作洗涤水，进入压缩机三级水冷器(E-213)；经 D-203 分出的油气进入压缩机三级入口进行压缩，气压机出口压力为 2.207MPa(G)。

The three-stage outlet oil and gas mixed with washing water enters E-213 and is cooled by circulating water to 40℃, and then enters into D-204 for separation.The pressure of D-204 is 2.162 MPa (G), and the crude gasoline separated by D-204 is pressurized by pump P-213 and then merged into the outlet stream of pump P-211, and is also sent to the 18th tray of

absorption and desorption column; The acidic water separated by D-204 is sent to an acidic water collection tank (D-209).
三段出口油气混合洗涤水进入 E-213，被循环水冷却至 40℃后进入 D-204 进行分离。D-204 压力为 2.162MPa(G)，经 D-204 分出的粗汽油经泵 P-213 升压后并入泵 P-211 出口物流，也被送至吸收解吸塔第 18 层塔盘；经 D-204 分出的酸性水送至酸性水收集罐(D-209)。
The upper 24 layer sieve tray of the absorption desorption column (C-204) is an absorption section, and the lower 26 layer sieve tray is a desorption section.The bottom of the column is equipped with a reboiler for the C2 component in the desorption stabilizer feed to meet the overhead liquefied gas product specification of C-207 column. The function of the absorption section is to recover the C3 and above components in the coking dry gas as much as possible. The absorption column pressure is 2.068 MPa (G), and the quality target of dry gas is controlled by adjusting the amount of making up the absorbent.
吸收解吸塔(C-204)的上部 24 层筛孔塔盘为吸收段，下部 26 层筛孔塔盘为解吸段。塔底设置重沸器用于解吸稳定塔进料中的 C2 组分，以满足塔 C-207 顶液化气产品指标。吸收段的作用是尽可能回收焦化干气中的 C3 及以上组分，吸收塔压力取值为 2.068 MPa(G)，干气质量目标通过调整补充吸收剂的量来控制。
Under the operating conditions of C-204, condensed water may appear in the middle of the column. Therefore, a reflux is set at the bottom of the 26th layer of the bottom of the absorption section, which is taken out from the oil collecting tank and cooled to 40℃ by the cooler (E-214) at the middle section of the absorption desorption column,and then it enters the cooler and separator (D-205) of the middle section of the absorption desorption column. The condensation water collected by D-205 is sent to D-209, and the bottom oil of the absorption column is pressurized by pump P-214 and returned to C-204.
在 C-204 操作条件下，塔中部可能出现冷凝水，因此在吸收段底部第 26 层塔盘处设置一个回流，从集油箱抽出，经吸收解吸塔中段冷却器(E-214)冷却至 40℃后进入吸收解吸塔中段冷却器分离器(D-205)，D-205 收集的冷凝水被送至 D-209，吸收塔底油用泵 P-214 升压后返回 C-204。
The gas phase at the top of D-204 and the crude gasoline separated from the second-stage and third-stage knockout drum of the compressor enter the 18th layer of C-204. In the desorption section, the 16th layer tray is provided with a dewatering side line, which is taken out from the oil collecting tank and enters the water settling tank (D-206)of absorption desorption column. The tank is fully operated, and the overflowed hydrocarbons are returned to the 15th layer tray of C-204. The free water collected by D-206 is sent to D-209.
D-204 顶的气相与压缩机二级、三级分液罐分出的粗汽油都进入 C-204 的第 18 层。在解吸段第 16 层塔盘设脱水侧线，该侧线从集油箱引出，进入吸收解吸塔水沉降罐(D-206)，该容器满罐操作，溢流的烃类返回 C-204 第 15 层塔盘。D-206 收集的游离水送至 D-209。
The desorption section is provided with a 2-stage reboiler, wherein the middle-stage reboiler (E-215) is placed on the 8th layer, and the E-215 heat source is stabilized naphtha.The bottom

reboiler (E-216) uses the middle section reflux of the fractionator as a heat source. In order to prevent the condensation and fouling of diolefins contained in the coking naphtha therein, the E-216 is necessary to adopt a concurrent heat exchange process flow.The temperature of the sensitive plate used to control the E-216 load is set on the 4th tray and controlled by the flow rate of the middle section reflux of the fractionator.

解吸段设有 2 段重沸器，其中中段重沸器(E-215)设置在第 8 层，E-215 热源为稳定石脑油。塔底重沸器(E-216)采用分馏中段回流作为热源。为防止焦化石脑油中含有二烯烃在此聚合结垢，E-216 需采用顺流换热流程。用于控制 E-216 负荷的灵敏板温度点设置在第 4 层塔盘上，通过分馏中段回流的流量进行控制。

The heavy components carried in the overhead lean gas of C-204 are further recovered when entering the resorption column (C-205). The C-205 is equipped with a 24-layer sieve tray.The rich absorption oil leaves the C-205 and is heated through the diesel oil /absorption oil heat exchanger (E-203) and returned to the fractionator (C-201). The overhead coking dry gas of the C-205 column is cooled by a dry gas water cooler (E-234) and sent to the outside of the plant.

C-204 顶贫气中携带的重组分在进入再吸收塔(C-205)会被进一步回收。C-205 设置 24 层筛孔塔盘。富吸收油离开 C-205 经过柴油/吸收油换热器(E-203)被柴油加热后返回分馏塔(C-201)。C-205 塔顶的焦化干气经过干气水冷器(E-234)冷却后送至装置外。

The Stabilizer (C-207) is equipped with a 36-layer sieve tray with and the operating pressure of the column is 1.331 MPa (G).

稳定塔(C-207)设有 36 层筛孔塔盘，操作压力 1.331MPa(G)。

The bottom of Stabilizer is equipped with a reboiler (E-220), which uses medium pressure steam as a heat source.Similarly, in order to prevent the condensation and fouling of diolefins in the coking naphtha, the E-220 is necessary to adopt a concurrent heat exchange process flow. The temperature of the sensitive plate used to control the E-220 load is set on the 4th tray and controlled by the steam flow.

稳定塔塔底设有重沸器(E-220)，使用中压蒸汽作为热源。同样为防止焦化石脑油中二烯烃在此聚合结垢，E-220 需采用顺流换热流程。用于控制 E-220 负荷的灵敏板温度点设置在第 4 层塔盘上，通过蒸汽流量进行控制。

The coking naphtha product and the supplementary absorbent at the bottom of stabilizer are firstly exchanged the heat with stabilizer feed through the E-232 after being pressurized by the pump (P-217A/B) of stabilizer, and then sent to E-215 to provide the heat source for the intermediate reboiler of the desorption section.

稳定塔底的焦化石脑油产品及补充吸收剂由稳定塔塔底泵(P-217A/B)升压后首先经 E-232 与稳定塔进料换热，接下来去 E-215 为解吸段中间重沸器提供热源。

The stream flows through A-217 and E-218 and then cooled to 40℃ by air and circulating water. After that, it is divided into 2 routes,one of which add absorbent to the top of C-204

column; Another stream of coke naphtha product leaves the plant with a boundary pressure of 0.85 MPa (G).

之后该股物流经 A-217 和 E-218 被空气及循环水冷却至 40℃。之后分为 2 路，一路补充吸收剂至 C-204 塔顶。另一路焦化石脑油产品出装置，边界压力为 0.85MPa(G)。

The liquefied gas is distilled from the overhead and cooled down to 40℃ through a stabilizer overhead condenser (E-219), and then enters to a stabilizer overhead reflux tank (D-208), and then withdrawn by a stabilizer reflux pump (P-215). After being pressurized , it is divided into two parts, one part is used as the stabilizer reflux, and the other part is sent to the outside of the plant as liquefied gas product.

液化气从塔顶馏出，经过稳定塔塔顶冷凝器(E-219)冷却后至 40℃进入稳定塔顶回流罐(D-208)，再由稳定塔回流泵(P-215)抽出，升压后分为两部分，一部分作为稳定塔回流，另一部分作为液化气产品送至装置外。

1.1.3.3 Flexigas processing section 灵活气处理部分

The flexigas leaving E103 enters the three cyclones and venturi scrubber to remove the fine coke powder, and then enters the direct contact column to remove the moisture and fine coke powder carried by the flexigas.After that, the flexigas enters the COS (carbonyl sulfide) conversion reactor, and the COS contained in the flexigas is converted into hydrogen sulfide by the catalyst. And then the flexigas enters the amine liquid absorption unit to remove H_2S. The control specification of H_2S containing in the final delivery flexigas from the plant is less than 10ppmv and total sulfur is not exceeding 60ppmv.

离开 E103 的灵活气进入三旋和文丘里洗涤器脱除细焦粉，之后再进入直接接触塔，除掉灵活气携带的水分及细焦粉。接下来，灵活气进入 COS（羰基硫）转换反应器，通过催化剂将灵活气所含的 COS 转化成硫化氢。之后灵活气进入胺液吸收单元，除掉其中的 H_2S，最终送出装置的灵活气控制指标为含 H_2S 小于 10ppmv 且总硫不大于 60ppmv。

The cooled flexigas enters the three cyclones,the inlet temperature of three cyclones is 215 ° C, and the pressure is 0.221 MPa (G).The three cyclones can recycle about 62% of the fine coke powder in the flexigas.The recovered fine coke powder enters the bottom cone of the three cyclones container (D-301) through the three cyclones leg. The cone section needs to be provided with external heat tracing, and the fluidizing medium also needs to be heated with nitrogen. Nitrogen was heated to 250℃ by an electric heater (F-301).

经降温的灵活气进入三旋，三旋入口温度为 215℃，压力为 0.221MPa(G)。三旋可回收灵活气中约 62%的细焦粉。回收下来的细焦粉通过三旋料腿进入三旋容器(D-301)底部圆锥。该圆锥段需设置外部伴热，流化介质也需采用加热氮气。氮气通过电加热器(F-301)被加热至 250℃。

The fine powder reclycled by the three cyclones is then sent to the coke powder silo (T-401), and the main air is used as the fluidization medium, and is transferred through the finned tube. The temperature of entering the T-401 is about 60℃.

三旋回收的细粉接下来会被送至焦粉料仓(T-401)，用主风作为流化介质，经翅片管输送，进 T-401 的温度约为 60℃。

After leaving the three cyclones, the flexigas at 215℃ enters the Venturi scrubber (DY-302), and there are multiple sets of nozzles at the throat of the Venturi scrubber where fine coke powder are further removed by spraying water to remove dust and cool off.The diluted slurry with coke enters the venturi separator (D-302) in the tangential direction. The flexigas is separated from the slurry in D-302. Part of the slurry is pressurized and circulated through venturi slurry pump (P-301) ,and then returns to DY-302.In the P-301 discharge pipeline, it is necessary to inject alkali and add the scale inhibitor. In the start-up phase, alkali injection is required, which is used for neutralization the SO_2 with higher concentration in flexigas during the initial stage of the start-up.The scale inhibitor is injected into the P-301 outlet line through the scale inhibitor skid PA-301, which can inhibit the scaling of calcium carbonate and magnesium carbonate on the internals of the baffle tray of the downstream slurry stripper (C-301).

离开三旋，215℃的灵活气进入文丘里洗涤器(DY-302)，在文丘里洗涤器喉道处设有多组喷嘴，经喷水除尘降温，进一步脱除细焦粉。含焦稀浆液沿切线方向进入文丘里分离器(D-302)，在 D-302 内灵活气与浆液分开，部分浆液通过泵文丘里浆液泵(P-301)升压循环，返回 DY-302。在 P-301 出口管线需要注碱及加入阻垢剂，开工阶段需要注碱，用于中和开工初期灵活气中浓度较高的 SO_2。通过阻垢剂撬块 PA-301 在 P-301 出口管线注入阻垢剂，可抑制碳酸钙、碳酸镁在下游浆液汽提塔(C-301)的折流塔盘内件上结垢。

The coke-containing slurry enters the column C-301 after heat exchange between the slurry stripper feed heat exchanger (E-302) and the stripper bottom slurry.The C-301 feed will contain some light components such as NH_3, H_2S and CO, which need to be stripped by low pressure steam to make the bottom slurry free of such materials. In the middle of the column C-301, alkali injection is required to react with chloride ions, which is beneficial to stripping out NH_3 in the slurry.In order to prevent the fine coke powder from clogging the tray, a baffle tray is used. The C-301 column stripping gas is returned to the venturi scrubber (DY-302).

含焦浆液在浆液汽提塔进料换热器(E-302)与汽提塔底浆液换热后进入塔 C-301。在 C-301 进料中将含有部分诸如 NH_3、H_2S 和 CO 的轻组分，需要通过低压蒸汽汽提，使塔底浆液不含此类物质。在塔 C-301 中部需要注碱，使其与氯离子反应，有利于汽提出浆液中的 NH_3。为了防止细焦粉堵塞塔盘，采用折流塔盘。C-301 塔汽提气体返回到文丘里洗涤器(DY-302)。

The diluted slurry from the bottom of C-301 is pressurized by pump P-302, and then exchanged the heat with C-301 feed through spiral plate heat exchanger E-302, and then passed through the diluted slurry cooler (E-303)of spiral plate type. After cooling with circulating water, it is sent to a slurry storage tank (T-403/404).

来自 C-301 底部的稀浆液，用泵 P-302 升压后，与 C-301 进料经螺旋板换热器 E-302 换热后，再经螺旋板式稀浆液冷却器(E-303)用循环水冷却后，送至稀浆液储罐(T-403/404)。

At the initial phase of start-up, the reactors and scrubbers ,Heater an Gasifier system will use a large amount of superheated steam to help the equipment heat up as quickly as possible. This steam will enter the flexigas system, which will be condensed and eventually discharged to the diluted slurry tank. At this stage, the amount of diluted slurry at the bottom of C-301 will be 60% higher than normal. At the same time, in order to prevent the deposition of fine coke powder herein, the linear velocity of this section pipeline is higher. Therefore, the two pumps P-302 need to be operated at the same time during start-up.The design head of the pump P-302 and the design flexibility of the E-303 shall meet the requirements of this working condition to avoid operational bottlenecks.To reduce the pressure drop, the part of cold and heat flow of the E-302 are allowed to use the crossover.

在开工初期，三器系统会使用大量过热蒸汽帮助设备尽快升温。这些蒸汽将进入灵活气系统，被冷凝后最终排到稀浆液储罐。该阶段 C-301 底部的稀浆液量将比正常高出 60%，同时为防止细焦粉在此沉积，该段管线设计线速较高。因此开工阶段需要使两台泵 P-302 同时运行。泵 P-302 的扬程设计及 E-303 的设计弹性均需满足该工况要求，以免产生操作瓶颈。为降低压降，此时 E-302 的冷、热流允许部分走跨线。

The temperature of flexigas leaving the venturi separator (D-302)is cooled to 93℃ and is cooled down to 55℃ via a first-stage contact cooling column (C-302).C-302 is a packed column with circulating reflux. The circulation is established via pump P-303 at the bottom of C-302 column. The acidic water reflux is first cooled to 55℃ via a first-stage contact cooling column return and flows back to air cooler (A-301). After that ,the acidic water reflux is cooled to 40℃ flowing through another stage contact cooling column subcooler (E-305)and returned to the column. Each plate type E-305 is designed according to 100% capacity, and one of them is allowed to be cleaned offline. A filter SR-310 is installed in front of the E-305 to prevent scale or other impurities from clogging the plate heat exchanger .Pump P-303 outlet also introduces a stream of acidic water into the venturi scrubber (DY-302), and a flow control is placed on the stream to control the level of the first-stage contact cooling column (C-302).

灵活气离开文丘里分离器(D-302)时温度降至 93℃，经一级接触冷却塔(C-302)被冷却到 55℃。C-302 是设有循环回流的填料塔，通过塔 C-302 底的泵 P-303 建立循环，酸性水回流首先经一级接触冷却塔回流空冷器(A-301)冷却至 55℃，之后再经一级接触冷却塔后冷器(E-305)冷却至 40℃后返塔，每台板式 E-305 均需按照 100%能力设计，允许其中 1 台进行离线清洗。E-305 前设有过滤器 SR-310，防止水垢或其他杂质堵塞板换。泵 P-303 出口还引出一股酸性水注入文丘里洗涤器(DY-302)，在该股物流上设置流控来控制一级接触冷却塔(C-302)塔底液位。

The inlet of first-stage contact cooling column (C-302) bottom pump needs to inject scale inhibitor to suppress fouling of the downstream heat exchanger.Operating experience has shown that acidic water reflux systems are highly susceptible to fouling.

一级接触冷却塔(C-302)塔底泵入口需注入阻垢剂，以抑制下游换热器结垢。运行经验表明酸性水回流系统极易结垢。

If the fine coke powder contained in the flexigas breaks through the precaution of the defoamer, the operation cycle of the COS conversion reactor (R-301) will be shortened, and the flexigas containing water will also poison the catalyst in the R-301. Therefore, a two-layer FLEXICHEVRON type defoamer is required on the upper part of the first-stage contact cooling column (C-302) for trapping the entrained fine coke powder and water droplets.

灵活气中所含细焦粉如果突破除沫器的防范，将缩短 COS 转换反应器(R-301)的运行周期，灵活气带水也会毒害 R-301 内的催化剂。因此在一级接触冷却塔(C-302)上部需设置 2 层 FLEXICHEVRON 型除沫器，用于捕集夹带的细焦粉及水滴。

Before entering the R-301, the flexigas shall be reheated by low-pressure steam via the carbonyl sulfide preheater (E-306). The initial and final temperatures are 120/135℃, respectively. The purpose of increasing the temperature is to prevent the alumina catalyst from condensate formation. R-301 and E-306 need to be designed as one in service and one in standby, switching operation.E-306 is placed above R-301 and after it it converted via the exothermic reaction , the outlet temperature rises to 141℃ (EOR).

灵活气进 R-301 之前需先经羰基硫预热器(E-306)用低压蒸汽将其重新加热，初期及末期的温度分别为 120/135℃，升温的目的是防止在氧化铝催化剂上出现凝液。R-301 及 E-306 需设计成 1 开 1 备，切换操作。E-306 置于 R-301 上方，经放热反应转化后，出口温度升高至 141℃(EOR)。

After leaving R-301, the flexigas enters the second-stage contact cooling column (C-303) and is cooled to 42℃. The C-303 configuration is similar to C-302. It also uses a packed column with recirculating reflux. The bottom acidic water is pressurized by pump P-305,filtered through filter SR-311,and then cooled to 38℃ by circulating water in a second-stage contact cooling column (E -307) and returned to the middle of column C-303 and distributed to the lower section packing of C-303. Each plate E-307 is designed to be 100% capability, allowing one to be cleaned offline. The circulating water entering E-307 also needs to be pre-filtered through SR-303 to prevent fouling and blockage the plate heat exchanger.The acidic water circulation is used to control the flexigas cooling temperature, and the acidic water discharge is used to control the bottom liquid level of the C-303.

离开 R-301 后，灵活气进入二级接触冷却塔(C-303)被冷却至 42℃。C-303 配置与 C-302 相近，也采用带循环回流的填料塔，塔底酸性水经泵 P-305 升压，经过滤器 SR-311 过滤，然后在二级接触冷却塔循环冷器(E-307)被循环水冷却至 38℃后返回塔 C-303 中部，分配至 C-303 下段填料。每台板式 E-307 均需按照 100%能力设计，允许其中 1 台进行离线清洗。进 E-307 的循环水也需要通过 SR-303 进行预过滤，防止结垢堵塞板换。酸性水循环量用于控制灵活气冷却温度，酸性水外排量用于控制 C-303 的塔底液位。

C-303 is also provided with the upper section packing. The function of this section of packing is to assist the deamination. The upper part of the circulating reflux is established by the pump P-306. The recycled purified water is used as the medium to control the flexigas containing NH_3 less than 15ppmv.The advantage of controlling the NH_3 content here is to reduce the solvent

consumption of the FlexSorb (Flexible Coking Special Solvent).A filter SR-304 is provided at the outlet of the pump P-306.The flexigas then enters the FlexSorb unit to remove hydrogen sulfide.

C-303 还设置有上段填料，该段填料的作用为辅助脱氨，上段循环回流通过泵 P-306 建立，采用回用净化水为介质，控制灵活气含 NH_3 小于 15ppmv。在此控制 NH_3 含量的优点是可降低 FlexSorb（灵活焦化专用溶剂）溶剂耗量。泵 P-306 出口设置了过滤器 SR-304。灵活气接下来进入 FlexSorb 单元脱除硫化氢。

The FlexSorb process is patented by ExxonMobil.The H_2S contained rich in CO_2 of the flexigas is highly selectively absorbed by the Sterically hindered amine, so that the H_2S in the purified flexigas is less than 10 ppmv.

FlexSorb 工艺为 ExxonMobil 专利技术。采用位阻胺高选择性地吸收富含 CO_2 的灵活气中的 H_2S，使净化后的灵活气中 H_2S 小于 10ppmv。

The flexigas is cooled to a temperature of 42℃ after washing and enters the flexigas desulfurization column (C-304) for removing H_2S. C-304 is set with 2 stages of packing and the lower section of the packing is washed with 30w% FlexSorb® solvent.The upper section of the packing is washed with deoxygenated water to recover the FlexSorb® solvent entrained in the lower section.The differential pressure control of the dilute phase pressure of the flexible coking reactor and the dense phase pressure of the heater determines the boundary pressure of the flexigas. The boundary condition of the plant is 0.11 MPa (G).In addition to a small amount for medium pressure steam superheater (F-102) in this plant, the flexigas is mainly used by other users throughout the plant.

灵活气经洗涤温度降至 42℃进入灵活气脱硫塔(C-304)，用于脱除其中的 H_2S。C-304 设置 2 段填料，下段填料用 30w%的 FlexSorb®溶剂洗涤。上段填料用除氧水洗涤，回收下段夹带上来的 FlexSorb®溶剂。灵活焦化反应器稀相压力与加热器密相压力的压差控制决定了灵活气的边界压力。本装置边界条件为 0.11MPa(G)。除少量供本装置中压蒸汽过热炉(F-102)使用以外，灵活气主要供全厂其他用户使用。

After the washing water is pressurized by the washing water pump (P-309), it is filtered through SR-306 and then circulated to the top of C-304 and distributed to the upper section packing of C-304.Low pressure boiler feed water (BFWL) is used as make-up water for the upper cirulation of C-304.The concentration of FlexSorb solvent in the washing water system is maintained by controlling the amount of make-up water. Excessive washing water is controlled by the level of passing through the middle oil collecting tank and drained to the inlet of the C-304 bottom FlexSorb rich solvent pump (P-310).

洗涤水经洗涤水泵(P-309)升压后，先通过 SR-306 过滤后循环到 C-304 的顶部，分配至 C-304 上段填料。低压锅炉给水(BFWL)用作 C-304 上段循环的补充水。通过控制补充水量，以保持 FlexSorb 溶剂在洗涤水系统内的浓度。过量的洗涤水通过中部集油箱液位控制，外排至 C-304 塔底 FlexSorb 富溶剂泵(P-310)的入口。

The FlexSorb rich solvent containing H_2S and CO_2 is pumped by a solvent rich pump (P-310) to a solvent regeneration column(C-305).Before entering the C-305 ,rich solvent is heated by the C-305 bottom lean solvent via the welded plate heat exchanger E-310 . Flow control was set on the route to control the C-304 bottom level.The flow control valve should be placed as close as possible to the solvent regeneration column.E-310 is required to be designed as two heat exchangers in parallel with 100% load to ensure that one of them can be cleaned offline when the heat exchanger is severely fouled.Filters are required to arrange at the inlets of hot and cold flow of the E-310 to avoid plugging the channel of plate exchanger.

含 H_2S 和 CO_2 的 FlexSorb 富溶剂由富溶剂泵(P-310)泵送到溶剂再生塔(C-305)。进塔 C-305 前富溶剂经焊接式板换 E-310 被 C-305 塔底贫溶剂加热，在该路上设置流控用于控制 C-304 塔底液位。该流控阀需尽可能靠近溶剂再生塔布置。E-310 要求设计为 2 台 100%负荷的并联换热器，以确保换热器严重结垢时允许其中 1 台进行离线清洗。E-310 的冷热流入口均需设置过滤器，以避免堵塞板换流道。

The feed position of the solvent regeneration column (C-305) is above the stripping section of the column, and only four layers of trays are placed above the feed point, which is the rectifying section of the column.The operating pressure of C-305 is 0.127 MPa (G), which is determined based on the acidic gas outside the battery limits of the plant. The sulfur plant requires an acidic gas boundary pressure of 0.09 MPa (G).

溶剂再生塔(C-305)的进料位置在塔的提馏段上方，在进料点上方仅设置 4 层塔盘，为塔的精馏段。C-305 操作压力 0.127MPa(G)，该压力基于酸性气出装置边界条件确定，硫磺装置要求酸性气边界压力为 0.09MPa(G)。

The H_2S and water steam stripped out from the top of the solvent regeneration column (C-305) are condensed and cooled to 48℃ by the regeneration overhead condenser (E-313) regeneration column overhead subcooler(E-315).The solvent regeneration column overhead gas is washed with low pressure boiler feed water (BFWL), and the washing water can dilute the ammonia concentration of the overhead gas.The regeneration column reflux tank (D-304) receives the overhead gas condensate, and a part of the liquid phase is separated as a overhead reflux to return to the solvent regeneration column; a part is used as an acidic water efflux.The effluent acidic water can carry away the accumulated NH_3 and cyanide and send it to the acidic water stripping unit.The overhead gas phase of the regeneration column reflux tank (D-304) is tail gas rich in H_2S and sent to the sulfur unit.This pipeline requires steam heat tracing to avoid condensation and corrosion.D-304 also collects polycyclic aromatic (PNA) components in the flexigas, which is periodically sent to D-102 via a regeneration column overhead waste oil pump (P-312).The pump can also be used to remove light hydrocarbons accumulated in the D-304 overflow partition.Both the reflux and the effluent acidic water are pressurized by pump P-311.The defoamer (from the defoamer skid PA-303) is injected into the overhead reflux to suppress the tendency of the solvent regeneration column to foam.

来自溶剂再生塔(C-305)塔顶汽提出来的H_2S和水蒸气经再生塔顶冷凝器(E-313)再生塔顶后冷器(E-315)冷凝并冷却至 48℃。为溶剂再生塔顶气采用低压锅炉给水(BFWL)洗涤，洗涤水可稀释塔顶气氨的浓度。再生塔回流罐(D-304) 接收塔顶气凝液，分出液相一部分作为顶回流返回溶剂再生塔；一部分作为酸性水外排。外排的酸性水可带走积聚的NH_3和氰化物，送至酸性水汽提装置。再生塔回流罐(D-304)顶气相是富含H_2S的尾气，送至硫磺装置。该管线需要蒸汽伴热，以避免冷凝产生腐蚀。D-304 还能收集到灵活气中的多环芳香族(PNA)组分，该物料经再生塔顶污油泵(P-312)定期送至 D-102。该泵还可用于去除 D-304 溢流隔断内积聚的轻烃。回流及外排酸性水均经过泵 P-311 升压。消泡剂(来自消泡剂撬块 PA-303)需注入到塔顶回流中，以抑制溶剂再生塔的发泡倾向。

A reboiler (E-311) is placed at the bottom of the solvent regeneration column (C-305). The reboiler is a thermosyphon reboiler, and low-low pressure saturated steam is used as a heat source. The liquid film temperature in the reboiler is minimized. The condensate water condensed by E-311 enters the condensate tank (D-305) and then flows into the condensate air cooler (A-304).The bottom of the C-305 lean solvent introduces a side line into the solvent recovery unit (E-312) to remove the heat stable salt (HSS) which is chemically reacted and produced from various components in the flexigas and accumulates in the FlexSorb solvent. The medium pressure steam after decreasing the temperature provide the heat for the E-312. In the E-312, the steam will boil the FlexSorb lean solvent and the gas phase will return to the solvent regeneration column. The heat stable salt (HSS) will accumulate in the vacuum residue of E-312. When the E-312 is shut down, it is diluted with several times of water and discharged into the vacuum residue pool(T-303).The vacuum residue is in the form of a viscous liquid, which needs to be vacuumed away by the negative pressure tank truck and transferred out of the plant.In operation, the operational goal of E-312 is to maintain the concentration of heat stable salt (HSS) in the FlexSorb lean solvent at 6w%.The condensate produced by the E-312 tube passes enters into the condensate tank (D-307) and then enters the condensate expansion vessel(D-308). The low low pressure steam that is flashed out to the header, and the condensed water flows into the air cooler (A-304).After cooling, the condensed water is sent to a deaerator (DH-101).

溶剂再生塔(C-305)塔底设置重沸器(E-311)，该重沸器为热虹吸式重沸器，采用低低压饱和蒸汽作为热源。使得重沸器中液膜温度最低。经 E-311 冷凝的凝结水进入冷凝水罐(D-305)，之后流入凝结水空冷器(A-304)。C-305 底部贫溶剂甩出一股侧线进入溶剂回收器(E-312)，用以去除热稳定盐(HSS)。热稳定盐由灵活气内的多种组分经化学反应而成，会积聚在 FlexSorb 溶剂中。为 E-312 提供热量的是减温后的中压蒸汽，在 E-312 内，该蒸汽会将 FlexSorb 贫溶剂煮沸，气相返回溶剂再生塔。而热稳定盐(HSS)会积聚在 E-312 的减渣内。当 E-312 停工时，用几倍的水将其稀释并排放到减渣池(T-303)内。该减渣呈粘性液体状，需利用负压槽车吸走，运出装置。操作中，E-312 的运行目标是将 FlexSorb 贫溶剂中热稳定盐(HSS)的浓度维持在 6w%。E-312 管程

产生的凝结水进入凝结水罐(D-307)，之后进入凝结水扩容器(D-308)。闪出的低低压蒸汽至总管，凝结水流入空冷器(A-304)。冷后凝结水送至除氧器(DH-101)。

The FlexSorb lean solvent from the bottom of the solvent regeneration column (C-305) is pressurized by a regeneration column bottom pump (P-315), first exchanged the heat with the rich solvent in E-310, and then passes through a lean solvent air cooler (A-302) and a lean solvent cooler (E-314) and is further cooled and sent to a lean solvent tank (T-302). The T-302 requires a system storage tank function that can hold all of the solvent when the plant is shut down. The tank is protected by nitrogen.

来自溶剂再生塔(C-305)底部的 FlexSorb 贫溶剂经再生塔底泵(P-315)升压，先在 E-310 与富溶剂换热，之后经贫溶剂空冷器(A-302)和贫溶剂冷却器(E-314)进一步冷却后，送到贫溶剂罐(T-302)内。T-302 需要具备系统储罐功能，当工厂停工时，该罐可容纳全部的溶剂，该罐设有氮气保护。

The fresh solvent is placed in a fresh solvent tank (T-301) which is protected with nitrogen. The solvent can be sent from T-301 to T-302 by pump P-307.A 30% concentration FlexSorb lean solvent can be prepared by adding demineralized water in T-302.

新鲜溶剂置于新鲜溶剂罐(T-301)内，该罐设有氮气保护。通过泵 P-307 可将溶剂从 T-301 送至 T-302。在 T-302 内通过加入除盐水可制备 30%浓度的 FlexSorb 贫溶剂。

The FlexSorb lean solvent is withdrawn from the lean solvent tank (T-302) via a FlexSorb lean solvent feed pump (P-308), filtered through a filter SR-305 and sent to a flexigas desulfurization column (C-304).Due to the presence of trace amounts of hydrocarbon impurities in the flexigas, the lean solvent needs to be injected with an antifoaming agent before entering the C-304.

FlexSorb 贫溶剂通过 FlexSorb 贫溶剂进料泵(P-308)从贫溶剂罐(T-302)抽出，经过滤器 SR-305 过滤后送至灵活气脱硫塔(C-304)。 由于灵活气中存在微量烃类杂质，贫溶剂在进入 C-304 前需注入消泡剂。

The lean solvent feed pump (P-308) is selected to meet 125% of the solvent required by the flexigas desulfurization column (C-304), bypassing the additional 25% of the FlexSorb solvent, and filtering and recirulating to remove any insoluble corrosives and other suspended solids.The filtration system consists of a first -stage mechanical filter (SR-310), a second-stage activated carbon drum (D-306) and a third-stage fine filter (SR-311).Of the 25% of the recirulating amount , only 10% of which requires D-306 and SR-311 filtration, and another 15% is only filtered by SR-310.

贫溶剂进料泵(P-308)选型需满足灵活气脱硫塔(C-304)所需溶剂量的 125%，为多出 25% 的 FlexSorb 溶剂设置旁路，进行过滤循环，以除去任何不溶性腐蚀物和其它悬浮固体。该过滤系统由第一级机械过滤器(SR-310)、第二级活性炭罐(D-306)及第三级精细过滤器(SR-311)组成。在 25%的循环量中，只有 10%的循环量需 D-306 和 SR-311 过滤，另有 15%只通过 SR-310 过滤。

The plant is also equippend with a subground solvent tank (D-309) for collecting low-point drians and blowdown of FlexSorb solvents.The solvent is returned to T-302 via pump P-314

and filter SR-309.The D-309 is also used to collect a portion of the FlexSorb solvent when the plant is shut down.
装置还设有 1 个的地下溶剂罐(D-309)，用于收集 FlexSorb 溶剂低点排放和排污。溶剂通过泵 P-314 和过滤器 SR-309 返回到 T-302。 在装置停工时，该 D-309 也用于收集部分 FlexSorb 溶剂。

1.1.3.4 Coke powder loading section 焦粉装车部分

In normal operation, the bed coke from the 200℃ coke quench tank (D-101)is sent to the bed coke bin (D-401) by means of pneumatic conveying with cold conveying air. When the plant is shut down, the bed coke is discharged from the quenching section of the heater R-102, and is sent to the D-401 by means of pneumatic conveying with hot conveying air .The heater (R-102) does not heat up during the first phase of start-up, and it is necessary to quickly add coke powder to R-102. The main air is used to pressurize the D-401. The main air is also used as the conveying air at the bottom of the D-401. The fluidized coke powder is pumped to the coke charging hopper (BN-402) and further pressurized into the heater(R-102), At this stage ,CY-401 is not put into service.An the second stage of start-up, the coke-filled cyclone separator (CY-401) shall be activated to prevent the main air from entering the heater (R-102). The coke powder enters the BN-402 from the D-401 through the cyclone leg of CY-401.Then, using the height difference between BN402 and R-102 makes the coke powder flow into R-102 by gravity.
正常操作时，床层焦用冷输送风通过气力输送的方式从 200℃的焦炭急冷罐(D-101)被送至床层焦料仓(D-401)。当装置停工时，床层焦从加热器 R-102 急冷段卸出，用热输送风通过气力输送方式被送至 D-401。开工第一阶段时加热器(R-102)未升温，该阶段需要向 R-102 快速加入焦粉。利用主风对 D-401 进行充压，主风同时还作为 D-401 底部的输送风，将流态化的焦粉压送至加焦炭装填料斗(BN-402)，并进一步压送进入加热器(R-102)，该阶段 CY-401 不投用。开工第二阶段，需启用焦炭装填旋风分离器(CY-401)，避免主风进入加热器(R-102)，焦粉从 D-401 通过 CY-401 的旋分料腿进入 BN-402。之后利用 BN402 与 R-102 的高差，使焦粉重力自流入 R-102。
The bed coke from the bed coke bin (D-401)is sent to the coke conveying hopper (BN-401) using cold conveying air.This section of the pipeline is a finned tube that reduces the temperature of the bed coke entering BN-401 to 60℃ (at least to 90℃), after that ,it is loaded and shipped out of the plant.Two sets of finned tubes are required, one for normal operating condition and two sets are put into operation at the same time when it is in low coke gasification case.The amount of coke flowing out of D-401 is controlled by a slide valve, and the pressure at the coke-air mixing point needs to be monitored during operation.
床层焦自从床层焦料仓(D-401)使用冷输送风被送到焦炭输送料斗(BN-401)。该段管线为翅片管，使床层焦的进入 BN-401 的温度降至 60℃(至少需降至 90℃)，之后装车运出装置。翅片管要求设

置 2 组，1 组用于正常工况；低焦炭气化量工况时两组同时投用。通过滑阀控制流出 D-401 的焦炭量，操作中需监控焦炭-空气混合点处的压力。

The 215℃ fine powder collected by three cyclones is sent to the coke powder bin(T-401) by using the main air as the fluidization medium. It is a finned tube, which reduces the temperature of the fine coke powder entering into the T-401 to 60℃ (at least to 90℃), after that ,it is loaded and shipped out of the plant.

215℃的三旋回收细粉通过使用主风作为流化介质，被送至焦粉料仓(T-401)，这段管线为翅片管，使细焦粉进入 T-401 的温度降至 60℃(至少需降至 90℃)，之后装车运出装置。

The air and nitrogen used for pneumatic conveying enter the bag filter (SR-401) through different processes flow , and the gas filtered by SR-401 enters the coke powder venturi scrubber(DY-402) and the coke powder venturi separator(D-402) is subjected to dust removal treatment and finally discharged into the atmosphere through a powder coke draft fan (K-401).Normally, DY-402 is used as a supplement means to the bag filter (SR-401).When the temperature of the medium exceeds 260℃ which is the upper limit of the SR-401 operating temperature, the SR-401 bypass route is required.When the SR-401 is bypassed or fails, the DY-402 needs to replace it to complete the dust removal.The SR-401 is required to be placed above the coke powder bin (T-401) in a multi-zone design where each zone can be switched off for backflushing.The coke powder recovered by SR-401 is returned to T-401 through the screw feeding valve.

用于气力输送的空气及氮气通过不同的流程进入袋式过滤器(SR-401)，经 SR-401 过滤的气体再进入焦粉文丘里洗涤器(DY-402)和焦粉文丘里分离器(D-402)进行除尘处理，最终通过粉焦引风机(K-401)排入大气。正常时 DY-402 作为袋式过滤器(SR-401)的一个补充手段。当介质温度超出 SR-401 工作上限 260℃时，需要走 SR-401 旁路。当 SR-401 被旁路或失效时，DY-402 需代替它完成除尘工作。SR-401 要求布置在焦粉料仓(T-401)的上方，采用多分区设计，每个分区均可切出进行反吹。SR-401 回收的焦粉通过螺旋给料阀返回 T-401。

The diluted slurry containing coke stripped from the bottom of the slurry stripper (C-301) is pressurized by P-302 and cooled to 40℃, and then sent to a diluted slurry storage tank (T-403) or a diluted slurry storage tank (T -404).The diluted slurry is then pumped to a slurry thickener storage tank (T-405) and sent to a gravity belt filter press SR-402 to form a coke cake.The thickening tank can concentrate the solid contained in the slurry to 7-20w%, and the clear solid content of the T-405 overflow efflux is 200ppmw, which flows through the T-406 and goes to the waste water treatment plant.

从浆液汽提塔(C-301)底汽提后的含焦稀浆液经 P-302 升压并冷却至 40℃后，送至稀浆液储罐(T-403)或稀浆液储罐(T-404)。稀浆液接下来被泵送至浆液增稠器储罐(T-405)，然后送至重力带式压滤机 SR-402 形成焦粉滤饼。增稠罐可以将浆液中固体含量浓缩至 7-20w%，T-405 溢流外排的清液固体含量为 200ppmw，流经 T-406 后去污水处理场。

In general, T-405 and T406 are continuously operated. The operation of the thickening slurry to the gravity belt filter press SR-402 is intermittent operation.
一般来讲，T-405、T406 是连续操作的。增稠浆液送至重力带式压滤机 SR-402 的操作为间歇操作（也可连续操作）。
The capacity of the diluted slurry storage tank (T-403/T-404) can meet the storage capacity of the dewatering section offline for 5 days when the upstream operation is normal.The design upper limit for the dewatering section is 130% of the normal amount.
稀浆液储罐(T-403/T-404)的容量在上游正常操作时，可满足脱水工段离线 5 天的存储能力。脱水工段的设计上限为正常量的 130%。
The solid content of the thickened slurry at the bottom of T-405 is 7-20w%. Even if SR-402 is not in service, this stream of thickening slurry needs to be recycled. The design velocity of this line is 1.2-2.4m/s to prevent solid from plugging the pipeline. After further removing water by the gravity belt filter press, the moisture content of the filtered wet coke cake is reduced to 55%.Before exporting from the plant, wet coke is storaged in the filtered coke storage pool(T-407)temporarily. The waste water containing ammonia and phenol without coke powder is sent to the waste water plant. Filtration liquid discharged from SR-402 returns to T-405. T-407 can meet the storage capacity of filtered coke cake for 15 days.
增稠后的 T-405 底部浆液固体含量为 7-20w%，即使 SR-402 不开时，该股增稠浆液也需循环，该线路设计线速为 1.2-2.4m/s，以防固体析出堵塞管道。经重力带式压滤机进一步去水后，湿焦滤饼含水率降低至 55%。湿焦运出装置前在滤饼储存池(T-407)临时存放。不含焦粉的含氨含酚废水外送至污水处理场。SR-402 排出的滤清液返回至 T-405。T-407 可满足 15 天的焦粉滤饼存储能力。
The filtered cake storage pool (T-407) is provided with a supporting grab crane, which is used for unloading filtered cakes to trucks or containers. Ceiling needs to be set in this area.
滤饼储存池(T-407)配套设有带抓斗的行车，用于将滤饼卸到卡车或集装箱内。该区域需设置顶棚。
PA-408 skid is used to inject a thickening agent, using compound polymer. The capacity of thickening solvent storage tank shall be considered as 1 cubic meters. Thickening agent is diluted to 0.1w% and injected into the inlet pipeline of T-405 by metering pump via a mixer.PA-408 skid needs to meet the requirements of the demand for adding anionic, cationic and non-ionic polymer. The expected concentration of thickening solvent in per 1000kg diluted slurry is 0.002kg.
PA-408 撬块是用于注入增稠剂的，采用复配的聚合物。增稠剂储罐容量按照 1 立方米考虑，增稠剂稀释到 0.1w%用计量泵注入经混合器注入到 T-405 入口管线上。PA-408 撬块需兼顾满足加入阴离子、阳离子及非离子聚合物的需求。在每 1000kg 稀释浆液中增稠剂的预期浓度为 0.002kg。
Filter Press package(PA-401) is used for adding flocculant. Flocculant tank capacity shall be considered according to 1 cubic meters. Flocculant is diluted to 0.1w% and injected with a metering pump to gravity belt filter press (SR-402) or its inlet pipeline via a mixer. PA-401 skid

needs to meet the requirements of the demand for adding anionic, cationic and non-ionic polymer.

压滤机絮凝剂成套设施(PA-401)是用于加入絮凝剂，絮凝剂储罐容量按照 1 立方米考虑，絮凝剂稀释到 1.0w%用计量泵注入经混合器注入到重力带式压滤机(SR-402)或其入口管线上。PA-401 撬块需兼顾满足加入阴离子、阳离子及非离子聚合物的需求。

If the thickening tank T-405 fails to work, one of T403 or T404 tank can be used for settlement where the slurry is concentrated to thicker slurry with solid content of 10% and directly pumped to SR-402 by pump P-402. At this time,the filtration liquid of SR-402 efflux is discharged directly to the T-409 ;T403 or T404; clarified water after the settlement is sent to T-406. Part of the wateris used as washing water and polymer dilution water circulating in the dewatering facilities, the rest of the water is drained to the waste water treatment plant.

如果增稠罐 T-405 无法工作，可使用 T403 或 T404 中的一个罐用于沉降，将浆液浓缩为含固 10%的浓浆液，直接用泵 P-402 送至 SR-402。此时，SR-402 外排的滤清液也直接排至 T-409；T403 或 T404 沉降后的澄清水被送至 T-406。有部分水作为洗涤水和聚合物稀释水，在脱水设施内循环，其余的水外排到到污水处理场。

The plant is equipped with one sewage systems, sewage system containing coke is used for collecting waste water from all the unit . A lifting pool for oily sewage is provided.

本装置设置一个污水系统，含焦污水系统收集全装置的污水，装置设有含油污水提升池。

Waste water containing coke from the Venturi separator (D-402) and water seal tank (T-402), drain and sewage from area D and fire-fighting water from area D may enter the coke powder separator/sewage pool (T-409).After settling separation takes place in T-409, the overflowed sewage containing coke is pressurized by pump and then sent waste water treatment plant.

来自文丘里分离器(D-402)和水封罐(T-402)的含焦污水及 D 区排水、排污水及 D 区消防水均可进入焦粉分离器/污水池(T-409)。在 T-409 进行沉降分离，溢流的含焦污水用泵升压后送至全厂污水处理场。

Loading facilities of bed coke and fine coke powder are equipped identically. but these two kinds of coke need to be processed differently. After reaching a predetermined level, the fine coke powder in a fluidization state flows into the common chute (CH-401) from the bottom of coke powder silo (T-401) by gravity ,and through the coke charging silde chute (LA-401) to complete the loading. The bed coke unloading truck enters to the bed coke conveyning belt(CNVR-403) from the bottom of BN-401 by gravity to degass and is transferred to the common chute (CH-401), through the coke charging silde chute (LA-401) to complete the loading.

床层焦及细焦粉的装车设施配置相同，但这两种焦粉需区别处理。达到预定料位后细焦粉以流化态从焦粉料仓(T-401)底部自流进入共用溜槽(CH-401)通过装焦滑槽(LA-401)完成装车。而床层焦卸车是从 BN-401 底部自流进入床层焦传送带(CNVR-403)脱气并传输至共用溜槽(CH-401)，在通过装焦滑槽(LA-401)完成装车。

The dust removal of the loading section can be realized by bag type collector (DC-401) and loading draft fan (K-402). Venting gas containing dust from the bed coke conveyor belt (CNVR-403) and other loading facilities is filtered by bag collector (DC-401)and then vented to the atomsphere. Coke powder recovered by DC-401 will be loaded to the truck via the coke powder conveying belt feeder (FDR-402) and the coke powder conveying belt (CNVR-401).
装车工段的除尘由袋式收集器(DC-401)和装车引风机(K-402)实现。来自床层焦传送带(CNVR-403)和其他装车设施的含尘排放气体将通过袋式收集器(DC-401)过滤后排放大气。DC-401 回收的焦粉将通过焦粉传送带加料器(FDR-402)和焦粉传送带(CNVR-401)进行装车。

1.1.3.5 Compressor system process flow 气压机系统流程

Medium pressure steam from the system (at 425 3.5MPa) enters the turbine through the two main steam isolation valves,quick closing valve and regulating valve;Steam after work(at250℃,1.0MPa) is discharged to 1.0MPa steam pipe network through a check valve, back pressure isolation valve and desuperheater.A manual vent valve and safety valve is set up for back pressure steam .
来自系统的中压蒸汽（425℃，3.5MPa），经两道主蒸汽隔离阀、速关阀、调节汽阀后进入汽轮机；做功后的蒸汽（250℃，1.0MPa）经单向阀、背压隔离阀、减温器后排入 1.0MPa 蒸汽管网。背压蒸汽设置了手动放空阀和安全阀。
Compressor process flow are as follows :the rich gas from the overhead oil gas separator D201 of the fractionator (0.02MPa)enters the first stage of compressor, the gas is cooled and separated at the first stage(cooling to 40℃), then enters the second stage of the compressor (0.31MPa), the rich gas coming from the second stage is cooled and separated at the second stage(cooling to 40℃), then enters the third stage of the compressor (0.8MPa), finally, the discharge pressure of the rich gas at the third stage is 2.3MPa.After cooling and separation at the discharge ,coking gas enters into the absorption column. Each section of naphtha is used as the absorption oil sending to the absorption columnto absorb components above C3 containing the rich gas. Acidic water separated from each stage after cooling down is exported from the plant .
气压机工艺流程从分馏塔顶油气分离器 D201 来的富气（0.02MPa）进入压缩机一段，一段出来的富气经一段冷却分离（冷却至 40℃）后进入压缩机二段（0.31MPa），二段出来的富气经二段冷却分离（冷却至 40℃）后再进入三段（0.8MPa），最终三段出口 2.3MPa 富气，经过出口冷却分离，焦化气进入吸收塔。各段石脑油作为吸收油送至吸收塔，以吸收富气中 C3 以上组分。各段冷却分离下来的酸性水送出装置。

1.1.3.6 The main fan system process flow 主风机系统流程

Medium pressure steam from the system (at 425 3.5MPa) enters the turbine through the two main steam isolation valves, quick closing valve and regulating valve; Steam after work(at

300℃,0.6MPa) is discharged to 0.65MPa steam pipe network through a check valve, back pressure isolation valve and then sent to the saturated low low steam through a desuperheater. A manual vent valve and safety valve is set up at the discharge.

来自系统的中压蒸汽（425℃，3.5MPa），经两道主蒸汽隔离阀、速关阀、调节汽阀后进入汽轮机；做功后的蒸汽（300℃，0.6MPa）经单向阀、背压隔离阀排入 0.65MPa 蒸汽管网，经减温器后送至饱和低低压蒸汽，出口还设置了手动放空阀和安全阀。

In the standard condition, the dust contained in the atmosphere is about 5-20 mg/m^3,as the plant production is different in nature, the contained particle distribution is also different. Rough mineral dust particles and mixtures of various gases have the following hazards to the compressor: (1) For the first 3 stages, the dust is easy to adhere to the surface of the blade leading to pitting corrosion on the blade; (2) For the blades of the following stages, because the temperature of medium rises and dust is difficult to adhere to ,blade is eroded with the gas flow; (3) Air volume of compressor is reduced due to corrosion and abrasion, resulting in the decrease of surge pressure and efficiency. Therefore, dust content of the axial flow compressor suction (standard condition)is 0.6-1.5mg/m^3, particle size is less than or equal to 5 micron meters. In order to make the compressor suction gas to meet this condition, an air filter is set up at the suction side. The noise generated from the operation of the compressor will spread out along the suction side, so silencer is arranged at the suction side. A rectifier grid is placed at the suction bend so that the compressor suction flow is stable and will not affect the suction characteristics of the compressor. A flexible compensator is set up at the junction of compressor and pipeline for suction gas to isolate the mechanical vibration and reduce the noise of the suction gas pipeline which casued by the compressor, while compensating compressor thermal expansion displacement, which will also help the alignment adjustment during the compressor maintenance. With the increase of compressor discharge pressure, the temperature of vent gas also rises . In order to reduce the thrust force piping system on the compressor discharge flange , metal compensator is set up in the discharge pipeline. The outlet silencer is set to prevent the noise inside the compressor along the pipeline from spreading out . Before the check valve on the discharge pipeline, vent pipe with a diameter of DN800 is also set up, the pipe is provided with a two (10″,14″) anti surge regulating valves to prevent the compressor from surging and refluxing, so the anti surge valve has to the ability of rapid opening and slow closing response and reliable performance. The noise power of vent inlet is up to 160dB (A), so the noise reducing value of the silencer is required to be around 40-50dB (A).A non-return valve (also called check valve) is installed at the outlet to prevent the compressor vanes and inlet pipeline equipment from breaking due to countercurrent .Check valve is required for good dynamic performance. After the outlet check valve of main draft fan ,5 sets of safety valve is installed, a silencer is equipped after the valve.

在标准状态下，大气中含尘约为 5-20 mg/m³，随着工厂生产性质不同，含粒分布亦不同。粗糙矿物尘粒及各种气体的混合物对压缩机产生如下危害：(1)对于前 3 级叶片，粉尘易附着于叶片表面，对叶片造成点状腐蚀；(2)后几级叶片，由于介质温度升高，粉尘难以附着，而随着气流对叶片冲刷磨损；③由于腐蚀和磨损造成压缩机风量降低，喘振点压力降低，效率降低。因此，轴流式压缩机入口含尘量（标准状态下）≤0.6-1.5mg/m³，粒径≤5μm。为使压缩机吸入气体满足此条件，入口设置空气过滤器。 压缩机运行中产生的噪声会沿着进气口传出，因此设置进气消声器。在入口弯管处设置整流栅，使压缩机吸入气流稳定，不影响压缩机的吸入特性。在压缩机与吸入气管道的连接处设置柔性补偿器，作用是隔离压缩机对吸气管道的机械振动、降低噪声，同时补偿压缩机的热膨胀位移，也利于压缩机检修时设备的对中调整。随着压缩机出口压力的升高，排出气体的温度也随之升高。为减小管道系统对压缩机出口法兰的推力，在出口管道上设置金属补偿器。设置出口消声器防止压缩机内部的噪声沿管道内传出。出口单向阀之前的管道上，还设一条直径为 DN800 的放空管道，该管道上装有两（10″、14″）反喘振放空调节阀，以防止压缩机喘振、逆流的发生，因此要求防喘振阀具有快开、慢关反应的能力及可靠的性能。放空入口处噪声功率最高可达 160dB(A)，因此要求该消声器降噪值为 40-50dB(A)左右。出口装设止回阀（也叫单向阀）以防止因逆流发生对压缩机叶片及进口管道设备的损坏。要求止回阀随动性能好。在主风机出口单向阀之后，设有 5 组安全阀，阀后配置消声器。

1.1.3.7 Others 其他

Purging oil (expressed as HDO) needs to be used during the shutdown and equipment maintenance. Flushing oil is used for puring the heavy hydrocarbon medium (such as vacuum residue feed, washing column bottom circulating oil and fractionator bottom oil and heavy coking gas oil system). HDO purging oil is mainly used for a lighter medium (such as middle section reflux , coking light gas oil system), purging and discharging waste oil needs to enter the closed drainage system. Diesel of this plant is suitable for HDO, which is introduced from diesel process flow and diesel water cooler (E-205). In start-up phase, coking light gas oil or light gas oil can be used as HDO.

在开停工及设备检修时需要用到置换油，用 HDO 表示。冲洗油用于置换重烃类介质(如减渣进料、洗涤塔底循环油、分馏塔底油及焦化重蜡油系统)。而 HDO 置换油主要用于稍轻的介质(如中段回流、焦化轻蜡油系统)，置换外排的污油需进入密闭排放系统。本装置柴油适合做置换油，从柴油流程柴油水冷器(E-205)后引出。开工阶段，可使用焦化轻蜡油或轻蜡油作为置换油。

A cooling water tank plant is provided in the plant,which is used for emergency shutdown of the reactor, circulating oil from the washing column bottom is cooled from 373℃ to 150℃ and then deliverying out of the plant.

装置内设有冷却水箱，用于在反应器紧急停工时，用热水将洗涤塔底循环油从 373℃冷却至 150℃后送出装置。

Closed drainage system for light waste oil (LCD) is used for receiving medium remaining liquidity under normal temperature and pressure,which is in combination with the flushing oil

system. The light waste oil (LCD) of this plant is merged with the flare knockout drum (D-211) and then sent out of the plant or enters into the sludge backrefining system.
轻污油密闭排放系统 LCD 用于接收常温常压条件下仍具流动性的介质。与冲洗油系统相配套。本装置轻污油（LCD）在汇入火炬分液罐(D-211)，之后可送出装置或进入污泥回炼系统。

1.2 Process specification 工艺指标

1.2.1 Main raw materials and auxiliary materials quality specification 主要原料及原辅料质量指标

Table 2: Main raw materials and auxiliary materials quality specification
表 2：主要原料和辅料质量指标

No 序号.	Materials 物料	Item Name 项目名称	Unit 单位	Control Target 控制指标	Remarks 备注
1	Raw oil 原料油	Carbon residue 残炭	w%	19～23	-
		Viscosity 粘度	cst	≤4652	-
		Iron content 铁含量	ppm	≤31	-
		Nickel content 镍含量	ppm	≤38	-
	Raw oil 原料油	Vanadium content 钒含量	ppm	≤106	-
		Sodium content 钠含量	ppm	≤25	-
		Sulfur content 硫含量	w%	≤4.6	-
2	Back refining sludge、oil 回炼污 泥、油	Solid content 固体含量	g/L	≤3	-
		Iron content 铁含量	ppm	≤31	-
		Nickel content 镍含量	ppm	≤38	-

No 序号.	Materials 物料	Item Name 项目名称	Unit 单位	Control Target 控制指标	Remarks 备注
		Vanadium content 钒含量	ppm	≤106	-
		Sodium content 钠含量	ppm	≤25	-
		Sulfur content 硫含量	w%	≤4.6	-

1.2.2 Product, intermediate product design composition and specification 产品、中间产品设计组成及指标

Table 3: Product quality specification

表 3：产品质量指标

No. 序号	Materials 物料	Item Name 项目名称	Unit 单位	Control Target 控制指标	Remarks 备注
1	Flexigas 灵活气	Hydrogen sulfide content 硫化氢含量	mg/m^3	≤50	-
		COS content 羰基硫含量	mg/m^3	≤150	-
No. 序号	Materials 物料	Item Name 项目名称	Unit 单位	Control Target 控制指标	Remarks 备注
2	Coking dry gas 焦化干气	Carbon three and above components content 碳三及以上组分含量	v%	≤3	-
3	Coking liquefied gas 焦化液化气	Carbon two and below components content 碳二及以下组分含量	v%	≤4	-
		Carbon five and above components content 碳五及以上组分含量	v%	≤1.9	-
4	Naphtha 石脑油	IBP 初馏点温度	℃	≥40	-
		FBP 终馏点温度	℃	≤220	-

5	Diesel 柴油	95% point distillation temperature95%点馏出温度	℃	≤345	-
6	Light gas oil 轻蜡油	95% point distillation temperature95%点馏出温度	℃	≤470	-
7	Heavy gas oil 重蜡油	95% point distillation temperature95%点馏出温度	℃	≤510	-
8	Coker sour gas 焦化酸性气	Hydrocarbon content 烃含量	v%	≤5	-

1.2.3 Utility specification 公用工程指标

Table 4: Utility specification

表 4：公用工程指标

No. 序号	Item Name 项目名称	Tag Number 位号	Unit 单位	Control Target 控制指标	Remarks 备注
1	RFG from refinery pressure 系统燃料气压力	PI12615	MPa	0.45～0.55	-
No. 序号	Item Name 项目名称	Tag Number 位号	Unit 单位	Control Target 控制指标	Remarks 备注
2	Circulating water inlet temperature 循环水进水温度	PI-52501	℃	≤33	-
3	Circulating water inlet pressure 循环水进水压力	PG-52501	MPa	0.4～0.5	-
4	MPS temperature 系统中压蒸汽温度	TI52401	℃	380～420	-
5	LPS temperature 1.0MPa 蒸汽温度	TI52402	℃	270～320	-
6	LPS pressure 1.0MPa 蒸汽压力	PI52402	MPa	1.0～1.2	-

7	LLPS temperature 0.5MPa 蒸汽温度	TI13401	℃	215～238	-
8	LLPS pressure 0.5MPa 蒸汽压力	PI13401	MPa	0.45～0.55	-
9	Plant air pressure 工厂风压力	PI52101	MPa	0.6～0.75	-
10	Instrument air pressure 仪表风压力	PI52201	MPa	0.6～0.75	-
11	Low nitrogen pressure 低压氮气压力	PI52302	MPa	0.6～0.75	-
12	Middle nitrogen pressure 中压氮气压力	PI52301	MPa	2.2～2.8	-
13	Production water pressure 生产水压力	PG52601	MPa	0.5～0.65	-

1.2.4 Main environmental specification 主要环保指标

Table 5: Environmental specification

表 5：环保指标

No. 序号	Materials 项目名称	Unit 单位	Control Target 控制指标	Remarks 备注
1	Sulfur water Fe2+ content 含硫污水 Fe2+含量	mg/L	≤3	-
No. 序号	Materials 项目名称	Unit 单位	Control Target 控制指标	Remarks 备注
2	Sewer water sulfide content T406 污水硫化物含量	mg/L	≤50	-
3	Sewer water ammonia nitrogen T406 污水氨氮含量	mg/L	≤50	-
4	Sewer water tank COD 污水池化学耗氧量	mg/L	≤800	-
5	Sewer water tank ammonia nitrogen 污水池化学氨氮含量	mg/L	≤35	-
6	Sewer water tank PH 污水池 PH 值	-	-	-
7	Sewer water tank oil content 污水池油含量	mg/L	≤500	-

8	Furnace flue gas particle matter 加热炉烟气颗粒物	mg/m3	≤25	-
9	Furnace flue gas SO2 content 加热炉烟气二氧化硫含量	mg/m3	≤100	-
10	Furnace flue gas NOX 加热炉烟气氮氧化物含量	mg/m3	≤150	-
11	Furnace flue gas ringelmann scale 加热炉烟气林格曼黑度	-	-	-

1.2.5 Main design specification 主要工艺指标

Table 6: Main Process Specification

表 6：主要工艺指标

No. 序号	Description 说明	Item Name 位号	Unit 单位	Range 范围
1	Reaction T 反应温度	TIC10510	℃	520～535
2	Scrubber Level 洗涤塔底液位	LI10401	%	20～50
3	Flexigas Scrubber Top P 灵活气脱硫塔出口压力	PI31201	MPa	0.110～ 0.140
No. 序号	Description 说明	Item Name 位号	Unit 单位	Range 范围
4	Differential P of Heater and Reactor 两器差压	PDIC10902A/B	kPa	100～135
5	D103 Level D103 液位	LIC12301	%	50～70
6	Reactor Throughput 反应器处理量	FIQ10505B	t/h	79～170
7	Sludge Capacity 污泥回炼量	FIC11704	m3/h	≤6
8	STR101/AB P Drop STR101/AB 过滤器差压	PDI10201	MPa	＜0.172
9	D107 Level D107 液位	LIC10101	%	30～70

10	MS Pressure 中压蒸汽进进料环管压力	PIC10502	MPa	2.8～3.1
11	Reactor Bed Level 反应器料位	LIC10502	%	5～40
12	Scrubber Liquid Phase T 洗涤塔底液相温度	TIC10413	℃	≤395
13	Scrubber Top T 洗涤塔顶温度	TI10403	℃	≤410
14	D101 T D101 温度	TI11203	℃	≤250
15	F101 Outlet T F101 出口温度	TIC11304	℃	≤610
16	Heater Bed T 加热器床层温度	TI10701	℃	623～645
17	Heater Upper Quench Section T 加热器急冷段上部温度	TIC11003	℃	≤685
18	Heater Density Phase Bed Level 加热器密相料位	LI10903	%	30～58
19	Gasifier Bed T 焦炭气化温度	TIC11604	℃	≤970
20	Gasifier Bed Level 气化器料位	LI11602	%	40～60
No. 序号	Description 说明	Item Name 位号	Unit 单位	Range 范围
21	Gasifier Air Rate 气化器主风量	FIC11607	Nm3/h	≥65000
22	E103 Outlet T 灵活气出 E103 温度	TIC12202	℃	200～230
23	D103 P D103 压力	PI12301	MPa	≤4.03
24	E104 Outlet Condensate T E104 冷后凝结水温度	TI12402	℃	≤105
25	Instrument Fuel Gas P 仪表瓦斯压力	PI12601	MPa	0.70～1.0
26	F102 Outlet T F102 出口蒸汽温度	TIC12508	℃	410～465
27	F102 Inlet Steam Flowrate	FIC12502	t/h	≥46

	F102 入口蒸汽流量			
28	F104 Outlet T F104 出口蒸汽温度	TI13209	℃	510～540
29	F104 Inlet Steam Flowrate F104 入口蒸汽流量	FI13201	t/h	≥7.4
30	F102 Chanmber P F102 炉膛负压	PI12701	Pa	-100～0
31	F104 Chamber P F104 炉膛负压	PI13301	Pa	-100～0
32	Saturated LLPS T 低低压饱和蒸汽温度	TIC13402	℃	145～175
33	DH101Level DH101 液位	LIC13501	%	50～80
34	VR Pumpout T 渣油外甩去减渣罐温度	TI11702	℃	100～160
35	Fractionator Bottom Level 分馏塔底缩颈段液位	LI20103	%	40～80
36	HKGO Draw Chimney Tray Level HKGO 抽出集油箱液位	LIC20102	%	20～60
37	LKGO Draw ChimneyTray Level LKGO 抽出集油箱液位	LIC20101	%	20～60
No. 序号	Description 说明	Item Name 位号	Unit 单位	Range 范围
38	Middle Draw Chimney Tray Level 分馏塔中段抽出集油箱液位	LIC20202	%	30～70
39	11 Draw Chimney Tray Level 分馏塔 11 层集液箱液位	LIC20201	%	0～70
40	C202 Level C202 液位	LIC20501	%	20～50
41	C203 Level C203 液位	LIC20802	%	40～60
42	E207 Shell Level E207 壳程液位	LIC20901	%	40～80
43	D210 Level D210 液位	LIC21201	%	40～80
44	D201 OVHD Rich Gas T	TI20401	℃	35～55

	D201 顶富气温度			
45	D201 Level D201 液位	LIC20401	%	20～50
46	D201 Interface Level D201 界位	LIC20402	%	30～60
47	D202 OVHD Rich Gas T D202 顶富气温度	TI20401	℃	35～55
48	D202 Level D202 液位	LIC22201	%	20～50
49	D202 Interface Level D202 界位	LIC22202	%	30～60
50	D203 Level D203 液位	LIC22301	%	20～50
51	D203 Interface Level D203 界位	LIC22302	%	30～60
52	D204 Level D204 液位	LIC22401	%	20～50
53	D204 Interface D204 界位	LIC22402	%	30～60
54	LKGO Returning Flowrate 轻蜡返分馏塔流量	FIC23201	t/h	≥9
No. 序号	Description 说明	Item Name 位号	Unit 单位	Range 范围
55	HKGO Returning Flowrate 重蜡返分馏塔底流量	FIC21401	t/h	≥13
56	HKGO Reflux Flowrate 重蜡回流量	FIC21701	t/h	≥78
57	HHKGO Returning Flowrate 重重蜡返分馏塔底流量	FIC20101	t/h	≥7
58	Fractionator OVHD P 分馏塔顶压力	PI20201	MPa	0.05～0.09
59	Fractionator OVHD T 分馏塔顶温度	TIC20201	℃	105～120
60	OVHD Air Cooler Wash Water 分馏塔空冷前注水量	FI20303	t/h	≥6.4
61	Diesel Product To Hydrocracking	TI20607	℃	55～115

	柴油至加氢装置温度			
62	Diesel Product To Tankage T 柴油至罐区温度	TI20605	℃	30～48
63	C210 Level C210 底液位	LIC23102	%	40～68
64	LKGO to Downstream Unit T 轻蜡至下游装置/储罐温度	TI21104	℃	60～135
65	HKGO to Downstream Unit T 重蜡至下游装置/储罐温度	TI21004	℃	70～135
66	Flushing Oil T 轻蜡作冲洗油温度	TIC21105	℃	100～150
67	Equipment Flushing Oil P 冲洗油的设备冲洗压	PIC21302	MPa	0.95～1.1
68	Instrument Flushing Oil P 冲洗油的仪表冲洗压力	PIC21303	MPa	1.1～1.3
69	Equipment High P Flushing Oil P 冲洗油的高压机冲洗压力	PIC21304	MPa	1.9～2.2
70	Compressor First Stage Outlet T 气压机一级出口温度	TI22102	℃	≤120
No. 序号	Description 说明	Item Name 位号	Unit 单位	Range 范围
71	Compressor Second Stage Outlet T 气压机二级出口温度	TI22104	℃	≤120
72	Compressor Third Stage Outlet T 气压机三级出口温度	TI22106	℃	≤120
73	C204 OVHD P C204 顶压力	PI22501	MPa	1.7～2.2
74	C204 OVHD T C204 顶温度	TI22501	℃	40～50
75	C204 Bottom T(Tray 4) C204（下部温度）灵敏板温度	TIC22705	℃	105～130
76	C204 Middle Draw Chimney Level C204 中段集液箱液位	LI22501	%	10～70
77	C204 Bottom Level	LI22703	%	30～70

	C204 底液位			
78	D205 Interface Level D205 界位	LIC22601	%	30～60
79	D206 Interface Level D206 界位	LIC22704	%	30～60
80	C205OVHD P C205 顶压力	PIC22901	MPa	≤2.1
81	C205 Level C205 液位	LIC22901	%	30～70
82	C205 OVHD T C205 顶温度	TI22901	℃	30～50
83	C207 Saturated Steam T C207 底饱和蒸汽温度	TIC23401	℃	200～239
84	C207 Bottom T(Tray 4) C207（下部温度）灵敏板温度	TIC23306	℃	150～180
85	C207 OVHD P C207 顶压力	PIC23501	MPa	0.9～1.4
86	C207 Bottom Level C207 底液位	LIC23302	%	30～90
No. 序号	Description 说明	Item Name 位号	Unit 单位	Range 范围
87	D208 Level D208 液位	LIC23501	%	30～60
88	D208 Interface Level D208 界位	LIC23502	%	0～30
89	Debutanizer Bottom to Unit T 稳定石脑油至罐区温度	TI23806	℃	30～50
90	Debutanizer Bottom to Unit T 稳定石脑油至下游温度	TI23807	℃	85～115
91	D209 Level D209 液位	LIC23901	%	30～60
92	D211 Level D211 液位	LI24002	%	5～50
93	D211 Interface Level D211 界位	LI24004	%	0～60

94	D301 Bottom Cone Level D301 锥段料位	LIC30101	%	4～17
95	CirculatingSlurry to DY302 Flowrate 洗涤液进 DY302 流量	FIC30202	t/h	≥260
96	D302 OVHD T D302 顶温度	TI30201	℃	≤100
97	C302OVHD T C302 顶温	TIC30302	℃	40～65
98	C302 Wash Water Rate C302 水洗水量	FIC30402	t/h	800～1050
99	COS Preheater Outlet T COS 预热器出口温度	TI30501/TI30504	℃	115～160
100	P322 Outlet P P322 出口压力	PIC32202	MPa	≥0.5
101	COS Reactor P Drop COS 反应器压降	PDI30501/PDI30502	MPa	≤0.038
102	C303 OVHD T C303 顶温	TIC30602	℃	35～55
No. 序号	Description 说明	Item Name 位号	Unit 单位	Range 范围
103	C303 Wash Water Rate C303 水洗水量	FIC30601	t/h	600～850
104	C303 Bottom T C303 底温	TI30701	℃	≤65
105	C304 Amine Circulation Rate C304 胺液循环量	FIC31201	t/h	250～530
106	T302 Amine T T302 胺液温度	TIC31303	℃	35～60
107	C304 Upper Circulation Rate C304 上段循环量	FIC31203	t/h	90～130
108	E310A/B Outlet Rich Flexisorb SE E310/AB 后富液温度	TIC31301	℃	100～120
109	C305 OVHD T C305 顶温度	TIC31401	℃	110～135

110	Sour Gas P 酸性气压力	PIC31501	MPa	≤0.135
111	C305 Sour Water Returning Flowrate C305 酸性水回流量	FIC31503	t/h	0～20
112	D312OVHD P D312 罐顶压力	PIC32201	Mpa	0.19～0.29
113	T401 OVHD T T401 顶温度	TI40102	℃	≤80
114	Coke to BN401 T 焦炭至 BN401 温度	TI40201/TI40202	℃	≤80
115	D401 OVHD T D401 至布袋过滤器温度	TI40501	℃	≤250
116	D401 OVHD P(Starting up) D401 顶压力（开工时）	PIC40301	Mpa	≤0.38
117	Filter Bag Package Inlet T 布袋过滤器入口温度	TI40501	℃	≤250
118	Filter Bag Package Inlet Flowrate 布袋过滤器入口流量	FIC40301	kg/h	≤6870
No. 序号	Description 说明	Item Name 位号	Unit 单位	Range 范围
119	Reactor stripping section T 反应器汽提段温度	TI10502	℃	520～540
120	T402 Water Seal Tank T402 水封罐液位	LI40501	%	38～62
121	DY402 Inlet P DY402 入口压力	PIC40501	kPa	-0.34～5
122	D401 OVHD P(Starting up) D401 顶压力（开工时）	PIC40301	MPa	≤0.38
123	Slurry Thickener Tank Feed Rate 刮泥机进料量	FIC41001	t/h	40～80
124	P403 Outlet Flowrate P403 出口流量	FIC41002	t/h	13～44
125	P404 Outlet Returning Flowrate P404 出口返回量	FIC41101	t/h	30～68

1.2.7 Main material balance 主要物料平衡

Table 7: Plant Material Balance

表 7：装置物料平衡

Material name 物料名称	Relative residue yield (w%)相对渣油收率 (w%)	t/h	×10^4 t/a
Feeding:进料：			
Vacuum residue 减渣	100%	130.95	110.00
Process steam 工艺蒸汽	68.5%	89.729	75.37
air 空气	134.5%	176.1	147.92
Process water 工艺水	23.1%	30.23	25.39
Nitrogen 氮气	0.1%	0.1	0.08
Backflush fuel gas 反吹燃料气	0.8%	1.02	0.86
total 合计	327%	428.1	359.6
Discharge:出料：			
Coking gas 焦化气	8.8%	11.56	9.71

Liquefied gas 液化气	6.0%	7.82	6.57
Naphtha 石脑油	15.9%	20.76	17.44
Diesel 柴油	20.2%	26.50	22.26
Light coke gas oil 轻焦化蜡油	7.5%	9.78	8.21
Heavy coking gas oil 重焦化蜡油	11.8%	15.39	12.93
Dry coke powder 干焦粉	0.5%	0.66	0.55
Wet coke 湿焦	0.3%	0.40	0.34
Bed coke 床层焦	0.7%	0.92	0.77
Flexible 灵活气	173.9%	227.70	191.27
Acidic water 酸性水	39.3%	51.42	43.19
Acid gas 酸性气	6.5%	8.45	7.10
Sewage 污水	35.7%	46.78	39.29
total 合计	327%	428.1	359.6

1.2.8 Raw material consumption, utility consumption and energy consumption specification
原材料消耗、公用工程消耗及能耗指标

1.2.8.1 Plant energy consumption composition 装置能耗组成

Table 8: Plant Energy Consumption Table

表 8：装置能耗表

No. 序号	Item 项目	Hourly consumption 小时耗量		Low calorific value or energy consumption index of fuel 燃料低热值或能耗指标		Total energy consumption 总能耗 10^4 MJ/a	Unit energy consumption 单位能耗 MJ/t
		Unit 单位	Quantity 数量	Unit 单位	Quantity 数量		
1	Living water 生活水	t/h	2.0	MJ/t	7.12	12.0	0.11
2	Recycled water 循环水	t/h	4968	MJ/t	4.19	17485.4	158.96
3	Sewage 污水	t/h	46.755	MJ/t	46.05	1808.6	16.44
4	Demineralized water 除盐水	t/h	10.008	MJ/t	96.3	809.6	7.36
5	Electricity 电	kWh/h	4593	MJ/kWh	9.546	36829.6	334.81

No. 序号	Item 项目	Hourly consumption 小时耗量		Low calorific value or energy consumption index of fuel 燃料低热值或能耗指标		Total energy consumption 总能耗 10^4 MJ/a	Unit energy consumption 单位能耗 MJ/t
		Unit 单位	Quantity 数量	Unit 单位	Quantity 数量		
6	3.5MPa steam3.5MPa 蒸汽	t/h	84.445	MJ/t	3684	261320.1	2375.64
7	1.0MPa steam1.0MPa 蒸汽	t/h	57.778	MJ/t	3182	154433.7	1403.94
8	0.5MPa steam0.5MPa 蒸汽	t/h	-52.191	MJ/t	2763	-121131.1	-1101.19
9	Heating furnace fuel gas 加热炉用燃料气	Nm^3/h	837	MJ/Nm^3	19.22	13513.4	122.85
10	Instrument air 仪表风	Nm^3/h	877	MJ/Nm^3	1.59	1171.3	10.65
11	Plant air 工厂风	Nm^3/h	1028	MJ/Nm^3	1.17	1010.3	9.18
12	Nitrogen 氮气	Nm^3/h	818	MJ/Nm^3	6.28	4315.1	39.23
13	Hot material discharge 热出料	MJ/h	-5901.65		0.5	-2478.7	-22.53
	Total 合计	-	-	-	-	-	3355.45

1.2.8.2 Nitrogen consumption 氮气消耗

Table 9: Nitrogen consumption

表 9：氮气消耗

Tag Number 位号	Equipment name 设备名称	Normal amount kg/h 正常量 kg/h	Maximum amount kg/h 最大量 kg/h
-	Low pressure nitrogen 低压氮气	-	
-	Hot coke pipeline sampling 热焦线采样	-	230

-	Scrubbing coke loose 洗刷焦松动	-	278
-	Quenching coke riser loose 急冷焦立管松动	-	249
-	Quenching coke injection gasifier top gas 急冷焦注入气化器顶气	-	1045
-	The heater coke unloading line loose 加热器卸焦线松动	-	112
-	Shutdown coke unloading line riser loose 停工卸焦线立管松动	-	186
-	Quench tank feed line loose 急冷罐进料线松动	-	363
-	Gasifier feed line loose 气化器进料线松动	-	2415
-	Gasifier overflow line loose 气化器溢流线松动	-	533
-	Riser on the returned coke pipelines from the gasifier loose 气化器返回焦线立管松动	-	1054
-	J-bend on the returned coke pipelines from the gasifier loose 气化器返回焦线 J 形弯松动	-	254
-	The inclined lifting tube on the returned coke pipelines from the gasifier loose 气化器返回焦线提升斜管松动	-	390
-	The lifting riser on the returned coke pipelines from the gasifier loose 气化器返回焦线提升立管松动	-	2378
-	The riser on the unloding mareial lines from the gasifier loose 气化器卸剂线立管松动	-	64
-	Instrument purge for Zone B B 区仪表吹扫		125
-	Zone C *consolidation*C 区合并量	226	454
-	Zone D *consolidation*D 区合并量	482	1348
-	total 合计	708	11478
Tag Number 位号	Equipment name 设备名称	Normal amount kg/h 正常量 kg/h	Maximum amount kg/h 最大量 kg/h
-	Conversion to calibrated (Nm3/h)折算标立 (Nm^3/h)	566	9182
-	High pressure nitrogen 高压氮气	-	-
R-101	Sludge feed atomization 污泥进料雾化		32
-	Zone A instrument backflushA 区仪表反吹	188	813

-	Zone A retractable thermocouple backflushA 区可伸缩热电偶反吹	128	463
-	total 合计	315	1308
-	Conversion calibrated (Nm3/h)折算标立(Nm³/h)	252	1046

1.2.8.3 Instrument air consumption 仪表风消耗

Table 10: Instrument air Consumption

表 10：仪表风消耗

Tag Number 位号	Equipment name 设备名称	Normal kg/h 正常量 kg/h	Maximum kg/h 最大量 kg/h
-	Instrument air for Control valve 控制阀用 IA	250	499
-	Instrument air for Control valve 控制阀用 IA	196	391
-	Instrument air for Control valve 控制阀用 IA	129	258
-	Instrument air for Control valve 控制阀用 IA	44	87
-	Venting purge 放空吹扫	21	-
SR-401 A/B	Bag filter backflushing and purging 袋式过滤器反冲吹扫	386	773
PA-402	Bag filter 袋式过滤器	0	773
PA-404	Dry coke loading system 干焦装车系统	103	258
-	total 合计	1129	1804
-	Conversion calibrated (Nm^3/h) 折算标立(Nm^3/h)	877	1401

1.2.8.4 Plant air consumption 工厂风消耗

Table 11: Plant air Consumption

表 11：工厂风消耗

Tag Number 位号	Equipment name 设备名称	Normal kg/h 正常量 kg/h	Maximum kg/h 最大量 kg/h
F-101	Auxiliary combustion chamber 辅助燃烧室用	36	-
D-106	Main fan outlet liquid separation tank 主风机出口分液罐	-	2550

PA-402	Bag filter 袋式过滤器	-	773
PA-403	Venturi scrubber package unit 文丘里洗涤器成套设施	258	516
T-406	Slurry thickener overflow tank 浆液增稠器溢流罐	-	773
SR-403	Air dryer 空气干燥器	1030	1931
-	Total 合计	1324	7867
-	Conversion calibrated (Nm^3/h)折算标立(Nm^3/h)	1028	6110

1.2.8.5 Fuel gas 燃料气

Table 12: Fuel Gas Consumption

表 12：燃料气消耗

Tag Number 位号	Equipment name 设备名称	Normal kg/h 正常量 kg/h	Maximum kg/h 最大量 kg/h
D-102	Sludge backrefining tank - nitrogen blanket 污泥回炼罐-气封	0	16
D-107	Vaccum residue feed tank - nitrogen blanket 减渣进料罐-气封	0	92
F-101	Auxiliary combustion chamber 辅助燃烧室	0	263
F-102	Medium pressure steam superheater 中压蒸汽过热炉	113	755
F-104	Low pressure steam superheater 低压蒸汽过热炉	136	156
Total 合计		249	1300
Conversion calibrated (Nm^3/h)折算标立(Nm^3/h)		837	4372

1.2.8.6 Power consumption 电力消耗

Table 13: Power consumption

表 13：电力消耗

Tag Number 位号	Equipment name 设备名称	Normal 正常量 kg/h	Capacity 容量	Number of equipment 设备台数		Voltage V 电压 V
				Operating 操作	Spare 备用	

A-201	Fractionation column overhead air condenser 分馏塔塔顶空气冷凝器	24 × 12	30 × 12	12	-	380
A-204	Diesel air cooler 柴油空冷器	24 × 4	30 × 4	4	-	380
A-208	Coking heavy gas oil product air cooler 焦化重蜡油产品空冷器	24 × 2	30 × 2	2	-	380
A-217	Coking naphtha air cooler 焦化石脑油空冷器	24 × 2	30 × 2	2	-	380
A-221	Sewage oil air cooler 污油空冷器	24	30	1	-	380
A-233	Coking light gas oil air cooler 焦化轻蜡油空冷器	24	30	1	-	380
A-301	Primary contact cooling column reflux air cooler 一级接触冷却塔回流空冷器	24 × 24	30 × 24	24	-	380
A-303	Regeneration column overhead condenser 再生塔顶冷凝器	24 × 6	30 × 6	6	-	380

Tag Number 位号	Equipment name 设备名称	Normal 正常量 kg/h	Capacity 容量	Number of equipment 设备台数		Voltage V 电压 V
				Operating 操作	Spare 备用	
A-302	Flexsorb poor solvent air coolerFlexsorb 贫溶剂空冷器	24 × 12	30 × 12	12	-	380

A-304	Condensate air cooler 凝结水空冷器	24 x 2	30 × 2	2	-	380
P-101A/B	Reaction feed pump 反应进料泵	225.5	280	1	1	10kv
P-102A-D	Scrubber bottom circulation oil pump 洗涤塔底循环油泵	52.5 × 2	75 × 2	2	2	380
P-103A/B	Sludge backrefining pump 污泥回炼泵	28.2	37	1	1	380
P-104A/B/C	High pressure deaerating water pump 高压除氧水泵	96.7 × 2	110 × 2	2	1	380
P-107A/B	Vacuum residue feed pump 减压渣油进料泵	48.1	75	1	1	380
P-108A/B	Low pressure deaerating water pump 低压除氧水泵	17.3	22	1	1	380
P-201A/B	Main fractionator reflux pump 主分馏塔回流泵	21.1	30	1	1	380
P-202A/B	Main fractionator acidic water pump 主分馏塔酸性酸性水泵	12.5	18.5	1	1	380

Tag Number 位号	Equipment name 设备名称	Normal 正常量 kg/h	Capacity 容量	Number of equipment 设备台数		Voltage V 电压 V
				Operating 操作	Spare 备用	
P-203A/B	Diesel stripper pump 柴油汽提塔泵	60.3	75	1	1	380
P-204A/B	Middle section circulating oil pump 中段循环油泵	58.7	75	1	1	380

P-205A/B	Coking heavy gas oil stripper pump 焦化重蜡油汽提塔泵	18.9	30	1	1	380
P-206A/B	Fractionator bottom circulation oil pump 分馏塔底循环油泵	67.7	90	1	1	380
P-207A/B	Fractionation bottom oil pump 分馏塔底油泵	26.1	37	1	1	380
P-208A/B	Amine injection pump (PK-201)注胺泵(PK-201)	3.0	5	1		380
P-209A/B	Compressor primary condensation oil pump 压缩机一级凝缩油泵	31.6	37	1	1	380
P-210A/B	Compressor primary acidic water pump 压缩机一级酸性水泵	11.3	15	1	1	380
P-211A/B	Compressor secondary condensate oilpump 压缩机二级凝缩油泵	14.8	18.5	1	1	380

Tag Number 位号	Equipment name 设备名称	Normal 正常量 kg/h	Capacity 容量	Number of equipment 设备台数		Voltage V 电压 V
				Operating 操作	Spare 备用	
P-212A/B	Compressor secondary oil pump 压缩机二级酸性水泵	21.7	30	1	1	380

P-213A/B	Compressor three-stage condensation pump 压缩机三级凝缩油泵	1.4	3	1	1	380
P-214A/B	Absorption and desorption column middle section cooler pump 吸收解吸塔中段冷却器泵	13.9	18.5	1	1	380
P-215A/B	Stabilizer column reflux pump 稳定塔回流泵	44.1	75	1	1	380
P-217A/B	Stabilizer column bottom pump 稳定塔塔底泵	113.5	132	1	1	380
P-218A/B	Flushing oil pump 冲洗油泵	18.2	30	1	1	380
P-221	Flare knockout drum acidic water pump 火炬分液罐酸性水泵	2.6	4	1		380
P-223A/B	Acidic water pump 酸性水泵	11.4	15	1	1	380
P-225	Diesel absorbent pump 柴油吸收剂	21.8	30	1	1	380

Tag Number 位号	Equipment name 设备名称	Normal 正常量 kg/h	Capacity 容量	Number of equipment 设备台数		Voltage V 电压 V
				Operating 操作	Spare 备用	
P-226	Acidic water tank waste oil pump 酸性水罐污油泵	1.8	2.2	1		380

P-227A/B	Coking light gas oil stripper pump 焦化轻蜡油汽提塔泵	26.7	37	1	1	380
P-228A/B	Coking light gas oil reflux pump 焦化轻蜡油回流泵	4.5	7.5	1	1	380
P-301AB	Venturi slurry pump 文丘里浆液泵	108.0	132	1	1	380
P-302A/B	Dilute slurry pump 稀浆液泵	9.5	15	1	1	380
P-303A/B	Primary contact condensing column bottom pump 一级接触冷凝塔塔底泵	256.6	315	1	1	10KV
P-305A/B	Secondary contact condensation column bottom pump 二级接触冷凝塔 塔底泵	179.4	220	1	1	10KV
P-306A/B	Washing water circulation pump 洗涤水循环泵	17.6	22	1	1	380
P-307	Flexsorb fresh solvent pump Flexsorb 新鲜溶剂泵	1.7	3	1		380
Tag Number 位号	Equipment name 设备名称	Normal 正常量 kg/h	Capacity 容量	Number of equipment 设备台数		Voltage V 电压 V
				Operating 操作	Spare 备用	

P-308A/B	Flexsorb lean solvent feed pump Flexsorb 贫溶剂进料泵	144.3	160	1	1	380
P-309A/B	Washing water pump 洗涤水泵	16.2	22	1	1	380
P-309A/B	Washing water pump 洗涤水泵	16.2	22	1	1	380
P-310A/B	Flexsorb rich solvent pump Flexsorb 富溶剂泵	132.7	160	1	1	380
P-311A/B	Regenerative column reflux pump 再生塔回流泵	16.7	22	1	1	380
P-312	Regeneration column overhead waste oil pump 再生塔顶污油泵	1.8	2.2	1	-	380
P-314	Flexsorb underground solvent pump Flexsorb 地下溶剂泵	4.2	7.5	1	-	380
P-315A/B	Regeneration column bottom pump 再生塔底泵	84.6	110	1	1	380
PA-301	Anti-block inhibitor injection system 阻垢剂注入系统	3.0	5	1	-	380
Tag Number 位号	Equipment name 设备名称	Normal 正常量 kg/h	Capacity 容量	Number of equipment 设备台数		Voltage V 电压 V
				Operating 操作	Spare 备用	

PA-302	Alkaline injection system 碱液注入系统	3.0	5	1	-	380
PA-303	Defoamer injection system 消泡剂注入系统	3.0	5	1	-	380
P-322A/B	Treated water pump 净化水泵	34.4	45	1	1	380
P-401A/B	Water circulation pump 水循环泵	4.3	7.5	1	1	380
P-402A/B	Dilute slurry lifting pump 稀浆液提升泵	5.8	7.5	1	1	380
P-403A/B	Slurry thickener pump 浆液增稠器泵	5.9	7.5	1	1	380
P-404A/B	Slurry thickener oily sewage pump 浆液增稠器含油污水泵	43.1	55	1	1	380
P-406A-C	Large flow sewage lifting pump 大流量污水提升泵	103.5	132	2	1	380
P-407A/B	Small flow sewage lifting pump 小流量污水提升泵	11.0	15	1	1	380
F-301	Nitrogen electric heater 氮气电加热器	114.0	-	1		380
F-401	Nitrogen electric heating furnace - fan 氮气电加热炉-风机	92.0	-	1		380
Tag Number 位号	Equipment name 设备名称	Normal 正常量 kg/h	Capacity 容量	Number of equipment 设备台数		Voltage V 电压 V
				Operating 操作	Spare 备用	

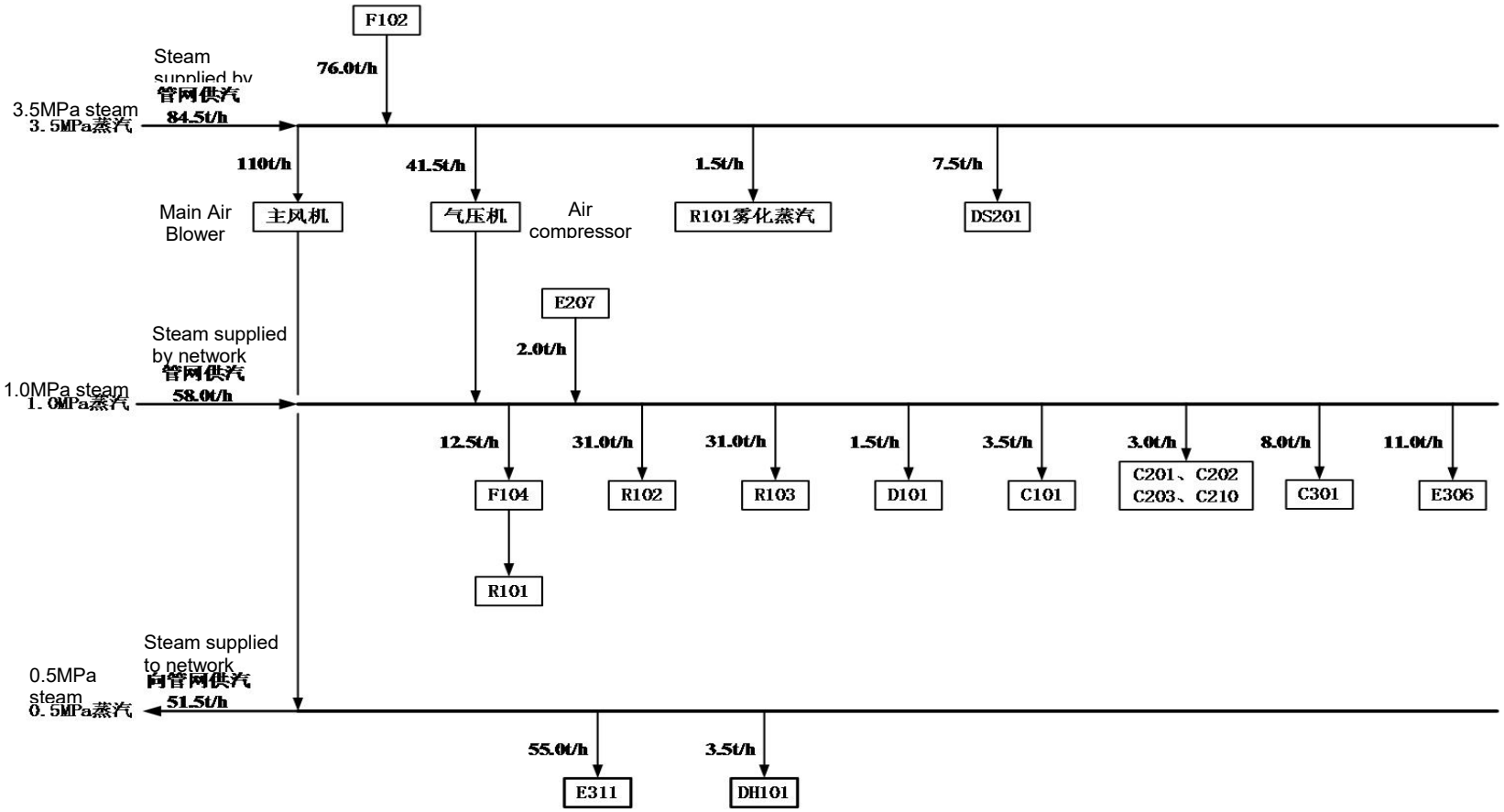
	Fume hood exhaust fan 通风柜排气扇	14.0	-	-	-	380
MA-401	Diluted slurry agitator 稀浆液搅拌器	66.0	-	1	-	380
MA-402	Diluted slurry agitator 稀浆液搅拌器	66.0	-	1	-	380
PA-401	Filter press flocculant package unit 压滤机絮凝剂成套设施	12.0	-	1	-	380
PA-404	Dry coke powder loading package unit 干焦粉装车成套设施	13.2	-	1	-	380
WS-401	Weighbridge 地磅	2.0	-	1	-	220
PA-405	Belt filter press package unit 带式压滤机成套设施	15.0	-	1	-	380
PA-406	Wet coke powder loading package unit 湿焦粉装车成套设施	120.0	-	1	-	380
PA-407	Slurry thickener tank package unit 浆液增稠器罐成套设施	7.0	-	1	-	380
Tag Number 位号	Equipment name 设备名称	Normal 正常量 kg/h	Capacity 容量	Number of equipment 设备台数		Voltage V 电压 V
				Operating 操作	Spare 备用	

PA-408	Thickener flocculant package unit 增稠器絮凝剂成套设施	3.0	5	1	-	380
-	Reactor elevator 反应器电梯	15.0	-	1	-	380
-	Coke powder silo elevator 焦粉料仓电梯	15.0	-	1	-	380
-	Power supply for Lighting 照明用电	20	-	-		-
-	Power supply for Instrument 仪表用电	20	-	-		-
-	Total 合计	4593	-	-		-

1.2.8.7 Steam balance 蒸汽平衡

Table 14: Steam balance

表 14：蒸汽平衡



(1) 3.5MPa medium pressure steam 3.5MPa 中压蒸汽

In normal operation, the plant's medium pressure steam system network supplies 84,445 kg/h of steam to the unit. Medium pressure steam for start-up is supplied by the plant system.

正常操作时，工厂中压蒸汽系统管网向装置提供 84445 kg/h 蒸汽。开工用中压蒸汽由工厂系统供给。

(2) 1.0MPa low pressure steam 1.0MPa 低压蒸汽

In normal operation, the plant's low pressure steam system network supplies 57778 kg/h of steam to the unit.

正常操作时，工厂低压蒸汽系统管网向装置提供 57778 kg/h 蒸汽。

(3) 0.5MPa low pressure steam 0.5MPa 低低压蒸汽

Under normal conditions, the plant will send 52191 kg/h of low low pressure superheated steam to the system pipe network.

正常情况下装置外输 52191 kg/h 低低压过热蒸汽至系统管网。

1.3 Environmental specification 环保指标

Table 16: Summary of "three wastes" emissions

表 16："三废"排放汇总表

Name 名称	Phase 形态	Emission Regularity 排放计划	Emissions amount t/times 排放量 t/次	Emissions t/a 排放量 t/a	Main composition 主要成分	Classification 分类	Disposal method 处置方式
COS spent catalystCOS 废催化剂	Solid 固态	1 time / six months 1 次/6 月	93.1 m^3 / times 93.1 m^3/次	242	Al_2O_3	Dangerous waste 危废	Landfill, blending incineration or sending to processing 锅炉掺烧或外委处理
Porcelain balls 瓷球		1 time / six months1 次/6 月	26.6 m^3 / times 26.6 m^3/次	69	Al_2O_3	Non-hazardous waste 非危废	Landfill or sending to processing 锅炉掺烧或外委处理
Activated carbon 活性炭		1 time / 2 years1 次/2 年	50 m^3 / times50 m^3/次	12.5	Activated carbon 活性炭	Non-hazardous waste 非危废	Boiler blending incineration 锅炉掺烧
HSS amine solutionHSS 胺液	Liquid 液态	间断	间断	122	Organic amine 有机胺	Non-hazardous waste 非危废	Vacuum residue treatment plant 减渣处理装置

Table 17: Flexible coking unit environmental monitoring plan

表 17：灵活焦化装置环境监测计划

Category 类别	Monitoring points 监测点	Frequency 频率	Monitoring Items 监测项目
Waste water 废水	Oily sewage point 含油污水(含焦污水 BA02 池)	Once a week 每周一次	Oil and coke powder content 油、焦粉含量、硫化物、氨氮、PH 值
	Sulfur-containing sewage point 含硫污水		Oil and sulfur content 油、硫含量
	Oily sewage point 含油污水(火炬区 BA03 池)	间断	含油量、COD、硫化物、氨氮、PH 值。
Exhaust gas 废气	Furnace F-102, Furnace F-104 炉 F-102、炉 F-104	Once a week 按需求检测	Ringermann blackness (smoke concentration) 排烟温度、烟尘浓度、含氧量、二氧化硫、氮氧化物、硫化氢。
	K-401, K-402, K-403 outlets 出口	间断	Dust concentration 粉尘浓度
Noise 噪声	Main fan area 主风机区	Twice a year 每月一次	现场噪声≤90dB
	Air compressor area 气压机区		
	Pump area 泵区		
有毒有害气体	装置区域内	Twice a year 每月一次	H_2S＜10 mg/m3 CO＜30 mg/m3 煤尘＜10mg/m3

1.3.1 Waste water 废水

The drainage system is designed according to the principle of sewage separation and sewage diversion. The wastewater generated by the plant includes oily sewage, salty sewage, and sulfur-containing sewage.

按清污分流及污污分流的原则设计排水系统。装置产生的废水包括含硫污水、含油污水(含焦粉污水)、初期雨水。

After the sulfur-containing sewage is sent to the acidic water stripping unit inside the plant to have been processed, it can be reused or sent to the waste water treatment plant .In the process of start-up ,shutdown and overhaul, the equipment area around which harmful fluid leakage and overflow may occur is provided with weir and liquid-conducting facilities not less

than 150mm high . Rainwater in the weir, fire-fighting water drainage and floor cleaning water are collected and discharges the oily sewage system.
含硫污水送厂内的酸性水汽提装置进行处理后，回用或送到厂区污水处理场处理。凡在开停工、检修过程中，可能出现有害流体泄漏、漫流的设备区周围，均设有不低于 150mm 高的围堰和导液设施，围堰内的雨水、消防排水、地面清洗水收集后排入初期雨水系统。
The waste water discharged from equipment, pipeline, sampling port and overflow port is collected centrally into the oily sewage system.The cooling of machine and pump mostly adopts circulation system, and only a small amount of cooling water from the machine and pump is discharged into oily sewage system. All steam condensate water is recycled without being discharged into the oily sewage system.
主装置各区域的设备、管道的排净口、地漏、采样口和溢流口等排出的污水均集中收集到含油污水(含焦污水)系统。机泵冷却大部分采用循环系统，机泵冷却水不回收的水和分馏、稳定反应区域的机泵水沟收集的污水排入初期雨水系统，收集到初期雨水提升池内 BA01。灵活气处理区、主风机、气压机、加热炉区域、干湿焦处理区域的水沟、机泵水沟收集污水、地漏、溢流口等排出的污水均进入含油污水系统，集中到达含油污水提升池内 BA02（含焦污水池）。装置火炬区域设备、管道的排净口、地漏、采样口和溢流口等排出的污水均集中收集到含油污水池 BA03。所有蒸汽凝结水全部回收利用，不排入其它污水系统。
The oily sewage enters the sewage pretreatment station in the combined plant through gravity flow for treatment. The oil content of the pretreated sewage is not more than 100mg/L, and is sent to the whole plant waste water treatment plant for concentrated treatment through the pump lifting pressure.
初期雨水、含油污水(含焦污水)通过重力分别流进入本联合装置内的污水预处理池 BA01、BA02、BA03 进行处理，预处理后的污水含油量不大于 100mg/L，经泵提升压力送至全厂污水处理场统一处理。
The clean rainwater in the plant weir is collected through the plant weir and collected through the gully to the rainwater pipeline system outside the plant. After the fire-fighting water drainage in the plant weir is collected in the accident state, it is discharged to the accident buffer pool in the plant's waste water treatment plant.
装置围堰内的清净雨水由装置围堰收集后，通过雨水口收集排出装置至装置外雨水管道系统。事故状态下装置围堰内的消防排水收集后，进入初期雨水提升池 BA01，通过泵排至厂区污水处理场内的厂区事故缓冲池。

1.3.2 Exhaust gas 废气

1.3.2.1 Combustion exhaust gas emission control 燃烧废气排放控制

The plant uses deep desulfurization fuel gas and flexigas, and the SO_2 emission concentration is 100 mg/m^3 which meets the requirements of the first level of clean production. The furnace

uses a low NOx burner and appropriately raises the height of the chimney so that the dye in the combustion exhaust gas of the furnace reaches the Brunei emission standard.
装置使用深度脱硫的燃料气和灵活气， 烟气排放满足清洁生产一级要求。加热炉(F102、F104)选用低 NOx 燃烧器，并适当提高烟囱高度，使加热炉燃烧废气中的染物达到文莱政府部门排放标准 SO_2≤100 mg/m3、NOx≤300 mg/m3、H_2S≤5 mg/m3 等要求。

1.3.2.2 Vent gas emission control 放空气体排放控制

The whole plant has a flare venting system and a fuel gas recovery system. During normal production, the safety valve opens and releases the hydrocarbon gas, which is separated with liquid and then sent into the fuel gas recovery system. The combustion gas discharged from the start-up and accident conditions enters the flare system and is discharged after combustion.
全厂设火炬放空系统和燃料气回收系统。正常生产时，安全阀启跳放出的烃类气体，分液进入燃料气回收系统。开停工和事故状态排出的可燃气体，进入火炬系统，燃烧后排放。

1.3.2.3 Light hydrocarbon gas 轻烃气

The Hengyi (Brunei) refinery project is equipped with a flare system. The flare only lights the pilot burner under normal working conditions. It only exceeds the adjustment capacity of the system when the plant is start-up and shutdown and in an accident condition. The oil and gas of the overpressure relief venting to flare is burned to ensure plant safe production and reduce hydrocarbon pollution. In normal production, the combustible gas released by each plant respectively enters the gas cabinet containing hydrocarbon and the gas cabinet containing hydrogen.
恒逸（文莱）炼油项目设有火炬系统，火炬在正常工况下只点长明灯，只有在装置开停车和事故状态下超过系统的调节能力，超压泄放的油气放火炬燃烧，以保证工厂的安全生产，并减少烃类的污染。正常生产时，装置放空的轻烃气、可燃性气体分别进 D212 缓冲后，排至全厂低压瓦斯管网，统一回收处理。

1.3.2.4 Flexigas 灵活气

The plant is equipped with a flexigas flare venting system. During normal production, the flexigas is sent to the flexigas pipeline network for the furnace. The flexigas discharged from the start-up, shutdown and the accident state enters the flare system and is discharged after combustion.
装置设灵活气火炬放空系统。正常生产时，灵活气送入灵活气管网，供加热炉使用。开停工和事故状态排出的灵活气，进入装置火炬系统，燃烧后排放。

1.3.3 Solid waste 固体放射源废弃物

The flexible coking unit uses three nuclear level instruments and one hydrometer at the bottom of the fractionation column, and its radioactive material is metal ruthenium (Cs-137). During the production process, management should be strengthened. If the handling is improper or the

container is damaged, it may cause radioactive radiation damage to the operator and will not affect the surrounding environment. For discarded radioactive materials, recycling is the top priority, or regularly send them to the urban radioactive waste storage designated by local provincial administrative department of environmental protection.
灵活焦化装置在分馏塔底使用了 3 个放射线料位计 LT-20103A/B/C 和 T405 外送浆液 1 个比重计 AT-41001，其放射性物质为金属铯（Cs-137）。在生产过程中应当加强巡检管理，如果处理不当或保护设备破损时，可能对操作人员造成放射性辐射危害，对周围环境不会产生影响。对于废弃的放射性材料，首先考虑回收利用，或定期送到所在地环境保护行政主管部门指定的地方放射性废物库贮存。

1.3.4 Noise 噪音

The noise of the plant mainly comes from the machine and pumps, air cooler fan, compressor and heating furnace, and steam vent. The main control measures are as follows: low-noise equipment is chosen in similar equipment. Soundproofing treatment for the high power pump. Main vents ports are equipped with silencers. The heating furnace is equipped with a burner with a soundproof cover. In the layout, the high-noise machine and pump are placed in an area away from the boundary of the plant to reduce the impact on the external environment. In summary, the environmental protection measures adopted in this project can control pollution and protect the environment.
灵活焦化装置的噪声主要来源于机泵、空冷器风机、压缩机和加热炉、蒸汽放空等。主要治理措施有：在同类设备中选用低噪声设备。对大率机泵进行隔音处理。主要放空口加消音器。加热炉选用带隔音罩的火咀。在平面布置上，将高噪声的机泵布置在远离厂界的区域，以减少对外环境的影响，现场作业员工佩备耳罩、耳塞等防护用品。综上所述，灵活焦化装置所采取的环境保护措施能够起到控制噪音污染、保护人、环境的目的。

1.3.5 Environmental specification 环保指标

Table 18: Environmental specification

表 18：环保指标

No. 序号	Item name 项目名称	Unit 单位	Design target 设计指标	Control target 控制指标	Remarks 备注
1	Chemical oxygen demand of the discharged sewage 外排含油污水(含焦污水)化学需氧量	mg/L	≤800	≤800	-

No. 序号	Item name 项目名称	Unit 单位	Design target 设计指标	Control target 控制指标	Remarks 备注
2	Ammonia nitrogen content of the discharged sewage 外排含油污水(含焦污水)氨氮含量	mg/L	≤50	≤50	-
3	PH value of the discharged sewage 外排含油污水(含焦污水)PH 值	---	6.00～9.00	6.00～9.00	-
4	Oils of the discharged sewage 外排含油污水(含焦污水)石油类	mg/L	≤500	≤500	-
5	Oils of the discharged sewage 外排含油污水(含焦污水)硫化物	mg/L	⩽50	⩽50	-
6	Oils of the discharged sewage 外排含油污水(含焦污水)发酚	mg/L	⩽40	-	-

1.4 Plant equipment 装置设备

1.4.1 List of Equipment and Main Design Parameters 设备一览表及主要设计参数

See the attached tables. 见附表。

2 Operation method for process production post 岗位操作法

2.1 The management range of the process production post 岗位管辖范围

2.1.1 The management range of the supervisor post 班长岗位管辖范围

Under the leading of the plant leader, the supervisor is responsible for the daily safe production of the shift he is on duty.
在装置领导下，负责本班的日常安全生产。

2.1.2 Inside operators post 内操岗位管辖范围

Under the organization and command of the supervisor, inside operators carry out the operating procedures and technical specification carefully and they are responsible for the work of this post, and the production tasks are completed on time.
在班长的组织指挥下，认真执行操作规程和工艺指标，对本岗位工作负责，按时完成各项生产任务。
Reaction post: Responsible for the daily operation of the plant's reaction gasification system, coke powder loading system and machinery equipment like compressor trains.
反应岗位：负责装置反应气化系统、焦粉装车系统和机组的日常操作。
Fractionation post: responsible for the daily operation of the fractionation stabilization system and the flexigas treatment system.
分馏岗位：负责分馏稳定系统和灵活气处理系统的日常操作。

2.1.3 The management range of outside operators 外操岗位管辖范围

Under the organization and command of the supervisor, outside operators are responsible for the daily routine operation of the system, completing the production and work tasks of this post; responsible for the operation, maintenance and maintenance of the equipment, instruments and process pipelines of this post, and the use and storage of raw materials.
在班长的组织指挥下，负责系统日常的定期作业，完成本岗位各项生产、工作任务；负责本岗位所属设备、仪表和工艺管线的操作、维护和保养、原材料的使用和保管。
Reaction post: Responsible for the daily operation of the plant's reaction gasification system, coke powder loading system and machinery equipment like compressor trains.
反应岗位：负责装置反应气化系统、焦粉装车系统和机组的日常操作。
Fractionation post: responsible for the daily operation of the fractionation stabilization system and the flexigas treatment system.
分馏岗位：负责分馏稳定系统和灵活气处理系统的日常操作。

2.2 Tasks of production post 岗位任务

2.2.1 Tasks of supervisor post 班长岗位任务

2.2.1.1 Convey all the working requirements from the joint unit and upper level leaders in a timely manner and implement them.
及时传达联合装置、上级的各项工作要求，并贯彻执行。
2.2.1.2 Responsible for daily production, emergency accident handling and start-up and shutdown operations during the shift on his duty, carefully implement the walkaround inspection system and urge the group members to perform according to the regulations.

负责当班期间的日常生产、紧急事故处理和开停工操作，认真执行巡检制度并督促班组人员照章执行。

2.2.1.3 Organize group members to carry out stable production according to process specification and operating procedures, ensure product quality and production rate, strive to reduce energy consumption, ensure the completion of various economic indexes; write down all kinds of operation records and carry out the shift changeas required.

组织班组人员按工艺指标和操作规程进行安稳生产，保证产品质量和产量，努力降低消耗，确保各项经济指标的完成；按要求做好各类操作记录和交接班。

2.2.1.4 Maintain the related pumps, equipment, process pipelines, instrumentation, electrical, fire-fighting facilities, etc., and do a good job of maintenance of the equipment; carefully check and find out equipment abnormalities and leaks which should be dealt with and reported in a timely manner.

维护好所属机泵、设备、工艺管道、仪表、电气、消防等设施，做好设备的保养工作；认真检查，发现设备异常和泄漏等情况要及时处理和汇报。

2.2.1.5 Organize the team to participate in post knowledge learning and post technical training activities.

组织班组参加岗位业务知识学习和岗位技术练兵活动。

2.2.1.6 Responsible for the attendance and holiday arrangements of the team members.

负责班组人员的考勤及假期安排。

2.2.1.7 Comply with the company's Staff Regulations

遵守公司《员工守则》。.

2.2.1.8 Complete all the tasks assigned by the leadership.

完成领导交办的各项工作。

2.2.2 Tasks of inside operators post 内操岗位任务

2.2.2.1 Responsible for the adjustment operation of all computers and indoor instruments of this plant, the start-up, shutdown and accident handling and knowing the use of field instruments.

负责本装置所有计算机及室内仪表的调节操作，开、停车及事故处理，掌握现场仪表使用情况。

2.2.2.2 Ensure the pass rate of the distillate exports of various products, and achieve good quality and high yield.

确保各类产品馏出口的合格率，做到质量好，收率高。

2.2.2.3 Strengthening post cooperation, adjustment operations must also take into account the impact on downstream posts, and make adjustments after first contact, and make a safe and proper adjustment.

加强岗位协作，调节操作的同时必须考虑到对下游岗位的影响，并做到先联系后调节，而且要稳妥。

2.2.2.4 Carefully operating to ensure that each system does not overheat, overpressure, rushing columns, and withdraw empty.
精心操作，保证各系统不超温、不超压、不冲塔、不抽空。
2.2.2.5 Execute the process operating cards, control the various process parameters, find out the abnormal situation and deal with it in time, and notify relevant process posts and report to the supervisor in time.
执行工艺卡片，控制好各工艺参数，发现异常情况及时处理，并及时通知相关工艺岗位及向班长汇报。
2.2.2.6 Carefully operating, timely knowing the changes in product quality, and making adjustment base on the causes to ensure the quality of products such as dry gas, liquefied petroleum gas, gasoline, propylene, liquid hydrocarbons, gasoline and diesel.
精心操作，及时掌握产品质量的变化情况，并针对原因进行调节，确保干气、液化气、汽油、丙烯、液态烃、汽油及柴油等产品的产品质量。
2.2.2.7 Constantly sum up experience, strive to improve the level of operation technology, and carefully fill in the operation records and shift change log, so that the data records are neat and tidy, and the data is complete and accurate.
不断总结经验，努力提高操作技术水平，认真填写操作记录和交接班日记，做到数据记录整洁，数据齐全准确。
2.2.2.8 Actively participate in technical learning, adhere to post training, continuously improve operation skills, and put forward more reasonable suggestions.
积极参加技术学习，坚持岗位练兵，不断提高操作技能，多提合理化建议。
2.2.2.9 Strive to reduce the consumption of various power and chemical raw materials.
努力降低各种动力和化工原材料的消耗。
2.2.2.10 Comply with the company's Staff Regulations.
遵守公司《员工守则》。
2.2.2.11 Complete the tasks assigned by the leadership.
完成领导交办的各项工作。

2.2.3 Tasks of Outside operators post 外操岗位任务

2.2.3.1 Under the leadership of the supervisor, complete the operation of the plant start-up, shutdown, daily operation and dealing with abnormal situation.
在班长领导下完成装置开车、停车，日常运行和异常情况的处理等作业。
2.2.3.2 Cooperate with inside operator to ensure safe and normal operation of the plant, actively cooperate with the test department to do all kinds of sampling work on time, prepare various additives according to requirements and add various additives in time.
配合内操做好装置安全、正常运行，积极配合测试部门按时做好各种采样工作，按要求配制各种助剂并及时添加各种助剂。

2.2.3.3 Implement the walkaround inspection system. For the monitor of each system, walkaround inspections of the plant production and operation shall carry out at least six times, so that problems could be find in a timely manner and reported to the supervisor to ensure safe production.

执行巡回检查制度，对各个系统的监控每班对装置生产运行情况，至少进行六次巡回检查，发现问题及时处理，并向班长汇报，确保安全生产。

2.2.3.4 Sampling points and discharge points containing hydrogen sulfide, the gas mask must be worn during operation, guarded by a special person and operated in the upwind direction.

含有硫化氢采样点及排入点，作业时必须戴好防毒面具，有专人监护，站在上风向操作。

2.2.3.5 Responsible for the use,maintenance and standardization of fire-fighting equipment and tools in the area of this post. Regularly check the application status of the hydrogen sulfide alarm detectors, keep the gas mask in good condition, and report the problem to the supervisor and the shift supervisor in time.

负责本岗位区域内的消防器材、工具的使用、维护和规范化。经常检查硫化氢报警仪投用状况，保管好防毒面具，发现问题及时向班长、值班长汇报。

2.2.3.6 Comply with the environmental protection system, do a good job in civilized production, do a good job of “no leakage posts” and “perfect posts”, and discharge process waste to protect the production environment. Do a good job in responsible area environmental sanitation.

遵守环保制度，搞好文明生产，做好“无泄漏岗位”和“完好岗位”的工作，按规定排放工艺废弃物保护生产环境。搞好负责区域环境卫生。

2.2.3.7 Implement the lubricant management system and equipment maintenance system. Familiar with and master the compressor and pump performance and practical operating skills, and implement the post operation method.

执行润滑油管理制度和设备维护保养制度。熟悉和掌握机泵性能和实际操作技能，执行岗位操作法。

2.2.3.8 Carefully fill in the shift change log and operation records, ensure the original data is correct and complete and the handwriting is good and clean.

认真填写交接班日记和操作记录，保证原始数据的正确齐全、字迹端正清洁。

2.2.3.9 Actively participate in the post training and rational proposal activities, study the process technology hard, and achieve “four understandings and three capabilities” for the equipment in this post, and constantly improve their own professional level.

积极参加岗位练兵和合理化建议活动，刻苦学习技术，对本岗位设备做到“四懂三会”，不断提高自己的业务水平。

2.2.3.10 Comply with the company's Staff Regulations.

遵守公司《员工守则》。

2.2.3.11 Complete the tasks assigned by the leadership.

完成领导交办的各项工作。

2.3 Startup scheme 开工方案

2.3.1 Complete check 全面检查

Before the Unit is put into commissioning, the preparation works are as follows:
装置进入投料试车前，准备工作如下：

2.3.1.1 Reaction gasification system 反应气化系统

(1) Before startup, conditions of reaction gasification system are as follows:
开工前反应气化系统状态如下：
1) Dry-out, check and verification of lining of heater, reactor and gasifier have been completed (including E102, E103); and fractionator inlet blind has been removed;
三器衬里烘好检查确认完（包括 E-102、E-103），分馏塔入口盲板拆除；
2) Dry-out, check and verification of lining of F101, F102, F104 have been completed;
F-101、F-102、F-104 衬里烘好检查确认完；
3) Boiling out of D103 has been completed;
D-103 完成煮炉；
4) Startup coke fines are ready, and loaded into D401. Put bottom heating nitrogen into service, and separate from the back-up one;
开工焦粉准备好，装进 D-401，投用底部加热氮气，隔离备用；
5) Startup coke fines are ready, and loaded into D401. Put bottom heating nitrogen into service, and separate from the back-up one;
加药、除氧剂、中和剂胺提前准备好。
(2) Key points:
重点注意事项：
1) Cyclone check: Verify that the diplegs of prime and secondary cyclones of heater and the diplegs of reactor cyclone shall be unobstructed;
旋分检查：确认加热器一二级旋分、反应器旋分料腿通畅；
2) Check conveying line aeration orifice connections, aeration fluid restriction orifices and instrument connections by poking a bar into the them, and verify that they shall be unobstructed;
输送管线松动点接口、松动介质限流孔板和仪表接口用捅杆进行检查，确保畅通；
3) Verify that reactor feed nozzles shall be manufactured properly, and that the nozzles shall be subject to spraying test. All water spraying shall be verified on a single test stand. Scrubbing oil distributor of scrubber has been assembled, and subject to the spraying test outside the vessel;
反应器进料喷嘴制造正确已确认且喷嘴进行了喷射试验；所有喷水均单独在试验台验证；洗涤塔洗涤油分布器已组装，且在容器外进行了喷射试验；

4) Check that filter element shall be sized properly, and that test assembling shall be acceptable;
检查过滤器滤芯规格正确、试装合格；
5) Check that primary, secondary and louver dampers of auxiliary combustion furnace F101 shall be opened/closed smoothly and properly, and that gas burner and electric igniter shall be operational;
检查辅助燃烧炉 F-101 一、二次风阀和百叶窗风门开关灵活好用，瓦斯火嘴和电打火好用；
6) Check and verify that coke loading line shall be unobstructed;
检查确认装焦线畅通；
7) Check that lubricating oil has properly been added to individual slide valves, that valve plate shall be opened/closed smoothly, that valve position sensing indication shall be in accordance with field valve position, and that the zeroing check shall be performed properly;
检查各滑阀润滑油加好，阀板开关灵活，阀位回讯显示和现场一致，零点校验好；
8) Check that self-preservation systems shall be activated properly by testing them, that actuation time of self-preservation control valve shall be documented, and countersigned;
试验检查各自保系统动作正确并记录自保控制阀动作时间，并要有文字会签；
9) All valves shall be in exact position as required, especially normally-open and normally-closed valves shall be in exact position;
所有阀门根据需要处于准确位置，特别是常开常闭阀处于正确位置；
10) Check that the flow process shall be proper, and supply water, electricy, steam and air to this Unit after asking instructions from production management department; and contact with the Instrument for supplying the instrument back flush air.
检查好流程，请示生产经营部后将水、电、汽、风引入本装置；联系仪表，引进仪表反吹风。

2.3.1.2 Fractionation stabilization system 分馏稳定系统

(1) Before startup, conditions of fractionation stabilization system are as follows:
开工前分馏稳定系统状态如下：
1) For fractionation stabilization system, the running with water has been completed, all of equipment, lines, instruments problems have been solved properly;
分馏稳定系统水联运做完，设备、管线、仪表问题处理好；
2) Water in the fractionation stabilization system is drained fully;
分馏稳定系统存水放完；
3) Ammonium polysulfide solution is ready.
多硫化铵溶液准备好。
(2) Key points:
重点注意事项：
1) Scrubbing oil distributor of scrubber has been assembledf completely, and subject to the spraying test outside the vessel;

分馏塔洗涤油分布器完成组装且喷射试验在容器外完成；

2) Checking proper filter element size and test assembling has been completed;

过滤器滤芯的正确规格检查和试装已经完成；

3) All of pumps, air cooler blowers are under good conditions. Grease has been added properly. Cooling water shall be unobstructed;

各泵、空冷器风机完好，润滑油脂加好，冷却水畅通；

4) Check that all instruments have been calibrated, and be operational, and under good back-up conditions;

检查所有仪表校验好用，并处于良好备用状态；

5) Open hand valve of relief valve;

打开安全阀手阀；

6) Supply the steam to the piping for purging; after seeing steam at vents and fully venting and cleaning the piping, close the piping, and vent the columns. According to the requirements of the equipment and pressure test values, perform leakage test by building up the pressure. Check that there shall be no leakage at piping welds, flanges;

各管线给汽吹扫，排空见汽，吹扫干净后，关闭各管线、塔器排空，按设备要求和试压值进行憋压试漏，检查管线焊缝、法兰等无泄露；

7) When supplying the steam to the heavy oil piping for purging, contact with the Maintenance for hot tightening when the temperature reaches 200°C;

重油管线给汽吹扫时，当温度达到200℃时，联系机修热紧；

8) After pressure test is completed, the piping shall be modified as required based on the production flow process, and the circulating water is supplied to the Unit;

试压结束后，各管线按要求改好生产流程，循环水引进装置；

9) All valves shall be in exact position as required, especially normally-open and normally-closed valves shall be in exact position;

所有阀门根据需要处于准确位置，特别是常开常闭阀处于正确位置；

10) Check that the flow process shall be proper, and supply water, electricy, steam and air to this Post.

检查好流程，将蒸汽、风、电、水引入本岗位。

2.3.1.3 Flexigas treatment system 灵活气处理系统

(1) Before startup, conditions of Flexigas treatment system are as follows:

开工前灵活气处理系统状态如下：

1) Caustic wash degreasing of amine absorption and regeneration system has been completed;

胺液吸收和再生系统做完碱洗除脂；

2) For Venturi scrubber, stage 1 contact cooling tower, stage 2 contact cooling tower, amine absorber and amine regenerator, running with water has been completed;

文丘里洗涤器、一级接触冷却塔、二级接触冷却塔、胺液吸收塔和胺液再生塔做完水联运；
3) COS reactor catalyst has been filled, inlet and outlet valves are closed, separation is kept;
COS 反应器催化剂装填好，进出口阀关闭，保持隔离；
4) After running with water has been completed, water in amine regenerator is drained fully, and water in other columns is kept;
水联运完成后，胺液再生塔存水放完，其它塔器水保留；
5) Amine, defoamer, caustic (30%), antiscalant are ready.
胺液、消泡剂、碱液（30%）、阻垢剂准备好。
(2) Key points:
重点注意事项：
1)Cyclone check: Prior to removal of inlet and outlet passageways of tertiary cyclone, make sure that cyclone dipleg shall be unobstructed;
旋分检查：拆除三旋入口和出口通道前，必须确认旋分料腿通畅；
2)Packed tower distributor has been assembled completely, and nozzle test has been completed outside the vessel;
填料塔分布器完成组装且喷嘴在容器外完成了试验；
3) All of pumps, air cooler blowers are under good conditions. Grease has been added properly. Cooling water shall be unobstructed;
各泵、空冷器风机完好，润滑油脂加好，冷却水畅通；
4) Check that all instruments have been calibrated, and be operational, and under good back-up conditions;
检查所有仪表校验好用，并处于良好备用状态；
5) Open hand valve of relief valve;
打开安全阀手阀；
6) The piping shall be modified as required based on the production flow process, and the circulating water is supplied to the Unit;
各管线按要求改好生产流程，循环水引进装置；
7) All valves shall be in exact position as required, especially normally-open and normally-closed valves shall be in exact position;
所有阀门根据需要处于准确位置，特别是常开常闭阀处于正确位置；
8) Check that the flow process shall be proper, and supply water, electricy, steam and air to this Post.
检查好流程，将蒸汽、风、电、水引入本岗位。

2.3.1.4 Coke fines loading system 焦粉装车系统
(1) Before startup, conditions of Flexigas treatment system are as follows:
开工前灵活气处理系统状态如下：
1) Through-purging of solid coke loading system by main air has been completed;

焦粉装焦系统用主风贯通吹扫完；

2) Through-treatment of wet coke treatment system by process water has been completed;

湿焦处理系统用生产水贯通处理完；

3) T406 has properly received process water for back-up;

T-406 收好生产水，备用；

4) For D402, running with water is normal;

D402 水联运正常；

5) Thickener, flocculant are ready.

增稠剂、絮凝剂准备好。

(2) Key points:

重点注意事项：

1) Bag-type dust collector is properly provided with PLC, and commissioning shall be normal;

布袋除尘器设置好 PLC，调试正常；

2) Commissioning of filter press shall be normal;

压滤机试运行正常；

3) Cyclone check: Prior to removal of inlet and outlet passageways of quartus cyclone, make sure that cyclone dipleg shall be unobstructed;

旋分检查：拆除四旋入口和出口通道前，必须确认旋分料腿通畅；

4) Check and verify that coke loading line shall be unobstructed;

检查确认装焦线畅通；

5) Check that all instruments have been calibrated, and be operational, and under good back-up conditions;

检查所有仪表校验好用，并处于良好备用状态。

2.3.1.5 Main air blower and gas compressor system 两机系统

(1) Before startup, conditions of main air blower and gas compressor system are as follows:

开工前两机系统状态如下：

1) Single commissioning of main air blower is acceptable, performance curves have been completed;

主风机单机试运合格，性能曲线做完；

2) Single commissioning of gas compressor is acceptable, commissioning is normal;

气压机单机试运合格，试运行正常；

(2) Key points:

重点注意事项：

1) Check that all of anti-surge valves, motor operated valves shall be operational, and that grease shall be added properly;

检查所有反飞动阀、电动阀好用，加好润滑油脂；

2) Tests of self-preservation systems of individual machines have been completed, and documented;
各机自保系统试验完成并做好记录；
3) Adequate and qualified grease shall be ready;
准备好足够数量合格的润滑油脂；
4) Commissioning of main air blower and gas compressor shall be under good conditions. All preparation works shall be ready as specified. Nitrogen for sealing protection shall be supplied to the machine from compressor section of the gas compressor;
主风机、气压机试运完好，按规定做好一切准备工作，气压机压缩机部分引氮气入机作密封保护用；
5) All valves shall be in exact position as required, especially normally-open and normally-closed valves shall be in exact position;
所有阀门根据需要处于准确位置，特别是常开常闭阀处于正确位置；
6) Check that the flow process shall be proper, and supply water, electricy, steam and air to this Post.
检查好流程，将蒸汽、风、电、水引入本岗位。

2.3.2 Tightness test 气密试验

Tightness pressure shall be equal to or slightly more than normal operating pressure, and less than pressure setting of relief valve. Tightness test shall be fully planned and coordinated, and shall not be performed in mutual independance.
气密压力要等于或稍高于正常操作压力，低于安全阀定压。气密试验要统筹协调，不能相互独立实施。

2.3.2.1 Reactor, scrubber, fractionator 反应器、洗涤塔、分馏塔

(1) Preparation works 准备工作
1)Close hot coke, scouring coke and cold coke slide valves to shut off the connection with the heater. Perform tightness test together by opening 2 valves on the upper section, and closing 2 valve on the lower section, of chunk discharge system of reactor;
关闭热焦、冲刷焦和冷焦滑阀切断和加热器联系。反应器卸大块焦系统上部 2 道阀打开、下部 2 道阀关闭，一起做气密试验；
2) Close fractionator overhead condenser to shut off the connection with the stabilization system, and perform tightness test of C202, C203, C210 together;
关闭分馏塔顶冷凝器切断和稳定系统联系，C202、C203、C210 一起做气密试验；
3) Open fractionator overhead vent, and prepare to perform steam purging;
打开分馏塔顶放空，准备进行蒸汽吹扫；

4) Put reactor stripping steam and individual stripper stripping steam into service, open the drains at low points to avoid water hammer;
投用反应器汽提蒸汽和各汽提塔汽提蒸汽，打开低点排凝避免水击；
5) Steam purging has been completed. Prepare to perform tightness test.
蒸汽吹扫完，准备进行气密试验。
(2) Building up the pressure 憋压
1) Decrease the opening of fractionator overhead vent to build up the pressure, and control scrubber overhead pressure to 0.1MPa;
关小分馏塔顶放空进行憋压，将洗涤塔顶压力控制在 0.1MPa；
2) Check all manholes, flanges and welds of reactor, scrubber, fractionator and individual strippers for leakage, record and mark any leak, and prepare for solving and repairing;
检查反应器、洗涤塔、分馏塔和各汽提塔等，所有人孔、法兰、焊口等是否泄漏并做好记录和泄漏标识准备处理；
3) After any leaked item located during pressure test is solved and repaired, perform depressurization, and continue to use steam to remove air. Check drains at low points to prevent clogging .
试压发现的漏项处理完毕后，进行撤压，继续用蒸汽赶空气。检查低点排凝，避免堵塞。

Table 19: Operating pressure of R101, C101, C201
表 19：R-101、C-101、C-201 操作压力

No. 序号	Description 名称	Pressure value, Mpa 压力值，MPa
1	Operating pressure of R101 overhead R-101 顶操作压力	0.11
2	Operating pressure of C101 overhead C-101 顶操作压力	0.1
3	Operating pressure of C201 overhead C-201 顶操作压力	0.06

2.3.2.2 Gasifier, heater, heater overheads 气化器、加热器、加热器顶
(1) Preparation works 准备工作
1) Before main air enters the system, establish water circulation of heater overhead, including Venturi scrubber, stage 1 contact cooling tower, stage 2 contact cooling tower. Water circulation shall be used for desulfurizer to prevent amine from being contaminated. COS reactor shall keep the shutoff condition;
在主风进系统前，建立加热器顶水循环，包括文丘里洗涤塔、一级接触冷却塔、二级接触冷却塔，脱硫塔用水进行循环避免污染胺液，COS 反应器保持切除状态；
2) E102, E103, D103 shall be filled with water in advance;

E102、E103、D103 提前上水；

3) Open gasifier feed coke, quenched coke, heater shutdown coke and gasifier shutdown coke slide valves. Open 4 valves of chunk discharge system of heater;

打开气化器进料焦滑阀、急冷焦滑阀、加热器停工焦滑阀、气化器停工焦滑阀，打开加热器卸大块焦系统 4 道阀；

4) Open root and vent valves of aeration orifices; open vent valves before single-action slide valve, and vent valves at bottom of heater and gasifier; open vent valves of E102, E103 and tertiary cyclone bottom; fully open Flexigas vent valve to flare;

打开各松动点的根部阀和放空阀，单动滑阀前、加热器和气化器底部的放空阀；打开 E102、E103 和三旋底部的放空阀；灵活气放火炬阀全开；

5) Supply the valve path purging steam to slide valves;

各滑阀引入阀道吹扫蒸汽；

6) Many water barrels, brushes, aurilave and soap powder are ready;

准备好水桶、毛刷、洗耳球及肥皂粉若干；

7) Open gasifier air valve, F101 prime and secondary air valves (including properly adjusted louver) and main air one-way orifice valve. Prepare to introduce air to heater and gasifier. Contact with the Main Air Blower Post to supply air to heater and gasifier; properly control heater overhead pressure and main air outlet flow rate;

打开气化器风阀、F101 一二次风阀（包括调好百叶窗）和主风单向阻尼阀，准备引风进加热器和气化器；联系主风机岗位向加热器和气化器送风，控制好加热器顶压力和主风出口流量；

8) Perform the through-purging of aeration orifice and vent points for 1hour. After they are unobstructed, close vent valves. Put aeration fluid into service, check that individual aeration orifices shall be unobstructed;

松动点与放空点贯通吹扫 1 小时，畅通后再关闭放空阀。投用松动介质，检查各松动点是否畅通；

9) After the through-purging is completed, put COS into service (tight shutoff is completed);

吹扫贯通完成后，COS 投用（做完气密切除）；

10) After the purging is finished, perform tightness gas of heater and reactor.

吹扫结束后进行加热器和气化器气密。

(2) Building up the pressure 憋压

1) Close vent valves of aeration orifices; close vent valves before single-action slide valve, vent valves at bottom of heater and gasifier, and vent valves of E102, E103 and tertiary cyclone bottom; close last 1 valve of chunk discharge system of heater;

关闭各松动点放空阀，关闭单动滑阀前放空、加热器和气化器底部的放空阀、E102、E103 和三旋底部的放空阀，加热器卸大块焦系统最后 1 道阀；

2) Gradually decrease the opening of Flexigas vent valve to flare, and control heater overhead pressure to 0.241MPa. Use soapy water to check all manholes, flanges, welds, slide valve stuffing boxes and cover plates of heater, gasifier, E102, E103 and tertiary cyclone for leakage, record and mark any leak, and prepare for solving and repairing;

逐渐关小灵活气放火炬阀，将加热器顶压力控制在 0.241MPa。用肥皂水检查加热器、气化器、E102、E103 和三旋等，所有人孔、法兰、焊口、滑阀填料函、大盖等是否泄漏并做好记录和泄漏标识准备处理；

3) After any leaked item located during pressure test is solved and repaired, perform depressurization by opening Flexigas vent valve to flare. Ensure that heater pressure shall be less than reactor pressure 0.007MPa, and avoid air from entering the reactor;

试压发现的漏项处理完毕后，打开灵活气放火炬阀进行撤压，确保加热器压力低于反应器压力 0.007MPa，避免风窜入反应器；

Table 20: Operating pressure of R102, R103, Flexigas system

表 20：R-102、R-103、灵活气系统操作压力

No. 序号	Description 名称	Pressure value, Mpa 压力值，MPa
1	Operating pressure of R103 overhead R-103 顶操作压力	0.29
2	Operating pressure of R102 overhead R-102 顶操作压力	0.241
3	Flexigas pressure at unit outlet 灵活气出装置压力	0.11

2.3.2.3 Absorption-stabilization system 吸收稳定系统

(1) Absorption-stabilization column 吸收稳定塔器

1) Nitrogen shall be used as tightness test medium of absorption-stabilization columns, including: D204, C204, D205, D206, C207, D208;

吸收稳定塔器气密试验介质用 N2，范围包括：D204、C204、D205、D206、C207、D208；

2) Prior to tightness test, close stage 3 outlet emergency shut-off valve EBV22106 of gas compressor (before stage 3 outlet of gas compressor enters D204), and open vent and drain of absorption-stabilization system;

气密试验前，关闭气压机三级出口紧急切断阀 EBV-22106（在气压机三级出口进 D-204 前），打开吸收稳定系统放空和排凝；

3) Open LLPS of column bottoms to perform purging. Open overhead vents and drains to achieve run-through;

开各塔底 LLPS 进行吹扫，开顶放空和排凝，进行贯通；

4) After purging is finished, supply medium pressure nitrogen to the system. Use the stabilizer overhead KO drum vent valve to flare HV23502 to control the pressure to 1.33MPa; check all manholes, flanges, welds and cover plates for leakage, record and mark any leak, and prepare for solving and repairing;

吹扫结束后，引中压 N2（C204 顶安全阀处新增管线）进系统，用稳定塔顶分液罐放火炬阀 HV-23502 控制压力在 1.33MPa；所有人孔、法兰、焊口、大盖等是否泄漏并做好记录和泄漏标识准备处理；

5) After all of missed items found during pressure test are treated properly, perform depressurization by opening the tstabilizer overhead KO drum valve to flare, stop MP N2, and continue to supply LLPS for purging displacement.
试压发现的漏项处理完毕后，打开稳定塔顶分液罐放火炬阀进行撤压，停中压 N2，继续给 LLPS 进行吹扫置换；

Table 21: Operating pressure of absorption-stabilization systems
表 21：吸收稳定系统操作压力

No. 序号	Description 名称	Pressure value, MPa 压力值，MPa
1	Operating pressure of C204 overhead C-204 顶操作压力	2.07
2	Operating pressure of C207 overhead C-207 顶操作压力	1.33
3	Operating pressure of D204 overhead D-204 顶操作压力	2.16

(2) Gas compressor 气压机
1) Nitrogen must be used as tightness test medium of gas compressor to avoid steam from condensation in the compressor, including: D201, D202, D203 and K201;
气压机气密必须用 N2 避免蒸汽在压缩机内冷凝，范围包括：D-201、D-202、D-203 和 K-201；
2) Supply nitrogen to gas compressor through D201 via FV20401, and perform tightness test of lines D201 to D204. Use D201 overhead vent valve to flare to control the pressure to 0.4Mpa. Check all manholes, flanges, welds and cover plates for leakage, record and mark any leak, and prepare for solving and repairing;
通过 FV-20401 引 N2 经 D-201 进气压机，对 D-201 至 D-204 管线进行气密试验；用 D-201 顶放火炬阀控制压力 0.4MPa，所有人孔、法兰、焊口、大盖等是否泄漏并做好记录和泄漏标识准备处理；
3) After any leaked item located during pressure test is solved and repaired, perform depressurization by opening D201 overhead vent valve to flare. Continue supplying nitrogen to perform purging and displacement;
试压发现的漏项处理完毕后，打开 D-201 顶放火炬阀进行撤压，继续给 N2 进行吹扫置换；

Table 22: Pressure setting of D201, D202, D203 relief valve overheads
表 22：D-201、D-202、D-203 安全阀顶压值

No. 序号	Description 名称	Pressure value, MPa 压力值，MPa
1	Pressure setting of D201 overhead relief valve	0.48

	D-201 顶安全阀定压	
2	Pressure setting of D202 overhead relief valve D-202 顶安全阀定压	0.431
3	Pressure setting of D203 overhead relief valve D-203 顶安全阀定压	0.926

2.3.2.4 Steam system 蒸汽系统

(1) F102: reversely supply 3.5MPa steam to the Unit. After desuperheating and pressure reducing through DS102, the steam enters F102 and D103, F102 outlet vent, D103 overhead vent (during cold oil operation, do not heat the steam reversely supplied to E101, E210, E235); F102 ignition (combusting RFG; there is no FXG during the Start Of Run);

F-102：倒引 3.5MPa 蒸汽进装置，经 DS-102 减温减压后进入 F-102 和 D-103，F-102 出口放空，D-103 顶放空（冷油运期间，不给 E-101、E-210、E-235 倒引蒸汽加热）；F-102 点火（烧 RFG，开工初期没有 FXG）；

(2) F104: reversely supply 1.0MPa steam to the Unit. After superheating through F104, the steam enters the reactor where it is used as stripping steam, steam for coking prevention and cold coke slide valve purging steam; F104 ignition; F104

F-104：倒引 1.0MPa 蒸汽进装置，经 F-104 过热后进入反应器作为汽提蒸汽、防焦蒸汽和冷焦滑阀吹扫蒸汽；F-104 点火；

2.3.3 Material seal established in coke-for-gasification return line 气化焦返回线建立料封

Material seal established in the coke-for-gasification return line by coke fines for coke fines bin, coke fines filling cyclone and coke fines filling hopper.

通过焦粉料仓、焦粉加注旋分和焦粉加注料斗用焦粉使气化焦返回线建立料封。

2.3.3.1 Before starting coke loading, conditions of system are as follows:

开始装焦前，系统状态如下：

(1) Reactor, fractionator and scrubber steam purging;

反应器、分馏塔和洗涤塔蒸汽吹扫；

(2) Heater, gasifier main air purging;

加热器、气化器主风吹扫；

(3) Stabilization system column is purged with steam, and gas compressor is purged with N2;

稳定系统塔器蒸汽吹扫，气压机用 N2 吹扫；

(4) Water circulation of Flexigas treatment system;

灵活气处理系统水循环；

(5) Coke fines loading system: D401, CY401, BN402, SR401 are put into service.

焦粉装车系统：D401、CY401、BN402、SR401 投用。

2.3.3.2 Preparation works 准备工作

(1) Perform air run-through purging of coke fines filling system several days in advance, and ensure that it shall be dry and in backup. Open the upper coke fines filling blind of gasifier overflow downcomer, and properly connect the sleeve pipe;

提前几天用风对焦粉加注系统进行吹扫贯通，确保干燥备用。打开气化器溢流斗上部焦粉加注的盲端，连接好套管；

(2) Check aeration orifices and instrument points in coke return line of gasifier, and ensure that the lines shall be dry, that double steam valves shall be closed, and that middle drain shall be opened. Supply back flush nitrogen to PDI-11501, PDI-11502, PDI-11503 measuring nozzles; check low points of coke-for-gasification return line, purge it with air to ensure that it shall be dry, and to avoid clogging resulting from muddy coke fines;

检查气化器焦返回线上松动点和仪表点，确保管线干燥，蒸汽阀关双阀，中间排凝打开；PDI-11501、PDI-11502、PDI-11503 测量咀子反吹氮气给上；检查气化焦返回线低点，用风进行吹扫确保干燥，避免焦粉成泥堵塞；

(3) 1500t coke has been charged to D-401. Restriction orifice shall supply hot nitrogen to top ring and bottom ring aeration, and dehumidification. Supply aeration nitrogen and cone section purging nitrogen of three conveying lines.

D-401 已装入 1500t 焦炭，限流孔板给热氮气至顶环和底环松动、除湿，给上三路输送线的的松动氮气与锥段吹扫氮气。

2.3.3.3 Specific procedures 具体步骤

(1) D401 pressurization:

D-401 充压：

With FC-40302, D401 is pressurized to 0.158MPa. Close slide valves PV-40401, PV-40402, PV-40403, and put differential pressure instruments of the slide valves into service.

D401 用 FC-40302 充压至 0.158MPa。关闭滑阀 PV-40401、PV-40402、PV-40403，投用滑阀差压仪表。

(2) Put SR-401 bag filter into service;

投用 SR-401 布袋过滤器；

1) T-402 shall make up water to water seal, D-402 until 50% level is reached, and start P-401 to establish circulation;

T-402 给上水封，D-402 补充水至 50%液位，启动 P-401 建立循环；

2) Start K-401 flow process of venting to atmosphere;

启动 K-401 放大气流程；

3) Bag filter is put into service; back flush is performed by field PLC; and coke fines in the cone section is vibrated by 4 pneumatic hammers; rotary feeder FDR401 is put into service; coke fines are returned to T-401;

布袋过滤器投用现场 PLC 反吹，及 4 个气动锤振动锥段焦粉，旋转送料机 FDR-401 投用，焦粉返回 T-401；

(3) Seal Established in coke-for-gasification return line;

气化焦返回线装焦建立密封；

1)PC-40403 pressure indication of CY401 inlet coke loading line shall be 0.13Mpa. Use PDC-40801 (maintaining more than 7.0kPa) to control PDV-40801 so that the pressure of CY401 and BN-402 shall be maintained at 0.04MPa (also manually controling PDV-40801). Close slide valve LV-40801. Load coke to BN-402 through CY-401 so that BN-402 reaches high level (HCL=5.2m);

CY401 入口装焦线上 PC-40403 压力显示为 0.13MPa，用 PDC-40801（维持 7.0KPa 以上）控制 PDV-40801 使 CY-401 和 BN-402 压力保持在 0.04MPa（亦可手动控制 PDV-40801），关闭滑阀 LV-40801，通过 CY-401 装焦至 BN-402，使 BN-402 达到高料位（HCL=5.2m）；

2)Close D-401 coke discharge PV-40403 slide valve, open LV-40801 slide valve so that level indication of LC-40801 shall be zero, close LV-40801 slide valve;

关闭 D-401 卸焦 PV-40403 滑阀，打开 LV-40801 滑阀，使 LC-40801 料位显示为零，关闭 LV-40801 滑阀；

3) Stand pipe of seal line may be filled fully by repeating these three times;

重复 3 次即可装满密封线的立管；

4) Put F-401 heating nitrogen into service. Supply hot nitrogen to two points of inlet, and also to 6 points of outlet (RO-1465, RO-1467, RO-1469, RO-1471, RO-1473, RO-1475, bypass closed) of coke-for-gasification return line;

投用 F-401 加热氮气，气化焦返回线入口 2 点给上热氮，出口 6 点也给上热氮（RO-1465、RO-1467、RO-1469、RO-1471、RO-1473、RO-1475，旁路关）；

5) Remove temporary coke loading piping, and install the plug properly.

拆除临时装焦管线，安装好塞子。

2.3.3.4 Important notes 注意事项

(1) Pressurize bed coke bin, firstly add coke fines to the heater through coke fines filling line, verify that the piping shall be unobstructed while preventing the chunk from entering coke-for-gasification return line;

床层焦料仓充压，先通过焦粉加注线向加热器加注焦粉，确认管线畅通，同时避免大焦块进入气化焦返回线；

(2) Once material seal is established, verify that double valves of aeration steam shall be closed, and that middle drain shall be opened. Avoid muddy clogging . Put heating N2 of inlet, outlet ends of coke-for-gasification return line, and ensure that the piping shall be dry. Material seal shall be maintained for 3 days before removing it when startup;

一旦料封建立，再次确认松动蒸汽双阀关闭、中间排空打开，避免成泥堵塞。投用气化焦返回线入口端、出口端的加热 N2，保证管线干燥。料封在开工解封前要维持 3 天；

(3) Periodically check material seal conditions (draining at low point, check temperature, etc.).
定期检查料封情况（低点排凝、检查温度等）。

2.3.4 Oil circulation established in fractionation stabilization system, and amine circulation established in amine regenerator 分馏稳定系统建立油循环、胺液再生塔建立胺液循环

2.3.4.1 Before Establishing oil circulation and amine, conditions of the system are as follows:
开始建立油循环和胺液前，系统状态如下：
(1) Purge reactor, fractionator and scrubber with reactor stripping steam, and stop stripping steam of individual strippers of fractionating system;
反应器、分馏塔和洗涤塔用反应器汽提蒸汽吹扫，停分馏系统各汽提塔汽提蒸汽；
(2) Main air purging of heater, gasifier;
加热器、气化器主风吹扫；
(3) For stabilization system column, stop steam purging, and prepare for oil collection. Gas compressor is pressurized by RFG;
稳定系统塔器停蒸汽吹扫准备收油，气压机入口用 RFG 充压；
(4) Water circulation in Flexigas treatment system;
灵活气处理系统水循环；
(5) Coke fines loading system: Put D401, CY401, BN402, SR401 into service.
焦粉装车系统：D401、CY401、BN402、SR401 投用。焦粉装车系统：D-401、CY-401、BN-402、SR-401 投用。
2.3.4.2 Oil circulation in fractionating system 分馏系统油循环
Verify that air removal of reactor, scrubber shall be finished, and close overhead vent valve. Introduce steam to E-201/E-202, and perform dehydration in the D-201. Close valve after draining. RFG is supplied to D201 for pressurization. Oil circulation in fractionating system includes cold oil circulation (diesel oil) and hot oil circulation (wax oil).
确认反应器、洗涤塔赶空气结束关闭顶部放空阀，蒸汽通向 E-201/E-202 并在 D-201 脱水，排净后关阀，D-201 顶引 RFG(燃料气)充压。 分馏系统油循环包括冷油循环（柴油）和热油循环（蜡油）。
(1)Cold oil circulation in fractionating system:
分馏系统冷油循环：
1)Diesel oil system take-off point: Diesel oil from flushing oil line to the Unit
引柴油系统点：从冲洗油进装置线引柴油
2)Procedures supplying diesel oil :
引柴油步骤：
A、After tightness test of fractionating system is completed and accepted, diesel oil may be supplied to individual systems, including diesel oil system, middle section circulation oil system,

light wax oil system, heavy wax oil system, heavy wax oil system, scrubber system and feedstock oil system.

分馏系统气密做完合格后，就可以引柴油进各系统，包括柴油系统、中段循环油系统、轻蜡油系统、重蜡油系统、重重蜡油系统、洗涤塔系统和原料油系统。

B、Diesel oil shall be supplied line by line, step by step.

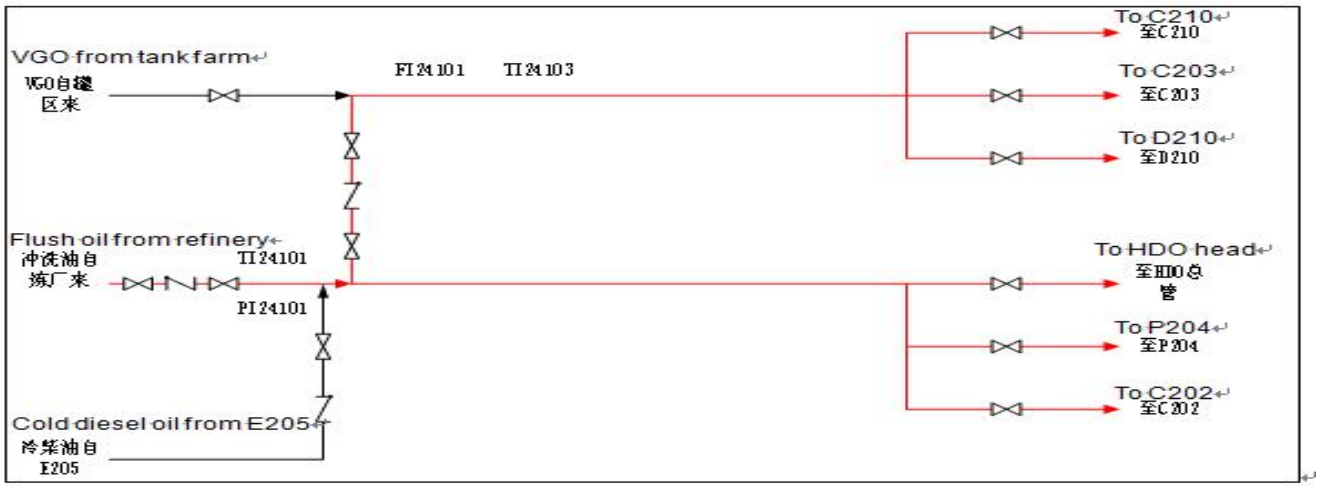
引柴油采取逐条管线、分步进行。

C、After diesel oil is supplied the Unit, liquid level established in diesel oil stripper, light wax oil stripper and heavy wax oil stripper. After tank bottom dehydration, start the pump, send to tank farm for line displacement outside the Unit.

柴油引进装置后，柴油汽提塔、轻蜡油汽提塔和重蜡油汽提塔建立液面，罐底脱水后开泵，送往罐区进行装置外管线置换。

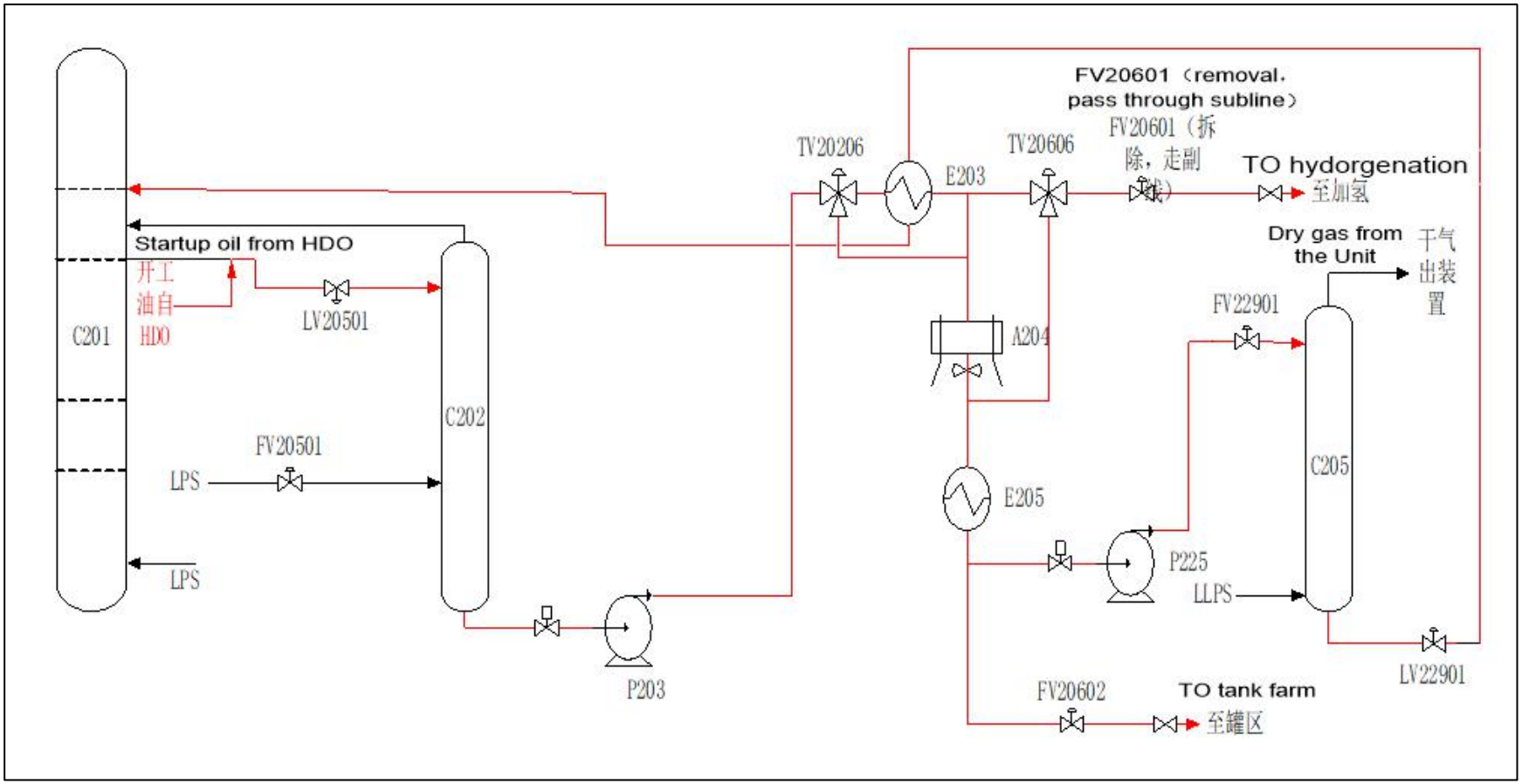
D、After liquid level established in individual pumped outlet, firstly perform dehydration at low point, then start the pump, circulation established in individual circuits.

各抽出口建立液位后，先在低点脱水，然后启动泵，建立各路循环。



◆Diesel oil system:

柴油系统:



Operating procedures:

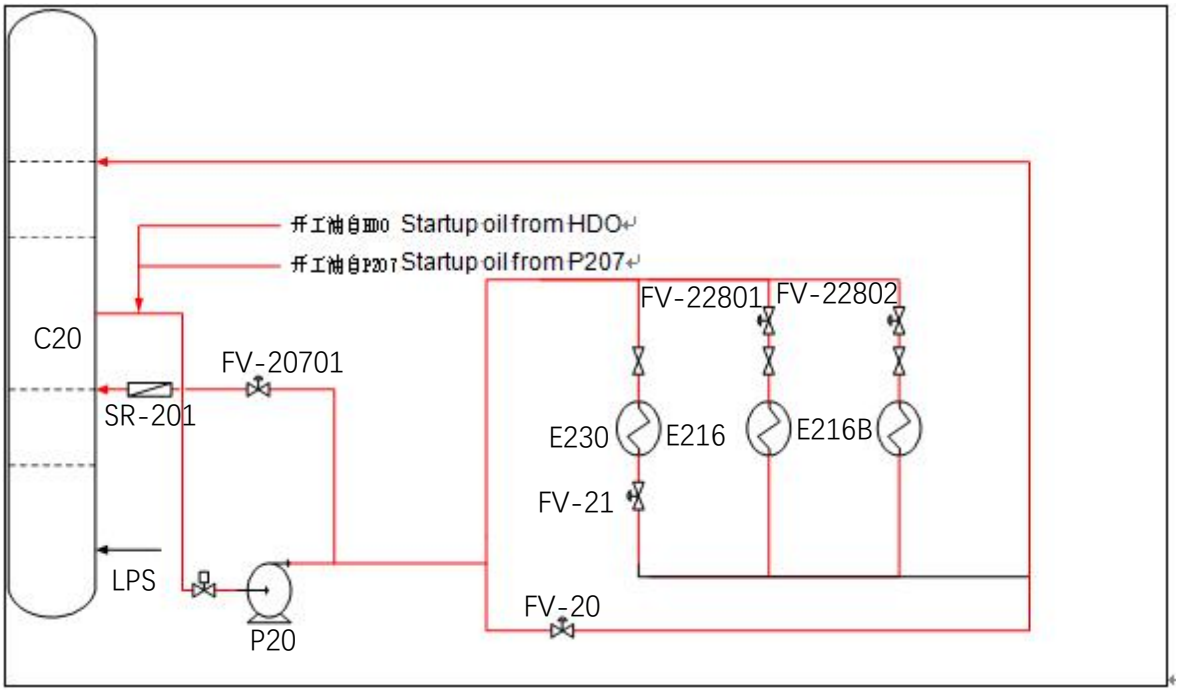
操作步骤：

(1) Supplying startup HDO to diesel oil stripper C-202—→Established liquid level LC-20501 reaches 50%—→Starting diesel oil pump P-203—→E-203—→P-225—→FV-22901—→C-205—→Established liquid level LC-22901 reaches 50%—→LV-22901—→E203—→Returning to column-201;

引入开工 HDO 至柴油汽提塔 C-202—→建立液位 LC-20501 至 50%—→启动柴油泵 P-203—→E-203—→P-225—→FV-22901—→C-205—→建立液位 LC-22901 至 50%—→LV-22901—→E203—→返回塔-201；

◆Middle section circulating oil system:

中段循环油系统：



Operating procedures:

操作步骤：

(1) Supplying startup HDO to P-204—→FV-20701—→SR-201—→Returning to C-201;

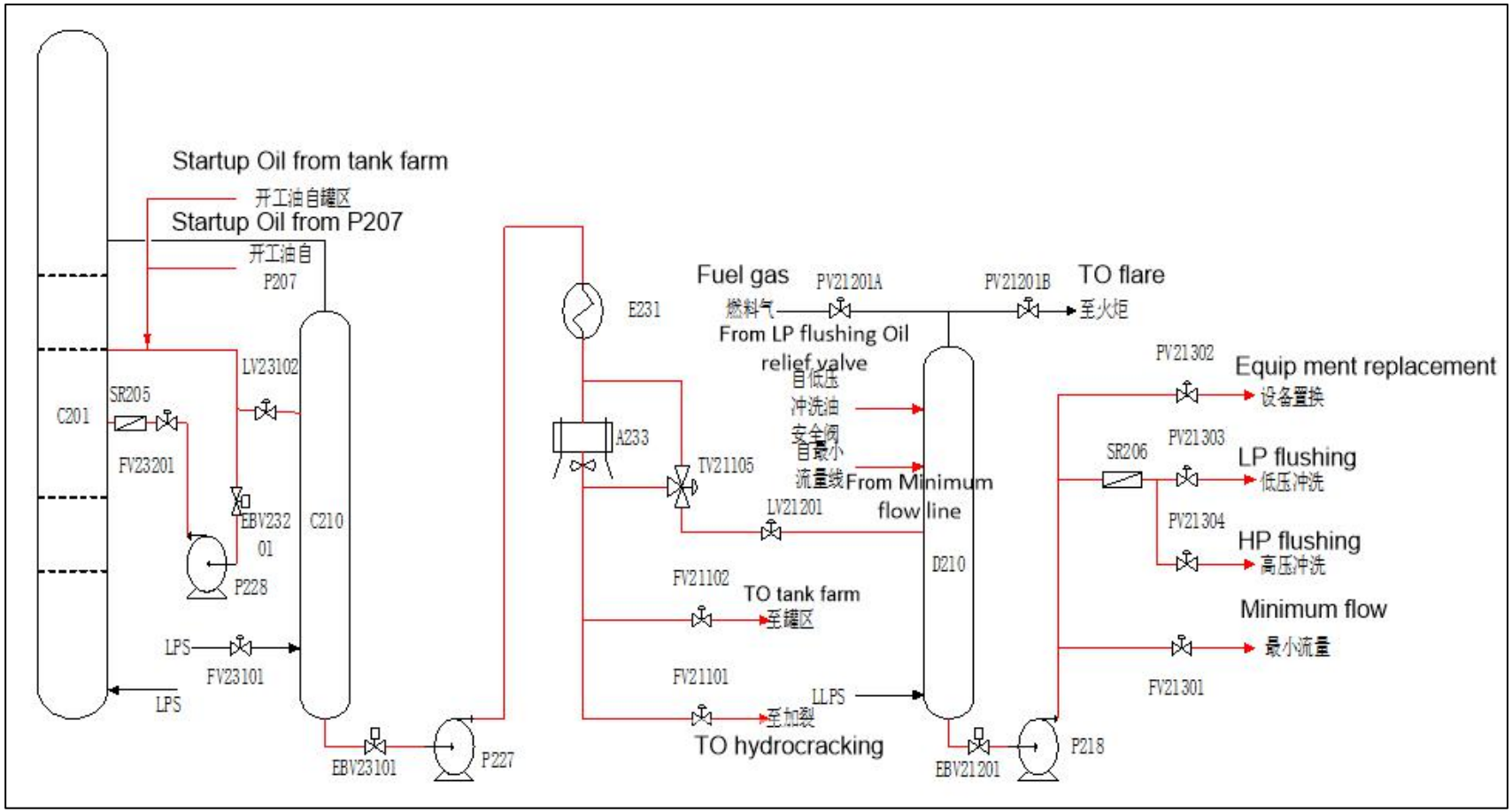
引入开工 HDO 至 P-204—→FV-20701—→SR-201—→返 C-201；

(2) Supplying startup HDO to P-204—→FV-20702 (E-230/E-216A/E-216B)—→Returning to C-201;

引入开工 HDO 至 P-204—→FV-20702（E-230/E-216A/E-216B）—→返 C-201；

◆Light wax oil system:

轻蜡油系统:



Operating procedures:

操作步骤：

(1) Supplying startup HDO to light wax oil stripper C-210—→Established liquid level LC-23102 reaches 50%—→Starting light wax oil pump P-227—→E-231—→E-233—→TV-21102—→D-210—→Starting pump P-218, Establishing flushing oil circulation for seal, instrument flushing of individual rotating machinery;

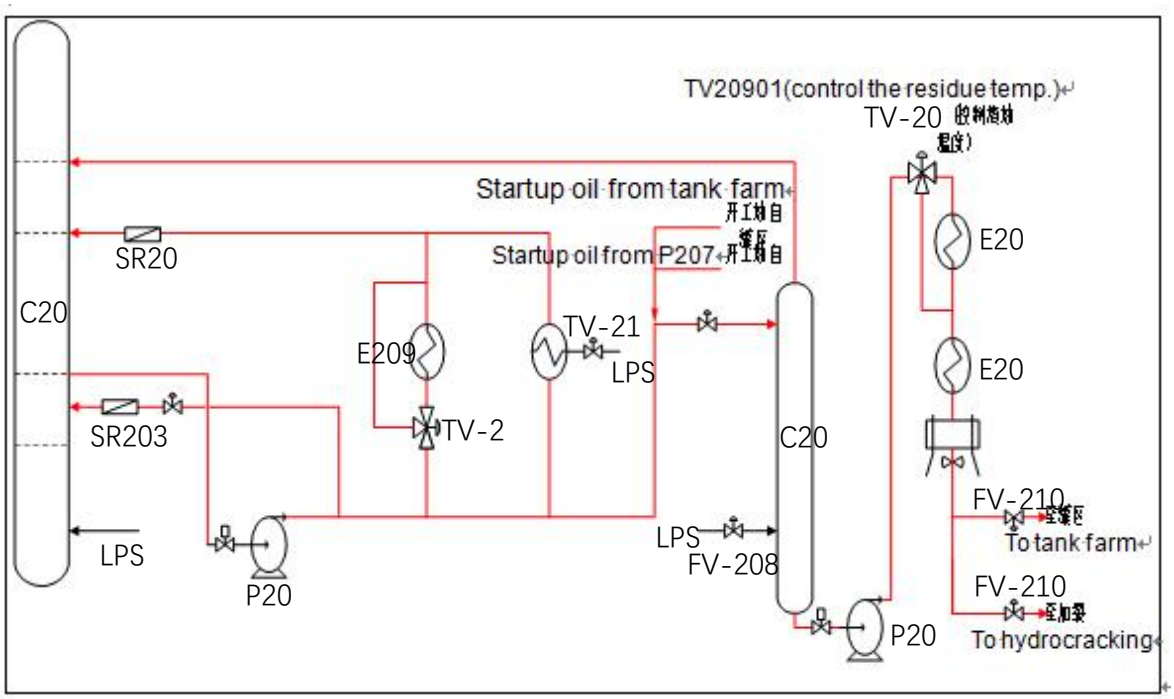
引入开工 HDO 至轻蜡油汽提塔 C-210—→建立液位 LC-23102 至 50%—→启动轻蜡油泵 P-227—→E-231—→E-233—→TV-21102—→D-210—→开泵 P-218，建立冲洗油循环，供各机泵密封、仪表冲洗用；

(2) Supplying startup HDO to pump P-228—→STR-205AB—→Returning to column-201 packing layer;

引入开工 HDO 至泵 P-228—→STR-205AB—→返塔-201 填料层；

Heavy wax oil system:

重蜡油系统：



Operating procedures:

操作步骤：

(1) When liquid level LC-20102 in pumped outlet of heavy wax oil of C-201 reaches 50%—→Starting Pump-206—→FC-21401—→STR-203—→Returning to column-201;

当 C-201 的重蜡油抽出口液位 LC-20102 的达到 50%时—→启动 P-206—→FC-21401—→STR-203—→返 C-201；

(2)P-206—→TV-21603—→E-209AB—→STR-202—→Returning to column-201;

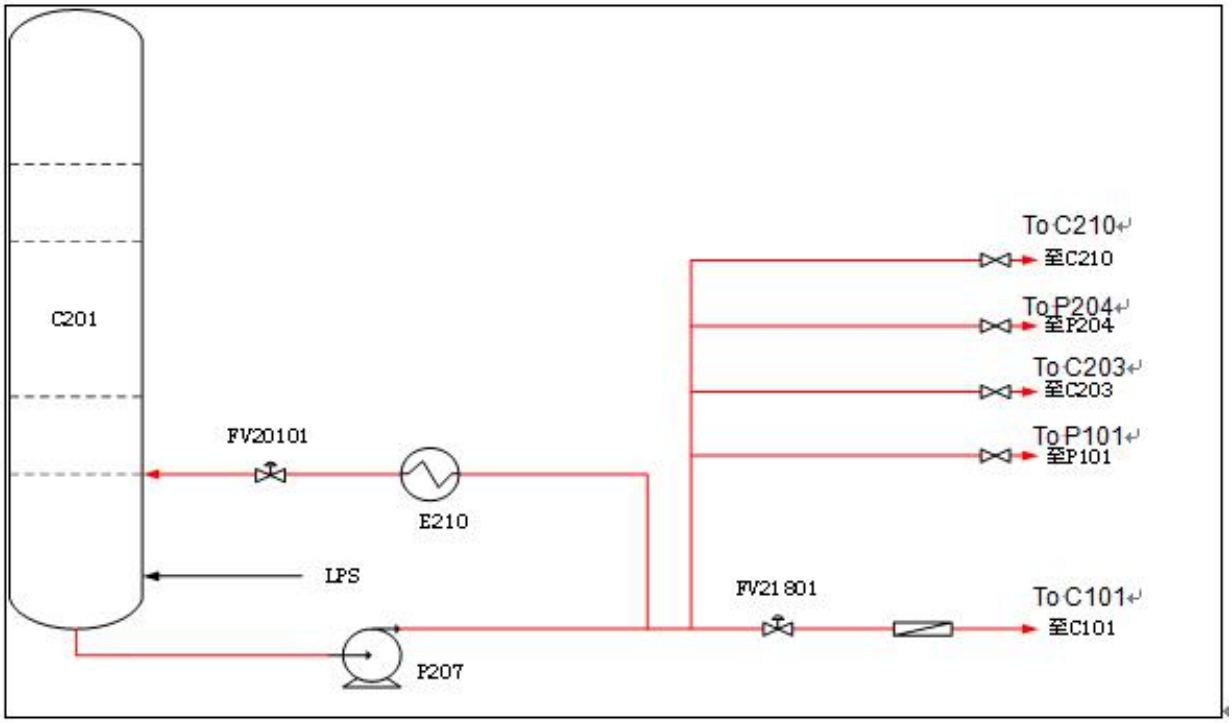
泵-206—→TV-21603—→E-209AB—→STR-202—→返 C-201；

(3) P-206—→E-235—→STR-202—→Returning to column-201;

泵-206—→E-235—→STR-202—→返 C-201；

◆Heavy heavy wax oil system

重重蜡油系统：



Operating procedures:

操作步骤：

(1) When liquid level LI-20103 in reducer section of C-201 bottom reaches 50%—→Starting P-207—→E-210—→FV-20101—→Returning to column bottom;

当 C-201 底缩径段液位 LI-20103 达到 50%时—→启动 P-207—→E-210—→FV-20101—→返塔底部；

(2) P-207—→FV-21801—→STR-204AB—→Column-101 upper packing layer (passing through nozzle bypass);

P-207—→FV-21801—→STR-204AB—→C-101 上部填料层（走喷嘴旁路）；

(3) P-207—→P-204 inlet;

P-207—→P-204 入口；

(4) P-207—→P-228 inlet;

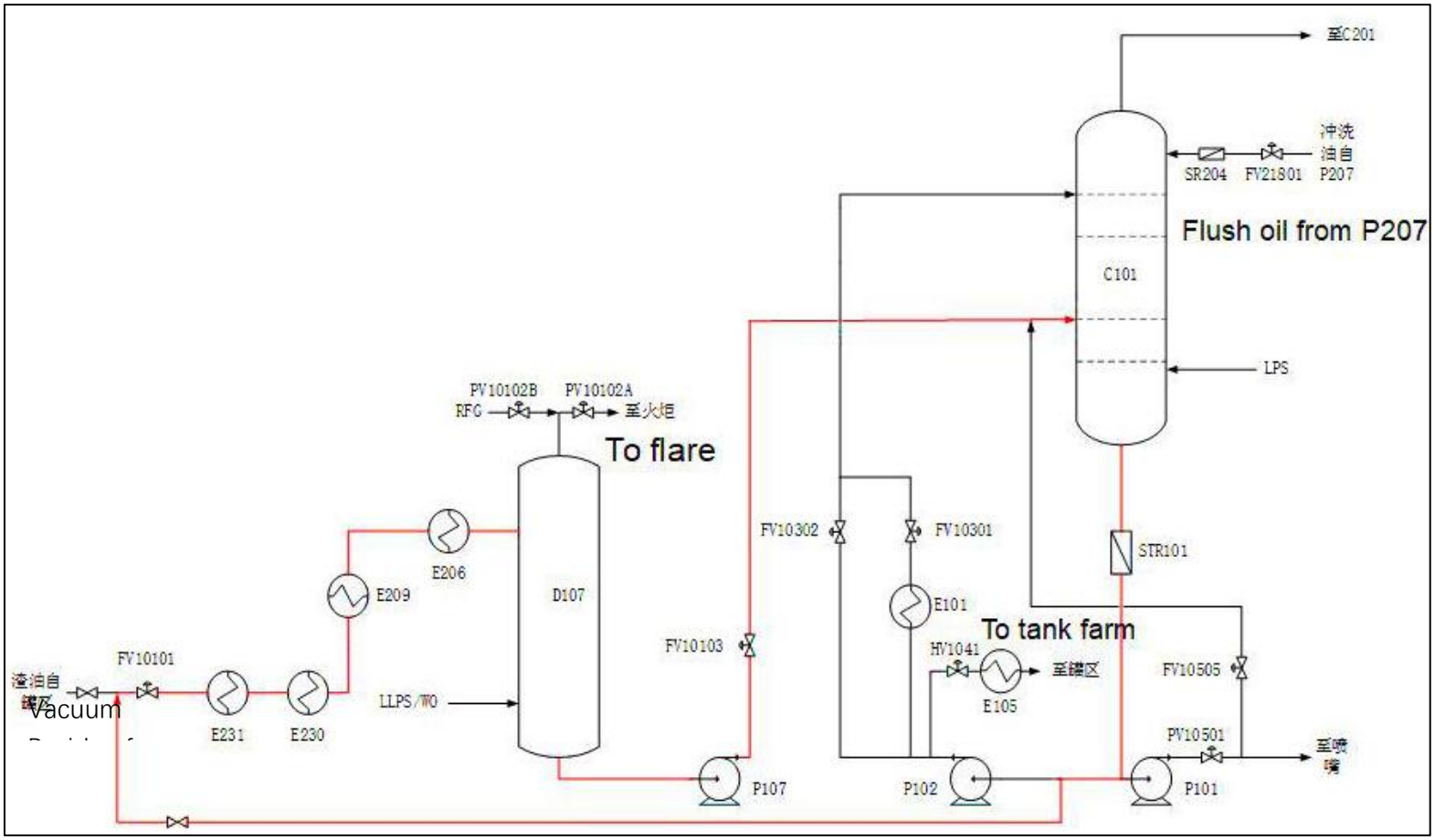
P-207—→P-228 入口；

(5) P-207—→P-206 outlet —→E209/E235—→SR202—→C201—→pumped outlet of heavy wax oil;

P-207—→P-206 出口—→E209/E235—→SR202—→C201—→重蜡油抽出口；

◆Feedstock oil system:

原料油系统:



Operating procedures:

操作步骤：

(1) Supplying HDO to C-101 from C-101 overhead flushing oil line—→Liquid level established in C-101 LC-10401 reaches 50%—→STR-101—→ Vacuum residue line to the Unit;

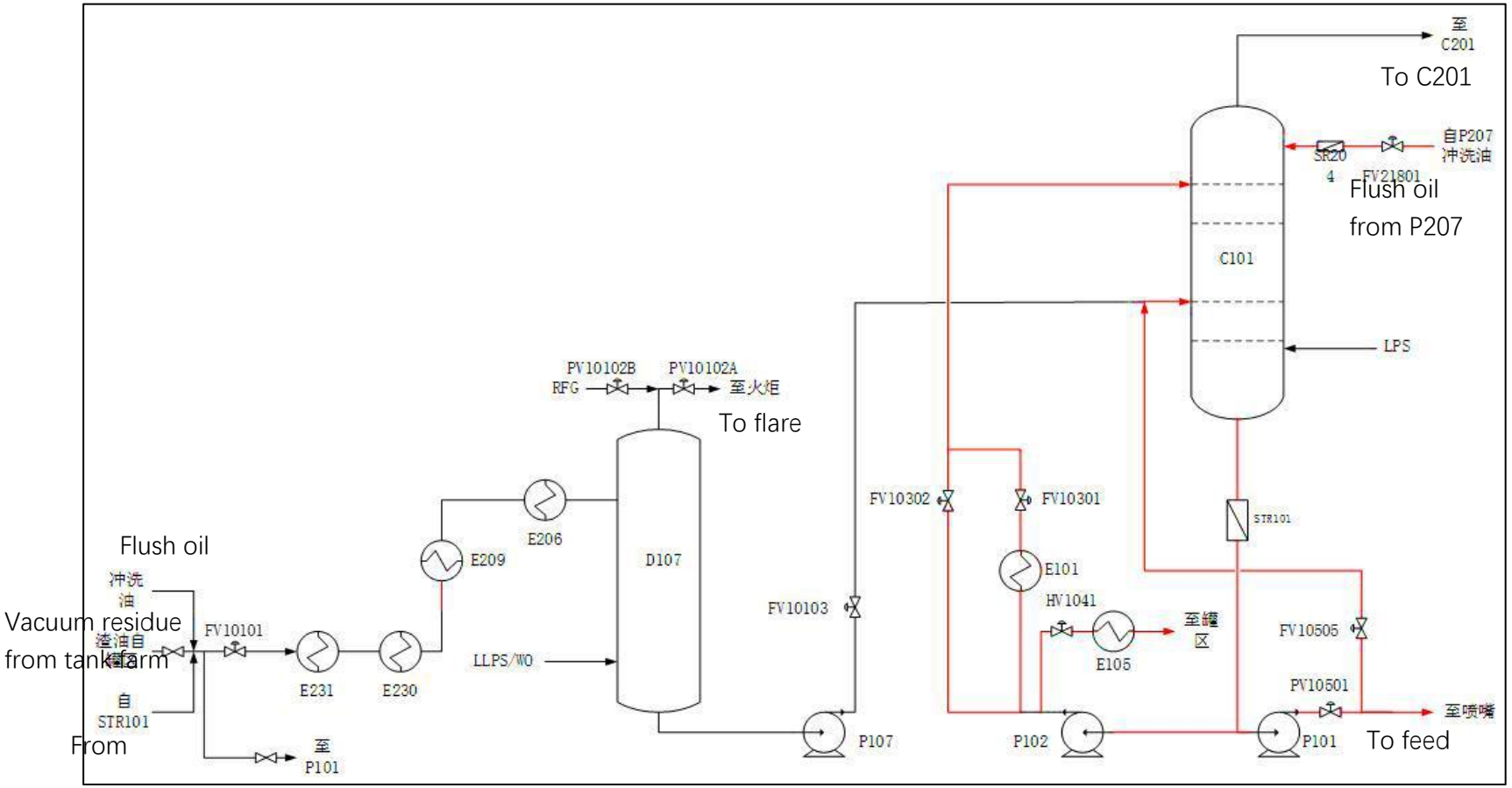
自 C-101 顶冲洗油线引 HDO 进 C-101—→C-101 建立液位 LC-10401 至 50%—→STR-101—→减渣进装置管线；

(2) Vacuum residue line to the Unit—→E-231—→E-230—→E-209AB—→E-206—→To feedstock tank D-107—→When established liquid level LC10101 reaches 50%—→Start the P-107—→FV-10103—→C-101

减渣进装置线—→E-231—→E-230—→E-209AB—→E-206—→至原料罐 D-107—→建立液位 LC-10101 达到 50%时—→启动 P-107—→FV-10103—→C-101；

◆Scrubber system:

洗涤塔系统：



Operating procedures:

操作步骤：

1) Supplying HDO to C101 from C101 overhead flushing oil line—→When liquid level LC10401 in C101 reaches 50%—→Start the pump P-101—→Before individual nozzles of reactor—→FV-10505—→C-101;

自 C-101 顶冲洗油线引 HDO 进 C-101—→当 C-101 的液位 LC-10401 达到 50%时—→启动泵 P-101—→反应器各喷嘴前—→FV-10505—→C-101；

2) Starting the pump P-102AB—→E-101—→Column-101 herringbone pattern baffle crossover line (Passing through distribution piping bypass)—→Returning to columnC-101;

启动泵 P-102AB—→E-101—→塔-101 人字档板跨线（走分配管旁路）—→返塔 C-101；

3) Starting the pump P-102AB—→HV-1041—→E-105 is ready—→E-105 is properly filled with hot water and in back up (Supplying circulating water, and heating it to about 60℃ with steam);

启动泵 P-102AB—→HV-1041—→E-105 作好准备—→E-105 装好热水备用（引循环水，用蒸汽加热至约 60℃）；

Note: Closely observe liquid level in scrubber bottom. When feeding oil to the scrubber, especially change of oil density shall be monitored by designated personnel during heating, temperature increase;

注：应密切注意洗涤塔底的液位，在向洗涤塔进油时，特别是在加热、升温时油的密度变化，应派专人监视；

(1) Hot oil circulation of fractionating system:

分馏系统热油循环：

1) Oil collection point: It is continued that HDO is circulated in diesel oil and middle section circulation systems. VGO is supplied to light wax oil and heavy wax oil systems from the outside of the Unit;

收油点：柴油和中段循环系统继续用 HDO 循环，轻蜡油系统和重蜡油系统从装置外引入 VGO；

2) Establishing circulation:

建立循环：

◆Light wax oil system: Supplying startup VGO to light wax oil stripper C-210—→Established liquid level LC-23102 reaches 50%—→Starting light wax oil pump P-227—→E-231—→E-233—→TV-21102—→D-210—→Starting pump P-218, establishing flushing oil circulation for rotating machinery sealing, instrument flushing; supplying startup HDO to pump P-228—→STR-205AB—→Returning to column-201 packing layer;

◆轻蜡油系统：引入开工 VGO 至轻蜡油汽提塔 C-210—→建立液位 LC-23102 至 50%—→启动轻蜡油泵 P-227—→E-231—→E-233—→TV-21102—→D-210—→开泵 P-218，建立冲洗油循环，供各机泵密封、仪表冲洗用；引入开工 HDO 至泵 P-228—→STR-205AB—→返塔-201 填料层；

◆Heavy wax oil system: When liquid level LC-20102 in pumped outlet of heavy wax oil of C-201 reaches 50%—→Starting pump-206—→FC-21401—→STR-203—→Returning to

column-201; pump-206—→TV-21603—→E-209AB—→STR-202—→Returning to column; pump-206—→E-235—→ STR-202—→Returning to column;

◆重蜡油系统：当 C-201 的重蜡油抽出口液位 LC-20102 的达到 50%时—→启动泵 -206—→FC-21401—→STR-203—→返塔-201；泵-206—→TV-21603—→E-209AB—→ STR-202—→返塔；泵-206—→E-235—→ STR-202—→返塔；

◆Heavy heavy wax oil system: When liquid level LI-20103 in reducer section of C-201 bottom reaches 50%—→Starting the pump-207—→E-210—→FV-20101—→Returning to column bottom; Pump-207—→FV-21801—→STR-204AB—→Column-101 upper packing layer (passing through nozzle bypass); pump -207—→Returning wax oil—→Pump -204 inlet; Pump -207—→Column-203—→Pump-205—→E-206—→E-207—→E-208—→FC-21001—→Tank farm (a few); Pump-207—→Column-210—→Pump -227—→E-231—→E-233—→FC-21102 —→Tank farm (a few);

◆重重蜡油系统：当 C-201 底缩径段液位 LI-20103 达到 50%时—→启动泵 -207—→E-210—→FV-20101—→返塔底部；泵-207—→FV-21801—→STR-204AB—→塔-101 上部填料层（走喷嘴旁路）；泵-207—→将蜡油返回—→泵-204 入口；泵-207—→塔-203—→泵 -205—→E-206—→E-207—→E-208—→FC-21001—→罐区（少量）；泵-207—→塔-210—→ 泵-227—→E-231—→E-233—→FC-21102—→罐区（少量）；

◆Feedstock oil system: Supplying startup VR to vacuum residue line to the Unit—→E-231—→E-230—→E-209AB—→E-206—→To feedstock tank D-107 (Static dehydration)—→Established liquid level LC10101 reaches 50%—→Starting the pump -107—→FV-10103—→C-101;

◆原料油系统：引入开工 VR 至减渣进装置管线—→E-231—→E-230—→E-209AB—→ E-206—→至原料罐 D-107（静置脱水）—→建立液位 LC10101 达到 50%时—→启动泵 -107—→FV-10103—→C-101；

◆Scrubber system: When liquid level LC10401 in C101 reaches 50%—→Starting the pump P-101—→Before individual nozzles of reactor—→FV-10505—→C-101; Starting the pump P-102AB—→E-101—→Column-101 herringbone pattern baffle crossover line (Passing through distribution piping bypass)—→Returning to column; starting the pump P-102AB—→HV-1041—→E-105 is ready—→E-105 is properly filled with hot water and in back up (Supplying circulating water, and heating it to about 60°C with steam);

◆洗涤塔系统：当 C-101 的液位 LC-10401 达到 50%时—→启动泵 P-101—→反应器各喷嘴前 —→FV-10505—→C-101；启动泵 P-102AB—→E-101—→塔-101 人字档板跨线（走分配管旁路） —→返塔；启动泵 P-102AB—→HV-1041—→E-105 作好准备—→E-105 装好热水备用（引循环水，用蒸汽加热至约 60℃）；

Note: Closely observe liquid level in scrubber bottom. When feeding oil to the scrubber, especially change of oil density shall be monitored by designated personnel during heating, temperature increase;

注：应密切注意洗涤塔底的液位，在向洗涤塔进油时，特别是在加热、升温时油的密度变化，应派专人监视；

2.3.4.3 Naphtha circulation of absorption-stabilization system 吸收稳定系统石脑油循环

Verify that air removal in stabilization system is finished, stop steam to individual column bottoms, and supply RFG for pressurization from D204. Since stage 3 outlet valve of gas compressor is closed, absorption-stabilization system is separated from gas compressor.

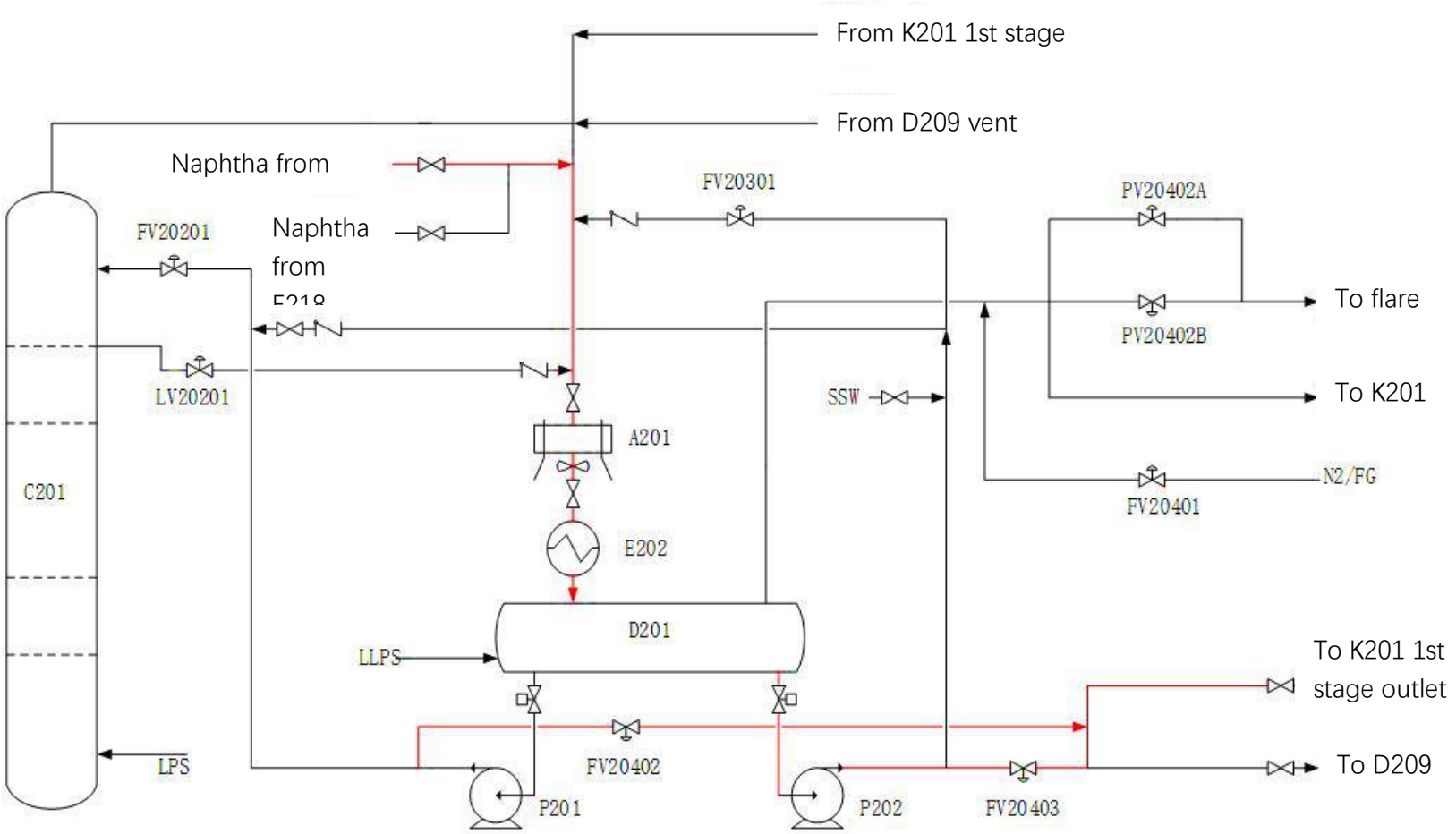
确认稳定系统赶空气结束，停各塔底蒸汽，从 D-204 引入 RFG 充压。由于气压机三级出口阀关闭，吸收稳定系统与气压机已隔离。

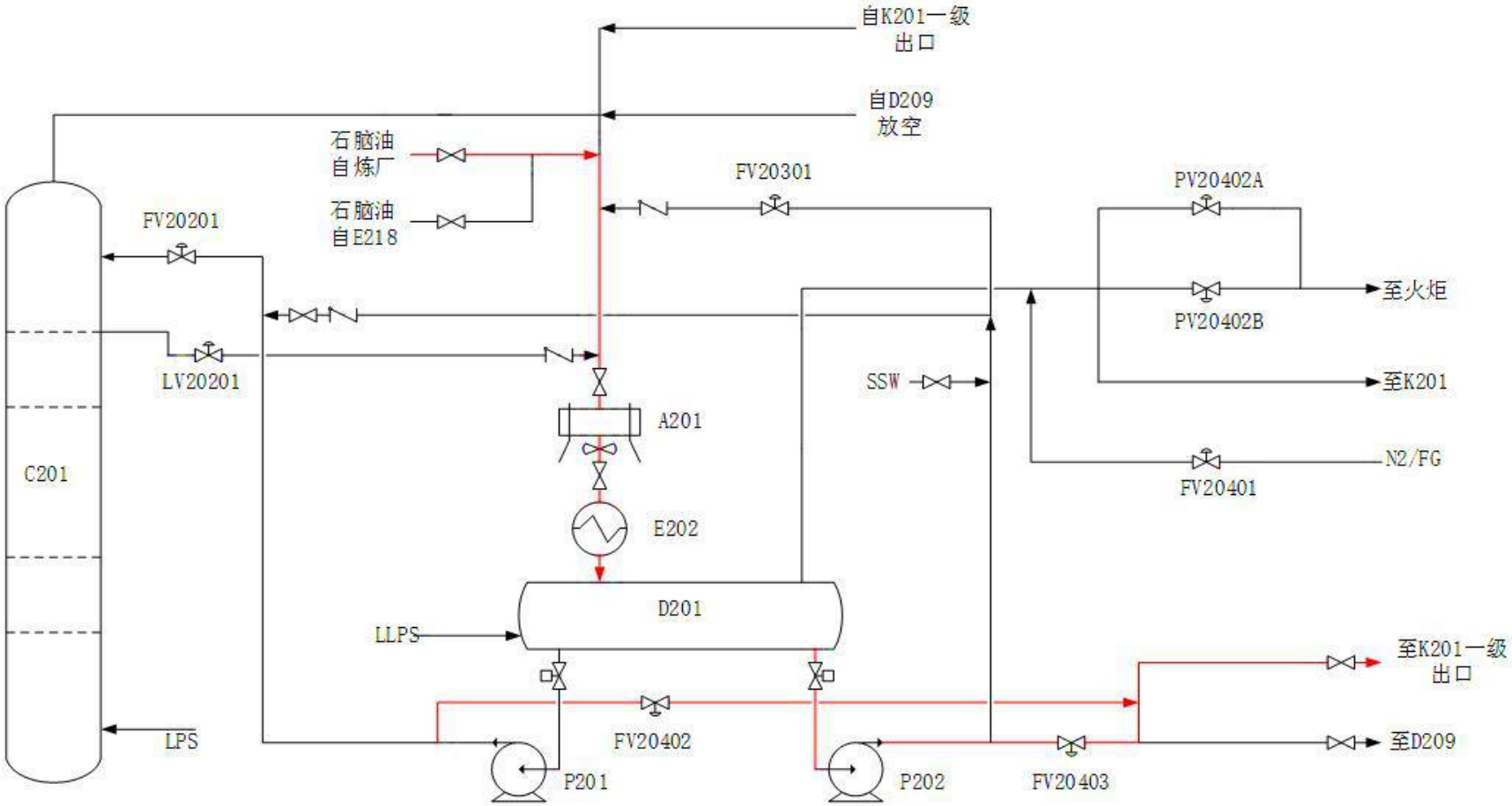
(1) Supplying naphtha: Supply startup naphtha from A201 inlet;

引石脑油：从 A-201 入口引入开工石脑油；

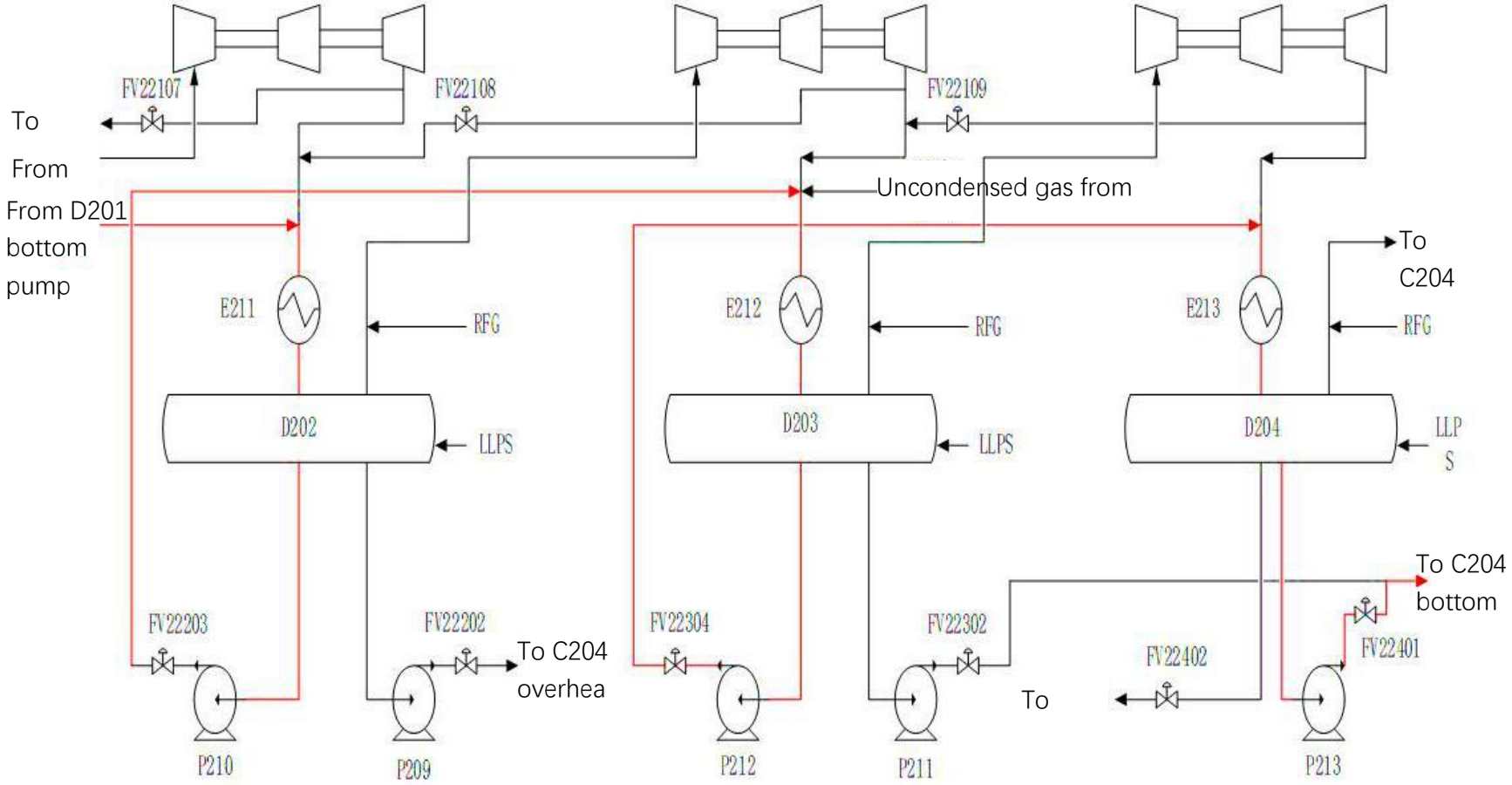
(2) Establishing circulation:

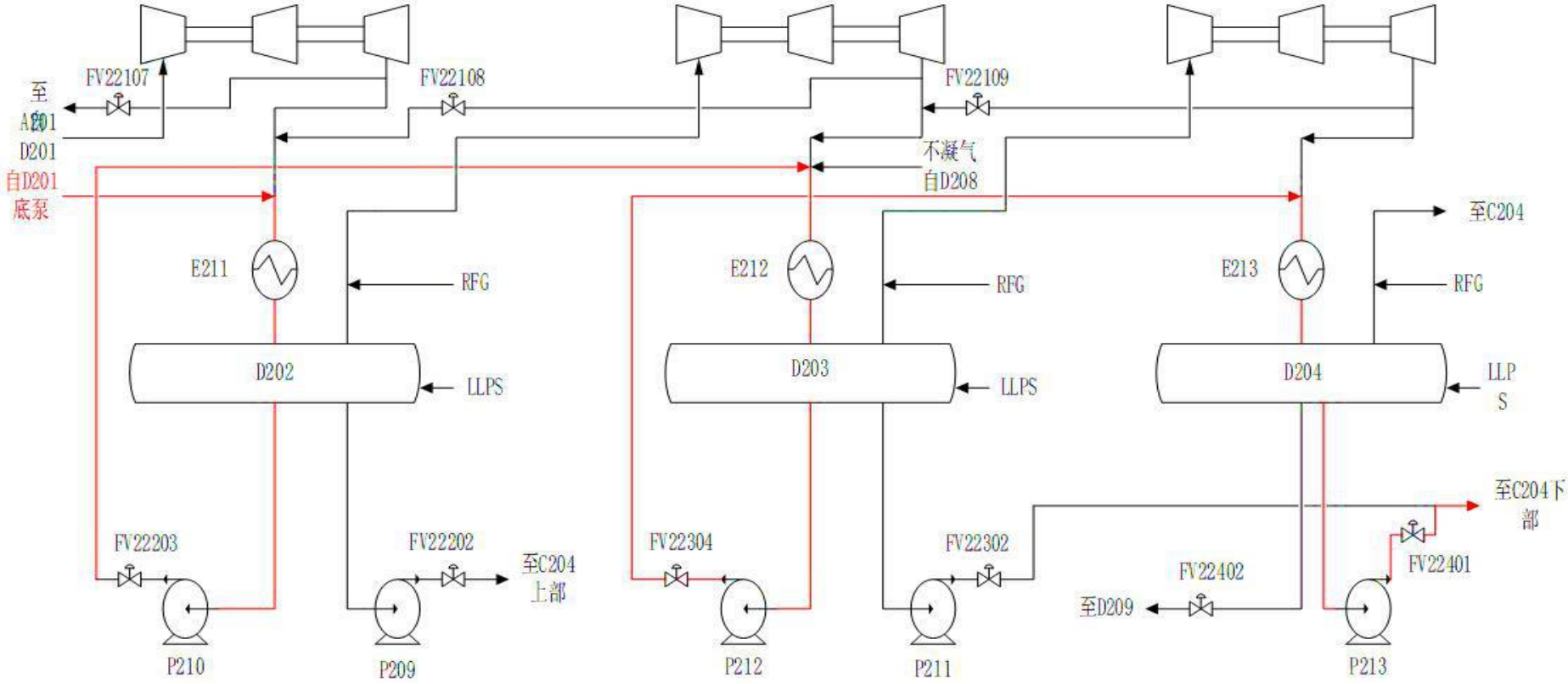
建立循环:




自K201一级
出口
自D209
放空
石脑油
自炼厂
石脑油
自E218
FV20301
PV20402A
FV20201
PV20402B
至火炬
LV20201
SSW
至K201
A201
C201
N2/FG
FV20401
E202
D201
LLPS
至K201一级
出口
至D209
LPS
FV20402
P201
P202
FV20403

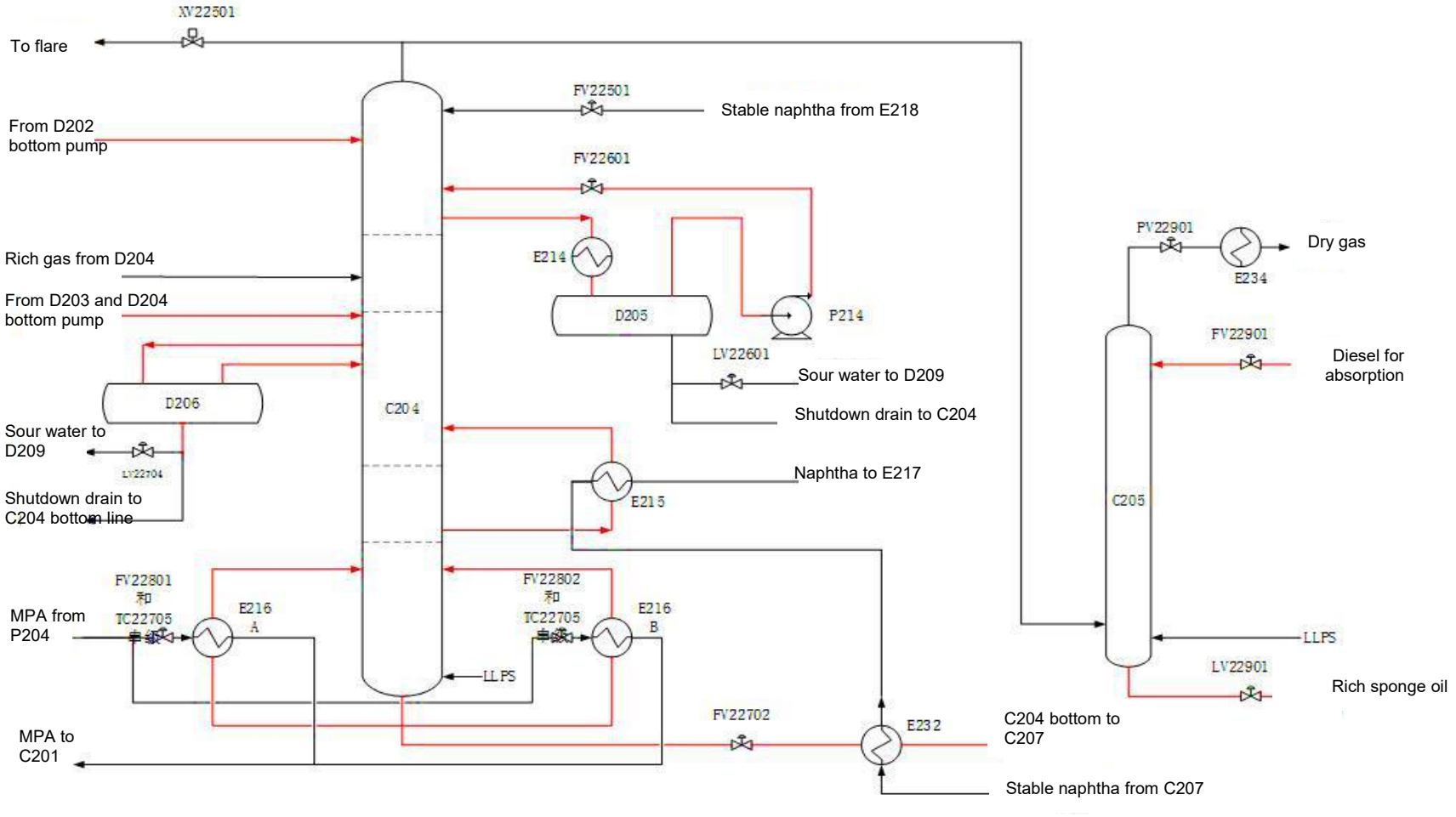
◆Oil is collected in D201, and transferred to D-202: Supply startup naphtha to—→A-201 inlet —→E-202—→D-201—→Established liquid level LC-20401 reaches 50%—→Starting the pump P-201/202—→E-211—→D-202—→Established liquid level LC-22201 reaches 50%;
D201 收油，并向 D202 转油：引开工石脑油至—→A-201 入口—→E-202—→D-201—→建立液位 LC-20401 至 50%—→启动泵 P-201/202—→E-211—→D-202—→建立液位 LC-22201 至 50%；

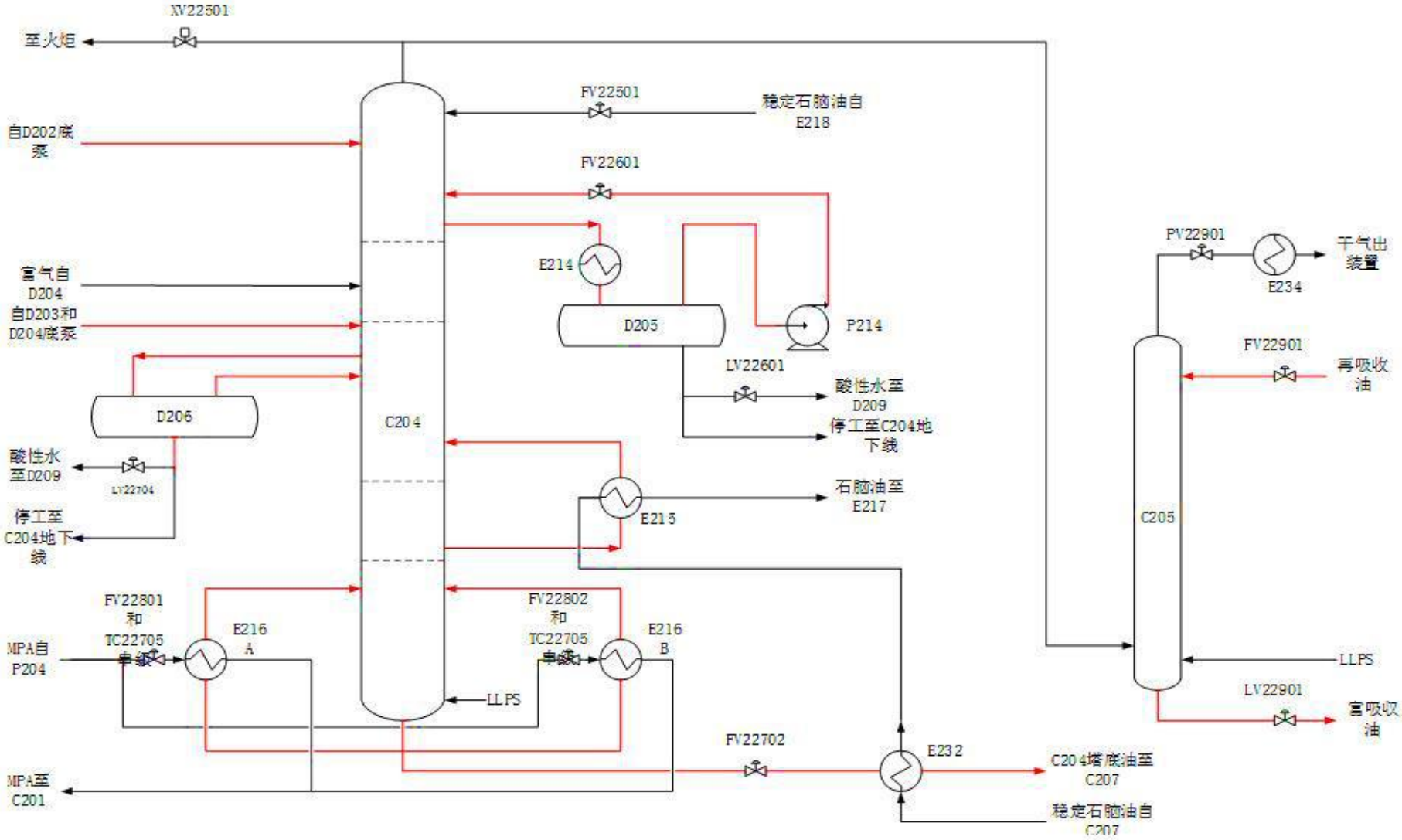




◆Oil is collected in D-202, and transferred to D-203, D-204: D-202—→Starting the pump -210—→E-212—→D-203—→Established liquid level LC-22301 reaches 50%—→Starting the pump -212—→E-213—→D-204—→Established liquid level LC-22401 reaches 50%;

D-202 收油，并向 D-203、D-204 转油：D-202—→启动泵-210—→E-212—→D-203—→建立液位 LC-22301 至 50%—→启动泵-212—→E-213—→D-204—→建立液位 LC-22401 至 50%；




XV22501
至火炬
FV22501
稳定石脑油自
E218
自D202底
泵
FV22601
E214
富气自
D204
自D203和
D204底泵
D205
P214
PV22901
干气出
装置
E234
FV22901
再吸收
油
LV22601
酸性水至
D209
停工至C204地
下线
D206
C204
C205
酸性水
至D209
LV22704
停工至
C204地下
线
石脑油至
E217
E215
FV22801
和
TC22705
FV22802
和
TC22705
MPA自
P204
E216
A
E216
B
LLPS
LLPS
LV22901
富吸收
油
FV22702
E232
C204塔底油至
C207
MPA至
C201
稳定石脑油自
C207

◆D203, D204 transfer the oil to C-204: Starting the pump P-211/213—→To column C -204 18th layer; D203、D204

◆D-203、D-204 向 C-204 转油：启动泵 P-211/213—→至塔 C -204 第十八层；

◆Middle section circulation is established in C-204: Removal of 26-layer oil collection tank of C-204—→E-214AB—→Full liquid level in D-205—→Starting the pump P-214—→ FV-22601Returning to column;

◆C-204 建立中段循环：C-204 的 26 层集油箱抽出—→E-214AB—→D-205 满液位—→启动泵 P-214—→FV-22601 返塔；

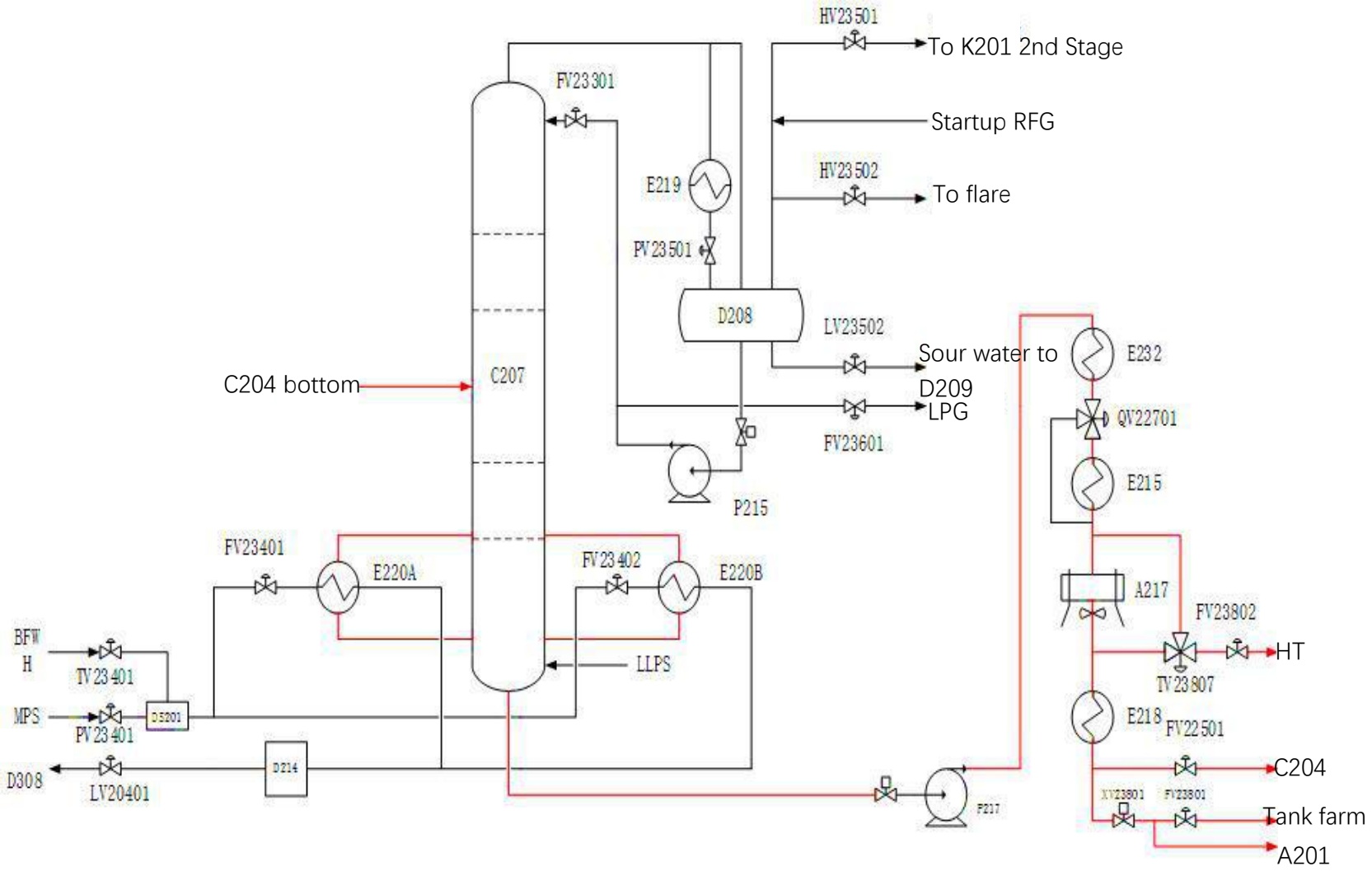
◆C-204 transfers the oil to C-207, and establish circulation in double columns: Column C-204 (RFG pressurization)—→Bottom FV-22702—→E-232—→Column C-207—→Established liquid level LC-23302 reaches 50%—→Starting the pump P-217—→E-232—→E-215 —→A-217—→E-218—→Returning to column C-204 overhead;

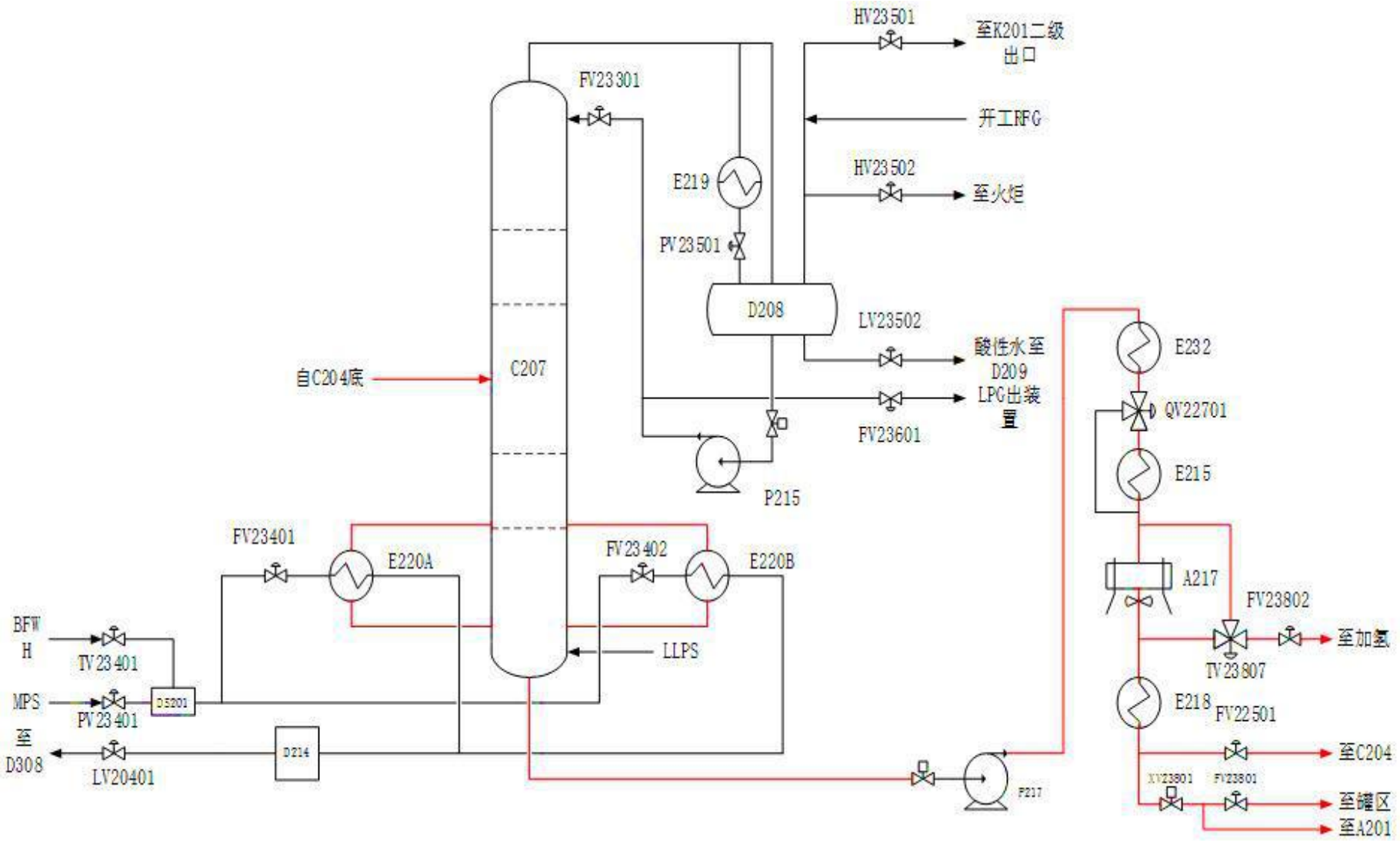
◆C-204 向 C-207 转油，建立双塔循环：塔 C-204（RFG 充压）—→底部 FV-22702—→E-232—→塔 C-207—→建立液位 LC-23302 至 50%—→启动泵 P-217—→E-232—→E-215—→A-217 —→E-218—→返回塔 C-204 顶部；

◆C207 transfers the oil to D201: Naphtha in column C-207 bottom —→Pump -217—→E-232—→E-215—→A-217—→E-218—→FV-23801—→Before A-201;

C-207 向 D-201

◆C-207 向 D-201 转油：塔 C-207 底石脑油—→泵-217—→E-232—→E-215—→A-217 —→E-218—→FV-23801—→A-201 前；


HV23501
To K201 2nd Stage
FV23301
Startup RFG
E219
HV23502
To flare
PV23501
D208
LV23502
Sour water to
D209
C204 bottom
C207
E232
LPG
FV23601
QV22701
P215
E215
FV23401
E220A
FV23402
E220B
A217
FV23802
BFW
H
TV23401
LLPS
HT
TV23807
MPS
PV23401
D5201
E218
FV22501
D308
LV20401
D214
C204
P217
XV23801
FV23801
Tank farm
A201


HV23501
至K201二级出口
FV23301
开工RFG
E219
HV23502
至火炬
PV23501
D208
LV23502
酸性水至D209
C207
自C204底
LPG出装置
FV23601
P215
E232
QV22701
E215
FV23401
E220A
FV23402
E220B
A217
FV23802
BFW H
TV23401
至加氢
TV23807
MPS
PV23401
D5201
E218
FV22501
至C204
至D308
LV20401
D214
XV23801
FV23801
至罐区
至A201
LLPS
P217

Complete large circulation, dehyration, equipment test. A little of naphtha product may be sent outside the Unit, and naphtha is made up.
完成大循环，脱水、考验设备。可将少量的石脑油产品送出装置，并补充石脑油。

2.3.4.4 Water and amine circulations is are established in amine system
胺液系统建立水和胺液循环
(1) Preparation of amine:
配制胺液：
First load about 140t of pure amine in the T-301, and then properly add demineralized water in T-302 to prepare 30% solution. Then add chemically pure ammonium sulfate. Based on adding 0.082 kg per 1kg pure amine, prepare 514 m3 amine (T-302).
首先将纯的胺液约 140t 装入 T-301 中，然后合格的加除盐水在 T-302 中配制成 30%的溶液，再加入化学纯的硫酸铵，按 1kg 纯胺液加入 0.082 kg 配制 514 m3 胺液（T-302）。
(2) Starting 25% of bypass circulation:
启用 25%的旁路循环：
Starting pump -308—→SR-310—→D-306—→SR-302—→FC-31801 (40% of flow)—→T-302;
开泵-308—→SR-310—→D-306—→SR-302—→FC-31801（40%量）—→T-302；
Starting pump -308—→SR-310—→FV-31802 (60% of flow)—→T-302;
开泵-308—→SR-310—→FV-31802（60%量）—→T-302；
(3) Establishing amine circulation in C305:
C305 建立胺液循环：
Column T-302—→P-308→SR-312—→E-310—→FV-31401—→C-305—→Established liquid level LC31401 reaches 50%—→Start the pump P-315—→STR-307—→E-310
—→A-302—→E-314—→FC-31301—→T-302;
塔 T-302—→泵-308—→SR-312—→E-310—→FV-31401—→C-305—→建立液位 LC31401 至 50%—→启动泵 P-315—→STR-307—→E-310—→A-302—→E-314
—→FC-31301—→T-302；

2.3.5 Preparation work of coke fines loading: 装焦粉准备工作：

2.3.5.1 Check details: 检查明细：
(1) Reactor, scrubber, fractionator: Maintain pressure of reactor higher 0.007MPa than that of heater. oil circulation shall be established in the feedstock oil, scrubber, fractionating systems;
反应器、洗涤塔、分馏塔：维持反应器压力高于加热器 0.007MPa，原料油系统、洗涤塔系统、分馏系统建立油循环；
(2) Gasifier, heater: Main air shall enter FXG flare through gasifier, heater, auxiliary combustion chamber;
气化器、加热器：主风通过气化器、加热器、辅助燃烧室进入 FXG 火炬；

(3) Stabilization system: Establish naphtha circulation, and pressurize gas compressor with RFG;
稳定系统：建立石脑油循环，气压机用 RFG 充压；
(4) Water circulation is established in Flexigas treatment system: Water circulation is established in Venturi scrubber, stage 1 contact cooling tower, stage 2 contact cooling tower. It is sent to coke fines treatment system by diluted slurry rejection to outside;
灵活气处理系统建立水循环：文丘里洗涤塔、一级接触冷却塔、二级接触冷却塔建立水循环，通过稀浆液外甩送至焦粉处理系统；
(5) Coke fines loading system: Put SR402 into service, and establish circulation in D402.
焦粉装车系统： SR-402 投用，D4-02 建立循环。

2.3.5.2 Putting tertiary cyclone in service 三旋投用
(1) Put tertiary cyclone tank N2 into service, and start electric heating. Get through the rear coke handling line with N2, and then put conveying air into service. Decrease opening of N2;
投用三旋罐 N2，打开电加热。用 N2 贯通后部焦炭处理管线，随后投用输送风，关小 N2；
(2) Get through downward flow process of tertiary cyclone, close upward flow process outlet, and ensure that the purging is clean;
打通三旋向下流程，关闭向上流程出口，确保吹扫干净；
(3) Adjust coke fines outlet slide valve of tertiary cyclone, and ensure that the upper XV30102 is opened, that PV30102A or B is fully opened, and that another one is adjusted;
调节三旋焦粉出口滑阀，确保上部 XV-30102 打开，PV-30102A 或 B 全开，另外 1 个调节；

2.3.5.3 COS reactor is ready for Putting into service COS 反应器准备投用
(1) Check and verify that COS reactor bypass is opened, that pressure control valve PV30501 is commissioned properly, and that COS relief valve is put into service;
检查确认 COS 反应器旁路打开，压控阀 PV-30501 调试好，COS 安全阀投用；
(2) Put low pressure steam of COS preheater into service. Condensate line shall be unobstructed;
COS 预热器低压蒸汽准备投用，凝结水线畅通；

2.3.5.4 Other Preparation works 其它准备工作
(1) Adjusting coke fines conveying line: Fully close hot coke slide valve, and put standpipe aeration steam into service. Fully close scouring coke slide valve, and put standpipe aeration steam into service. Fully close cold coke slide valve, and put standpipe aeration steam into service (including riser). Fully close quenched coke slide valve, and put standpipe aeration steam into service. Fully close feedstock coke-for-gasification slide valve, and put standpipe aeration steam into service. Material seal is established in the coke-for-gasification return line, and hot nitrogen shall be used for end. Fully close feedstock cooling coke line;

调节焦粉输送管线：热焦滑阀关死，立管松动蒸汽投用；冲刷焦滑阀关死，立管松动氮气投用；冷焦滑阀关死，松动蒸汽投用（包括提升管）；急冷焦滑阀关死，立管松动氮气投用；气化原料焦滑阀关死，立管松动氮气投用；气化焦返回线建立料封，末端投用热氮气；冷却焦原料线关死；

(2) Get through flow process of BFW and purified water to gasifier and heater atomization. Get through low pressure steam to heater atomization;

打通 BFW 和净化水到气化器和加热器喷雾流程，打通低压蒸汽到加热器喷雾；

(3) Ignite in auxiliary combustion chamber;

辅助燃烧室点火；

(4) Put cold coke riser aeration steam into service (Because the heater bed will be loaded with coke fines, prevent from clogging);

冷焦提升管松动蒸汽投用（因为加热器床层会装焦粉，防止堵塞）；

(5) Put steam to gasifier into service.

气化器投用蒸汽。

2.3.6 Loading coke fines in heater, reactor and gasifier, and increasing temperature:

三器装焦粉、升温：

Loading coke fines in heater, reactor and gasifier is divided into two stages. In first stage, coke fines will not be combusted, and may directly be loaded bypassing CY401 and BN402. In second stage, coke fines will be combusted, thus coke shall be loaded through CY401 and BN402.

三器装焦粉分为两个阶段，第一阶段焦粉不燃烧，可以跨过 CY-401 和 BN-402 直接装；第二阶段焦粉燃烧，所以必须经 CY-401 和 BN-402 装焦。

2.3.6.1 First stage startup of coke loading: Load coke fines in the heater, ignite F-101, keep the outlet temperature TC-11304 below 250°C, and coke will not be combusted.

开工装焦第一阶段：向加热器装焦粉，点燃 F-101，保持出口温度 TC-11304 在 250℃以下，焦炭不燃烧。

(1) First perform first stage coke loading, open XV-1920 valve, and directly load the coke in the D-401 to R-102 through DN300 line;

先执行第一阶段装焦，打开 XV-1920 阀，直接将 D-401 的焦通过 DN300 管线装至 R-102；

(2) Coke fines seal will be established gradually in cold coke, hot coke, scouring coke lines during coke loading, thus D-401 may be pressurized gradualy to 0.34MPa, pressure of reactor and R-102 may be increased gradualy to 0.11MPa and 0.241MPa respectively, and air supply point pressure at PC-40403 may be increased to 0.313MPa;

在装焦过程中，由于冷焦、热焦冲刷焦管线逐渐建立焦粉密封，可将 D-401 充压逐渐提至 0.34MPa，反应器压力逐渐提至 0.11MPa，R-102 的压力逐渐提至 0.241MPa，PC-40403 处的给风点压力至 0.313MPa；

(3) Total 681.4t coke is loaded during the first stage. After first stage is finished, Distribution of heater, reactor and gasifier coke fines: 141t for heater, 221.5t for gasifier, and rest for reactor coke;
第一阶段共装入 681.4t 焦炭，第一阶段结束后三器焦粉的分配：加热器 141t，气化器 221.5t，其余为反应器的焦；

2.3.6.2 In the second stage of startup coke loading: Increase F-101 outlet temperature to more than 350℃, and ignite coke in the heater.
开工装焦第二阶段：F-101 出口温度提至 350℃以上，点燃加热器的焦炭。
(1) In the second stage, after air is removed by CY-401, load coke to R-102 by DN300 line after loading coke to BN-402, and put LC-40801 and slide valve LV-40801 into service;
第二阶段通过 CY-401 脱除空气后向 BN-402 装焦后的 DN300 管线向 R-102 装焦，投用 LC-40801 与滑阀 LV-40801；
(2) Increase F-101 outlet temperature to more than 350℃ (design outlet temperature is 594℃), ignite coke in the heater, and quantity of loaded coke reaches 763.5t.
提高 F-101 出口温度至 350℃以上（设计出口温度为 594℃），点燃加热器的焦炭，装焦至 763.5t。
(3) In the second stage, 145.1t of coke is added. Coke distribution list of heater, reactor and gasifier is as the following table.
第二阶段加入焦炭为 145.1t。三器焦炭量的分配如下表。
(4) Speed up the upward circulation flow of cold coke and hot coke to reactor, and increase temperature of reactor to 530℃ (based on rate of 50℃ per hour).
加快至反应器的冷焦与热焦循上环量，将反应器的温度提至 530℃（按每小时 50℃的速率）。

2.3.6.3 Important notes 注意事项
(1) When igniting coke, inject caustic to water circulation system in heater overhead to control pH value of water between 7 to 8, and inject scale inhibitor;
焦炭引燃时，应向加热器顶部水循环系统注入碱液，以控制水的 PH 值在 7～8 之间，并注入防垢剂；
(2) Transfer hot coke to gasifier (fluidization steam flow is 25 to 30t/h). When coke is ignited, it may be changed to main air coke-for-gasification.
向气化器转热焦（流化用蒸汽量 25～30t/h），当焦炭点燃后，可改入主风气化焦炭。
(3) Increase the speed of coke transfer to reactor (analyzing solid content in the SPA of pump-102, adjusting rejection flow to outside through E-105), and maintain that level in the reactor shall not be more than 30% (when feeding, the bed will raise).
加快向反应器转焦速度（分析泵-102 的 SPA 中的固含量，调节走 E-105 的外甩量），保持反应器的料位不大于 30%（进料时床层会提高）。
(4) Ignite coke in the heater. Main air flow is 22.3kNm3/h. Transfer hot coke to gasifier (do not put quenching slide valve).

点燃加热器焦炭，主风量 22.3kNm3/h，向气化器转热焦（不投用急冷滑阀）。
(5) Enhance caustic and scale inhibitor injections of heater overhead water wash.
加强加热器顶水洗的注碱、注防垢剂。
(6) Start hot and cold coke valves at the rate of 50℃/h to increase temperature in the reactor.
以 50℃/h 的速度开热焦阀与冷焦阀提高反应器的温度。

2.3.7 Reaction feed 反应进料

2.3.7.1 Before reaction feed, conditions of the system are as follows:
反应进料前，系统状态如下：
(1) Establish coke fines circulations in the reactor and heater. Reactor and heater bed temperatures will reaches 530℃ and 560℃ respectively;
反应器和加热器建立焦粉循环，反应器床温达到 530℃，加热器床温达到 560℃,；
(2) Naphtha, diesel oil and hot wax oil circulations in the fractionating system, residue circulation in the scrubber and feedstock oil system;
分馏系统石脑油、柴油和热蜡油循环，洗涤塔和原料油系统渣油循环；
(3) Maintain naphtha circulation in the stabilization system;
稳定系统维持石脑油循环；
(4) Fill RFG at gas compressor inlet. Start, warm it at low speed;
气压机入口充 RFG(燃料气)，开启，低速速暖机；
(5) Water circulation, caustic and scale inhibitor injection facilities of Flexigas treatment system are ready;
灵活气处理系统水循环，注碱、阻垢剂设施准备好；

2.3.7.2 Specific processes: 具体过程：
(1) Contact with the Tank Farm to supply vacuum residue to D-107. Feeding may be performed when 2/3 of wax oil in scrubber is replaced;
联系罐区引入减压渣油至 D-107,将洗涤塔的蜡油置换 2/3 时即可进料；
(2) Increase circulation flow of cold coke and hot coke. Increase temperature in the reactor. Closely observe that the level in the reactor LI-10502 shall not be more than 30%, and that the temperature in the reactor TC-10510AB shall be higher 10℃ than normal value (normal reaction temperature is 530℃). Feeding may be performed;
加大冷焦与热焦的循环量，提高反应器的温度，密切注意反应器的料位 LI-10502 不大于 30%，反应器温度 TC-10510AB 在高于正常值的 10℃，正常反应温度为 530℃，可以进料；
(3) First start 1 nozzle in 3rd layer. After 15 minutes of interval, start 1 nozzle in 4th layer, and then start 1 nozzle in 2nd layer, until feeding maintains 66*104t/year. Circulation ratio shall be calcuated based on 1.34 (properly control the opening of return line valve FV-10505, and

difference against flow of FI-10201 is actual feed flow). For feeding, about 13 nozzles are required (first do not put nozzles in 1st and 6th layers into service);
先开第 3 层的 1 个喷嘴，间隔 15 分钟后，再开第 4 层的 1 个喷嘴，然后再开第 2 层的 1 个喷嘴，直至将进料维持至 66*104t/年，循环比按 1.34 计算（控制好返回线阀的开度 FV-10505，并对照 FI-10201 的量之差即为实际进料量），约需 13 个喷嘴进料（首先不投用第一层与第六层的喷嘴）；
(4) Adjust air and steam flow rates of gasifier, start gasification of coke, and supply heat to heater. Meanwhile, air and steam flow rates of heater are also adjusted;
调节气化器的空气量和蒸汽量，开始气化焦炭，向加热器供热，同时加热器自身的空气、蒸汽量也进行调整；
(5) Put gasifier overhead nozzle into service to prevent heater grating from overtemperature. After linear speed reaches 15m/s, put quenched coke slide valve into service;
投用气化器顶喷嘴，以防止加热器格栅超温，线速达到 15m/s 后投用急冷焦滑阀；
(6) Adjust fractionator operations, adjust individual circulation backflows, output the product;
分馏塔操作调整，各循环回流调整，出产品；
(7) Change open-loop circulation of feedstock oil to closed-loop circulation: Observe solid content in pump-102, close E-105 to return oil, and perform purging until heavy slop oil tank;
改原料油的开路循环为闭路循环：观察泵-102 的固含量情况，关闭 E-105 退油，并吹扫至重污油罐；
(8) Depending on feedstock preheating conditions, E-101, E-210 generate saturated steam, stop E-235, put E-209 into service. Feedstock oil shall be preheated according to the normal flow process;
视原料预热情况，E-101，E-210 发生饱和蒸汽，停用 E-235，投用 E-209，原料油按正常流程预热；

2.3.8 Operation adjustment 操作调整

2.3.8.1 Reaction gasification system: Convert main air to gasifier from heater;
反应气化系统：将主风从加热器切换到气化器；
(1) Adjust gasifier main air and steam flows, and properly control the level;
调整气化器主风和蒸汽量，控制好料位；
(2) Remove restriction of overflow downcomer, start coke fines circulation of heater and gasifier, and convert main air to gasifier from heater;
气化器返焦线解封，开始加热器和气化器焦粉循环，将主风从加热器转到气化器；
(3) Slowly increase gasifier main air flow to increase bed temperature, and adjust heater air flow and coke fines circulation flow to properly control heater bed temperature;
缓慢提高气化器主风量提高床层温度，调整加热器风量和焦粉循环量控制好加热器床温；
(4) Properly monitor heater grating temperature to avoid overtemperature;
监控好加热器格栅温度，避免超温；

(5) Prior to put quenched coke into service (linear speed is adequate), control heater grating temperature by gasifier atomization;
在急冷焦投用前（线速足够），用气化器喷雾控制加热器格栅温度；
(6) When linear speed in the quenched coke line exceeds 15m/s, slowly put quenched coke into service, and adapt to increase of differential pressure between gasifier - heater;
当急冷焦管线处线速超过 15m/s，缓慢投用急冷焦，适应气化器-加热器差压增加；
(7) After main air flow is adjusted properly to balance coke fines inventory, adjust steam flow to control gasifier temperature.
主风量调整好能平衡焦粉藏量后，调节蒸汽量控制气化器温度。

2.3.8.2 Fractionating system: 分馏系统：
(1) Ensure that air cooling and water cooling shall be put into service;
确保空冷和水冷全部投用；
(2) With scrubber overhead oil vapor entering fractionator, properly control individual levels;
随着洗涤塔顶油气进入分馏塔，控制好各液位；
(3) Properly control individual temperatures of fractionator above steam dew point;
控制好分馏塔各温度在蒸汽露点以上；
(4) Establish liquid levels in light wax oil, heavy wax oil and diesel oil strippers, put stripping steam into service, and send oil product to outside;
轻蜡油、重蜡油和柴油汽提塔建立液面，投用汽提蒸汽，外送油品；
(5) After feed is stable, properly adjust backflow flow, and control heat balance;
进料稳定后，调整好回流量，控制热平衡；
(6) Properly control product quality; after product quality is acceptable, send it to the downstream units;
控制好产品质量；产品质量合格后，外送到下游装置；

2.3.8.3 Stabilization system: 稳定系统：
(1) Properly control pressure in absorption-stabilization system, fuel gas may be withdrew slowly;
控制好吸收稳定系统压力，燃料气可以慢慢退出；
(2) After naphtha quality is acceptable, put additional absorbent into service;
石脑油质量合格后，投用补充吸收剂；
(3) Increase pressure in re-absorber, and adjust the operation to normal.
提高再吸收塔压力，调整操作至正常。

2.3.8.4 Flexigas treatment system: 灵活气处理系统：
(1) Putting FXG desulphurization system into service
FXG 脱硫系统投用

1) After Reaction gasification systemhas operated smoothly for 4 to 6 hours, load desulfurizing agent to FXG desulfurizer: Coke fines is combusted in the heater and gasifier. Inject caustic to Venturi scrubber, control pH value between 6.5 and 7.5. pH value of condensing tower shall be 7.0 to 7.5. pH value of cooling tower shall be 7.0 to 7.5. Solid content in water shall be normal;
在反应气化系统平稳运行 4～6 小时后，脱硫剂打入 FXG 脱硫塔：焦粉在加热器和气化器燃烧；碱注入文丘里洗涤器控制 PH 值在 6.5～7.5；冷凝塔 PH 值 7.0～7.5；冷却塔 PH 值 7.0～7.5；水中固体含量正常；
2) Now, for FXG, only a little of SO2 enters the desulfurizer, amine is protected, and circulating H2S removal may be started.
此时，FXG 只有少量 SO2 进入脱硫塔，胺液得到保护可以开始循环脱除 H2S。
(2) Putting COS reactor into service. COS 反应器投用
After FXG output is normal and FXG desulphurization system is put into service, COS reactor may be put into service. Now, FXG may be sent to the consumer. The operating procedures are as follows:
当 FXG 产量正常和 FXG 脱硫系统投用后，可以投用 COS 反应器。此时，FXG 可以送至用户。操作步骤如下：
1) Check COS preheater steam and condensate water, and ensure that flow process shall be unobstructed;
检查 COS 预热器蒸汽和冷凝水，确保流程畅通；
2) COS inlet temperature shall reach design value (higher 10℃ than normal temperature to avoid condensate water);
COS 入口温度达到设计值（超出正常温度 10℃，避免冷凝水）；
3) Open outlet valve MOV30503, slowly open inlet valve MOV30501, and monitor inlet temperature;
打开出口阀 MOV-30503，缓慢打开入口阀 MOV-30501，监控入口温度；
4) Slowly close bypass valve (until it is closed fully), and properly control Flexigas pressure;
旁路阀慢慢关闭（直到关死），控制好灵活气压力；
5) Before Flexigas is sent to the consumer, Check and verify that air in the piping shall be removed, and the piping shall be drained at low point. Slowly change to PDV-10902C control from flare control.
灵活气送至用户之前，检查确认管线赶空气、低点排凝。缓慢由火炬控制改至 PDV-10902C 控制。

2.3.9 Full gasification mode 全气化模式

After COS reactor and FXG desulphurization system are put into service, they shall be changed to full gasification mode. Check items are as follows:
当 COS 反应器和 FXG 脱硫系统投用后，改为全气化模式，检查内容如下：

2.3.9.1 Put main cooling air into service, convey tertiary cyclone coke fines, and stop startup N2 or other gas medium;
冷却主风投用，输送三旋焦粉，停开工用 N2 或其它气体介质；

2.3.9.2 Tertiary cyclone is changed to normal operating mode, and startup line is closed;
三旋改为正常操作模式，开工线关闭；

2.3.9.3 Stop caustic injection;
碱加注停用；

2.3.9.4 Adjust individual circulation flows of FXG to design values;
FXG 各循环量调至设计值；

2.3.9.5 Stop coke fines injection system;
焦粉加注系统停用；

2.3.9.6 Put scouring coke line into service;
冲刷焦线投用；

2.3.9.7 Start to discharge the coke from heater, and maintain heavy metal balance;
开始从加热器卸焦，维持重金属平衡；

2.3.9.8 Adjust the operation to design load.
调整操作至设计负荷。

2.4 Normal operation, instrument control scheme and main instrument performance 正常操作、仪表控制方案及主要仪表性能

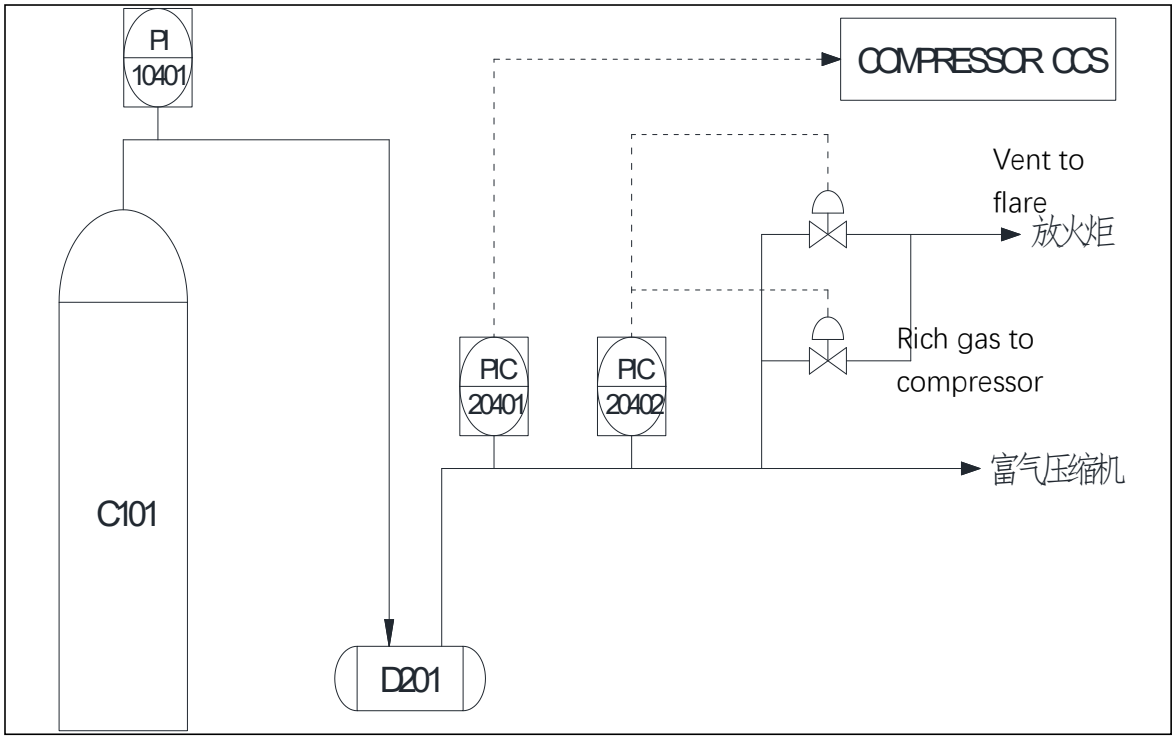
2.4.1 Process control of reaction section 反应部分工艺控制操作法

(1) Scrubber overhead and reactor pressure control PI-10401.
洗涤塔顶、反应器压力控制 PI-10401。
1) Control range: pressure of scrubber overhead, reactor should be controlled at 0.85-0.11MPa.
控制范围：洗涤塔顶、反应器压力控制 0.85～0.11MPa。

2) Control target: The reaction pressure should be controlled within the above range during Normal adjustment, and the specific control value should be given according to the production plan. The controlled reaction pressure fluctuation should up to the set value ± 0.05 MPa.
控制目标：正常操作中反应压力应控制在上述范围内，具体控制数值根据生产方案给定。控制的反应压力波动不超过设定值±0.05MPa。

3) Related parameters: Fractionator pressure; nozzle feed rate; reaction cyclone pressure drop; reaction temperature; heater pressure, stripping steam flow rate, rotate speed of pneumatic compressor;
相关参数：分馏塔压力；喷嘴进料量；反应旋分压降；反应温度；加热器压力、汽提蒸汽量；气压机转速。

4) Control mode: The reactor pressure is controlled by the air inlet pressure PIC-20401 of pneumatic compressor and adjusted by rotation speed of the compressor. It is very important to keep the pressure difference between the reactor and the heater constant, to better control the cold coke circulation rate between the reactor and heater and the circulation rate of the scouring coke and hot coke between the heater and reactor.
控制方式： 反应器压力是通过气压机入口压力 PIC-20401 来控制的。通过气压机转速调节，保持反应器压力恒定。以此保持反应器和加热器之间的压差恒定非常重要，这样可以更好地控制反应器和加热器之间冷焦炭的循环速率以及加热器和反应器之间的冲刷焦炭和热焦炭的循环速率。



5) Normal adjustment: 正常调整：

Influence factors 影响因素	Adjustment mode 调整方法

Influence factors 影响因素	Adjustment mode 调整方法
Nozzle feed rate 喷嘴进料量	The nozzle feed rate FI-10201 is controlled by the feed pressure PIC-10501. The pressure rises as the feed rate increases; The pressure drops as the feed rate decreases . 喷嘴进料量通过控制进料压力 PIC-10501 控制喷嘴进料量 FI-10201。进料量上升，压力上升；进料量下降，压力下降。
Fractionator pressure 分馏塔压力	As the pressure of the fractionator rises, the pressure of scrubber overhead and reactor increases; As the pressure of the fractionator decreases, the pressure of the scrubber and the reactor decreases. 分馏塔压力上升，洗涤塔顶、反应器压力上升；分馏塔压力下降，洗涤塔顶、反应器压力下降。
Reaction cyclone pressure drop 反应旋分压降	As the reaction cyclone pressure drop increases, the pressure of scrubber top decreases and the reactor pressure increases; As the reaction cyclone pressure drop decreases, and the pressure of scrubber top increases and the reactor pressure decreases. 反应旋分压降上升，洗涤塔顶压力下降、反应器压力上升；反应旋分压降下降，洗涤塔顶上升、反应器压力下降。
Reaction temperature 反应温度	As the reaction temperature decreases, the pressure of scrubber and the reactor decrease; As the reaction temperature increases, the pressure of the scrubber and the reactor increases. 反应温度下降，洗涤塔顶、反应器压力降低；反应温度升高，洗涤塔顶、反应器压力上升。
Stripping steam flow rate 汽提蒸汽量	As the stripping steam flow rate decreases, the pressure of scrubber and the reactor decreases; As the stripping steam flow rate increases, the pressure of scrubber and the reactor increases. 汽提蒸汽量下降，洗涤塔顶、反应器压力降低；汽提蒸汽量升高，洗涤塔顶、反应器压力上升。
Rotate speed of pneumatic compressor 气压机转速	As the rotate speed of the pneumatic compressor decreases, the pressure of scrubber overhead and reactor increases; As the rotate speed of the pneumatic compressor increases, the pressure of scrubber overhead and reactor decreases; 气压机转速下降，洗涤塔顶、反应器压力上升；气压机转速升高，洗涤塔顶、反应器压力下降。

6) Troubleshooting: 异常处理：

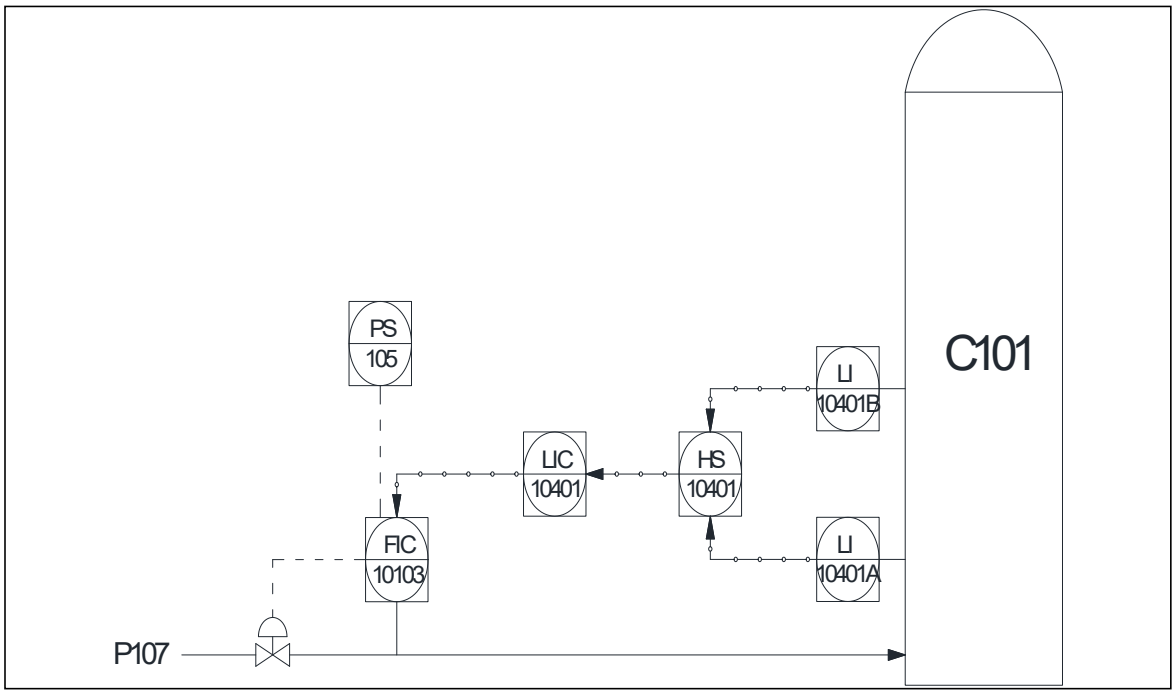
Fault 现象	Cause 原因	Action 处理方法
Reaction pressure fluctuation 反应压力波动	Feed pump failed 进料泵故障	Switch to the stand-by pump and contact the maintenance worker for repairing.切换至备用泵，并联系钳工处理。
	Large fluctuations in total feed rate due to control instrument failure 控制仪表失灵等原因引起总进料大幅度波动	If the feeding instrument of feedstock is out of control, the control valve position should be manually controlled or bypass the control valve and contact the instrument engineer for repairing.若原料进料仪表失控，应手动控制调节阀阀位，或改副线将调节阀切除操作并联系仪表处理。
	The reaction temperature changes greatly 反应温度大幅度变化	Change the hot coke and the scouring coke slide valve to manual control, restore temperature control and stabilize pressure after troubleshooting instrument equipment . 将热焦滑阀、冲刷焦滑阀改手动控制，排除仪表设备故障后，恢复温度控制 ，平稳压力。
	Reaction temperature changed greatly 气压机跳停	Inform the production scheduling, pay attention to the pressure of medium-pressure steam and low-pressure steam, prevent it from being too high or too low, change the large/small valve to flare to maual operation and control the reactor pressure to normal, contact the equipment and instruments for inspection and treatment, and start the air blower unit to resume production after troubleshooting. If the problem cannot be corrected for a long time, cut off the reactor feed and maintain the low-load fluidization of the three vessels. 通知生产调度，注意中压蒸汽、低压蒸汽压力，防止过高或过低，将大小防火炬改手动维持操作，控制反应器压力正常，并联系设备、仪表检查处理，待故障排除后，启动气压机组，恢复生产。若故障长时间无法排除，切断反应器进料，维持三器低负荷流化。
	Feedstock from tank area was water-entrained 罐区来原料带水	Switch the hot coke valve and the flushing coke valve to manual mode, inform the production coordinator and the supervisor of tank area to drain in time or change the tank.热焦滑阀和冲刷焦滑阀改手动控制，通知调度，联系罐区加强脱水或换罐。

Fault 现象	Cause 原因	Action 处理方法
	Steam injected into reactor was water-entrained 反应器注入蒸汽带水	Contact production scheduling. Increase the 1.0MPa steam temperature and pressure, adjust the operation of F104 and drain in time.联系生产调度，提高 1.0MPa 蒸汽温度、压力，调整 F104 操作、并及时进行脱水。
	Cyclone pressure drop increased 旋分压降增大	Open the scouring coke slide valve according to the solid content of oil slurry to increase the scouring rate. 视油浆固含量情况，开大冲刷焦滑阀，增大冲刷焦量。
	Catalyst fluidization or circulation are abnormal due to the pressure changed greatly 压力大幅度变化而引起催化剂流化或循环不正常	Quickly change cold coke slide valve, hot coke slide valve and scouring coke slide valve to manual operation. Control stable reaction pressure by using compressor rotation speed or by using the large/small valve to flare and assist in the adjustment of flexigas to flare valve to ensurea stable pressure difference between reactor and heater. Notify production scheduling, pay attention to the pressure of gas and flexigas pipeline networ. The reaction pressure is controlled by the speed of the compressor and the flow rate of the large/small valves to flare. When the speed increases, the reaction pressure decreases, and vice versa; when the flow rate of the large/small valves to flare increases, the reaction pressure decreases, and vice versa. The heater pressure is controlled by the flow rate of the flexible gas torch. When the flow rate of the torch increases, the heater pressure decreases, and vice versa. 迅速将冷、热焦滑阀和冲刷焦滑阀改手动调节，通过气压机转速或大小放火炬阀控制稳反应压力，辅助调节灵活气放火炬小阀，确保反应器、加热器压差平稳压力。并通知生产调度，注意瓦斯、灵活气管网压力。反应压力通过气压机转速和大小放火炬流量来控制，转速提高，反应压力下降，反之上升；大小放火炬流量提高，反应压力下降，反之上升。加热器压力通过灵活气放火炬流量来控制，放火炬流量提高，加热器压力下降，反之上升。

(2) Scrubber C-101 liquid level control LIC-10401

洗涤塔 C-101 液位控制 LIC-10401

1)Control range: scrubber C-101 liquid level control 30-50%.
控制范围：洗涤塔 C-101 液位控制 30～50%。
2)Control target: The liquid level of the scrubber should be controlled within the above range during Normal adjustment, and the specific control value should be given according to the production plan. The controlled liquid level fluctuation should be up to ±5% of the set value.
控制目标：正常操作中洗涤塔液位应控制在上述范围内，具体控制数值根据生产方案给定。控制的液位波动不超过设定值±5%。
3) Related Parameters: reaction temperature, nozzle feed rate, washing oil flow rate, reaction pressure, vacuum residue (VR) feed rate, scrubber top temperature.
相关参数：反应温度、喷嘴进料量、洗涤油量、反应压力、减压渣油（VR）进料量、洗涤塔顶温度。
4) Control mode: The scrubber level is controlled by LI-10401A or LI-10401B, which cascaded to the vacuum distillation (VR) feed controller FIC-10103. The operator can select the level measuring device LI-10401A or LI-10401B with the aid of a manual switch. The scrubber level must be maintained under the nasal tube of the cyclone and can also be verified by TI-10407/10408/10409/10410/10411 to prevent liquid in the scrubber from entering the reactor bed. The five TIs are arranged with a given distance from the bottom of the scrubber to the bottom of the nasal tube. The scrubber level is lower than the TI level if the temperature above 400℃, (there is hydrocarbon gases if the temperature is above 400℃). The scrubber level is higher than the TI level if the temperature is above 390℃, (there is liquid if the temperature is above 390℃). Readings of bottom three TIs, TI-10410/10411/10409(typically located at the liquid sump), are approximately maintained between 378℃ and 381℃. Readings of upper two TIs, TI-10407/10408 (typically located at the vapor space), are approximately maintained between 461℃ to 525℃.
控制方式：洗涤塔料位受 LI-10401A 或 LI-10401B 控制，LI-10401A 或 LI-10401B 级联到减压蒸馏（VR）进料控制器 FIC-10103。操作人员可借助手动开关选择料位测量装置 LI-10401A 或 LI-10401B。洗涤塔料位必须保持在旋风分离器鼻管下方位。以防止洗涤塔池内的液体进入反应器床上.洗涤塔料位也可通过 TI-10407/10408/10409/10410/10411 来验证。这五个 TI 按一定距离排开，从洗涤塔底部一直到鼻管底部。如果温度高于 400℃，表明洗涤塔池料位低于 TI 料位（如果温度高于 400℃，表明有油气存在）。如果温度低于 390℃，表明洗涤塔池料位高于 TI 料位（如果温度低于 390°C，表明有液体存在）。底部的三个 TI，即 TI-10410/10411/10409，一般位于液体池内，读数大约保持在 378~381℃之间。上部的两个 TI，即 TI-10407/10408，一般位于蒸汽空间内，读数大约保持在 461~525℃。



5) Normal adjustment:正常调整：

Influence factors 影响因素	Adjustment method 调整方法
Nozzle feed rate 喷嘴进料量	The nozzle feed rate FIQ-10505B is controlled by the feed pressure PIC-10501. The level decreases as the feed rate increases; the level increases as the feed rate decreases.喷嘴进料量通过控制进料压力 PIC-10501 控制喷嘴进料量 FIQ-10505B。进料量上升，液位下降；进料量下降，液位上升。
Reaction temperature 反应温度	As the reaction temperature increases, the level of scrubber decrease; As the reaction temperature decreases, the level of scrubber increases. 反应温度上升，洗涤塔液位下降；反应温度下降，洗涤塔液位上升。
Washing oil flow rate 洗涤油量	As the washing oil flow rate increases, the level of scrubber increase; As the washing oil flow rate decreases, the level of scrubber decreases. 洗涤油量上升，洗涤塔液位上升；洗涤油量下降，洗涤塔液位上升下降。
Vacuum residue feed rate 减压渣油进料量	As the vacuum residue feed rate decreases, the level of scrubber decrease; As the vacuum residue feed rate increases, the level of scrubber increases.减压渣油进料量下降，洗涤塔液位降低；减压渣油进料量升高，洗涤塔液位上升。
C101 Feed flow rate C101 进料流量	As C101 feed flow rate decreases, the level of scrubber decreases; As C101 feed flow rate increases, the level of scrubber increases. C101 进料流量下降，洗涤塔液位下降；C101 进料流量升高，洗涤塔液位上升。

Influence factors 影响因素	Adjustment method 调整方法
Scrubber top temperature 洗涤塔顶温度	The temperature at the top of the scrubber is controlled by the E101 cold circuit FIC10301 flow control. The flow of FIC10301 increases, the temperature at the top of the scrubber decreases, and the liquid level of the scrubber rises; the flow of FIC10301 decreases, the temperature of the scrubber rises, and the liquid level of the scrubber drops 洗涤塔顶温通过 E101 冷路 FIC10301 流量控制，FIC10301 流量上升，洗涤塔顶温度下降，洗涤塔液位上升；FIC10301 流量下降，洗涤塔温度上升，洗涤塔液位下降

6)Troubleshooting:异常处理：

Fault 现象	Cause 原因	Action 处理方法
Scrubber liquid level fluctuation 洗涤塔液位波动	Feed pump, circulation pump fail 进料泵、循环泵故障	Switch to the stand-by pump and contact the maintenance worker for repairing.切换至备用泵，并联系钳工处理。
	Large fluctuations in total feed due to control instrument failure 控制仪表失灵等原因引起总进料大幅度波动	If the feeding instrument of feedstock is out of control, the control valve position should be manually controlled, or bypass the control valve and contact the instrument engineer for repairing. 若原料进料仪表失控，应手动控制调节阀阀位，或改副线将调节阀切除操作并联系仪表处理。
	The reaction temperature changes greatly 反应温度大幅度变化	Switch the hot coke valve and the flushing coke valve to manual mode, and reset temperature control and check the scrubber liquid level for abnormal condition. 将热焦、冲刷焦手动，排除仪表设备故障后，恢复温度控制 ；同时检查洗涤塔液位有无异常。
	hot coke slide valve and the flushing coke slide valve are out of control 热焦、冲刷焦滑阀失控	Switch the hot coke slide valve, flushing coke slide valve to manual or on-site hand operation, keep the hot coke slide valve to normal opening, and stabilize reaction temperature and scrubber level; contact the maintenance and instrument people for repairing.将热焦、冲刷焦滑阀改手动或现场手摇维持操作，控制热焦滑阀至正常开度，平稳反应温度和洗涤塔液位；并联系（钳工、仪表）处理。

In Normal operation, when the liquid level irreversibly rises continuously and the reaction temperature is lower than 505℃, the liquid level self-protection system should be activated immediately. At high level of the scrubber pool, PS-105 cuts off the feed to the reactor, the feed

to the scrubber pool and the flushing oil to the scrubber halved, and the emergency external valve HV10301 is opened, and the raw material dump control valve needs to be closed manually.

正常操作中，当液位出现不可逆转的持续上升且反应温度低于 505℃时，应立即启用液位自保，在洗涤塔池的高料位，PS-105 切断向反应器的进料、向洗涤塔池的进料和向洗涤塔的冲洗油减半，并打开紧急外甩阀 HV10301，需手动关闭原料外甩调节阀。

(3) The scrubber bottom extraction temperature control TIC-10413

洗涤塔底抽出温度的控制 TIC-10413

1)Control range: The control of the scrubber bottom extraction temperature cannot be more than 373℃.

控制范围：洗涤塔底抽出温度的控制不大于 373℃ 。

2)Control target: The control of the extraction temperature of the scrubber should be controlled within the above range during Normal adjustment, and the specific control value should be given according to the plant flow rate. The controlled reaction pressure fluctuation should not exceed ±5% of the set value.

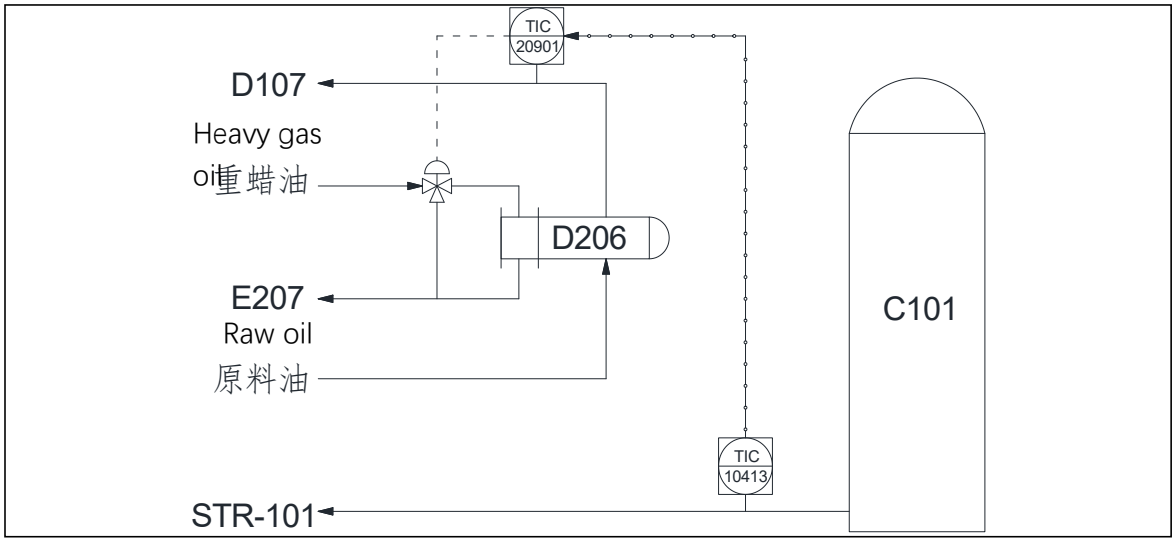
控制目标：正常操作中洗涤塔底抽出温度的控制 TIC-10413 应控制在上述范围内，具体控制数值应根据装置负荷来确定。控制洗涤塔温度不超过设定值 ±5℃。

3) Related parameters: flow rate and temperature for vacuum residue to the scrubber, reaction temperature, HHKGO washing oil flow rate, reaction feed rate, scrubber recycle flow rate and temperature, return flow rate under scrubber.

相关参数：减渣进洗涤塔流量及温度、反应温度、循环重重蜡油流量、反应进料量、洗涤塔循环量及循环温度，洗涤塔循环下返塔流量。

4) Control mode: In normal production, the temperature of the scrubber bottom is controlled by cascading TIC-10413 to TIC-20901.

控制方式：正常生产中，通过将 TIC-10413 级联到 TIC-20901 来控制洗涤塔底部温度。



5) Normal adjustment: 正常调整：

Influence factors 影响因素	Adjustment method 调整方法
flow rate and temperature for vacuum residue to the scrubber 减渣进洗涤塔流量及温度	Normally, the extraction temperature of the scrubber bottom TIC-10413 is controlled with heat exchange capacity of the E-206 adjusted by the TIC-20901 three way valve to control the temperature of vacuum residue to the scrubber. As the feed temperature drops, the temperature of the scrubber bottom decreases. As the feed temperature rises and the temperature of the scrubber bottom rises. The feed to the scrubber is adjusted by FIC10301, the feed flow increases, the temperature at the bottom of the scrubber decreases, the feed flow decreases, and the temperature at the bottom of the scrubber increases 正常情况下洗涤塔底抽出温度 TIC-10413 是通过 TIC-20901 三通来调节 E-206 换热量，控制进洗涤塔减渣温度进行调节，进料温度下降，洗涤塔底温度下降，进料温度上升，洗涤塔底温度上升。洗涤塔进料通过 FIC10301 调节，进料流量上升，洗涤塔底温度下降，进料流量下降，洗涤塔底温度上升
Reaction temperature 反应温度	Normally, As the reaction temperature increases, the temperature of scrubber bottom increases. As the reaction temperature decreases, the temperature of scrubber bottom decreases.正常情况下反应温度上升，洗涤塔底温度上升，反应温度下降，洗涤塔底温度下降。
Scrubber circulating oil temperature and flow rate 洗涤塔循环油温度及流量	Normally, As the Scrubber circulating oil temperature decreases, the temperature of scrubber bottom increases. As the scrubber circulating oil temperature increases, the temperature of scrubber bottom decreases. As the Scrubber circulating oil flow rate decreases, the temperature of scrubber bottom decreases; As the scrubber circulating oil flow rate increases, the temperature of scrubber bottom increases . 正常情况下洗涤塔循环油温度下降，洗涤塔底温度上升。洗涤塔循环油温度上升，洗涤塔底温度下降。洗涤塔循环油流量下降，洗涤塔底温度下降。洗涤塔循环油流量上升，洗涤塔底温度上升。
Scrubber washing heavy-heavy wax oil temperature and flow rate 洗涤塔顶冲洗油温度及流量	Normally, as the scrubber washing oil temperature decreases, the temperature of scrubber bottom increase; As the scrubber washing oil temperature increases, the temperature of scrubber bottom decreases . As the scrubber circulating oil flow rate decreases, the temperature of scrubber bottom decreases; As the washing oil flow rate increases, the temperature of scrubber bottom increases . 正常情况下洗涤塔顶冲洗油温度下降，洗涤塔底温度上升。洗涤塔顶冲洗油温度上升，洗涤塔底温度下降。洗涤塔顶冲洗油流量下降，洗涤塔底温度下降。洗涤塔顶冲洗油流量上升，洗涤塔底温度上升。
洗涤塔循环下返塔流量	正常情况下洗涤塔循环下返塔流量下降，洗涤塔底温度上升；洗涤塔循环下返塔流量上升，洗涤塔底温度下降。

6) Troubleshooting: 异常处理：

Fault 现象	Cause 原因	Action 处理
Scrubber bottom extraction temperature fluctuation 洗涤塔底抽出温度波动	Feed pump, circulation pump failed 进料泵、循环泵故障	Switch to the standby pump and contact the maintenance people for repairing.切换至备用泵，并联系钳工处理。
	Scrubber bottom extraction pump failed 洗涤塔底抽出泵故障	Switch to the standby pump and contact the maintenance people for repairing. In severe cases, decrease the temperature and capacity of the reaction post.切换至备用泵，并联系钳工处理。严重时反应岗位降温降量。
	Large fluctuation for the returning flow of scrubber due to the control instrument failure 控制仪表失灵等原因引起返塔流量、温度大幅度波动	If the feeding instrument of feedstock is out of control, the control valve position should be manually controlled, or bypass the control valve and contact the instrument engineer for repairing.若仪表失控，应手动控制调节阀阀位，或改副线将调节阀切除操作并联系仪表处理。
	Reaction feed is cut off 反应切断进料	Contact fractionation posts to reduce the amount of HHKGO oil, reduce the amount of circulating oil in the scrubber, establish an open loop of raw materials, and maintain a stable pressure and liquid level in the scrubber. The device is handled according to the cut-off feed accident plan. 联系分馏岗位减少重重蜡油量，减少洗涤塔循环油量，建立原料开路循环，维持洗涤塔压力、液位平稳。装置按切断进料事故预案进行处置。

The temperature in the scrubber sump is up to 388℃ to minimize coking as possible.
洗涤塔池内的温度不得超过 388℃，以尽可能减少结焦情况发生。

(4) Scrubber overhead temperature control TIC-10401
洗涤塔顶温度的控制 TIC-10401
1)Control range: The scrubber overhead temperature is controlled as 360-390℃.
控制范围：洗涤塔顶温度的控制 360～390℃ 。
2)Control target: The control of the scrubber overhead temperature TIC-10401 should be controlled within the above range during Normal adjustment, and the specific control value

should be given according to the plant flow rate. Control the temperature fluctuation at the top of scrubber to not exceed the set value ±1℃.

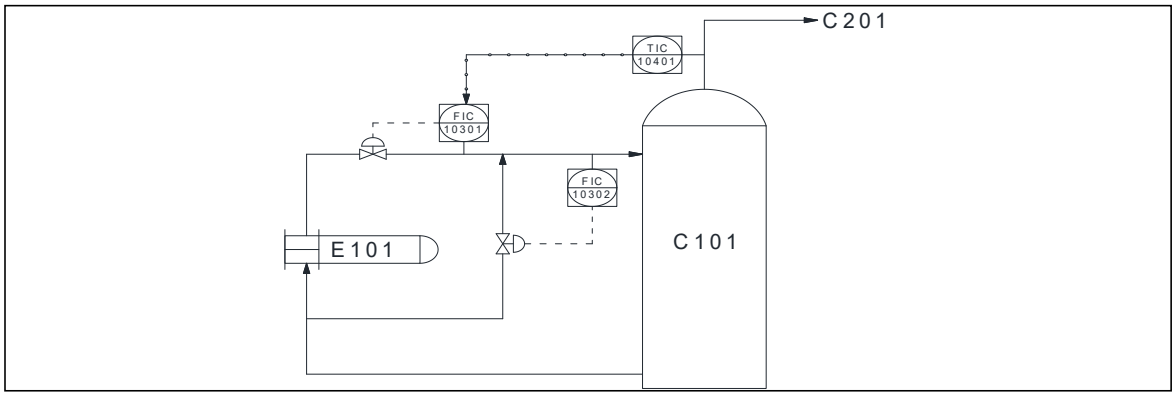
控制目标：正常操作中洗涤塔顶温度的控制 TIC-10401 应控制在上述范围内，具体控制数值应根据装置负荷来确定。控制洗涤塔顶温度波动不超过设定值±1℃。

3) Related parameters: reaction temperature, washing oil flow rate and temperature, reaction feed rate, scrubber circulation rate and temperature.

相关参数：反应温度，洗涤塔顶冲洗油流量及温度，反应进料量，洗涤塔循环量及循环温度。

4) Control mode: In Normal operation, the scrubber overhead temperature can be controlled by adjusting the flow rate of liquid entering the E-101 and its bypass.

控制方式：正常生产中，通过调节进入 E-101 的油浆流量可以控制洗涤塔塔顶温度。



5) Normal adjustment: 正常调整：

Influence factors 影响因素	Adjustment method 调整方法
Reaction temperature 反应温度	Normally, as the reaction temperature increases, the scrubber overhead temperature increases; As the reaction temperature decreases, the scrubber overhead temperature decreases. 正常情况下反应温度上升，洗涤塔顶温度上升，反应温度下降，洗涤塔顶温度下降。
Scrubber circulating oil temperature and flow rate 洗涤塔循环油温度及流量	Normally, as the scrubber circulating oil temperature decreases, the scrubber overhead temperature decreases. As the scrubber circulating oil temperature increases, the scrubber overhead temperature increase. As the scrubber circulating oil flow rate decreases, the scrubber overhead temperature increases. As the scrubber circulating oil flow rate increases, the scrubber overhead temperature decreases. 正常情况下洗涤塔循环油温度下降，洗涤塔顶温度下降。洗涤塔循环油温度上升，洗涤塔顶温度上升。洗涤塔循环油流量下降，洗涤塔顶温度上升。洗涤塔循环油流量上升，洗涤塔顶温度下降。

Influence factors 影响因素	Adjustment method 调整方法
Scrubber washing oil temperature and flow rate 洗涤塔顶冲洗油温度及流量	Normally, as the scrubber washing oil temperature decreases, the scrubber overhead temperature decreases; As the scrubber washing oil temperature increases, the scrubber overhead temperature increases. As the scrubber circulating oil flow rate decreases, the scrubber overhead temperature increase. As the scrubber washing oil flow rate increases, the scrubber overhead temperature decrease .正常情况下洗涤塔顶冲洗油温度下降，洗涤塔顶温度下降。洗涤塔顶冲洗油温度上升，洗涤塔顶温度上升。洗涤塔顶冲洗油流量下降，洗涤塔顶温度上升。洗涤塔顶冲洗油流量上升，洗涤塔顶温度下降。

6)Troubleshooting: 异常处理：

Fault 现象	Cause 原因	Action 处理
Scrubber overhead temperature fluctuation 洗涤塔顶温度波动	Circulating pump failed 循环泵故障	Switch to the standby pump and maintenance people for repairing.切换至备用泵，并联系钳工处理。
	Large fluctuation for the returning flow of scrubber due to the control instrument failure 控制仪表失灵等原因引起返塔流量、温度大幅度波动	If the feeding instrument of feedstock is out of control, the control valve position should be manually controlled ,or bypass the control valve and contact the instrument engineer for repairing. 若仪表失控，应手动控制调节阀阀位，或改副线将调节阀切除操作并联系仪表处理。
	Reaction feed is cut off 反应切断进料	Contact the fractionation post to decrease the amount of HHKGO and reduce the amount of circulating oil in the scrubber and the fresh feed to scrubber , establish an open loop of raw materials and maintain a stable pressure and liquid level. 联系分馏岗位减少重重蜡油量，减少洗涤塔循环油量，减少洗涤塔新鲜原料进料量，建立原料开路循环，维持压力、液位平稳。

The scrubber overhead set temperature is 368℃. The scrubber overhead temperature can be controlled by adjusting the flow rate of liquid into E-101 and its bypass while maintaining the flow rate into the scrubber shelter area constant.

洗涤塔塔顶温度设置为 368℃。通过调节进入 E-101 及其旁路的液体流速可以控制洗涤塔塔顶温度，同时使进入洗涤塔棚区的流速保持恒定。

(5) Reactor feed level LIC-10502

反应器料位 LIC-10502

1)Control range: Reactor feed level 25-35%.

控制范围：反应器料位 25～35%。

2)Control target: In the Normal adjustment, the reactor material level LIC-10502 is controlled within the above range, and the feed level fluctuation amplitude is controlled at the set value ± 5%.

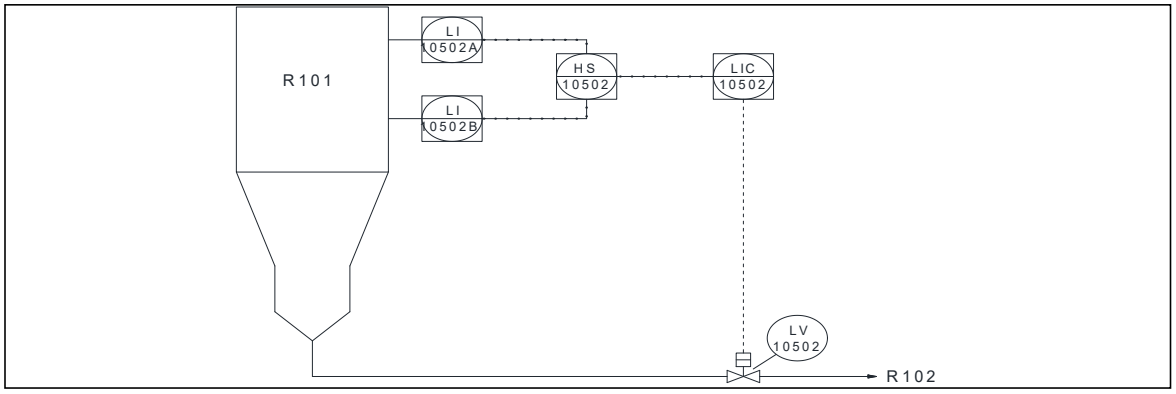
控制目标：正常操作中反应器料位 LIC-10502 控制在上述范围，料位波动幅度控制在设定值±5%。

3) Related parameters: cold coke slide valve opening, flushing coke slide valve opening, hot coke slide valve opening, nozzle feed rate, differential pressure of heater and scrubber.

相关参数：冷焦滑阀开度，冲刷焦滑阀开度，热焦滑阀开度，喷嘴进料量，两器差压。

4) Control mode: The feed level of the reactor bed is controlled by the cold coke slide valve LV-10502 which obtains the signal from LI-10502A or LI-10502B. The feed level can be selected with the manual switch HS-10502 by operator. The dense phase level of the reactor which is used to balance thermal coke dilute phase superheater and the corresponding cyclone separator is controlled below outlet of the hot coke riser.

控制方式：反应器床的料位受冷焦滑阀 LV-10502 控制，滑阀从 LI-10502A 或 LI-10502B 处获得信号。操作人员可使用手动开关 HS-10502 来选择料位。反应器密相料位控制在热焦立管出口下方。该料位用于实现热焦稀相过热和相应旋风分离器的平衡。



5) Normal adjustment: 正常调整：

Influence factors 影响因素	Adjustment method 调整方法
Cold coke slide valve opening change 冷焦滑阀开度变化	As the valve opening decreases ,the reactor level rises. As the valve opening increases, the reactor level drops.阀关小，反应器料位上升；阀开大，反应器料位下降。
Thermal coke slide valve opening change 热焦滑阀开度变化	As the valve opening decreases ,the reactor level decreases. As the valve opening increases, the reactor level increases 阀关小，反应器料位下降。；阀开大，反应器料位上升。

Influence factors 影响因素	Adjustment method 调整方法
Flushing coke slide valve opening change 冲刷焦滑阀开度变化	As the slide valve opening increases, the reactor level increases, otherwise, the reactor level drops.滑阀开度增大，反应器料位上升。；反之，反应器料位下降。
Differential pressure change 两器差压变化	As the differential pressure of the reactor and heater increases, the reactor level increases; otherwise, the reactor level decreases.两器差压增大，反应器料位上升；反之，反应器料位下降。
Nozzle feed rate 喷嘴进料量	As the nozzle feed rate increases, the reactor level rises; otherwise, the reactor level decreases.喷嘴进料量增加，反应器料位上升；反之，反应器料位下降。

6) Troubleshooting: 异常调整：

Fault 现象	Cause 原因	Action 处理方法
Reactor level fluctuation 反应器料位波动	Slide valve failed 滑阀故障	Increase the opening of the slide valve manually; if the manual control failed, switch to site control. Contact the Related department for handling .滑阀改手动控制开大；若手动控制失灵，改为现场控制。联系相关单位处理。
	Differential pressure of reactor and heater fluctuation 两器差压波动	Adjust the operating pressure of reactor and heater , maintain a suitable differential pressure between them.调整反应器及加热器操作压力，保持适宜的两器差压。
	Slope tube bridge 斜管架桥	Switch the slide valve to manual and change the opening; decrease the differential pressure properly, the adjust loose point to make the fluidization normal.滑阀改手动，改变滑阀开度；适当减小两器差压；调节松动点，使流化正常。
	Nozzle feed flow rate fluctuated 喷嘴进料量波动	Adjust the feed rate to keep the feed flow and pressure stable 调整进料量，保持进料流量和压力的平稳
	Instrument indication failed 仪表指示失灵	Contact the instrument people for repairing .联系仪表处理

(6) Reaction temperature TIC-10510AB

反应温度 TIC-10510AB

1)Control range: reaction temperature 525-530℃.

控制范围：反应温度 525～530℃。

2)Control target: The reaction temperature is controlled within the above range during Normal adjustment, and the temperature fluctuation does not exceed the set temperature ±3℃.

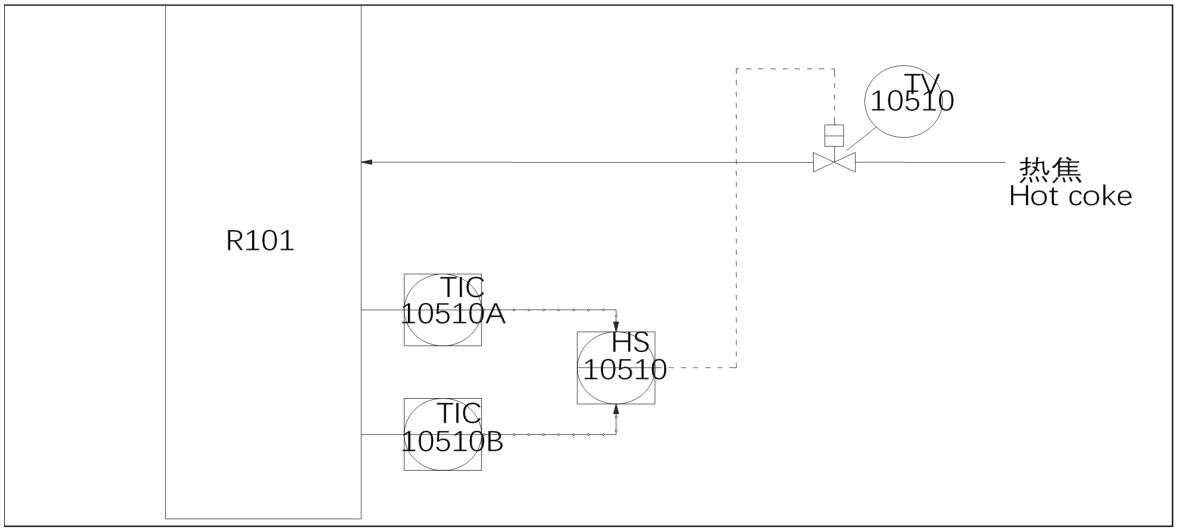
控制目标：正常操作中反应温度控制在上述范围内，温度波动不超过设定温度±3℃。

3) Related parameters: feedstock amount, the opening of the hot coke slide valve and scouring slide valve, heater bed temperature, scrubber bottom temperature, stripping steam temperature.

相关参数：原料量、热焦滑阀开度、冲刷焦滑阀开度、加热器床温、洗涤塔底温度、汽提蒸汽温度。

4) Control mode: The temperature of the reactor bed is controlled by the thermal coke slide valve TV-10510. The normal temperature range is between 525 and 530℃. The reaction temperature will be affected by both the opening of the flushing coke slide valve and the feed flow rate.

控制方式： 反应器床的温度是利用热焦滑阀 TV-10510 来控制的，一般温度范围为 525～530℃之间，冲刷焦滑阀开度和进料量均会对反应温度造成影响。



5) Normal adjustment: 正常调整：

Influence factors 影响因素	Adjustment method 调整方法
Feedstock flow rate 原料量	As the flow rate increases, the reaction temperature increases. As the flow rate increases, the reaction temperature decreases.降低处理量，反应温度上升；提高处理量，反应温度下降。
Thermal coke valve opening 热焦滑阀开度	As the slide valve opening decreases, the temperature decreases,, As the slide valve opening decreases,the temperature drops.滑阀开度小，温度下降；滑阀开度大，温度上升。

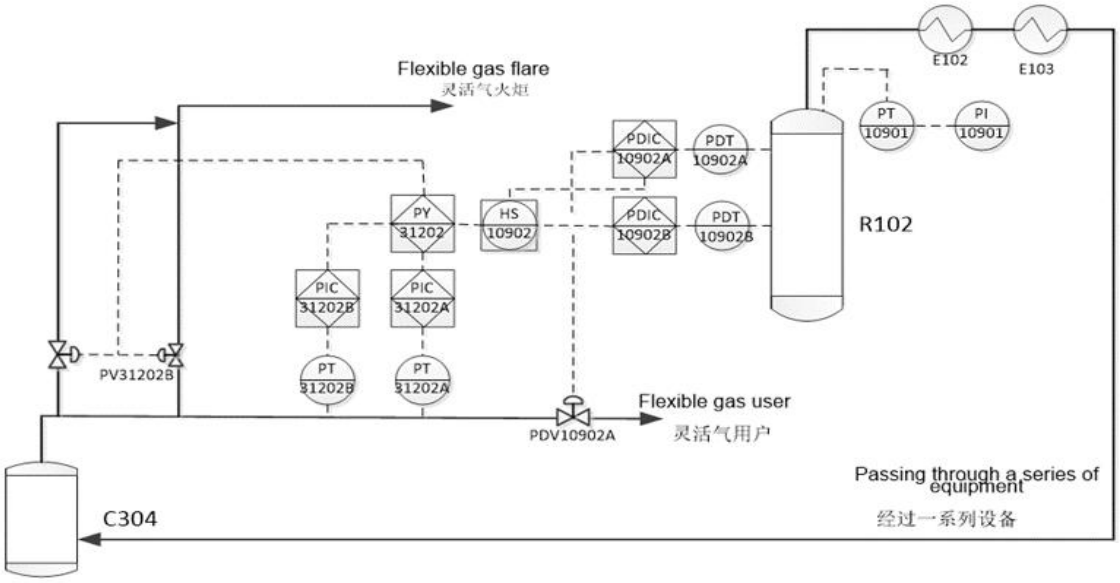
Influence factors 影响因素	Adjustment method 调整方法
Flushing coke slide valve opening 冲刷焦滑阀开度	As the slide valve opening decreases, the temperature decreases, As the slide valve opening is decreases ,the temperature drops.滑阀开度小，温度下降；滑阀开度大，温度上升。
Heater bed temperature 加热器床层温	As Heater bed temperature increases, Reactor temperature decreases; Heater bed temperature decreases, Reactor temperature increases. 加热器床温上升，反应温度上升；加热器床温下降，反应温度下降。
Scrubber bottom temperature 洗涤塔底温度	As Scrubber bottom temperature increases, Reactor temperature increases; Scrubber bottom temperature decreases, Reactor temperature decreases. 洗涤塔底温度上升，反应温度上升；洗涤塔底温度下降，反应温度下降。
Stripping steam temperature 汽提蒸汽温度	As stripping steam temperature increases, Reactor temperature increases; strippign steam temperature decreases, Reactor temperature decreases 汽提蒸汽温度上升，反应温度上升；汽提蒸汽温度下降，反应温度下降。

6) Troubleshooting: 异常调整:

Reaction temperature fluctuation 反应温度波动	Slide valve failed 滑阀故障	Increase the opening of the slide valve manually; if the manual control failed, switch to site control. Contact the Related department for handling .滑阀改手动控制开大；若手动控制失灵，改为现场控制。联系相关单位处理。
	Differential pressure fluctuation of reactor and heater 两器差压波动	Adjust the operating pressure of reactor and heater to maintain a suitable differential pressure between them. 调整反应器及加热器操作压力，保持适宜的两器差压。
	Thermal coke, flushing coke slide valve slope tube bridge 热焦、冲刷焦斜管架桥	Switch the slide valve to manual mode and change the opening; decrease the differential pressure properly, adjust loose point to make the fluidization normal.滑阀改手动，改变滑阀开度；适当减小两器差压；调节松动点，使流化正常。
	Nozzle feed rate fluctuation 喷嘴进料量波动	Adjust the feed rate to keep the feed flow and pressure stable 调整进料量，保持进料流量和压力的平稳

	Instrument indication failed 仪表指示失灵	Contact the instrument people to handle.联系仪表处理。

(7) Heater pressure control: PI-10901
加热器压力控制：PI-10901
1) Control range: 0.21-0.25MPa
控制范围：0.21～0.25MPa。.
2) Control target: The purpose is to maintain a constant differential pressure within the above range during the fluctuation of the entire FLEXIGAS production period, and the specific control value should be given according to the production plan ±0.05 MPa.
控制目标：目的是在整个 FLEXIGAS 生产过程的波动中保持恒定的差压在上述范围内，具体控制数值根据生产方案给定±0.05MPa。
3) Related parameters: reaction pressure, heater pressure.
相关参数：反应压力、加热器压力。
4) Control mode: The pressure difference between the reactor and the heater is mainly controlled by operating the control valve at the top of C-304. Open PDV-10902A more at big differential pressure, and close more at small differential pressure.
控制方式：反应器、加热器差压主要通过操作 C-304 顶部的控制阀进行控制，差压大时开大 PDV-10902A，差压小时关小。
FXG low pressure protection:
FXG 低压保护：
As the FXG header pressure decreases, the differential pressure of the PDIC-10902A will decrease. When the differential pressure measured by the PDIC-10902A decreases, the low differential pressure protection for the refinery equipment will be provided with manipulating the PDV-10902A by the controller PDIC-10902A
随着 FXG 总管压力的降低，PDIC-10902A 的差压将降低。当 PDIC-10902A 测得的差压下降时，控制器 PDIC-10902A 通过操纵 PDV-10902A 为炼油厂设备提供低差压保护。
FXG high pressure protection:
FXG 高压保护：
As the FXG header pressure rises, PV-31202A is used to control the pressure of FXG header for slower pressure rise. PV-31202B is used to control the FXG header for quicker pressure rise.
随着 FXG 总管压力的上升，FXG 总管压力上升速度较慢时使用 PV-31202A 控制 FXG 总管压力，FXG 总管压力上升速度较快时使用 PV-31202B 控制 FXG 总管压力。



5) Normal adjustment: 正常调整：

Influence factors 影响因素	Adjustment method 调整方法
Main air flow rate 主风量	As the main air flow increases, the heater pressure rises, and otherwise, the heater pressure drops.主风流量增大，加热器压力上升，反之加热器压力下降。
FXG header pressure FXG 总管压力	As the opening of FXG header pressure control valve PDV-10902A increases, the heater pressure decreases, the differential pressure decreases, as the opening of FXG header pressure control valve PDV-10902A decreases , the heater pressure increases, the differential pressure increases. FXG 总管压控阀 PDV-10902A 开大，加热器压力下降，差压变小，阀关小加热器压力升高，差压变大。

6) Troubleshooting: 异常调整:

Fault 现象	Cause 原因	Action 处理
differential pressure fluctuations due to reaction pressure fluctuations 反应压力波动导	Total reaction feed (including sludge refining) and reaction severity change 反应总进料量（包含污泥回炼）及反应深度变化	As the total feed increases, the reaction pressure rises, so adjust the compressor rotation speed to control the reaction pressure. As the rotation speed increases, the pressure drops, and vice versa.总进料增加，反应压力上升，及时调节气压机转速控制好反应压力。转速提高，压力下降，反之上升。

Fault 现象	Cause 原因	Action 处理
致差压波动	Feedstock entrained with water 原料带水	Contact the production coordinator to inform the tank area to drain water or change the tank in time. If the entrained water becomes more, the reaction post will be cooled down and turned down.联系调度，通知罐区加强脱水或换罐，带水严重时，反应岗位降温降量。
	Variation for feedstock atomization steam, stripping steam, scrubber stirring steam, reactor grinding steam, reactor anti-coke steam, etc.原料雾化蒸汽、汽提蒸汽、洗涤塔搅拌蒸汽、反应器磨碎蒸汽、反应器防焦蒸汽等量变化	As the steam capacity is adjusted stable and the opening of valve position is increased, the steam becomes more , and otherwise, the steam becomes less.将蒸汽的量调节稳定，阀位开大，蒸汽量大，反之蒸汽量小。
	cold reflux at fractionator overhead is too high 分馏塔顶冷回流量过大	Contact the fractionator department to reduce cold return flow.联系分馏岗位减少冷回流量。
	Change in opening of compressor inlet valve vent for flare 气压机入口放火炬阀开度变化	If the reaction pressure cannot be controlled, it should be adjusted by venting to the flare at the inlet of the compressor. As the opening of valve which vent to the flare increases, the reaction pressure decreases, and vice versa.如反应压力控制不了，及时通过气压机入口放火炬来调节，放火炬阀开大，则反应压力下降，反之上升。
	Change in anti-surge control valve failed 反飞动调节阀故障或量变化	Close or bypass the anti-surge control valve and contact the instrument people for repairing.及时将反飞动调节阀切除改走副线并联系仪表处理。
	Positions of valves for venting to flare fluctuate 大小放火炬阀阀位波动	Manually close the valves and contact the instrument or maintenance people.及时将放火炬阀改现场手动关闭，联系仪表或钳工处理。

Fault 现象	Cause 原因	Action 处理
	Reaction temperature change 反应温度变化	While the total feed remains unchanged, the reactor temperature and pressure remain unchanged, and the speed of the compressor machine does not change. When the reaction temperature rises, the reaction pressure also rises, and vice versa.总进料量不变、反应器温度、压力不变、气压机转速不变，反应温度上升，反应压力也随之上升，反之下降。
	Charging valve FV20401 failed 充压阀 FV20401 故障	The failure of charging valve FV20401 results in 0.5MPa fuel gas to to blow into D201 resulting in increased fractionator overhead and reaction pressure. 充压阀 FV20401 故障，导致 0.5MPa 燃料气窜入 D201 内,造成分馏塔顶压力升高，进而使反应压力升高。
	rich absorption oil fail to return to fractionator 富吸收油返分馏塔影响	The rich absorption oil should return to fractionator smoothly. It is strictly prohibited for the dry gas to route to the fractionator due to the condition that the reabsorber is empty. 富吸收油返塔要平稳，严禁再吸收塔压空，干气窜入分馏塔。
	Emergency steam is activated due to feed rate of HHKO, HKGO, LKGO, and MPA greatly decreased. HHKO、HKGO、LKGO、MPA 量大幅减小导致其事故蒸汽开启	Quickly restore the amount of HHKGO, HKGO, LKGO and MPA, close the emergency steam valve of flushing oil, and adjust the reaction pressure through the rotating speed of air compressor.快速恢复 HHKGO、HKGO、LKGO、MPA 量，关闭冲洗油事故蒸汽阀，并通过气压机转速调节反应压力。
	Change in nitrogen amount in sludge refining 污泥回炼氮气量的变化	Keep the flow rate of nitrogen stable, as the opening of valve position increase, nitrogen amount increase and vice versa. 将氮气的量调节稳定，阀位开大，氮气量大，反之氮气量小。
Pressure fluctuations of heater and	Main fan stationary vane control system failed 主风机静叶控制系统故障	Change the control to manual control at site and contact instrument for processing.静叶改现场手动控制，联系仪控部处理。

Fault 现象	Cause 原因	Action 处理
flexigas treatment post lead to differential pressure fluctuations 加热器及灵活气处理部分压力波动导致差压波动	D-101 unloading amount increases, resulting in a larger return air volume of D-101, and an increase in the amount of cooling water and steam for D-101 D-101 卸焦量增大，导致 D-101 返气量变大，D101 降温水及蒸汽用量增加	Adjust the heater pressure by changing the opening of FXG header pressure control valve PDV-10902A.通过 FXG 总管压控阀 PDV-10902A 开度来调节加热器压力。
	Change in tempering air and steam of heater 加热器调温风和调温蒸汽量的变化	Control tempering air and steam to normal condition.控制好调温风和调蒸汽的量。
	Changes in gasification rate, resulting in changes in flexible gas production 气化率发生变化，导致灵活气产量变化	Adjust the heater pressure by changing the opening of FXG header pressure control valve PDV-10902A .通过 FXG 总管压控阀 PDV-10902A 开度来调节加热器压力。
	As the temperature at the top of the Gasifier increases, the temperature of quench section of Heater increases and PS-107 is activated to spray steam and water at the top of Gasifier causing the Heater pressure to rise 气化器顶部温度升高，导致加热器急冷锻温度升高，触发 PS-107 开启气化器顶部喷汽喷水，导致加热器压力升高.	Adjust the main air volume and process steam volume of the vaporizer to control the top temperature of the vaporizer, and adjust the heater pressure through the opening of the FXG manifold pressure control valve PDV-10902A. 调整气化器主风量和工艺蒸汽量控制气化器顶部温度，通过 FXG 总管压控阀 PDV-10902A 开度来调节加热器压力。
	Main fan failed and shuts down.主风机故障停机	For the detailed interlock activation procedure ,see the emergency plan. 触发联锁详细处理方法见应急预案。

Fault 现象	Cause 原因	Action 处理
	Pressure drop for first and second-stage water washing and FXG desulfurizer packing increased.一、二级水洗及FXG 脱硫塔填料压降变大	Rinse the packing with purified water to restore differential pressure.用净化水冲洗填料，恢复差压。
	R-301AB differential pressure increased. R-301AB 差压变大	Switch to the standby reactor.切换至备用反应器。
	safety valve of flexigas header failed 灵活气总管安全阀故障	Switch to the standby safety valve and contact maintenance people.切换至备用安全阀，联系检修。
	Flexigas downstream usage changes resulting in Heater pressure change 灵活气下游用户使用量变化，导致加热器压力变化	Close the flexigas to flare valve or contact the production scheduling, and require the downstream users to control a stable flexigas usage 关小灵活气放火炬阀或联系生产调度，要求下游用户控制平稳灵活气使用量

(8) Heater dense bed temperature: TIC-10910

加热器密相床层温度：TIC-10910

1) Control range: 585-605℃.

控制范围：585～605℃

2) Control target: maintain the heat balance of the reaction system by controlling the temperature of the dense phase bed of the heater to realize smooth operation, and control the temperature of the dense phase bed of the heater up to set value ± 5℃.

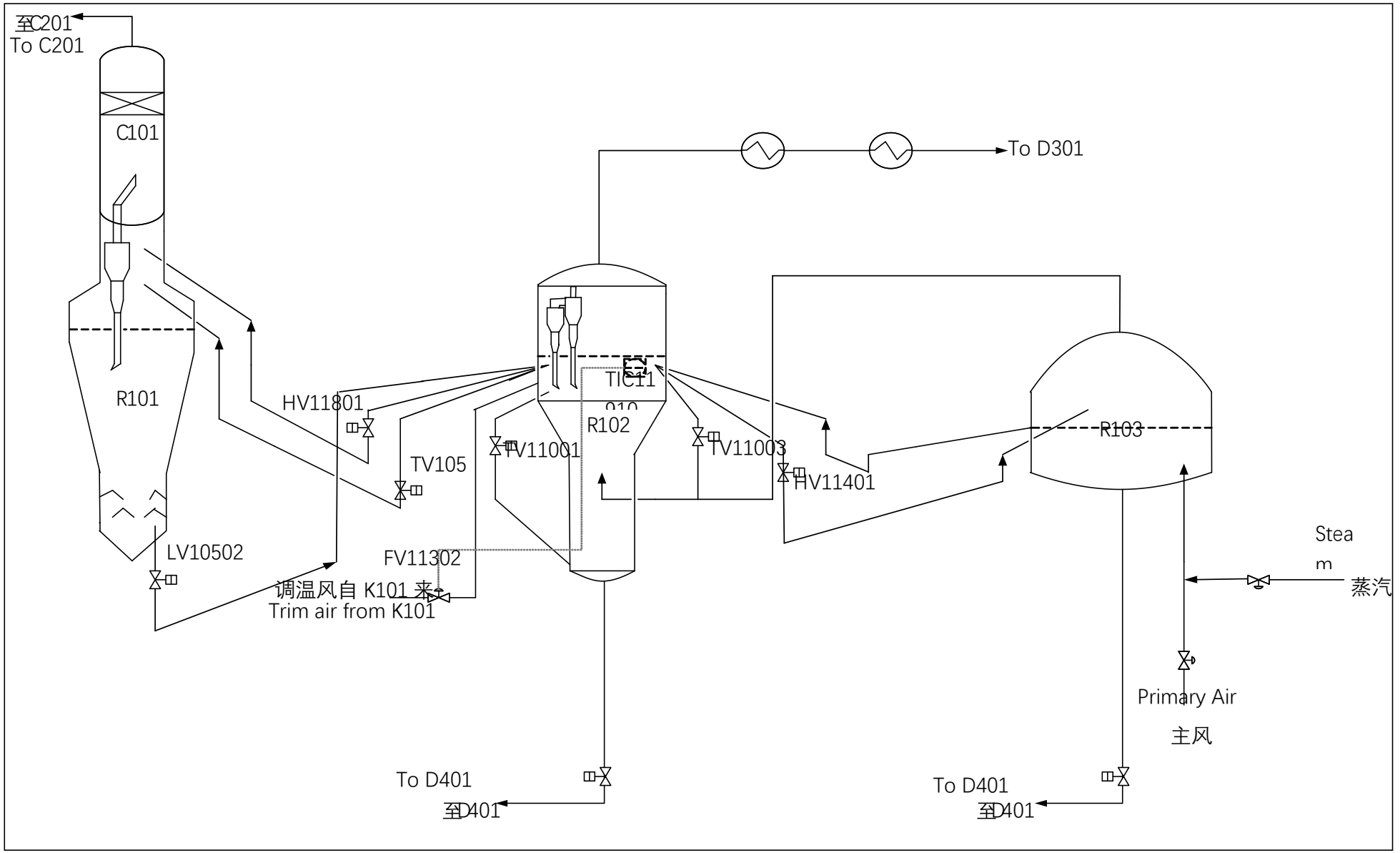
控制目标：通过控制好加热器的密相床层温度，达到维持反应系统的热量平衡，使操作平稳，控制加热器密相床层温度不超过设定值±5℃。

3) Related parameters: heater capacity, main air flow rate, gasification rate, hot coke ,cold coke, returning coke, coke powder combustion rate.

相关参数：加热器藏量 主风量 气化率 热焦 冷焦 返回焦 焦粉燃烧率

4) Control mode: The heater temperature is mainly controlled by the capacity of coke powder circulation between heater and vaporizer and the flow rate of tempered wind.

控制方式：加热器温度主要由加热器和气化器焦粉循环量及调温风的量来控制。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5) Normal adjustment: 正常调整：

Influence factors 影响因素	Adjustment method 调整方法
Flow rate of cold coke 冷焦量	Adjust the opening of LV-10502 slide valve to control cold coke from the reactor to the heater.通过调整 LV-10502 滑阀开度来调节反应器来的冷焦进加热器的量。
Flow rate of quench coke 急冷焦量	The temperature of the lower part of the heater grating is controlled by adjusting the flow rate of TV-11003 quenching coke.通过调整 TV-11003 急冷焦量来控制加热器格栅下部温度。
Flow rate of tempered air 调温风量	The flow rate of tempered air is adjusted by adjusting the FV-11301/FV-11304A valve opening.通过调整 FV-11301/FV11304A 阀开度来调节调温风量。
Flow rate of tempered steam 调温蒸汽量	Adjust the low pressure steam FV-11305A\B\C feeding into the heater.通过调整 FV-11305A\B\C 进加热器的低压蒸汽量。
Coke powder burning rate 焦粉燃烧率影响	Adjust the coke powder combustion rate by adjusting the angle of the air blower stator blades to control the amount of main air entering the Heater. 通过调整主风机静叶角度来控制主风进加热器的量来调节焦粉燃烧率。
Gasifier level 气化器料位	By increasing the material level of the gasifier and the dilute phase temperature of the gasifier, the amount of coke powder carried in the flexible gas is increased, and the coke amount of the Gasifier return line is also increased. 通过提高气化器料位，提升气化器稀相温度，增加灵活气中焦粉携带量，同时也增加了返焦线输送量

6) Troubleshooting: 异常处理：

Influence factors 影响因素	Adjustment method 调整方法
Main fan stopped and main air interrupted 主风机停机，主风中断事故	Handle the accident according to the accident preliminary plan of main air interruption, report to production coordinator and department leaders to take corresponding actions; immediately confirm the reason why the main air interrupted and main fan stopped; and check whether the interlock is enabled or not.按照主风中断的事故预案进行事故处理，汇报调度及部门领导，采取相应处理措施；立即确认主风中断的具体原因，主风机的停机原因；立即查看联锁是否启用。

Influence factors 影响因素	Adjustment method 调整方法
Cold coke slide valve failed 冷焦滑阀故障	Switch the slide valve to the manual mode, contact the instrument people to handle the failure of the slide valve; Control the pressure of the three vessels and ensure stability.滑阀改现场手动，联系仪表处理滑阀故障；控制好反应三器压力并保证平稳；联系仪表处理滑阀问题。
Quench coke slide valve failed 急冷焦滑阀故障	Switch the slide valve to the manual mode, contact the instrument people to handle the failure of the slide valve; Control the pressure of the three vessels and ensure stabilityy. As the heater bed level is too low, the gasifier overhead gas from the quench coke slide valve will backflow, triggering PS-106 to close the quench coke valve. At this time, the heater inventory should be increased to the normal position. 滑阀改现场手动，联系仪表处理滑阀故障；控制好三器压力并保证平稳；联系仪表处理滑阀问题；加热器床层料位过低，引起气化器顶气由急冷焦滑阀向上反串，触发 PS-106 使急冷焦滑阀关闭,此时应提高加热器藏量到正常位置。
Quench coke line bridge 急冷焦管线架桥	The bridge is removed by increasing the opening the steam loose point on the quench coke line; the bridge is removed by a loose rod on the quench coke line.通过开大急冷焦管线上的蒸汽松动点来处理架桥；通过急冷焦管线上的松动的的棒出来处理架桥。
Cold coke line bridge 冷焦管线架桥	The bridge is removed by increasing the opening the steam loose point on the quench coke line; the bridge is removed by a loose rod on the quench coke line. The driving force the cold coke line is adjusted by controlling steam delivered from DN150 at the lowest part of cold coke line 通过开大冷焦管线上的蒸汽松动点来处理架桥；通过冷焦管线上的松动的的棒出来处理架桥；通过调整冷焦管线最底部的 DN150 输送蒸汽量的大小来调节冷焦管线的推动力。

(9) Temperature of heater grating bottom: TIC-11003

加热器格栅下部温度：TIC-11003

1)Control range: 640-660℃.

控制范围：640～660℃。

2)Control target: Prevent the internal parts of the equipment from storing in the over-temperature environment for a long time by keeping the temperature of the heater grating bottom within the range to protect the equipment. The temperature fluctuation does not exceed ±5℃ of set value.

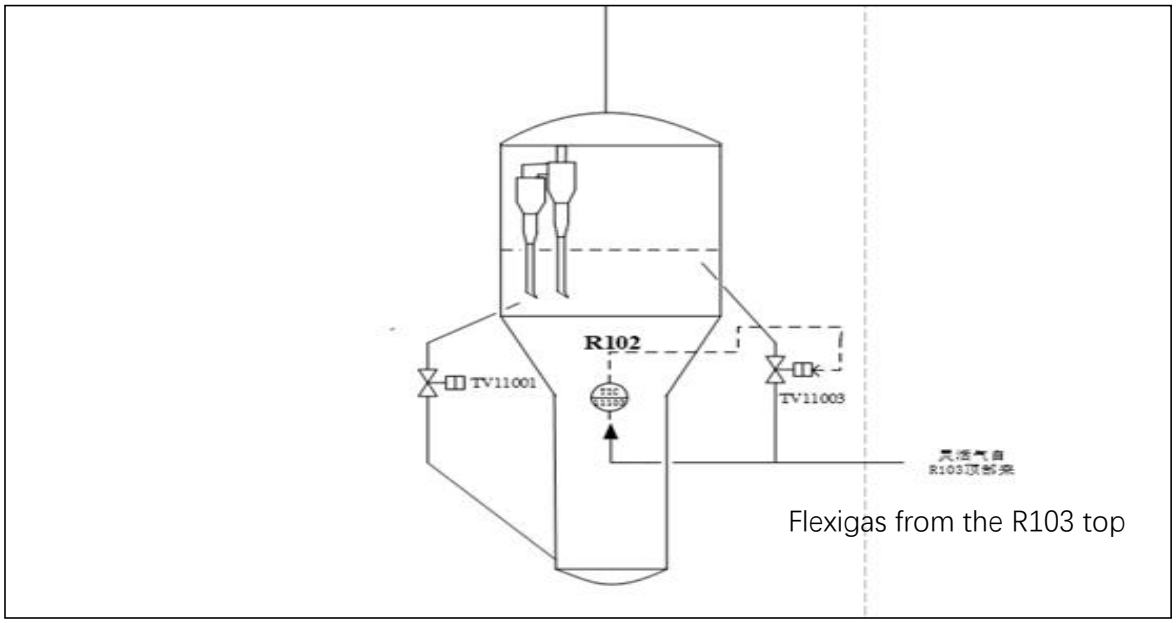
控制目标：通过控制好加热器格栅下部温度在范围内，使设备内件不长期处在超温环境里，从而起到保护设备的目的，温度波动不超过设定±5℃。

3)Related parameters: main air flow, gasification rate, quench coke flow rate, and cooling water.

相关参数：主风量、气化率、急冷焦量、降温水。

4)Control mode: change the quench coke flow rate entering into the gasifier overhead pipe by controlling the quench coke slide valve TV-11003.The design temperature of the heater grid may be exceeded if the temperature of gasifier flexigas is too high, which can be avoided by opening the cooling spray on the top of gasifier.

控制方式：通过急冷焦滑阀 TV-11003 改变进入气化器顶部管道内的急冷焦炭流量。如果气化器的灵活气温度比较高，可能会超出加热器格栅的设计温度。PS-107 通过打开气化器顶降温喷雾可防止加热器格栅的灵活气温度过高。



5) Normal adjustment: 正常调整：

Influence factors 影响因素	Adjustment method 调整方法
Flexigas temperature change 灵活气温度变化	Adjust the opening of the quench coke slide valve TV-11003.调整急冷焦滑阀 TV-11003 的开度。
Flexigas temperature is extremely high 灵活气温度超高	When the temperature TE-11004 reaches 695℃ ,the alarm will be activated. The self-protect interlock PS-107 will be activated at 700℃ by two-out-of-three operation, FV11602, RBV11601 and FV11603 will be activated to spray water at the Gasifier top to cool the Gasifier overhead gas.当温度 TE-11004 达到 695℃报警，700℃通过三取二自保联锁 PS-107，启用气化器顶部 FV-11602 阀喷水，启用 RBV-11601、FV-11603 阀喷水来使气化器顶部气体降温。

6) Troubleshooting: 异常处理：

Influence factors 影响因素	Adjustment method 调整方法
Quench coke slide valve failed 急冷焦滑阀故障	Switch the slide valve to the manual mode, contact the instrument people to handle the failure of the slide valve; control the pressure of the reactor system and keep it stable. As the heater bed level is too low, the vaporizer overhead gas from the quenching coke slide valve will be routed to the top reversely, thus the quench coke slide valve will be closed due to the PS-106 is triggered. At this time, the heater capacity should be increased to the normal position.滑阀改现场手动，联系仪表处理滑阀故障；控制好三器压力并保证平稳；联系仪表处理滑阀问题；防止加热器床层料位过低，引起汽化器顶气由急冷焦滑阀向上反串，触发 PS-106 使急冷焦滑阀关闭，此时应提高加热器藏量到正常位置。
Quench coke line bridge 急冷焦管线架桥	The bridge is removed by increasing the opening the steam loose point on the quench coke line; the bridge is removed by a loose rod on the quench coke line.通过开大急冷焦管线上的蒸汽松动点来处理架桥；通过急冷焦管线上的松动的的棒出来处理架桥。

(10) Control of heater level: LI-10903, LI-10904

加热器料位的控制：LI-10903、LI-10904

1)Control range: 30-58%.

控制范围：30～58%。

2)Control target: The heater ,which is used for heat transfer of cokes, acts as a buffer tank to adjust the coke powder for the reactor ,scrubber ,heater and gasifier and the whole system .It is very important for stabilization of heater operation to keep a stable heater capacity. The fluctuation of the material level should up to ±10% of set value.

控制目标：加热器还充当缓冲罐的作用，以调节三器之间的焦粉藏量以及整个系统的焦粉总藏量，同时是三器焦炭进行传热的场所，稳定好加热器的藏量对稳定反应系统的操作起关键作用，料位波动不超过设定±10%。

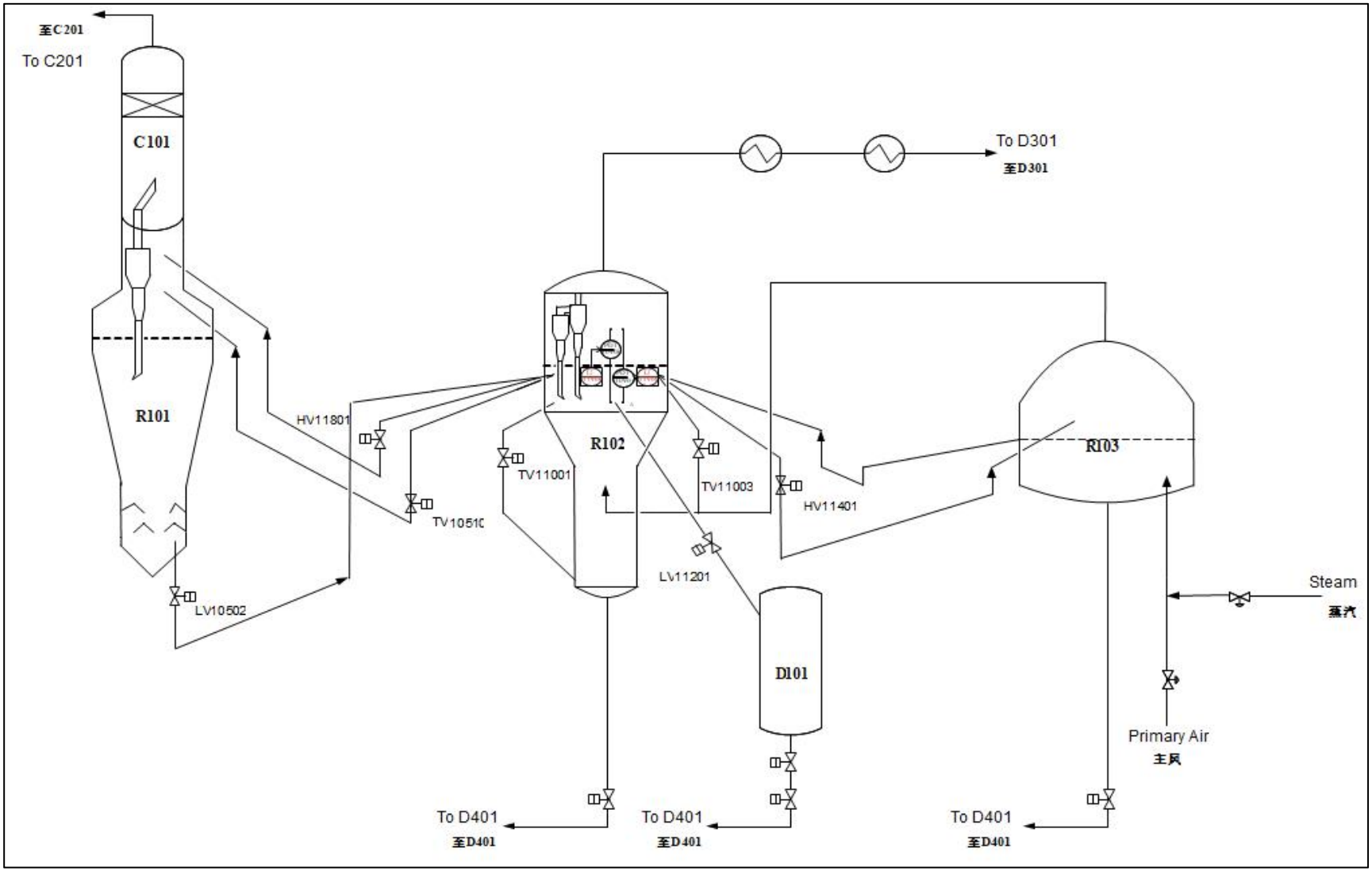
3)Related parameters: Reactor capacity, gasifier capacity, reactor capacity

相关参数：反应器藏量 汽化器藏量 反应器藏量。

4)Control mode: The heater bed level control range, which is wide, can be adjusted by changing the coke powder gasification rate or the heater discharge rate. However, the high and low level alarms have been set for both the heater level indicators LI-10903 and LI-10904 which the differential pressure is used for level measuring instead of direct measurement. PDI-10905, PDT-10903A/B and PDT-10904A/B are used to determine the bed density and the level of the heater. The top-bottom differential pressure and the middle-bottom differential pressure can be measured respectively by using of instrument manifold, As the distance between the two

pressure points of the dense phase is known, the bed density can be calculated by measuring the differential pressure between two impulse points of the dense phase bed. The bed level of the heater can be calculated by measuring the pressure difference between the top and bottom. The heater bed level control is realized by controlling the opening of the slide valves such as the hot coke slide valve, the flushing coke valve, the cold coke slide valve and the bed coke slide valve to control the coke in and out the heater. The capacity of the reactor ,heater ,scrubber and gasifier is controlled and the balance of the reactor ,scrubber and gasifier and smooth operation are also realized

控制方式：加热器床层料位控制范围较宽，可以通过改变焦粉气化速率或加热器卸焦速率来调节。然而，加热器料位指标计 LI-10903 和 LI-10904 都设置料位高报和料位低报，不过这些料位不是直接测量的，而是通过测量加热器床层之间的差压计算所得。PDI-10905、PDT-10903A/B 和 PDT-10904A/B 用于确定加热器的床层密度和加热器的料位。由于采用仪表歧管，它们可以分别测出顶—底差压和中部—底部差压，因为密相两个引压点之间的距离已知，通过测量密相床层两个引压点之间的差压可以计算出床层密度，然后再通过测量顶部和底部之间的压差来计算加热器的床层料位。加热器床层料位控制即通过控制热焦滑阀、冲刷焦滑阀、冷焦滑阀和床层焦滑阀等滑阀的开度控制进出加热器的焦炭的量的多少，来调整加热器的藏量，达到平衡三器藏量的平衡和平稳操作的目的。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5)Normal adjustment: 正常调整：

Influence factors 影响因素	Adjustment method 调节方法
Reactor capacity 反应器藏量	The hot coke entering into the reactor is adjusted by controlling the opening of the TV-10510 hot coke slide valve; the cold coke entering into heater is adjusted by controlling the opening of the LV-10502 cold coke slide valve; The bed coke feeding to D-101 is adjusted by controlling the valve position of LV-11201 通过调节 TV-10510 热焦滑阀的开度来调节热焦进反应器的量；通过调节 LV-10502 冷焦滑阀的开度来调节冷焦进加热器的量；通过控制 LV-11201 的阀位来调节床层焦去 D-101 的量。
Vaporizer capacity 汽化器藏量	The coke entering gasifier is adjusted by controlling the opening of the HV-11401 gasifier feed coke from heater; The pressure drop of PDI-11502 and PDI-11503 on the gasifier coke return line is used to adjust the amount of loose steam on the inclined pipe or the amount of loose nitrogen on the riser pipe to control the amount of hot coke from gasifier to heater; By adjusting TV-11003 quench coke slide valve and differential pressure between heater and gasfier, the aommunt of coke transfer on the gasifier coke return line can be controlled. 通过调节 HV-11401 汽化器进料焦滑阀的开度来调节进加热器焦炭的量；通过汽化器返回焦线上的 PDI-11502 和 PDI-11503 的压降大小来调节返回焦线斜管上的松动蒸汽或返回焦立管上的松动氮气量的大小来控制去加热器热焦的量；通过调节 TV-11003 急冷焦滑阀，调节加热器与气化器压降，可控制返焦线输送量。

6)Troubleshooting: 异常处理：

Influence factors 影响因素	Adjustment method 调节方法
Cold coke slide valve failed 冷焦滑阀故障	Switch the slide valve to the manual mode, contact the instrument people to handle the failure of the slide valve. Keep the pressure of the reactor ,scrubber ,heater and gasifier stable.滑阀改现场手动，联系仪表处理滑阀故障；控制好三器压力并保存平稳；联系仪表处理滑阀问题。

Influence factors 影响因素	Adjustment method 调节方法
Hot coke slide valve failed 热焦滑阀故障	Switch the slide valve to the manual mode, contact the instrument people to handle the failure of the slide valve; keep the pressure of the reactor ,scrubber ,heater and gasifier stable. As the heater bed level is too low, the vaporizer overhead gas from the quench coke slide valve will be routed to the top reversely, thus the quench coke slide valve will be closed due to the PS-106 is triggered. At this time, the heater capacity should be increased to the normal position.滑阀改现场手动，联系仪表处理滑阀故障；控制好三器压力并保存平稳；联系仪表处理滑阀问题；加热器床层料位过低，引起汽化器顶气由急冷焦滑阀向上反串，触发 PS-106 使急冷焦滑阀关闭，此时应提高加热器藏量到正常位置。
Vaporizer returning to coke line bridge 汽化器返回焦管线架桥	The bridge is removed by increasing the opening the steam loose point feeding back to slope tube of coke line and loose nitrogen feeding back to riser of coke line; the bridge is removed by a loose rod on the feed coke line.通过开大汽化器返回焦斜管上的蒸汽松动点或返回焦立管上的松动氮气来处理架桥；通过汽化器返回焦管线上的松动的的棒出来处理架桥。
Gasifier feed coke line bridge 气化器进料焦管线架桥	By adjusting the nitrogen loosening point on the gasifier feed coke riser pipeline, opening or closing HV-11401 slide valve, eliminating the air resistance in the riser and re-establishing the coke accumulation pressure in the riser, the coke circulation can be restored; The bridge is removed by increasing the opening the steam loose point on the feed coke line of gasifier; The driving force of the cold coke line is adjusted by controlling steam delivered from DN80 at the lowest part of feed coke line of gasifier. 通过调节气化器进料焦立管管线上的氮气松动点，开大或关小 HV-11401 滑阀，消除立管内气阻，重新建立立管内焦粉蓄压，来恢复焦粉循环；通过气化器进料焦管线上的松动的的棒出来处理架桥；通过调整气化器进料焦管线最底部的 DN80 输送蒸汽量的大小来调节加热器进料焦管线的推动力。
Cold coke line bridge 冷焦管线架桥	The bridge is removed by increasing the opening the steam loose point on the cold coke line; the bridge is removed by a loose rod on the cold coke line. The driving force of the cold coke line is adjusted by controlling steam delivered from DN150 at the lowest part of cold coke line and the coke powder circulation is restored by blowing steam through the large cold coke filter screen 通过开大冷焦管线上的蒸汽松动点来处理架桥；通过冷焦管线上的松动的的棒出来处理架桥；通过调整冷焦管线最底部的 DN150 输送蒸汽量的大小来调节冷焦管线的推动力，通过开大冷焦滤网鼓风蒸汽，来恢复焦粉循环。

(11) Heater dilute phase temperature control: TI-10903

加热器稀相温度的控制：TI-10903

1)Control range: 625-640℃.

控制范围：625～640℃。

2)Control target: protect the equipment and ensure safe and stable operation by preventing the service life of heater internals from being affected by over-temperature. The temperature fluctuation is up to ±5℃ of set value.

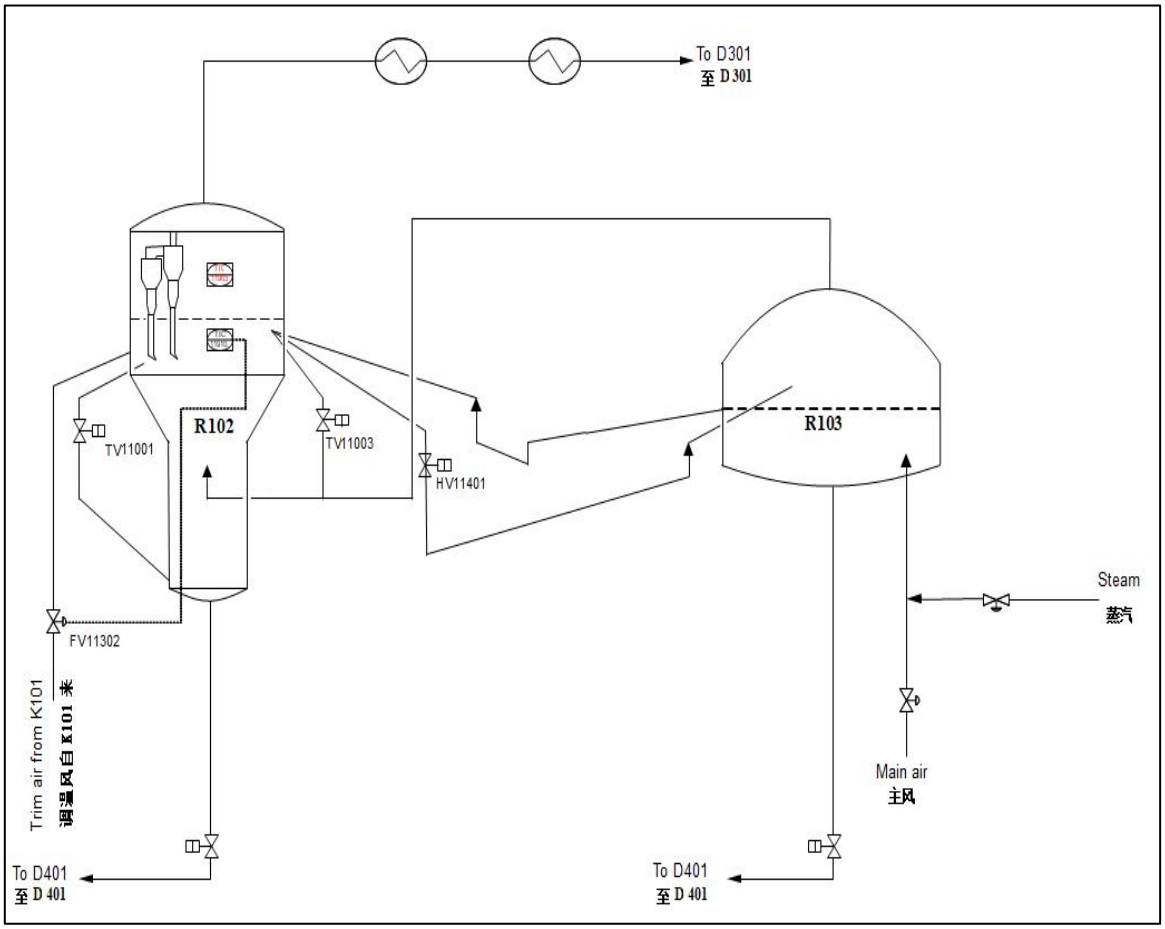
控制目标：为了保护加热器内件不受超温而影响设备的使用寿命，达到保护设备，保证装置安全平稳运行的目的，温度波动不超过设定±5℃。

3)Related parameters: gasifier level, secondary combustion,` flexigas temperature, trim air flow rate

相关参数：汽化器料位 二次燃烧 灵活气温度 调温风流量 。

4)Control mode: control the gasifier capacity not lower than the overflow port for a long time.

控制方式：通过控制气化器藏量不要长时间低于溢流口。



5)Normal adjustment: 正常操作：

Influence factors 影响因素	Adjustment method 调节方法
Gasifier capacity 气化器藏量	The coke entering into the gasifier is adjusted by controlling the opening of the HV-11401 gasifier feed coke slide valve.The hot coke feeding into the heater is controlled by adjusting loose steam feeding back to slope tube of coke line and loose nitrogen feeding back to riser of coke line with the pressure drop of PDI-11502 and PDI-11503 of coke line from gasifier.通过调节 HV-11401 汽化器进料焦滑阀的开度来调节进气化器焦炭的量；通过汽化器返回焦线上的 PDI-11502 和 PDI-11503 的压降大小来调节返回焦线斜管上的松动蒸汽或返回焦立管上的松动氮气量的大小来控制去加热器热焦的量。
Trim air 调温风流量	The dilute phase temperature of the heater is controlled by adjusting the main air flow of FV-11301/FV-11304A into the heater. The temperature of TI-10903 rises with the increase of trim air flow rate. Trim air flow rate decreases, and temperature of TI-10903 decreases. 通过调节 FV-11301/FV-11304A 进入加热器主风流量，控制加热器稀相温度。调温风流量增加，TI-10903 温度上升；调温风流量减小，TI-10903 温度下降。

6)Troubleshooting: 异常调整:

Influence factors 影响因素	Adjustment method 调节方法
Low gasifier capacity 气化器藏量过低	The feed level control of the gasifier is based on the overflow hopper of the return line. Lower than the overflow hopper for a long time is not allowed , otherwise, secondary combustion will occur and damage to heater internals due to the feed seal destroyed and air enter into the dilute phase of the heater. The coke entering into the heater is adjusted by controlling the opening of the HF-11401 vaporizer feed coke slide valve; the hot coke feeding into the heater is controlled by adjusting loose steam feeding back to slope tube of coke line and loose nitrogen feeding back to riser of coke line with the pressure drop of PDI-11502 and PDI-11503 of coke line from vaporizer.气化器的料位控制以返回线的溢流斗漫过为原则，不能长时间低于溢流斗，否则造成料封破坏，空气窜入加热器的稀相，造成二次燃烧。损坏加热器内件。通过调节 HV-11401 汽化器进料焦滑阀的开度来调节进加热器焦炭的量；通过汽化器返回焦线上的 PDI-11502 和 PDI-11503 的压降大小来调节返回焦线斜管上的松动蒸汽或返回焦立管上的松动氮气量的大小来控制去加热器热焦的量。

Influence factors 影响因素	Adjustment method 调节方法
Insufficient reactor stripping 反应器汽提效果不好	The heavy hydrocarbons on the surface of the coke particles (low hydrogen, high aromatics) entered into the heater instead of being stripped due to insufficient stripping ,and 3 to 4 polycyclic heavy aromatic hydrocarbon is generated due to the thermal cracking reaction because the heater temperature is higher. If the tempered air is not matched, the heater will be overheated in dilute phase due to the hydrocarbons burns in the dilute phase of the heater, so that. Therefore, the capacity of stripping steam should be adjusted depend on the production yield . 汽提不好，焦炭粒子表面的重烃（低氢、高芳烃）没有汽提出去，而进入加热器，而加热器温度较高，产生热裂解反应而生成 3～4 环重芳烃，此时如果调温风配比不好，极易使烃类在加热器稀相燃烧，使加热器稀相超温。所以应视加工量的多少配比好汽提蒸汽量。
Tempered air capacity 调温风量	The heater will be overheated in dilute phase due to the secondary combustion caused by the oxygen which route into dilute phase of the heater caused by excessive tempered air and react with carbon monoxide at a high temperature. The secondary combustion can be controlled by adjusting the tempered air capacity and opening of FV-11302/FV-11304A valve .调温风过量使氧气带到加热器稀相在高温下与一氧化碳发生反应发生二次燃烧，使加热器稀相超温。通过调整调整 FV-11301/FV-11304A 阀开度来调节调温风量达到控制二次燃烧。

(12) Gasifier dense phase bed temperature: TIC-11604

气化器密相床层温度：TIC-11604

1)Control range: 868-970℃.

控制范围：868～970℃。

2)Control target: The gasifier temperature should be as low as possible and be determined according to the coke cycle limit to prevent the gasifier bed from being sintered. The temperature fluctuation should up to ±5℃ of set value.

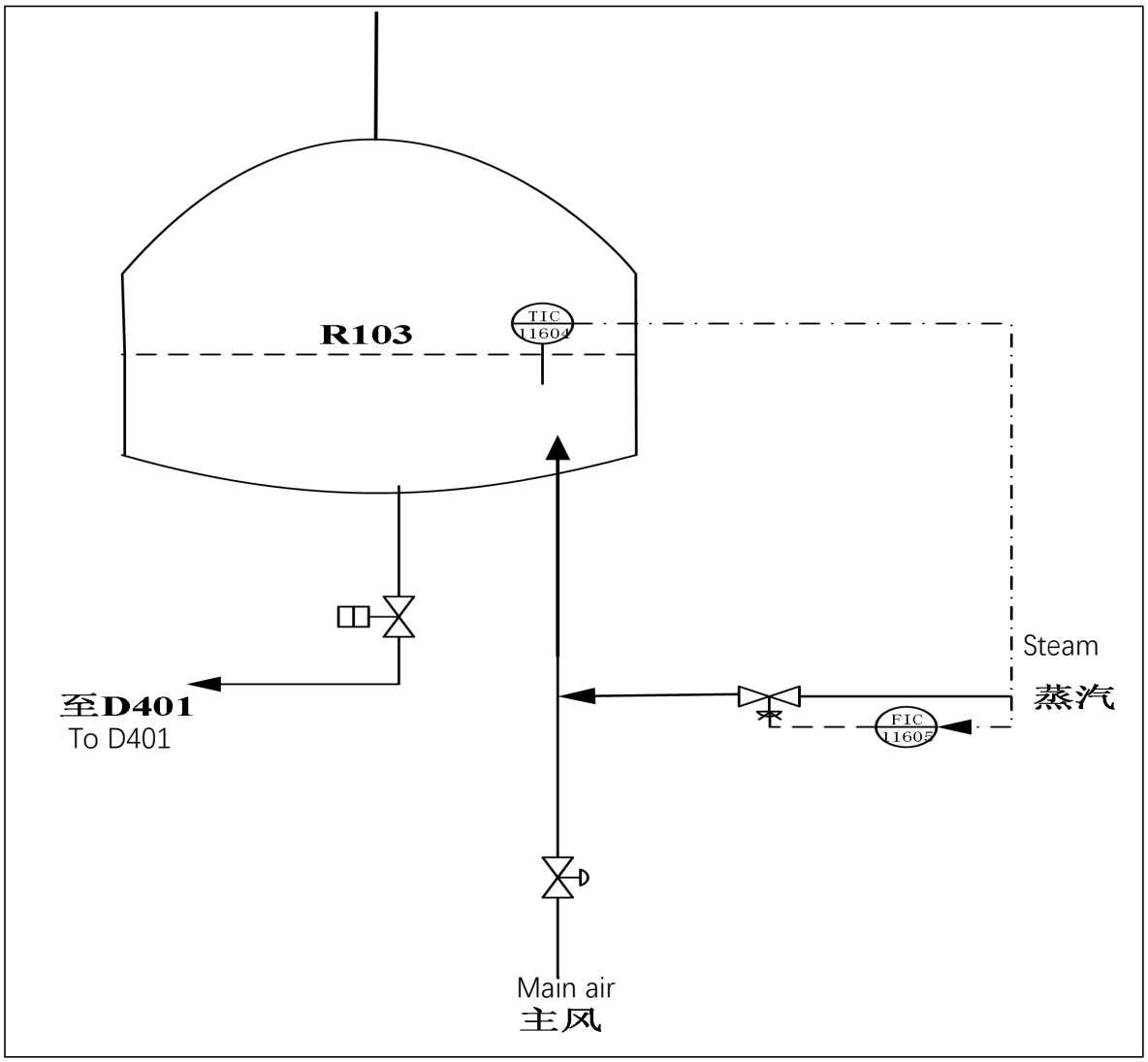
控制目标：气化器温度应尽可能低，根据焦炭循环限值来确定，以防止在气化器床床内烧结。温度波动不超过设定±5℃。

3)Related parameters: gasification process steam flow rate, main air flow rate.

相关参数：气化器工艺蒸汽量、主风量。

4)Control mode: adjust the steam flow rateof the gasifier with FIC-11605 to keep TIC-11604 at 899℃.

控制方式：利用 FIC-11605 调节气化器工艺蒸汽量的大小，可使 TIC-11604 保持在 899℃。



5)Normal adjustment: 正常操作：

Influence factors 影响因素	Adjustment method 调节方法
Gasifier process steam 气化器工艺蒸汽	The process steam entering the gasifier is adjusted by adjusting the opening of FIC-11605 control valve . As the steam flow increases, the gasifier bed temperature decreases; the steam flow decreases, and the gasifier bed temperature rises.通过调节 FIC-11605 调节阀的开度，来调节进入气化器工艺蒸汽的量大小。蒸汽流量增加，气化器床温下降；蒸汽流量减少，气化器床温上升。
Gasifier air amount 气化器主风量	By adjusting the angle of the stator blades of the main fan, the main air flow into the Gasifier is controlled. When the angle of the stationary blade is opened, the main air flow increases, and the bed temperature of the gasifier rises; when the angle of the stationary blade is closed, the main air flow

Influence factors 影响因素	Adjustment method 调节方法
	decreases, and the bed temperature of the gasifier decreases. 通过调节主风机静叶角度，控制进入气化器内的主风流量。静叶角度开大，主风流量增加，气化器床温上涨；静叶角度关小，主风流量减少，气化器床温下降。

6)Troubleshooting：异常影响：

Influence factors 影响因素	Adjustment method 调节方法
Main air flow rate is too low 主风量过低	Coke will flow back to the gasifier end cap through the gasifier grating cap which is made of carbon steel. The high temperature inside the gasifier bed will exceed the design temperature. PS-111 interlock will be activated when FT-11607ABC reaches 54565m³/h with two-out–of three operation. Therefore, close attention must be paid for the main air flow rate of the gasifier to prevent the main wind from being too low.会导致焦炭通过气化器格栅帽回流到气化器底盖。底盖为碳素钢材料，气化器床内的高温会超出设计温度，当 FT-11607ABC 三取二值到 54565m³/h 会启动 PS-111 联锁。所以要密切关注气化器主风量。防止主风过低。
Gasifier coke return 气化器返回焦	The amount of coke returned by the gasifier is controlled by the opening of the gasifier feed slide valve HV-11401. When too much, the main air volume of the gasifier is not adjusted in time, which will cause the temperature of the gasifier to drop. When it is too small, the gasifier storage capacity will be lower than the overflow, causing the gasifier top vessel to directly enter the dilute phase of the heater and cause over-temperature.通过化器进料滑阀 HVS-11401 的开度大小来控制气化器返回焦量的多少。过多时，气化器主风量不及时调整，会使气化器温度下降。过少时，气化器藏量会低于溢流口，使气化器顶器直接进入加热器稀相引起超温。
Gasifier process steam flow rate 气化器工艺蒸汽量	The temperature of the gasifier will be influenced greatly by process steam flow rate of the gasifier due to the endothermic reaction, Coke feeding back to gasifier should be adjusted according to the gasification rate and production rate.焦炭气化反应使吸热反应，所以气化器的工艺蒸汽量的大小对气化器的温度有较大影响，操作中要根据气化率的大小及时调整进气化器返回焦的多少和加工量的多少。

Influence factors 影响因素	Adjustment method 调节方法
Gasifier feed slide valve failed 化器进料滑阀故障	Switch the slide valve to the manual mode, contact the instrument people to handle the failure of the slide valve. Keep the pressure of the reactor and scrubber stable.滑阀改现场手动，联系仪表处理滑阀故障；控制好三器压力并保存平稳； 联系仪表处理滑阀问题。
Gasifier feed coke line bridge 气化器进料焦管线架桥	By adjusting the nitrogen loosening point on the feed coke riser pipeline of the gasifier, open or close the HV-11401 slide valve, eliminate the air resistance in the riser, and re-establish the coke powder pressure accumulation in the riser to restore the coke powder circulation; The bridge is removed by increasing the opening the steam loose point on the feed coke line of gasifier; The driving force of the cold coke line is adjusted by controlling steam delivered from DN80 at the lowest part of feed coke line of gasifier. 通过调节气化器进料焦立管管线上的氮气松动点，开大或关小 HV-11401 滑阀，消除立管内气阻，重新建立立管内焦粉蓄压，来恢复焦粉循环；通过气化器进料焦管线上的松动的的棒出来处理架桥；通过调整气化器进料焦管线最底部的 DN80 输送蒸汽量的大小来调节加热器进料焦管线的推动力。

(13) Gasifier level control: LI-10601, LI-10602

气化器料位的控制：LI-10601、LI-10602

1)Control range: Lower than the overflow hopper for a long time is not allowed, 42-55%.

控制范围：不能长时间低于溢流斗，42～55%。

2)Control target: The feed level control of the gasifier is based on the overflow hopper of the return line. Lower than the overflow hopper for a long time is not allowed , otherwise, secondary combustion will occur and damage to heater internals due to the feed seal destroyed and air enter into the dilute phase of the heater. The material level fluctuation should up to ±5% of set value.

控制目标：气化器的料位控制以返回线的溢流斗漫过为原则，不能长时间低于溢流斗，否则造成料封破坏，空气窜入加热器的稀相，造成二次燃烧，损坏加热器内件。料位波动不超过设定±5%。

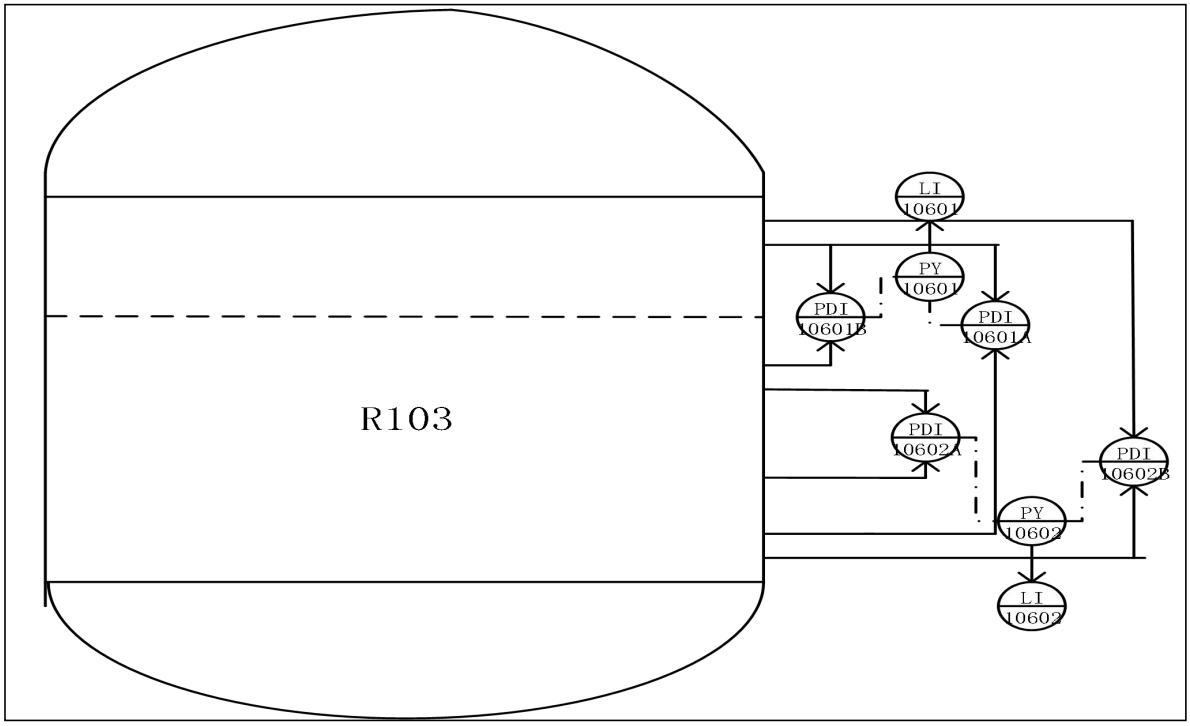
3)Related parameters: heater dilute phase temperature, secondary combustion, differential pressure between heater and gasifier, gasifier feed coke slide valve opening.

相关参数：加热器稀相温度、二次燃烧、气化率、加热器与气化器压降、气化器进料焦滑阀开度。

4)Control mode: The level is measured indirectly by level indicators LI-11602 and LI-11601 according to the calculation results from the differential pressure transmitter . The gasifier bed density and Gasifier level are determined and checked by PDI-11602A/B and PDI-11601A/B.

As the distance between the two taps in the dense phase is known, the density of the bed can be determined by measuring the pressure difference between the two dense phase taps. The level of the coke bed in the gasifier can be determined by combining the differential pressure between the taps of overhead and bottom of the column.

控制方法：料位指示器 LI-11602 和 LI-11601 根据利用压差变送器得出的计算结果间接测量料位。安装 PDI-11602A/B 和 PDI-11601A/B 来确定气化器床密度及检查气化器料位。密相内两个抽头之间的距离已知。通过测量两个密相抽头之间的压差，可以确定床的密度。可与塔顶和塔底抽头之间的压差结合起来确定气化器内焦炭床的料位。



5)Normal adjustment: 正常操作：

Influence factors 影响因素	Adjustment method 调节方法
Coke feeding back to Gasifier 气化器返回焦	The coke feeding back to gasifier is adjusted by controlling the opening of the HF-11401 vaporizer feed coke slide valve; when feeding too much, the temperature of the gasifier will decrease due to the in-time adjustment of main air flow rate of the gasifier. When feeding too little, overheating will occur due to the gasifier capacity lower the overflow port and gasifier top gas directly enter into the heater dilute phase.通过化器进料滑阀 HVS-11401 的开度大小来控制气化器返回焦量的多少。过多时，气化器主风量部及时调整，会使气化器温度下降。过少时，气化器藏量会低于溢流口，使气化器顶器直接进入加热器稀相引起超温。

Gasification rate 气化率	The process steam entering the gasifier is adjusted by adjusting the opening of FIC-11605 control valve according to the actual production rate.根据实际加工量的大小，通过调节 FIC-11605 调节阀的开度，来调节进入气化器工艺蒸汽的量大小控制气化率的多少。
Differential pressure between heater and gasifier 加热器与气化器压降	Control the differential pressure between heater and gasifier by adjusting TV-11003. When the differential pressure rises, the gasifier level drops; when the differential pressure drops, the gasifier level rises. 通过调节 TV-11003 控制加热器与气化器压降。压降上升，气化器料位下降；压降下降，气化器料位上涨。

6)Troubleshooting: 异常操作：

Influence factors 影响因素	Adjustment method 调节方法
Gasifier feed slide valve failed 化器进料滑阀故障	Switch the slide valve to the manual mode, contact the instrument people to handle the failure of the slide valve. Keep the pressure of the reactor heater, scrubber and gasifier stable. Contact the meter to handle the slide valve problem.滑阀改现场手动，联系仪表处理滑阀故障；控制好三器压力并保存平稳； 联系仪表处理滑阀问题。
Gasifier feed line bridge 气化器进料管线架桥	By adjusting the nitrogen loose point on the feed coke riser pipeline of the gasifier, open or close the HV-11401 slide valve, eliminate the air resistance in the riser, and re-establish the pressure accumulation of the coke powder in the riser to restore the coke powder circulation The bridge is removed by increasing the opening the steam loose point on the feed line of gasifier; The driving force of the cold coke line is adjusted by controlling steam delivered from DN80 at the lowest part of feed coke line of vaporizer. 通过调节气化器进料焦立管管线上的氮气松动点，开大或关小 HV-11401 滑阀，消除立管内气阻，重新建立立管内焦粉蓄压，来恢复焦粉循环；通过气化器进料管线上的松动的的棒出来处理架桥；通过调整气化器进料管线最底部的 DN80 输送蒸汽量的大小来调节冷焦管线的推动力。

(16)Vacuum residue feed tank D-107 level

减压渣油进料罐 D-107 液位

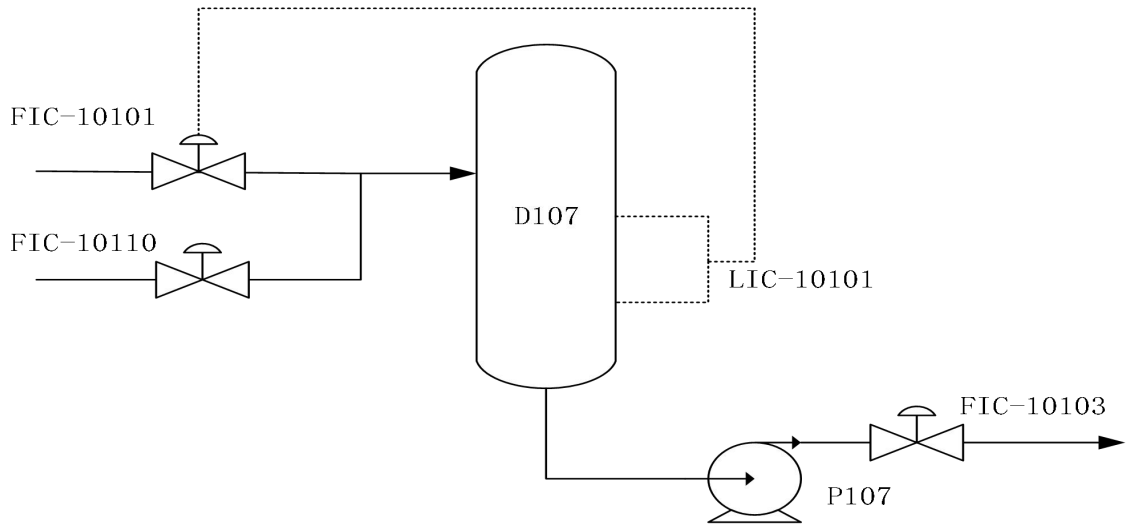
1)Control target: 30-70%.

控制目标：30～70%。

2)Control range: The set liquid level fluctuation range of vacuum residue tank (D-107) ± 5%.
控制范围：设定的减压渣油罐（D-107）液面波动范围±5%。

3)Related parameters: D-107 vacuum residue feed tank liquid level control LIC-10101; flow FIC-10101 of vacuum residue from refinery, flow FIC-10103 of vacuum residue to scrubber C-101.
相关参数：D-107 减压渣油进料罐液位控制 LIC-10101；炼厂来减压渣油量 FIC-10101，减压渣油至洗涤塔 C-101 量 FIC-10103。

4)Control mode: in the circumstances that the flow rate FIC-10103 of vacuum residue to the scrubber C-101 is fixed, the liquid level of the feed tank D-107 is controlled by cascade LIC-10101 with FIC-10101. If the actual flow rate of the vacuum residuum from the refinery is greater than the actual flow rate of scrubber C-101 feed ,the liquid level of the feed tank D-107 rises; vice verse.
控制方式：在减压渣油至洗涤塔 C-101 流量 FIC-10103 一定的情况下，进料罐 D-107 液位是由 LIC-10101、FIC-10101 串级控制的。炼厂来减压渣油实际流量大于洗涤塔 C-101 进料实际流量，则进料罐 D-107 液位上升；反之下降。



5)Normal adjustment: 正常调整：

Influence factors 影响因素	Adjustment method 调整方法
Vacuum Residue flow FIC-10101 from refinery 炼厂来减渣油流量 FIC-10101	while increase the flow of FIC-10110, the liquid level rises; vice versa.提高 FIC-10110 流量，液位上升；反之下降。
Flow rate FIC-10103 of vacuum Residue to C-101 减渣油至 C-101 流量 FIC-10103	While increase the flow of FIC-10103, the liquid level drops; vice versa.提高 FIC-10103 流量，液位下降；反之上升。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Approach 处理方法

Fault 现象	Cause 原因	Approach 处理方法
D-107 liquid level drop D-107 液位下降	insufficient flow of vacuum residue FIC-10101 from refinery 炼厂来减压渣油 FIC-10101 量不够	Contact the responsible people to increase the flow of refinery wax oil, hydrogenated tail oil or increase the flow rate of the vacuum residue FIC-10110 fromthe tank area.联系增加炼厂蜡油、加氢尾油的量或者提高罐区来减压渣油 FIC-10110 的流量。
	Feed control valve failed 进料控制阀故障	Switch Control the valve to secondary line operation, contact the instrument people to repair the control valve.控制阀改副线操作，联系仪表检修控制阀。
	Liquid level indicator failed 液面指示仪表故障	Contact the instrumentation people to calibrate the level indicator.联系仪表工校表。
	Flow area of feed line decreased 进料管线流通面积减小	Unblock the feed line.对进料管线进行疏通。
D-107 liquid level rise D-107 液位上升	Feed flow is more than extraction flow 进料罐进料量大于抽出量	Close the LIC-10101, adjust the in and out flow 关小 LIC-10101，调整进出流量相等。
	Liquid level indicator failed 液面指示仪表故障	Contact the instrumentation people to calibrate the level indicator.联系仪表工校表。
	Feed pump P-107 failed 进料泵 P-107 故障	Switch to the standby pump.切换至备用机泵。

(15)Liquid level of sludge tank D-102

污泥罐 D-102 液位

1)Control target: 0-70%.

控制目标：0～70%。

2)Control range: The setting fluctuation range of D102 liquid level is ±10%.

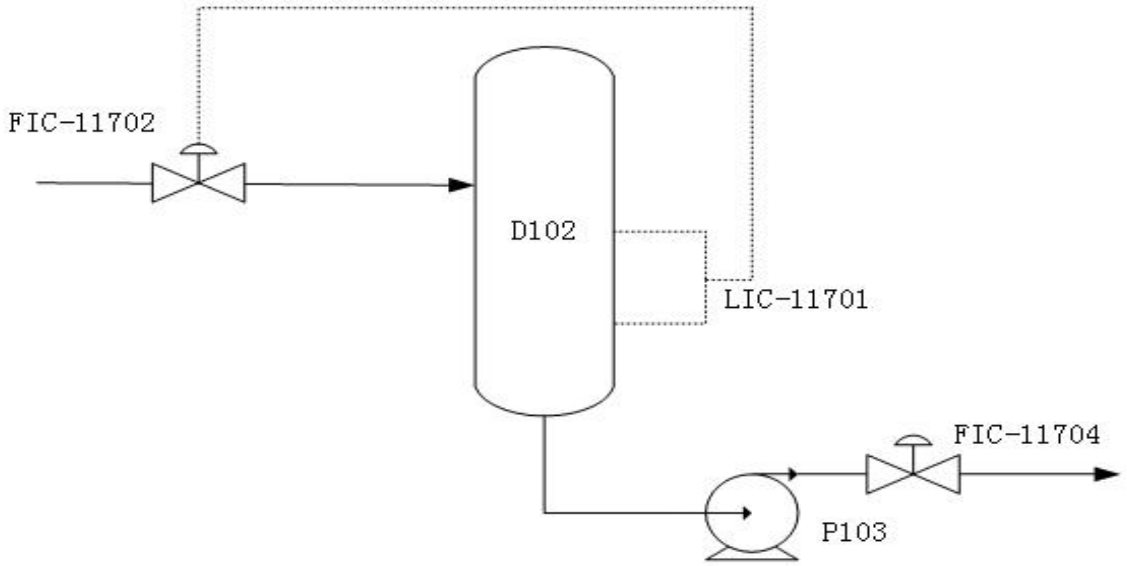
控制范围：设定的 D102 液面波动范围±10%。

3)Related parameters: flow rate FIC-11702 of refinery sludge, flow rate FIC-11704 waste oil of from R-101, and level control LIC-11701 of D-102.

相关参数：炼厂来污泥流量 FIC-11702,污油至 R-101 流量 FIC-11704，D-102 液位控制 LIC-11701。

4)Control mode: Under the certain flow rate FIC-11704 of waste oil to R-101, the liquid level of the waste oil from back-refining tank D-102 is controlled by LIC-11701 and FIC-11702 in

cascade. When the actual flow rate of sludge from the refinery is greater than the actual flow rate of the waste oil to R-101, the liquid level of the feed tank D-102 rises; vice versa.
控制方式：在污油至R-101流量FIC-11704一定的情况下，污油回炼罐D-102液位是由LIC-11701、FIC-11702串级控制的。炼厂来污泥实际流量大于污油至R-101实际流量，则进料罐D-102液位上升；反之下降。



5)Normal adjustment: 正常调整：

Influence factors 影响因素	Adjustment methods 调整方法
Flow rate FIC-11702 of refinery sludge 炼厂来污泥流量 FIC-11702	With the increase of flow rate FIC-11702, the liquid level will rise; vice versa.提高 FIC-11702 流量，液位上升；反之下降。
Flow rate FIC-11704 of waste oil to R-101 污油至 R-101 流量 FIC-11704	With the increase of flow rate FIC-11704, the liquid level will drop; vice versa 提高 FIC-11704 流量，液位下降；反之上升。.

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Action 处理方法
D-102 liquid level drops D-102 液位下降	The amount to R-101 is too high 至 R-101 量过大	Decrease the opening of FIC-11704, and adjust the inlet and outlet flow rate to be same .关小 FIC-11704，调整进出流量相等。
	FV-11702 control valve fails FV-11702 控制阀故障	Control valve is switched to the bypass line operation, contact the instrument operator to repair the control valve.控制阀改副线操作，联系仪表检修控制阀。

Fault 现象	Cause 原因	Action 处理方法
	Liquid level gauge fails 液面指示仪表故障	Contact the instrument operator to calibrate it.联系仪表工校表。
D-102 liquid level rise D-102 液位上升	The refinery comes from heavy aromatics, heavy oil and P-220, P-312 炼厂来重芳烃、重污油和 P-220、P-312 来总量过大	Reducing the openings of LIC-11701, adjust the inflow and outflow equal 关小 LIC-11701，调整进出流量相等。.
	Liquid level gauge fails 液面指示仪表故障	Contact the instrument operator calibrate it. 联系仪表工校表。
	Feed pump P-103 fails 进料泵 P-103 故障	Switch to the standby compressor and pump. 切换至备用机泵。

(16)Preheating temperature of vacuum residue feed 减压渣油进料预热温度

1)Control target: 180-270℃.

控制目标：180～270℃。

2)Control range: The fluctuation range set for preheating temperature is ±10℃.

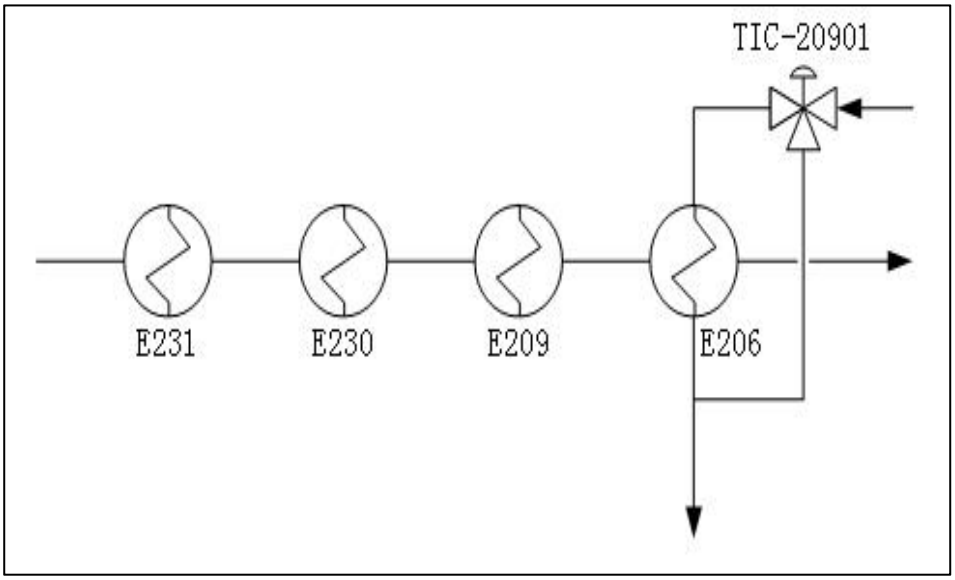
控制范围：设定的预热温度波动范围±10℃。

3)Related parameters: vacuum residue feed flow rate FI-10101, temperature TI-10101; stripping temperature of LKGO to E231, flow rate FI-23102; flow rate FIC-21501 of middle section circulating oil to E230, temperature TI-20701; E-209 HKGO Three-way valve flow rate FIC-21701, temperature TIC-21603; E-206 stripping HKGO three-way valve flow FI-20802; If the above mentioned parameters fluctuates, feed preheating temperature TIC-20901 will fluctuate.

相关参数：减压渣油进料流量 FI-10101、温度 TI-10101；进 E231 汽提 LKGO 温度、流量 FI-23102；进 E230 中段循环油流量 FIC-21501、温度 TI-20701；E-209HKGO 流量 FIC-21701、温度 TIC-21603；E-206 汽提 HKGO 流量 FI-20802；以上参数波动会引起进料预热温度 TIC-20901 波动。

4)Control mode: normal feed preheating temperature is controlled by adjusting E-206 three-way control valve TV-20901 , the opening of TV-20901 is controlled by TIC-20901, and then achieve the purpose of controlling feed preheating.

控制方式：正常进料预热温度控制是通过调节 E-206 三通控制阀 TV-20901，由 TIC-20901 来控制 TV-20901 开度，进而达到控制进料预热的目的。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Three-way valve TV-20901 openings 三通阀 TV-20901 开度	Reduce the openings of TV-20901 and increase the flow rate of feed flowing through the E-206, then, feed preheating temperature TIC-20901 will rise too; vice versa.关小 TV-20901，E-206 主路流量增加，进料预热温度 TIC-20901 上升；反之下降。
HKGO stripping flow rate FI-20802 汽提 HKGO 量 FI-20802	As the flow rate FI-20802 increases, and the feed preheating temperature TIC-20901 will rise; vice versa. FI-20802 流量大，进料预热温度 TIC-20901 上升；反之下降。

6)Troubleshooting: 异常处理：

Fault 现象	Cause 原因	Action 处理方法
Feed preheating temperature fluctuates 进料预热温度波动	The vacuum residue feed flow FI-10101 suddenly fluctuates greatly or the temperature TI-10101 drops.减渣进料流量 FI-10101 突然波动大或温度 TI-10101 降低	The D-107 liquid level is switched to manual control, and then it is put into auto control after running smoothly. D-107 液位改手动调节，平稳后再投自动调节。
	Flow rate FI-23102 of stripping LKGO fluctuates greatly 汽提 LKGO 流量 FI-23102 波动大	Check P-227 and switch to the standby pump when it is pumped out.检查 P-227，抽空则切换至备用泵。

Fault 现象	Cause 原因	Action 处理方法
	Mid-cycle oil flow FIC-21501, temperature TI-20701 fluctuation 中段循环油流量 FIC-21501、温度 TI-20701 波动	FIC-20501 is switched to manual control, and then it is put into auto adjustment after running smoothly. FIC-20501 改手动控制，平稳后再投自动调节。
	E-209HKGO flow rate FIC-21701 and temperature TIC-21603 fluctuate E-209HKGO 流量 FIC-21701、温度 TIC-21603 波动	Check P-206 and switch to the standby pump when P-206 is pumped out. Switch TIC-21603 to manual control, and then it will be put into auto control after running smoothly.检查 P-206，抽空则至切换备用泵；TIC-21603 改手动调节，平稳后再投自动调节。

(17)F-104 steam outlet temperature TIC-13208

F-104 蒸汽出口温度 TIC-13208

1)Control range: 475-495℃.

控制范围：475～495。

2)Control target: The steam outlet temperature should be controlled within the above range during normal operation, and the specific control value is given according to the production plan. The controlled steam outlet temperature fluctuation does not exceed the set value ± 5℃.

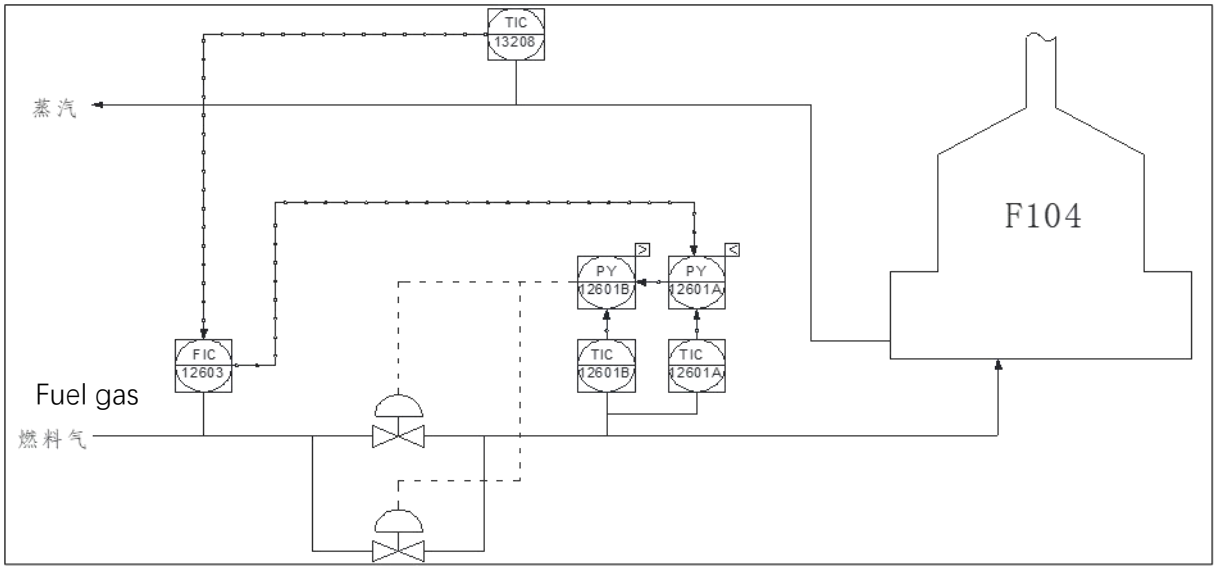
控制目标：正常操作中蒸汽出口温度应控制在上述范围内，具体控制数值根据生产方案给定。控制的蒸汽出口温度波动不超过设定值±5℃。

3)Related parameters: feed steam flow rate; feed steam temperature; outlet steam pressure; fuel gas flow rate; fuel gas pressure; air flow rate.

相关参数：进料蒸汽流量；进料蒸汽温度；出口蒸汽压力；燃料气流量；燃料气压力；空气流量。

4)Control mode: The steam outlet temperature and the fuel gas flow composition are controlled in cascade. Under normal conditions, the steam temperature is regulated by fuel gas flow rate FIC-12603 through the TIC-13208 cascade control. In order to minimize the pressure and flow rate fluctuation in the burner, PIC-12610A and FIC-12603 are also used for low range selection. The PIC-12610B and FIC-12603 are used for high range selection as the final valve position set point.

控制方式：蒸汽出口温度与燃料气流量组成串级控制。正常情况下，蒸汽温度由 TIC-13208 串级控制燃料气流量 FIC-12603 来调节，同时为了尽可能降低燃烧器内的压力及流量波动，还要使用 PIC-12610A 和 FIC-12603 做低选及 PIC-12610B 和 FIC-12603 做高选来作为最终阀位给定值。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Fuel gas flow valve openings 燃料气流量阀开度	The steam outlet temperature TIC-13208 is controlled by controlling the openings fuel gas flow valve. Increase the flow valve opening, the steam outlet temperature will rise; vice versa.蒸汽出口温度 TIC-13208 通过控制燃料气流量阀开度来控制。流量阀开大，蒸汽出口温度上升；流量阀关小，蒸汽出口温度下降。

6)Troubleshooting: 异常处理：

Fault 现象	Cause 原因	Action 处理方法
Steam temperature fluctuation 蒸汽温度波动	Sudden decrease in upstream steam supply or sudden increase in downstream steam consumption 上游供汽突然减少或下游用汽量突然增大	Adjust the fuel gas volume in time and contact the Related operating posts to stabilize the steam consumption.及时调整燃料气量，并联系相关岗位稳定蒸汽用量。
	Fuel gas carried with oil or water 燃料气带油或带水	Drain the knock out drum of fuel gas in time.燃料气分液罐加强切液。
		Check if the system heat tracing is normal.检查系统伴热线是否正常。

Fault 现象	Cause 原因	Action 处理方法
		If there is too much liquid , contact the production coordinator immediately and find out the cause.若带液较重则立即联系调度查找原因。
	Outside pipe network pressure of fuel gas fluctuated greatly 燃料气管外网压力大幅波动	Report to the supervisor and contact the production coordinator immediately and find out the cause to stabilize the pressure.报告班长并联系调度及时查找原因稳定压力。
	Control valve or instrument failed 调节阀或仪表故障	If the instrument failed, switch to bypass line or manual operation, and contact the instrument operator to deal with. 仪表失灵，改副线或手动操作，并联系仪表工处理。
	Furnace tube ruptured 炉管破裂	If the damage is not serious, the furnace can be shut down after asking for instructions, and reduce the load appropriately.损坏不严重时，可进行请示停炉，并适当降低负荷。
		When the damage is serious, the furnace must be shutdown urgently to prevent the steam ejected from the damaged pipe from blowing the adjacent superheater tube. After the furnace is shut down, the flue gas and steam in the furnace should be drained in time.损坏严重时，必须紧急停炉，以免从损坏管中喷出的蒸汽吹坏邻近过热器管。停炉后，应将炉内烟气和蒸汽及时排净。
	Furnace flame is out 炉熄火	Deal with this situation according to the furnace emergency plan.按加热炉应急方案处理。

(18)F-104 steam outlet pressure PIC-13202, F-104 steam flow rate FI-13201

F-104 蒸汽出口压力 PIC-13202、F-104 蒸汽流量 FI-13201

1)Control range: F-104 steam outlet pressure is 0.7-1.0MPa; F-104 steam flow rate is not less than 7.4t/h.

控制范围：F-104 蒸汽出口压力 0.7～1.0MPa；F-104 蒸汽流量不小于 7.4t/h。

2)Control target: The steam outlet pressure should be controlled within the above range during normal operation, and the specific control value is given according to the production plan. The controlled steam outlet pressure fluctuation does not exceed the set value ± 0.1 MPa; at the same time, ensuring that the F-104 inlet steam flow is not less than 7.4 t / h.

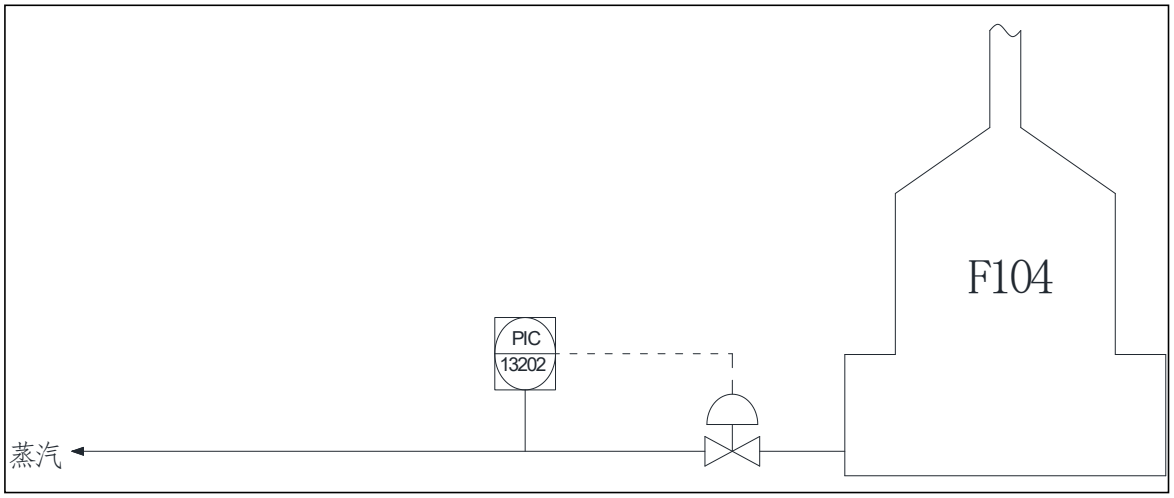
控制目标：正常操作中蒸汽出口压力应控制在上述范围内，具体控制数值根据生产方案给定。控制的蒸汽出口压力波动不超过设定值±0.1MPa；同时保证 F-104 入口蒸汽流量不小于 7.4t/h。

3)Related parameters: upstream steam supply; downstream steam consumption; steam temperature.

相关参数：上游供汽量；下游用汽量；蒸汽温度。

4)Control mode: The opening of pressure control valve PIC-13202 is used to control the steam outlet pressure

控制方式：采用压力控制调节阀 PIC-13202 开度控制蒸汽出口压力。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Control valve openings 调节阀开度	The steam outlet pressure PIC-13202 is controlled by controlling the opening of the control valve. When the opening of control valve is increased, the steam outlet pressure rises; vice versa.蒸汽出口压力 PIC-13202 通过控制调节阀开度来控制。调节阀开大，蒸汽出口压力上升；调节阀关小，蒸汽出口压力下降。

6)Troubleshooting: 异常处理：

Fault 现象	Cause 原因	Action 处理
Pressure fluctuates greatly 压力大幅度波动	Sudden decrease in downstream steam consumption 下游用汽量突然减少	Contact the Related post to stabilize the steam volume 联系相关岗位稳定蒸汽量

Fault 现象	Cause 原因	Action 处理
	Sudden increase in downstream steam consumption 下游用汽量突然加大	
	Sudden decrease in upstream steam supply 上游供汽量突然减少	
	Instrument fault 仪表故障	If the instrument failed, switch to bypass line or manual operation, and contact the instrument operator to deal with.仪表失灵，改副线或手动操作，并联系仪表工处理。

(19)F-104 furnace box pressure PIC-13301

F-104 炉膛压力 PIC-13301

1)Control range: F-104 furnace pressure is -20~50Pa.

控制范围：F-104 炉膛压力-20～50Pa。

2)Control target: The furnace box pressure shall be controlled within the above range during normal operation, and the specific control value is given according to the production plan. The controlled furnace box pressure fluctuation does not exceed the set value ± 5 Pa.

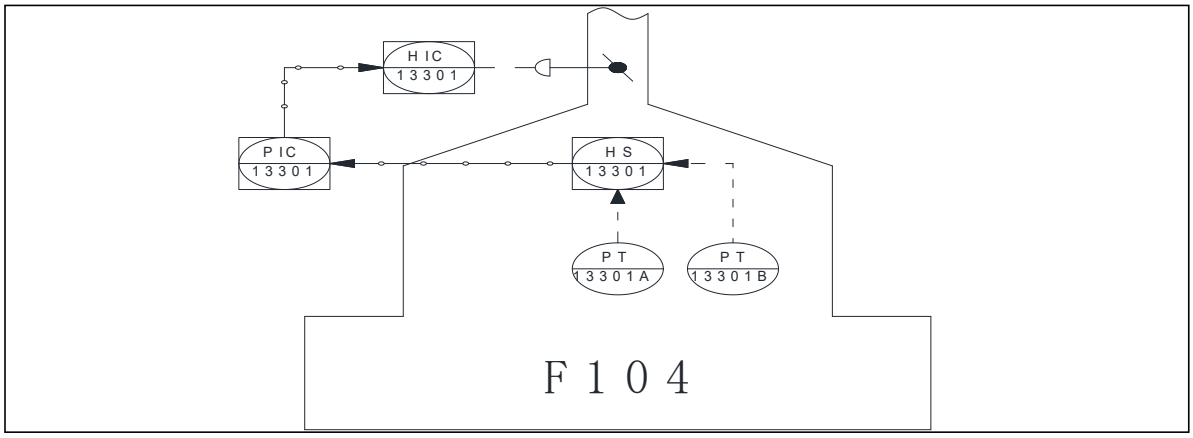
控制目标：正常操作中炉膛压力应控制在上述范围内，具体控制数值根据生产方案给定。控制的炉膛压力波动不超过设定值±5Pa。

3)Related parameters: furnace air intake; fuel gas flow rate; fan air intake.

相关参数：炉膛进风量；燃料气流量；风机引风量。

4)Control mode: pressure measurement point PT-13301A/B is selected by manual selector HS-13301and furnace box pressure is controlled by adjusting the opening of PIC-13301.

控制方式：由手动选择器 HS-13301 选择压力测量点 PT-13301A/B 并通过调节阀 PIC-13301 开度控制炉膛压力。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Control valve openings 调节阀开度	Furnace box pressure PIC-13301 is controlled by adjusting the opening of control valve , when the opening of control valve is increased ,the furnace box will drop; vice versa. 炉膛压力 PIC-13301 通过调节阀开度来控制。调节阀开大，炉膛压力下降；调节阀关小，炉膛压力上升。
HV-13302 opening degree HV-13302 开度	When the regulating valve is opened, the oxygen content in the furnace increases, and the furnace pressure rises; when the regulating valve is closed, the oxygen content in the furnace decreases, and the furnace pressure decreases. 调节阀开大，炉膛氧含量上升，炉膛压力上升；调节阀关小，炉膛氧含量下降，炉膛压力下降。
K202 frequency conversion K202 变频	The frequency conversion is turned up, and the furnace pressure drops; When the frequency conversion is turned down, the furnace pressure rises. 变频开大，炉膛压力下降；变频关小，炉膛压力上升。

6)Troubleshooting: 异常处理：

Fault 现象	Cause 原因	Action 处理
Pressure fluctuates greatly 压力大幅度波动	Blower or draft fan failed 鼓风机或引风机故障	Switch to standby blower or draft fan immediately and contact the maintenance operators to deal with. 立即切换备机并联系维修工处理。
	Instrument or control valve failed 仪表或调阀故障	If the instrument failed, switch to bypass line or manual operation, and contact the instrument operator to deal with.仪表失灵，改副线或手动操作，并联系仪表工处理。

(20)F-104 pilot burner pressure PIC-12604

F-104 长明灯压力 PIC-12604

1)Control range: F-104 pilot burner pressure shall be 0.25-0.55MPa.

控制范围：F-104 长明灯压力 0.25～0.55MPa。

2)Control target: The pilot burner pressure shall be controlled within the above range during normal operation, and the specific control value is given according to the production plan. The controlled pilot burner pressure fluctuation does not exceed the set value ± 5 Pa.

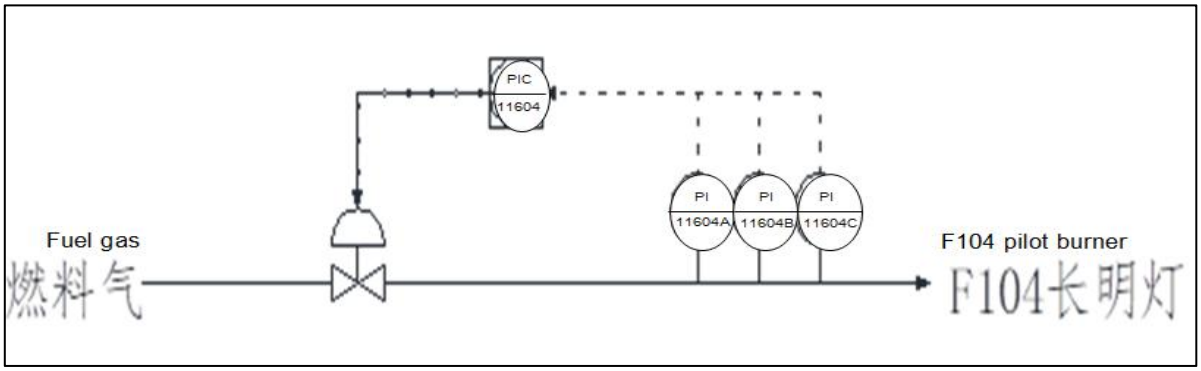
控制目标：正常操作中长明灯压力应控制在上述范围内，具体控制数值根据生产方案给定。控制的长明灯压力波动不超过设定值±0.1MPa。

3)Related parameters: the opening of fuel gas pressure control valve.

相关参数：燃料气压力调节阀开度。

4)Control mode: the average value of PT-12604A/B/C measuring points is used as the basis for adjusting valve opening of PIC-12604 to control pilot burner pressure.

控制方式：采用测量点 PT-12604A/B/C 平均值作为调节阀 PIC-12604 开度依据控长明灯压力。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Control valve opening 调节阀开度	Pilot burner pressure PIC-12604 is controlled by adjusting the valve opening . when the opening of control valve is increased , pilot burner pressure rises; vice versa.长明灯压力 PIC-12604 通过调节阀开度来控制。调节阀开大，长明灯压力上升；调节阀关小，长明灯压力下降。

6)Troubleshooting: 异常处理：

Fault 现象	Cause 原因	Action 处理
Pressure dropped 压力降低	Flame arrestor was plugged 阻火器堵	Switch to standby flame arrestor immediately and clean the blocked flame arrestor core.立即切换备用阻火器并清理堵塞阻火芯。
Pressure fluctuated greatly 压力大幅波动	The fuel gas pipe network pressure fluctuated 燃料气外管网压力波动	Report to the supervisor and contact the production coordinator immediately and find out the cause to stabilize the pressure.报告班长并联系调度及时查找原因稳定压力。
	Instrument or control valve failed 仪表或调阀故障	If the instrument failed, switch to bypass line or manual operation, and contact the instrument operator to deal with.仪表失灵，改副线或手动操作，并联系仪表工处理。

(21) F-102 Steam outlet temperature TIC-12508

F-102 蒸汽出口温度 TIC-12508

1)Control range: 425-455 ℃.

控制范围：425～455℃。

2)Control target: the outlet temperature of middle pressure superheated steam shall be set in the temperature range of±5℃.

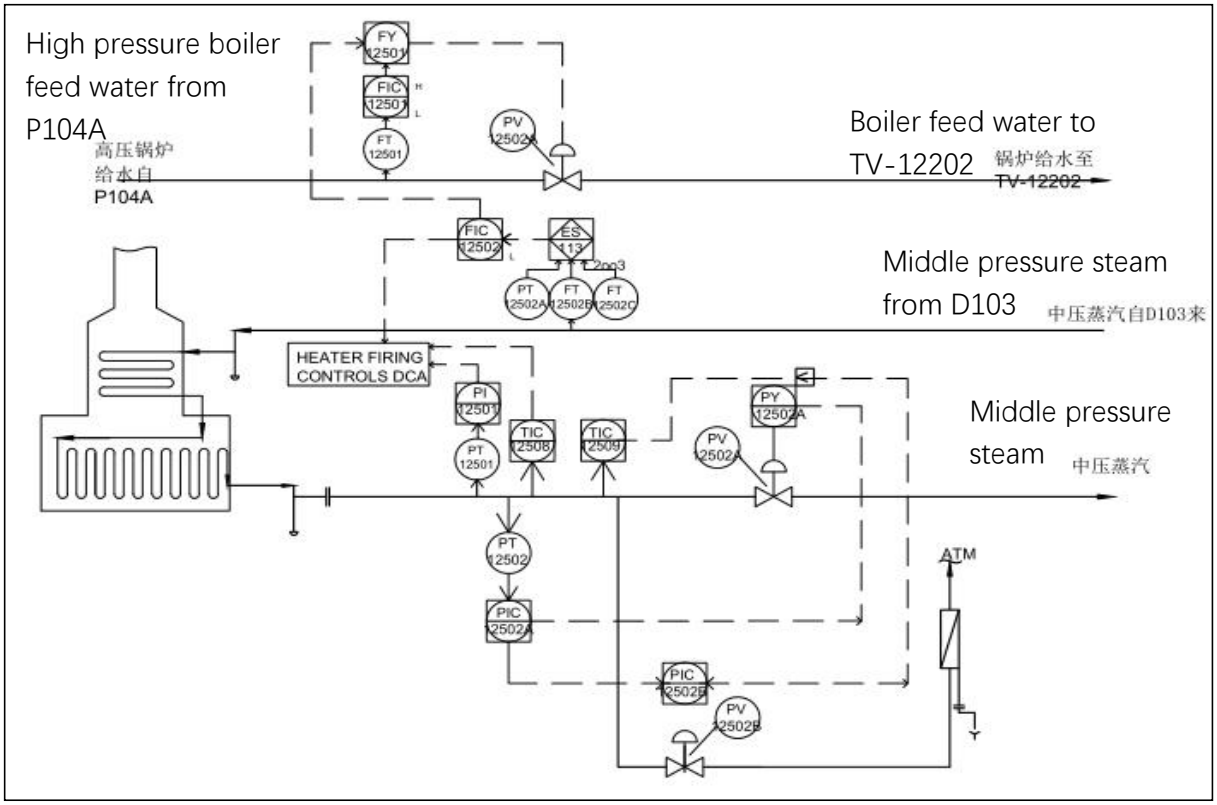
控制目标：设定中压过热蒸汽出口温度在设定±5℃范围内。

3)Related parameters: the inlet flow rate FIC-12502 of steam entering F-102 and the temperature, the temperature TI-12705 inside the fire box F-102 ,combustion gas pressure, flow rate, calorific value, PV-12502AB opening.

相关参数：进 F-102 入口蒸汽流量 FIC-12502 与温度，F-102 炉膛内温度 TI-12705，燃烧气的压力、流量、热值，PV-12502AB 开度。

4)Control mode: sending the signals of F-102 outlet temperature TIC-12508, pressure PI-12501, inlet air flow rate FIC-12502, calorific value of combustion gas ,flow rate and pressure respectively to the DCA control, when the TIC-12509 is low low , switch off low range selector PV-12502A and open the PV-12502B in a delay way.

控制方式：是由 F-102 出口温度 TIC-12508、压力 PI-12501、入口进气量 FIC-12502、燃烧气热值、流量、压力分别给信号到 DCA 控制，当 TIC-12509 低低时，低选关闭 PV-12502A，延迟打开 PV-12502B。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Inlet flow rate FIC-12502 of steam entering F-102 进 F-102 入口蒸汽流量	When the flow rate is increased, the outlet steam temperature decreases and vice versa.流量增大，出口蒸汽温度下降；反之上升。
The temperature TI-12705 inside the fire box F-102 F-102 炉膛内温度	When the temperature is decreases, steam outlet temperature F-102 drops and vice versa.温度下降，F-102 出口蒸汽温度下降；反之上升。
PV-12502B opening is too small PV-12502B 开度大小	When the opening of PV-12502B is increased, the temperature drops, and vice versa. PV-12502B 开大温度下降，反之上升。
Combustion conditions of combustion gas (flow, pressure, calorific value)燃烧气燃烧情况（流量、压力、热值）	During normal operation, adjust the air distribution of burners and flue consumption according to the furnace running conditions ;adjust the various materials according to the combustion situation ,so maintaining the normal and smooth operation of the burners is the key to controlling the steam temperature .正常操作时，根据加热炉的运行情况调整燃烧器的配风和燃料气的用量，根据燃烧情况进行各物料进行调节，保持燃烧器的正常平稳运行是控制蒸汽温度的关键。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Action 处理方法
The steam outlet temperature F-102 is too low F-102 蒸汽出口温度过低	F-102 furnace box inside temperature droppedF-102 炉膛内温度下降	The flow rate of the flexigas entering the F-102 decreased, increase the flow rate of flexigas.灵活气进 F-102 流量变小，开大灵活气量。
		Flexigas calorific value decreased, adjust gasification ratio of the gasifier. 灵活气热值变小，调整气化器气化比例。
		The flow rate of the gas entering the F-102 decreased, increase the flow rate of gas.瓦斯进 F-102 流量变小，开大瓦斯量。
		The gas calorific value decreased, increase the flow rate of gas.瓦斯热值变小，开大瓦斯量。
	The generated steam quantity increased 产汽量增加	Increase the flow rate of gas as appropriate.视情况提高瓦斯量。

Fault 现象	Cause 原因	Action 处理方法
	PV-12502A control valve failed and opened too much PV-12502A 调节阀失灵开大	Close the manual valve on site and switch to bypass control.到现场关手阀，改副线控制。
	F-102 outlet pressure control valve failed and opened too much. F-102 出口压控阀 PV-12502B 失灵开大	Close the manual valve on site and switch to bypass control.到现场关手阀，改副线控制。
	Instrument failed 仪表失灵	Switch to manual control on DCS and contact instrument operators to deal with it. DCS 改手动，联系仪表处理。
	The inlet steam carried with water 入口蒸汽带水	Trigger TIC-12509, close PV-12502A, and close PV-12502B.触动 TIC-12509，关闭 PV-12502A，关闭 PV-12502B。
The steam outlet temperature F-102 is too high F-102 蒸汽出口温度过高	Temperature inside the furnace box F-102 increased F-102 炉膛内温度升高	The flow rate of the flexigas entering the F-102 increased, decrease the flow rate of flexigas.灵活气进 F-102 流量变大，关小灵活气量。
		Flexigas calorific value increased, adjust gasification ratio of the gasifier . 灵活气热值变大，调整气化器气化比例。
		The flow rate of the gas entering the F-102 increased, decrease the flow rate of gas.瓦斯进 F-102 流量变大，关小瓦斯量。
		The gas calorific value increased, decrease the flow rate of gas.瓦斯热值变大，关小瓦斯量。
	The opening of PV-12502A control valve is too small, the valve failed. PV-12502A 调节阀开太小，阀失灵	Close the manual valve on site and switch to bypass control.到现场关手阀，改副线控制。
	The generated steam quantity decreased 产汽量下降	Increase the flow rate of gas as appropriate.视情况降低瓦斯量。
	Gas carried with liquid 瓦斯带液	Discharge the D-105 in time.加强 D-105 排液。

Actions for runaway situation: Steam pipe ruptured, switch off the steam and shut down the furnace ,and then contact with the production coordinator to maintain the pipe network.

失控处理：若 F-102 蒸汽出口温度过低将蒸汽切出管网，中压蒸汽管网压力补外来蒸汽

(22) F-102 To control the steam outlet pressure

F-102 蒸汽出口压力的控制

1)Control range: 3.80-4.3MPa.

控制范围：3.80～4.3MPa。

2)Control target: to make sure that the F-102 outlet pressure shall be set to ±0.1MPa, to prevent safety valve from lifting and damage the equipment or causing other users production fluctuation.

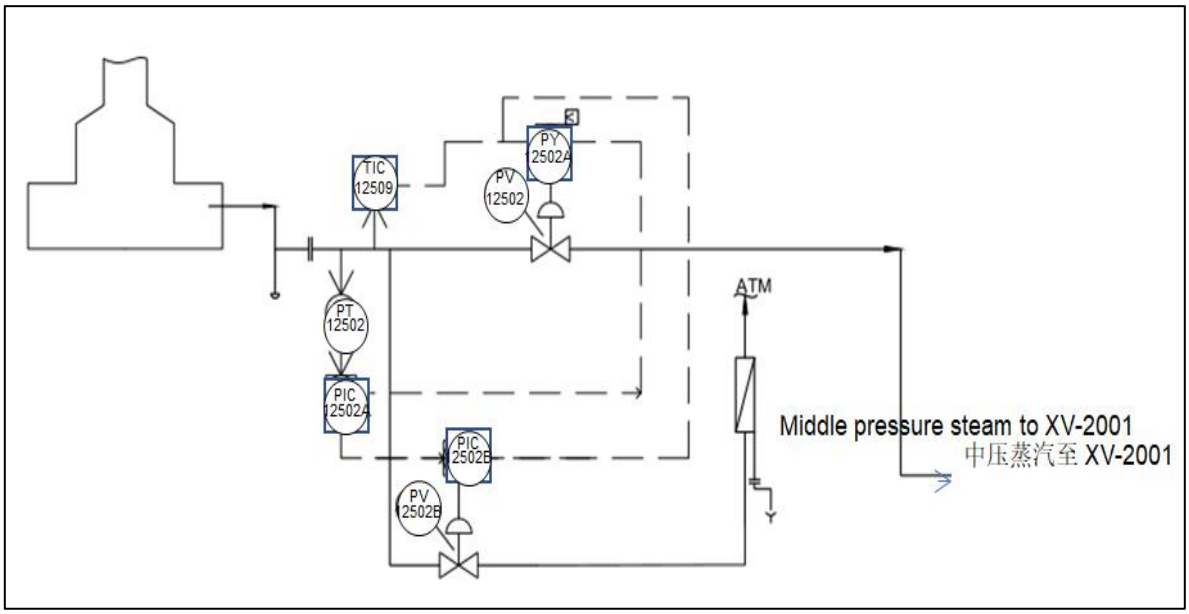
控制目标：保证 F-102 出口压力设定±0.1MPa，防止跳安全阀损坏设备或其他用户生产波动。

3)Related parameters: temperature TIC12509 of F-102 steam outlet, steam temperature TIC12509 of F-102 outlet; opening of valve controlled by pressure control valve PV-12502AB at the F-102 outlet , D-103 gas production amount.

相关参数：F-102 蒸汽出口温度 TIC12509；F-102 出口压控阀 PV-12502AB 控制阀的开度，D-103 产气量。

4)Control mode: PV-12502AB opening is controlled by PIC-12502A control, adjusting the pressure of PIC-12502, while TIC-12509 has a low range selector, when it is low low value, low range selector is switched off PV-12502A, PV-12502B is delayed to open .

控制方式：通过 PIC-12502A 控制 PV-12502AB 开度，调节 PIC-12502 的压力，同时 TIC-12509 有个低选，当低低时，低选关闭 PV-12502A，延迟打开 PV-12502B。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
D-103 steam production amount	When steam generating flow rate is increased, the outlet pressure rises; and vice versa.产汽流量增大，出口压力增加；反之下降。

D-103 产气量	
PV-12502	When the valve opening is increased, pressure drops and vice versa.阀位开大，压力降低，反之升高。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Action 处理方法
The steam outlet pressure of F102 is too high F-102 蒸汽出口压力过高	E-101 heat removal(exchange)amount increased E-101 取热量增加	Increase the opening of PV-12502A, while adjusting the gas to control the outlet temperature well, if it was not adjusted timely, then switch to vent by PV-12502B. 开大 PV-12502A，同时调节瓦斯控制好出口温度，调节不及时可以用 PV-12502B 改放空。
	E-210 heat removal(exchange)amount increased E-210 取热量增加	Increase the opening of PV-12502A, while adjusting the gas to control the outlet temperature well, if it was not adjusted timely, then switch to vent by PV-12502B. 开大 PV-12502A，同时调节瓦斯控制好出口温度，调节不及时可以用 PV-12502B 改放空。
	E-102 heat removal(exchange) amount increased E-102 取热量增加	Increase the opening of PV-12502A, while adjusting the gas to control the outlet temperature well, if it was not adjusted timely, then switch to vent by PV-12502B . 开大 PV-12502A，同时调节瓦斯控制好出口温度，调节不及时可以用 PV-12502B 改放空。
	PV-12502AB control valve failed and closed completely PV-12502AB 调节阀失灵全关	Open the bypass hand valve on site.到现场开副线手阀。
	Medium pressure steam pipe network pressure 中压蒸汽管网压力	The pipe network pressure increased, and contact the production coordinator to reduce pipe network pressure 管网压力提高，联系调度降低管网压力。
	Steam carried with water 蒸汽带水	Trigger TIC-12509, close PV-12502A, open PV-12502B.触动 TIC-12509，关闭 PV-12502A，打开 PV-12502B。

Fault 现象	Cause 原因	Action 处理方法
The steam outlet pressure of F102 is too low F-102 蒸汽出口压力过	E-101 heat removal(exchange)amount decreased E-101 取热量减少	Decrease the opening of PV-12502A, while adjusting the gas to control the outlet temperature well. If there is still PV-12502B vent openings, then firstly close the vent . 关小 PV-12502A，同时调节瓦斯控制好出口温度，如 PV-12502B 放空有开度，先关放空。
	E-210 heat removal(exchange) amount decreased E-210 取热量减少	Decrease the opening of PV-12502A, while adjusting the gas to control the outlet temperature well. If there is still PV-12502B vent openings, then firstly close the vent . 关小 PV-12502A，同时调节瓦斯控制好出口温度，如 PV-12502B 放空有开度，先关放空。
	E-102 heat removal(exchange) amount decreased E-102 取热量减少增加	Decrease the opening of PV-12502A, while adjusting the gas to control the outlet temperature well. If there is still PV-12502B vent openings, then firstly close the vent .关小 PV-12502A，同时调节瓦斯控制好出口温度，如 PV-12502B 放空有开度，先关放空。
	PV-12502AB control valve failed and closed completely PV-12502 控制阀失灵全开	Close the hand valve on site and switch to bypass control.到现场关手阀，改副线控制。
	PV-12502A control valve failed and closed completely PV-12502A 调节阀失灵全开	Close the hand valve on site and switch to bypass control.到现场关手阀，改副线控制。

Actions for runaway situations: Steam pipe ruptured, switch off the steam and shut down the furnace, and then contact with the production coordinator to maintain the pipe network.
失控处理：蒸汽管爆管，切出蒸汽停炉，联系调度维持管网压力

(23) F-102 Furnace pressure control
F-102 炉膛压力的控制
1)Control range: -20--50Pa.
控制范围：-20～-50Pa。
2)Control target: to control the F-102 furnace box pressure PIC-12701 to be negative pressure , to prevent backfire, the controlled fluctuation shall not exceed the set value of ±5Pa.

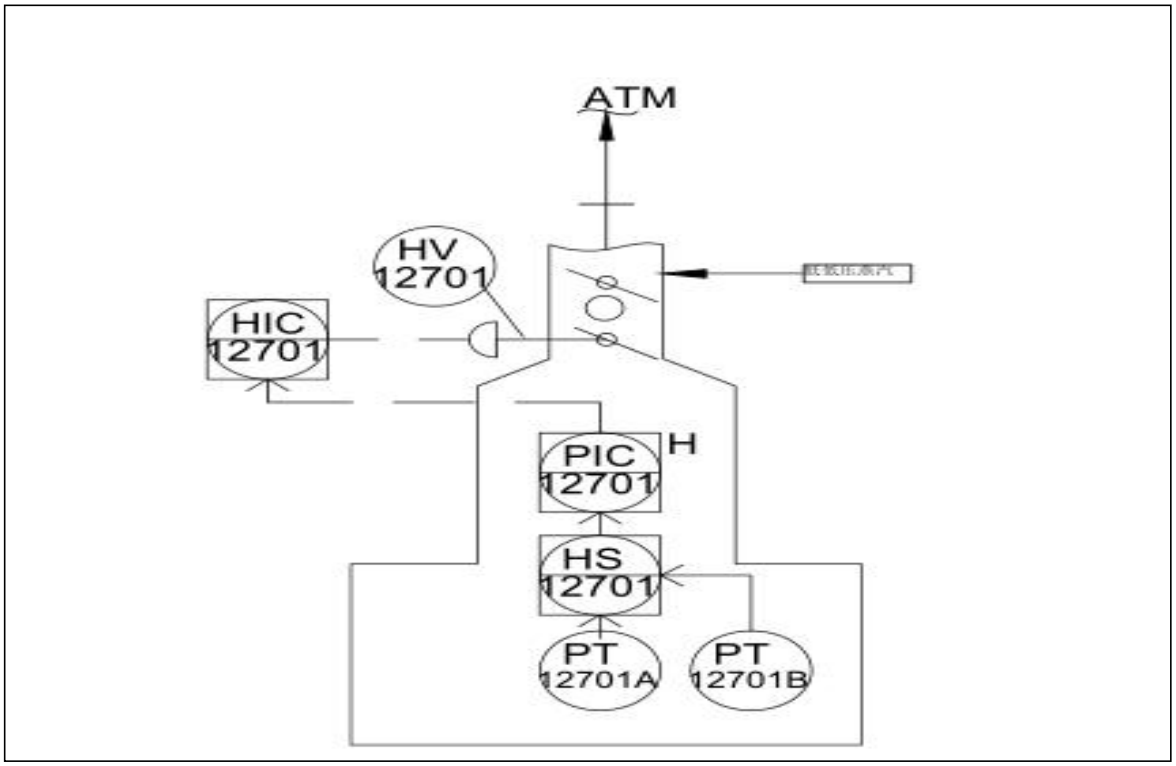
控制目标：控制 F-102 炉膛压力 PIC-12701 负压，防止回火，控制波动不超过设定值±5Pa。

3)Related parameters: the opening of HV-12701, F-104 flue gas amount, combustion gas amount, pressure, air volume entering F-102, flue gas pressure at mixing section , draft fan power.

相关参数：HV-12701 的开度，F-104 烟气量，燃烧气量、压力，进 F-102 的空气量，烟气混合段压力，引风机功率。

4)Control mode: The pressure is controlled by adjusting the flue butterfly valve at the top of furnace via PIC-12701.

控制方式：通过 PIC-12701 调节炉顶烟道蝶阀来控制压力。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
The amount of all medium entering the F-102 furnace box 进入 F-102 炉膛所有介质量	When the feeding amount of total medium is too high, the pressure increases and vice versa.总介质通入量大，压力高，反之压力低。
The outlet pressure of air preheater 出口空气预热器压力	Adjust the preheater pressure through controlling the draft fan volume.通过引风机量调节预热器压力。
The opening of butterfly valve at the top of furnace 炉顶蝶阀开度	When the opening is increased, pressure drops and vice versa.开大压力降低，反之压力升高。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Action 处理方法
The F-102 furnace box pressure increased F-102 炉膛压力升高	Medium amount entering the F-102 furnace box increased 进入 F-102 炉膛燃烧介质量增加	Find out the cause and restore it.查明原因恢复。
	HV-12702 failed and opened too much HV-12702 失灵开大	Close the front hand valve on site. 现场关前手阀。
	Draft fan failed 引风机故障	Switch the flue gas to bypass directly. 直接将烟气改旁通。
	Butterfly valve at the inlet of draft fan failed and closed fault closed 引风机入口蝶阀故障关闭	Open the bypass line for draft fan inlet butterfly valve on site.到现场开引风机入口蝶阀副线。
	HV-12701 failed and closed HV-12701 失灵关闭	Reduce the load and shake it open on site.降炉负荷，到现场手动摇开。
	Gas carried with liquid 瓦斯带液	Drain the D-105 in time.加强 D-105 排液。
The F-102 furnace box pressure decreased F-102 炉膛压力降低	Medium amount entering the F-102 furnace box decreased 进入 F-102 炉膛燃烧介质量降低	The combustion gas triggered the interlock, so find out the cause and restore it.燃烧气联锁，查明原因恢复。
	HV-12702 failed and opened completely HV-12701 失灵全开	Manually decrease the opening of HV-1270 on site. 到现场手动关小 HV-12701 开度。
	Flow rate valve for blowing air entering the F-102 failed and decreased the openings.进 F-102 鼓风流量阀失灵关小	Manually decrease the opening of HV-1270 on site. 到现场手动开大 HV-12702 开度。
	The blower was stopped 鼓风机停机	The combustion gas triggered the interlock, so start the standby blower on site.燃烧气联锁，到现场启动备用鼓风机后恢复。

Actions for runaway situations: Steam pipe ruptured so contact with the production coordinator to switch off the steam. Combustion air triggered the interlock so contact with the production coordinator to maintain the medium steam pressure.

失控处理：蒸汽管爆管，联系调度切出蒸汽，燃烧气联锁，联系调度维持中压蒸汽压力

(24) Control of F-102 pilot burner pressure PIC-12605

F-102 长明灯 PIC-12605 压力的控制

1)Control range: 0.2-0.55MPa.

控制范围：0.2～0.55MPa

2)Control target: to prevent the low pressure and pilot burner out, the controlled fluctuation shall not exceed the set value of ±0.1MPa

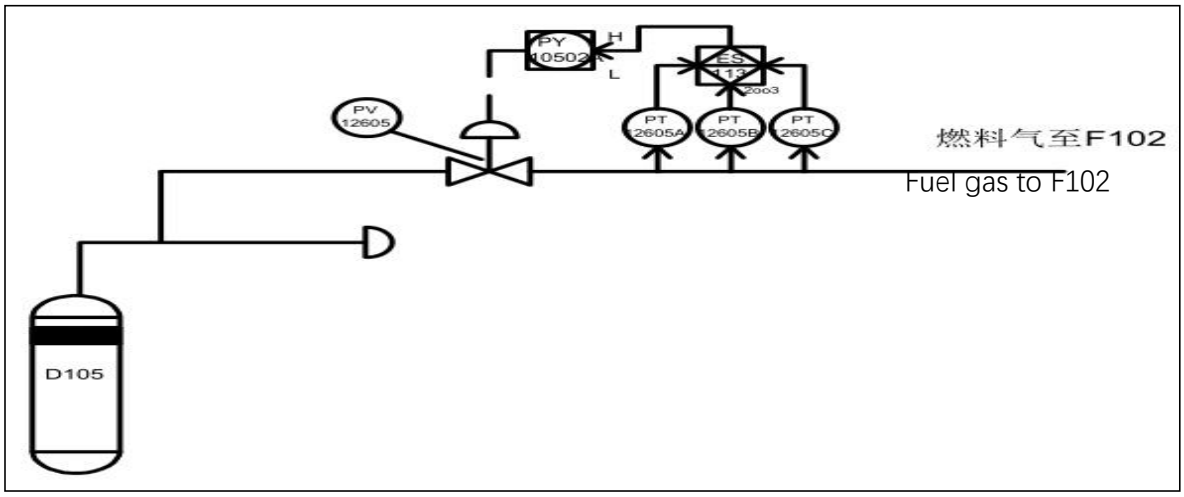
控制目标：防止压力低，长明灯熄灭，控制波动不超过设定值±0.1MPa。.

3)Related parameters: flame arrestor differential pressure, gas header pressure, inlet filter differential pressure, furnace box pressure.

相关参数：阻火器差压，瓦斯总管压力，入口过滤器差压 ，炉膛压力。

4)Control mode: F-102 pilot burner pressure is controlled by adjusting the opening of PV-12605 .When the pressure is low,three out of two low pressure will trigger an interlock.

控制方式：F-102 长明灯压力是通过调节 PV-12605 开度控制压力，同时当压力低时会带动三取二低压力联锁。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
PV-12605 opening PV-12605 开度	Increase the PV-12605 opening, so the pilot burner pressure increases, and vice versa. PV-12605 开度开大，长明灯压力提高，反之下降。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Action 处理方法
F-102 pilot burner pressure is low F-102 长明灯压力低	The pressure difference of flame arrestor was high 阻火器差压高	After switching off the flame arrestor and clean it.切换阻火器后清理。
	Gas header pressure was low 瓦斯总管压力低	Increase the opening of PV-12605.开大 PV-12605 开度。
	The pressure difference of inlet filter was high. 入口过滤器差压高	After switching off the filter and clean it.切换过滤器后清理。

	Instrument failed 仪表失灵	Self-protection bypass, contact instrument operators to deal with it.自保旁路，联系仪表处理。
	The furnace box pressure was low 炉膛压力低	Decrease the opening of HV-12701.关小 HV-12701 的开度。

Actions for runaway situations: Gas was interrupted resulting in the poilt burner pressure dropped quickly, which triggers the interlock.

失控处理：瓦斯中断，导致长明灯压力下降快，引起联锁启动

(25) Control of F-102 flexigas pressure PI-12603

F-102 灵活气压力 PI-12603 的控制

1)Control range: 0.06-0.12MPa.

控制范围：0.06～0.12MPa

2)Control target: to prevent the flexigas pressure is low, the main fire mouth out, the controlled fluctuation shall not exceed the set value of ±0.1MPa.

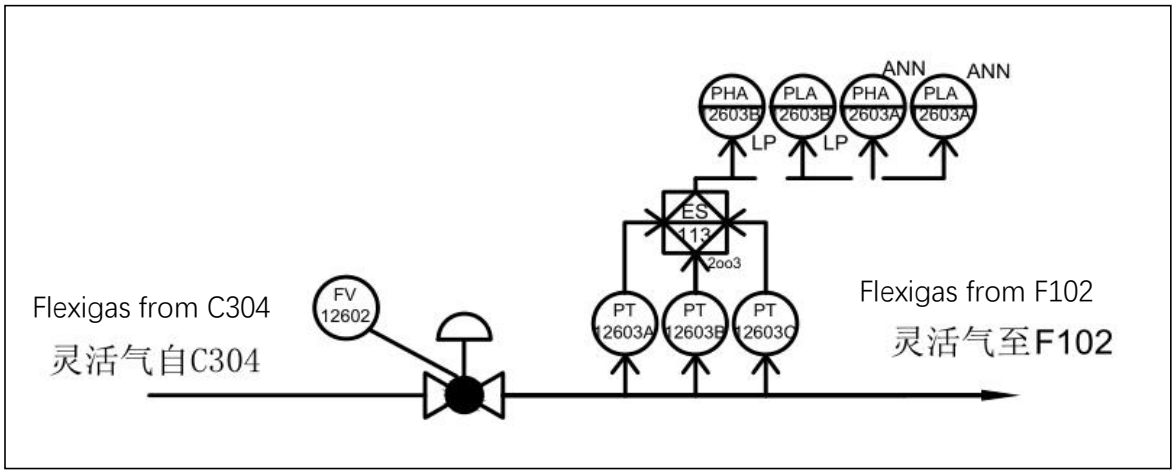
控制目标：防止灵活气压力低，主火嘴熄灭，控制设定值波动不超过±0.01MPa。

3)Related parameters: flame arrestor differential pressure, flexigas header inlet filter differential pressure, flexigas flow rate, furnace box pressure.

相关参数：阻火器差压、灵活气总管压力、入口过滤器差压、灵活气流量大小、炉膛压力。

4)Control mode: F-102 flexigas pressure is controlled by adjusting the opening of PV-12602 .When the pressure is low,three out of two low pressure will trigger an interlock.

控制方式：F-102 灵活气压力是通过调节 PV-12602 开度控制压力，同时当压力低时会带动三取二低压力联锁。



5)Normal adjustment: 正常调节:

Influence factor 影响因素	Adjustment method 调整方法
Flexigas header pressure decreased 总管灵活气压力降低	Increase the opening of PV-12602.开大 PV-12602 开度。

Flexigas header pressure increased 总管灵活气压力升高	Decrease the opening of PV-12602.关小 PV-12602 开度。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Actions 处理方法
F-102 Flexigas pressure was low F-102 灵活气压力低	The pressure difference of flame arrestor was high 阻火器差压高	After switching off the flame arrestor and clean it .切换阻火器后清理。
	Flexigas header pressure was low 灵活气总管压力低	Increase the opening of PV-12602.开大 PV-12602 开度。
	The pressure difference of filter was high. 入口过滤器差压高	After switching off the filter and clean it.切换过滤器后清理。
	Instrument failed 仪表失灵	Self-protection bypass, contact instrument operators to deal with it.自保旁路，联系仪表处理。
	The furnace box pressure was low 炉膛压力低	Decrease the opening of HV-12701.关小 HV-12701 的开度。
	The total amount of flexigas decreased 灵活气总量减少	Find out the cause, increase the PV-12602 opening.查明原因，将 PV-12602 开度开大。

Actions for runaway situations: flexigas was interrupted resulting in flexigas pressure dropped quickly, which triggers the interlock.

失控处理：灵活气中断，导致灵活气压力下降快，引起联锁启动。

(26)Temperature control of air preheater outlet flue gas 空气预热器出口烟气温度的控制

1)Control range: air preheater outlet temperature shall control to 160-200 ℃.

控制范围：空气预热器出口温度控制 160～200℃

2)Control target: make use of heating furnace flue gas heat reasonably ,and the preheater outlet temperature can be controlled within 200℃, which will prevent draft fan from burning down.

控制目标：合理利用加热炉烟气热量，控制预热器出口温度 200℃以内，防止烧坏引风机。

3)Related parameters: F-102/F-104 furnace box temperature; flue gas amount(flow rate); the opening of regulating baffle for flue gas bypass ; the opening of regulating baffle for air bypass.

相关参数：F-102/F-104 炉膛温度；烟气量；烟气旁路调节挡板开度；空气旁路调节挡板开度。

4)Control mode: 控制方式：

a. The normal air preheater outlet temperature is determined by the temperature of the furnace box and is controlled by the air bypass baffle PID.

正常空气预热器出口温度由炉膛温度决定,由空气旁路调节挡板 PID 控制。

b. When the draft fan inlet temperature (200℃) is too high, an alarm will be activated; when the temperature of flue gas entering the draft fan is high high , (250 ℃) ,open the regulating baffle of flue gas bypass , and shut down the draft fan. close the inlet and outlet baffle for preheater flue gas , and then open the air bypass baffle, close the air inlet and outlet baffle for preheater ,continue to send the air by the blower.

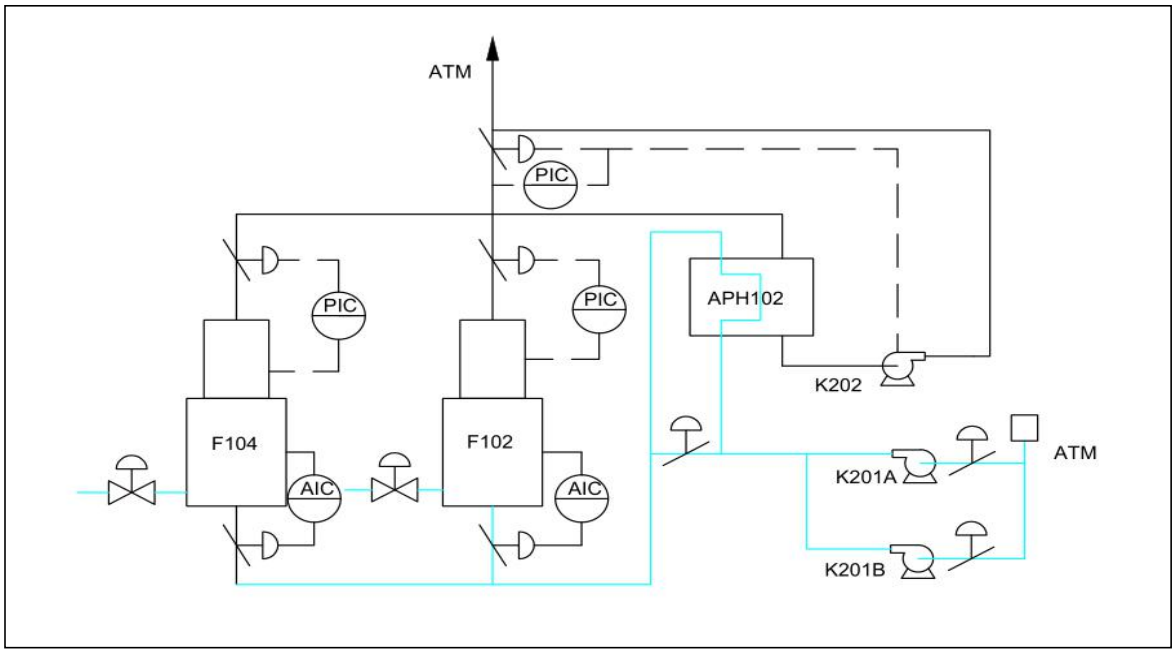
当引风机入口温度高时(200℃)报警；当进入引风机的烟气温度高高时(250℃)，打开烟气旁路调节挡板，关闭引风机、关闭预热器烟气进出口挡板，再打开空气旁路调节挡板，关闭预热器空气进出口挡板，由鼓风机继续送风。

c. When the temperature of flue gas entering the preheater is high (400 ℃),it will activate an alarm.

当烟气进入预热器温度高时(400℃)报警。

d. When the outlet temperature of preheater flue gas is lower than the specified value, increase the opening of air bypass baffle, reduce heat absorption, increase the exhaust gas temperature to avoid dew point corrosion

当预热器出口烟气温度低于规定数值时，增大空气旁路挡板开度，减少吸热量，提高排烟温度避免产生露点腐蚀。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
F-102/F-104 Furnace box temperature F-102/F-104 炉膛温度	When the furnace box temperature is increased, the outlet temperature of air preheater rises, and vice versa.炉膛温度升高，空气预热器出口温度升高，反之下降。

Influence factor 影响因素	Adjustment method 调整方法
The flow rate of flue gas 烟气量	When the flow rate of flue gas is increased, the outlet temperature of air preheater rises, and vice versa.烟气量增加，空气预热器出口温度升高，反之下降。
The opening of regulating baffle for flue gas bypass 烟气旁路调节挡板开度	When the opening of regulating baffle for flue gas bypass is increased, the outlet temperature of air preheater drops, and vice versa.增加烟气旁路调节挡板开度，空气预热器出口温度降低，反之上升。
The opening of regulating baffle for air bypass 空气旁路调节挡板开度	When the opening of regulating baffle for air bypass is decreased, the outlet temperature of air preheater drops, and vice versa.减小空气旁路调节挡板开度，空气预热器出口温度降低，反之上升。

6)Troubleshooting: 异常处理：

Fault 现象	Cause 原因	Action 处理方法
Over temperature 超温	Instrument failed 仪表失灵	Switch to manual or bypass control and observe on site, and then contact with the instrument operators to deal with it.改手动或副线控制，现场观测，并联系仪表处理。
	F-102/F-104 furnace box temperature was too high F-102/F-104 炉膛温度高	Control the temperature of the furnace box, increase the opening of flue gas bypass regulating baffle.控制炉膛温度，开大烟气旁路调节挡板。
	The opening of regulating baffle for air bypass was too big 空气旁路调节挡板开度过大	Reduce or close the air bypass regulating baffle opening, adjust the furnace box temperature.减小或关闭空气旁路调节挡板开度，调节炉膛温度。
	The flue gas bypass regulating baffle was closed 烟气旁路调节挡板关闭	Increase the opening of flue gas bypass regulating baffle, adjust the furnace box temperature.开大烟气旁路调节挡板开度，调节炉膛温度。
Low temperature 低温	Instrument failed 仪表失灵	Switch to manual or bypass control and observe on site, and then contact with the instrument operators to deal with it.改手动或副线控制，现场观测，并联系仪表处理。

Fault 现象	Cause 原因	Action 处理方法
	F-102/F-104 furnace box temperature was too low F-102/F-104 炉膛温度低	Raise the temperature of the furnace box , increase the opening of air bypass regulating baffle.提高炉膛温度，开大空气旁路调节挡板。
	The opening of regulating baffle for air bypass was too small 空气旁路调节挡板开度过小	Increase the opening of air bypass regulating baffle, adjust the furnace box temperature, reduce heat absorption, increase the exhaust gas temperature to avoid dew point corrosion.开大空气旁路调节挡板开度，调节炉膛温度，减少吸热量，提高排烟温度避免产生露点腐蚀。
	The opening of flue gas bypass regulating baffle is too big 烟气旁路调节挡板开度过大	Decrease the opening of air bypass regulating baffle, adjust the furnace box temperature, reduce heat absorption, increase the exhaust gas temperature to avoid dew point corrosion.关小烟气旁路调节挡板开度，调节炉膛温度，增加吸热量，提高排烟温度避免产生露点腐蚀。

(27) Outlet pressure control of air preheater hot air 空气预热器热空气出口压力的控制

1)Control range: air preheater outlet pressure is controlled to 500-700Pa.

控制范围：空气预热器出口压力控制 500～700Pa。

2)Control target: to ensure that the oxygen content needed guarantees the combustion and the control of slight vacuum on the furnace box .Therefore ,heat can be utilized effectively and prevent backfire safely.

控制目标：即保证燃烧需要的氧含量又要保证炉膛控制微负压，能有效利用热量，安全防回火。

3)Related parameters: flue gas flow rate; regulating baffle opening of flue gas bypass; regulating baffle opening of air bypass; chimney baffle opening of the furnaces; quick opening damper at the bottom of furnaces; blower/ induced fan motor speed.

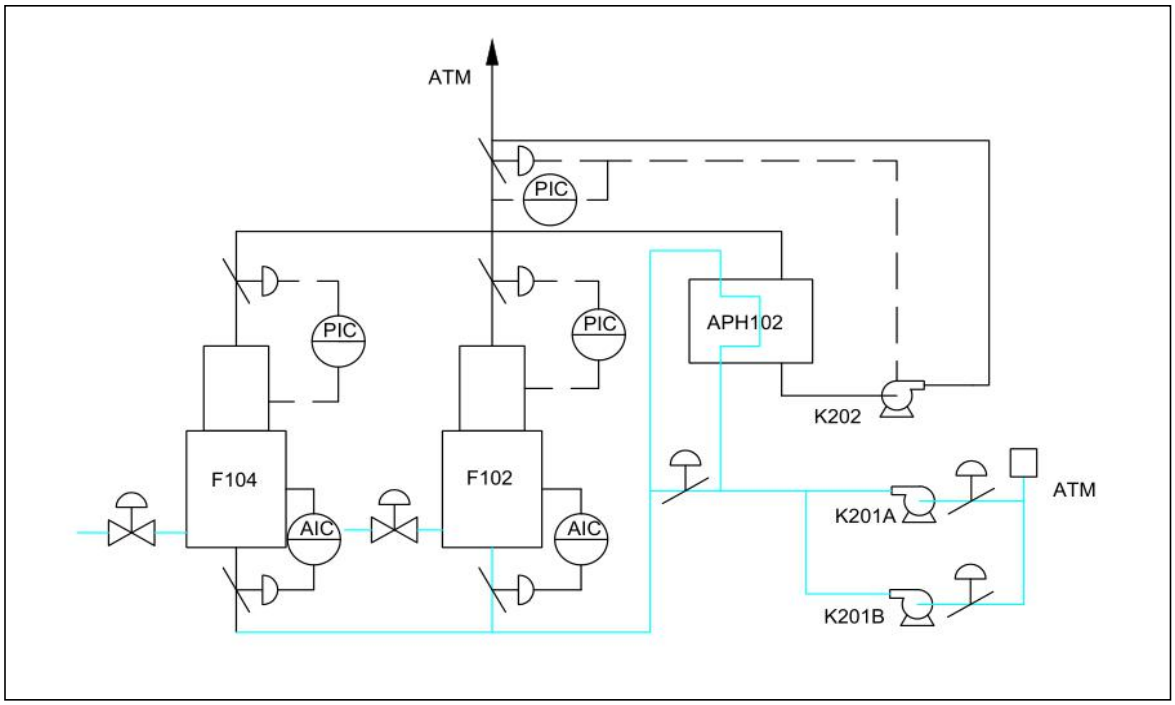
相关参数：烟气量；烟气旁路调节挡板开度；空气旁路调节挡板开度；各炉的烟囱挡板开度；各炉炉底快开风门；鼓/引风机电机的转速。

4)Control mode: 控制方式：

a. During normal operation, the flue gas bypass regulating baffle and air bypass regulating baffle are closed, the rest of baffles are opened. The total pressure of hot air is controlled by regulating the speed of blower motor. Air flow rate of other furnaces is determined by the oxygen content at the top of furnace. The front regulating baffle of furnaces are controlled respectively by using the oxygen content at the top of furnaces to meet the amount of air required by the furnaces. Draft force of the whole flue duct system is controlled by adjusting the rotary speed of induced fan motor. The slight negative pressure in flue duct is controlled by

using the rotary speed of induced fan motor and flue gas bypass regulating baffle. Make adjustments to chimney baffle of the furnaces and a fine adjustment to the negative pressure at the top of furnaces .The furnace negative pressure shall be maintained at -20--50Pa.
正常操作时，烟气旁路调节挡板、空气旁路调节挡板关闭，其余挡板打开。调节鼓风机电机的转速控制总的热风风压，其各炉的空气量由炉顶氧含量确定，利用各炉炉顶氧含量分别控制各炉前调节挡板以达到各炉所需的空气量。调节引风机电机的转速控制整个烟道系统的抽力，用引风机电机的转速和烟气旁路调节挡板分程控制烟道负压。调节各炉的烟囱挡板微调各炉炉顶负压，使各炉炉顶负压保持在-20～-50Pa。

b. When the total hot air duct pressure is low，an alarm will be given out; when the total hot air duct pressure is low low, open the door, open the quick opening damper at the bottom of furnaces and regulating baffle of flue gas bypass, and stop the blower and induced drum fan, close the inlet and outlet baffle of the preheater flue gas, heating furnace is switched to natural ventilation to burn continuously, At this time ,the furnace top negative pressure at -20--50Pa is maintained by adjusting the chimney baffle of furnaces and flue gas bypass regulating baffle
当总热风道压力低时报警；当总热风道压力低低时，打开各炉炉底快开风门、烟气旁路调节挡板，关闭鼓、引风机，关闭预热器烟气进出口挡板，加热炉改自然通风继续燃烧，此时通过调节烟气旁路调节挡板和各炉的烟囱挡板，使各炉炉顶负压保持在-20～-50Pa。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Induced Fan rotary speed 引风机的转速	When the speed is increased, the outlet pressure of the air preheater decreased, and vice versa.转速增加，空气预热器出口压力下降，反之上升。

The flow rate of flue gas 烟气量	When the flow rate of flue gas is increased, the outlet pressure of the air preheater rises, and vice versa.烟气量增加，空气预热器出口压力升高，反之下降。
The flue gas bypass regulating baffle opening 烟气旁路调节挡板开度	When the regulating baffle opening of air bypass is increased, the outlet pressure of the air preheater increases, and vice versa.减小烟气旁路调节挡板开度，空气预热器出口压力升高，反之下降。
Air bypass regulating baffle opening 空气旁路调节挡板开度	When the regulating baffle opening of flue gas bypass is reduced the outlet pressure of the air preheater increases, and vice versa. 增加空气旁路调节挡板开度，空气预热器出口压力升高，反之下降。
The opening of quick opening damper at the bottom of furnaces 各炉炉底快开风门开度	When the opening of quick opening damper at the bottom of furnaces is increased, the outlet pressure of the air preheater increases, and vice versa.增加各炉炉底快开风门开度，空气预热器出口压力升高，反之下降。
Blower rotary speed 鼓风机转速	When the blower rotary speed is increased, air preheater outlet pressure increases, and vice versa.升高鼓风机转速，空气预热器出口压力升高，反之下降。

6)Troubleshooting: 异常处理：

Fault 现象	Cause 原因	Action 处理方法
Overpressure 超压	Instrument failed 仪表失灵	Switch to manual or bypass control and observe on site, and then contact with the instrument operators to deal with it.改手动或副线控制，现场观测，并联系仪表处理。
	Induced Fan failed 引风机故障	Open the flue gas bypass regulating baffle ,, pay attention to backfire, contact maintenance operators to deal with it .开烟气旁路调节挡板，注意回火，联系维修处理。
	Baffles of the flue duct failed 烟道各挡板故障	Open the flue gas bypass regulating baffle , stop the induced fan, pay attention to backfire, contact maintenance operators to deal with it .开烟气旁路调节挡板，停引风机，注意回火，联系维修处理。
Low pressure 低压	Instrument failed 仪表失灵	Switch to manual or bypass control and observe on site, and then contact with the instrument operators to deal with it.改手动或副线控制，现场观测，并联系仪表处理。
	Flue gas bypass regulating baffle opening is excessive 烟气旁路调节挡板开度过大	Decrease the flue gas bypass regulating baffle , pay attention to backfire,关小烟气旁路调节挡板，注意回火。

Fault 现象	Cause 原因	Action 处理方法
	blower failed 鼓风机故障	Switch to the standby unit, pay attention to the combustion situation inside the furnace box , contact maintenance operators to deal with it .切至备用机组，注意炉膛燃烧情况，联系维修处理。

Precautions: 注意事项：

a. During normal operation, the flue gas bypass regulating baffle and air bypass regulating baffle are closed, the rest of baffles are opened. The total pressure of hot air is controlled by regulating the speed of blower motor. Air flow rate of other furnaces is determined by the oxygen content at the top of furnace. The front regulating baffle of furnaces are controlled respectively by using the oxygen content at the top of furnaces to meet the amount of air required by the furnaces. Draft force of the whole flue duct system is controlled by adjusting the rotary speed of induced fan motor. The slight negative pressure in flue duct is controlled by using the rotary speed of induced fan motor and flue gas bypass regulating baffle. Make adjustments to chimney baffle of the furnaces and a fine adjustment to the negative pressure at the top of furnaces .The furnace negative pressure shall be maintained at -20--50Pa.

正常操作时，烟气旁路调节挡板、空气旁路调节挡板关闭，其余挡板打开。调节鼓风机电机的转速控制总的热风风压，其各炉的空气量由炉顶氧含量确定，利用各炉炉顶氧含量分别控制各炉前调节挡板以达到各炉所需的空气量。调节引风机电机的转速控制整个烟道系统的抽力，用引风机电机的转速和烟气旁路调节挡板分程控制烟道负压。调节各炉的烟囱挡板微调各炉炉顶负压，使各炉炉顶负压保持在-20～-50Pa。

b. When the inlet temperature of induced fan is high(200℃) an alarm will be give out ; when the temperature of flue gas entering the induce fan is high high (250℃), open the gas bypass regulating baffle, stop the induced fan ,close the inlet and outlet baffle of the preheater flue gas , and then open the air bypass regulating baffle, close inlet and outlet baffle of preheater air, continue to send the air through blower.

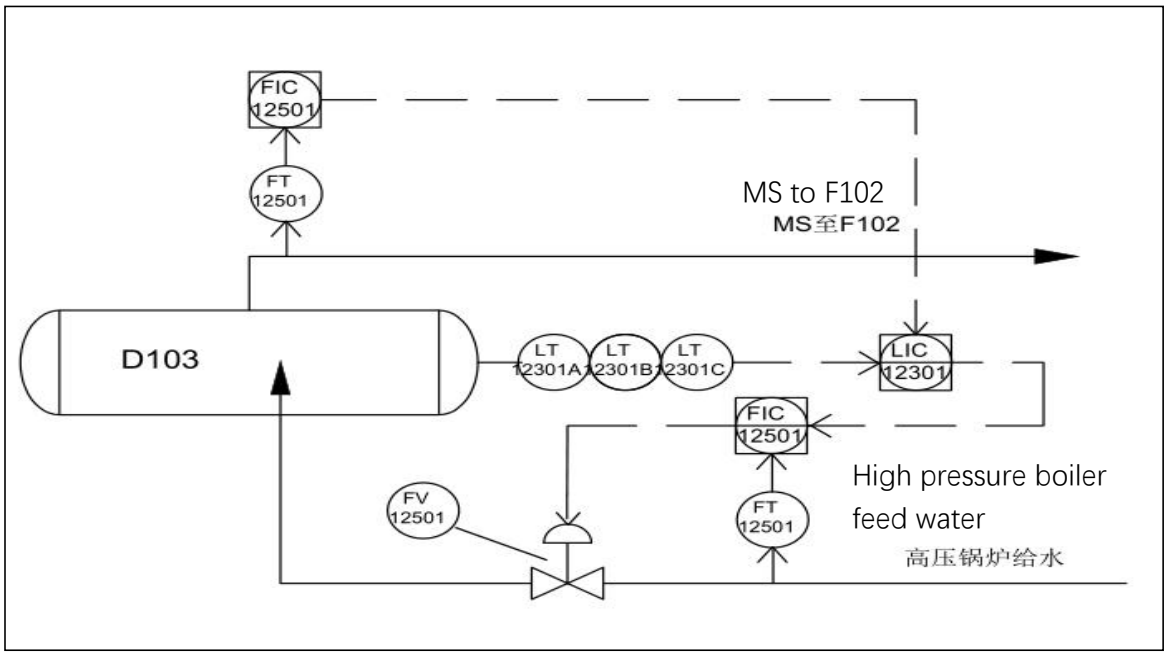
当引风机入口温度高时(200℃)报警；当进入引风机的烟气温度高高时(250℃)，打开烟气旁路调节挡板，关闭引风机、关闭预热器烟气进出口挡板，再打开空气旁路调节挡板，关闭预热器空气进出口挡板，由鼓风机继续送风。

c. When the total hot air duct pressure is low，an alarm will be given out; when the total hot air duct pressure is low low, open the door, open the quick opening damper at the bottom of furnaces and regulating baffle of flue gas bypass, and stop the blower and induced drum fan, close the inlet and outlet baffle of the preheater flue gas, heating furnace is switched to natural ventilation to burn continuously, At this time ,the furnace top negative pressure at -20--50Pa is maintained by adjusting the chimney baffle of furnaces and flue gas bypass regulating baffle.

当总热风道压力低时报警；当总热风道压力低低时，打开各炉炉底快开风门、烟气旁路调节挡板，关闭鼓、引风机，关闭预热器烟气进出口挡板，加热炉改自然通风继续燃烧，此时通过调节烟气旁路调节挡板和各炉的烟囱挡板，使各炉炉顶负压保持在-20～-50Pa。

d. When the flue gas temperature at the preheater outlet is lower than the specified value,increase the opening of air bypass baffle and reduce the heat asorption ,increase the fume exhaust to avoid the dew point corrosion 。
当预热器出口烟气温度低于规定数值时，增大空气旁路挡板开度，减少吸热量，提高排烟温度避免产生露点腐蚀。

(28) D-103 Liquid level control
D-103 液位的控制
1)Control range: 40-70%.
控制范围：40～70%。
2)Control target: In normal operation, steam drum level shall be controlled to 50% (+ 5% fluctuation). Steam drum is not allowed in an empty or full of water condition.
控制目标：正常操作中气包液位控制 50%（±5%的波动）。严禁汽包满水或汽包干锅现象出现。
3)Related parameters: Steam drum water supply volume; water supply temperature; pipe network pressure; E-102/E-101/E-210 heat exchange volume; blowdown capacity ; deaerator water pressure.
相关参数：汽包上水量；上水温度；管网压力；E-102/E-101/E-210 取热量；排污量；除氧水压力。
4)Control mode:
控制方式：
a. The steam drum level LIC-12301 and the steam drum feed water FIC-12501/ the steam drum generated steam FIC-12502 are in three parameters control.
汽包液位 LIC-12301 与气包上水 FIC-12501/气包产汽 FIC-12502 三冲量控制。
b. The steam drum level LIC-12301 and the steam drum feed water FIC-12501are in cascade control.
汽包液位 LIC-12301 与气包上水 FIC-12501 串级控制。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Steam drum feed water flow rate 汽包上水量	When the steam drum feed water flow rate is increased, the steam drum level LIC-12301 increases and vice versa. 汽包上水量 FIC-12501 增加，汽包液位 LIC-12301 升高。反之下降。
The steam drum pressure 气包压力	When the steam drum pressure is increased, steam drum level LIC-12301decreases and vice versa.汽包压力升高，汽包液位 LIC-12301 下降。反之上升。
E-102/E-101/E-210 heat exchange volume E-102/E-101/E-210 取热量	When the heat supply of evaporators is increased, water level declines and vice versa.各蒸发器取热量增加，汽包液位下降。反之上升。
Blowdown 排污量	When the amount of blowdown is increased and the level of the steam drum decreases and vice versa.排污量增加，汽包液位下降。反之上升。
Deaerating water pressure 除氧水压力	When the deaerating water pressure is increased, the steam drum level rises and vice versa.除氧水压力升高，汽包液位上升。反之下降。
Deaerating water temperature 除氧水温度	When the deaerating water temperature is increased, the steam drum level drops and vice versa.除氧水温度上升，汽包液位下降。反之上升。

6)Troubleshooting: 异常处理：

Fault 现象	Cause 原因	Action 处理方法
Steam drum feed water was interrupted 汽包上水中断	Instrument failed 仪表失灵	Switch to manual or bypass control and observe on site, and then contact with the instrument operators to deal with it.改手动或副线控制，现场观测，并联系仪表处理。
	P-104 pump stopped P-104 停泵	Switch to the backup pump and contact with the instrument operators to deal with it.切换至备用泵，并联系钳工处理。
	control valve failed 调节阀故障	Switch to the bypass and contact with the instrument operators to deal with it.现场改付线，并联系仪表处理。
	Deaerator level is low 除氧器液位低	Contact the utility to increase the supply of demineralized water.联系公用加大除盐水补给。
	P-104 pressure control valve is fully open P-104 压控阀故障全开	Switch to manual or bypass control and observe on site, and then contact with the instrument operators to deal with it.改手动或副线控制，现场观测，并联系仪表处理。
	P-104 pumped out P-104 抽空	Switch to the backup pump and contact with the instrument operators to deal with it.切换至备用泵，并联系钳工处理。
Steam drum was full of water 汽包满水	Instrument failed 仪表失灵	Switch to manual or bypass control and observe on site, and then contact with the instrument operators to deal with it.改手动或副线控制，现场观测，并联系仪表处理。
	Steam and water azeotropy 汽水共沸	Control the steam drum pressure and drain in time (continuous discharge).控制汽包压力，加强排污（连排）。
	Control valve failed 调节阀失灵	Switch to manual or bypass control and observe on site, and then contact with the instrument operators to deal with it.改手动或副线控制，现场观测，并联系仪表处理。

Remarks: The heat exchanger tube bundle burst, causing the steam drum to be empty, see the emergency action plan.

备注：取热器管束爆裂，造成汽包干锅情况，参见紧急预案。

(29) DH-101 pressure control

DH-101 压力控制

1)Control range: DH-101 pressure is controlled to 0.09-0.11Pa.

控制范围：DH-101 压力控制 0.09～0.11Pa

2)Control target: The pressure of DH-101 is controlled to 0.1MPa (±0.05MPa fluctuation) in order to achieve good oxygen removal.

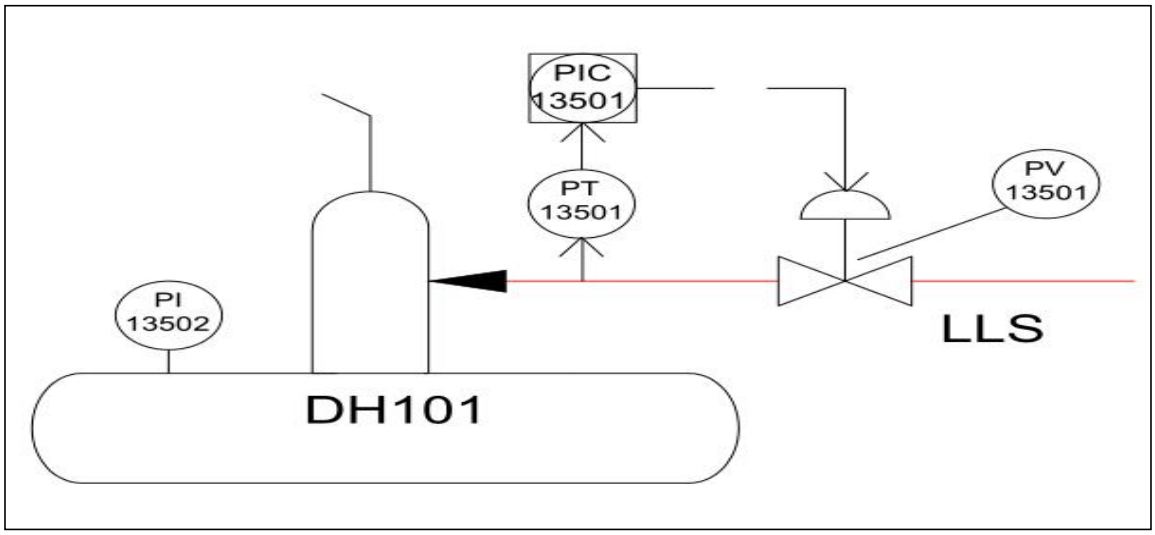
控制目标：将 DH-101 压力控制 0.1MPa（±0.05MPa 的波动），以便达到很好的除氧目的。

3)Related parameters: LLS temperature, LLS pressure, demineralized water amount, demineralized water temperature, DH-101 top vent opening, DH-101 liquid level, condensed water volume, condensed water temperature.

相关参数：LLS 温度、LLS 压力、除盐水量、除盐水温度、DH-101 顶部放空开度、DH-101 液位、凝结水量、凝结水温度。

4)Control mode: LLS pressure PIC-13501 PID control DH-101 pressure PI-13502, adjust the top opening of DH-101 according to the oxygen removal condition.

控制方式：LLS 压力 PIC-13501 PID 控制 DH-101 压力 PI-13502，根据除氧情况调节 DH-101 顶部放空开度。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
LLS pressure LLS 压力	When the LLS pressure is increased and the DH-101 pressure PI-13502 rises and vice versa. LLS 压力增大，DH-101 压力 PI-13502 升高。反之下降。
LLS flow rate LLS 流量	When the LLS flow rate is increased and the DH-101 pressure PI-13502 rises and vice versa. LLS 流量升高，DH-101 压力 PI-13502 升高。反之下降。
Demineralized water temperature 除盐水温度	DH-101 pressure PI-13502 increased as the demineralized water temperature increased and vice versa. As demineralized water flow rate increases, PI-13502 decreases. 除盐水温度升高，DH-101 压力 PI-13502 升高。反之下降。除盐水流量上升，PI-13502 压力下降。

Influence factor 影响因素	Adjustment method 调整方法
Condensate temperature 凝结水温度	When the condensate temperature is increased and the DH-101 pressure PI-13502 increases and vice versa. As condensate flow rate increases, PI-13502 increases. 凝结水温度升高，DH-101 压力 PI-13502 升高。反之下降。凝结水水流量上升，PI-13502 压力上升。
DH-101 top venting opening DH-101 顶部放空开度	When the DH-101 top vent opening is reduced, and the DH-101 pressure PI-13502 raises and vice versa.减小 DH-101 顶部放空开度，DH-101 压力 PI-13502 升高。反之下降。

6)Troubleshooting: 异常处理：

Fault 现象	Cause 原因	Action 处理方法
Pressure was high 压力高	Instrument failed 仪表失灵	Switch to manual or bypass control and observe on site, and then contact with the instrument operators to deal with it.改手动或副线控制，现场观测，并联系仪表处理。
	LLS steam valve failed LLS 蒸汽阀失灵	Switch to manual or bypass control and observe on site, and then contact with the instrument operators to deal with it.改手动或副线控制，现场观测，并联系仪表处理。
	LLS pressure fluctuated LLS 压力波动	Adjust the operation and contact the utility system to stabilize the pressure.调整操作，并联系公用系统稳定压力。
	LLS flow rate fluctuatedLLS 流量波动	Adjust the operation and contact the utility system to stabilize the flow rate.调整操作，并联系公用系统稳定流量。
	Demineralized water temperature changed 除盐水温度变化	Adjust the operation and contact the utility system to stabilize the temperature. Affected by the condensate system, the temperature of the demineralized watergenerally changes littleand the flow rate changes greatly.调整操作，并联系公用系统稳定温度。受凝结水系统影响，一般除盐水温度变化小，流量变化大。
	Condensate temperature changed 凝结水温度变化	Check the condensate water process flow and check the A-304 operation situation .检查凝结水流程，检查 A-304 运行情况。
	The opening of DH-101 top venting was decreased DH-101 顶部放空关小	Open the opening of DH-101 top venting.开大 DH-101 顶部放空。

Fault 现象	Cause 原因	Action 处理方法
Pressure was low 压力低	Instrument failed 仪表失灵	Observe on site and then contact with the instrument operators to deal with it.现场观测，并联系仪表处理。
	LLS pressure fluctuated LLS 压力波动	Adjust the operation and contact the utility system to stabilize the pressure.调整操作，并联系公用系统稳定压力。
	LLS flow rate fluctuated LLS 流量波动	Adjust the operation and contact the utility system to stabilize the flow rate.调整操作，并联系公用系统稳定流量。
	Demineralized water temperature changed 除盐水温度变化	Adjust the operation and contact the utility system to stabilize the temperature.调整操作，并联系公用系统稳定温度。
	Condensate temperature changed 凝结水温度变化	Check the condensate flow and check the A-304 operation.检查凝结水流程，检查 A-304 运行情况。
	The opening of DH-101 top venting was increased DH101 顶部放空开大	Close the opening of DH-101 top venting. 关小 DH-101 顶部放空。

(30) Control of DH-101 liquid level

DH-101 液位的控制

1)Control range: 40-70%.

控制范围：40～70%。

2)Control target: control to the reference value ± 5% so that make ensure that water is supplied continuously to the steam drum.

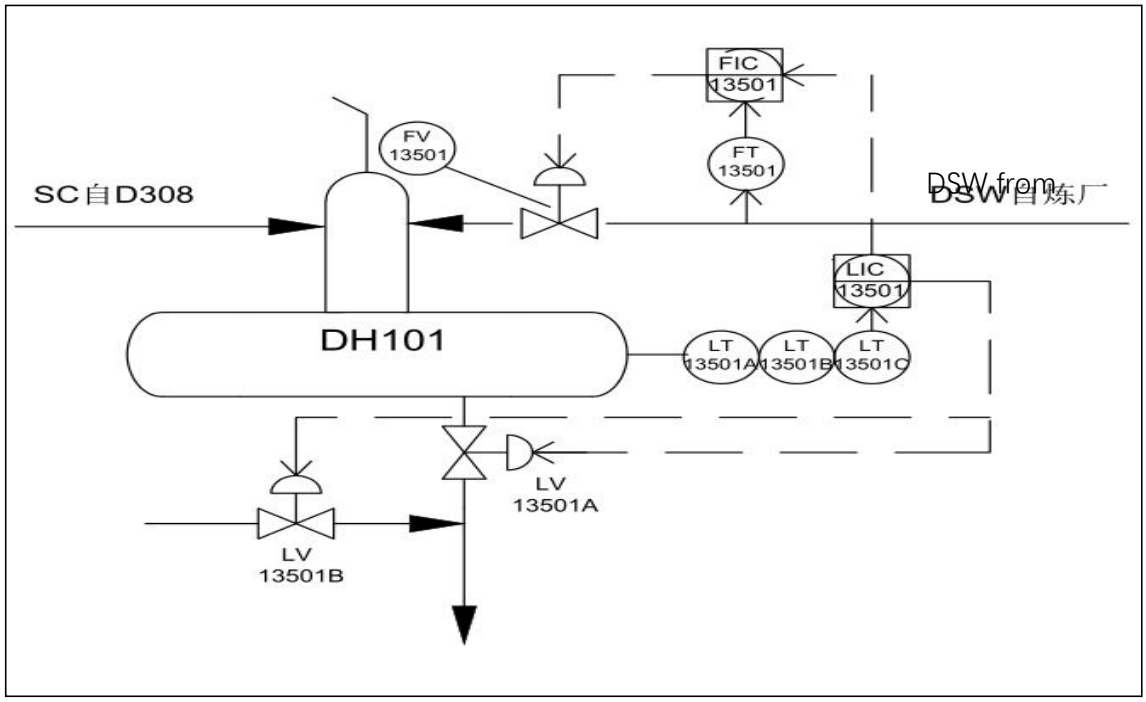
控制目标：控制在基准值±5%,保证向汽包持续供水。

3)Related parameters: flow rate of demineralized water from refinery FIC-13501; flow rate of steam condensate from D-308; flow rate of high pressure boiler water to steam drum FIC-12501; flow rate FIC-20902 of low pressure boiler water to E-207; flow rate of high and low pressure boiler water to the users.

相关参数：自炼厂来除盐水的流量 FIC-13501；自 D-308 来蒸汽凝结水的流量；高压锅炉水去汽包的流量 FIC-12501；低压锅炉水去 E-207 流量 FIC-20902；高、低压锅炉水去各用户的流量。

4)Control method: DH-101 liquid level LIC-13501 and the flow rate of demineralized water from the refinery FIC-13501 is in cascade control. When the DH-101 liquid level is HH, close the demineralized valve RBV-13501 while opening the drain valves LV-13501B and LV-13501A (cooling water), and when the liquid level is LL, stop the pumps P-104 and P-108.

控制方式： DH-101 液位 LIC-13501 与自炼厂来除盐水的流量 FIC-13501 串级控制。当 DH-101 液位 HH 时，关闭除盐水阀 RBV-13501 同时打开排污阀 LV-13501B 和 LV-13501A(冷却水)，液位 LL 停泵 P-104、P-108



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Demineralized water flow rate FIC-13501 除盐水流量 FIC-13501	As the demineralized flow rate is increased, the liquid level rises and vice versa.除盐水流量增大，液位上升。反之下降。
The total outlet flow rate of P-104/P-108 P-104/P-108 的出口总流量	The total outlet flow of P-104/P-108 is increased and the liquid level drops and vice versa. P-104/P-108 的出口总流量增加，液位下降。反之上升。
LV-31901 valve opening LV-31901 阀位开度	Normally, it will be put into cascade control with the expansion tank D-308.when the valve opening is increased and the liquid level rises and vice versa.正常情况与扩容罐 D-308 投串级，阀开大，液位上升。反之下降。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Action 处理
DH-101 liquid level fluctuated DH-101 液位波动	FIC-13501 instrument failed FIC-13501 仪表失灵	Switch to manual or bypass control and observe on site, and then contact with the instrument operators to deal with it.改手动或副线控制，现场观测，并联系仪表处理。

Fault 现象	Cause 原因	Action 处理
DH-101 liquid level was high DH-101 高液位	Subsequent user consumption suddenly was decreased or the amount of feed suddenly was increased 后续用户用量突然减小或进入量突然增加	Close RBV-13501, after the liquid level returns to normal, open RBV-13501 and restore to normal control.关 RBV-13501，等液位恢复正常后，开 RBV-13501，恢复正常控制。
DH-101 liquid level was high high DH-101 高高液位	Subsequent user usage suddenly decreases or the amount of entry suddenly increases 后续用户用量突然减小或进入量突然增加	Open the bottom drain valve LV-13501B and the circulating cold water valve LV-13501A. After the liquid level returns to normal, turn off the LV-13501A and B to restore to normal control.开底部排空阀 LV-13501B 和循环冷水阀 LV-13501A，等液位恢复正常后，关 LV-13501A 和 B，恢复正常控制。
	Pump failed 机泵故障	Start the spare pump and contact the repair department.启备用泵，联系维修处理。
DH-101 liquid level was low low DH-101 低低液位	Instrument failed 仪表失灵	Switch to manual or bypass control and observe on site, and then contact with the instrument operators to deal with it.改手动或副线控制，现场观测，并联系仪表处理。
	Inlet water was reduced or interrupted 进水减小或中断	Stop the pump P-104 and P-108, contact the production coordinator to restore the demineralized water, and increase the water supply valve.停泵 P-104 和 P-108,联系调度恢复除盐水，开大上水阀。

Remarks:备注：

Actions for runaway situations treatment: If the low and low liquid levels cannot be recovered in time, the steam level is low, and the accident plan is transferred.

失控处理：若低低液位不能及时恢复，引发汽包液位低，转入事故预案

(31)Temperature control TIC-12202 1 of flexigas to D-301

灵活气至 D-301 温度 TIC-12202 控制

1)Control range: control temperature 190-230℃.

控制范围：控制温度 190～230℃

2)Control target: control at the reference value ± 5℃, so that the flexigas is cooled to the requirements of the water washing system and the deaerated water has sufficient heat exchange(supply ?).

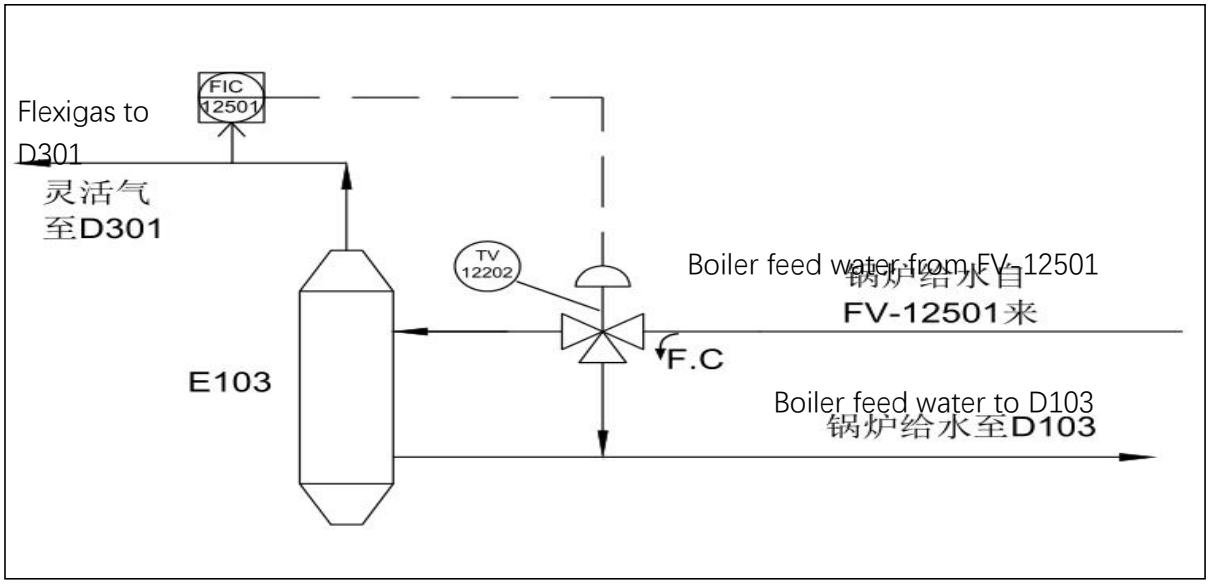
控制目标：控制在基准值±5℃，使灵活气降温至水洗系统要求且使除氧水有足够的取热。

3)Related parameters: flow rate and temperature of deaerated water to E-102/E-103; flexigas temperature and flow rate from the heater.

相关参数：进 E-102/E-103 除氧水的流量和温度； 自加热器来的灵活气温度和流量。

4)Control mode: generally adopts PID control for deaerator water entering to the preheater three-way valve TV-12202.

控制方式：一般采用除氧水进预热器三通阀 TV-12202 PID 控制。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
TV-12202 valve opening TV-12202 阀位开度	When the valve is closed, the amount of water circulating into the E-103 increases, and the temperature of the flexigas decreases, and vice versa.关阀，进 E-103 的水循环量增多，灵活气温度下降，反之，则升高。
Flexigas temperature from the heater 自加热器来灵活气温度	The temperature of the gasifier is controlled to be normal, and the amount of spraying steam and water and the quenching coke at the top of the gasifier are normal.控制气化器温度正常，气化器顶喷汽喷水和急冷焦量正常。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Action 处理
The	Temperature control valve	Switch to manual or bypass control and

temperature of flexigas to D-301 fluctuated 灵活气至 D-301 温度波动	TIC-12202 failed 温控阀 TIC-12202 失灵	observe on site, and then contact with the instrument operators to deal with it.改手动或副线控制，现场观测，并联系仪表处理。
The temperature of flexigas to D-301 fluctuated was too high 灵活气至 D-301 温度过高	Flexigas temperature from the heater was extremely high 自加热器来灵活气温度超高	Open the spraying steam and water at the top of heater to reduce the flexigas temperature.开加热器顶喷汽喷水，降低灵活气温度。
	Flow rate of deaerated water was low or interrupted 除氧水流量低或中断	Check the deaerator level and the operating status of the P-104 and restore in time.查看除氧器液位和 P-104 的运行状况，及时恢复。
The temperature of flexigas to D-301 fluctuated was too low 灵活气至 D-301 温度过低	The three-way valve TV-12202 is faulty, and the amount of water circulating water entering into the preheater was too large.三通阀 TV-12202 故障，进预热器循环水量过大	Repair or replace the three-way valve as soon as possible.尽快对三通阀进行维修或更换。
	Flexigas temperature from the heater was low 自加热器来灵活气温度低	Increase the flexigas temperature while meeting the process requirements.在满足工艺要求情况下，提高灵活气温度。

(32) Outlet temperature control of F-101 auxiliary combustion chamber (only needs to be controlled during start-up, during normal operation will be used as temperature adjustment air operation)

F-101 辅助燃烧室出口温度的控制（仅开工初期需要控制，正常时作为调温风运行通道）

1)Control range: furnace outlet temperature TIC-11304 is 300-600°C; furnace box temperature TIC-11302 is less than and equal to 950℃.

控制范围：炉出口温度 TIC-11304 在 300～600℃；炉膛温度 TIC-11302 ≯950℃。

2)Control target: This unit is equipped with an auxiliary combustion chamber F-101. It is used to provide main hot air when baking the liner of the heater and heating the coke powder. When it is normal, it is used as the main air passage. The specific temperature after igniting the furnace is not more than the set value ±10℃.

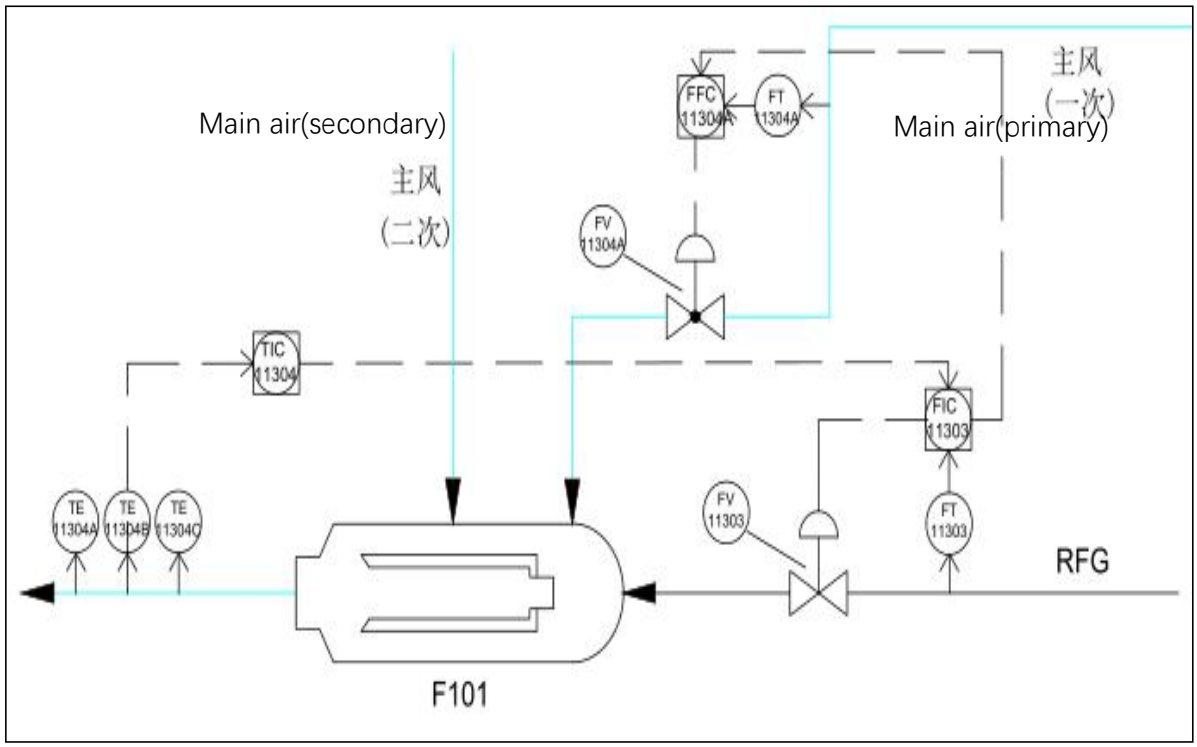
控制目标：本单元设有一个辅助燃烧室 F-101，烘加热器衬里及加热焦粉时提供热主风使用，正常时作为主风通道，点炉后具体温度不超过设定值±10℃。

3)Related parameters: fuel gas volume; fuel gas pressure; the blowing air volume; blowing air temperature; primary and secondary air distribution ratio.

相关参数：燃料气量；燃料气压力；鼓入空气量；鼓入空气温度;一、二次风配比。

4)Control mode: furnace outlet temperature TIC-11304 and main fuel gas (main tile) FIC-11303 is in cascade control. The primary air volume FFC-11304A and the fuel gas FIC-11303 is in proportional control.

控制方式：炉出口温度 TIC-11304 与主燃料气（主瓦）FIC-11303 串级控制。一次风量 FFC-11304A 与燃料气 FIC-11303 比例控制。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
RFG flow rate RFG 流量	When the flow rate of RFG FIC-11303 is increased, and the furnace outlet temperature TIC-11304 rises and vice versaRFG FIC-11303 流量增大，炉出口温度 TIC-11304 升高。反之下降。.
RFG pressure RFG 压力	When the pressure of RFG PG-11306 is increased and the furnace outlet temperature TIC-11304 rises and vice versa. RFG PG-11306 压力升高，炉出口温度 TIC-11304 升高。反之下降。
Main air volume 主风量	When the main air volume FLC-11305 is increased and the furnace outlet temperature TIC-11304 decreases and vice versa. 主风量 FLC-11305 增加，炉出口温度 TIC-11304 降低。反之下降。
Primary and secondary air distribution ratio 一、二次风配比	The primary air mainly provides the oxygen needed for combustion and carries heat out of the furnace.一次风主要提供燃烧需要的氧气及将热量带出炉膛。
Main air temperature 主风温度	When the main air temperature TI-11803 is increased and the furnace outlet temperature TIC-11304 rises and vice versa.主风温度 TI-11803 升高，炉出口温度 TIC-11304 升高。反之下降。

6)Troubleshooting: 异常处理：

Fault 现象	Cause 原因	Action 处理方法
Flame of furnace out 炉熄火	RFG interrupted RFG 中断	Close the inlet hand valve of RFG entering into the F-101, decrease the inlet valve opening of main air entering into the F-101, contact the main air post to carry out emergency response, and re-ignite the furnace after the RFG is restored.关闭 RFG 进 F-101 入口手阀，关小主风进 F-101 入口阀，联系公用紧急处理，RFG 恢复后重新点炉。
	Main air interrupted 主风中断	Close the RFG into the F-101 inlet hand valve, close the main air into the F-101 inlet valve, contact the main air station for emergency treatment, and re-fire the main air after recovery.关闭 RFG 进 F-101 入口手阀，关小主风进 F-101 入口阀，联系主风岗位紧急处理，主风恢复后重新点炉。
	RFG/PA distribution ratio was imbalanced RFG/PA 配比失衡	Close the inlet hand valve of RFG entering into the F-101, decrease the inlet valve opening of main air entering into the F-101, re-ignite the furnace 关闭 RFG 进 F-101 入口手阀，关小主风进 F-101 入口阀，重新点炉。

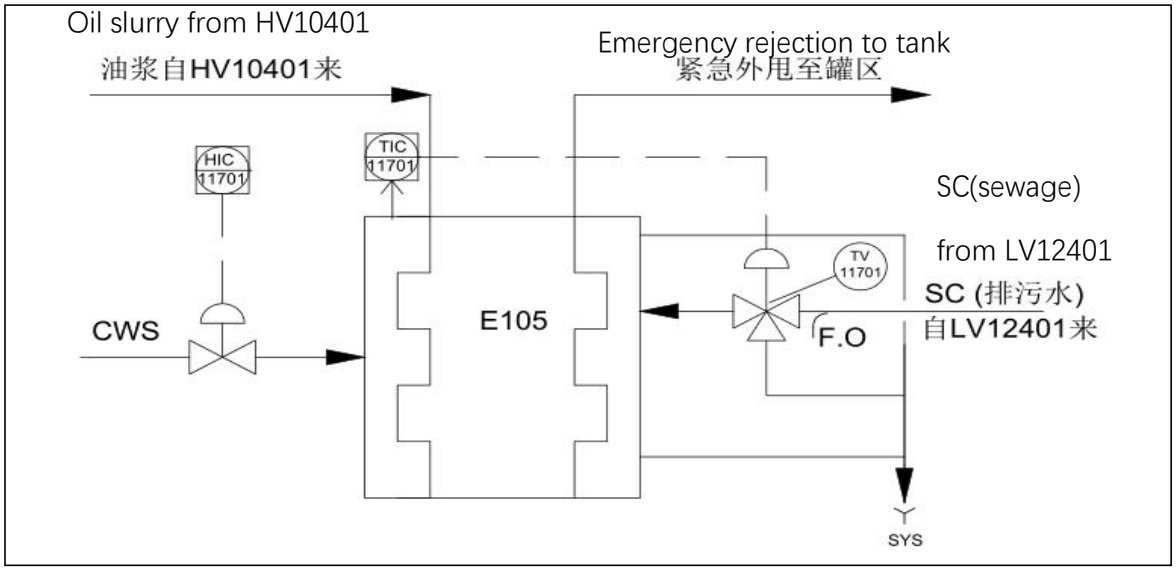
Fault 现象	Cause 原因	Action 处理方法
	Gas carried with liquid 瓦斯带液	Contact production coordinator to drain in time.联系调度加强脱水。
Furnace overheated 炉超温	RFG/PA distribution ratio was imbalanced RFG/PA 配比失衡	Adjust the RFG/PA distribution ratio.调整 RFG/PA 配比。
	RFG pressure / flow fluctuated RFG 压力/流量波动	Decrease the opening of pressure control valve and contact the common stable pipe network pressure.操作关小压控阀，联系公用稳定管网压力。
	Main air fluctuated 主风波动	The main air section stabilizes the main air volume.主风岗位稳定主风量。
Flame with smoke / flame turned blue 火焰带烟/火焰变蓝	RFG/PA distribution ratio was imbalanced RFG/PA 配比失衡	The flame brings smoke, and the air volume should be increased appropriately. The flame turns blue, increase RFG appropriately. A bright flame indicates sufficient oxygen content, while a darker flame indicates insufficient oxygen supply.火焰带烟，适当增加一次风量。 火焰变蓝，适当增加 RFG。火焰明亮则说明氧含量充足，灰暗则供氧不足

Remarks: equipment overview: This unit is equipped with an auxiliary combustion chamber F-101. It is used to provide main hot air when baking the liner of the heater and heating the coke powder. When it is normal, it is used as the main air passage.
备注：设备概述:本单元设有一个辅助燃烧室 F-101，烘加热器衬里及加热焦粉时提供热主风使用，正常时作为主风通道。

(33) Water temperature control TIC-11701 of E-105 cooling water tank
E-105 冷却水箱水温 TIC-11701 控制
1)Control range: The temperature of control shall be controlled to 80°C.
控制范围：控制温度在 80℃。
2)Control target: to control at ±10 °C of the reference value ,to prevent oil slurry from condensing and fouling on the pipe wall and affecting the heat exchange.
控制目标：控制在基准值±10℃，防止管壁上有油浆冷凝结垢，影响换热。
3)Related parameters: temperature and flow rate of condensate from E-104; temperature and flow rate of circulating water into E-105; temperature and flow rate of oil slurry entering the E-105.
相关参数：自 E-104 来凝结水的温度和流量；进 E-105 循环水的温度和流量；进 E-105 油浆的温度和流量。

4)Control mode: generally adopts three-way temperature control valve TV-11701 PID to control E-105 water temperature TIC-11701.

控制方式：一般采用三通温控阀 TV-11701 PID 控制 E-105 水温 TIC-11701。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
TV-11701 valve opening TV-11701 阀位开度	When the valve is opened, the water temperature of E-105 rises.开阀，E-105 水温上升。
HV-11701 valve opening HV-11701 阀位开度	When the valve is opened, the water temperature of the E-105 drops.开阀，E-105 水温下降。
Circulating water temperature 循环水温度	Contact the production coordinator to reduce circulating water temperature so that the E105 temperature drops.联系调度，降低循环水温度，E105 温度下降。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Action 处理
Water temperature fluctuated 水温波动	Three-way temperature control valve TIC-11701 failed 三通温控阀 TIC-11701 失灵	Switch to manual or bypass control and observe on site and contact with the instrument operators to deal with it ; oil slurry running down changed.改手动或副线控制，现场观测，并联系仪表处理；外甩油浆量变化。

Fault 现象	Cause 原因	Action 处理
Water temperature wass too high 水温过高	Three-way valve failed, the amount of condensed water into the E-105 is too large 三通阀故障，凝结水进 E-105 量过大	Increase the circulating water volume and repair or replace the three-way valve as soon as possible.增大循环水量，尽快对三通阀进行维修或更换。

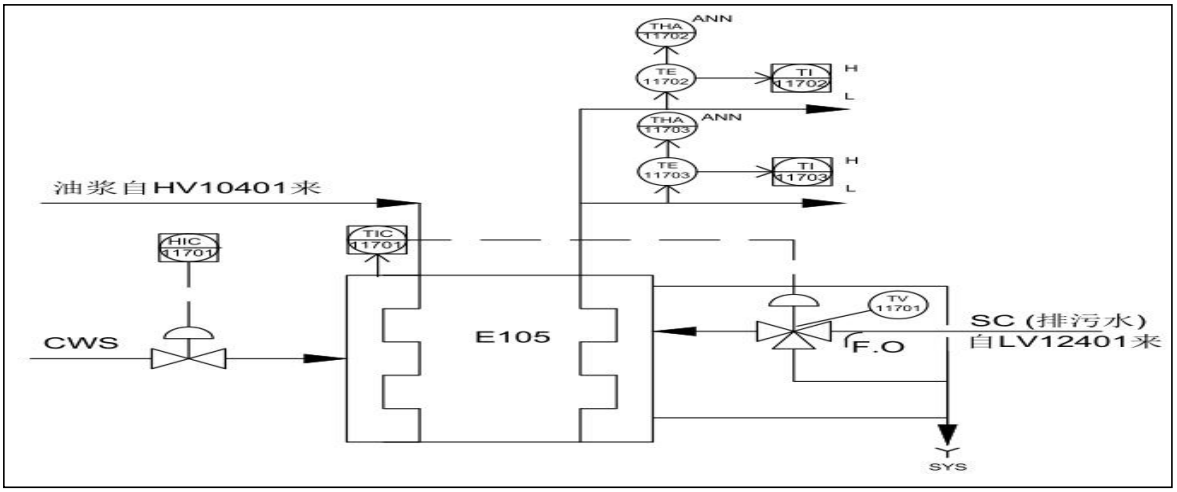
(34) Temperature control TI-11702 and TI-11703 1 of Oil Slurry exporting
油浆外送温度 TI-11702 和 TI-11703 控制

1) Control range: control the temperature at not more than 99℃ (At present, the temperature is controlled at 140-150℃. when only one tube bundle is put into service, the flow rate of slurry thrown outside should be controlled at least 15 tons /h, and the flow rate should be over 1m /s to prevent pipeline condensation, especially when the residual carbon of residual oil is higher than 23)
控制范围：控制温度在不大于 99℃。（目前控制 140-150℃，当只投用一根管束时，控制外甩油浆流量不小于 15 吨/h，保证流速 1 米/s 以上，防止管线凝线，尤其渣油残碳高于 23 时需要特别注意）

2)Control target: to control at the reference value of 80°C± 10°C, at this time the slurry has better fluidity and storage is safer.
控制目标：控制在基准值 140-150℃，此时油浆具有较好的流动性，而且储存比较安全

3)Related parameters: temperature and flow rate of circulating water entering the E-105; temperature and flow rate of oil slurry entering the E-105; temperature and flow of condensate from E-104; level of water in E-105.
相关参数：进 E-105 循环水的温度和流量；进 E-105 油浆的温度和流量；自 E-104 来凝结水的温度和流量；E-105 中水的液位。

4)Control mode: generally controlled by circulating water flow control valve HIC-11701.
控制方式：一般采用循环水流量调节阀 HIC-11701 控制。



Oil slurry from HV10401

5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
The amount of oil slurry running down 油浆外甩量	The amount of external helium is large, and the water temperature of E-105 rises and vice versa.外甩量大，E-105 水温上升。反之下降。
The opening of HIC-11701 valve HIC-11701 阀位开度	When the valve is opened, the water temperature in the E-105 drops and the temperature of the slurry drops and vice versa.开阀，E-105 中水温下降，油浆温度下降。反之升高。
Circulating water temperature 循环水温度	Contact production coordinator to reduce circulating water temperature, water temperature drops in E105, and slurry temperature drops.联系调度，降低循环水温度，E105 中水温下降，油浆温度下降。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Action 处理
Circulating water increased, but the temperature of oil slurry did not drop 增大循环水，但油浆温度不降低	The oil slurry is solidified on the E-105 pipe wall, and the cooling effect gets worse.油浆在 E-105 管壁上凝固，冷却效果变差	Increase the opening of TV-11701, and send more condensed water into E-105, so the water temperature rises, and it will not return to normal until the oil slurry melts.开大 TV-11701，将凝结水更多送入 E-105 中，水温升高，待油浆融化后，恢复正常。

2.4.2 Process control in fractionation stabilization section 分馏稳定部分工艺控制操作法

(1) Control of fractionator (C-201) bottom heavy wax oil (HHKGO) extraction temperature TIC-20116

(1) 分馏塔（C-201）底重重蜡油抽出温度 TIC-20116

1)Control range: Heavy wax oil (HHKGO) extraction temperature: 320 - 358℃.

控制范围：重重蜡油（HHKGO）抽出温度 320～358℃

2)Control range: ±6℃ deviation of the extraction temperature setpoint of heavy wax oil (HHKGO).

控制目标：设定的重重蜡油（HHKGO）抽出温度值偏差±6℃。

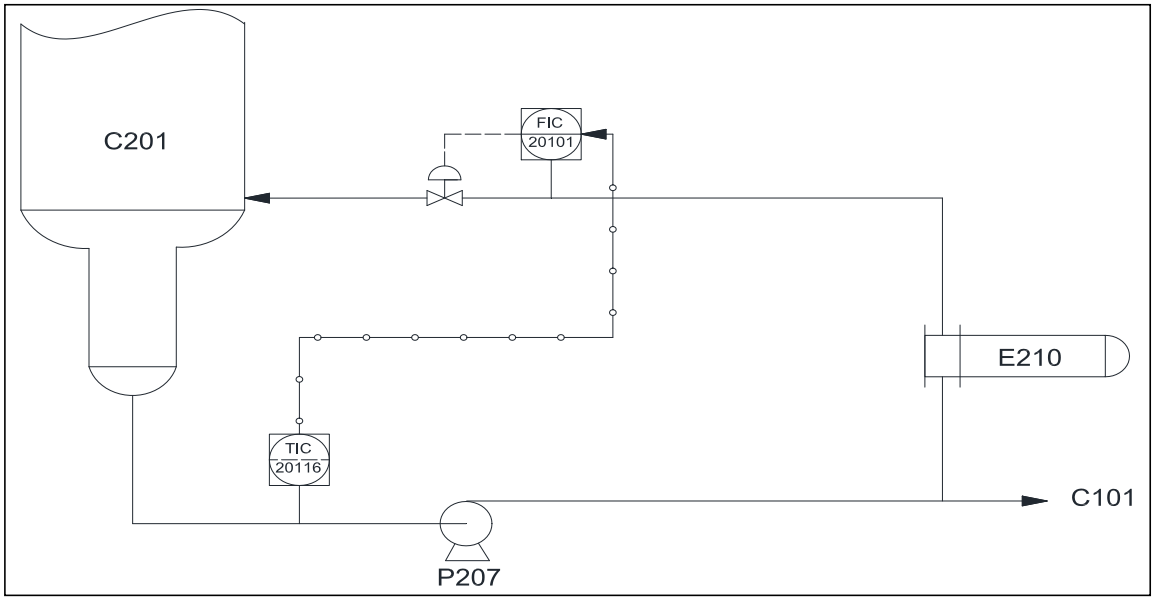
3)Control range: The temperature TI-20114 and flow rate FIC-20101 of heavy wax oil (HHKGO) returning to fractionator; Wash tower overhead temperature TIC-10401.

相关参数：重重蜡油（HHKGO）返分馏塔温度 TI-20114 和流量 FIC-20101；洗涤塔顶温度 TIC-10401。

4)Control range: Heavy wax oil (HHKGO) extraction temperature TIC-20116 is controlled by the flow rate FIC-20101 of heavy wax oil (HHKGO) returning to fractionator. In order to prevent

fractionator bottom from coking heavily, heavy wax oil (HHKGO) extraction temperature shall be controlled within lower value of target range and maintained stably. Under the same operating conditions, the higher the wash tower overhead temperature is, the larger the total heat introduced into fractionator is, the higher the fractionator overall heat load is; and vice versa.

控制方式：重重蜡油（HHKGO）抽出温度 TIC-20116 由重重蜡油（HHKGO）返塔调流量 FIC-20101 控制量大小。为了防止分馏塔底部大量结焦，将重重蜡油（HHKGO）抽出温度控制在指标范围内偏低一些，并保持平稳控制。同等操作条件下洗涤塔顶温度越高，带入分馏塔的总热量增加，全塔热负荷也随之增加。反之则降低。



5)Normal adjustment: 正常调节：

Influence factor 影响因素	Adjustment methods 调整方法
The flow rate of heavy wax oil (HHKGO)returning to tower 重重蜡油返塔流量	If the flow rate of heavy wax oil (HHKGO) returning to tower increases, the tower bottom extraction temperature will decrease; and vice versa.重重蜡油返塔流量增大，塔底抽出温度下降；反之上升。
The temperature of heavy wax oil (HHKGO) returning to tower 重重蜡油返塔温度	If the temperature of heavy wax oil (HHKGO) returning to tower decreases, the tower bottom extraction temperature will decrease; and vice versa.重重蜡油返塔温度下降，塔底抽出温度下降；反之上升。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Actions 处理方法

Fault 现象	Cause 原因	Actions 处理方法
Extraction temperature of heavy wax oil is too high 重重蜡油抽出温度过高	The flow rate of heavy wax oil returning to tower dropped significantly 重重蜡油返塔流量大幅下降	Check the pump inlet filter for blockage. Switch to standby pump and clean the filter in time if it is blocked.检查判断机泵入口过滤器是否堵塞，若堵塞则切换机泵并及时清理。检查是否机泵冲洗油量过大引起机泵抽空。
		Check the pump for failure. Switch to the standby pump if it is faulty.检查确认机泵是否故障，若故障则切备用机泵运行。
		Check the control valve for malfunction. Switch to bypass line for operation if it malfunctioned.检查确认调节阀是否失灵，若失灵则切换至副线操作。
		Check if the wash oil flow rate FIC-21801A of heavy wax oil (HHKGO) suddenly increased, causing the decreasing of the reflux flow FIC-20101.检查确认重重蜡油（HHKGO）冲洗油量 FIC-21801A 是否突然增大导致返塔流量 FIC-20101 下降。
		检查塔底液位是否过低，液位计 LI20103 是否失灵，使 P207 发生抽空引起重重蜡油返塔流量下降。
	The temperature of heavy wax oil returning to tower increased.重重蜡油返塔温度上升	With the extension of operation or increasing of the coked fines in the heavy wax oil (HHKGO), coke-blocking of tube bundle in the E-210 will cause heat exchange efficiency dropping gradually, so the flow rate returning to tower should be increased for compensation.随着装置运行时间加长或重重蜡油中焦粉含量的增加，E-210 导致结焦堵塞管束取热效率逐步下降，则需要更大的返塔流量补偿。
		Check the level of D-103, steam drum of steam generator E-210, and normally control it at 40-60%. It is strictly prohibited to have false level and “dry pot” of the steam drum.检查确认 E-210 蒸汽发生器的汽包 D-103 液位是否正常，将 D-103 汽包液面控制在 40～60%，严禁出现假液位和汽包干锅现象。
		检查是否因重重蜡油去洗涤塔的实际量变小或者中断引起 P207 出口压力升高使重重蜡油返塔流量增加。

Fault 现象	Cause 原因	Actions 处理方法
	The flow rate and temperature of the oil-gas entering fractionator from the wash tower overhead, increased significantly. 洗涤塔顶油气进分馏塔的流量和温度大幅上升	Inform and cooperate with the reaction post to timely increase the flow rate of heavy wax oil (HHKGO) returning to tower to prevent overheating and coking at the bottom of tower.通知并配合反应岗位处理，及时加大重重蜡油返塔流量，防止塔底超温结焦。
	Heavy wax oil pump P-207 failed 重重蜡油泵 P-207 故障	Immediately find out the Cause and restore the pump operation. Start the standby pump immediately if Cause cannot be found out in time. Contact the repairman if the pump failed.立即查明原因恢复机泵运行，若无法及时查明应立即启用备用机泵，机泵原因联系维修工处理。
	Thermometer TIC-20116 of heavy wax oil (HHKGO) extraction temperature failed 重重蜡油（HHKGO）抽出温度 TIC-20116 仪表失灵	Immediately notify the instrument staff for handling.立即通知仪表工处理。
Extraction temperature of heavy wax oil is too low 重重蜡油抽出温度过低	The flow rate of heavy wax oil (HHKGO) returning to tower increased significantly 重重蜡油返塔流量大幅增加	Check the control valve for malfunction.检查确认调节阀是否失灵。
		Check if the wash oil flow rate FIC-21801A of heavy wax oil (HHKGO) suddenly decreased, causing the increasing of the reflux flow FIC-20101.检查确认重重蜡油（HHKGO）冲洗油量 FIC-21801A 是否突然降低导致返塔流量 FIC-20101 增大。
		Check if the heavy wax oil pump P-207 self-started for low pressure or failure, leading to double pump operation. Immediately find out the Cause and restore single pump operation.重重蜡油泵 P-207 低压自启或故障，双泵运行，立即查明原因恢复单泵运行。
		如果返塔流量大幅增加且返塔温度下降，分馏塔压力突然升高，应检查 E210 管束是否泄漏，使中压蒸汽窜入到重重蜡油里。这样必须切除 E210.

Fault 现象	Cause 原因	Actions 处理方法
	The flow rate and temperature of the oil-gas entering fractionator from wash tower overhead greatly reduced.洗涤塔顶油气进分馏塔的流量和温度大幅下降	Notify and cooperate with the reaction post for operation adjustment.通知并配合反应岗位处理。
	Thermometer signal failed.温度计信号故障失灵	Immediately notify the instrument staff for handling.立即通知仪表工处理。

(2)Control of fractionator (C-201) bottom level LI-20103

分馏塔（C-201）底液位的控制 LI-20103

1)Control range: Fractionator (C-201) bottom level: 30-70%.

控制范围：分馏塔（C-201）底液位 30～70%。

2)Control range: ±5% of fractionator (C-201) bottom level set point.

控制目标：设定的分馏塔（C-201）底液位±5%。

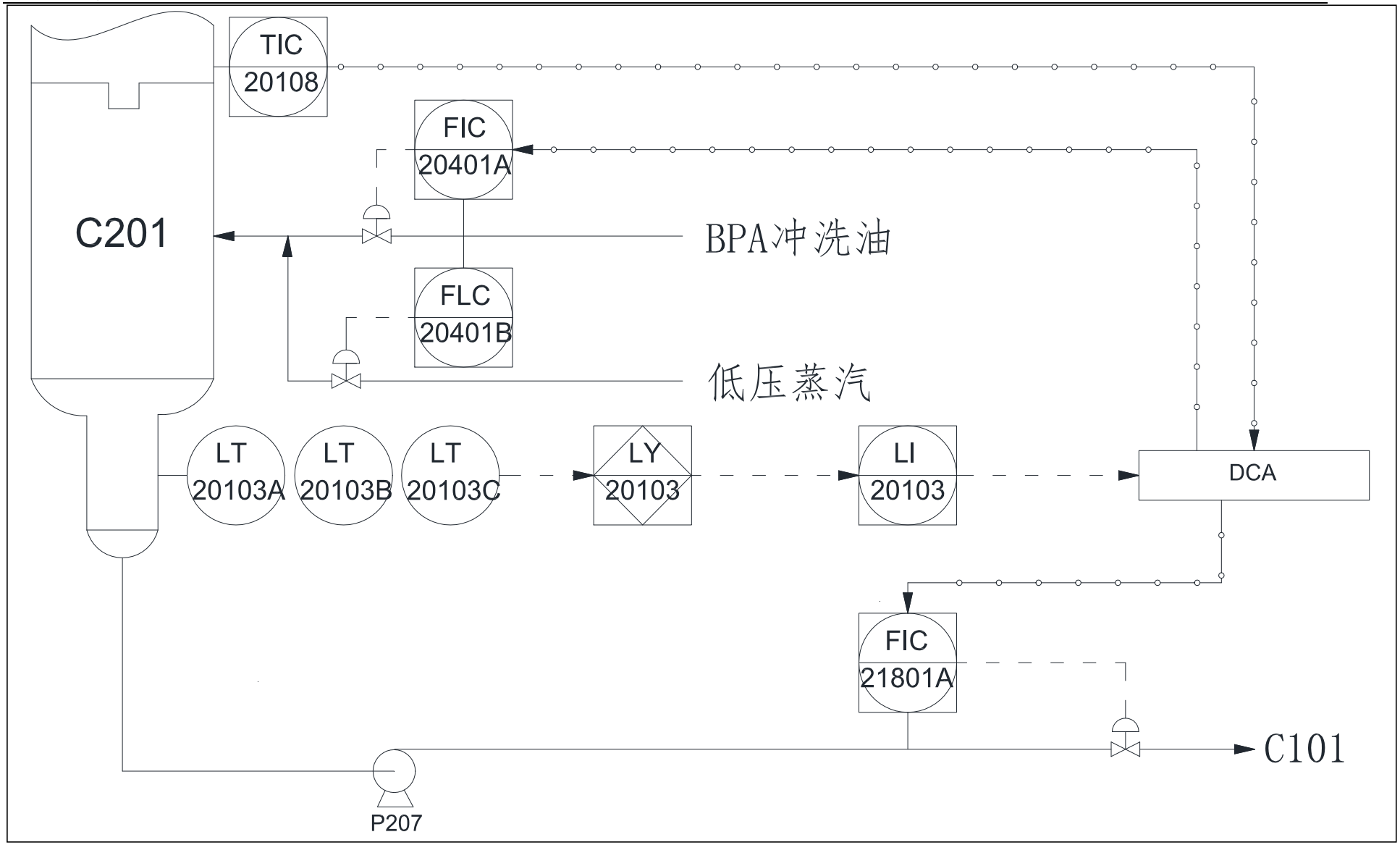
3)Control range: The flow rate FIC-21401A of heavy wax oil (HKGO) returning to tower as BPA wash oil; The temperature TIC-20108 of heavy wax oil (HKGO) extraction tray; The wash oil flow rate FIC-21801A of heavy wax oil (HKGO) returning to the wash tower(C-101); Wash tower overhead temperature TIC-10401; Fractionator bottom temperature TI-20115.

相关参数：重蜡油（HKGO）作 BPA 冲洗油返塔流量 FIC-21401A；重蜡油（HKGO）抽出塔盘温度 TIC-20108；重重蜡油（HHKGO）冲洗油返洗涤塔（C-101）流量 FIC-21801A；洗涤塔顶温度 TIC-10401；分馏塔底温度 TI-20115

4)Control range: The median value of fractionator (C-201) bottom level is taken as the setpoint of LT-20103A/B/C. Normally it is controlled by the flow rate FIC-21401A of heavy wax oil (HKGO) returning to tower as the BPA wash oil. The higher the flow rate of BPA wash oil returning to tower, the higher the level is, and vice versa. If the flow rate of the BPA wash oil returning to tower is too low, the low flow shutoff device FLC-21401B will introduce steam into the spray distributor through RBV-20103 to prevent nozzle from coking blockage. When fractionator level LI-20103 is super high, the DCA controller will increase the wash oil flow rate FIC-21801A of heavy wax oil (HHKGO) returning to the wash tower (C-101) and prevent fractionator bottom level becoming super high.

控制方式：分馏塔（C-201）底液位 LT-20103A/B/C 取中值作为控制液位，正常时主要由重蜡油（HKGO）作 BPA 冲洗油返塔流量 FIC-21401A 控制。BPA 冲洗油返塔量越大液位越高，反之则越低。若 BPA 冲洗油返塔流量过低，低流量切断装置 FLC-21401B 将通过 RBV-20103 将蒸汽

引入到喷雾分配器中，防止喷嘴结焦堵塞。分馏塔分馏塔底液位 LI-20103 超高时，DCA 控制器将开大重重蜡油（HHKGO）作冲洗油返洗涤塔（C-101）流量 FIC-21801A，保护分馏塔底液位不超高。


TIC
20108
FIC
20401A
C201
BPA冲洗油
FLC
20401B
低压蒸汽
LT
20103A
LT
20103B
LT
20103C
LY
20103
LI
20103
DCA
FIC
21801A
C101
P207

5)Normal adjustment: 正常调节：

Influence factor 影响因素	Adjustment methods 调整方法
The flow rate of BPA wash oil returning to tower BPA 冲洗油返塔流量	If the BPA wash oil flow rate returning to tower decreases, fractionator bottom level will decrease; and vice versa.BPA 冲洗油返塔流量减小，分馏塔底液位降低；反之上升。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Actions 处理方法
Fractionator bottom level is strictly prohibited from full level, preventing the large oil-gas line from blockage causing reactor overpressure.分馏塔底液面高 严禁满液位，防止堵塞大油气管线造成反应器憋压	Heavy wax oil flow rate returning to tower as BPA wash oil increased.重蜡油作 BPA 冲洗油返塔流量增大	Reduce the flow rate of BPA wash oil returning to tower in time.及时减小 BPA 冲洗油返塔流量。
	Heavy wax oil pump P-207 failed 重重蜡油泵 P-207 故障	Immediately find out the Cause and restore the pump operation. Start the standby pump immediately if Cause cannot be found out in time. Contact the repairman if the pump failed.立即查明原因恢复机泵运行，若无法及时查明应立即启用备用机泵，机泵原因联系维修工处理。检查是否机泵冲洗油量过大引起机泵抽空。在塔底液位过高且 P207 无法启动的紧急情况下可通过塔底抽出线退油线将油退至 D211 罐
		Check the pump inlet filter for blockage. Switch to standby pump and clean the filter in time if it is blocked.检查判断机泵入口过滤器是否堵塞，若堵塞则切换机泵并及时清理。
	The process of heavy wax oil returning to wash tower as wash oil is not lined up 重重蜡油作冲洗油返洗涤塔后路不畅	Check if the differential pressure is too high for the clogged rear filter (SR-204). If it exceeds 0.172MPa, flush the filter immediately or switch the filter.检查后路过滤器（SR-204）是否堵塞造成差压过大，若超过 0.172MPa 应立即进行冲洗或者切换过滤器运行。

Fault 现象	Cause 原因	Actions 处理方法
	Fractionator bottom temperature changed 分馏塔底温度变化	Reasonably control the tower bottom temperature is beneficial to control the tower bottom level stably. The higher the tower bottom temperature is, the lower the level is, and vice versa.合理控制塔底温度有利于平稳控制塔底液位，塔底温度越高液位越低，反之则越高。
	Control valve failed 调节阀故障	Switch to the bypass line of the control valve and contact the instrument staff for handling.切换至调节阀副线，并联系仪表工处理。
	Level gauge signal failed 液位计仪表信号故障失灵	Contact the instrument staff for handling.联系仪表工处理。
Fractionator bottom level is low.分馏塔底液面低	The flow rate of heavy wax oil as BPA wash oil returning to tower decreased.重蜡油作 BPA 冲洗油返塔流量减小	Timely increase the BPA wash oil flow rate of returning to tower.及时加大BPA冲洗油返塔流量。
		Check if the differential pressure is too high for the clogged rear filter (SR-203). If it exceeds 0.172MPa, flush the filter immediately or switch the filter.检查后路过滤器（SR-203）是否堵塞造成差压过大，若超过0.172MPa应立即进行冲洗或者切换过滤器运行。
	Fractionator bottom temperature changed 分馏塔底温度变化	Reasonably control the tower bottom temperature is beneficial to control the tower bottom level stably. The higher the tower bottom temperature is, the lower the level is, and vice versa.合理控制塔底温度有利于平稳控制塔底液位，塔底温度越高液位越低，反之则越高。
	Control valve failed 调节阀故障	Switch to bypass line of the control valve and contact the instrument staff for handling.切换至调节阀副线，并联系仪表工处理。

	Level gauge signal failure 液位计仪表信号故障失灵	Contact the instrument staff for handling.联系仪表工处理。

(3)Control of heavy wax oil (HKGO) extraction tray temperature

重蜡油（HKGO）抽出塔盘温度的控制

1)Control range: The gas phase temperature under the extraction tray of heavy wax oil (HKGO): 340-390 °C.

控制范围：重蜡油（HKGO）抽出塔盘下气相温度的控制 TIC-20108 在 340～390℃

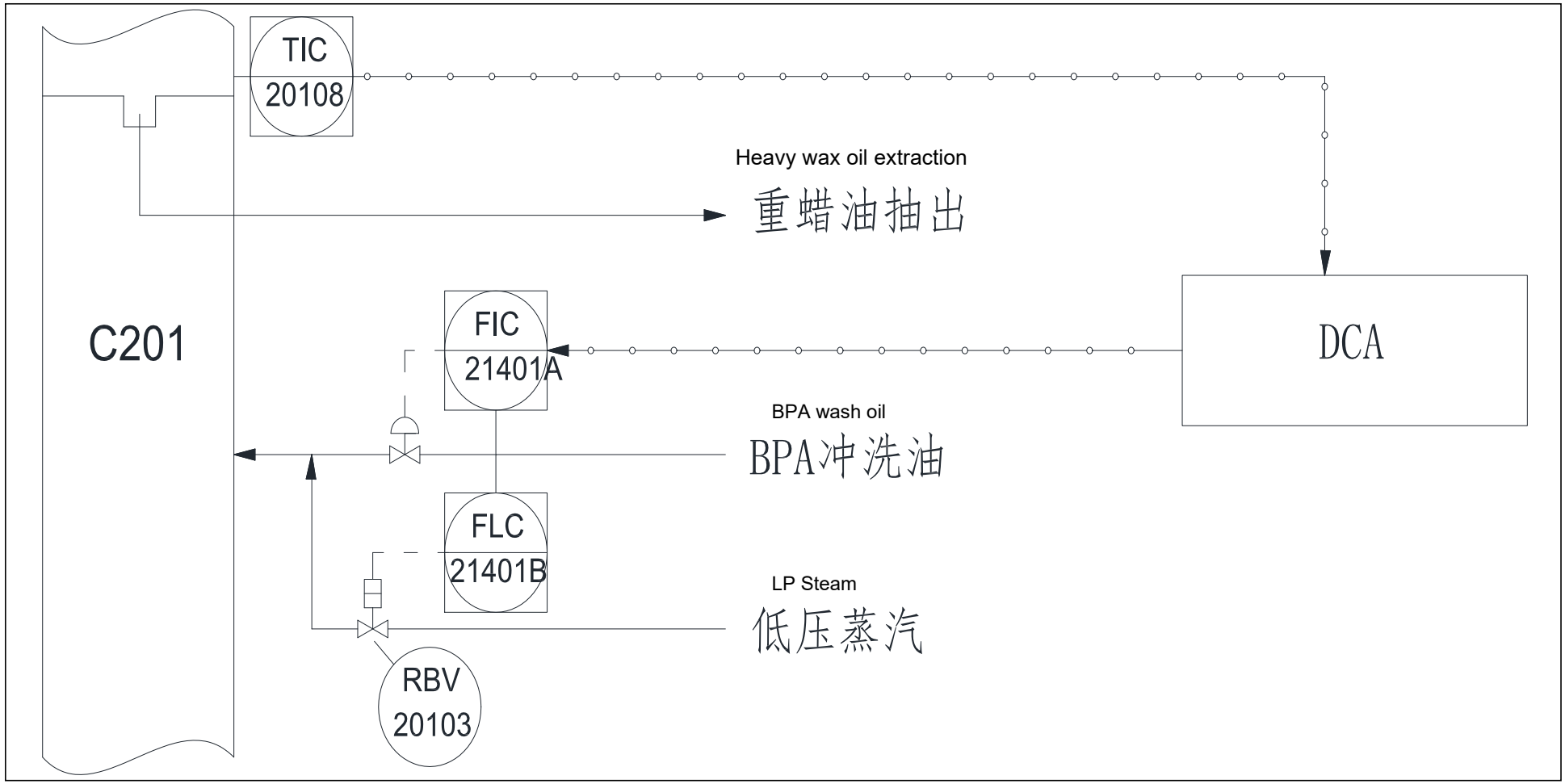
2)Control range: ± 5°C deviation of setpoint of heavy wax oil (HKGO) extraction tray temperature.

控制目标：设定的重蜡油（HKGO）抽出塔盘温度值偏差±5℃。

3)Control range: The flow rate FIC-21701 and temperature TI-20104 of heavy wax oil (HKGO) returning to the tower as bottom circulating oil; Flow rate FIC-21401A of the heavy wax oil (HKGO) returning to tower as BPA wash oil; Heavy wax oil (HKGO) temperature TIC-21603 at the outlet of the diverging three-way valve (TV-21603) of E-209 tube side; Extraction temperature TI-20111 at bottom of heavy wax oil collecting tank; The baffle temperature TI-20106 on the top of extraction heavy wax oil collecting tank; gas phase temperature TI-20113 after desuperheating of the oil-gas.相关参数：重蜡油（HKGO）作塔底循环油返塔流量 FIC-21701 和温度 TI-20104；重蜡油（HKGO）作 BPA 冲洗油返塔流量 FIC-21401A；E-209 管层三通分流阀（TV-21603）重蜡油（HKGO）出口温度 TIC-21603；重蜡油抽出集油箱下方温度 TI-20111；重蜡油抽出集油箱上方折流挡板温度 TI-20106；油气脱过热后气相温度 TI-20113。

4)Control range: Normally, the temperature is controlled by the heavy oil (HKGO) flow rate FIC-21401A returning to tower as the BPA wash oil. The higher the flow rate returning to tower is, the lower the temperature is, and vice versa. If flow rate FIC-21401A of heavy wax oil (HKGO) returning to tower is too low, the low flow shutoff device FLC-21401B will introduce steam into the spray distributor through RBV-20103 to prevent nozzle from coking blockage.

控制方式：正常时通过重蜡油（HKGO）作 BPA 冲洗油返塔流量 FIC-21401A 控制。返塔流量越高温度越低，反之则越高。若重蜡油（HKGO）返塔流量 FIC-21401A 过低，低流量切断装置 FLC-21401B 会通过 RBV-20103 将蒸汽引入到喷雾分配器中，防止喷嘴结焦堵塞。


TIC
20108
Heavy wax oil extraction
重蜡油抽出
C201
FIC
21401A
DCA
BPA wash oil
BPA冲洗油
FLC
21401B
LP Steam
低压蒸汽
RBV
20103

5)Normal adjustment: 正常调节：

Influence factor 影响因素	Adjustment methods 调节方法
The flow rate of BPA wash oil returning to tower BPA 冲洗油返塔流量	If the BPA wash oil flow rate returning to tower increases, the temperature will decrease; and vice versa 返回流量增大，温度下降；反之升高。.

6)Trobleshooting:

异常调节：

Fault 现象	Cause 原因	Actions 处理方法
Heavy wax oil extraction tray temperature is high 重蜡油抽出塔盘温度高	Gas phase temperature increased after fractionator oil-gas desuperheating.分馏塔油气脱过热后气相温度升高	Open wide the control valve to let more BPA wash oil returning to tower.开大 BPA 冲洗油返塔调节阀。
	The filter of BPA wash oil returning to tower or the filter of fractionator bottom circulating oil returning to tower blockedBPA 冲洗油返塔过滤器或塔底循环油返塔过滤器堵塞	Flush the filters in time or switch to the standby filter.及时冲洗过滤器或切换至备用过滤器运行。
	Fractionator bottom circulating oil pump P-206 failed 塔底循环油泵 P-206 故障	Immediately find out the Cause and restore the pump operation. Start the standby pump immediately if Cause cannot be found out in time. Contact the repairman if the pump failed.立即查明原因恢复机泵运行，若无法及时查明应立即启用备用机泵，并联系维修工处理。检查是否机泵冲洗油量过大引起机泵抽空。
		Check the pump inlet filter for blockage. Switch to standby pump and clean the filter in time if it is blocked.检查判断机泵入口过滤器是否堵塞，若堵塞则切换机泵并及时清理。

Fault 现象	Cause 原因	Actions 处理方法
	The reflux of fractionator middle section circulating oil suddenly dropped or interrupted.分馏塔中部循环回流突然降低或中断	Increase the flow rate of the bottom circulating oil and BPA wash oil to prevent the tower being flooded.加大塔底循环油和 BPA 冲洗油流量，还可适当加大塔顶冷回流量来控制他顶温度防止冲塔。同时注意控制好分馏塔顶压力。
	Control valve failed 调节阀故障	Switch to bypass line of the control valve and contact the instrument staff for handling.切换至调节阀副线，并联系仪表工处理。
	Thermometer signal failed 温度计信号故障失灵	Contact the instrument staff for handling.联系仪表工处理。
Heavy wax oil extraction tray temperature is low 联系仪表工处理。	The flow rate of BPA wash oil returning to tower increased BPA 冲洗油返塔流量增大	Close the control valve more to reduce BPA wash oil returning to tower.关小 BPA 冲洗油返塔调节阀。检查 E209 BPA 路量是否变化较大，引起返塔量变化。
	Reaction feeding suddenly dropped or interrupted.反应进料突降或者中断	Notify and cooperate with the reaction post to make operation adjustment.通知并配合反应岗位调整操作。
	Control valve failed 调节阀故障	Switch to bypass line of the control valve and contact the instrument staff for handling.切换至调节阀副线，并联系仪表工处理。
	Thermometer signal failed 温度计信号故障失灵	Contact the instrument staff for handling.联系仪表工处理。

(4)Control of heavy wax oil (HKGO) extraction oil collecting tank level

重蜡油（HKGO）抽出集油箱液位的控制

1)Control range: The level LIC-20102 of the heavy oil (HKGO) extraction oil collecting tank: 30-70%.

控制范围： 重蜡油（HKGO）抽出集油箱液位的控制 LIC-20102 在 30～70%。

2)Control range: ±5% deviation of setpoint of the extraction heavy oil (HKGO) collecting tank level.

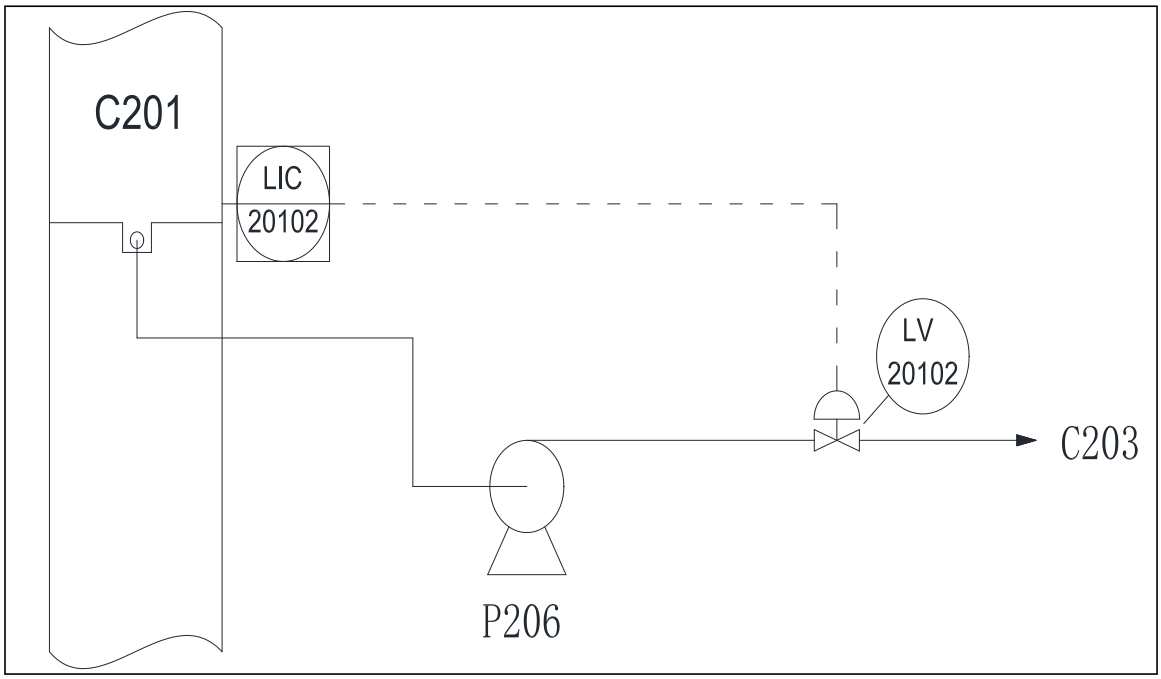
控制目标：设定的重蜡油（HKGO）抽出集油箱液位值偏差±5%。

3)Control range: The flow FIC-21701 and temperature TI20104 of heavy wax oil (HKGO) returning to tower as the circulating oil, the flow rate FIC-21401A of heavy wax oil (HKGO) returning to tower as BPA wash oil.

相关参数：重蜡油（HKGO）作塔底循环油返塔流量 FIC-21701 和温度 TI20104；重蜡油（HKGO）作 BPA 冲洗油返塔流量 FIC-21401A。

4)Control range: Normally the heavy wax oil (HKGO) extraction oil collecting tank level LIC-20102 is controlled by level control valve LV-20102 of heavy wax oil to stripper (C-203). The larger the valve opening is, the lower the oil collecting tank level is.

控制方式：重蜡油（HKGO）抽出集油箱液位 LIC-20102 正常时通过重蜡油去汽提塔（C-203）调节阀 LV-20102 控制。开度越大集油箱液位越低。



5)Normal adjustment: 正常调节：

Influence factor 影响因素	Adjustment methods 调节方法
Opening of the control valve LV-20102 调节阀 LV-20102 控制开度	The larger the control valve opening is, the lower the oil collecting tank level is, and vice versa.调节阀开度越大集油箱液位液位越低，反之则越高。
The flow rate and temperature of the bottom circulating oil returning to tower 塔底循环油返塔流量、温度	If the flow rate returning to tower increases, the level will increase; and if the temperature returning to tower decreases, the level will increase; and vice versa.返塔流量增大，液位增高；返塔温度降低，液位增高；反之则降低。
The flow rate of BPA wash oil returning to tower BPA 冲洗油返塔流量	With the increasing of flow rate returning to tower, the level decreases; and vice versa.返塔流量增大，液位降低。反之则增高。

6)Trobubleshooting: 异常调节：

Fault 现象	Cause 原因	Actions 处理方法
Heavy wax oil (HKGO) extraction oil collecting tank level drops drastically. 重蜡油（HKGO）抽出集油箱液位猛降	The flow of BPA wash oil returning to tower suddenly increased BPA 冲洗油返塔流量突然增大	Close more the control valve for BPA wash oil returning to the tower.关小 BPA 冲洗油返塔流量调节阀。
	The flow rate of bottom circulating oil returning to tower suddenly decreased 塔底循环油返塔流量突然减小.	Open wide the flow rate control valve to increase bottom circulating oil returning to tower.开大塔底循环油返塔流量调节阀。
		Check if the differential pressure is too high for the clogged rear filter (SR-202). If it exceeds 0.172MPa, flush the filter immediately or switch the filter.检查后路过滤器（SR-202）是否堵塞造成差压过大，若超过 0.172MPa 应立即进行冲洗或者切换过滤器运行。
	Reaction feed suddenly dropped or interrupted.反应进料突降或者中断	Notify and cooperate with the reaction post to make operation adjustment.通知并配合反应岗位调整操作。
	Control valve failed 调节阀故障	Switch to bypass line of the control valve and contact the instrument staff for handling.切换至调节阀副线，并联系仪表工处理。
	Level gauge signal failed 液位计仪表信号故障失灵	Contact the instrument staff for handling.联系仪表工处理。
Heavy wax oil (HKGO) extraction oil collecting tank level increases drastically. 重蜡油（HKGO）抽出集油箱液位猛涨	The flow rate of BPA wash oil returning to tower suddenly decreased. BPA 冲洗油返塔流量突然减小	Open wide the flow rate control valve to increase the bottom circulating oil returning to tower.开大 BPA 冲洗油返塔流量调节阀。

Fault 现象	Cause 原因	Actions 处理方法
		Check if the differential pressure is too high for the clogged rear filter (SR-203). If it exceeds 0.172MPa, flush the filter immediately or switch the filter.检查后路过滤器（SR-203）是否堵塞造成差压过大，若超过 0.172MPa 应立即进行冲洗或者切换过滤器运行。
	The flow rate of bottom circulating oil returning to tower suddenly increased.塔底循环油返塔流量突然增大	Close more the flow rate control valve to reduce the bottom circulating oil returning to tower.关小塔底循环油返塔流量调节阀。
	Heavy wax oil (HKGO) pump P-206 failed.重蜡油（HKGO）泵 P-206 故障	Immediately find out the Cause and restore the pump operation. Start the standby pump immediately if Cause cannot be found out in time. Contact the repairman if the pump failed.立即查明原因恢复机泵运行，若无法及时查明应立即启用备用机泵，机泵原因联系维修工处理。
		Check the pump inlet filter for blockage. Switch to standby pump and clean the filter in time if it is blocked.立即查明原因恢复机泵运行，若无法及时查明应立即启用备用机泵，机泵原因联系维修工处理。
	Control valve failed.调节阀故障	Switch to bypass line of the control valve and contact the instrument staff for handling.切换至调节阀副线，并联系仪表工处理。
	Level gauge signal failed.液位计仪表信号故障失灵	Contact the instrument staff for handling.联系仪表工处理。

(5)Control of the extraction light wax oil (LKGO) collecting tank level

轻蜡油（LKGO）抽出集油箱液位的控制

1)Control range: The level LIC-20101 of the light wax oil (LKGO) extraction oil collecting tank: 30-70%.

控制范围： 轻蜡油（LKGO）抽出集油箱液位的控制 LIC-20101 在 30～70%。

2)Control range: ±5% deviation of the setting level of extraction light wax oil (LKGO) collecting tank.

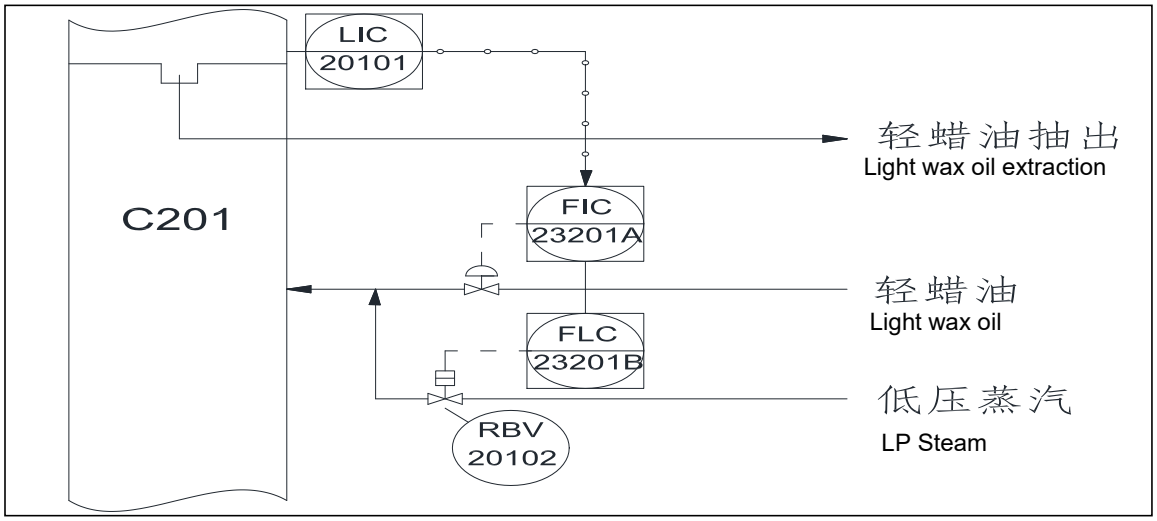
控制目标：设定的轻蜡油（LKGO）抽出集油箱液位值偏差±5%。

3)Control range: Flow rate FIC-23201A of light wax oil (LKGO) returning to tower; Light wax stripper (C-201) level control valve LV-23102 of light wax oil (LKGO)feeding; Lower reflux flow FIC-20701A of the middle section circulating oil.

相关参数： 轻蜡油（LKGO）返塔流量 FIC-23201A；轻蜡油（LKGO）至轻蜡汽提塔（C-201）液控阀 LV-23102，中段循环回流下部回流量 FIC-20701A。

4)Control range: Normally the extraction light wax oil (LKGO) collecting tank level LIC-20102 is controlled by control valve FV-23201A for light wax oil returning to tower. The larger the valve opening is, the lower the oil collecting tank level is. If the flow rate FIC-23201A of the light wax oil (LKGO) returning to tower is too low, the low flow shutoff device FLC-23201B will introduce steam into the spray distributor through RBV-20102 to prevent nozzle from coking blockage.

控制方式： 轻蜡油（LKGO）抽出集油箱液位 LIC-20102 正常时通过轻蜡油返塔回流调节阀 FV-23201A 控制。开度越大液位越低。若轻蜡油（LKGO）返塔流量 FIC-23201A 过低，低流量切断装置 FLC-23201B 会通过 RBV-20102 将蒸汽引入到喷雾分配器中，防止喷嘴结焦堵塞。



5)Normal adjustment: 正常调节：

Influence factor 影响因素	Adjustment methods 调节方法
The flow rate of the light wax oil returning to tower 轻蜡油返塔流量大小	The higher the lighter wax oil flow rate returning to tower, the lower the level is; and vice versa 轻蜡油返塔流量越大液位越低，反之则越高。.
Opening of the control valve for light wax oil to light wax stripper 轻蜡油至轻蜡汽提塔液控阀开度	The larger the control valve opening the lower the level, and vice versa.调节阀开度越大液位越低，反之则越高。

The flow rate of the lower middle section circulating oil 中段循环油下部回流量大小	If the reflux flow rate of the middle section circulating oil increases, the level will rise; and vice versa.中段循环油下部回流量增大，液位升高。反之则降低。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Actions 处理方法
The level of light wax oil (LKGO) extraction oil collecting tank drops drastically.轻蜡油（LKGO）抽出集油箱液位猛降	The flow rate of light wax oil returning to tower suddenly increased 轻蜡油返塔流量突然增大	Close more the flow rate control valve to reduce the light wax oil returning to tower.关小轻蜡油返塔流量调节阀。
	The control valve opening of light wax oil to light wax stripper suddenly increased.轻蜡油至轻蜡汽提塔液控阀突然开大	Close more the level control valve of the light wax oil stripper 关小轻蜡汽提塔液控阀。
	The reflux flow of the lower middle section circulating oil returning to tower suddenly decreased.中段循环油下部返塔回流量突然减小	Increase the reflux flow of the lower middle section circulating oil.加大中段循环油下部回流量。
		Check if the differential pressure is too high for the clogged rear filter (SR-201). If it exceeds 0.172MPa, flush the filter immediately or switch the filter.检查后路过滤器（SR-201）是否堵塞造成差压过大，若超过 0.172MPa 应立即进行冲洗或者切换过滤器运行。
	Reaction feed drastically dropped or interrupted 反应进料猛降或者中断	Notify and cooperate with the reaction post to make operation adjustment.通知并配合反应岗位调整操作。
	Control valve failed.调节阀故障	Switch to bypass line of the control valve and contact the instrument staff for handling.切换至调节阀副线，并联系仪表工处理。
	Level gauge signal failed. 液位计仪表信号故障失灵	Contact the instrument staff for handling. 联系仪表工处理。
The level of light wax oil (LKGO) extraction oil	The flow rate of light wax oil returning to tower suddenly decreased.轻蜡	Open more the control valve to increase the flow rate of the light wax oil returning to tower.开大轻蜡油返塔流量调节阀。

Fault 现象	Cause 原因	Actions 处理方法
collecting tank increases drastically 轻蜡油（LKGO）抽出集油箱液位猛涨.	油返塔流量突然减小	Check if the differential pressure is too high for the clogged rear filter (SR-205). If it exceeds 0.172MPa, flush the filter immediately or switch the filter.检查后路过滤器（SR-205）是否堵塞造成差压过大，若超过 0.172MPa 应立即进行冲洗或者切换过滤器运行。
	The control valve opening of light wax oil to light wax stripper liquid suddenly decreased.轻蜡油至轻蜡汽提塔液控阀突然关小	Open more the level control valve of light wax oil to the light wax stripper.开大轻蜡油至轻蜡汽提塔液控阀。
	The reflux flow of the lower middle section circulating oil returning to tower suddenly increased.中段循环油下部返塔回流量突然增大	Close more the reflux flow of the lower part middle section circulating oil.关小中段循环油下部回流量。
	The pump P-228 of light wax oil reflux failed.轻蜡油回流机泵 P-228 故障	Immediately find out the Cause and restore the pump operation. Start the standby pump immediately if Cause cannot be found out in time. Contact the repairman if the pump failed.立即查明原因恢复机泵运行，若无法及时查明应立即启用备用机泵，机泵原因联系维修工处理。
		Check the pump inlet filter for blockage. Switch to standby pump and clean the filter in time if it is blocked.检查判断机泵入口过滤器是否堵塞，若堵塞则切换机泵并及时清理。
	Control valve failed 调节阀故障	Switch to bypass line of the control valve and contact the instrument staff for handling.切换至调节阀副线，并联系仪表工处理。
	Level gauge signal failed. 液位计仪表信号故障失灵	Contact the instrument staff for handling 联系仪表工处理。.

(6)Control of middle section extraction circulating oil collecting tank level

中段循环油抽出集油箱液位的控制

1)Control range: The level LIC-20102 of the middle section extraction circulating oil collecting tank: 30-70%.

控制范围：中段循环油抽出集油箱液位的控制 LIC-20102 在 30～70%。

2)Control range: ±5% deviation of middle section circulating oil collecting tank level set point.

控制目标：中段循环油抽出集油箱液位值偏差±5%。

3)Control range: The reflux flow FIC-20701A of the lower middle section circulating oil; The minimum reflux flow FIC-20702 of the middle section circulating oil; Heat source flow rate FIC-22801 and FIC-22802 to destabilization system E-216 of the middle section circulating oil; Flow rate FIC-21501 of the middle section circulating oil to E-230 for heating the feeding oil.

相关参数：中段循环油下部返塔回流量 FIC-20701A；中段循环油最小回流量 FIC-20702；中段循环油去稳定系统 E-216 热源流量 FIC-22801 和 FIC-22802；中段循环油去 E-230 加热原料油流量 FIC-21501。

4)Control range: Normally the level LIC-20102 of middle circulating oil collecting tank is controlled by control valve FV-20701A of the middle section circulating oil returning to tower. The larger the valve opening is, the lower the oil collecting tank level is.

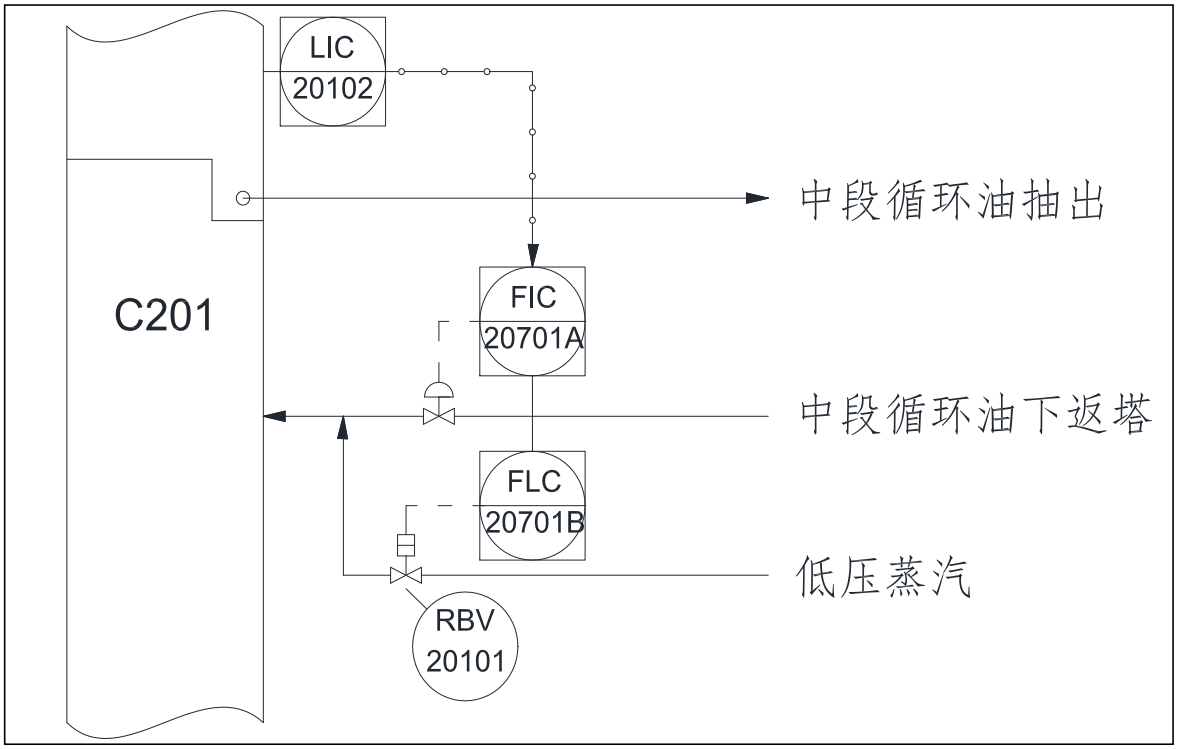
If flow rate FIC-20701A of the lower reflux flow is too low, the low flow shutoff device FLC-20701B will introduce steam into the spray distributor through RBV-20101 to prevent nozzle from coking blockage.

控制方式：中段循环油抽出集油箱液位 LIC-20102 正常时通过中段循环油下部返塔回流调节阀 FV-20701A 控制。开度越大液位越低。若下部返塔回流量太低 FIC-20701A，低流量切断装置 FLC-20701B 会通过 RBV-20101 将蒸汽引入喷雾分配器内，防止喷嘴结焦堵塞。

Middle section circulating oil extraction

Lower middle section circulating oil returing to tower

LP steam



5)Normal adjustment: 正常调节：

Influence factor 影响因素	Adjustment methods 调节方法
FV-20701A opening of the reflux flow control valve of the lower middle section circulating oil 中段循环油下部返塔回流量调节阀 FV-20701A 开度	The larger the control valve opening is, the lower the level is, and vice versa.调节阀开度越大液位越低，反之则越高。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Actions 处理方法
The level of middle section circulating extraction oil collecting tank drops drastically.中段循环油抽出集油箱液位猛降	The reflux flow of the lower middle section circulating oil suddenly increased.中段循环油下部返塔回流量突然增大	Close more the control valve of the lower middle section circulating oil returning to tower. 关小中段循环油下部返塔回流调节阀。
	Reaction feed dropped or interrupted drastically.反应进料猛降或者中断	Notify and cooperate with the reaction post to make adjustment operation.通知并配合反应岗位调整操作。
	Control valve malfunctioned, open more or open fully.调节阀失灵开大或全开	Switch to bypass line of the control valve and contact the instrument staff for handling.切换至调节阀副线，并联系仪表工处理。

Fault 现象	Cause 原因	Actions 处理方法
	Level gauge signal failed. 液位计仪表信号故障失灵	Contact the instrument staff for handling. 联系仪表工处理。
The level of middle section circulating extraction oil collecting tank increases drastically 中段循环油抽出集油箱液位猛涨.	The reflux flow of the lower middle section circulating oil suddenly decreased.中段循环油下部返塔回流量突然减小	Open more the control valve of the lower middle section circulating oil returning to tower.开大中段循环油下部返塔回流调节阀。
		Check if the differential pressure is too high for the clogged rear filter (SR-201). If it exceeds 0.172MPa, flush the filter immediately or switch the filter.检查后路过滤器（SR-201）是否堵塞造成差压过大，若超过 0.172MPa 应立即进行冲洗或者切换过滤器运行。
	Middle section circulating oil pump P-204 failed 中段循环油泵 P-204 故障	Immediately find out the Cause and restore the pump operation. Start the standby pump immediately if Cause cannot be found out in time. Contact the repairman if the pump failed.立即查明原因恢复机泵运行，若无法及时查明应立即启用备用机泵，机泵原因联系维修工处理。
		Check the pump inlet filter for blockage. Switch to standby pump and clean the filter in time if it is blocked.检查判断机泵入口过滤器是否堵塞，若堵塞则切换机泵并及时清理。
	Control valve failed ,closing more or closing fully 调节阀失灵关小或全关	Switch to bypass line of the control valve and contact the instrument staff for handling.切换至调节阀副线，并联系仪表工处理。
	Level gauge signal failed. 液位计仪表信号故障失灵	Contact the instrument staff for handling. 联系仪表工处理。

(7)Control of fractionators overhead temperature

分馏塔顶温度的控制

1)Control range: Fractionator overhead temperature TIC-20201: 105-120°C.

控制范围：分馏塔顶温度的控制 TIC-20201 在 105～120℃。

2)Control range: ±5°C deviation of the extraction temperature setpoint of heavy wax oil (HHKGO).

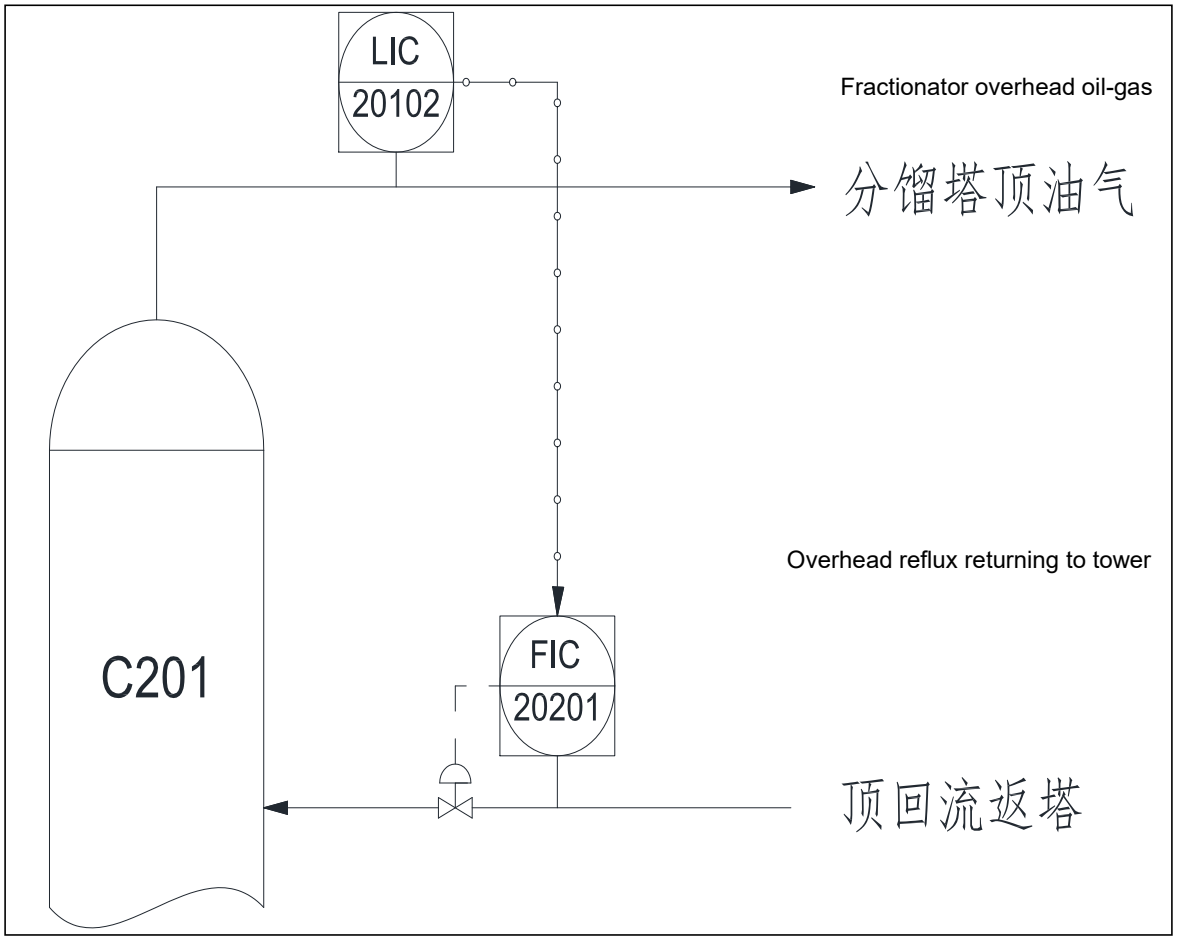
控制目标：设定的重重蜡油（HHKGO）抽出温度值偏差±5℃。

3)Control range: Fractionator overhead reflux flow FIC-20201; Fractionator overhead pressure PI-20201; Fractionator middle (1st tray) temperature TI-20210.

相关参数：分馏塔顶回流量 FIC-20201；分馏塔顶压力 PI-20201；分馏塔中部（第 1 层塔盘）温度 TI-20210。

4)Control range: Normally the temperature is controlled by flow control valve FV-20201 of fractionator overhead reflux. The larger the valve opening is, the lower the temperature is

控制方式：正常时通过分馏塔顶回流量调节阀 FV-20201 控制。开度越大温度越低。.



5)Normal adjustment 正常调节：

Influence factor 影响因素	Adjustment methods 调节方法
Flow rate of overhead circulating reflux 顶循环回流返塔流量大小	If the overhead circulating reflux flow rate increases, fractionator overhead temperature will decrease; and vice versa.提高顶循返塔流量，分馏塔顶温度下降；反之上升。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Actions 处理方法
Fractionator overhead temperature rises 塔顶温度升高.	The overhead reflux flow of returning to tower dropped.顶回流返塔流量下降	Increase the overhead reflux flow to the tower.提高顶回流返塔流量。
	Fractionator middle temperature rose significantly.分馏塔中部温度大幅上升	Reduce fractionator middle temperature and increase overhead reflux flow to the tower.降低分馏塔中部温度，提高顶回流返塔流量。提高顶回量要注意分馏塔顶压力，联系反应岗位注意两器差压。
	Fractionator overhead pressure dropped.分馏塔顶压力下降	Contact the reaction post to increase the inlet pressure of the compressor.适当降低气压机转速，或者增加气压机反飞动量来提高气压机入口压力。
	Pump P-201 failed.机泵 P-201 故障	Immediately find out the Cause and restore the pump operation. Start the standby pump immediately if Cause cannot be found out in time. Contact the repairman if the pump failed.立即查明原因恢复机泵运行，若无法及时查明应立即启用备用机泵，并联系维修工处理。如果机泵长时间不能启动，则联系反应岗位降低反应加工量，本岗位可提高分馏塔顶温度和降低 D201 的界位来短时维持操作。
Fractionator overhead temperature drops 降低气压机入口压力。	The overhead reflux flow rate of returning to tower dropped.顶回流返塔流量下降	Reduce the overhead reflux flow rate of returning to tower.降低顶回流返塔流量。
	反应加工量降低，或中断。	配合反应岗位处理。
	Fractionator middle temperature dropped significantly.分馏塔中部温度大幅下降	Increase fractionator middle temperature and reduce overhead reflux flow rate to the tower.提高分馏塔中部温度，降低顶回流返塔流量。
	Fractionator overhead pressure rose.分馏塔顶压力上升	Contact the reaction post to reduce the suction pressure of the compressor 岗位降低气压机入口压力。.

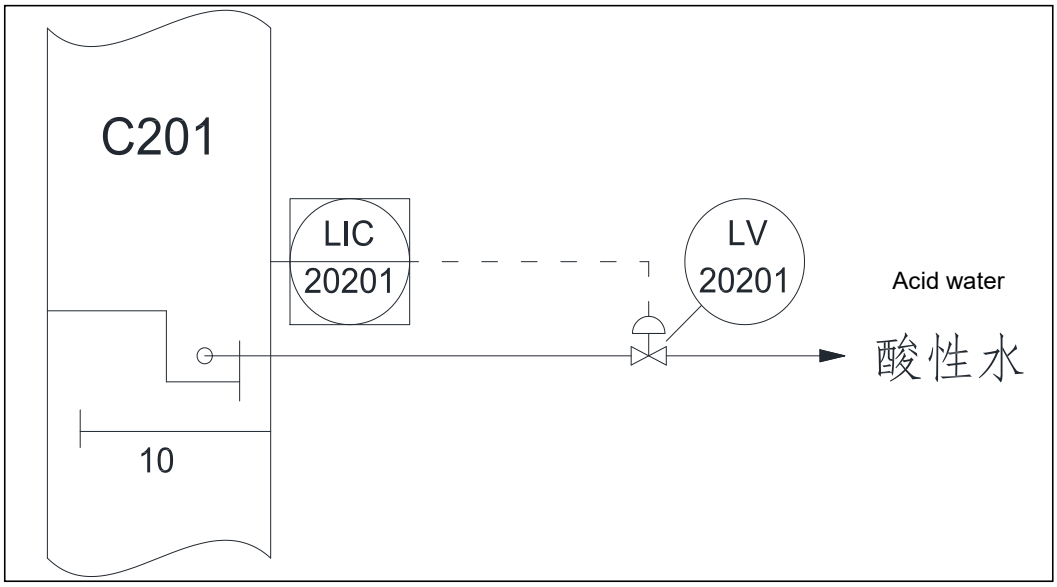
(8)Control of naphtha/sewage interface level of 10th tray water collecting tank of fractionator
分馏塔 10 层集水箱，石脑油/污水界位的控制

1)Control range: Naphtha/sewage interface level LIC-20201 of the 10th tray water collecting tank of fractionator: 30-70%.
控制范围：分馏塔 10 层集水箱，石脑油/污水界位的控制 LIC-20201 在 30～70％。

2)Control range: ±5% deviation of setpoint of naphtha/sewage interface level LIC-20201 of the water collecting tank at the 10th tray of fractionator.
控制目标：分馏塔 10 层集水箱，石脑油/污水界位偏差±5%。

3)Control range: Upper temperature TI-20203 of water collecting tank at the 10th tray; Temperature TI-20204 under the water collecting tank of the 10th tray; Fractionator overhead temperature TIC-20201.
相关参数：十层塔盘集水箱上方温度 TI-20203；十层塔盘集水箱下方温度 TI-20204；分馏塔顶温度 TIC-20201。

4)Control range: Normally the naphtha/sewage interface level LIC-20201 at the 10th tray water collection tank of fractionator is controlled by the self-overflow control valve LV-20201 of the acidic water. The larger the valve opening is, the lower the interface level is.
控制方式：分馏塔 10 层集水箱，石脑油/污水界位 LIC-20201 正常时通过酸性水自溢流液控阀 LV-20201 开度控制。开度越大界位越低。



5)Normal adjustment: 正常调节：

Influence factor 影响因素	Adjustment methods 调节方法
Opening of the acid water self-overflow level control valve 酸性水自溢流液控阀开度大小	The larger the level control valve opening is, the lower the interface level is, and vice versa.调节阀开度越大界位越低，反之则越高。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Actions 处理方法
The interface level of water collecting tank is high.集水箱界位高	The temperature TI-20203 above the 10th tray water collecting tank is low 十层塔盘集水箱上方温度 TI-20203 低	Reasonably control fractionator overhead temperature and drain water in the tank in time. 合理控制分馏塔顶温，加强切水。
	The temperature TI-20204 under the 10th tray water collecting tank is low 十层塔盘集水箱下方温度 TI-20204 低	Reasonably control fractionator overhead temperature and drain water in the tank in time.合理控制分馏塔顶温，加强切水。
	Fractionator overhead temperature TIC-20201 is low 分馏塔顶温度 TIC-20201 低	Reasonably control fractionator overhead temperature and drain water in the tank in time.合理控制分馏塔顶温，加强切水。
	Steam consumption of the reactor and fractionator increased 反应器、分馏塔蒸汽使用量大	Reasonably control fractionator overhead temperature and drain water in the tank in time.合理控制分馏塔顶温，加强切水。
	分馏塔压降 PID20204-20201 较高＞0.020MPa	反应适当降低加工量，打开反冲洗线，控制反冲洗水量 5 吨/小时进行反冲洗作业。连续冲洗 24 小时，，视 PID20204-20201 压降恢复到正常时停止反冲洗。
	The flow rate of fractionator overhead circulating wash water suddenly increased.塔顶循环冲洗水量突然增大	Reasonably control fractionator overhead temperature and drain water in the tank in time.合理控制分馏塔顶温，加强切水。

(9)Control of D-201 naphtha level

D-201 石脑油液位的控制

1)Control range: 20-50%.

控制范围：20～50%。

2)Control range: Fluctuation range is within ± 5% of the setting level of naphtha tank (D-201).

控制目标：设定的石脑油罐（D-201）液面波动范围±5%。

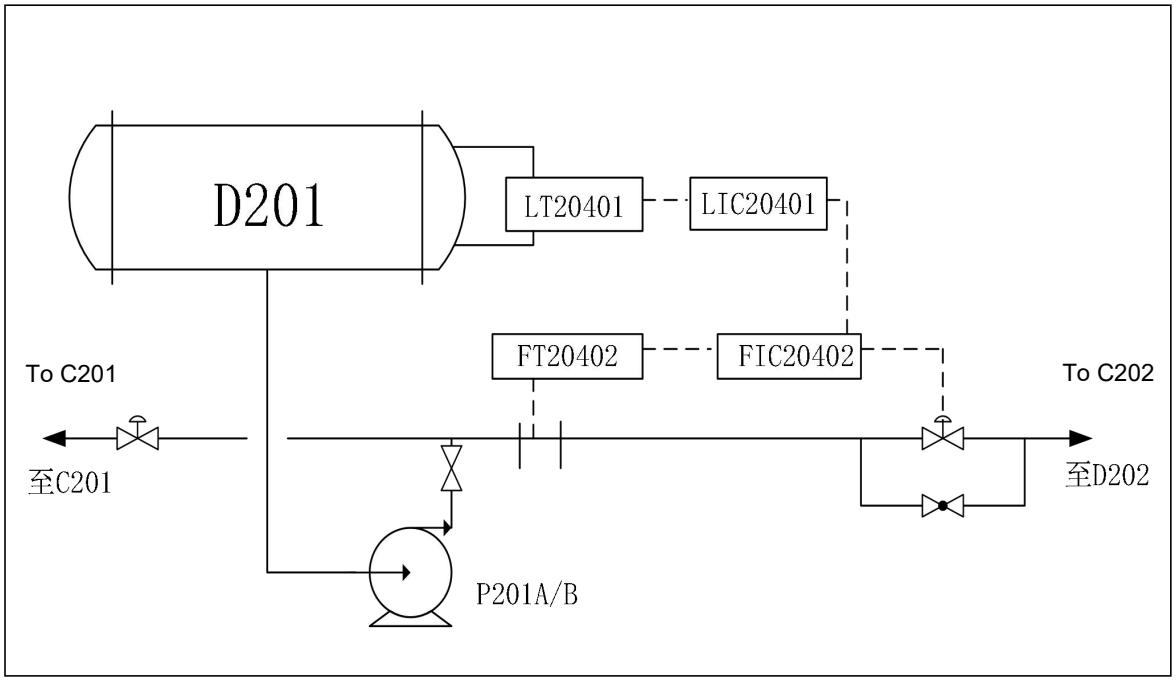
3)Control range: Stripper overhead temperature TIC-20101; Acidic water feed flow rate FIC-20301; Fractionator overhead temperature TIC-20201, Temperature TI-20301 after cooling; Fractionator overhead reflux FIC-20201; First stage compression overflow FV- 22107.

Fluctuations in the above parameters will cause the level LIC-20402 fluctuation of naphtha drum D-201.

相关参数：洗涤塔顶温度 TIC-20101；酸性水进料 FIC-20301；分馏塔顶温度 TIC-20201、冷后温度 TI-20301；分馏塔顶回流 FIC-20201；一级压缩溢流 FV-22107。以上参数波动会引起石脑油罐 D-201 液面 LIC-20402 波动。

4)Control range: Normally the naphtha tank (D-201) level is controlled by the flow rate to first stage gas/liquid separation drum D-202 of compressor.

控制方式：石脑油罐（D-201）液面正常时用去压缩机一级分液罐 D-202 的流量来调节。



5)Control range: 正常调整:

Influence factor 影响因素	Adjustment methods 调整方法
D-201 overhead temperature D-201 顶温度	If D-201 overhead temperature increases, the level will increase, and vice versa. D-201 顶温度高，液面高；反之降低。
The extraction flow rate of Naphtha pump 石脑油泵抽出量	If the extraction flow rate increases, the level will decrease, and vice versa.抽出量大，液面下降；反之升高。
C-201 reflux flow C-201 回流量	If the reflux flow increases the level decreases, and vice versa.回流量增大液面下降；反之升高。
C-201 overhead pressure C-201 顶压力	If the overhead pressure rises and the level will drop, and vice versa. 压力升高，液位下降；反之升高。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Actions 处理方法
D-201 level rises sharply. D-201 液面大幅上升	Operation flooded the tower.操作冲塔	Start reverse reflux of tower to reduce D-201 overhead temperature.启用反塔回流，降低 D-201 顶温度。
	Naphtha pump failed.石脑油泵故障	Switch to the standby pump.切换至备用泵。
	The process of naphtha exporting is not lined up 石脑油外放流程不通	Check and contact related posts to line up the process of naphtha exporting .检查联系，倒通石脑油外放流程。
	Inner leakage of the cooler 冷却器内漏	Cut off the inner leaking cooler.将泄漏的冷却器切除。加大酸性水外甩量。
	Instrument failure 仪表故障	Switch to the bypass line at site and contact the instrument for handling.现场改侧线，联系仪表处理。
	The valve for the D-201 oil collecting is open D201 收油线阀开	Fully closed the valve on the D-201 oil collecting line.全关 D-201 收油线阀。
D-201 level drops sharply D-201 液面大幅下降	The process of naphtha exporting lined up wrongly 石脑油外放流程倒错	Check and restore the correct process of Naphtha exporting .检查恢复正确流程。
	D-201 interface level control valve failed and opened fully, this cause interface level empty. D-201 界控阀故障全开，界面空	Switch the D-201 interface level control to bypass line operation, at the same time decrease the opening of the bypass valve to increase the D-201 interface level, and Contact the instrument people for handling. D-201 界控改副线操作，同时关小副线阀开度，提高 D-201 界面，联系仪表处理界控阀。

Actions of runaway situation: If D-201 level is runaway, then take the actions of the fractionation stabilization post in the emergency shutdown plan of accident.

失控处理：若 D-201 液面超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分

(10)Control of D-201 naphtha/sewage interface level

D-201 石脑油/污水界位的控制

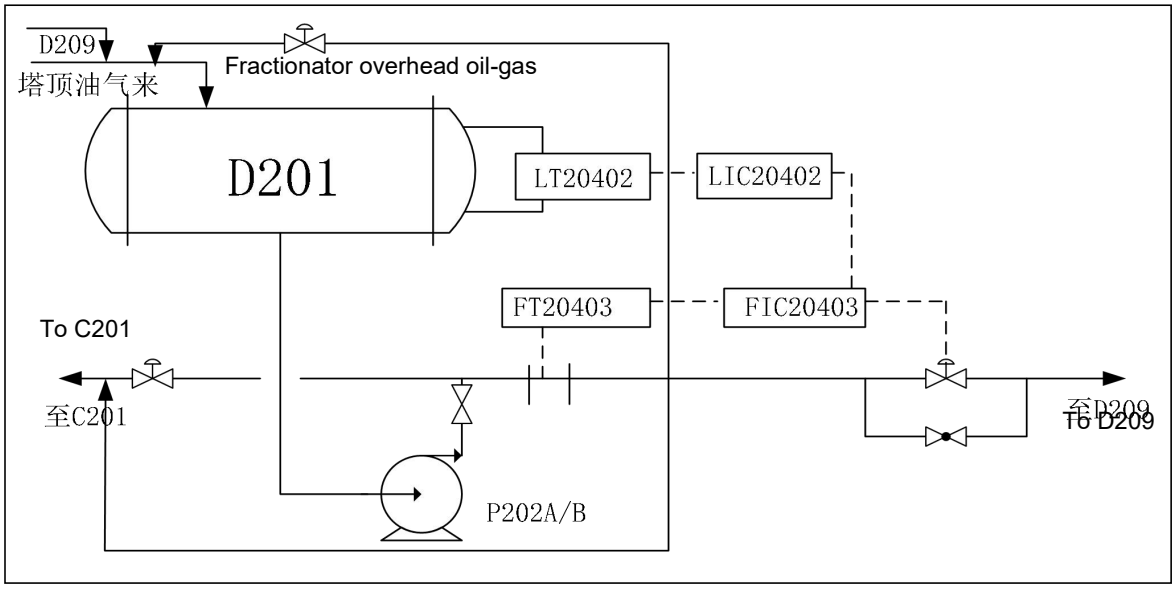
1)Control range: 40-70%.

控制范围：40～70%。

2)Control range: ±5% of oil-gas/water interface level setpoint

控制目标：D-201 汽水界面设定值±5%。

3)Control range: Opening of control valve FIC-20402 for D-201 oil-gas/water interface; D-201 interface level LIC-20402; Temperature TI-20301 after cooling.
相关参数：D-201 汽水界面控制阀开度 FIC-20402；D-201 界面 LIC-20402；冷后温度 TI-20301。
4)Control range: D-201 oil-gas/water interface is controlled by the opening of interface level control valve FIC-20401. In the case of constant flow rate of water entering D-201, if the interface control valve opening increases, the interface level will decrease; if the interface control valve opening decreases, the interface level will increase.
控制方式：D-201 汽水界面是由界面控制阀 FIC-20401 开度控制的。进入 D-201 水量一定时，界控阀开度增大，界面下降；界控阀开度减小，界面上升。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment methods 调整方法
Opening of the D-201 interface level control valve D-201 界面控制阀开度	If the opening of the interface level control valve increases, the interface will decrease; and vice versa.界面控制阀开度大，界面下降；反之，界面升高。
Opening of fractionator overhead water injection valve 分馏塔顶注水阀开度	If the opening of the control valve increases, the interface will decrease; and vice versa.控制阀开度越大，界面下降；反之，界面升高。
Opening of the water injection valve on the line from fractionator to fractionator overhead 分馏塔至塔顶注水阀开度	If the opening of the control valve increases, the interface will decrease; and vice versa.控制阀开度越大，界面下降；反之，界面升高。
反应器及分馏塔蒸汽用量	反应器及分馏塔蒸汽用量大界位上升，反之下降。

Influence factor 影响因素	Adjustment methods 调整方法
Opening of the valve on the reflux line of acid water to overhead of the D-211/C-201 tower 酸性水至 D-211/C-201 塔顶回流线阀门开度	If the opening of the valve increases, the interface level will decrease; and vice versa.阀门开度越大，界面下降；反之，界面升高。

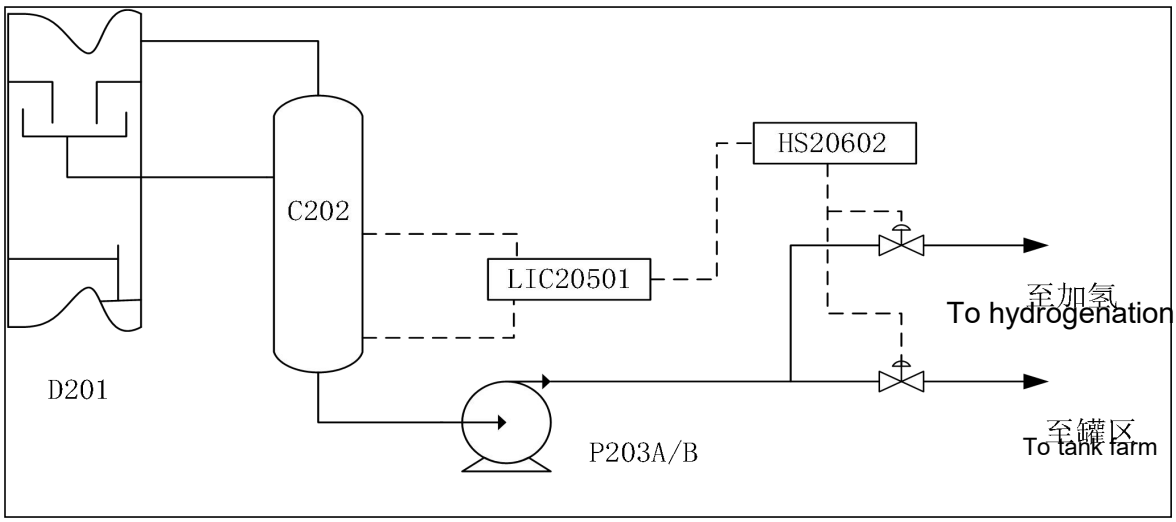
6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Actions 处理方法
Interface level increases 界面上升	Internal leakage of the valves on the overhead oil-gas line and purification water line 塔顶油气线净化水管线阀门内漏	Find the Cause and shutoff the valves.查找原因，将阀门隔断。
	反应岗位R101或C101蒸汽量突然增大	联系反应岗位降低蒸汽用量
	Acidic water injection from D-209 to tower overhead increased. D-209 注入塔顶线的酸性水增大	Increase the flow rate of sulfur-containing sewage exporting and reduce the injection of D-209.提高含硫污水外量，将 D-209 的注入量降低。
	Acid pump failed.酸性水泵故障	Switch to the standby pump.切换至备用泵。
	Inner leakage of the oil-gas /circulating water cooler 塔顶油气循环水冷却器内漏	Cut off the inner leaking cooler.将内漏的冷却器切除。
	Instrument failure 仪表故障	Contact the instrument people for handling.联系仪表处理。
Interface level decreases 界面下降	Fractionator overhead temperature is high. 分馏塔顶温度高	Increase the reflux to reduce fractionator overhead temperature.开大回流量，降低塔顶温度。或者适当降低 A201 变频温度、降低 E202 冷后温度。
	The water injection from fractionator to the overhead reduced.分馏塔至塔顶注水量减少	Properly reduce the flow rate of acid water exporting .适当减少酸性水的外送量。

Fault 现象	Cause 原因	Actions 处理方法
	The water injecting line of acid water to fractionator overhead is blocked 酸性水至分馏塔顶注水线堵塞	Line up the water injecting line.倒通注水线。
Interface level fluctuates 界面波动	Fractionator overhead pressure fluctuated.分馏塔顶压力波动	Contact the reaction and compressor posts to stabilize the reaction pressure and inlet pressure of compressor. 联系反应机组岗位将反应压力和气压机入口压力控制平稳。

Actions of runaway situation: If D-201 oil-gas/water interface level is runaway, then take the actions of the fractionation stabilization post in the emergency shutdown plan of accident.
失控处理：若 D-201 汽水界面超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(11)Control of C-202 level
C-202 液位的控制
1)Control range: 30-70%.
控制范围：30～70％。
2)Control range: ± 5% of the tower C-202 level setpoints.
控制目标：塔 C-202 液面设定值±5%。
3)Control range: Opening of flow control valve FIC-20601/FIC-20602 for diesel exporting ; Fractionator middle temperature TIC-20209; Fractionator overhead temperature TIC-20201; Fractionator overhead pressure PI-20201; The stripping steam flow FIC-20501 of diesel stripper.
相关参数：柴油外放流量阀开度 FIC-20601/FIC-20602；分馏塔中部温度 TIC-20209 ；分馏塔顶部温度 TIC-20201；分馏塔顶部压力 PI-20201；柴油汽提塔汽提蒸汽量 FIC-20501。
4)Control range: Normally the C-202 level is controlled by the diesel flow rate exporting to hydrogenation unit, with the flow rate increasing, the level decreases; with the flow rate decreasing, the level rises.
控制方式：塔 C-202 液面正常情况下由柴油外放流量/至加氢单元流量控制，流量上升，液面下降；流量减小，液面升高。



5)Normal adjustment 正常调整：

Influence factor 影响因素	Adjustment methods 调整方法
The control valve of diesel distillate entering the drum 柴油馏分进罐控制阀	As the control valve opening reduces, the level drops, and vice versa.控制阀开度减小，液面下降；反之升高。
The control valve of diesel exporting 柴油外送控制阀	As the hydrogenation/tank control valve opening increases, the level will drop, and vice versa. 柴油至加氢/罐区控制阀开大液面下降；反之升高。
Valve opening on the line of diesel to re-absorption tower 柴油至再吸收塔阀门开度	As the valve opening increases, the level will drop, and vice versa.阀门开大液面下降；反之升高。
Valve opening on the line of diesel to wash oil line 柴油至冲洗油管线阀门开度	As the valve opening increases, the level will drop, and vice versa.阀门开大液面下降；反之升高。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Actions 处理方法
C-202 level rises. 液面上升	The process of diesel exporting is not lined up.柴油外放流程不通	Line up the process of diesel exporting process flow .倒通柴油外放流程。
	Diesel pump failed 柴油泵故障	Switch to the standby pump.切换至备用机泵。
	C-201 bottom temperature is too high and diesel components become heavier C-201 塔底温度过高柴油组分变重	Reduce the tower bottom temperature.降低塔底温度。

Fault 现象	Cause 原因	Actions 处理方法
	Valve inner leakage of wash oil to C-202.冲洗油至 C-202 阀门内漏	Check the process and handle the inner leaking valve.检查流程，处理内漏阀门。
	The flow rate of C-202 stripping steam is small C-202 汽提蒸汽量小	Adjust the flow rate of C-202 stripping steam. 调整 C-202 汽提蒸汽量。
C-202 level drops. C-202 液面下降	Lean absorption pump failed.贫吸收油泵故障	Switch to the standby pump.切换至备用机泵。
	Diesel distillate line blocked 柴油流出管线堵塞	Line up the diesel distillate line.倒通柴油流出管线。
	The line of rich absorption oil returning to tower is blocked 富吸收油反塔管线堵塞	Line up the rich absorption oil line returning to towerv 倒通富吸收油反塔管线
	Fractionator middle temperature is too high or too low 分馏塔中部温度过高或过低	Adjust fractionator middle temperature to the range of 220 to 260 °C by a middle section circulating.通过一中循环量，将分馏塔中部温度调整到 220～260℃范围内。
	The line of gas returning is blocked 气返线堵塞	Line up the process of gas returning.倒通气返线管线。
	The flow rate of C-202 stripping steam is too large C-202 汽提蒸汽量大	Close more the stripping steam control valve and adjust the flow rate of C-202 stripping steam.关小汽提蒸汽控制阀，调整 C-202 汽提蒸汽量。

Actions of runaway situation: if the C-210 level is out of control, then switch to the fractionation stabilization post of the emergency shutdown plan for accidents.

失控处理：若 C202 液面超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(12)Control of C-203 level

C-203 液位的控制

1)Control range: 30-70%.

控制范围：30～70%。

2)Control range: ± 5% of the tower C-203 level set point.

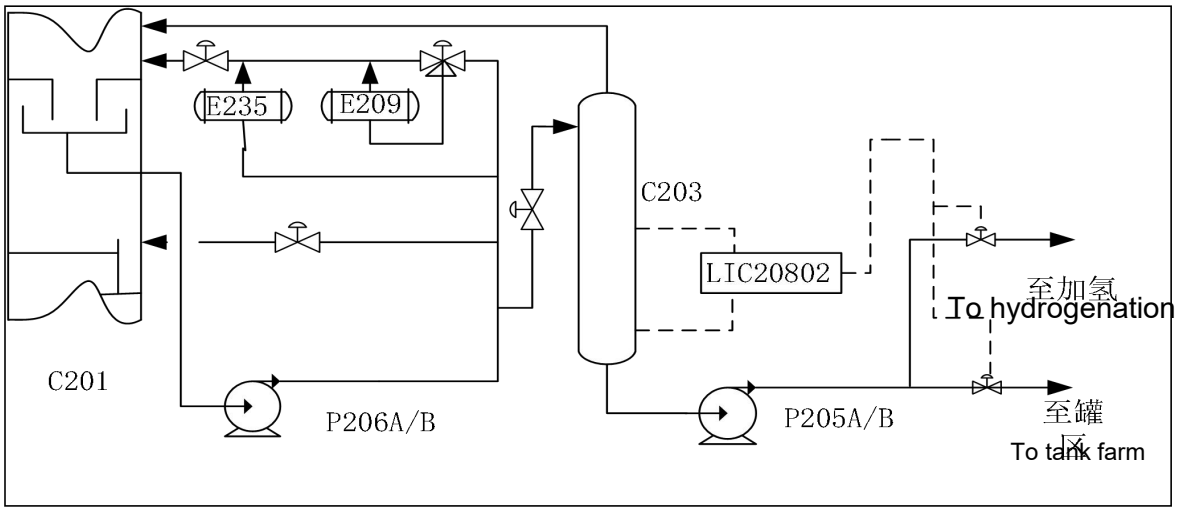
控制目标：塔 C-203 液面设定值±5%。

3)Control range: Opening of the flow control valve FIC-21001 for heavy wax oil exporting ; Fractionator heavy wax oil extraction temperature TIC-20108; Fractionator overhead temperature TIC-20201; Fractionator overhead pressure PI-20201; The stripping steam flow FIC-20801 of heavy wax oil stripper.

相关参数：重蜡油外放流量阀开度 FIC-21001；分馏塔重蜡油抽出温度 TIC-20108 ；分馏塔顶部温度 TIC-20201；分馏塔顶部压力 PI-20201；重蜡油汽提塔汽提蒸汽量 FIC-20801

4)Control range: Normally the C-203 level is controlled by the diesel flow rate exporting to hydrogenation unit, with the flow rate increasing, the level decreases; and with the flow rate decreasing, the level rises.

控制方式：塔 C-203 液面正常情况下由重蜡油外放流量/至加氢单元流量控制，流量上升，液面下降；流量减小，液面升高。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment methods 调整方法
Opening of control valve for heavy wax oil distillate exporting 重蜡油馏分外放控制阀开度	If opening of the control valve increases, the level will lower; and vice versa.控制阀开度增大，液面下降；反之升高。
The opening of control valve for heavy wax oil distillate entering drum 重蜡油馏分进罐控制阀开度	If opening of the control valve decreases, the level will lower; and vice versa.控制阀开度减小，液面下降；反之升高。
The opening of control valve for heavy wax oil distillate returning to tower 重蜡油馏分下反塔控制阀开度	If opening of the control valve increases, the level will lower; and vice versa.控制阀开度增大，液面下降；反之升高。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Actions 处理方法
C-203 level rises. C-203 液面	The process of heavy wax oil exporting is not lined up 重蜡油外放流程不通	Line up the process of heavy wax oil exporting 倒通重蜡油外放流程。.

Fault 现象	Cause 原因	Actions 处理方法
上升	Heavy wax oil stripper bottom pump failed 重蜡油汽提塔塔底泵故障	Switch to the standby pump.切换至备用机泵。
	The flow rate of C-203 stripping steam is small C-203 汽提蒸汽量小	Adjust the flow rate of C-203 stripping steam.调整 C-203 汽提蒸汽量。
	Heavy wax oil components become heavier 重蜡油组分变重	Reduce the temperature returning to tower.降低反塔温度。
	Heavy wax oil component becomes lighter 重蜡油组分变轻	Increase the temperature returning to tower.提高反塔温度。
C-203 level drops. C-203 液面下降	Fractionator heavy wax oil temperature is too high or too low 分馏塔重蜡油温度过高或过低	Adjust the heavy wax oil fractionator temperature to a suitable range by adjusting the flow rate of heavy wax oil circulation.通过重蜡油循环量，将分馏塔重蜡油温度调整到合适范围内。
	The line of heavy wax oil entering into the drum blocked 重蜡油进罐管线堵塞	Clear and clean the pipeline.倒通管线。
	The flow rate of C-203 stripping steam is too large C-203 汽提蒸汽量大	Close more the stripping steam control valve to adjust the flow rate of C-203 stripping steam.关小汽提蒸汽控制阀，调整 C-203 汽提蒸汽量。
	Heavy wax oil circulation pump failed 重蜡油循环泵故障	Switch to the standby pump.切换至备用机泵。

Actions of runaway situation: If the C-203 level is runaway, then take the actions of the fractionation stabilization post in the emergency shutdown plan of accident.

失控处理：若 C-203 液面超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(13)Control of D-202 naphtha level

D-202 石脑油液位的控制

1)Control range: 20-50% .

控制范围：20～50%。

2)Control range: ± 5% of D-202 level set point.

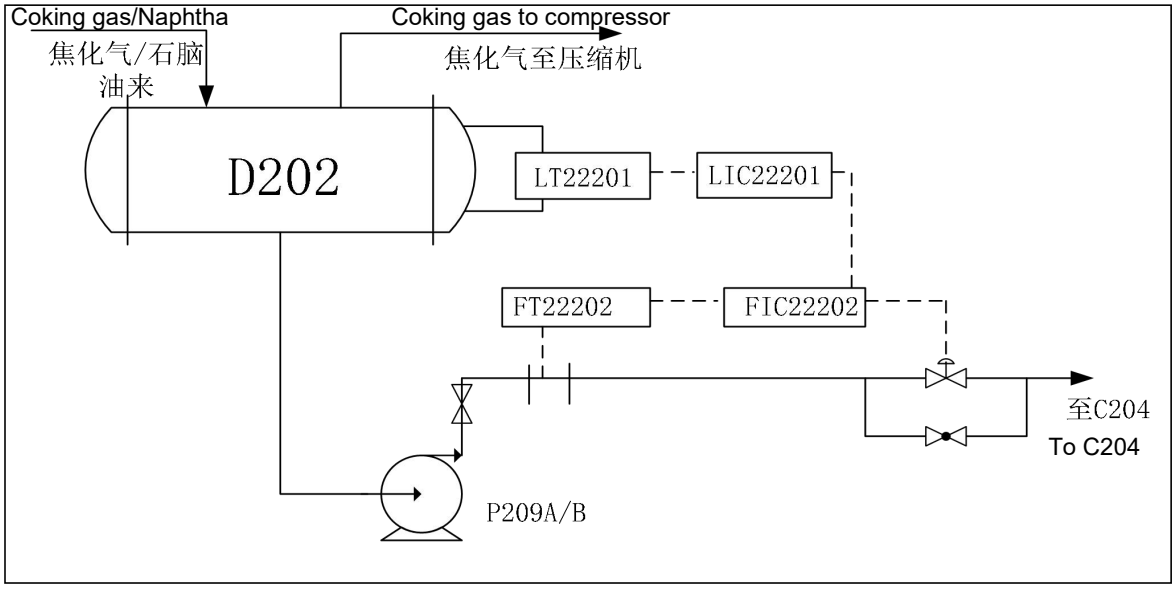
控制目标：D-202 液位设定值±5%。

3)Control range: Naphtha flow rate FIC-20402; D-202 level LIC-22201.

相关参数：石脑油流量 FIC-20402；D-202 液面 LIC-22201

4)Control range: D-202 level is controlled by the opening of level control valve. As the control valve opening increases, the level decreases; as the opening of the control valve decreases, the level will increase.

控制方式：D-202 液面是由液面控制阀开度控制的。控制阀开度开大，液面下降；控制阀开度减小，液面上升。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment methods 调整方法
Opening of D-202 level control valve D-202 液面控制阀开度	As the opening of the control valve increases, the level decreases; and vice versa.液面控制阀开度大，液面下降；反之，液面升高。
Opening of Unstable gasoline control valve 不稳定汽油调节阀开度	As the opening of the control valve decreases and the level decreases; and vice versa.控制阀开度减小，液面下降；反之，液面升高。

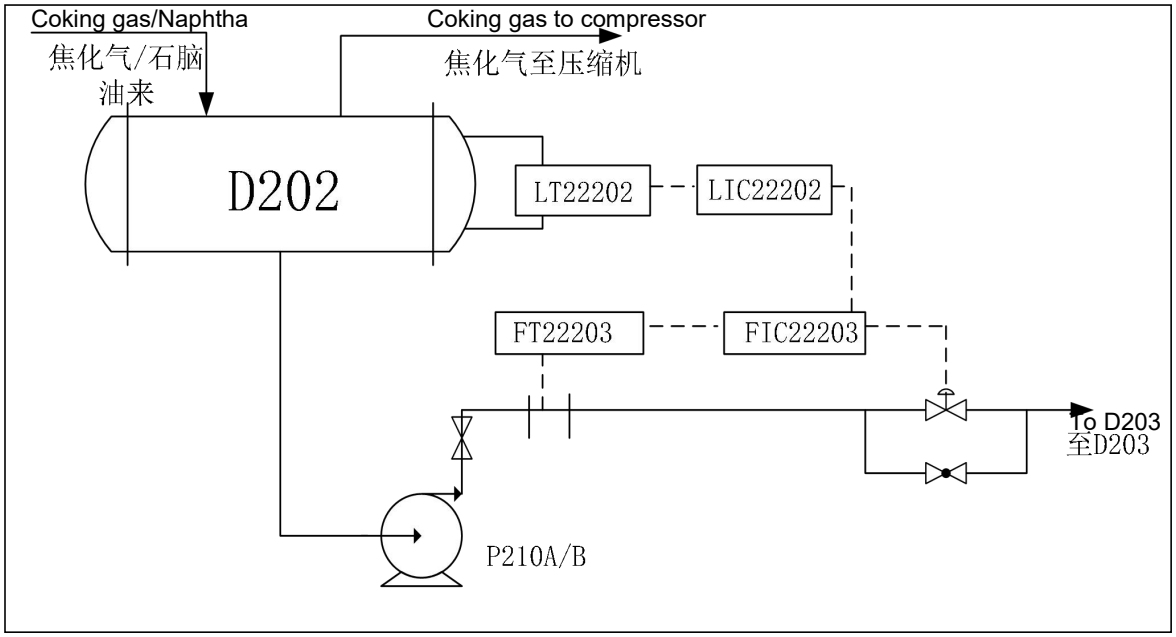
6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Actions 处理方法
Level rises. 液面上升	The process to C-204 is not lined up.至 C-204 流程不通	Line up the process.打通流程。
	Condensation oil pump failed 凝缩油泵故障	Switch to the standby pump.切换至备用机泵。
	The oil-gas temperature of fractionator overhead is low after cooling.塔顶油气冷后温度低	Increase the temperature.提高温度。

Fault 现象	Cause 原因	Actions 处理方法
	Interface is full.界面满	Lower the D-202 interface.降低 D-202 界面。
	Instrument failed.仪表故障	Contact the instrument people for handling.联系仪表处理。
Level drops 液面下降	Inlet temperature is high.入口温度高	Open more the cooling water control valve to reduce the temperature after cooling.开大冷却器冷却水控制阀，降低冷后温度。
	Fractionator overhead reflux pump failed 分馏塔顶回流泵故障	Switch to the standby pump.切换至备用机泵。
	Interface level is empty. 界面空	Increase the D-202 interface level.提高 D-202 界面。
Level fluctuates.液面波动	D-202 pressure fluctuated D-202 压力波动	Control the D-202 pressure stably.将 D-202 压力控制平稳。

Actions of runaway situation: If the D-202 oil-gas/water interface level is runaway, then take the actions of the fractionation stabilization post in the emergency shutdown plan of accident.
失控处理：若 D-202 液面超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(14)Control of D-202 naphtha/sewage interface level
D-202 石脑油/污水界位的控制
1)Control range: 30-70%.
控制范围：30～70%。
2)Control range: ± 5% of the D-202 interface level set point.
控制目标：D-202 界面设定值±5%。
3)Control range: Opening of control valve FIC-22203 for D-202 interface level; D-201 interfaces level LIC-22202; Oil-gas temperature TI-22201.
相关参数：D-202 界面控制阀开度 FIC-22203；D-201 界面 LIC-22202；油气温度 TI-22201。
4)Control range: D-202 oil-gas/water interface is controlled by the opening of interface level control valve FIC-22203. In the case of constant flow rate of water entering D-202, if the interface control valve opening increases, the interface level will decrease; if the interfaces control valve opening decreases, the interface level will increase.
控制方式：D-202 界面是由界面控制阀 FIC-22203 开度控制的。进入 D-202 水量一定时，界控阀开度增大，界面下降；界控阀开度减小，界面上升。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment methods 调整方法
Opening of D-202 interface control valve D-202 界面控制阀开度	As opening of the interface control valve increases, the interface level decreases; and vice versa.界面控制阀开度大，界面下降；反之，界面升高。
The flow rate of acidic water injection at fractionator overhead 分馏塔顶酸性水注入量.	As the flow rate of the injection increases, the interface level rises; and vice versa.注入量大界位升高；反之，界面下降。
D-202 inlet temperature D-202 入口温度	As the temperature increases, the interface level decreases; and vice versa.温度升高界位下降；反之，界面升高。

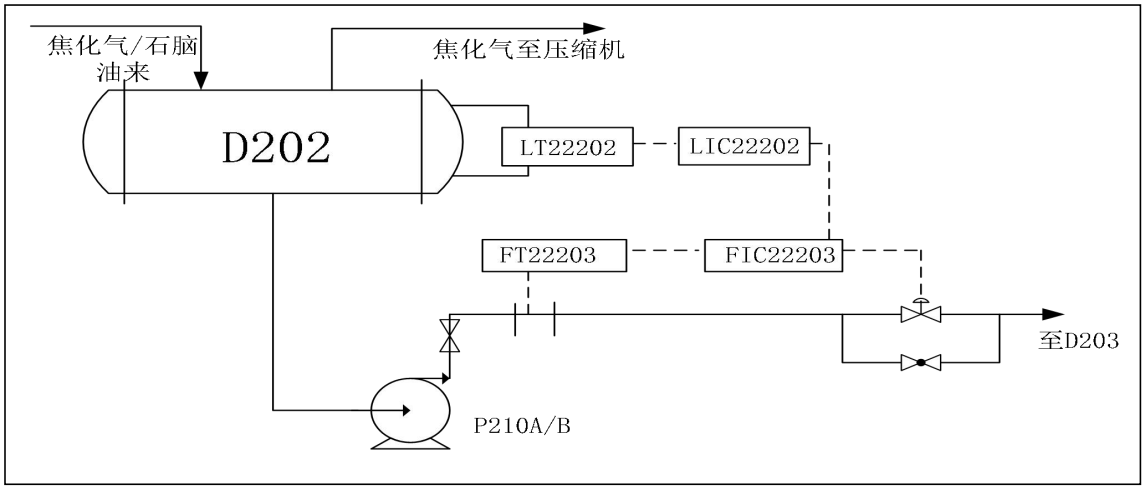
6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Actions 处理方法
Interface level rises 界面上升	Unstable gasoline contained water 不稳定汽油带水	Find Cause and lower the water containing.查找原因，降低带水。
	Inner leakage in the overhead cooler of oil-gas /circulating water 塔顶油气循环水冷却器内漏	Cut off the inner leaking cooler.将内漏的冷却器切除。
	The pipeline of D-202 to D-203 is blocked D-202 至 D-203 管线堵塞	Clean and clear the pipeline.疏通管线。

Fault 现象	Cause 原因	Actions 处理方法
	P-210 acid water pump failed P-210 酸性水泵故障	Switch to the standby pump.切换至备用机泵。
	Instrument failed 仪表故障	Contact the instrument people for handling.联系仪表处理。
Interface level drops 界面下降	P-202 pump failed P-202 机泵故障	Switch to the standby pump.切换备用泵。
	Water injection line blocked 注水线堵塞	Clear and clean the water injection line.倒通注水线。

Actions of runaway situation: If D-202 oil-gas/water interface level is runaway, then take the actions of the fractionation stabilization post in the emergency shutdown plan of accident.
失控处理：若 D-202 汽水界面超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(15)Control of D-203 naphtha/sewage interface level
D-203 石脑油/污水界位的控制
1)Control range: 30-70%. 控制范围：30～70%。
控制范围：30～70%。
2)Control range: ± 5% of D-203 oil-gas and water interface level set point.
控制目标：D-203 汽水界面设定值±5%。
3)Control range: Opening of flow control valve FIC-22304 for D-203 oil-gas /water interface level; D-201 interface level LIC-22302; Oil-gas temperature TI-22301.
相关参数：D-203 汽水界面控制阀开度 FIC-22304；D-201 界面 LIC-22302；油气温度 TI-22301。
4)Control range: D-203 oil-gas/water interface is controlled by the opening of interface level control valve FIC-22304. In the case of constant flow rate of water entering D-203, if the interface control valve opening increases, the interface level will decrease; if the interfaces control valve opening decreases, the interface level will increase.
控制方式：D-203 汽水界面是由界面控制阀 FIC-22304 开度控制的。进入 D-203 水量一定时，界控阀开度增大，界面下降；界控阀开度减小，界面上升。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment methods 调整方法
Opening of D-203 interface control valve D-203 界面控制阀开度	As the opening of the interface control valve increases, the interface level decreases; and vice versa.界面控制阀开度大，界面下降；反之，界面升高。
The flow rate of Acid water injection 酸性水注入量	As the flow rate of the injection increases, the interface level increases; and vice versa.注入量大界位升高；反之，界面下降。
D-203 inlet temperature D-203 入口温度	As the temperature increases, the interface level decreases; and vice versa.温度升高界位下降；反之，界面升高。

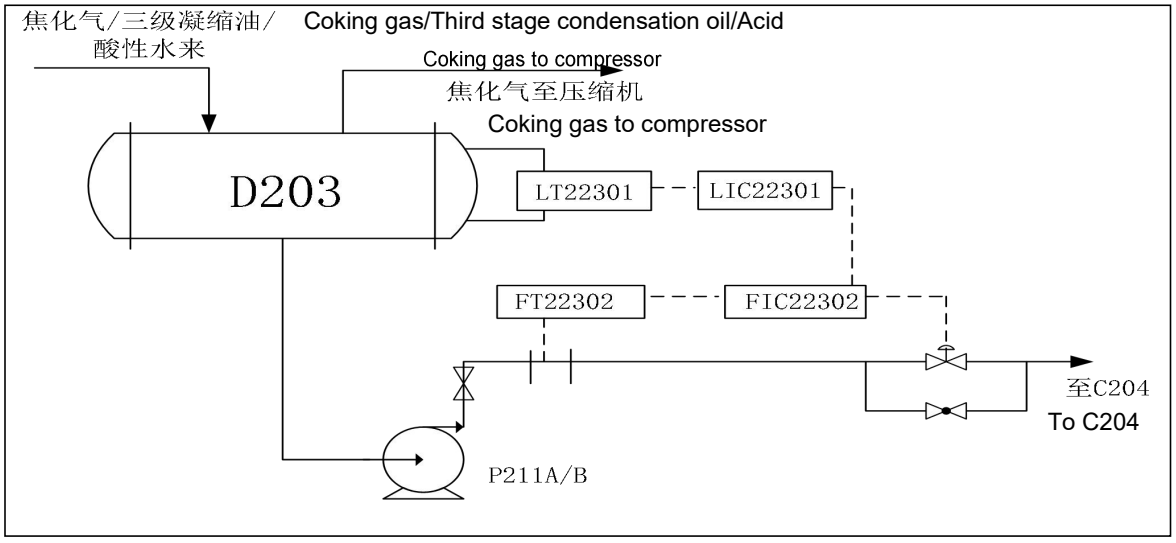
6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Actions 处理方法
Interface level rises 界面上升	Secondary condensation oil contained water 二级凝缩油带水	Find Cause and lower the water containing.查找原因，降低带水。
	Inner leakage in fractionator overhead cooler of oil-gas /circulating water 塔顶油气循环水冷却器内漏	Cut off the inner leaking cooler.将内漏的冷却器切除。
	The pipeline of D-203 to D-204 is blocked D-203 至 D-204 管线堵塞	Clean and clear the pipeline.疏通管线。
	P-212 pump failed P-212 泵故障	Switch to the standby pump.切换至备用机泵。

Fault 现象	Cause 原因	Actions 处理方法
	Instrument failed 仪表故障	Contact the instrument people for handling.联系仪表处理。
Interface level drops 界面下降	P-210 pump failed P-210 机泵故障	Switch to the standby pump.切换备用泵。
	Water injection line blocked 注水线堵塞	Clear the water injection line.倒通注水线。

Actions of runaway situation: If the D-203 oil-gas/water interface level is runaway, then take the actions of the fractionation stabilization post in the emergency shutdown plan of accident
失控处理：若 D-203 汽水界面超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(16)Control of D-203 naphtha level
D-203 石脑油液位的控制
1)Control range: 20-50%.
控制范围：20～50%。
2)Control range: ± 5% of D-203 level set point.
控制目标：D-203 液面设定值±5%。
3)Control range: Naphtha flow rate FIC-22302; D-202 level LIC-22301.
相关参数：石脑油流量 FIC-22302；D-202 液面 LIC-22301。
4)Control range: D-203 level is controlled by the level control valve. As the opening of the control valve increases, the level decreases; and as the opening of control valve decreases, the level rises.
控制方式：D-203 液面是由液面控制阀开度控制的。控制阀开度开大，液面下降；控制阀开度减小，液面上升。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment methods 调整方法
Opening of D-203 level control valve D-203 液面控制阀开度	As the opening of the control valve increases, the level decreases; and vice versa.液面控制阀开度大，液面下降；反之，液面升高。
The flow rate of P-211 condensation oil injection P-211 凝缩油注入量	As the flow rate of the injection increases, the level increases; and vice versa.注入量大液面升高；反之，液面下降。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Actions 处理方法
Level rises 液面上升	The line to C204 is not lined up 至-C204 流程不通	Line up the process.打通流程。
	Condensation oil pump failed 凝缩油泵故障	Switch to the standby pump.切换至备用机泵。
	Fractionator overhead oil-gas temperature is low after cooling.塔顶油气冷后温度低	Increase the temperature.提高温度。
	Interface level is full 界面满	Reduce interface level of the D-203.降低 D-203 界面。
	Instrument failure 仪表故障	Contact the instrument people for handling.联系仪表处理。
Level drops 液面下降	The temperature after cooling is high 冷后温度高	Open more the cooling water control valve to reduce the temperature after cooling.开大冷却器冷却水控制阀，降低冷后温度。
	Interface level is empty 界面空	Increase the D-203 interface level.提高 D-203 界面。
Level fluctuates 液面波动	D-203 pressure fluctuated. D-203 压力波动	Control D-203 pressure stably.将 D-203 压力控制平稳。

Actions of runaway situation: If the D-203 level is runaway, then take the actions of the fractionation stabilization post in the emergency shutdown plan of accident.

失控处理：若 D-203 液面超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(17)Control of D-204 naphtha level

D-204 石脑油液位的控制

1)Control range: 20-50%.

控制范围：20～50%。

2)Control range: ± 5% of D-204 level set point.

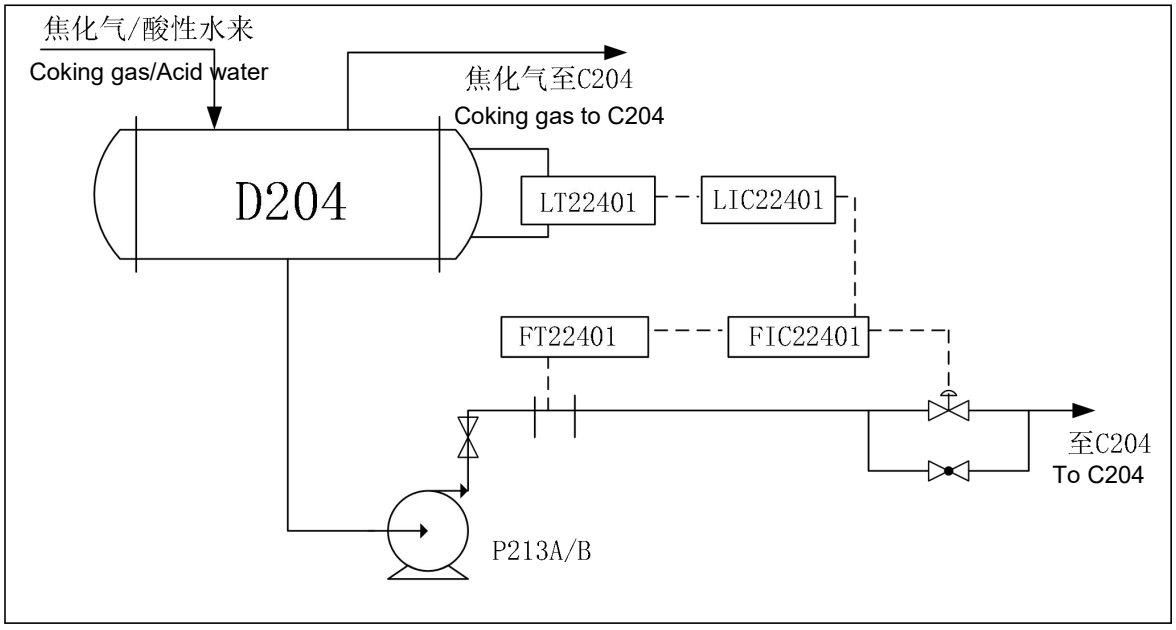
控制目标：D-204 液面设定值±5%。

3)Control range: Naphtha flow rate FIC-22401; D-204 level LIC-22401.

相关参数：石脑油流量 FIC-22401；D-204 液面 LIC-22401。

4)Control range: D-204 level is controlled by the level control valve. As the opening of the control valve increases, the level decreases; and if the opening of the control valve decreases, the level will rise.

控制方式：D-204 液面是由液面控制阀开度控制的。控制阀开度开大，液面下降；控制阀开度减小，液面上升。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment methods 调整方法
Opening of D-204 level control valve D-204 液面控制阀开度	As the opening of the level control valve increases, the level decreases; and vice versa.液面控制阀开度大，液面下降；反之，液面升高。

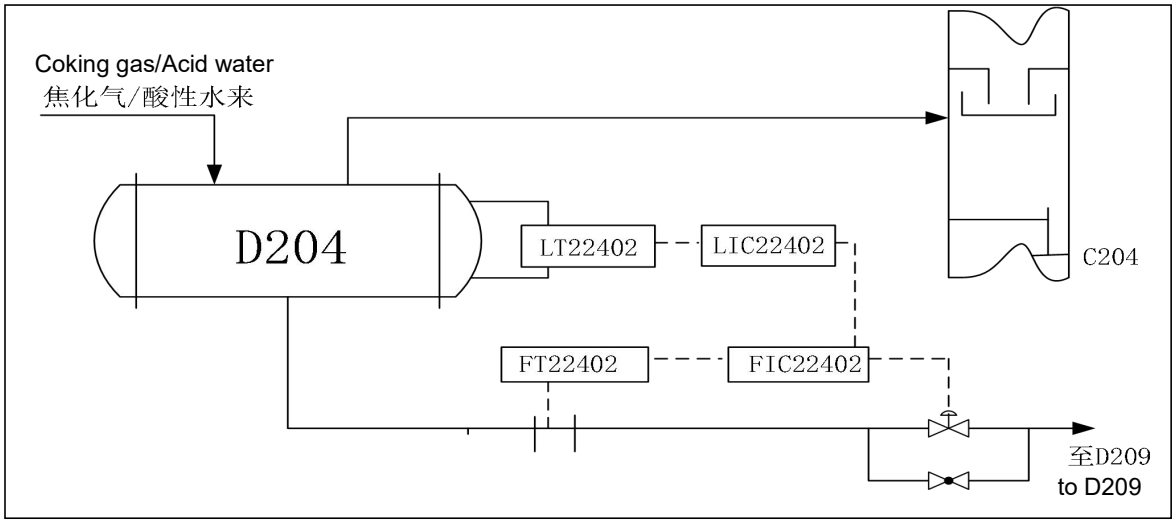
6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Actions 处理方法
Level rises 液面上升	The process to C-204 is not lined up 至 C-204 流程不通	Line up the process.打通流程。
	Condensation pump failed 凝缩油泵故障	Switch to the standby pump.切换至备用机泵。

Fault 现象	Cause 原因	Actions 处理方法
	Fractionator overhead oil-gas temperature is low after cooling.塔顶油气冷后温度低	Increase the temperature.提高温度。
	Interface level is full 界面满	Reduce the D-204 interface level.降低 D-204 界面。
	Instrument failure 仪表故障	Contact the instrument people for handling.联系仪表处理。
Level drops 液面下降	The temperature after cooling is high 冷后温度高	Increase the control valve opening of cooling water to reduce the temperature after cooling.开大冷却器冷却水控制阀，降低冷后温度。
	Interface level is empty 界面空	Increase the D-204 interface level.提高 D-204 界面。
Level fluctuates 液面波动	D-204 pressure fluctuated. D-204 压力波动	Control D-204 pressure stably.将 D-204 压力控制平稳。

Actions of runaway situation: If the D-204 level is runaway, then take the actions of the fractionation stabilization post in the emergency shutdown plan of accident.
失控处理：若 D-204 液面超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(18)Control of D-204 naphtha/sewage interface level
D-204 石脑油/污水界位的控制
1)Control range: 30-70%.
控制范围：30～70%。
2)Control range: ± 5% of D-204 oil-gas and water interface level set point.
控制目标：D-204 汽水界面设定值±5%。
3)Control range: Control valve opening of FIC-22402 for D-204 oil-gas/water interface level; D-201 interfaces level LIC-22402; oil-gas temperature TI-22401.
相关参数：D-204 汽水界面控制阀开度 FIC-22402；D-201 界面 LIC-22402；油气温度 TI-22401。
4)Control range: D-204 oil-gas/water interface is controlled by the opening of interface level control valve FIC-22402. In the case of constant flow rate of water entering D-204, if the interface control valve opening increases, the interface level will decrease; and if the interfaces control valve opening decreases, the interface level will increase.
控制方式：D-204 汽水界面是由界面控制阀 FIC-22402 开度控制的。进入 D-204 水量一定时，界控阀开度增大，界面下降；界控阀开度减小，界面上升。



5)Normal adjustment: 正常调整：

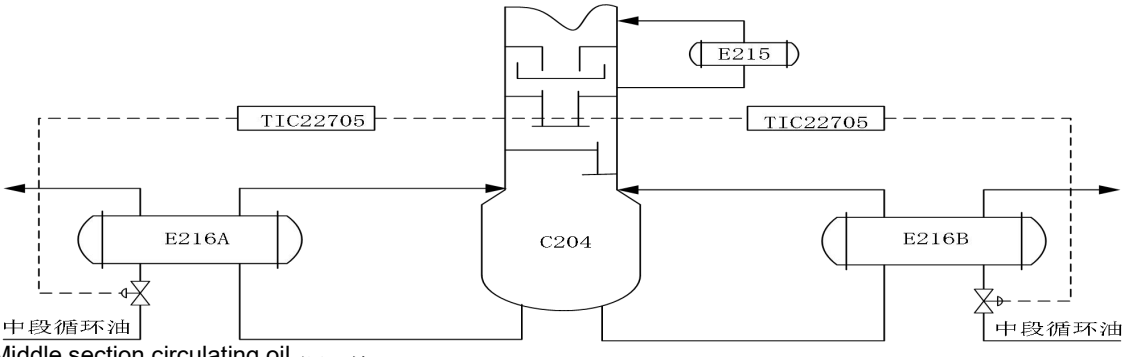
Influence factor 影响因素	Adjustment methods 调整方法
Opening of D-204 interface control valve D-204 界面控制阀开度	As the opening of the interface control valve increases, the interface level decreases; and vice versa.界面控制阀开度大，界面下降；反之，界面升高。
Flow rate of acid water injection 酸性水注入量	As the flow rate of the injection increases, the interface level increases; and vice versa.注入量大界位升高；反之，界面下降。
D-204 inlet temperature D-204 入口温度	As the temperature increases, the interface level decreases; and vice versa.温度升高界位下降；反之，界面升高。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Actions 处理方法
Interface level rises 界面上升	Inner leakage in the cooler of fractionator overhead oil-gas /circulating water. 塔顶油气循环水冷却器内漏	Cut off the inner leaking cooler.将内漏的冷却器切除。
	The pipeline of D-204 to D-209 blocked D-204 至 D-209 管线堵塞	Clean and clear the pipeline.疏通管线。
	Instrument failure 仪表故障	Contact the instrument people for handling.联系仪表处理。
Interface level drops 界面下降	P-212 water injection decreased P-212 注水量下降	Open more water injection control valve to increase the flow rate of water injection.开大注水控制阀，提高注水量量。

Actions of runaway situation: If the D-204 level is runaway, then take the actions of the fractionation stabilization post in the emergency shutdown plan of accident.
失控处理：若 D-204 汽水界面超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(19)Control of C-204 sensitive plate temperature
C-204 灵敏板温度的控制
1)Control range: The temperature TIC-22705 of C-204 sensitive plate: 105-130°C.
控制范围：C-204 灵敏板温度控制 TIC-22705 在 105-130°C
2)Control range: Normally the temperature of C-204 sensitive plate is controlled within the above range to ensure that C2 of liquefied gas is on specification, but the temperature of C-204 sensitive plate should not be controlled too high to avoid excessive desorption, affecting quality of dry gas. The temperature of C-204 sensitive plate should be controlled within ±5 °C of the set point.
控制目标：正常操作中 C-204 灵敏板温度的控制在上述范围内，保证液化气 C2 合格，但 C-204 灵敏板温度不宜控制过高，以避免解吸过度，影响干气质量，C204 灵敏板温度控制设定±5℃。
3)Control range: Temperature TI-22708/TI-22714 of E-216A/B return to tower; Flow rate FIC-22302/FIC-22401 of desorption tower feeding; Temperature TI-22709 of middle section returning to tower.
相关参数：E-216A/B 返塔温度 TI-22708/TI-22714；解吸塔进料量：FIC-22302/FIC-22401；中段反塔温度：TI-22709 塔顶压力 PIC22901。
4)Control range: Normally C-204 sensitive plate temperature is controlled by adjusting the middle section oil flow rate to control the temperature of E-216A/B absorption / desorption tower bottom liquid returning to tower; In order to realize the purpose of temperature controlling of the C-204 sensitive plate, the return temperature of E-216A/B absorption /desorption tower bottom liquid and TIC-22705 simultaneously apply to two control valves FIC-22801/FIC-22802.
控制方式：正常 C-204 灵敏板温度控制是通过调解中段油流量，来控制 E-216A/B 吸收解吸塔底液的返塔温度，E-216A/B 吸收解吸塔底液的返塔温度由 TIC-22705 同时作用到 FIC-22801/FIC-22802 两个调节阀进行控制，进而达到控制 C-204 灵敏板温度的目的。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment methods 调整方法
Control valve opening 调节阀开度	If close more the control valve, main flow rate of E-216A/B reduces, the temperature will decrease, and vice versa.关小调节阀，E-216A/B 主路流量减少，温度下降；反之上升。
The extraction temperature of middle section circulating oil 中段循环油抽出温度	If extraction temperature of the middle circulating oil is high, the tower bottom temperature will be high; and vice versa.中段循环油抽出温度高，塔底温度高；反之下降。
The flow rate of middle section circulating oil 中段循环油流量	If the middle section circulating oil flow rate increases, the tower bottom temperature will be high; and vice versa.中段循环油流量大，塔底温度高；反之下降。。
The middle section re-boiler load of desorption tower 解吸塔中段重沸器负荷	If the load increases, the sensitive plate temperature will rise; and vice versa.增加负荷，灵敏板温度上升；反之下降。
塔顶压力变化	C205 塔顶压力升高，温度升高，反之则低。

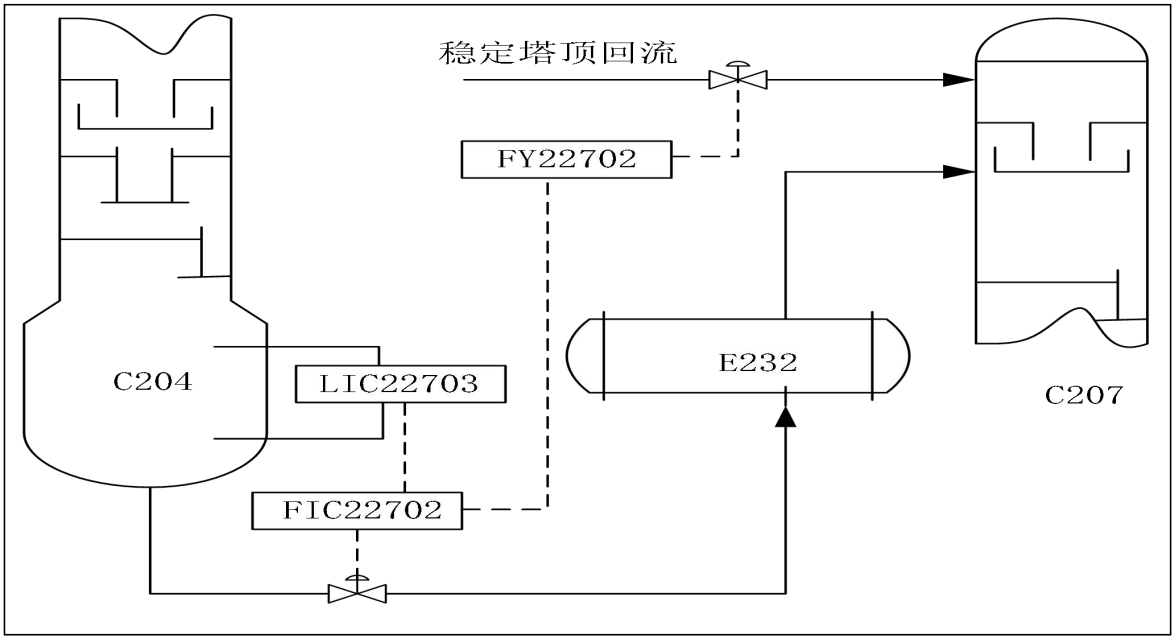
6)Troubleshooting: 异常处理：

Fault 现象	Cause 原因	Actions 处理方法
C-204 bottom temperature drops C-204 底温度下降	Fractionator bottom heating source interrupted.塔底热源中断	Fully open re-boiler control valve to increase heat exchanging, and find out the cause and restore the heat source as soon as possible.全开重沸器调节阀，增加取热量，同时立即查找原因，尽快恢复热源。
	Pipeline of Re-boiler blocked.重沸器管路堵塞	Cut off, clean and clear it.切除，疏通清洗。
	Line of desorption tower middle Re-boiler blocked 解吸塔中段重沸器管路堵塞	Clean and clear the line.疏通清洗。
C-204 bottom temperature is high C-204 底温度高	C-204 bottom level is low or zero. C-204 底液面低或空	Control the bottom level within the specification by the control valves of C-204 feeding and discharging.通过 C-204 进料和出料控制阀，将塔底液面控制在指标范围内。
	Middle section oil circulating temperature is high 中段油循环温度高	Reduce the middle section oil circulating temperature.降低中段油循环温度。

Fault 现象	Cause 原因	Actions 处理方法
The desorption gas contain liquid 解析气带液	Excessive desorption or low pressure of desorption tower 解吸过度或解吸塔压力低	Reduce desorption tower bottom temperature by closing more the control valve, and increase desorption tower pressure by opening more the fractionator overhead control valve 通过关小调节阀降低吸收解吸塔底温度，通过关小吸收解析塔顶压控阀提高解吸塔压力。

Actions of runaway situation: If the desorption tower bottom temperature is runaway, then take the actions of the fractionation stabilization post in the emergency shutdown plan of accident.
失控处理：若解析塔底温度超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(20)Control of C-204 bottom level
C-204 底液位的控制
1)Control range: 30-70%.
控制范围：30～70%。
2)Control range: ±5% of C-204 level set point.
控制目标：C-204 液面设定值±5%。
3)Control range: C-204 feed flow FIC-22302/FIC-22401/FIC-22202; C-204 level LIC-22703.
相关参数：C-204 进料流量 FIC-22302/FIC-22401/FIC-22202；C-204 液面 LIC-22703
4)Control range: C-204 level is controlled by level control valve opening of FIC-22702. FIC-22702 opening controls stabilizer overhead reflux in proportion. As level control valve opening of FIC-22702 increases, C-204 level decreases; and if the control valve opening decreases, the C-204 level will increase.
控制方式：C-204 液面是液面控制阀 FIC-22702 开度控制的。FIC-22702 的开度与稳定塔顶回流量进行比例调节，液面控制阀 FIC-22702 开度开大，C-204 液面下降；控制阀开度减小，C-204 液面上升。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment methods 调整方法
Opening of C-204 level control valve C-204 液面控制阀开度	If opening of C-204 level control valve increases, the level will lower; and vice versa.液面控制阀开度大，液面下降；反之，液面升高。
Opening of C-204 control valve for feedstock C-204 进料控制阀开度	If the control valve opening increases, the level will increase; and vice versa.控制阀开度大，液面上升；反之，液面下降。
C-204 bottom temperature C-204 塔底温度	If the temperature increases, the level will lower; and vice versa.温度上升，液面下降；反之，液面升高。
C204 中段回流温度	温度过低塔底液位上升，反之，液面下降。
C-204 overhead pressure C-204 塔顶压力	If the pressure increases, the level will increase; and vice versa.压力上升，液面上升；反之，液面下降。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Actions 处理方法
Level rises 液面上升	The process to C-207 is not lined up 至 C-207 流程不通	Line up the process.打通流程。
	补充吸收剂的流量增大或者温度变低	调整好补充吸收剂的量和温度
	Stabilizer reflux becomes large 稳定塔回流量变大	Reduce the reflux.减少回流量。

Fault 现象	Cause 原因	Actions 处理方法
	C-204 feeding increased; fractionator bottom temperature is low. C-204 进料量增大；塔底温度低	Reduce C-204 feeding to increase the bottom temperature.减少 C-204 进料；提高塔底温度。
	Instrument failure 仪表故障	Contact the instrument for handling.联系仪表处理。
Level drops 液面下降	C-207 bottom temperature is high C-207 塔底温度高	Reduce the bottom temperature of the C-207.降低 C-207 塔底温度。
	C-204 feeding interrupted C-204 进料量中断	Find Cause and restore the feed of tower.查找原因，恢复进料量。
Level fluctuates 液面波动	D-204 pressure fluctuated D-204 压力波动	Control the D-204 pressure stably.将 D-204 压力控制平稳。

Actions of runaway situation: If the D-204 level is runaway, then take the actions of the fractionation stabilization post in the emergency shutdown plan of accident.

失控处理：若 D-204 液面超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(21) C-210 Liquid level control

C-210 液位的控制

1)Control range: 30-70%.

控制范围：30～70%。

2)Control target: ± 5% of the columnC-210 level setpoint.

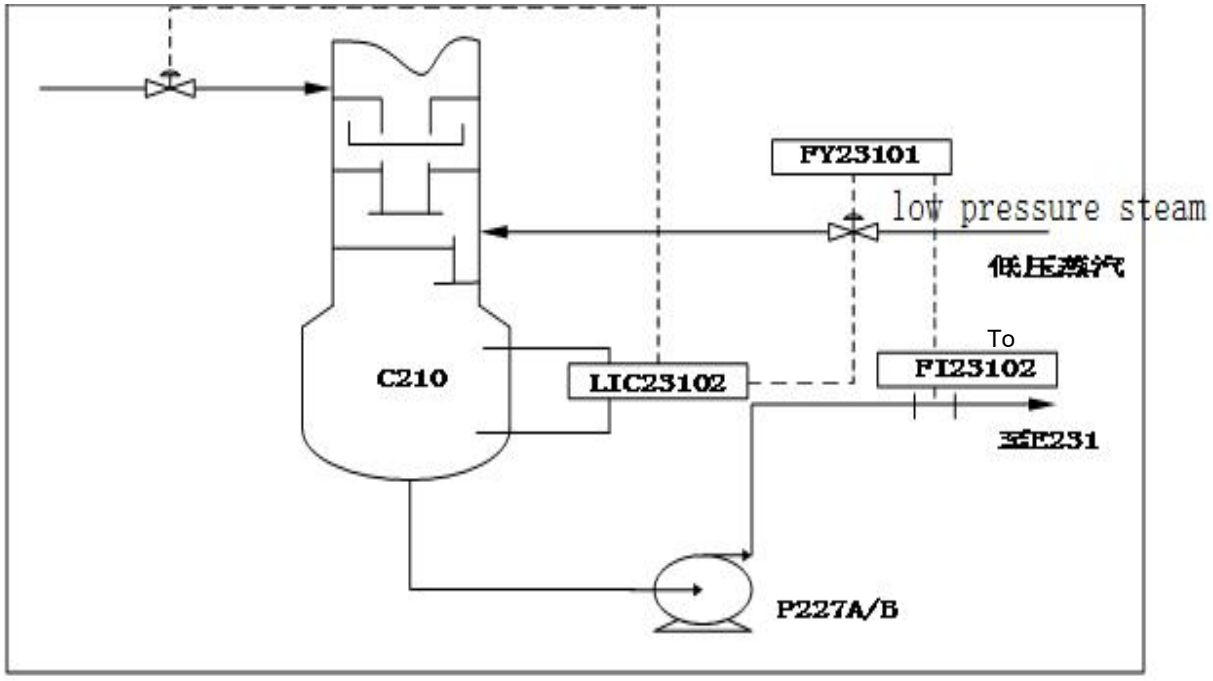
控制目标：C-210 液面设定值±5%。

3)Related parameters: C-210 feed LV-23102; C-2010 level LIC-23102; exporting flow rate FI-23102.

相关参数：C-210 进料 LV-23102；C-2010 液面 LIC-23102；外送流量 FI-23102。

4)Control mode: C-210 level is controlled by the feed control valve opening LV-23102 and exporting flow rate FI-23102. The opening of LV-23102 is controlled by LIC-23102, exporting flow rate FI-23102 and stripping steam flow rate FIC-23101 is in proportional control; With the decrease the opening of LV-23102, the C-210 level decreases; With the control valve opening increases, C-210 level increases.

控制方式：C-210 液面是进料控制阀 LV-23102 的开度与外送量 FI-23102 控制的。LV-23102 的开度由 LIC-23102 来进行控制，外送流量 FI-23102 与汽提蒸汽量 FIC-23101 比例控制；LV-23102 关小 C-210 液面下降；控制阀开度增大，C-210 液面上升。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Light gas oil feed control valve opening 轻蜡油进料控制阀开度	As the control valve opening increases, the level rises, and vice versa.控制阀开度增大，液面上升；反之下降。
Control valve for light gas returning to the column 轻蜡油反塔控制阀	As the control valve opening reduces, the level drops, and vice versa.控制阀开度增大，液面下降；反之上升。

6)Troubleshooting: 异常调节：

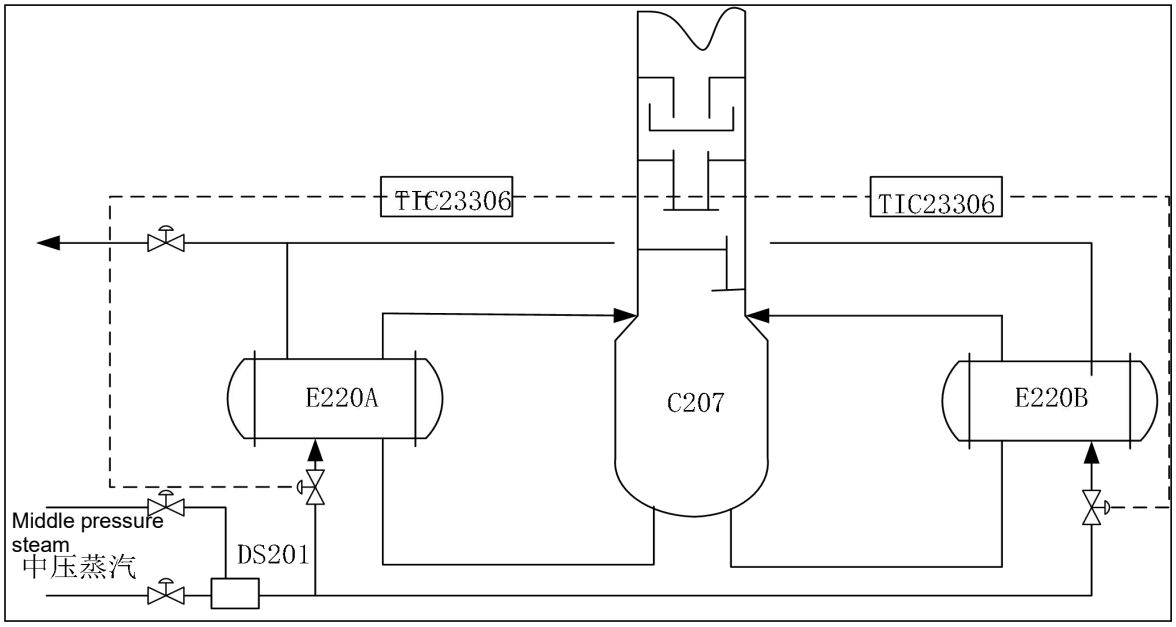
Fault 现象	Cause 原因	Action 处理方法
C-210The rise of the liquid level C-210 液面上升	light gas oil exporting process flow is not lined up 轻蜡油外放流程不通	Line up the process of light gas oil exporting process flow .倒通轻蜡油外放流程。
	Light gas oil pump P-227 failed 轻蜡油泵 P-227 故障	Switch to the standby pump.切换至备用机泵。
	The pipe returning to the column is blocked.反塔管线堵塞	Line up the pipe returning to the tower 倒通反塔管线。

Fault 现象	Cause 原因	Action 处理方法
	Stripped steam reduced 汽提蒸汽减少	Adjust the flow rate of steam stripping.调节汽提蒸汽量。
C-210The level is low C-210 液面下降	The flow rate light gas returning to the fractionators increased 分馏塔轻蜡反塔量增大	Adjust the flow returning to the column with an appropriate flow rate.调节反塔量至合适的流量。
	C-210A the flow rate of stripped steam increased C-210 汽提蒸汽量大	Decrease the opening of stripping steam control valve, adjustC-210 stripping steam flow rate.关小汽提蒸汽控制阀，调整 C-210 汽提蒸汽量。
	Gas return line is blocked 气返线堵塞	Line up the gas return pipe.倒通气返线管线。

Actions for runaway situations: if the C-210 level is Actions of runaway situtaions, then switch to the fractionation stabilization post of the emergency shutdown plan for accidents.
失控处理：若 C-210 液面超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(22) Control of C-207 Sensitive plate temperature
C-207 灵敏板温度的控制
1)Control range: The sensitive plate temperature TIC-23306 of C-204 is controlled to 150-180°C.
控制范围：塔 C-207 灵敏板温度控制在 150-180°C.
2)Control target: In normal operation, the bottom temperature of stabilizer is controlled within the above range to ensure that the gasoline 10% is on specification, but the temperature of stabilizer should not be controlled too high to avoid the influence of C5 content of liquefied gas, The temperature of C-207 sensitive plate should be controlled within ±5 °C of the set points.
控制目标：正常操作中稳定塔底温度控制在上述范围内，保证汽油 10%点合格，但稳定塔底温度不宜控制过高，以避免影响液化气 C5 含量，塔 C-207 灵敏板温度设定值±5℃。
3)Related parameters: E-220A/B return column temperature TI-23309/TI-23310; stabilizer feed rate: FIC-22702; stabilizer feed temperature TI-23304; If the above parameters fluctuate, the bottom temperature of stabilizer will fluctuate.
相关参数：E-220A/B 返塔温度 TI-23309/TI-23310；稳定塔进料量：FIC-22702；稳定塔进料温度：TI-23304；稳定塔顶压力；以上参数波动会引起稳定塔底温度 TIC-23306 波动。
4)Control mode: In normal operation , the temperature of stabilizer is controlled by adjusting E-220AB inlet steam control valve with TIC-23306 working on the two control valve simultaneously, leading to achieve the purpose of controlling the temperature of stabilizer sensitive plate.

控制方式：正常稳定塔灵敏板温度控制是通过调节 E-220AB 入口蒸汽控制阀实现的，由 TIC-23306 同时作用在两个控制阀上，进而达到控制稳定塔灵敏板温度的目的。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Control valve opening 调节阀开度	If close more the control valve, main line flow rate of E-220A/B reduces, the temperature will decrease; and vice versa.关小调节阀，E-220A/B 主路流量减少，温度下降；反之上升。
Medium pressure steam temperature 中压蒸汽温度	If the temperature of medium pressure steam is high, the bottom temperature of the column will be high; and vice versa.中压蒸汽温度高，塔底温度高；反之下降。
Medium pressure steam circulating flow rate 中压蒸汽循环流量	If the medium pressure steam circulating flow rate increases, the bottom temperature of the column will be high; and vice versa.中压蒸汽循环流量大，塔底温度高；反之下降。

6)Troubleshooting: 异常处理：

Fault 现象	Cause 原因	Action 处理方法
C-207 bottom temperature dropped sharply C-207 底温度急剧下降	Fractionator bottom heating source is interrupted.塔底热源中断；	Fully open re-boiler control valve to increase heat exchanging, and find out the cause and restore the heat source as soon as possible. 全开重沸器调节阀，增加取热量，同时立即查找原因，尽快恢复热源。

Fault 现象	Cause 原因	Action 处理方法
	D214 液位过高或D308液位压力高	打开 LIC23401 副线降低 D214 液位。将 D308 顶压力稍微控制低一点，同时防止水击现象发生。
	Pipeline of Re-boiler is blocked.重沸器管路堵塞	Cut off, clear and clean it.切除，疏通清洗。
	The condensate pipeline of medium pressure steam is blocked.中压蒸汽凝结水管线堵塞	Clear and clean the line.疏通清洗。
C-207 bottom temperature is high C-207 底温度高	C-207 bottom level is low or empty C-207 底液面低或空	Control the bottom level within the specification by the control valves of C-207 feeding and discharging.通过 C-207 进料和出料控制阀，将塔底液面控制在指标范围内。
	C-207 bottom steam desuperheater is blocked C-207 底蒸汽减温器堵塞	Clear and clean the line.疏通清洗。
	C-207 feed is interrupted C-207 进料中断	Inspect the process flow, restore the feed.检查流程，恢复进料。
Liquid is carried at the top of the tower 塔顶带液	The bottom temperature of the column is too high or the pressure of stabilizer is low. 塔底温度过度或稳定塔压力低	The bottom temperature of the column is decreased by reducing the opening of control valve; the pressure of stabilizer is increased by reducing the opening of pressure control valve at the top of stabilizer 通过关小调节阀降低稳定塔底温度，通过关小稳定塔顶压控阀提高稳定塔压力。

Actions for runaway situations: if the bottom temperature of the stabilizer is Actions of runaway situtaions, then switch to the fractionation stabilization post of the emergency shutdown plan for accidents.

失控处理：若稳定塔底温度超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(23) Control of C-207 bottom liquid level

C-207 底液位的控制

1)Control range: 30-70%.

控制范围：30～70%。

2)Control target: ±5% of C-207 liquid level set point.

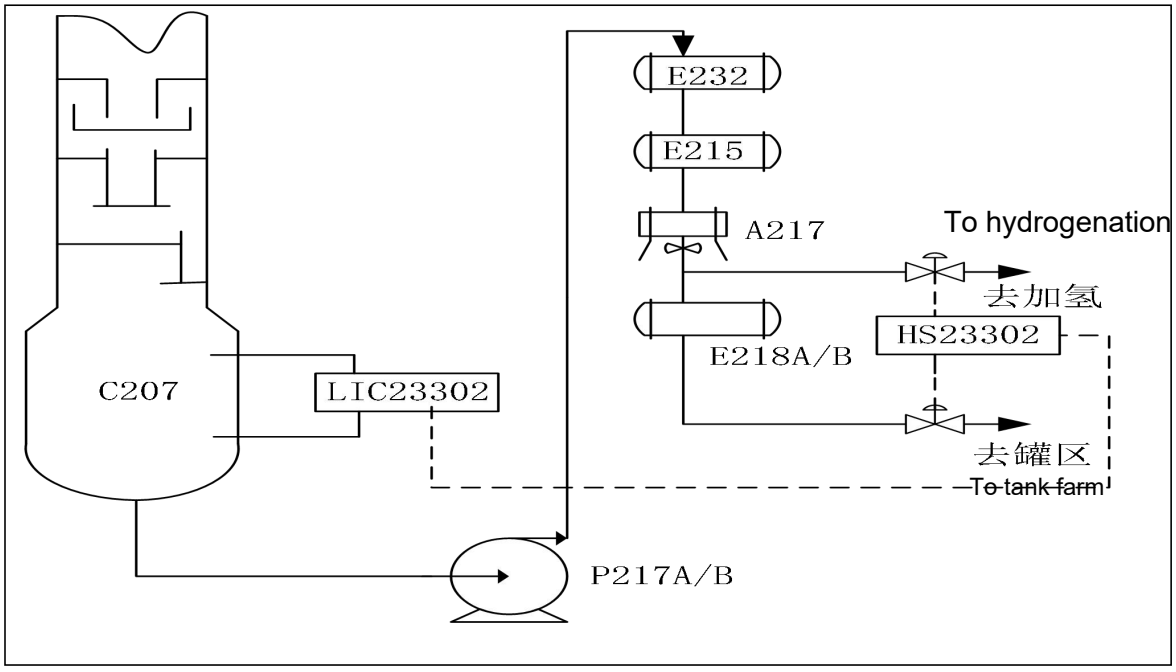
控制目标：C-207 液面设定值±5%。

3)Related parameters: C-207 feed rate FIC-22702; C-207 level LIC-23302.

相关参数：C-207 进料流量 FIC-22702；C-207 液面 LIC-23302 C207 顶压力 PIC23501。

4)Control mode: C-207 level is controlled by the opening of level control valve FIC-23801/FIC-23802. In normal operation, the C-207 column level is controlled by the exporting flow rate of stabilizer bottom or the flow rate of the hydrogenation unit, if flow rate is increased , liquid flow rate will decrease, and vice versa.

控制方式：C-207 液面是液面控制阀 FIC-23801/FIC-23802 开度控制的。塔 C-207 液面正常情况下由稳定塔底外放流量/至加氢单元流量控制，流量上升，液面下降；流量减小，液面升高。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Control valve opening of the exporting stabilizer bottom oil 稳定塔底油外放控制阀开度	Two control valves are manually selected to control; when the control valve opening is increased, the level drops; and vice versa.手动选择两个控制阀进行控制；控制阀开度增大，液面下降；反之升高。
Stabilizer feed flow rate 稳定塔进料量	When feed flow rate is increased, bottom level increases; and vice versa.进料量大，塔底液位升高，反之下降。
Stabilizer bottom temperature 稳定塔底温度	When the temperature is increased and liquid level drops; and vice versa.温度上升，液位下降；反之液位上升。
Stabilizer overhead pressure 稳定塔顶压力	When the pressure is increased, liquid level rises; and vice versa.压力上升，液位上升；反之液位下降。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Action 处理方法
C-207 liquid level rises C-207 液面上升	The stabilizer bottom exporting oil process flow is not lined up. 稳定塔底油外放流程不通	Line up the stabilizer bottom exporting oil process flow.倒通稳定塔底油外放流程。
	Stabilizer bottom oil pump failed 稳定塔底油泵故障	Switch to the standby pump.切换至备用机泵。
	The pipeline of stabilizer bottom reboiler is blocked.稳定塔底重沸器管线堵塞	Cut off, clear and clean the pipeline.切除疏通管线。
	The column is flooded due to malfunction.操作淹塔	Increase the C-207 column bottom temperature, reduce the reflux flow rate.提高 C-207 塔底温度，减少回流量。
C-207 level dropsC-207 液面下降	Stabilizer bottom temperature was too high stability 稳定塔底温度过高	By adjusting the column bottom temperature and the heating steam circulation flow rate, stabilizer bottom is regulated to the specified range.通过调节温度塔底加热蒸汽的循环量，将稳定塔底温度调整到范围内。
	Stabilizer feed was interrupted 稳定塔进料量中断	Adjust and restore the feed flow rate of stabilizer.调节恢复稳定塔进料量。
	Stabilizer overhead pressure decreased sharply 稳定塔顶压力急剧下降	Adjust the overhead pressure.调节塔顶压力。
	E220 管束泄漏，塔顶压力上升	检查确认时哪组泄漏及时切除系统检修。

Actions for runaway situations: if the C-207 level is Actions of runaway situtaions, then switch to the fractionation stabilization post of the emergency shutdown plan for accidents.

失控处理：若 C-207 液面超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(24) Liquid level control of D-208 liquefied petroleum gas

D-208 液化石油气液位的控制

1)Control range: 30-70%.

控制范围：30～70%。

2)Control target: level fluctuations range of stabilizer overhead reflux drum is set (D-208) to ±5%.

控制目标：设定的稳定塔顶回流罐（D-208）液面波动范围±5%。

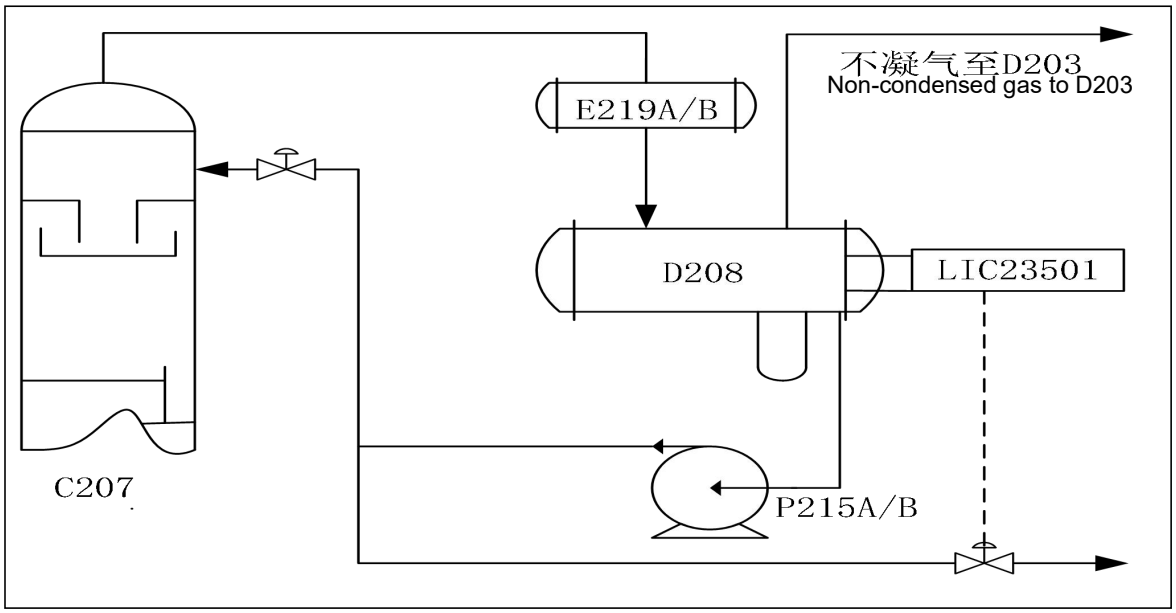
3)Related parameters: the stabilizer overhead temperature TI-23301; after-cooling temperature TI-23501; Stabilizer overhead pressure PIC-23501; D-208 LIC-23501; D-208 level LIC-23502.

The fluctuation of above parameters will cause the level LIC-23501 of stabilizer overhead reflux drum D-208 to fluctuate.

相关参数：稳定塔顶温度 TI-23301；冷后温度 TI-23501；稳定塔顶压力 PIC-23501；D-208 液面 LIC-23501；D-208 界位 LIC-23502；D208 外送量 FIC23601。以上参数波动会引起稳定塔顶回流罐 D-208 液面 LIC-23501 波动。

④Control mode: In normal operation, the level LIC-23501 of stabilizer overhead reflux drum D-208 is regulated by the flow rate FIC-23301 of liquefied gas processing unit or the FIC-23601 of stabilizer overhead reflux.

控制方式：稳定塔顶回流罐（D-208）液面正常时用去液化气处理单元 FIC-23601/稳定塔顶回流 FIC-23301 的流量来调节。



5)Normal adjustment: 正常调整:

Influence factor 影响因素	Adjustment method 调节方法
C-207 overhead temperature C-207 顶温度	If the overhead temperature of C-207 is high, liquid level will rise; and vice versa. C-207 顶温度高，液面高；反之降低。
Reflux pump extracting flow rate 回流泵抽出量	If the extracting flow rate is high, and the liquid level will drop; and vice versa.抽出量大，液面下降；反之升高。
C-207 Reflux flow rate C-207 回流量	If the reflux flow rate increases, the liquid level will drop; and vice versa.回流量增大液面下降；反之升高。
C-207 overhead pressure C-207 顶压力	If the pressure rises, the liquid level will drop; vice versa.压力升高，液位下降；反之升高。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Action 处理方法

Fault 现象	Cause 原因	Action 处理方法
D-208 liquid level increased significantly D-208 液面大幅上升	Liquid entrained in vapor stream due to malfuction 操作冲塔	Start the retuning column reflux, and reduce the C-207 overhead temperature.启用反塔回流，降低 C-207 顶温度。
	Stabilizer overhead reflux pump failed.稳定塔顶回流泵故障	Switch to the backup pump.切换至备用泵。
	The stabilizer bottom exporting oil process flow is not lined up.稳定塔顶油外放流程不通	Check and contact the relevant department to line up the exporting oil process flow.检查联系，倒通外放流程。
	Instrument failed 仪表故障	Switch to bypass on site and contact instrument operators to deal with it.现场改侧线，联系仪表处理。
D-208 liquid level decreased significantly D-208 液面大幅下降	The stabilizer bottom exporting oil process flow is not lined up correctly.稳定塔顶油外放流程倒错	Check and restore the correct process flow.检查恢复正确流程。
	D-208 interface level control valve failed and fully opened, and interface level did exist. D-208 界控阀故障全开，界面空	Switch the D-208 interface level control valve to bypass operation , and decrease the opening of bypass control valve; increase the D-208 interface level, contact instrument operators to deal with this interface level control valve. D-208 界控改复线操作，同时关小复线阀开度，提高 D-208 界面，联系仪表处理界控阀。
D-208 liquid level fluctuated significantly D-208 液面大幅波动	D-208 pressure fluctuated. D-208 压力波动	Adjust the D-208 pressure control valve PIC-23501.调整 D-208 压力控制阀 PIC-23501。
	Cooler internal leakage 冷却器内漏	Switch off the leaking cooler.将泄漏的冷却器切除。

Actions for runaway situations: if the D-208 level is Actions of runaway situtaions, then switch to the fractionation stabilization post of the emergency shutdown plan for accidents.

失控处理：若 D-208 液面超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(25) Control of D-208 liquefied petroleum gas /sewage interface level

D-208 液化石油气/污水界位的控制

1)Control range: 30-70%.

控制范围：30～70%。

2)Control target: D-208 steam and water interface level is set to ±5%.

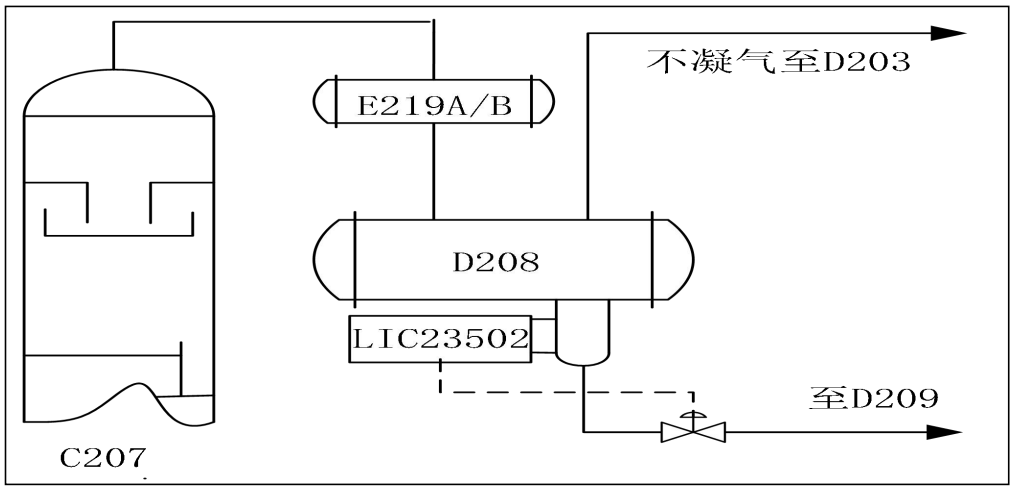
控制目标：D-208 汽水界面设定值±5%。

3)Related parameters: D-208 steam and water interface level control valve FIC-23502 D-208 interface level LIC-23502 interface; after-cooling temperature TI-23501.

相关参数：D-208 汽水界面控制阀 FIC-23502；D-208 界面 LIC-23502；冷后温度 TI-23501。

4)Control mode: D-208 steam and water interface level is controlled by the opening of the interface control valve of FIC-23502. When the water flow rate entering the D-208 is certain, with the increase of the opening of interface control valve, the interface level will decrease; and vice versa.

控制方式：D-208 汽水界面是由界面控制阀 FIC-23502 开度控制的。进入 D-208 水量一定时，界控阀开度增大，界面下降；界控阀开度减小，界面上升。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
D-208 the opening of interface control valve D-208 界面控制阀开度	With the increase of the opening of interface control valve, the interface level will decrease; and vice versa. 界面控制阀开度大，界面下降；反之，界面升高。。
D-208 outlet temperature D-208 出口温度	With the increase of temperature; the interface level will decrease; and vice versa.温度升高界位下降；反之，界面升高。

Non-condensed gas to D203

To D209

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Action 处理方法

Fault 现象	Cause 原因	Action 处理方法
Interface level rises 界面上升	Exporting process flow is not lined up.外送流程不通	See the process flow drawings and line it up.查看流程导通流程。
	Instrument failed 仪表故障	Contact instrument operators to deal with.联系仪表处理。
Interface level drops 界面下降	After-cooling temperature was too High 冷后温度高	Increase the cooling water circulation flow rate, reduce the after-cooling temperature.开大冷却水循环量，降低冷后温度。
	C-207 overhead temperature was low C-207 塔顶温度低	Raise the overhead temperature of C-207.提高 C-207 塔顶温度。
Interface fluctuates 界面波动	D-208 pressure fluctuated D-208 压力波动	Control the pressure control valve to keep the D-208 pressure stable.控制 D-208 压力控制阀使 D-208 压力平稳。

Actions of runaway situtaions: if D-208 steam and water interface level is Actions of runaway situtaions, then switch to the fractionation stabilization post of the emergency shutdown plan for accidents.

失控处理：若 D-208 汽水界面超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(26) Control of compressor suction oil and gas temperature 气压机入口油气温度的控制

1)Control range: 35-55℃.

控制范围：35～55℃。

2)Control target: Temperature fluctuation range of compressor suction oil and gas temperature is set to ±5%.

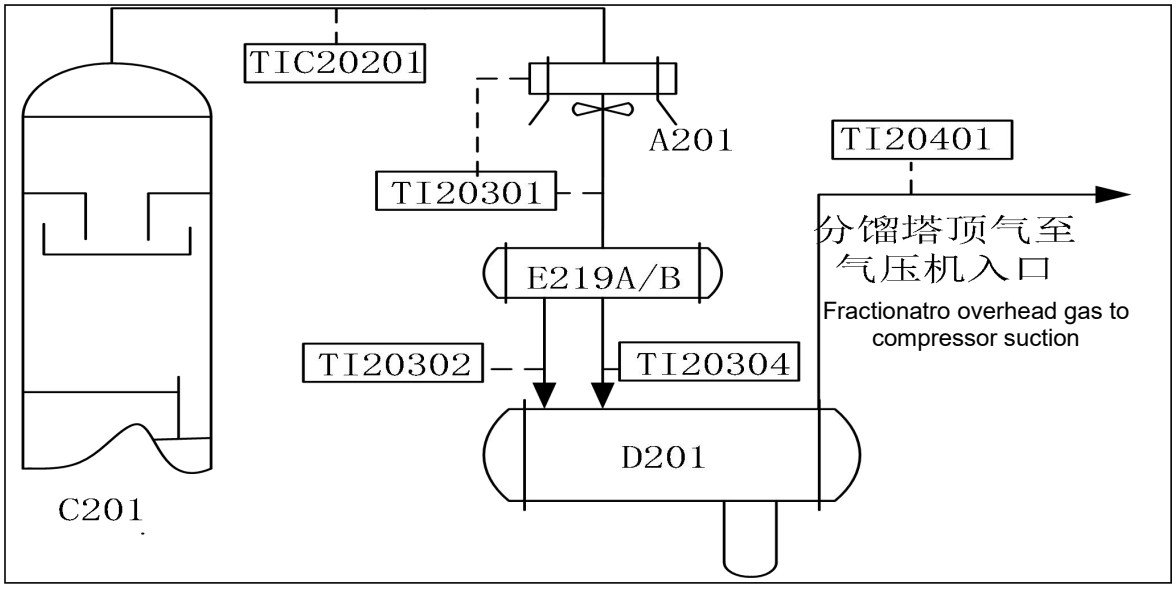
控制目标：设定的气压机入口油气温度波动范围±5℃。

3)Related parameters: compressor suction oil and gas temperature TI-20401; after-cooling temperature TI-20302/TI-20304; air cooling temperature TI-20301; The fluctuation of above parameters will cause the compressor suction oil and gas temperature TI-20401 to fluctuate.

相关参数：气压机入口油气温度 TI-20401；冷后温度 TI-20302/TI-20304；空冷后温度 TI-20301；。以上参数波动会引起气压机入口油气温度 TI-20401 波动。

4)Control mode: In normal operation, the compressor suction oil and gas temperature TI-20401 is regulated by after-cooling temperature TI-20301 which is adjusted by using the air-cooled inverter / the flow rate of cooler circulating water

控制方式：气压机入口油气温度 TI-20401 正常时用空冷变频调节空冷后温度 TI-20301/调节冷却器循环水的流量来调节。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
C-201 overhead temperature C-201 顶温度	If C-201 overhead temperature is high, the temperature of TI-20401 will increase accordingly; and vice versa. C-201 顶温度高，TI-20401 温度相应升高；反之则下降。
After air cooling temperature 空冷后温度	If after air cooling temperature is increased, TI-20401 temperature will increase accordingly; and vice versa.空冷后温度升高，TI-20401 温度相应升高；反之则下降。
After water cooling temperature 水冷后温度	If after water cooling temperature is increased, TI-20401 temperature will increase accordingly; and vice versa.水冷后温度升高，TI-20401 温度相应升高；反之则下降。

6)Troubleshooting: 异常处理：

Fault 现象	Cause 原因	Action 处理方法
TI-20401 Temperature drops TI-20401 温度下降	The fractionator overhead temperature / after air cooling temperature/after water cooling temperature dropped;分馏塔顶温度/空冷后温度/水冷后温度下降；	Increase fractionators overhead temperature/ air cooled inverter / after water cooling temperature.。提高分馏塔顶/空冷变频/水冷后温度。

TI-20401 Temperature rises TI-20401 温度上升	Air cooling tube was Blocked 空冷管束堵塞	Cut off and clear the tube.切除疏通管束。
	Water cooling tube was Blocked 水冷管束堵塞	Cut off and clear the tube.切除疏通管束。

Actions of runaway situtaions: if compressor suction oil and gas temperature exceeds the control range, then switch to the fractionation stabilization post of the emergency shutdown plan for accidents.

失控处理：若气压机入口油气温度超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(27) Control of middle section circulation returning to fractionator temperature 分馏塔中段循环返塔温度 TIC-20209 的控制

1)Control range: 150-280 ℃.

控制范围：150～280℃。

2)Control target: The temperature of fractionator middle section is set to ±20℃.

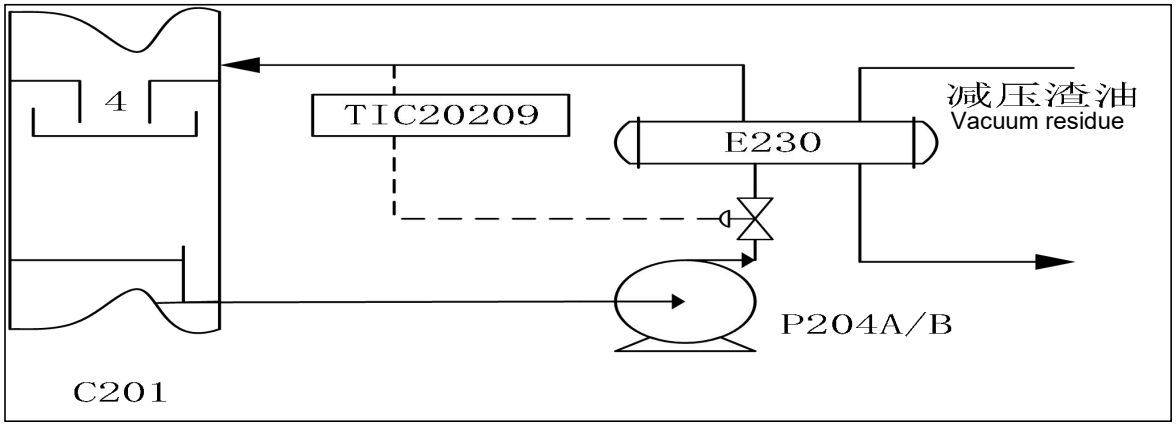
控制目标：设定的分馏塔中段温度值±20℃。

3)Related parameters: fractionator middle circulating flow rate FIC-21501; fractionator middle section returning to column temperature TIC-20209; fractionator overhead temperatureTIC-20201; fractionator overhead pressure PI-20201.

相关参数：分馏塔中段循环量 FIC-21501；分馏塔中段返塔温度 TIC-20209；分馏塔顶部温度 TIC-20201；分馏塔顶部压力 PI-20201。

4)Control mode: the temperature TIC-20209 of fractionator middle section returning to column is controlled by regulating the fractionator middle section reflux and the heat exchange flow rate of vacuum residue to regulate the returning to the column flow rate.

控制方式：分馏塔中段返塔温度是通过调节分馏塔中段循环回流与减压渣油的换热量来调节返塔流量来控制的。



5)Normal adjustment: 正常调节：

Influence factor 影响因素	Adjustment method 调整方法

The temperature of middle section circulating reflux returning to the column 中段循环回流返塔温度	When the middle section extraction temperature is increased, the temperature of middle section circulating reflux returning to the column will increase; and vice versa.提高中段抽出温度，中段回流返塔温度升高，反之则下降。
The flow rate of middle section circulating reflux returning to the column 中段循环回流返塔流量	When the opening of middle section and vacuum residue heat exchanging control valve, the temperature of middle section circulating reflux returning to the column will decrease ; and vice versa.开大中段与减渣换热量控制阀，中段回流返塔温度下降，反之则上升。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Action 处理方法
The temperature of fractionator middle section circulating reflux returning to the column rises 分馏塔中段返塔温度升高	Fractionator overhead temperature increased significantly 分馏塔顶部温度大幅升高	Raise the overhead circulating flow rate or reduce the temperature of overhead circulating reflux returning to the column 提高顶巡流量或降低顶巡返塔温度，降低分馏塔顶部温度。
	Fractionator middle section circulating pump failed 分馏中段循环泵故障	Switch to the standby pump.切换至备用机泵。
	The circulating flow rate of middle section and vacuum residue reduced 中段与减渣循环量降低	Increase the circulating flow rate of middle section and vacuum residue 提高中段与减渣的循环量。
	The fractionator pressure decreased significantly 分馏塔压力大幅下降	Contact reaction section to increase fractionator pressure.联系反应机组岗位提高分馏塔压力。
	稳定系统的 C204 的 E216 取热量减少	增大 E230 取热量维持中段循环返塔温度 TIC-20209 在正常范围内
The temperature of fractionator middle section circulating reflux returning to the column drops 分馏塔中段返塔温	The fractionator temperature dropped significantly 分馏塔顶部温度大幅下降	Increase fractionator overhead temperature.提高分馏塔顶部温度。
	The circulating flow rate of middle section and vacuum residue increased 中段与减渣循环量增大	Decrease the circulating flow rate of middle section and vacuum residue 减少中段与减渣的循环量。

Fault 现象	Cause 原因	Action 处理方法
度下降	Fractionation column top pressure rises 分馏塔顶压力上升	Contact reaction section to reduce the compressor suction pressure.联系反应机组岗位降低气压机入口压力。
	The fractionator bottom temperature decrease 分馏塔塔底温度降低	Increase fractionator bottom temperature. 提高分馏塔塔底温度。

Actions for runaway situations: if the temperature of fractionator middle section returning to column is Actions of runaway situtaions, then switch to the fractionation stabilization post of the emergency shutdown plan for accidents.

失控处理：若分馏塔中段返塔温度超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(28）Control of C-205 Liquid level

C-205 液位的控制

1)Control range: 30-70%.

控制范围：30～70%。

2)Control target: ±5% of C-205 liquid level set point.

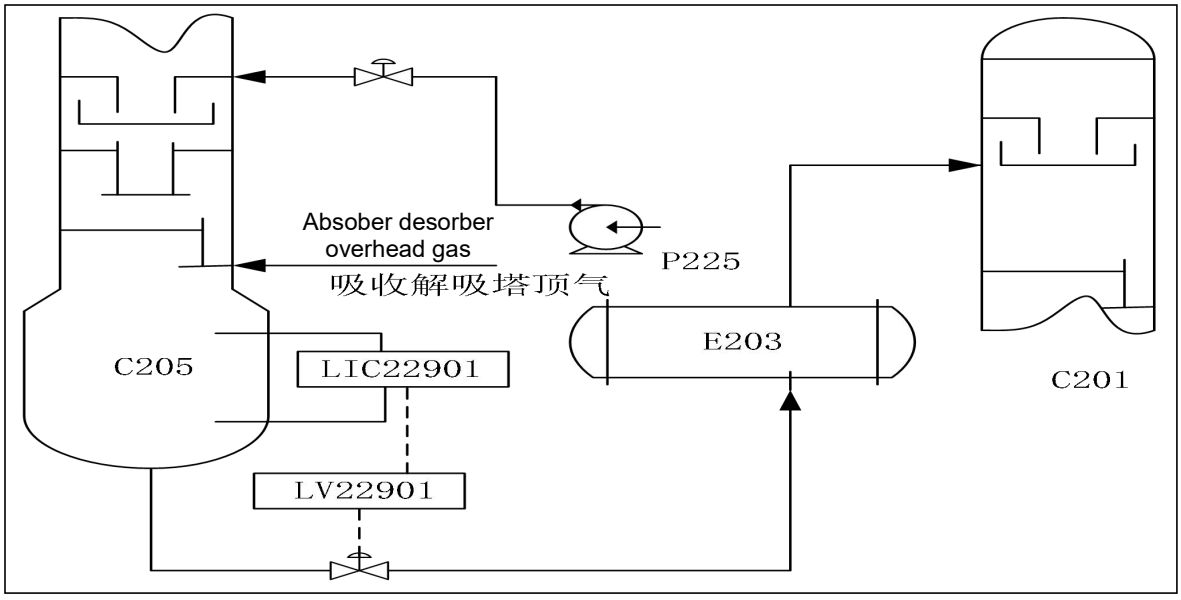
控制目标：C-205 液面设定值±5%。

3)Related parameters: C-205 feed rate FIC-22901; C-205 liquid level LIC-22901.

相关参数：C-205 进料流量 FIC-22901；C-205 液面 LIC-22901 C-205 顶压力 PIC22901。

4)Control mode: C-205 liquid level is controlled by the opening of LV-22901 level control valve. In normal operation, the level of C-201 is controlled by the rich absorption oil to C-201, when the flow rate is increased, the liquid level will decrease; and vice versa.

控制方式：C-205 液面是液面控制阀 LV-22901 开度控制的。塔 C-205 液面正常情况下由富吸收油至 C-201 的流量控制，流量上升，液面下降；流量减小，液面升高。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
The control valve opening of reabsorber bottom oil exporting 再吸收塔底油外放控制阀开度	When the opening of the control valve is increased, the liquid level will drop; and vice versa. 控制阀开度增大，液面下降；反之升高。
Reabsorber feed 再吸收塔进料	When the feed flow rate is increased, liquid level will drop; and vice versa.进料量大液位上升；反之液面下降。
C205 顶压力高低	在再吸收塔底油外放控制阀手动操作的情况下，C205 顶压力上升则液位下降，反之上升。

6)Troubleshooting: 异常调节：

Fault 现 象	Cause 原因	Action 处理方法
C-205 liquid level rises C-205 液面上升	The process flow of reabsorber bottom oil exporting is not line up 再吸收塔底油外放流程不通	Line up the process flow of reabsorber bottom oil exporting.倒通塔底油外放流程。
	Reabsorber gas feed carried with liquid 再吸收塔气相进料带液	Check the process flow to prevent liquid was carried in it.检查流程防止带液。
C-207 liquid level drops C-207 液面下降	Reabsorber overhead temperature was too high 再吸收塔塔顶温度过高	Reabsorber overhead temperature was regulated to the specified range through adjusting the reabsorber overhead temperature 通过调节再吸收塔顶温度，将再吸收塔顶温度调整到范围内。
	Reabsorber gas phase feed temperature was high 再吸收塔气相进料温度高	Adjust reabsorber gas phase feed temperature. 调节再吸收塔气相进料温度。

Actions for runaway situations: if the C-205 level is Actions of runaway situtaions, then switch to the fractionation stabilization post of the emergency shutdown plan for accidents.
失控处理：若 C-205 液面超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。
特别提醒：C205 液位抽空的情况下，再吸收塔底油外放控制阀必须全关，防止反串至分馏塔，造成更大的事故发生。

(29) Temperature control of diesel exporting from plant (hydrogenation, tank farm)
柴油出装置温度的控制（加氢、罐区）

1)Control range: the temperature of diesel to hydrogenation unit is 45-115℃; the temperature of diesel to tank farm is 35-55℃.

控制范围：柴油去加氢温度 TI-20607 45～115℃；去罐区温度 35～55℃

2)Control target: the temperature of diesel to hydrogenation /tank is set to ±5℃ of set points.

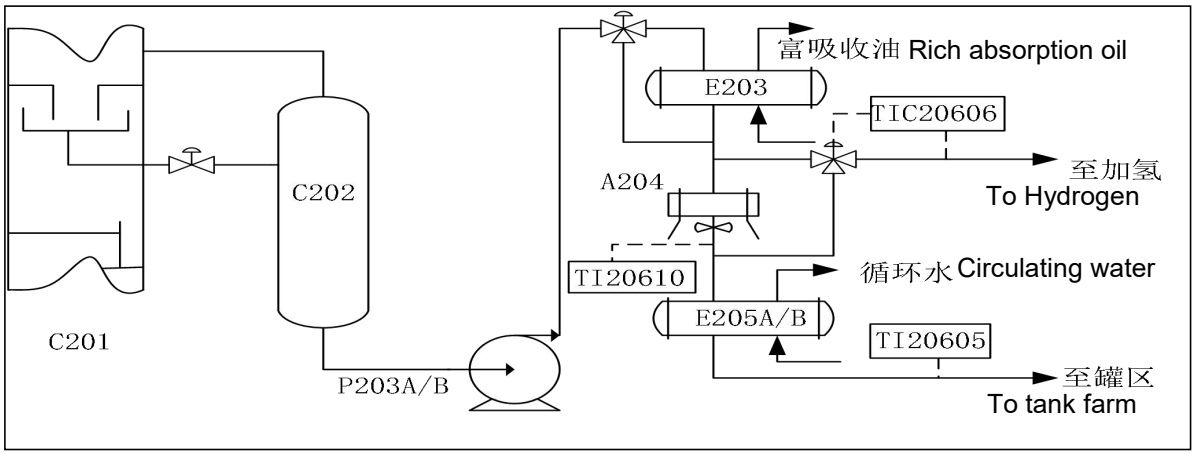
控制目标：设定的柴油去加氢/罐区温度 TI-20605 值±5℃。

3)Related parameters: diesel and rich absorption oil after heat exchange temperature TI-20602/TI-20603; after air cooling temperature TIC-20609A/TI-20610. after the three-way valve temperature TIC-20606; diesel to hydrogenation unit temperature TI-20607; diesel to tank farm temperature TI-20605.

相关参数：柴油与富吸收油换热后温度 TI-20602/TI-20603；空冷后温度 TIC-20609A/TI-20610。三通阀后温度 TIC-20606；柴油至加氢温度 TI-20607；柴油至罐区温度 TI-20605。

4)Control mode: In normal operation, the temperature of diesel to tank farm is controlled by A-204 diesel air-cooled inverter; the temperature of diesel to hydrogenation is controlled by the flow rate of diesel before air cooling and after air cooling; Temperature control of diesel to hydrogenation and tank farm can be achieved by adjusting the diesel air cooling inverter and after air cooling.

控制方式：正常柴油至罐区温度由 A-204 柴油空冷变频来控制；柴油至加氢温度由柴油空冷前流量与空冷后的流量进行控制；通过调节柴油空冷的变频与空冷后柴油至加氢的流量进而达到控制柴油至加氢与罐区温度的目的。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Three-way valve opening 三通阀开度	Increase the opening of three-way valve for diesel to hydrogenation, the flow rate of diesel to main line increases, the temperature will rise ; and vice versa.开大至加氢三通阀，至加氢主路流量增加，温度上升；反之下降。

Three-way valve opening 三通阀开度	Increase the opening of three-way valve for diesel to main line, the flow rate of diesel to main line increases, the temperature will drop ; and vice versa.开大主路三通阀，主路流量增加，温度下降；反之上升。
Air cooling inverter 空冷变频	Reduce the opening of air cooling inverter, diesel exporting temperature will rise; and vice versa. 关小空冷变频，柴油外送温度上升；反之下降。

6)Troubleshooting: 异常处理：

Fault 现象	Cause 原因	Action 处理方法
Diesel to hydrogenation temperature is low 柴油至加氢温度低	Diesel to tank farm was leaked to hydrogenation pipeline.柴油至罐区流量内漏至加氢管线	Shut off the valve and increase the diesel to hydrogenation temperature. 切除阀门，提高至加氢温度。
Diesel to hydrogenation temperature is high 柴油至加氢温度高	In diesel exporting process flow, cold line valve was leaking.柴油外送流程冷路阀内漏	Shut off the valve and decrease the diesel exporting temperature 切除阀门降低外送温度。.
Diesel exporting temperature is high 柴油外送温度高	Diesel extraction temperature was high.柴油抽出温度高	Adjust diesel extraction temperature and reduce diesel exporting temperature.调整柴油抽出温度，降低柴油外送温度。

Actions for runaway situation: If the diesel exporting from the plant I (hydrogenation, tank farm) exceeds the control range, then switch to the fractionation stabilization post of the emergency shutdown plan for accidents.

失控处理：若柴油出装置温度的控制（加氢、罐区）超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(30) Control of D-210 liquid level

D-210 液位的控制

1)Control range: 30-70%.

控制范围：30～70%。

2)Control target: Flush oil tank level is set to ±5%.

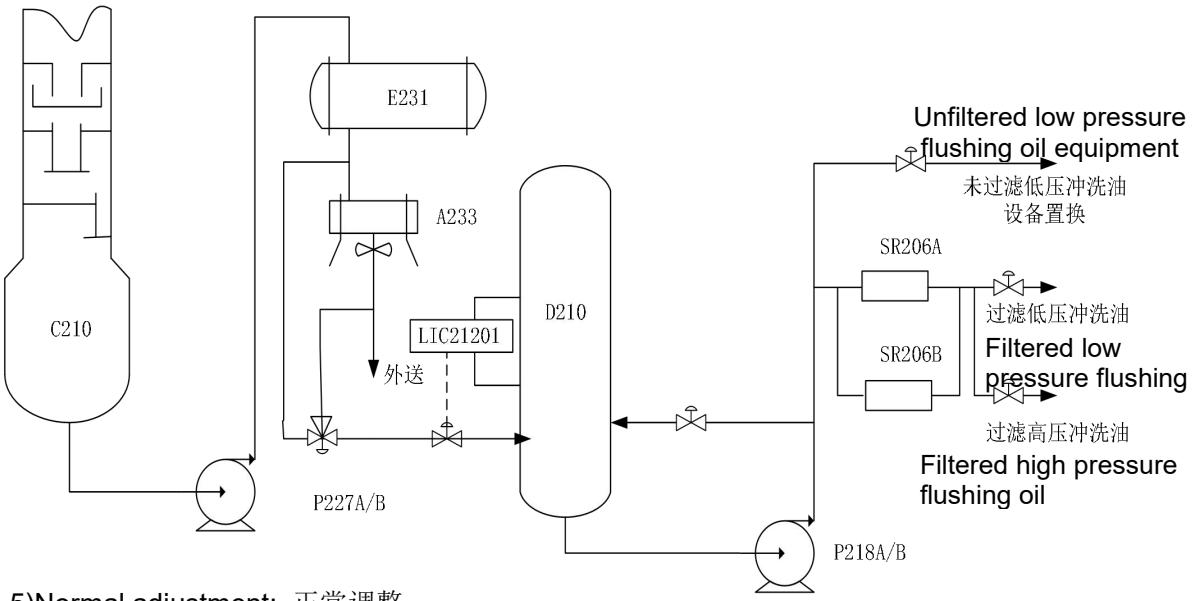
控制目标：冲洗油罐液面设定值±5%。

3)Related parameters: light gas oil tank level LIC-23102; flushing oil flow rate FI-21102; flushing oil tank level LIC-21201.

相关参数：轻蜡油罐液位 LIC-23102；冲洗油流量 FI-21102；冲洗油罐液位 LIC-21201。

4)Control mode: In normal operation, flushing oil collecting tank level is controlled by the opening of LIC-21201 flushing oil control valve. when the opening of control valve is increased, the liquid level will increase ; and vice versa.

控制方式：冲洗油罐液面正常情况下由收冲洗油控制阀 LV-21201 开度控制，控制阀开度增大，液面上升；控制阀开度减小，液面下降。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
The opening of flushing oil collecting control valve 收冲洗油控制阀开度	When the opening of control valve is increased, the liquid level will increase; and vice versa.控制阀开度增大，液面上升；反之下降。
Flow rate of flushing oil to tank 冲洗油进罐流量	When the flow rate is increased, the liquid level will rise; and vice versa.流量增大，液面上升；反之下降。

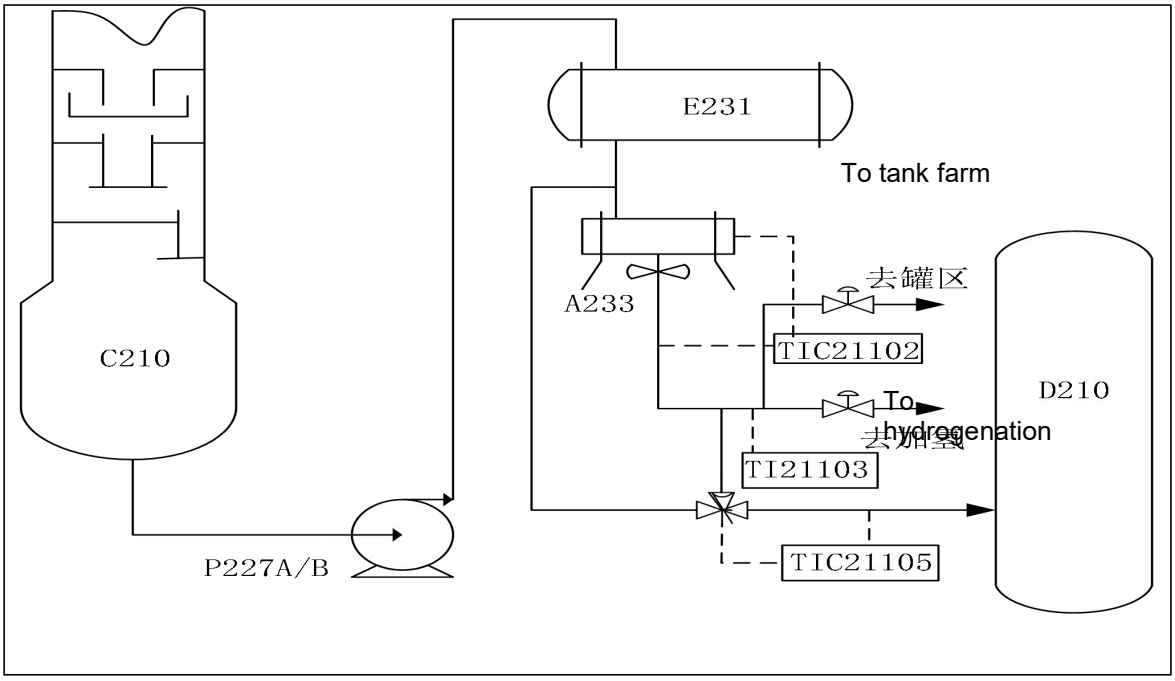
6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Action 处理方法
Flushing oil tank level rises 冲洗油罐液面上升	Flushing oil exporting process flow was not lined up.冲洗油外放流程不通	Line up the flushing oil exporting process flow and increase the opening of front and rear valves of flushing oil flow meter.倒通冲洗油外放流程，开大冲洗油流量计前后阀门。
	Flushing oil pump failed 冲洗油泵故障	Switch to the standby pump.切换至备用机泵。

Fault 现象	Cause 原因	Action 处理方法
	Flushing oil minimum reflux valve flow rate increased 冲洗油最小回流阀流量增加	Check the process flow to deal with the valve.检查流程处理阀门。
	Liquid level indicator failed 液面指示仪表故障	Contact the instrument operators to calibrate the instrument.联系仪表工校表。
Flushing oil tank level drops 冲洗油罐液面下降	The flow rate of flushing oil used in oil injection point of each pump and heat exchanger is too high. 各机泵、换热器的冲洗油注入点用冲洗油量过大	Decrease the opening of flushing oil valve used for pump and heat exchanger and reduce the flow rate of sealing oil for the pump and heat exchanger.关小机泵、换热器用冲洗油阀门，降低机泵、换热器用封冲洗油量。
	Liquid level indicator failed 液面指示仪表故障	Contact the instrument operators to calibrate the instrument.联系仪表工校表。
	The flow rate of light gas oil exporting increased 轻蜡油外放量增大	Reduce the opening of light gas oil exporting control valve.减少轻蜡油外放控制阀。

Actions for runaway situation: If the level of the flushing tank exceeds the control range, then switch to the fractionation stabilization post of the emergency shutdown plan for accidents.
失控处理：若冲洗油罐液面超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。.

(31) Temperature control of D-210 flushing oil
D-210 冲洗油温度的控制
1)Control range: The temperature of the flushing oil is controlled at 100-150°C.
控制范围：冲洗油温度控制 100～150℃。
2)Control target: set the flushing oil inlet temperature value to ± 5 °C.
控制目标：设定的冲洗油进罐温度值±5℃。
3)Related parameters: light gas oil after air cooling temperature TIC-21102; light gas exporting temperature TI-21103; flushing oil into tank temperature TIC-21105.
相关参数：轻蜡油空冷后温度 TIC-21102；轻蜡外送温度 TI-21103；冲洗油进罐温度 TIC-21105。
4)Control mode: In normal operation, flushing oil tank inlet temperature is controlled by adjusting the light gas oil exporting flow rate to the flushing oil to the tank inlet flow rate; the flushing oil to tank inlet temperature is controlled by TIC-21102 and TIC-21105.
控制方式：正常冲洗油进罐温度由调节轻蜡油外送流量至冲洗油进罐流量进行控制的；冲洗油进罐温度由 TIC-21102 与 TIC-21105 进行控制。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Three-way valve opening 三通阀开度	Decrease the opening of three-way valve , the flow rate of diesel to main line decreases, the temperature will decrease ; and vice versa.关小三通阀，主路流量减少，温度下降；反之上升。。
Air cooling inverter 空冷变频	Reduce the opening of air cooling inverter, light gas oil exporting temperature will increase, flushing oil into tank temperature will rise; and vice versa.关小空冷变频，轻蜡油外送温度上升，冲洗油进罐温度上升；反之下降。

6)Troubleshooting: 异常处理：

Fault 现象	Cause 原因	Action 处理方法
Flush oil temperature is low 冲洗油温度低	Flushing oil cold circuit leakage is too large.冲洗油冷路漏量过大。	Reasonably adjust the opening of the three-way valve and deal with the valve to increase the temperature.合理调整三通阀的开度，处理阀门提高温度。
Flushing oil temperature is high 冲洗油温度高	The flushing oil hot circuit leakage is too large.冲洗油热路漏量过大。	Reasonably adjust the opening of the three-way valve and deal with the valve to lower the temperature.合理调整三通阀的开度，处理阀门降低温度。

Fault 现象	Cause 原因	Action 处理方法
Flushing oil temperature is high 冲洗油温度高	Light gas oil exporting temperature is high 轻蜡油外送温度高	Adjust air cooling inverter to reduce the temperature of light gas oil exporting.调整空冷变频，降低轻蜡油外送温度。

Actions for runaway situation: If the temperature control of the flushing oil is out of the control range, then switch to the fractionation stabilization post of the emergency shutdown plan for accidents.

失控处理：若冲洗油温度的控制超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(32) Pressure control of three streams of flushing oil

三路冲洗油压力的控制

1)Control range: the flushing pressure of the flushing oil is 0.95～1.1MPa; the flushing pressure of the flushing oil for instrument is 1.1-1.3MPa; the flushing pressure of the flushing oil for high-pressure pump is 1.9-2.2MPa.

控制范围：冲洗油的设备冲洗压力 0.95～1.1MPa；冲洗油的仪表冲洗压力 1.1～1.3MPa；冲洗油的高压机泵冲洗压力 1.9～2.2MPa。

2)Control target: The pressure of unfiltered flushing oil header is at 1.1-1.3MPa; the pressure is maintained by PIC-21302; the filtered flushing oil header operates under the pressure of 1.1-1.3MPa (absolute), and the pressure is maintained by PIC-21303; the high pressure filter flushing oil header operates under the pressure of 1.9-2.2 MPa (absolute), which is maintained by PIC-21304.

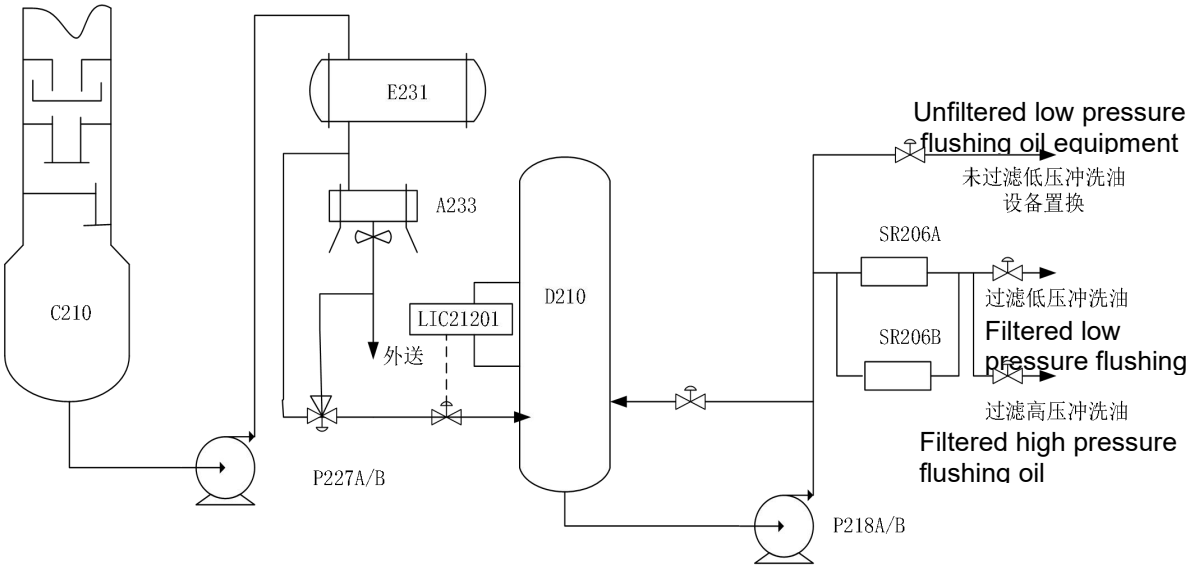
控制目标：未过滤冲洗油总管在 0.95～1.1MPa；该压力由 PIC-21302 保持；过滤冲洗油总管在 1.1～1.3MPa a 压力下工作，由 PIC-21303 保持压力；高压过滤冲洗油总管将在 1.9～2.2 压力下工作，由 PIC-21304 保持。

3)Related parameters: flushing oil header pressure PIC-21301; unfiltered low pressure flushing oil pressure PIC-21302; low pressure filtration flushing oil pressure PIC-21303; high pressure filtration flushing oil pressure PIC-21304.

相关参数：冲洗油总管压力 PIC-21301；未过滤低压冲洗油压力 PIC-21302；低压过滤冲洗油压力 PIC-21303；高压过滤冲洗油压力 PIC-21304。

4)Control mode: In normal operation, the flushing oil header pressure PIC-21301 is adjusted by the minimum refulx FIC-21301; the pressure of the high and low pressure flushing oil is maintained by the header pressure; the unfiltered low pressure flushing oil pressure is controlled by the PIC-21302. PIC-21303 is used to control low pressure filtration flushing oil pressure; PIC-21304 is used to control high pressure filtration flushing oil pressure.

控制方式：正常情况由最小回流 FIC-21301 来调节冲洗油总管压力 PIC-21301；再通过总管压力来维持低压冲洗油，高压冲洗油的压力；由 PIC-21302 来控制未过滤低压冲洗油压力；PIC-21303 来控制低压过滤冲洗油压力；PIC-21304 来控制高压过滤冲洗油压力。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Control valve opening 调节阀开度	When the opening of control valve is increased, the pressure will rise; and vice versa.开大调节阀，压力上升；反之下降。
Minimum reflux line control valve opening 最小回流线调节阀开度	When the opening of control valve is increased, the header pressure will drop and vice versa.开大调节阀，总管压力下降，反之上升。

6)Troubleshooting: 异常处理：

Fault 异常处理：	Cause 原因	Action 处理方法
Header pressure is low 总管压力低	The minimum reflux valve opening is too large.最小回流阀开度过大。	Reasonably adjust the opening of the minimum reflux valve to increase the header pressure.合理调整最小回流阀的开度，提高总管压力。
The pressure of flushing oil after filtration is low 过滤后冲洗油压力低	The process is blocked or the header pressure was low.流程堵塞或总管压力低。	After the minimum flow valve is closed to the minimum valve position, gradually close more/close the unfiltered flushing oil control valve, increase the pressure of the flushing oil after filtration.在最小流量阀关到最小阀位后，逐渐关小/关闭未过滤冲洗油调节阀，提高过滤后冲洗油压力。
Header pressure is low 总管压力低	Pump failed 机泵故障	Switch the standby pump.切换备用机泵。

Fault 异常处理：	Cause 原因	Action 处理方法
Header pressure is low 总管压力低	D-210 liquid level was low and pump was pumping out D-210 液面低机泵抽空	Increase the D-210 level to prevent the pump from pumping out.提高 D-210 液面防止机泵抽空。

Actions for runaway situation: If the control of the three streams of flushing oil pressure exceeds the control range, then switch to the fractionation stabilization post of the emergency shutdown plan for accidents.

失控处理：若三路冲洗油压力的控制超出控制范围，则转入事故预案紧急停工方法中的分馏稳定岗位部分。

(33) Temperature control of light gas oil exporting from the plant 轻蜡油出装置温度控制

1)Control range: light gas oil to tank farm temperature TI-21104 is controlled at 40-60 °C; light gas oil to hydrogenation temperature is controlled to 50-130 °C.控

制范围：轻蜡油至罐区温度 TI-21104 在 40～60℃；轻蜡油至加氢温度 50～130℃。

2)Control target: control the temperature of light gas oil exporting from the plant to ± 5°C of set points.

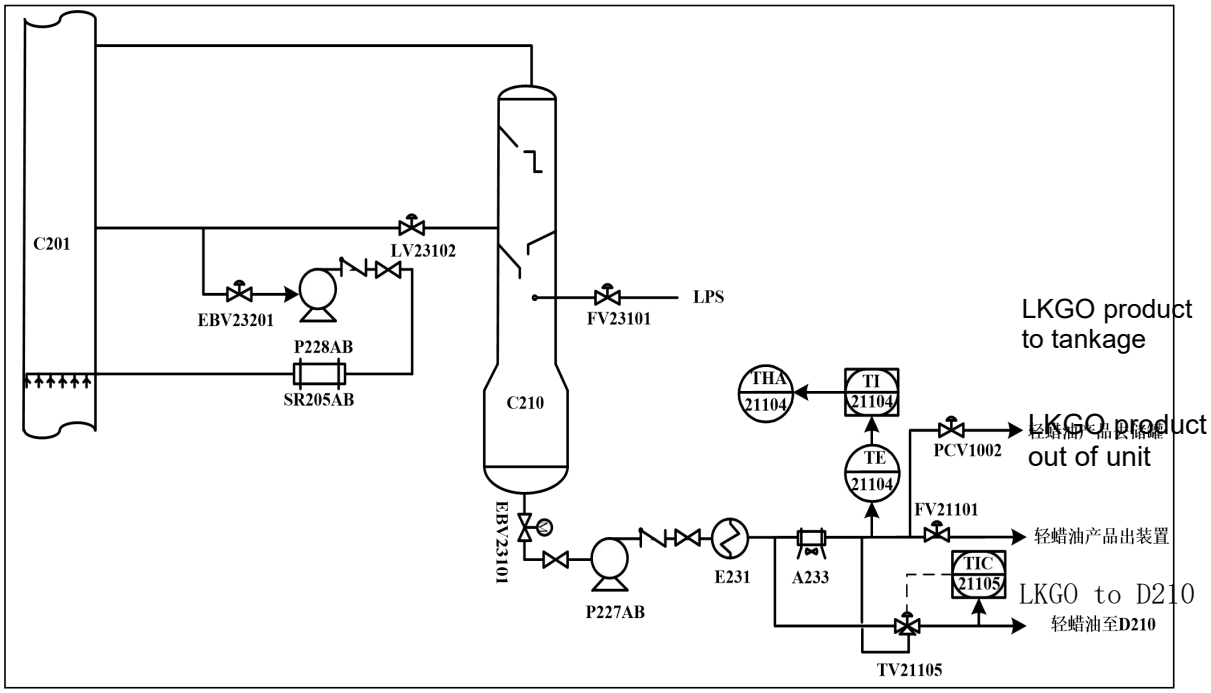
控制目标：设定的轻蜡油出装置温度±5℃。

3)Related parameters: light gas oil to tank farm flow rate FV-21101; light gas oil product air cooler A-233 after cooling temperature TI-21101; light gas oil / vacuum residue heat exchanger E-231 after cooling temperature.

相关参数：轻蜡油至罐区流量 FV-21101；轻蜡油产品空冷器 A-233 冷后温度 TI-21101；轻蜡油/减压渣油换热器 E-231 冷后温度。

4)Control method: In normal operation, the temperature of light gas oil to tank area and hydrogenation is adjusted with the opening of the three-way valve TV-21105 mainly based on light gas oil product air cooler A-233 after cooling temperature TI-21101 and light gas oil / vacuum residue heat exchanger E-231 after cooling temperature .

控制方式：轻蜡油至罐区、加氢温度正常情况下主要参考轻蜡油产品空冷器 A-233 冷后温度 TI-21101 和轻蜡油/减压渣油换热器 E-231 冷后温度用三通阀 TV-21105 的开度进行调节。两路蜡油在出装置前汇合至 SR0204 过滤器，后去加氢装置。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
The status of E-231 is in service E-231 投用状态	When the opening of E-231 shell-side inlet valve is increased, light gas oil to the tank farm and hydrogenation temperature will decrease. E-231 壳程入口阀开大，轻蜡油至罐区、加氢温度低。
The condition of A-233 is in service A-233 投用状态	As the A-233 is started, light gas oil to the tank farm and hydrogenation temperature will decrease. A-233 开启，轻蜡油至罐区、加氢温度低。
The flow rate of light gas oil exporting from the plant 轻蜡油出装置流量	The flow rate of light gas oil exporting from the plant FV-21101 is decreased and the temperature will be low.轻蜡油出装置流量 FV-21101 流量小，温度低。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Action 处理方法

The temperature of light gas oil to tank farm and hydrogenation is too high 轻蜡油至罐区、加氢温度过高	When A-233 was running ,air cooler failed and shutdown A-233 运行空冷故障关闭	Start the A-233 standby air cooler.启运 A-233 备用空冷。
	E-231 shell-side circulation flow rate decreased E-231 壳程循环量减小	Increase the opening of E-231 shell-side circulation inlet valve.开大 E-231 壳程循环量入口阀。
	Instrument indication was faulty 仪表指示故障	Contact the instrument operators to calibrate the instrument.联系仪表进行校表。
	E-231 shell-side circulation flow rate decreased E-231 壳程循环量增大	Decrease the opening of E-231 shell-side inlet valve.关小 E-231 壳程入口阀。
	Instrument indication was faulty 仪表指示故障	Contact the instrument operators to calibrate the instrument.联系仪表进行校表。

Actions for runaway situation: If the temperature of the light gas oil exporting from the plant exceeds the control range, then switch to the fractionation stabilization post of the emergency shutdown plan for accidents.

失控处理：若轻蜡油出装置温度超出控制范围则转入紧急停工预案中的分馏稳定岗位部分。

(34) Control of E-207 level

E-207 液位控制

1)Control range: LIC-20901 is 40-70%.

控制范围：LIC-20901 在 40～70%。

2)Control target: The set E-207 liquid level LIC-20901 controls at ±5%.

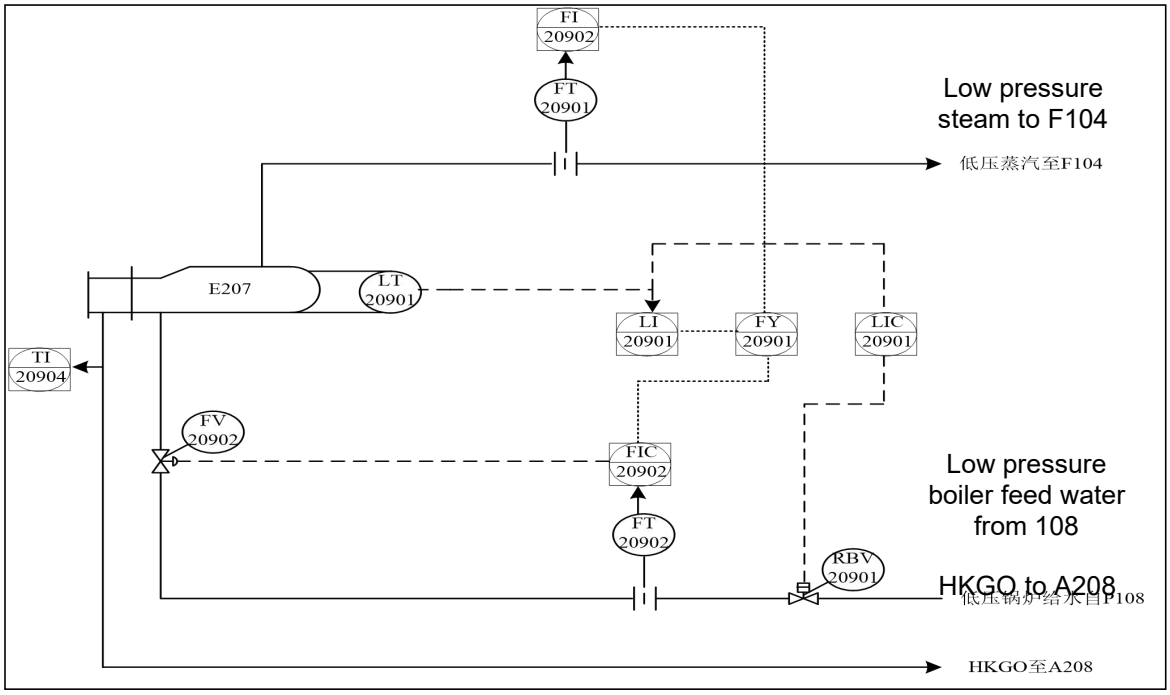
控制目标：设定的 E-207 液位 LIC-20901 控制±5%。

3)Related parameters: Low-pressure boiler feed water flow rate FV-20902; E-207 shell-side outlet low-pressure steam to F-104 flow rate FT-20901, HKGO exporting from the plant flow rate FV-21001; E-207 tube-side outlet temperature TI-20904.

相关参数： 低压锅炉给水流量 FV-20902；E-207 壳程出口低压蒸汽至 F-104 流量 FT-20901，HKGO 出装置流量 FV-21001；E-207 管程出口温度 TI-20904。

4)Control mode: In normal operation, E-207 liquid level control is adjusted with low-pressure boiler feed water flow rate FV-20902 and mainly makes reference for the flow rate FT-20901 of E-207 shell-side outlet low-pressure steam to F-104.

控制方式：E-207 液位控制正常情况下主要参考 E-207 壳程出口低压蒸汽至 F-104 流量 FT-20901 用低压锅炉给水流量 FV-20902 进行调节。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Low pressure boiler feed water flow control valve FV-20902 低压锅炉给水流量控制阀 FV-20902	When the opening of control valve is increased, the liquid level will rise, and vice versa.控制阀开度增大，液面上升；反之下降。
Low pressure boiler feed water flow shut-off valve RBV-20901 低压锅炉给水流量切断阀 RBV-20901	When the opening of shut-off valve is increased, the liquid level will rise, and vice versa.切断阀开度增大，液面上升；反之下降。

6)Troubleshooting: 异常调节：

Fault 现象	Cause 原因	Action 处理方法
E-207 liquid level is too high E-207 液位过高	Low pressure boiler feed water flow control valve FV-20902 failed and fully opened 低压锅炉给水流量控制阀 FV-20902 故障全开	Contact the inside operator to decrease the opening of hand valve upstream the control valve FV-20902 on site , contact the instrument operators to deal with the control valve.联系内操现场关小控制阀 FV-20902 上游手阀，联系仪表进行处理控制阀。
	Liquid level indicator failure 液面指示仪表故障	Contact the instrument operators to calibrate the instrument.联系仪表进行校表。

Fault 现象	Cause 原因	Action 处理方法
E-207 liquid level is too low E-207 液位过低	Low pressure boiler feed water flow control valve FV-20902 failed and fully closed 低压锅炉给水流量控制阀 FV-20902 故障全关	Contact the inside operator to increase the opening of bypass hand valve of the control valve FV-20902 on site , contact the instrument operators to deal with the control valve.联系内操现场开大控制阀 FV-20902 副线手阀，联系仪表进行处理控制阀。
	Low-pressure deaerating water pump P-108 failed to pump 低压除氧水泵 P-108 故障不上量	Switch to the standby pump.切换至备用机泵。
	Instrument indication was faulty 仪表指示故障	Contact the instrument operators to calibrate the instrument.联系仪表进行校表。

Actions for runaway situation: If the light gas oil to the tank farm and the hydrogenation temperature exceeds the control range, then switch to the fractionation stabilization post of the emergency shutdown plan for accidents.

失控处理：若轻蜡油至罐区、加氢温度超出控制范围则转入紧急停工预案中的分馏稳定岗位部分。

(35) Temperature control of Heavy gas oil exporting from plant 重蜡油出装置温度控制

1)Control range: Heavy gas oil to tank farm temperature TI-21004 is controlled at 40-60 °C; heavy gas oil to hydrogenation temperature 50-130 °C.

控制范围：重蜡油至罐区温度 TI-21004 在 40～60℃；重蜡油至加氢温度 50～130℃。

2)Control target: set the weight of the heavy gas oil exporting from the plant ± 5 °C

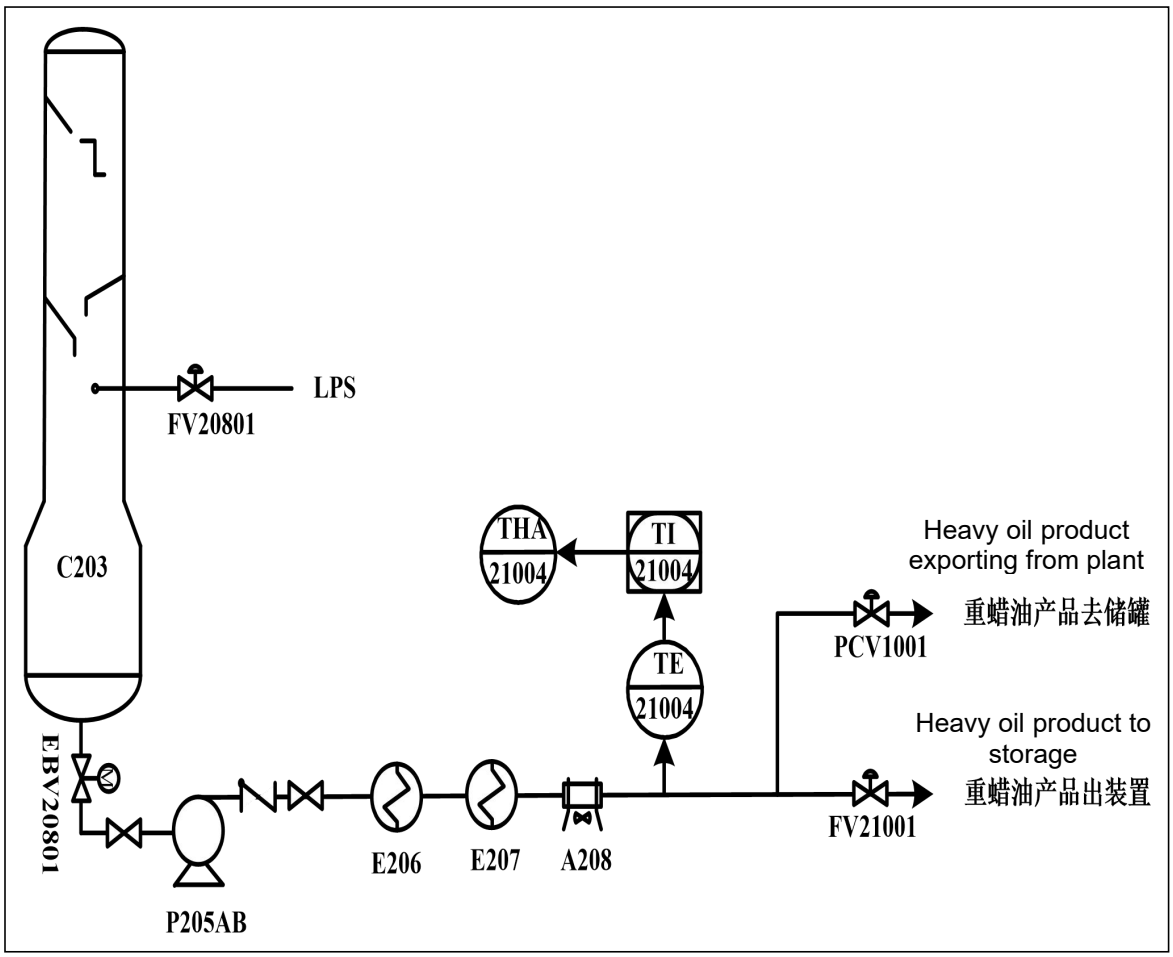
控制目标：设定的重蜡油出装置温度±5℃。

3)Related parameters: heavy gas oil to tank flow rate FV-21001; heavy gas oil product air cooler A-208 after cooled temperature TI-21003; HKGO low pressure steam generator E-207 outlet temperature TI-20904; HKGO / vacuum residue Oil heat exchanger E-206 outlet temperature TI-20903.

相关参数：重蜡油至罐区流量 FV-21001；重蜡油产品空冷器 A-208 冷后温度 TI-21003；HKGO 低压蒸汽发生器 E-207 出口温度 TI-20904；HKGO/减压渣油换热器 E-206 出口温度 TI-20903。

4)Control method: heavy gas oil to tank farm, hydrogenation temperature is mainly adjusted with reference to TI-21004 via using heavy gas oil product air cooler A-208 and HKGO low pressure steam generator E-207.

控制方式：重蜡油至罐区、加氢温度主要参考 TI-21004 利用重蜡油产品空冷器 A-208 和 HKGO 低压蒸汽发生器 E-207 进行调节。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
The status of E-206 is in service E-206 投用状态	When the opening of the E-206 shell-side inlet valve is increased, the temperature of heavy gas oil to the tank farm and hydrogenation unit will decrease. E-206 壳程入口阀开大，重蜡油至罐区、加氢温度低。
The status of E-206 is in service A-208 投用状态	As the A-208 is started, heavy gas oil to the tank farm and hydrogenation temperature will decrease. A-208 开启，重蜡油至罐区、加氢温度低。
Heavy gas oil to tank farm flow rate 重蜡油至罐区流量	When the flow rate FV-21001 of heavy gas oil to tank area is reduced, the temperature will decrease.重蜡油至罐区流量 FV-21001 流量减小，温度低。
The status of E-207 is in service E-207 投用状态	When the flow rate of E-207 shell-side inlet water supply is increased, the temperature of heavy gas oil to tank area and hydrogenation unit will decrease. E-207 壳程入口给水流量增大，重蜡油至罐区、加氢温度低。

6)Abnormal adjustment: 异常调节：

Fault 现象	Cause 原因	Action 处理方法
The temperature of heavy gas oil to tank farm and hydrogenation unit is too high 重蜡油罐区、加氢温度过高	When A-208 was running ,air cooler failed and shutdown A-208 运行空冷故障关闭	Start the A-208 standby air cooler.启运 A-208 备用空冷。
	The flow rate of E-206 shell-side inlet circulation reduced E-206 壳程入口循环量减小	Increase the opening of E-206 shell-side inlet valve.开大 E-206 壳程入口阀。
	The flow rate of E-207 shell-side inlet water supply decreased E-207 壳程入口给水流量减小	Increase the opening of E-207 shell-side inlet valve.开大 E-207 壳程入口阀。
	Instrument indication was faulty 仪表指示故障	Contact the instrument operators to calibrate the instrument.联系仪表进行校表。
The temperature of heavy gas oil to tank farm and hydrogenation unit is too low 重蜡油罐区、加氢温度过低	The flow rate of E-206 shell-side inlet circulation increased E-206 壳程入口循环量增加	Decrease the opening of E-206 shell-side inlet valve.关小 E-206 壳程入口阀。
	The flow rate of E-207 shell-side inlet water supply increased E-207 壳程入口给水流量增加	Decrease the opening of E-207 shell-side inlet valve.关小 E-207 壳程入口阀。
	Instrument indication was faulty 仪表指示故障	Contact the instrument operators to calibrate the instrument.联系仪表进行校表。

Actions of runaway situtaions treatment: If the temperature of heavy gas oil to tank farm and the hydrogenation unit exceeds the control range, then switch to the fractionation stabilization post of the emergency shutdown plan for accidents.

失控处理：若重蜡油罐区、加氢温度超出控制范围则转入紧急停工预案中的分馏稳定岗位部分。

(36) D-206 interface level control

D-206 界位控制

1)Control range: LIC-22704: 30~70%.

控制范围：LIC-22704 在 30～70%。

2)Control objective: the set D-206 interface level LIC-22704 ±5%.

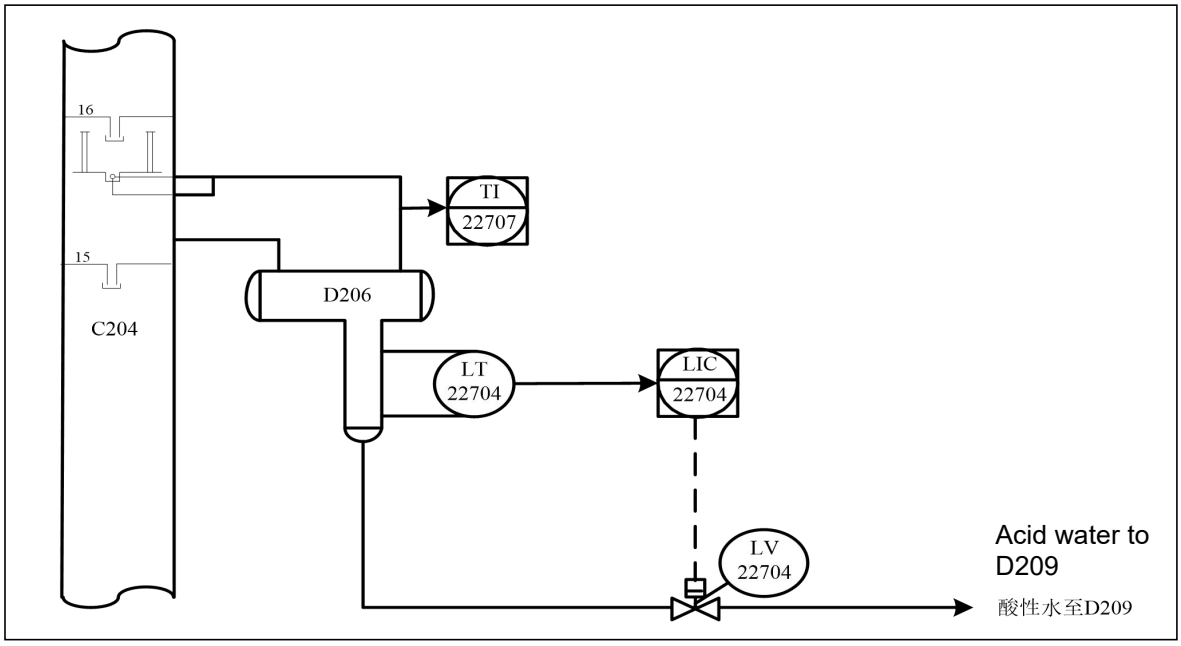
控制目标：设定的 D-206 界位 LIC-22704 控制±5%。

3)Relevant parameters: D-206 pressure PG-22701; D-206 temperature TI-22707; D-206 LLP steam rate; D-209 liquid level LT-23901.

相关参数： D-206 压力 PG-22701；D-206 温度 TI-22707；D-206 低低压蒸汽量；D-209 液位 LT-23901。

4)Control mode: D-206 interface level is mainly controlled by the opening of interface level control valve LV-22704.

控制方式：D-206 界位主要是由界位控制阀 LV-22704 开度进行控制。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Opening of interface level control valve 界位控制阀开度	When the opening of control valve increases, the liquid level drops; otherwise, it rises. 控制阀开度增大，液面下降；反之上升。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
Interface level rises 界位上升	Acid water collecting tank D-209 is full 酸性水收集罐 D-209 液位满	Increase acid water delivery rate to make D-209 liquid level drop to 30~50%. 开大酸性水外送量，将 D-209 液面降低至 30～50%。
	Fault of interface level indicator 界位指示仪表故障	Contact instrument personnel for calibration. 联系仪表进行校表。

Interface level declines 界位下降	Interface level control valve LV-22704 is fully opened due to fault 界位控制阀 LV-22704 故障全开	Contact internal operator to turn down the manual valve upstream of control valve LV-22704, and contact instrument personnel to deal with the control valve. 联系内操现场关小控制阀 LV-22704 上游手阀，联系仪表进行处理控制阀。
	Fault of interface level indicator 界位指示仪表故障	Contact instrument personnel for calibration. 联系仪表进行校表。

Out-of-control handling: If D-206 interface level exceeds the control range, switch to the fractionation stabilization post in emergency shutdown plan.

失控处理：若 D-206 界位超出控制范围则转入紧急停工预案中的分馏稳定岗位部分。

(37) D-205 interface level control

D-205 界位控制

1)Control range: LIC-22601: 30~70%.

控制范围：LIC-22601 在 30～70%。

2)Control objective: the set D-205 interface level LIC-22601 ±5%.

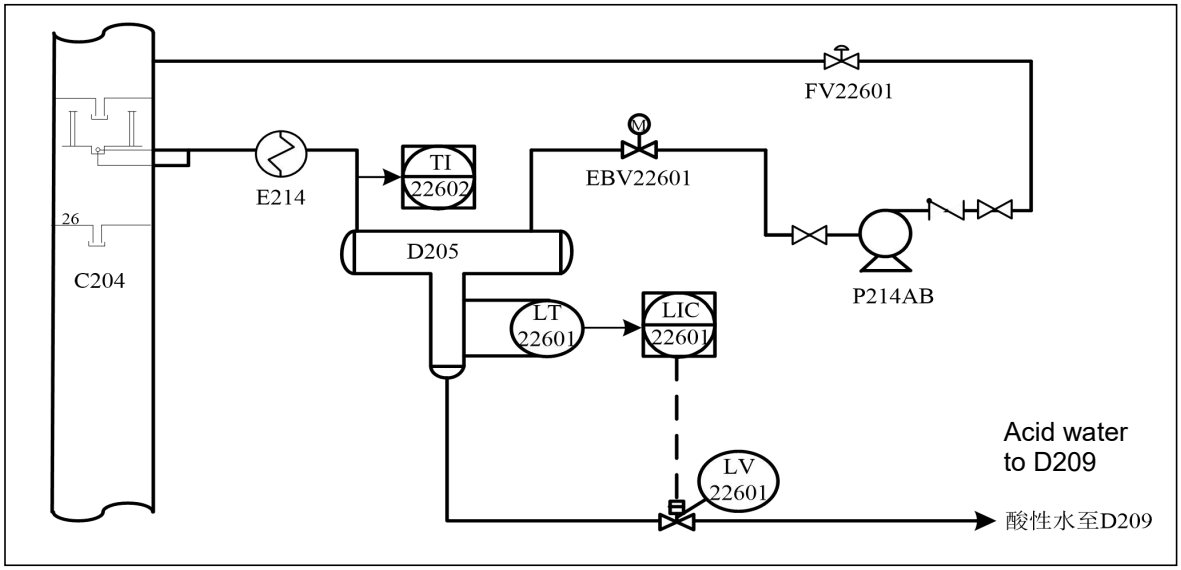
控制目标：设定的 D-205 界位 LIC-22601 控制±5%。

3)Relevant parameters: D-205 pressure PG-22601; D-205 temperature TI-22602; D-205 LLP steam rate; D-209 liquid level LT-23901.

相关参数： D-205 压力 PG-22601；D-205 温度 TI-22602；D-205 低低压蒸汽量；D-209 液位 LT-23901。

4)Control mode: D-205 interface level is mainly controlled by the opening of interface level control valve LV-22601.

控制方式：D-205 界面主要是由界位控制阀 LV-22601 开度进行控制。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Opening of interface level control valve 界位控制阀开度	When the opening of control valve increases, the liquid level drops; otherwise, it rises. 控制阀开度增大，液面下降；反之上升。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
Interface level rises 界位上升	Acid water collecting tank D-209 is full 酸性水收集罐 D-209 液位满	Increase acid water delivery rate to make D-209 liquid level drop to 30~50%. 开大酸性水外送量，将 D-209 液面降低至 30～50%。
	Fault of interface level indicator 界位指示仪表故障	Contact instrument personnel for calibration. 联系仪表进行校表。
Interface level declines 界位下降	Interface level control valve LV-22601 is fully opened due to fault 界位控制阀 LV-22601 故障全开	Contact internal operator to turn down the manual valve upstream of control valve LV-22601, and contact instrument personnel to deal with the control valve. 联系内操现场关小控制阀 LV-22601 上游手阀，联系仪表进行处理控制阀。
	Fault of interface level indicator 界位指示仪表故障	Contact instrument personnel for calibration. 联系仪表进行校表。

Out-of-control handling: If D-205 interface level exceeds the control range, switch to the fractionation stabilization post in emergency shutdown plan.

失控处理：若 D-205 界位超出控制范围则转入紧急停工预案中的分馏稳定岗位部分。

(38) C-204 overhead temperature control

C-204 顶温度的控制

1)Control range: TI-22501:40~50℃.

控制范围：TI-22501 在 40～50℃。

2)Control objective: the set C-204 overhead temperature ±5℃.

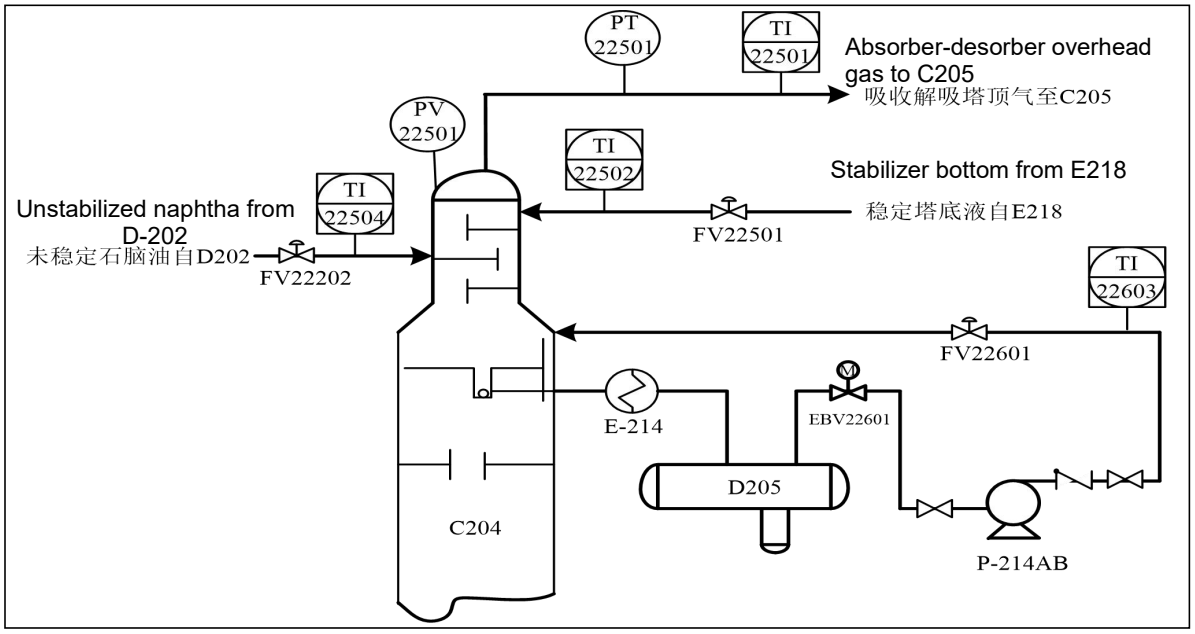
控制目标：设定的 C-204 顶温度控制±5℃。

3)Relevant parameters: C-204 pressure PG-22501; stabilizer bottom flow rate FV-22501; temperature TI-22504 of unstabilized naphtha from D-202; reflux rate FV-22601 from middle absorber section; return temperature TI-22603 from middle absorber section; flow rate FV-22202 of unstabilized naphtha from D-202; stabilizer bottom temperature TI-22501.

相关参数：C-204 压力 PG-22501；稳定塔底液流量 FV-22501；自 D-202 未稳定石脑油温度 TI-22504；吸收塔中段返回流量 FV-22601；吸收塔中段返回温度 TI-22603；自 D-202 未稳定石脑油流量 FV-22202； 稳定塔底液温度 TI-22501。

4)Control mode: C-204 overhead temperature is mainly adjusted by stabilizer bottom temperature TI-22502, temperature TI-22504 of unstabilized naphtha from D-202 and reflux temperature TI-22603 from middle absorber section referring to TI-22501.

控制方式：C-204 顶温度主要主要参考 TI-22501 利用稳定塔底液温度 TI-22502、自 D-202 未稳定石脑油温度 TI-22504 和吸收塔中段返回流温度 TI-22603 进行调节。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Flow rate of unstabilized naphtha from D-202 自 D-202 未稳定石脑油流量	When the flow rate to the absorber-desorber increases, overhead temperature drops; otherwise, it rises. 进吸收解吸塔流量增加，顶部温度降低；反之顶部温度增加。
Temperature of unstabilized naphtha from D-202 自 D-202 未稳定石脑油温度	When the temperature to the absorber-desorber increases, overhead temperature rises; otherwise, it drops. 进吸收解吸塔温度增加，顶部温度增加；反之顶部温度降低。
Stabilizer bottom flow rate	When the flow rate to the absorber-desorber increases,

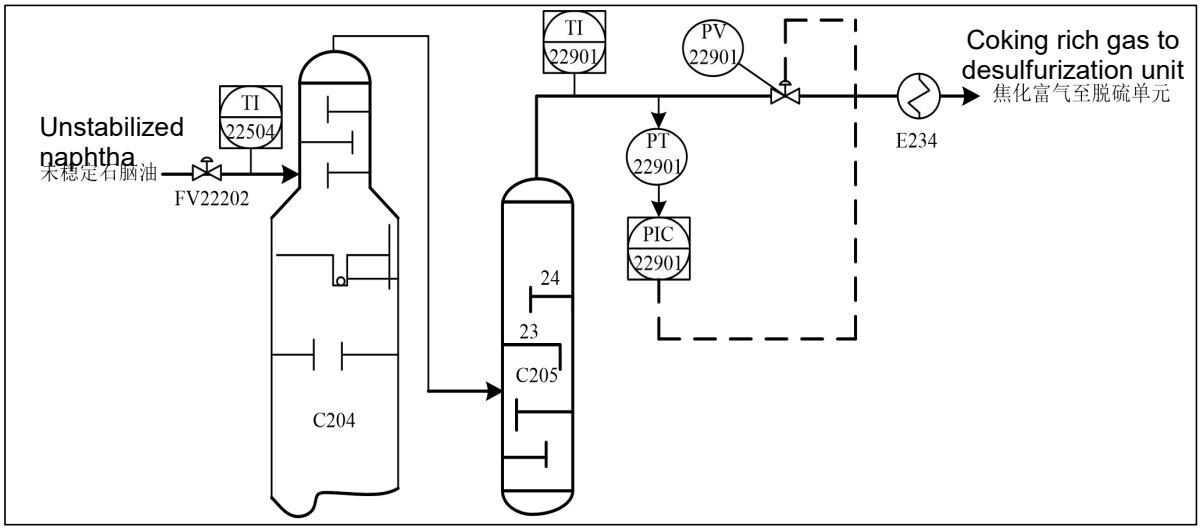
稳定塔底液流量	overhead temperature drops; otherwise, it rises. 进吸收解吸塔流量增加，顶部温度降低；反之顶部温度增加。
Stabilizer bottom temperature 稳定塔底液温度	When the temperature to the absorber-desorber increases, overhead temperature rises; otherwise, it drops. 进吸收解吸塔温度增加，顶部温度增加；反之顶部温度降低。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
Absorber-desorber overhead temperature rises sharply 吸收解吸塔顶温度大幅上升	High temperature of unstabilized naphtha 未稳定石脑油温度高	Increase E-211 cooling water circulating rate or increase unstabilized naphtha flow rate. 开大 E-211 冷却水循环量或者增加未稳定石脑油流量。
	Low stabilizer bottom flow rate 稳定塔底液流量低	Turn up stabilizer bottom flow rate control valve. 开大稳定塔底液流量控制阀。
	High stabilizer bottom temperature 稳定塔底液温度高	Increase E-218 cooling water circulating rate or increase stabilizer bottom flow rate. 开大 E-218 冷却水循环量或者增加增加稳定塔底液流量。
	Unstabilized naphtha is interrupted 未稳定石脑油中断	Recover unstabilized naphtha flow rate quickly. 迅速恢复未稳定石脑油流量。
Absorber-desorber overhead temperature drops sharply 吸收解吸塔顶温度大幅下降	C205 顶压力突然降低	控制好 C205 塔顶压力
	Stabilizer bottom flow rate increases 稳定塔底液流量增大	Turn down stabilizer bottom flow rate control valve. 关小稳定塔底液流量控制阀。
	Low stabilizer bottom temperature 稳定塔底液温度低	Decrease E-218 cooling water circulating rate. 关小 E-218 冷却水循环量。

Out-of-control handling: If C-204 overhead temperature exceeds the control range, switch to the fractionation stabilization post in emergency shutdown plan.
失控处理：若 C-204 顶温度超出控制范围则转入紧急停工预案中的分馏稳定岗位部分。

(39) C2-05 overhead pressure control
C2-05 顶压力的控制
1)Control range: PIC-22901: ≤2.1MPa.
控制范围：PIC-22901 在≤2.1MPa.
2)Control objective: the set C-205 overhead pressure PIC-22901 1.8MPa ±0.1MPa.
控制目标：设定的 C-205 顶压力 PIC-22901 控制 1.8MPa±0.1MPa。
3)Relevant parameters: gas compressor outlet pressure PI-22106; outlet pressure of coking rich gas from the unit. Fluctuation of the parameters above will lead to fluctuation in reabsorber pressure PIC-22901.
相关参数：气压机出口压力 PI-22106；焦化富气出装置的压力；以上参数波动会引起再吸收塔压力 PIC-22901 波动。
4)Control mode: reabsorber pressure is controlled by pressure control valve PIC-22901 through controlling the flow rate of the coking rich gas to desulfurization unit.
控制方式：再吸收塔压力由压控阀 PIC-22901 控制，通过控制焦化富气至脱硫单元流量来控制再吸收塔压力。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Opening of pressure control valve for coking rich gas from the unit 焦化富气出装置压控阀开度	When the opening of pressure control valve increases, the pressure drops; otherwise, it rises. 压控阀开度大，压力下降；反之压力上升。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
Reabsorber pressure rises sharply 再吸收塔压力急剧上升	Reabsorber pressure control valve is fully closed due to fault 再吸收塔压控阀故障全关	Open side-line valve of pressure control valve on site immediately to make the reabsorber pressure drop to normal range, and contact instrument personnel to repair the control valve. 立即到现场打开压控阀副线阀，降低再吸收塔压力在正常范围内，同时联系仪表修控制阀。
Reabsorber pressure drops, and flow rate of coking rich gas rises, which will lead to liquid carrying in coking rich gas in severe case. 再吸收塔压力下降，焦化富气流量上升，严重时造成焦化富气带液	Reabsorber pressure control valve is fully opened due to fault 再吸收塔压控阀故障全开	Switch to side-line valve for pressure control on site immediately to increase the reabsorber pressure, and contact instrument personnel to repair the control valve. 立即到现场改用副线阀控制压力，提高再吸收塔压力，同时联系仪表修控制阀。
Pressure rises, and there is no change in side-line pressure when opening the pressure control valve. 压力上升，开压控阀副线压力没有变化	Back flow path of coking rich gas is blocked 焦化富气后路堵	Contact dispatcher immediately to release the pressure to LP pipe network or flare line. 立即联系调度，向低压管网或火炬线卸压。
		Reduce handling capacity. 降低处理量。
		Contact the person in charge of desulfurization unit to clear the back flow path. 联系脱硫单元，导通后路流程。

Out-of-control handling: If C-205 overhead pressure exceeds the control range, switch to the fractionation stabilization post in emergency shutdown plan.

失控处理：若 C-205 顶压力超出控制范围则转入紧急停工预案中的分馏稳定岗位部分。（紧急情况下通过 C204 顶紧急泄压阀 XV22501 向火炬系统泄压）

(40) C-207 overhead pressure control PIC-23501

C-207 顶压力的控制 PIC-23501

1)Control range: 0.9~1.4MPa.

控制范围：0.9~1.4MPa.

2)Control objective: control stabilizer pressure at 1.1MPa during normal operation to ensure acceptable coking LPG and coking naphtha quality. Stabilizer pressure control is based on the fact that the saturated steam pressure of coking LPG at post-cooling temperature is less than the stabilizer pressure. Improving operating pressure appropriately is beneficial to complete condensation of coking LPG when the post-cooling temperature of coking LPG rises and zero release of non-condensable gas, so as to improve recovery rate of coking LPG. The pressure fluctuation set shall not exceed ±0.05MPa.

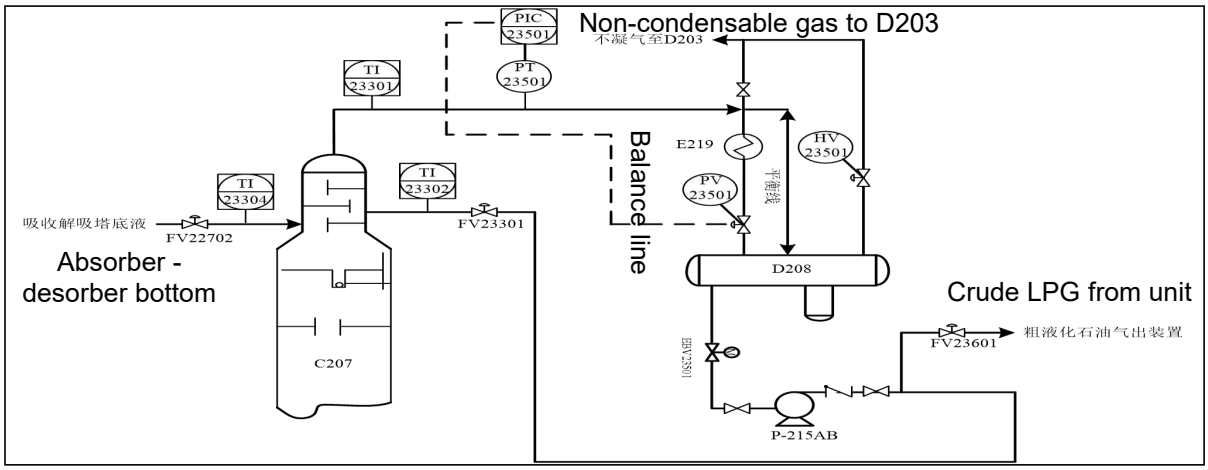
控制目标：正常操作中控制稳定塔压力控制在 1.1MPa，保证液焦化液化气、焦化石脑油质量合格；稳定塔压力控制是以焦化液化气在冷却后温度下的饱和蒸汽压小于塔的压力为依据。适当提高操作压力，利于在焦化液化气冷后温度上升时，焦化液化气全凝，不排放不凝气，从而提高焦化液化气收率。设定的压力波动不超过±0.05MPa。

3)Relevant parameters: stabilizer feed temperature TI23304; stabilizer feed rate FV-22702; stabilizer bottom temperature TI-23307; coking LPG reflux rate FV-23301; coking LPG reflux temperature TI-23302.

相关参数：稳定塔进料温度 TI23304；稳定塔进料量 FV-22702；稳定塔塔底温度 TI-23307；焦化液化气回流量 FV-23301；焦化液化气回流温度 TI-23302。

4)Control mode: it is controlled by stabilizer overhead pressure control valve PV-23501 under normal circumstances. Adjust with non-condensable gas control valve HIC-23501 in the case of ultra-high pressure that cannot be controlled by stabilizer overhead pressure control valve PV-23501. When stabilizer overhead pressure control valve PV-23501 is turned up, stabilizer overhead pressure drops. When stabilizer overhead pressure control valve PV-23501 is turned down, stabilizer overhead pressure rises. When the non-condensable gas control valve HIC-23501 is turned up, stabilizer overhead pressure drops. When the non-condensable gas control valve HIC-23501 is turned down, stabilizer overhead pressure rises.

控制方式：正常情况用稳定塔顶压控阀 PV-23501 的开度控制，当出现压力超高，稳定塔顶压控阀 PV-23501 无法控制时用不凝气控制阀 HIC-23501 调节。稳定塔顶压控阀 PV-23501 开大，稳定塔顶压力下降；稳定塔顶压控阀 PV-23501 关小，稳定塔顶压力上升。不凝气控制阀 HIC-23501 开大，稳定塔顶压力下降；不凝气控制阀 HIC-23501 关小，稳定塔顶压力上升。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Opening of stabilizer overhead pressure control valve 稳定塔顶压控阀开度	When the opening of pressure control valve increases, the pressure drops; otherwise, it rises. 压控阀开度大，压力下降；反之压力上升。
Opening of non-condensable gas valve 不凝气阀开度	When the opening of non-condensable gas valve increases, pressure drops; otherwise, it rises. Pressure will be adjusted only by discharging non-condensable gas when the pressure is higher than the process card indicator rather than under normal circumstances. 不凝气阀开度大，压力下降；反之上升。正常操作时不用外放不凝气的方法调节压力，仅在压力高于工艺卡片指标时才采用此方法。
稳定塔进料组成	稳定塔进料当中的 C2 含量高则稳定塔压力高，反之则低。可以通过微调 C204 低温来控制稳定塔进料中的 C2 含量来微调稳定塔的压力。

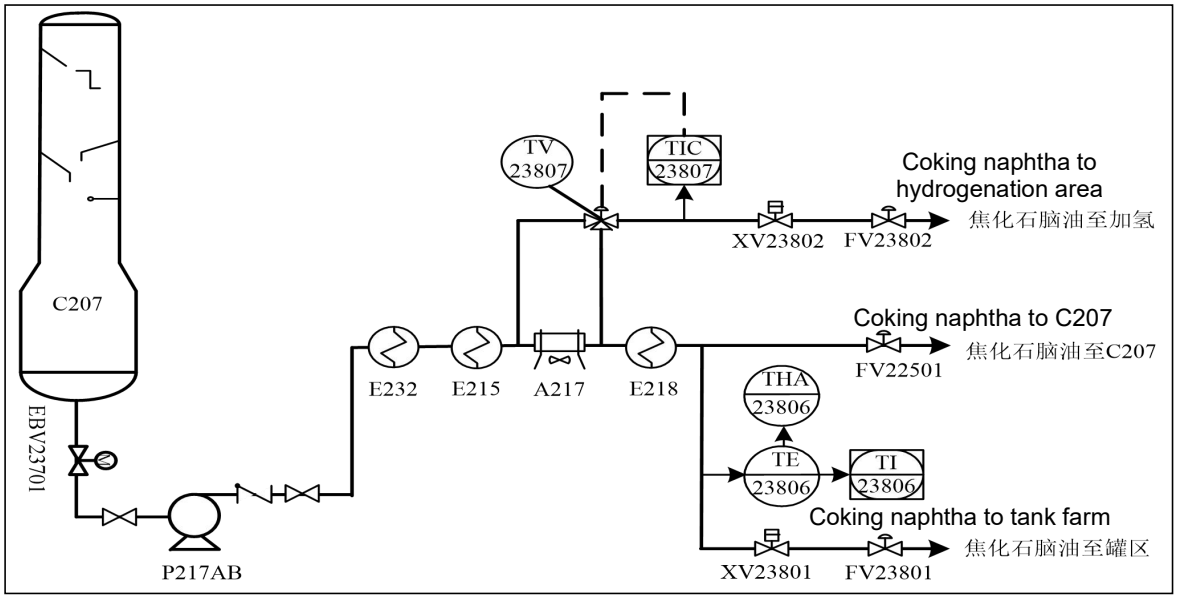
6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
Stabilizer pressure drops 稳定塔压力下降	Failure of bottom temperature control valve of stabilizer; non-condensable gas control valve is opened; stabilizer overhead pressure control valve is fully opened due to fault 稳定塔底温控阀失灵；不凝气控制阀开；稳定塔顶压控阀故障全开	Immediately find out causes, recover heat source, switch temperature control valve to manual adjustment mode, turn down non-condensable gas control valve, control pressure with the manual valve upstream of control valve, and contact instrument personnel to deal with the control valve. 立即查找原因， 恢复热源，将温控阀改为手动调节，关小不凝气控制阀，用控制阀上游手阀控制压力，联系仪表进行处理控制阀。
Stabilizer pressure rises sharply 稳定塔压力急剧上升	Stabilizer overhead pressure control valve is fully closed due to fault, temperature flow rate of bottom heat source of stabilizer increases; failure of bottom temperature control valve of	Immediately switch to side-line valve to control pressure on site and contact instrument personnel to repair the control valve; reduce steam circulating rate and temperature, switch temperature control valve to manual adjustment mode and

	stabilizer; opening of non-condensable gas control valve drops to fast 稳定塔顶压控阀故障全关，稳定塔底热源温度流量增大；稳定塔底温控阀失灵；不凝气控制阀开度降低过快	turn up non-condensable gas control valve. 立即到现场改用副线阀控制压力，同时联系仪表修控制阀；降低蒸汽循环量和温度，将温控阀改为手动调节，开大不凝气控制阀。

Out-of-control handling: If C-207 overhead pressure exceeds the control range, switch to the fractionation stabilization post in emergency shutdown plan.
失控处理：若 C-207 顶压力超出控制范围则转入紧急停工预案中的分馏稳定岗位部分。

(41) Temperature control of naphtha from unit 石脑油出装置温度控制
1)Control range: temperature TI-23806 of naphtha to tank farm: 30~50℃; temperature TI-23807 of naphtha to hydrogenation area: 85~115℃.
控制范围：石脑油至罐区温度 TI-23806 在 30~50℃；石脑油至加氢温度 TI-23807 在 85~115℃。
2)Control objective: the set temperature of the naphtha from unit and of the naphtha to hydrogenation area within ±5℃.
控制目标：设定的石脑油出装置温度和至加氢温度±5℃。
3)Relevant parameters: post-cooling temperature TI-23804 of coking naphtha air cooler A-217; outlet temperature TI-23805 of coking naphtha water cooler E-218; outlet temperature TI-22712 of reboiler E-215 in middle section of absorber-desorber; outlet temperature TI-22711 of stabilizer feed preheater E-232.
相关参数：焦化石脑油空冷器 A-217 冷后温度 TI-23804；焦化石脑油水冷器 E-218 出口温度 TI-23805；吸收解吸塔中段重沸器 E-215 出口温度 TI-22712；稳定塔进料预热器 E-232 出口温度 TI-22711。
4)Control mode: temperature of naphtha to tank farm is mainly adjusted by coking naphtha water cooler E-218, reboiler E-215 in middle section of absorber-desorber, stabilizer feed preheater E-232 and coking naphtha air cooler A-217 referring to TI-23806; temperature of naphtha to hydrogenation area is mainly adjusted by reboiler E-215 in middle section of absorber-desorber, stabilizer feed preheater E-232 and coking naphtha air cooler A-217 three-way valve TV-23807 referring to TIC-23807.
4)控制方式：石脑油至罐区温度主要参考 TI-23806 利用焦化石脑油水冷器 E-218、吸收解吸塔中段重沸器 E-215、稳定塔进料预热器 E-232 和焦化石脑油空冷器 A217 进行调节；石脑油至加氢温度主要参考 TIC-23807 利用吸收解吸塔中段重沸器 E-215、稳定塔进料预热器 E-232 和焦化石脑油空冷器 A-217 通过三通阀 TV-23807 进行调节。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Service state of E-218 E-218 投用状态	When the tube pass inlet valve of E-218 is turned up, the temperature of naphtha to tank farm drops. E-218 管程入口阀开大，石脑油至罐区温度低。
Service state of A-217 A-217 投用状态	When A-217 is opened, the temperature of naphtha to tank farm drops. A-217 开启，石脑油至罐区温度低。
Service state of E-232 E-232 投用状态	When the shell pass inlet valve of E-232 is turned up, the temperature of naphtha to tank farm and hydrogenation area drops. E-232 壳程入口阀开大，石脑油至罐区、加氢温度低。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
The temperature of naphtha to tank farm and hydrogenation area is too	A-217 operating air cooler is closed due to fault A-217 运行空冷故障关闭	Start A-217 standby air cooler. 启运 A-217 备用空冷。
	E-218 tube pass inlet circulating rate decreases E-218 管程入口循环量减小	Turn up E-218 tube pass inlet valve. 开大 E-218 管程入口阀。

high 石脑油至罐区、加氢温度过高	E-232 shell pass inlet circulating rate decreases E-232 壳程入口循环量减小	Turn up E-232 shell pass inlet valve. 开大 E-232 壳程入口阀。
	Instrument indication fault 仪表指示故障	Contact instrument personnel for calibration. 联系仪表进行校表。
The temperature of naphtha to tank farm and hydrogenation area is too low 石脑油至罐区、加氢温度过低	E-218 tube pass inlet circulating rate increases E-218 管程入口循环量增加	Turn down E-218 tube pass inlet valve. 关小 E-218 管程入口阀。
	E-232 shell pass inlet circulating rate increases E-232 壳程入口循环量量增加	Turn down E-232 shell pass inlet valve. 关小 E-232 壳程入口阀。
	Instrument indication fault 仪表指示故障	Contact instrument personnel for calibration. 联系仪表进行校表。

Out-of-control handling: If the temperature of naphtha to tank farm and hydrogenation area exceeds the control range, switch to the fractionation stabilization post in emergency shutdown plan.

失控处理：若石脑油罐区、加氢温度超出控制范围则转入紧急停工预案中的分馏稳定岗位部分。

注意：加强对冷却器的巡检和冷却器的循环水检查发现循环水带油要及时将泄漏组冷却器切出。

(42) Post-cooling temperature of LPG 液化石油气冷后温度

1)Control range: TI-23501: 30~50℃.

控制范围：TI-23501 在 30～50℃。

2)Control objective: control the post-cooling temperature of LPG at the set value ±5℃ in normal operation, so as to ensure LPG C2 is acceptable.

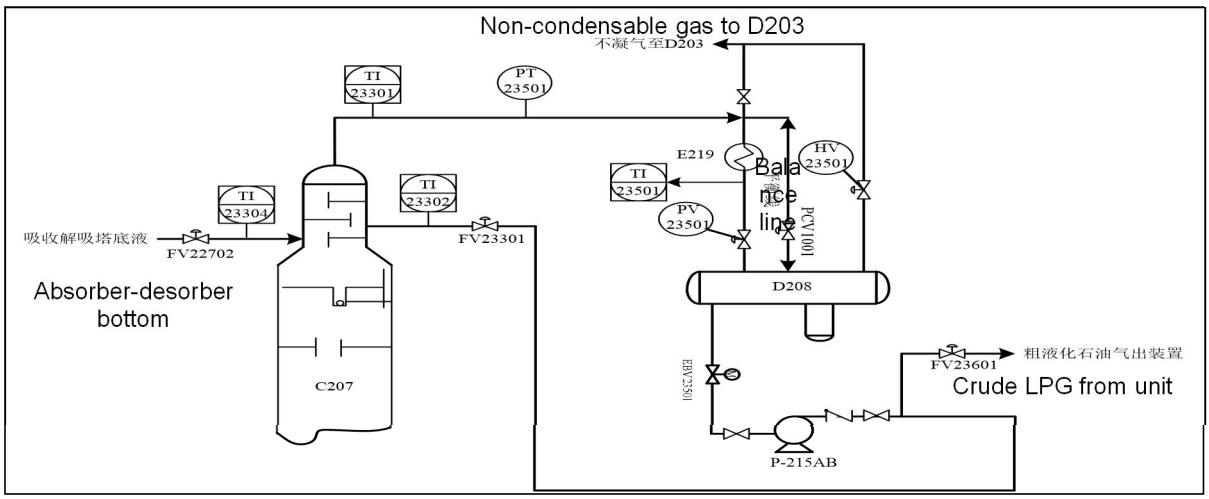
控制目标：正常操作中液化石油气冷后温度控制在设定值±5℃，保证液化气 C2 合格。

3)Relevant parameters: stabilizer overhead temperature TI-23301; stabilizer feed temperature TI-23304; stabilizer feed rate FV-22702; stabilizer bottom temperature TI-23307; coking LPG reflux rate FV-23301; coking LPG reflux temperature TI-23302.

相关参数：稳定塔顶温度 TI-23301；稳定塔进料温度 TI-23304；稳定塔进料量 FV-22702；稳定塔塔底温度 TI-23307；焦化液化气回流量 FV-23301；焦化液化气回流温度 TI-23302。

4)Control mode: it is controlled by the circulating water rate of stabilizer overhead condenser E-219 under normal circumstances.

控制方式：正常情况用稳定塔顶冷凝器 E-219 循环水量控制。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Opening of stabilizer pressure control valve 稳定塔压控阀开度	When the opening of pressure control valve increases, temperature drops; otherwise, it rises. 压控阀开度大，温度下降；反之温度上升。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
Post-cooling temperature of LPG drops 液化石油气冷后温度下降	High circulating water rate of stabilizer overhead condenser E-219; stabilizer overhead pressure control valve is fully opened due to fault. 稳定塔顶冷凝器 E-219 循环水流量大；稳定塔顶压控阀故障全开	Immediately find out causes, turn down circulating water inlet manual valve of stabilizer overhead condenser E-219, control with the manual valve upstream of control valve, and contact instrument personnel to deal with the control valve. 立即查找原因， 关小稳定塔顶冷凝器 E-219 循环水入口手阀，用控制阀上游手阀控制，联系仪表进行处理控制阀。
Post-cooling temperature of LPG rises sharply 液化石油气冷后温度急剧上升	Small circulating water flow rate of stabilizer overhead condenser E-219 稳定塔顶冷凝器 E-219 循环水流量小	Turn up the circulating water inlet manual valve of stabilizer overhead condenser E-219. 开大稳定塔顶冷凝器 E-219 循环水入口手阀。

Out-of-control handling: If post-cooling temperature of LPG exceeds the control range, switch to the fractionation stabilization post in emergency shutdown plan.

失控处理：若液化石油气冷后温度超出控制范围则转入紧急停工预案中的分馏稳定岗位部分。

(43) Control of content of C2 and lighter fractions in LPG

液化石油气碳二及以下组分含量的控制

1)Control range: ≦4V%.

控制范围：≦4V%。

2)Control objective: control the content of C2 and lighter fractions in LPG ≦3 in normal operation, so as to ensure LPG C2 is acceptable.

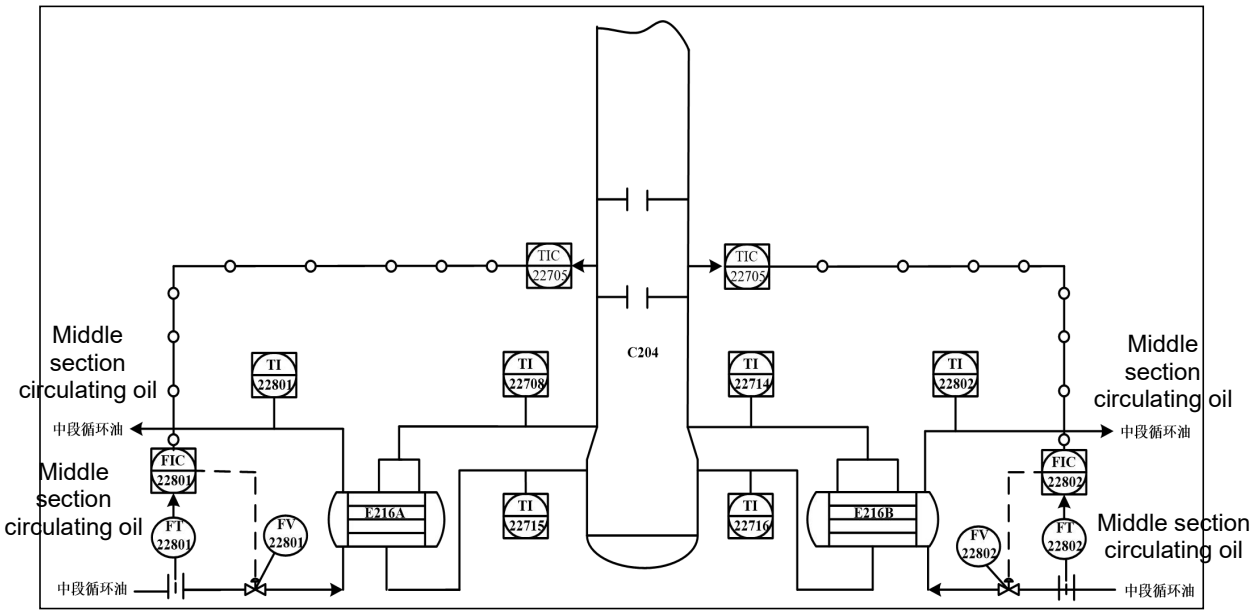
控制目标：正常操作中液化石油气碳二及以下组分含量控制在≦3，保证液化气 C2 合格。

3)Relevant parameters: E-216A gas phase return temperature TI-22708; E-216B gas phase return temperature TI-22714; stabilizer feed temperature TI-23304; desorber feed rates FV-22302 and FV-22401; middle section circulating oil temperature TI-22801 and TI-22802; middle section circulating oil flow rates FV-22801 and FV-22802.

相关参数：E-216A 气相返塔温度 TI-22708；E-216B 气相返塔温度 TI-22714；稳定塔进料温度 TI-23304；解吸塔进料量 FV-22302、FV-22401；中段循环油温度 TI-22801、TI-22802；中段循环油流量 FV-22801、FV-22802。

4)Control mode: the content of C2 and lighter fractions in LPG is controlled by adjusting middle section circulating oil flow rates FV-22801 and FV-22802 to control E-216AB gas phase return temperature, so as to control bottom temperature under normal circumstances.

控制方式：正常液化石油气碳二及以下组分含量控制是通过调解中段循环油流量 FV-22801、FV-22802 来控制 E-216AB 气相返塔温度，E-216AB 气相返塔温度由 FV-22801 与 FV-22802 进行控制，进而达到控制塔底温度的目的。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Opening of middle fractionator section circulating oil control valve 分馏中段循环油控制阀开度	When the opening of the control valve increases, overhead temperature rises; otherwise, it drops. 控制阀开度大，塔顶温度上升；反之塔顶温度下降。
Middle fractionator section draw-off temperature 分馏中段抽出温度	When middle section draw-off temperature rises, bottom temperature rises; otherwise, it drops. 中段抽出温度高，塔底温度高；反之下降。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
Content of C2 and lighter fractions in LPG decreases 液化石油气碳二及以下组分含量下降	Interruption of heat source at the bottom of absorber-desorber 吸收解吸塔底热源中断	Immediately find out causes and recover heat source. 立即查找原因，恢复热源。
Content of C2 and lighter fractions in LPG rises sharply 液化石油气碳二及以下组分含量急剧上升	Low or empty liquid level at the bottom of absorber-desorber 吸收解吸塔底液面低或空	Control the bottom level within the indicator range with the feed and discharge control valve of absorber-desorber. 通过吸收解吸塔进料和出料控制阀，将塔底液面控制在指标范围内。

Out-of-control handling: If the content of C2 and lighter fractions in LPG exceeds the control range, switch to the fractionation stabilization post in emergency shutdown plan.
失控处理：若液化石油气碳二及以下组分含量的控制超出控制范围则转入紧急停工预案中的分馏稳定岗位部分。

(44) Control of C5 and heavier fractions in LPG 液化石油气碳五及以上组分含量的控制

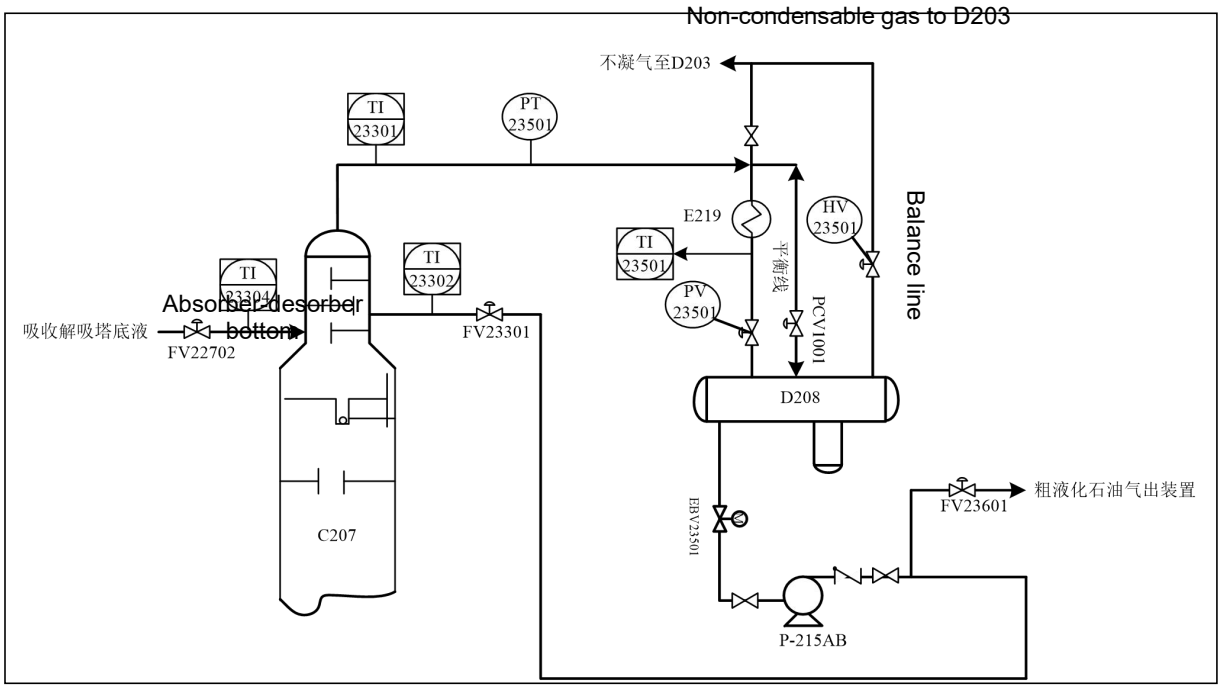
1)Control range: ≦1.9 控制范围：≦1.9。

2)Control objective: control the content of C5 and heavier fractions in LPG ≦2.2 in normal operation, so as to ensure LPG C5 is acceptable.
控制目标：正常操作中碳五及以上组分含量度控制在≦2.2，保证液化气 C5 合格。

3)Relevant parameters: stabilizer overhead temperature TI-23301; stabilizer feed temperature TI-23304; stabilizer feed rate FV-22702; stabilizer bottom temperature TI-23307; coking LPG reflux rate FV-23301; coking LPG reflux temperature TI-23302.
相关参数：稳定塔顶温度 TI-23301；稳定塔进料温度 TI-23304；稳定塔进料量 FV-22702；稳定塔塔底温度 TI-23307；焦化液化气回流量 FV-23301；焦化液化气回流温度 TI-23302。

4)Control mode: It is controlled by coking LPG reflux rate control valve FV-23301 under normal circumstances.

控制方式：正常情况用焦化液化气回流量控制阀 FV-23301 控制。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Opening of coking LPG reflux rate control valve 焦化液化气回流量控制阀开度	When the opening of the control valve increases, temperature drops; otherwise, it rises. 控制阀开度大，温度下降；反之温度上升。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
Content of C5 and heavier fractions in LPG decreases 液化石油气碳五及以上组分含量下降	Coking LPG reflux rate control valve is fully opened due to fault 焦化液化气回流量控制阀开度故障全开	Immediately find out causes, control with the manual valve upstream of control valve, and contact instrument personnel to deal with the control valve. 立即查找原因，用控制阀上游手阀控制，联系仪表进行处理控制阀。
Content of C5 and heavier fractions in	Coking LPG reflux rate control valve is fully opened	Immediately find out causes and switch to side-line manual valve of the

Phenomenon 现象	Cause 原因	Handling method 处理方法
LPG rises sharply 液化石油气碳五及以上组分含量急剧上升	due to fault 焦化液化气回流量控制阀开度故障全开	control valve to control. 即查找原因，改为控制阀副线手阀控制。

Out-of-control handling: If the content of C5 and heavier fractions in LPG exceeds the control range, switch to the fractionation stabilization post in emergency shutdown plan.

失控处理： 若液化石油气碳五及以上组分含量超出控制范围则转入紧急停工预案中的分馏稳定岗位部分。

(45) Control of C3 and heavier fractions in coking dry gas 焦化干气碳三及以上组分含量的控制

1)Control range: ≦3V%.

控制范围：≦3V%。

2)Control objective: control the content of C3 and heavier fractions in coking dry gas to be no more than 5V% in normal operation, so as to ensure C3 in coking dry gas is acceptable.

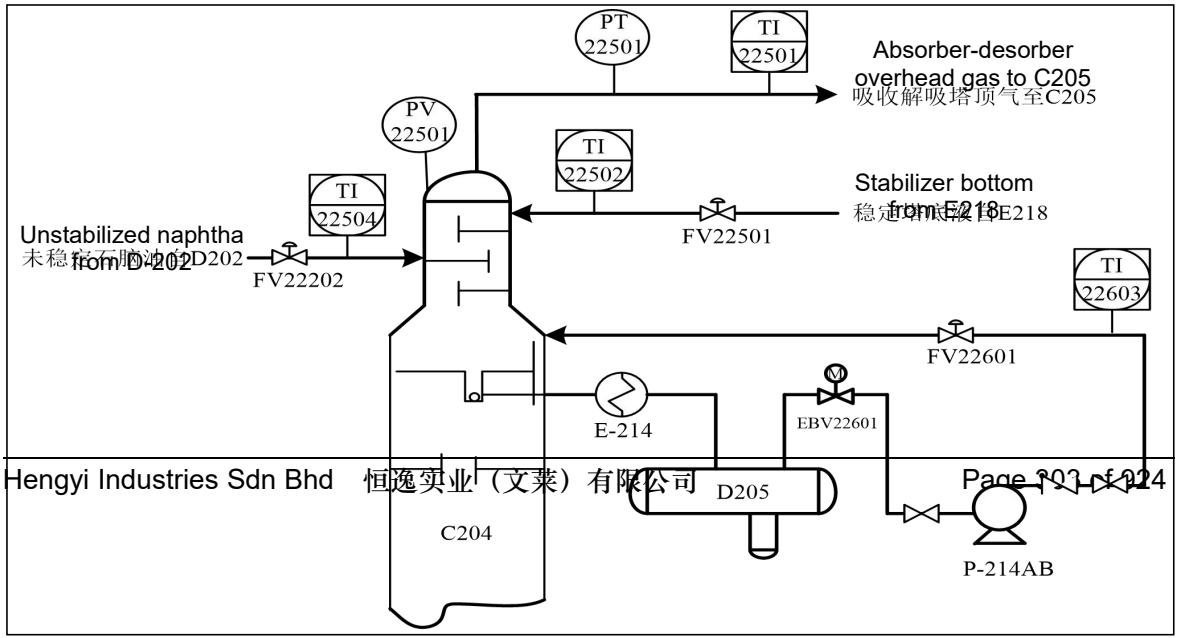
控制目标：正常操作中焦化干气碳三及以上组分含量控制在不大于 3V%，保证焦化干气 C3 合格。

3)Relevant parameters: absorber-desorber overhead temperature TI-22501; absorber-desorber overhead pressure PI-22501; absorber-desorber feed temperature TI-22504; absorber-desorber feed rate FV-22202; stabilizer bottom reflux temperature TI-22502; stabilizer bottom reflux rate FV-22501; middle section reflux temperature TI-22603 of absorber-desorber; middle section reflux rate FV-22601 of absorber-desorber.

相关参数：吸收解吸塔顶温度 TI-22501；吸收解吸塔顶压力 PI-22501；吸收解吸塔进料温度 TI-22504；吸收解吸塔进料量 FV-22202；稳定塔塔底液回流温度 TI-22502；稳定塔塔底液回流量 FV-22501；吸收解吸塔中段回流温度 TI-22603；吸收解吸塔中段回流量 FV-22601。

4)Control mode: Content of C3 and heavier fractions in coking dry gas is controlled by stabilizer bottom reflux rate control valve FV-22501 and absorber-desorber middle section reflux temperature under normal circumstances.

控制方式：正常焦化干气碳三及以上组分含量通过稳定塔塔底液回流量 FV-22501 和吸收解吸塔中段回流温度来控制。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Opening of stabilizer bottom reflux rate control valve 稳定塔塔底液回流量控制阀开度	When the opening of the control valve increases, overhead temperature drops; otherwise, it rises. 控制阀开度大，塔顶温度下降；反之塔顶温度上升。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
Content of C3 and heavier fractions in coking dry gas decreases 焦化干气碳三及以上组分含量下降	Stabilizer bottom reflux rate control valve is fully opened due to fault 稳定塔塔底液回流量控制阀故障全开	Immediately find out causes, switch to the manual valve upstream of stabilizer bottom reflux rate control valve to control, and contact instrument personnel to deal with the control valve. 立即查找原因，改用稳定塔塔底液回流量控制阀上游手阀控制；联系仪表进行处理。
Content of C3 and heavier fractions in coking dry gas rises sharply 焦化干气碳三及以上组分含量急剧上升	Stabilizer bottom reflux rate control valve is fully closed due to fault 稳定塔塔底液回流量控制阀故障全关	Immediately find out causes, switch to the side-line manual valve of stabilizer bottom reflux rate control valve to control, and contact instrument personnel to deal with the control valve. 立即查找原因，改用稳定塔塔底液回流量控制阀副线手阀控制；联系仪表进行处理。

Out-of-control handling: If the content of C3 and heavier fractions in coking dry gas exceeds the control range, switch to the fractionation stabilization post in emergency shutdown plan.
失控处理：若焦化干气碳三及以上组分含量超出控制范围则转入紧急停工预案中的分馏稳定岗位部分。

(46) Control of distillation temperature of naphtha 石脑油终馏点温度的控制

1)Control range: ≦220℃.
控制范围：≦220℃。

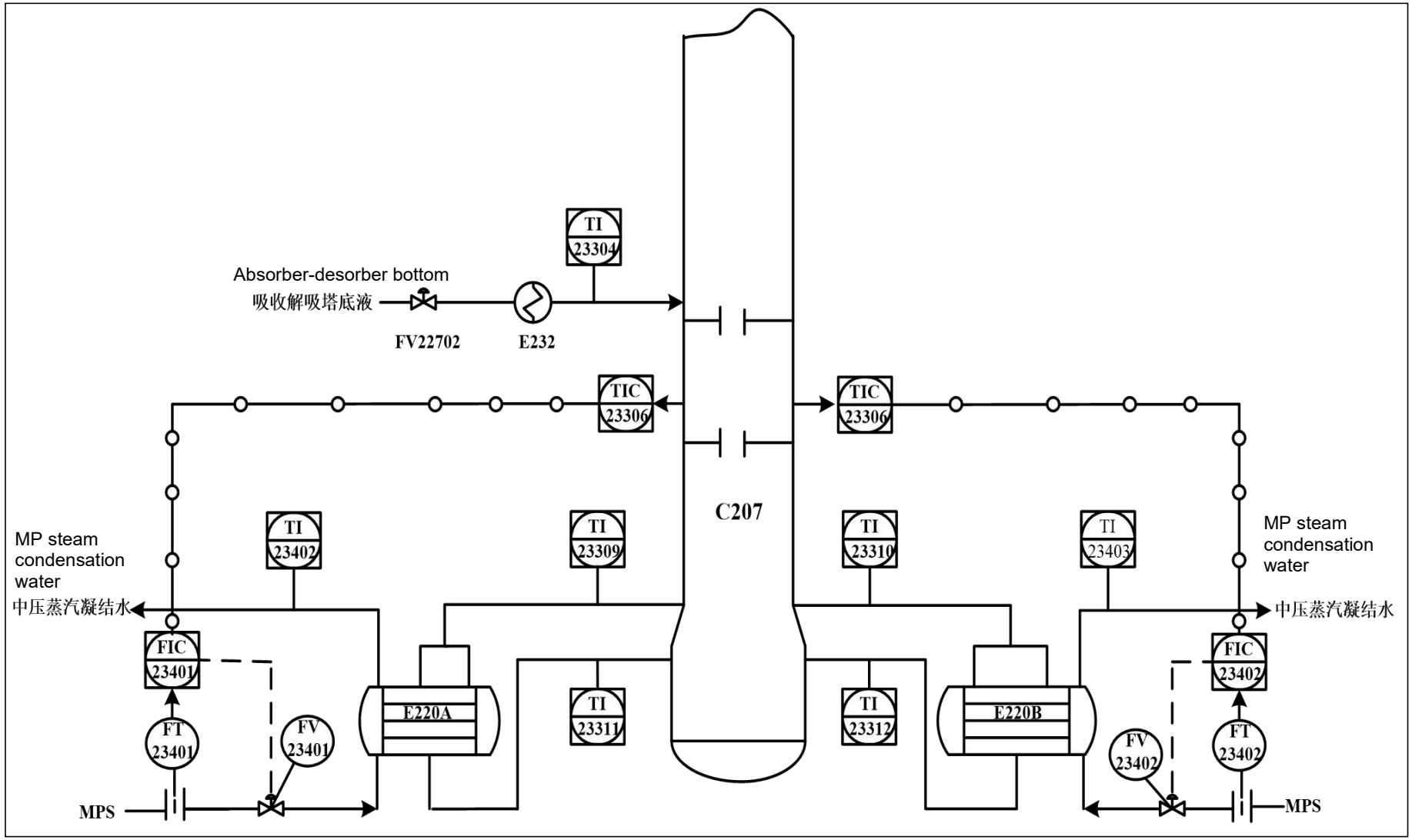
2)Control objective: the distillation temperature of naphtha ≦220℃.
控制目标：石脑油 95%馏出温度控制≦220℃。

3)Relevant parameters: stabilizer bottom temperature TIC-23306; stabilizer bottom pressure PI-23302; stabilizer overhead reflux rate FV-23301; reflux temperature TI-23302; E-220A return temperature TI-23309; E-220B return temperature TI-23310.

相关参数：稳定塔底温度 TIC-23306；稳定塔压力 PI-23302；稳定塔顶回流量 FV-23301；回流量温度 TI-23302； E-220A 返塔温度 TI-23309；E-220B 返塔温度 TI-23310。

4)Control mode: 95% distillation temperature of naphtha is controlled by adjusting MP steam flow rates FV-23401 and FV-23402 to control E-220AB gas phase return temperature, so as to control bottom temperature under normal circumstances.

控制方式：正常石脑油终馏点温度控制是通过调解中压蒸汽流量 FV-23401、FV-23402 来控制 E-220AB 气相返塔温度，E-220AB 气相返塔温度由 FV-23401 与 FV-23402 进行控制，进而达到控制塔底温度的目的。


TI
23304
Absorber-desorber bottom
吸收解吸塔底液
FV22702
E232
TIC
23306
TIC
23306
C207
MP steam
condensation
water
中压蒸汽凝结水
TI
23402
TI
23309
TI
23310
TI
23403
MP steam
condensation
water
中压蒸汽凝结水
FIC
23401
FIC
23402
E220A
E220B
TI
23311
TI
23312
FT
23401
FV
23401
FV
23402
FT
23402
MPS
MPS

5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
MP steam control valve 中压蒸汽控制阀	When MP steam circulating rate increases, 95% distillation temperature of naphtha rises; otherwise, it drops. 中压蒸汽循环量大，石脑油 95%馏出温度上升；反之下降。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
95% distillation temperature of naphtha exceeds limit 石脑油 95%馏出温度超标	Low or empty liquid level at stabilizer bottom 稳定塔底液面低或空	Control the bottom level within the indicator range with the feed and discharge control valve of stabilizer. 通过稳定塔进料和出料控制阀，将塔底液面控制在指标范围内。

Out-of-control handling: If distillation temperature of naphtha exceeds the control range, switch to the fractionation stabilization post in emergency shutdown plan.

失控处理：若石脑油终馏点温度超出控制范围则转入紧急停工预案中的分馏稳定岗位部分。

(47) Control of naphtha steam pressure 石脑油蒸汽压的控制

1)Control range: ≦65KPa.

控制范围：≦65KPa。

2)Control objective: the naphtha steam pressure ≦65KPa.

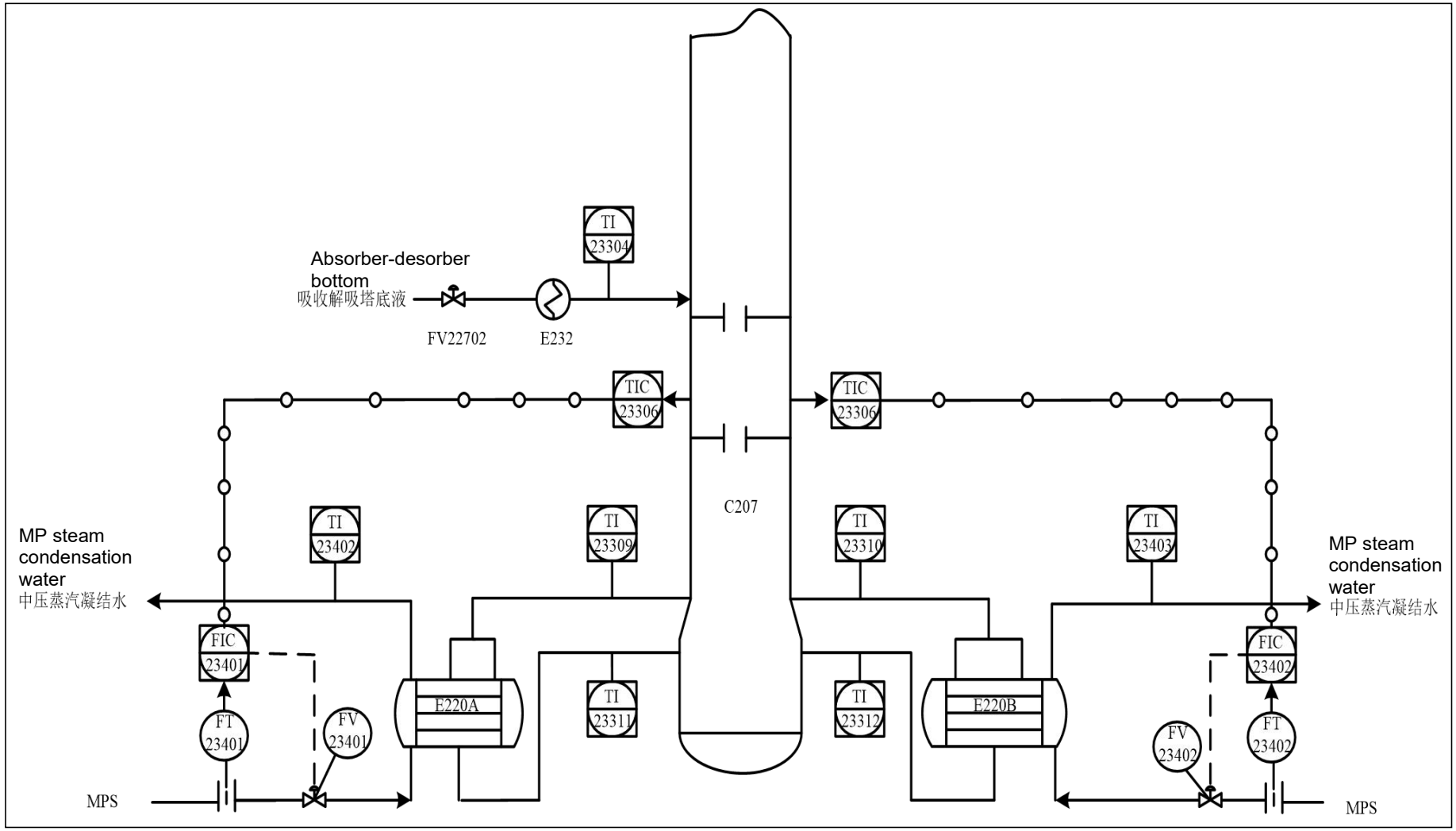
控制目标：石脑油蒸气压控制≦65KPa。

3)Relevant parameters: stabilizer bottom temperature TIC-23306; stabilizer bottom pressure PI-23302; stabilizer overhead reflux rate FV-23301; reflux temperature TI-23302.

相关参数：稳定塔底温度 TIC-23306；稳定塔压力 PI-23302；稳定塔顶回流量 FV-23301；回流量温度 TI-23302。

4)Control mode: naphtha steam pressure is controlled by adjusting stabilizer C-207 bottom temperature and appropriately adjusting stabilizer overhead reflux rate under normal circumstances. Generally, it is controlled by adjusting stabilizer bottom temperature, supplemented by adjusting reflux rate.

控制方式：正常石脑油蒸气压控制是通过调节稳定塔 C-207 塔底温度，同时适当调节稳定塔顶回流量来进行控制。一般以调节塔底温度为主，调节回流量为辅。


Absorber-desorber bottom
吸收解吸塔底液
FV22702
E232
TI 23304
TIC 23306
TIC 23306
C207
TI 23402
TI 23309
TI 23310
TI 23403
MP steam condensation water
中压蒸汽凝结水
MP steam condensation water
中压蒸汽凝结水
FIC 23401
FT 23401
FV 23401
E220A
TI 23311
TI 23312
E220B
FIC 23402
FT 23402
FV 23402
MPS
MPS

5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Stabilizer C-207 bottom temperature 稳定塔 C-207 塔底温度	When stabilizer bottom temperature rises, naphtha steam pressure drops. 稳定塔底温度高，石脑油蒸气压低。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
Naphtha steam pressure exceeds indicator 石脑油蒸气压超指标	MP steam is interrupted 中压蒸汽中断	Control stabilizer bottom temperature ≮ 140℃, increase naphtha delivery rate, maintain stabilizer bottom temperature, immediately find out causes and recover heat source as soon as possible. If it cannot be recovered, handle as per emergency shutdown. If stabilizer bottom temperature ＜ 140℃, naphtha delivery is prohibited. Contact instrument personnel to handle valve fault. 控制稳定塔底温度≮140℃，加大石脑油外送量，维持好稳定塔底温度；同时立即查找原因，尽快恢复热源。若无法及时恢复，按紧急停工处理；若稳定塔底温度＜140℃，严禁石脑油外送。同时联系仪表人员处理故障阀门。

Out-of-control handling: If naphtha steam pressure exceeds the control range, switch to the fractionation stabilization post in emergency shutdown plan.

失控处理：若石脑油蒸气压超出控制范围则转入紧急停工预案中的分馏稳定岗位部分。

(48) Control of 95% distillation temperature of diesel 柴油 95%馏出温度的控制

1)Control range: ≤345℃

控制范围：≤345℃。

2)Control objective: the 95% distillation temperature of diesel ≤345℃.

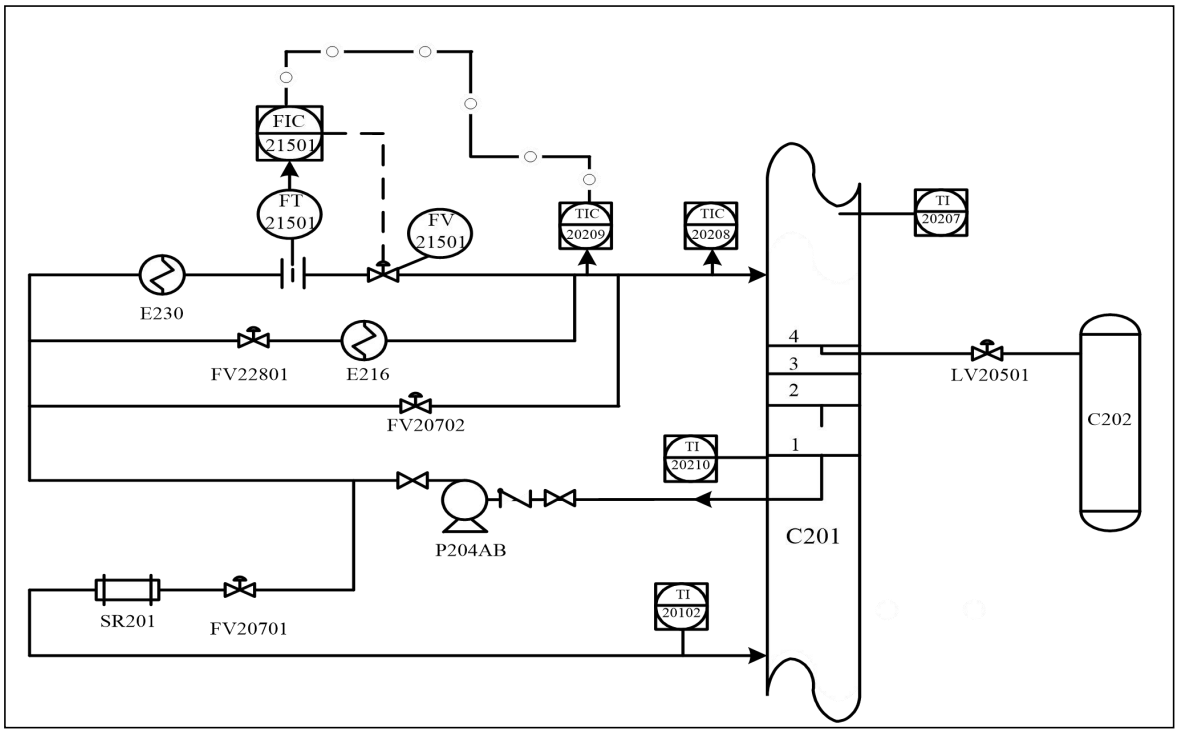
控制目标：柴油 95%馏出温度≤345℃。

3)Relevant parameters: middle section circulating oil return temperature TI-20208; middle section circulating oil return rate FV-21501.

相关参数：中段循环油返塔温度 TI-20208；中段循环油返塔流量 FV-21501。

4)Control mode: 95% distillation temperature of diesel is controlled by adjusting middle section circulating oil return temperature and middle section circulating oil return rate to control lower gas phase temperature of fractionator diesel draw-off nozzle. Generally, it is controlled by adjusting middle section circulating oil return temperature, supplemented by adjusting middle section circulating oil return rate.

控制方式： 柴油 95%点温度是通过中段循环油返塔温度及中段循环油返塔流量来控制分馏塔柴油抽出口下层气相温度来控制的。一般以调节中段循环油返塔温度为主，调节中段循环油返塔流量为辅。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Middle section circulating oil return temperature 中段循环油返塔温度	When the middle section circulating oil return temperature rises, the lower gas phase temperature of diesel draw-off nozzle and the 95% distillation temperature of diesel rise. 中段循环油返塔温度高，柴油抽出口下层气相温度高，柴油 95%点温度高。
Middle section circulating oil return rate 中段循环油返塔流量	When the middle section circulating oil return rate decreases, the lower gas phase temperature of diesel draw-off nozzle and the 95% distillation temperature of diesel rise. 中段循环油返塔流量小，柴油抽出口下层气相温度高，柴油 95%点温度高。

Influence factor 影响因素	Adjustment method 调整方法
Rich absorption oil return rate 富吸收油返塔流量	When the rich absorption oil return rate decreases, the lower gas phase temperature of diesel draw-off nozzle and the 95% distillation temperature of diesel rise. 富吸收油返塔流量小，柴油抽出口下层气相温度高，柴油 95%点温度高。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
High 95% distillation temperature of diesel 柴油 95%馏出温度高	Surge in the middle section of fractionator 分馏塔中部冲塔	Turn up HHKGO return control valve to improve HHKGO return rate and reduce fractionator bottom steam phase temperature. 开大 HHKGO 返塔控制阀，提高 HHKGO 上返塔量，降低分馏塔底汽相温度。
Low 95% distillation temperature of diesel 柴油 95%馏出温度低	Fractionator overhead liquid phase reflux rate is too large 分馏塔顶部液相回流量过大	Turn down fractionator overhead reflux rate to reduce fractionator overhead liquid phase reflux rate. 关小分馏塔顶回流量，降低分馏塔顶部液相回流量。
	The temperature of middle and lower parts of fractionator is too low 分馏塔中下部温度过低	Turn down HHKGO return control valve to reduce HHKGO return rate, improve fractionator bottom steam phase temperature and improve temperature of middle and lower parts of fractionator. 关小 HHKGO 返塔控制阀，降低 HHKGO 返塔流量，提高分馏塔底汽相温度，提高分馏塔中下部温度。

Out-of-control handling: If 95% distillation temperature of diesel exceeds the control range, switch to the fractionation stabilization post in emergency shutdown plan.
失控处理：若柴油 95%馏出温度超出控制范围则转入紧急停工预案中的分馏稳定岗位部分。

(49) Control of diesel flash point 柴油闪点的控制

1)Control range: diesel flash point (closed-cup) ≥57℃.

控制范围：柴油闪点（闭口）≥57℃。

2)Control objective: diesel flash point (closed-cup) ≥57℃.

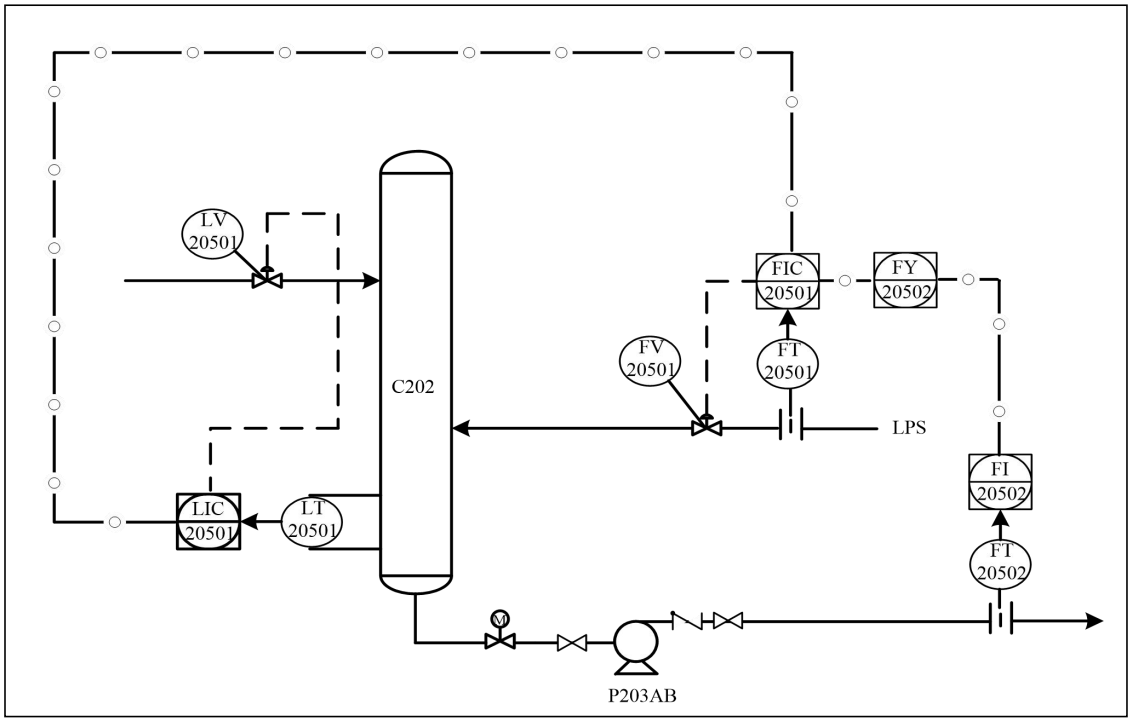
控制目标：柴油闪点（闭口）≥57℃。

3)Relevant parameters: diesel stripper liquid level LIC-20501; diesel stripper stripping steam rate FV-20501; middle part temperature TI-20207.

相关参数：柴油汽提塔液位 LIC-20501；柴油汽提塔汽提蒸汽量 FV-20501；中部温度 TI-20207。

4)Control mode: diesel flash point is controlled by adjusting the opening of diesel stripper stripping steam rate FV-20501.

控制方式：柴油闪点控制是通过柴油汽提塔汽提蒸汽量 FV-20501 的开度来控制的。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Temperature of middle part of fractionator 分馏塔中部温度	When the temperature of middle part rises, diesel flash point rises; otherwise, it drops. 中部温度高，柴油闪点高；反之，闪点低。
Stripping steam of diesel stripper 柴油汽提塔汽提蒸汽	When the stripping steam rate of diesel stripper increases, diesel flash point rises; otherwise, it drops. 柴油汽提塔汽提蒸汽量大，柴油闪点上升，反之下降。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
Low diesel flash point 柴油闪点低	Liquid level of diesel stripper is too high 柴油汽提塔液面过高	Turn up diesel delivery control valve to reduce the liquid level of diesel stripper to 40~60%. 开大柴油外送控制阀，将柴油汽提塔液面降低至 40～60%。
Low diesel flash point 柴油闪点低	Liquid level of diesel stripper is too low 柴油汽提塔液面过低	Turn down diesel delivery control valve to improve the liquid level of diesel stripper to 40~60%. 关小柴油外送控制阀，将柴油汽提塔液面提高至 40～60%。

Out-of-control handling: If diesel flash point exceeds the control range, switch to the fractionation stabilization post in emergency shutdown plan.

失控处理：若柴油闪点超指标超出控制范围则转入紧急停工预案中的分馏稳定岗位部分。

(50)Control of 95% distillation temperature of light wax oil 轻蜡油 95%馏出温度的控制

1)Control range: ＞338℃~≤440℃

控制范围：＞338℃~≤440℃。

2)Control objective: the 95% distillation temperature of light wax oil ≤440℃ (executed as per production requirements).

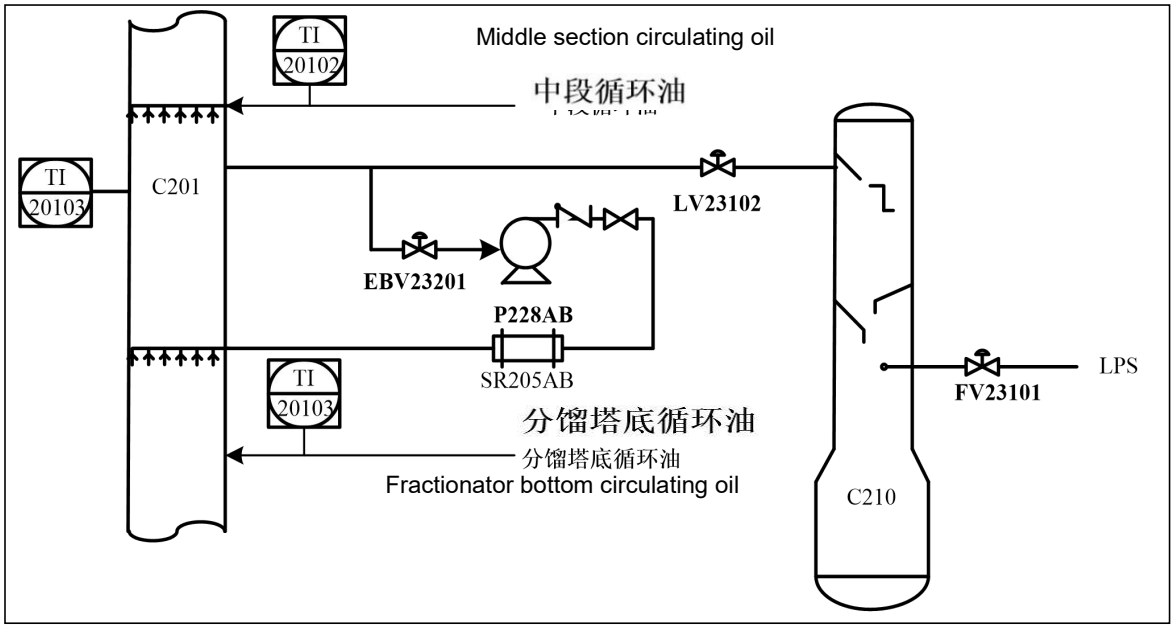
控制目标：轻蜡油 95%馏出温度＞338℃~≤440℃（根据生产要求执行）。

3)Relevant parameters: fractionator bottom circulating oil return temperature TI-20104; light wax oil return rate FV-23201.

相关参数：分馏塔底循环油返塔温度 TI-20104；轻蜡油返塔流量 FV-23201。

4)Control mode: 95% distillation temperature of light wax oil is controlled by fractionator bottom circulating oil and middle section circulating oil return temperature and light wax return rate FV-23201. Generally, it is controlled by adjusting fractionator bottom circulating oil and middle section circulating oil return temperature, supplemented by adjusting light wax return rate.

控制方式：轻蜡油 95％点温度是通过分馏塔底循环油以及中段循环油返塔温度及轻蜡油返塔流量 FV-23201 来控制的。一般以调节分馏塔底循环油以及中段循环油返塔温度为主，调节轻蜡油返塔流量为辅。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Middle section circulating oil return temperature 中段循环油返塔温度	When the middle section circulating oil return temperature rises, the lower gas phase temperature of light wax oil draw-off nozzle and the 95% distillation temperature of light wax oil rise. 中段循环油返塔温度高，轻蜡油抽出口下层气相温度高，轻蜡油 95%点温度高。
Middle section circulating oil return rate 中段循环油返塔流量	When the middle section circulating oil return rate decreases, the lower gas phase temperature of light wax oil draw-off nozzle and the 95% distillation temperature of light wax oil rise. 中段循环油返塔流量小，轻蜡油抽出口下层气相温度高，轻蜡油 95%点温度高。
Fractionator bottom circulating oil return temperature 分馏塔底循环油返塔温度	When the fractionator bottom circulating oil return temperature rises, the lower gas phase temperature of light wax oil draw-off nozzle and the 95% distillation temperature of light wax oil rise. 分馏塔底循环油返塔温度高，轻蜡油抽出口下层气相温度高，轻蜡油 95%点温度高。
Fractionator bottom circulating oil return rate 分馏塔底循环油返塔流量	When the fractionator bottom circulating oil return rate decreases, the lower gas phase temperature of light wax oil draw-off nozzle and the 95% distillation temperature of light wax oil rise. 分馏塔底循环油返塔流量小，轻蜡油抽出口下层气相温度高，轻蜡油 95%点温度高。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
High 95% distillation temperature of light wax oil 轻蜡油 95%馏出温度高	Surge in the middle section of fractionator 分馏塔中部冲塔	Turn up middle section circulating oil return control valve and fractionator bottom circulating oil return control valve to improve middle section circulating oil return rate and reduce fractionator bottom gas phase temperature. 开大中段循环油返塔控制阀，开大分馏塔底循环油返塔控制阀，提高中段循环油上返塔量，降低分馏塔底汽相温度。
Low 95% distillation temperature of light wax oil 轻蜡油 95%馏出温度低	Fractionator overhead liquid phase reflux rate is too large 分馏塔顶部液相回流量过大	Turn down fractionator overhead reflux rate to reduce fractionator overhead liquid phase reflux rate. 关小分馏塔顶回流量，降低分馏塔顶部液相回流量。
	The temperature of middle and lower parts of fractionator is too low 分馏塔中下部温度过低	Turn down fractionator bottom circulating oil return control valve to reduce fractionator bottom circulating oil return rate, improve fractionator bottom gas phase temperature and improve temperature of middle and lower parts of fractionator. 关小分馏塔底循环油返塔控制阀，降低分馏塔底循环油返塔流量，提高分馏塔底汽相温度，提高分馏塔中下部温度。

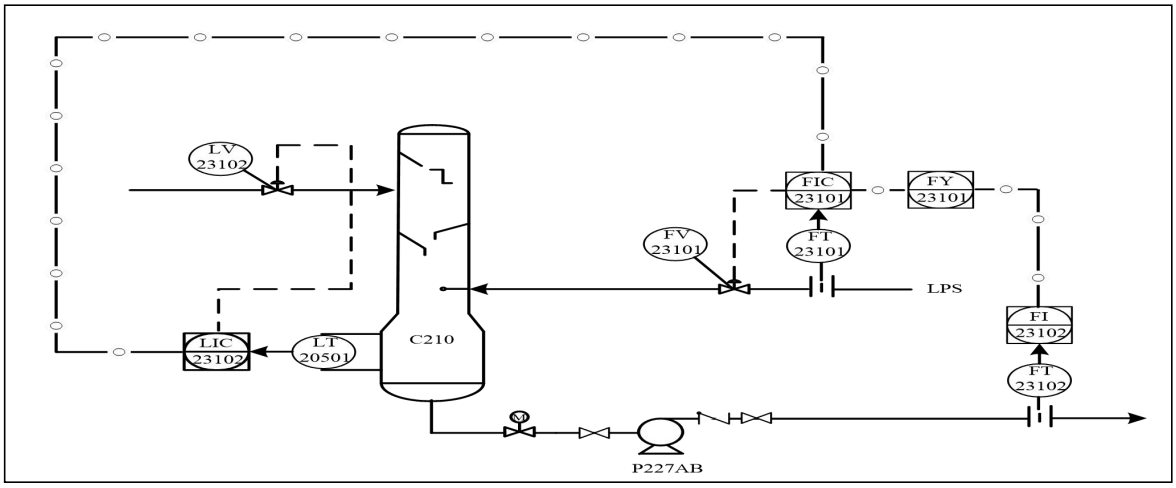
Out-of-control handling: If 95% distillation temperature of light wax oil exceeds the control range, switch to the fractionation stabilization post in emergency shutdown plan.
失控处理：若轻蜡油 95%馏出温度超出控制范围则转入紧急停工预案中的分馏稳定岗位部分。

(51)Control of flash point of light wax oil 轻蜡油闪点的控制
1)Control range: flash point of light wax oil (closed-cup) ≥57℃.
控制范围：轻蜡油闪点（闭口）≥57℃。
2)Control objective: flash point of light wax oil (closed-cup) ≥57℃.
控制目标：轻蜡油闪点（闭口）≥57℃。
3)Relevant parameters: light wax oil stripper liquid level LIC-23102; light wax oil stripper stripping steam rate FV-23101; middle part temperature TI-20103.

相关参数：轻蜡油汽提塔液位 LIC-23102；轻蜡油汽提塔汽提蒸汽量 FV-23101；中部温度 TI-20103。

4)Control mode: flash point of light wax oil is controlled by adjusting the opening of light wax oil stripper stripping steam rate FV-23101.

控制方式：轻蜡油闪点控制是通过轻蜡油汽提塔汽提蒸汽量 FV-23101 的开度来控制的。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Temperature of middle part of fractionator 分馏塔中部温度	When the temperature of middle part rises, flash point rises; otherwise, it drops. 中部温度高，闪点高；反之，闪点低。
Stripping steam of light wax oil stripper 轻蜡油汽提塔汽提蒸汽	When the stripping steam rate of light wax oil stripper increases, flash point rises; otherwise, it drops. 轻蜡油汽提塔汽提蒸汽量大，闪点上升，反之下降。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
Flash point of light wax oil is too low 轻蜡油闪点低	Liquid level of light wax oil stripper is too high 轻蜡油汽提塔液面过高	Turn up light wax oil delivery control valve to reduce the liquid level of light wax oil stripper to 40~60%. 开大轻蜡油外送控制阀，将轻蜡油汽提塔液面降低至 40～60%。
Flash point of light wax oil is too low	Liquid level of light wax oil stripper is too low 轻蜡油汽提塔液面过低	Turn down light wax oil delivery control valve to improve the liquid level of light wax oil stripper to 40~60%.

轻蜡油闪点低		关小轻蜡油外送控制阀，将轻蜡油汽提塔液面提高至 40～60%。

Out-of-control handling: If flash point of light wax oil exceeds the control range, switch to the fractionation stabilization post in emergency shutdown plan.

失控处理：若轻蜡油闪点超出控制范围则转入紧急停工预案中的分馏稳定岗位部分。

(52) Control of final boiling point of heavy wax oil 重蜡油终馏点的控制

1)Control range: ≤510℃.

控制范围：≤510℃。

2)Control objective: the final boiling point of heavy wax oil ≤510℃ (executed as per production requirements).

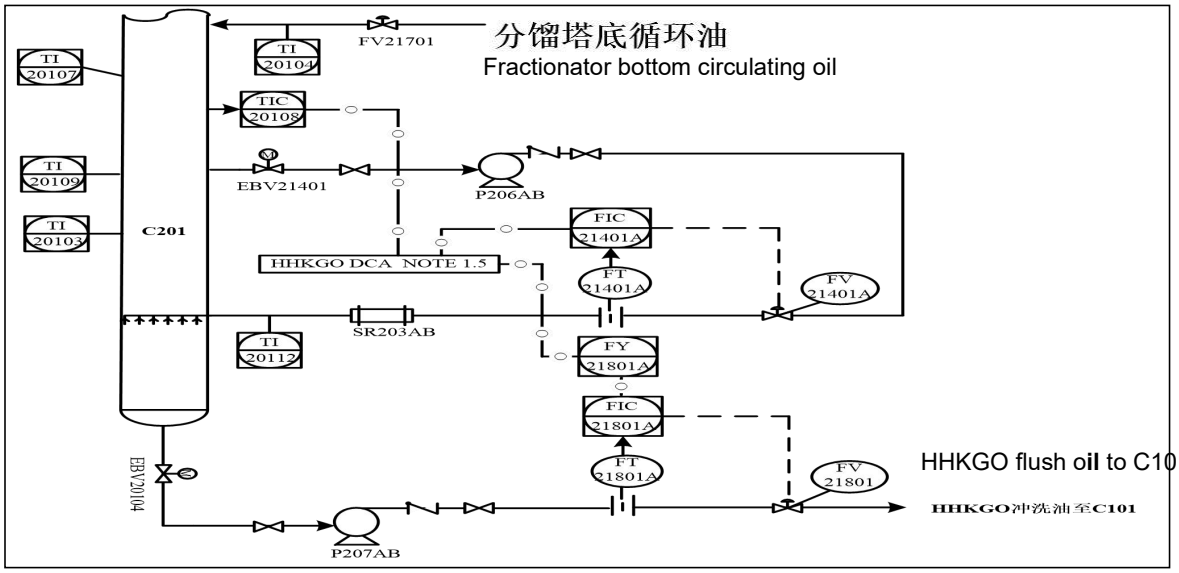
控制目标：重蜡油终馏点≤510℃（根据生产要求执行）。

3)Relevant parameters: fractionator bottom circulating oil return temperature TI-20104; BPA flush oil return rate FV-21401A; BPA flush oil return temperature TI-20112; fractionator bottom circulating oil return rate FV-21701.

相关参数：分馏塔底循环油返塔温度 TI-20104；BPA 冲洗油返塔流量 FV-21401A；BPA 冲洗油返塔温度 TI-20112；分馏塔底循环油返塔流量 FV-21701。

4)Control mode: final boiling point of heavy wax oil is controlled by adjusting BPA flush oil return temperature and fractionator bottom circulating oil return temperature to control lower gas phase temperature of fractionator heavy wax oil draw-off nozzle. Generally, it is controlled by adjusting BPA flush oil return temperature and fractionator bottom circulating oil return temperature, supplemented by adjusting fractionator bottom circulating oil return rate and BPA flush oil return rate.

控制方式：重蜡油终馏点温度是通过 BPA 冲洗油返塔温度及分馏塔底循环油返塔温度来控制分馏塔重蜡油抽出口下层气相温度的。一般以调节 BPA 冲洗油返塔温度及分馏塔底循环油返塔温度为主，调节分馏塔底循环油返塔流量和 BPA 冲洗油返塔流量为辅。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Fractionator bottom circulating oil return temperature 分馏塔底循环油返塔温度	When the return temperature rises, the lower gas phase temperature of heavy wax oil draw-off nozzle and the final boiling point temperature of heavy wax oil rise. 返塔温度高，重蜡油抽出口下层气相温度高，重蜡油终馏点温度高。
Fractionator bottom circulating oil return rate 分馏塔底循环油返塔流量	When the circulating oil return rate decreases, the lower gas phase temperature of heavy wax oil draw-off nozzle and the final boiling point temperature of heavy wax oil rise. 循环油返塔流量小，重蜡油抽出口下层气相温度高，重蜡油终馏点温度高。
BPA flush oil return temperature BPA 冲洗油返塔温度	When the return temperature rises, the lower gas phase temperature of heavy wax oil draw-off nozzle and the final boiling point temperature of heavy wax oil rise. 返塔温度高，重蜡油抽出口下层气相温度高，重蜡油终馏点温度高
BPA flush oil return rate BPA 冲洗油返塔流量	When the return rate decreases, the lower gas phase temperature of heavy wax oil draw-off nozzle and the final boiling point temperature of heavy wax oil rise. 返塔流量小，重蜡油抽出口下层气相温度高，重蜡油终馏点温度高。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
High final boiling point temperature of heavy wax oil 重蜡油终馏点温度高	Surge in the middle section of fractionator 分馏塔中部冲塔	Turn up HHKGO return control valve to improve HHKGO return rate and reduce fractionator bottom steam phase temperature. 开大 HHKGO 返塔控制阀，提高 HHKGO 上返塔量，降低分馏塔底汽相温度。
Low final boiling point temperature of heavy wax oil 重蜡油终馏点	Fractionator bottom circulating oil reflux rate is too large 分馏塔底循环油回流量过大	Turn down fractionator bottom circulating oil reflux rate to reduce fractionator bottom circulating oil liquid phase reflux rate. 关小分馏塔底循环油回流量，降低分馏塔底循环油液相回流量。
	The temperature of middle	Turn down HHKGO return control valve to

温度低	and lower parts of fractionator is too low 分馏塔中下部温度过低	reduce HHKGO return rate, improve fractionator bottom steam phase temperature and improve temperature of middle and lower parts of fractionator. 关小 HHKGO 返塔控制阀，降低 HHKGO 返塔流量，提高分馏塔底汽相温度，提高分馏塔中下部温度。

Out-of-control handling: If final boiling point temperature of heavy wax oil exceeds the control range, switch to the fractionation post in emergency shutdown plan.
失控处理：若重蜡油终馏点温度超出控制范围则转入紧急停工预案中的分馏岗位部分。

(53) DCA control of fractionator 分馏塔 DCA 控制

1)Control range: Control fractionator liquid level LI-20103: 30%~70%; fractionator HKGO oil collecting tank gas phase temperature TIC-20108: ≤399℃ by circulating heat recovery of HKGO. Meanwhile, to prevent coking of scrubber top flushing grid and fractionator bottom flushing grid, it is required to control scrubber top grid flush oil rate FIC-21808A: ≥24m³/h; fractionator bottom grid flush oil rate FIC-21401A: ≥24m³/h; fractionator herringbone baffle flush oil rate FIC-21701: ≥144m³/h.
控制范围：通过 HKGO 的循环取热，控制分馏塔液位 LI-20103：30%～70%；分馏塔 HKGO 集油箱上的气相温度 TIC-20108：≤399℃。同时为了防止洗涤塔顶部、分馏塔底部冲洗格栅结焦，控制洗涤塔顶格栅冲洗油量 FIC-21808A：≥24m³/h ；分馏塔底部格栅冲洗油量 FIC-21401A：≥24m³/h；分馏塔人字挡板冲洗油量 FIC-21701：≥144m³/h。

2)Control objective: control various parameters within the range above in normal operation based on specific control values in the production scheme, control fractionator liquid level LI-20103 no greater than the set value ±5% (40%~60%); fractionator HKGO oil collecting tank gas phase temperature TIC-20108 no greater than the set value ±5℃ (380℃~390℃); scrubber top grid flush oil rate FIC-21808A no greater than the set value ±10m³/h (30m³/h~50m³/h); fractionator bottom grid flush oil rate FIC-21401A no greater than the set value ±10m³/h (30m³/h~50m³/h); fractionator herringbone baffle flush oil rate FIC-21701 no greater than the set value ±25m³/h (150m³/h～200m³/h).
控制目标：正常操作中各参数控制在上述范围内，具体控制数值根据生产方案给定，控制分馏塔液位 LI-20103 不超过设定值±5%（40%～60%）；分馏塔 HKGO 集油箱上的气相温度 TIC-20108 不超过设定值±5℃（380℃～390℃）；控制洗涤塔顶格栅冲洗油量 FIC-21808A 不超过设定值±10m³/h（30m³/h～50m³/h）；分馏塔底部格栅冲洗油量 FIC-21401A 不超过设定值±10m³/h（30m³/h～50m³/h）；分馏塔人字挡板冲洗油量 FIC-21701 不超过设定值±25m³/h（150m³/h～200m³/h）。

3)Control mode: 控制方式：

A. Control of fractionator HKGO oil collecting tank gas phase temperature TIC-20108.

分馏塔 HKGO 集油箱上的气相温度 TIC-20108 的控制。

a. Fractionator HKGO oil collecting tank gas phase temperature TIC-20108 is controlled by adjusting heavy wax oil post-cooling temperature TIC-21603 and heavy wax oil post-cooling return rate FIC-21701A. (Cascade control of TIC-21603 and TIC-20108; split-ranging control of TIC-21603 and FIC-21701), the heat recovery load of E-209 can be figured out with equation and be displayed on DCS as reference data.

通过重蜡油冷却后温度 TIC-21603 和重蜡油冷却后返塔流量 FIC-21701A 的调整达到控制分馏塔 HKGO 集油箱上的气相温度 TIC-20108 的目的。(TIC-21603 与 TIC-20108 串级控制；TIC-21603 与 FIC-21701 分程控制)，E-209 的取热负荷可以通过公式计算出来，作为参考数据显示在 DCS 上。

b. When the actual temperature of TIC-20108 exceeds the set value, DCA will turn up TIC-21603 control valve first; when TIC-21603 control valve is fully opened, DCA will turn up FIC-21701 control valve; when FIC-21701 flow rate reaches 200m³/h, it will be maintained at 200m³/h rather than being turned up.

当 TIC-20108 实际温度超过设定值后，DCA 首先选择开大 TIC-21603 控制阀，当 TIC-21603 控制阀全开后，DCA 开始选择开大 FIC-21701 控制阀，当 FIC-21701 流量达到 200m³/h 后，将不再开大 FIC-21701 控制阀，保持 FIC-21701 流量为 200m³/h。

c. An interlocking relationship is formed between TIC-20108 and FIC-21401A. When the actual temperature of TIC-20108 exceeds 399℃, DCA will turn up FIC-21401A control valve; when FIC-21401A flow rate exceeds 50m³/h, it will be maintained at 50m³/h rather than being turned up.

TIC-20108 与 FIC-21401A 形成联锁关系，当 TIC-20108 实际温度超过 399℃后，DCA 开始选择开大 FIC-21401A 控制阀，当 FIC-21401A 流量超过 50m³/h 后，FIC-21401A 控制阀将不再开大，保持 FIC-21401A 流量维持在 50m³/h。

d. When the actual temperature of TIC-20108 drops to 399℃, the interlocking relationship between TIC-20108 and FIC-21401A will be released, DCA will switch to TIC-21603 and FIC-21701 control valves to control TIC-20108.

当 TIC-20108 的实际温度降回到 399℃后，TIC-20108 与 FIC-21401A 联锁关系解除，DCA 返回选择 TIC-20108 由 TIC-21603 控制阀和 FIC-21701 控制阀进行控制。

e. When the actual temperature of TIC-20108 is lower than the set value, DCA will turn down FIC-21701 control valve first; when FIC-21701 flow rate reaches 150m³/h, FIC-21701 control valve will no longer be turned down, instead, DCA will turn down TIC-21603 control valve gradually until it is fully closed, and FIC-21701 will be maintained at the flow rate of 150m³/h in this state.

当 TIC-20108 的实际温度低于设定值后，DCA 首先选择关小 FIC-21701 控制阀，当 FIC-21701 流量达到 150m³/h 后，将不再关小 FIC-21701 控制阀，DCA 开始选择逐渐关小 TIC-21603 控制阀，直至全关 TIC-21603 控制阀，在此状态下 FIC-21701 保持 150m³/h 的流量。

B. Control of fractionator liquid level LI-20103 分馏塔液位 LI-20103 的控制。

a. Fractionator liquid level LI-20103 is controlled by heavy wax oil fractionator bottom grid return flush oil rate FIC-21401A and scrubber top grid return flush oil rate FIC-21801A. (Cascade control of LI-20103 and FIC-221401A; split-ranging control of FIC-21401A and FIC-21801A).

分馏塔液位LI-20103由重蜡油返分馏塔底部格栅冲洗油量FIC-21401A和返洗涤塔顶部格栅冲洗油量 FIC-21801A 进行控制。（LI-20103 与 FIC-221401A 串级控制；FIC-21401A 与 FIC-21801A 分程控制）。

b. When the actual liquid level of LI-20103 exceeds the set value, DCA will turn down FIC-21401A control valve; when the actual flow rate of FIC-21401A reaches 30 m³/h, DCA will maintain FIC-21401A flow rate at 30 m³/h, and turn up FIC-21801A control valve gradually to control fractionator liquid level; when FIC-21801A flow rate reaches 50 m³/h, it will be maintained by DCA rather than being turned up.

当 LI-20103 实际液位超过设定值后，DCA 选择关小 FIC-21401A 控制阀，当 FIC-21401A 实际流量已经达到 30 m³/h 后，DCA 保持 FIC-21401A 流量维持在 30 m³/h；DCA 开始选择逐渐开大 FIC-21801A 控制阀控制分馏塔液位，当 FIC-21801A 流量达到 50 m³/h 后，DCA 不再开大 FIC-21801A 控制阀，保持 FIC-21801A 流量维持在 50m³/h。

c. When the actual liquid level of LI-20103 is lower than the set value, DCA will turn down FIC-21801A control valve; when the actual flow rate of FIC-21801A reaches 30 m³/h, DCA will maintain FIC-21801A flow rate at 30 m³/h, and turn up FIC-21401A control valve gradually to control fractionator liquid level; when FIC-21401A flow rate reaches 50 m³/h, it will be maintained by DCA rather than being turned up.

当 LI-20103 实际液位低于设定值后，DCA 选择关小 FIC-21801A 控制阀，当 FIC-21801A 实际流量已经达到 30 m³/h 后；DCA 保持 FIC-21801A 流量维持在 30 m³/h， DCA 开始选择逐渐开大 FIC-21401A 控制阀控制分馏塔液位，当 FIC-21401A 流量达到 50 m³/h 后，DCA 不再开大 FIC-21401A 控制阀，保持 FIC-21401A 流量维持在 50m³/h。

C. Other control relationships of DCA.

DCA 的其他控制关系。

a. In the case of conflict between FIC-21401A selection by LI-20103 and by TIC-20108, priority shall be given to the selection of TIC-20108.

当 LI-20103 与 TIC-20108 选择 FIC-21401A 出现冲突时，TIC-20108 选择优先。

b. When PS-105 is started, DCA control will be released automatically, and various control valves will act as per the requirements of PS-105.

当 PS-105 启动后，DCA 控制自动解除，各控制阀根据 PS-105 的要求进行动作。

c. When FIC-21401B flow rate is less than 24 m³/h, RBV-20103 interlocking will be executed.

当 FIC-21401B 流量低于 24 m³/h，执行 RBV-20103 联锁。

d. When FIC-21801B flow rate is less than 24 m³/h, RBV-10401 interlocking will be executed.

当 FIC-21801B 流量低于 24 m³/h，执行 RBV-10401 联锁。

e. The ranges and interlocking data of FIC-21401, FIC-21801, TIC-20108 and FIC-21701 can be adjusted by DCS.

FIC-21401、FIC-21801、TIC-20108、FIC-21701 的上下范围及联锁数据可通过 DCS 调整。

4)Service condition of DCA.

DCA 的投用条件。

a. Stable production state of unit.

装置平稳生产状态。

b. Automatic state of FIC-21701.

FIC-21701 自动状态。

c. Cascade state of FIC-21401A and LI-20103.

FIC-21401A 与 LI-20103 串级状态。

d. Cascade state of TIC-20108 and TIC-21601.

TIC-20108 与 TIC-21601 串级状态。

e. Automatic state of FIC-21801A.

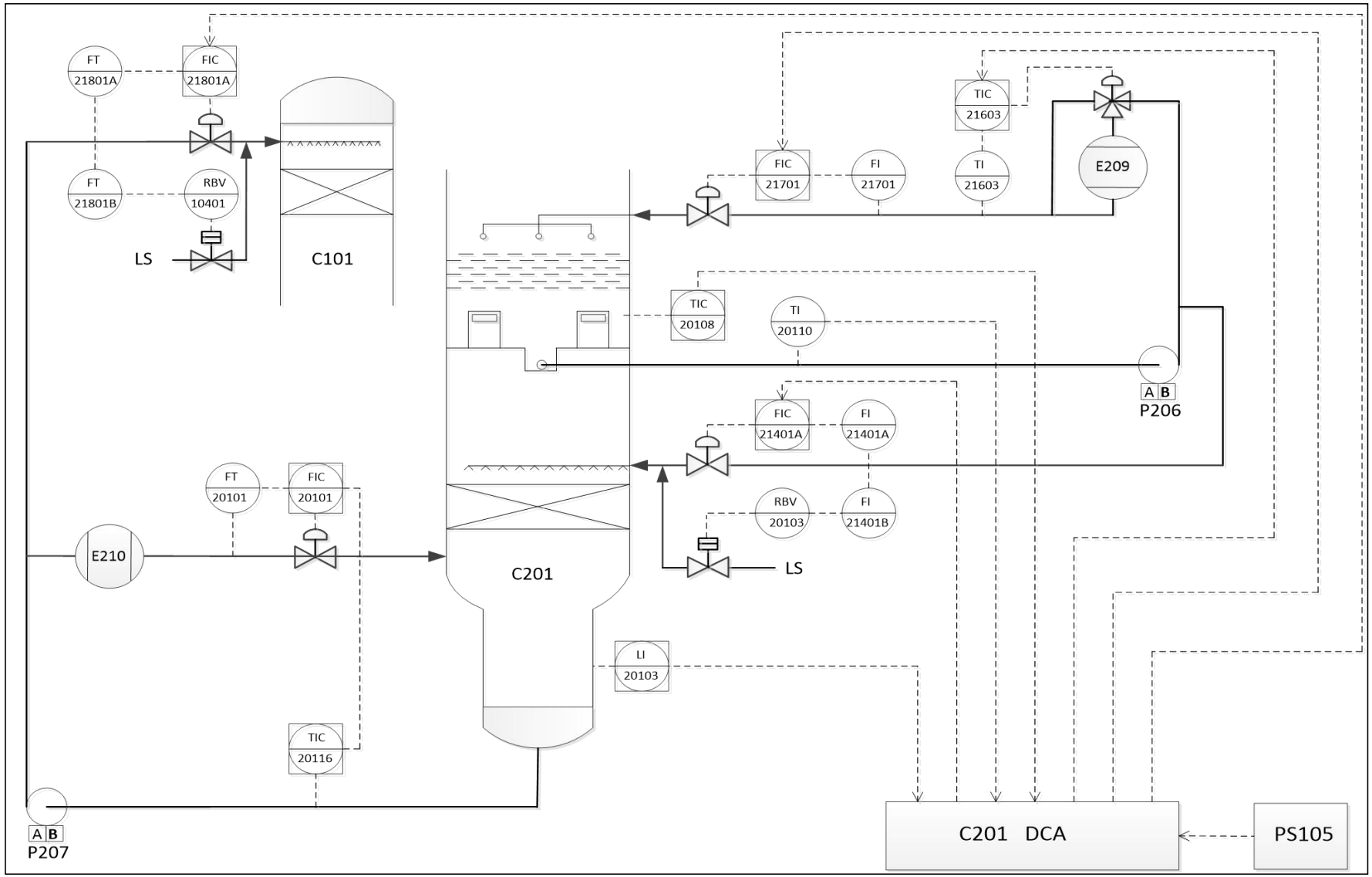
FIC-21801A 自动状态。

f. Service state of PS-105.

PS-105 投用状态。

g. Service command given by DCA controller.

DCA 控制器给定投用命令。


FT
21801A
FIC
21801A
FT
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RBV
10401
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E209
TIC
20108
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20110
A B
P206
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21401B
LS
C201
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P207
C201 DCA
PS105

2.4.3 Process control for flexigas processing part 灵活气处理部分工艺控制操作法

(1) D-312 liquid level LIC-32201

D-312 液位 LIC-32201

1)Control range: 30~70%.

控制范围：30～70%。

2)Control objective: the set liquid level fluctuation range of the purified water tank (D-312) ±5%.

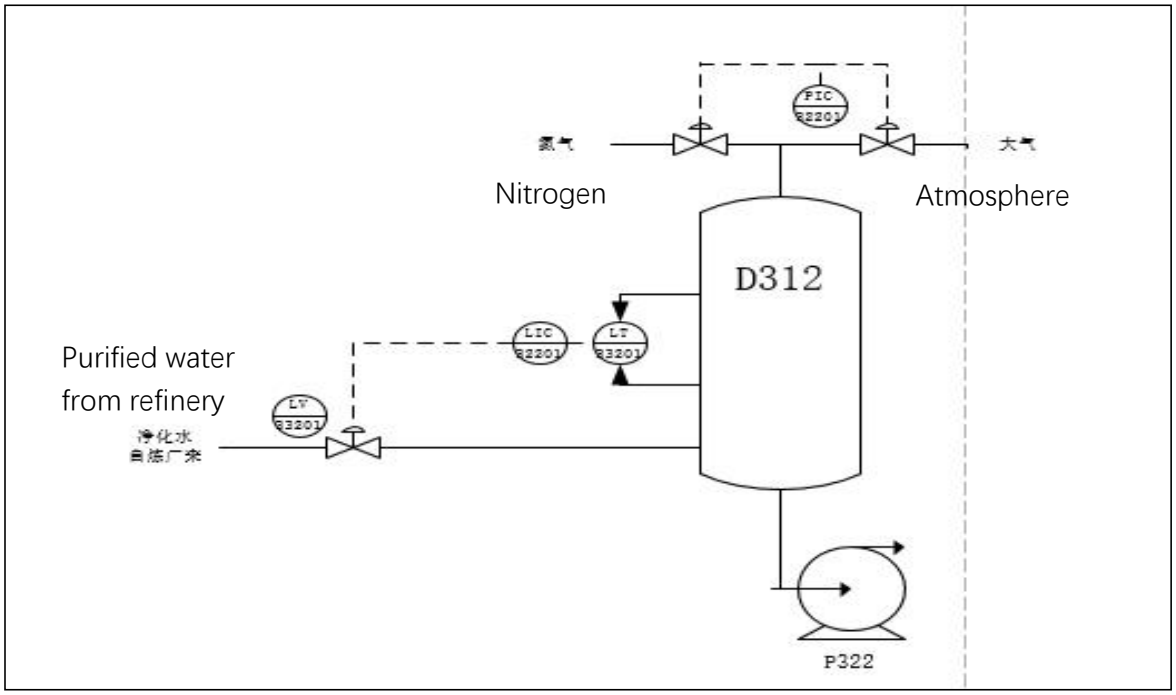
控制目标：设定的净化水罐（D-312）液面波动范围±5%。

3)Relevant parameters: purified water flow rate FI-32201 from refinery, purified water flow rate FI-32202 to various users, tank top pressure PIC-32201.

相关参数：净化水自炼厂来 FI-32201,净化水去各用户 FIC-32202，罐顶压力 PIC-32201。

4)Control mode: D-312 liquid level is adjusted by regulating valve LV-32201 for the purified water from refinery under normal circumstances.

控制方式：D-312 液面正常用来自炼厂的净化水调节阀 LV-32201 来调节。



5) Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Flow rate to various water consumers 至各用水点流量	Generally, liquid level is controlled by LIC-32201. When the flow rate to various water consumers increases, liquid level drops; otherwise, liquid level rises. 一般采用 LIC-32201 控制液面；至各用水点流量变大，液面下降；反之，液面上升。
Flow rate of purified	When the flow rate FI-32201 of purified water from refinery decreases,

water from refinery 炼厂来净化水流量	liquid level drops; otherwise, liquid level rises. 炼厂来净化水流量 FI-32201 降低，液面下降；反之，液面上升。
Pressure PIC-32201 压力 PIC-32201	When PIC-32201 pressure increases, liquid level drops; otherwise, it rises. 调节 PIC-32201 压力，压力变大，液面下降；反之液面上升。

6)Troubleshooting: 异常调节：

Influence factor 影响因素	Adjustment method 调整方法
Fault of LV-32201 LV-32201 故障	First switch to manual control, then control the liquid level by the side-line of the regulating valve LV-32201 and contact the instrument personnel for handling. 先改手动，然后调节阀 LV-32201 副线控制液面，并联系仪表处理。
Fault of liquid level meter LIC-32201 液位计 LIC-32201 故障	Contact the outdoor operator to confirm the liquid level meter on site and contact the instrument personnel for handling. 联系外操确认现场液位计，联系仪表处理。
Sudden change of pressure PIC-32201 压力 PIC-32201 突变影响	Switch PIC-32201 to manual control to stabilize pressure and liquid level. When the pressure rises, attention shall be paid to outflow rate FIC-32202. In the case of low pressure, contact the outdoor operator to confirm whether pump P-322 is empty on site. PIC-32201 改手动，调稳压力，控制稳液面；压力升高，注意出去流量 FIC-32202;压力很低，联系外操现场确认泵 P-322 是否有抽空迹象。
P-322 is empty P-322 抽空	In the case of low-flow rate automatic start-up of P-322 emergency pump, contact the outdoor operator to discharge the pump switched and contact the mechanical worker for handling. P-322 备用泵低流量自启，联系外操对被切泵排水，联系机修处理。
Fault of FV-32202 FV-32202 故障	First switch to manual control, then control by the side-line of the regulating valve FV-32202 and contact the instrument personnel for handling. 先改手动，然后调节阀 FV-32202 副线控制，并联系仪表处理。
Water purification system interrupted 净化水系统中断	Close the purified water inlet valve in the northern boundary area, and improve the purified water system through fresh water and purified water across the line 在北界区将净化水进装置阀关闭，通过新鲜水与净化水跨线将新鲜水改进净化水系统

(2) D-308 liquid level LIC-31901

D-308 液面 LIC-31901

1)Control range: 30~70%.

控制范围：30～70%。

2)Control objective: the set liquid level fluctuation range of D-308 ±5%.

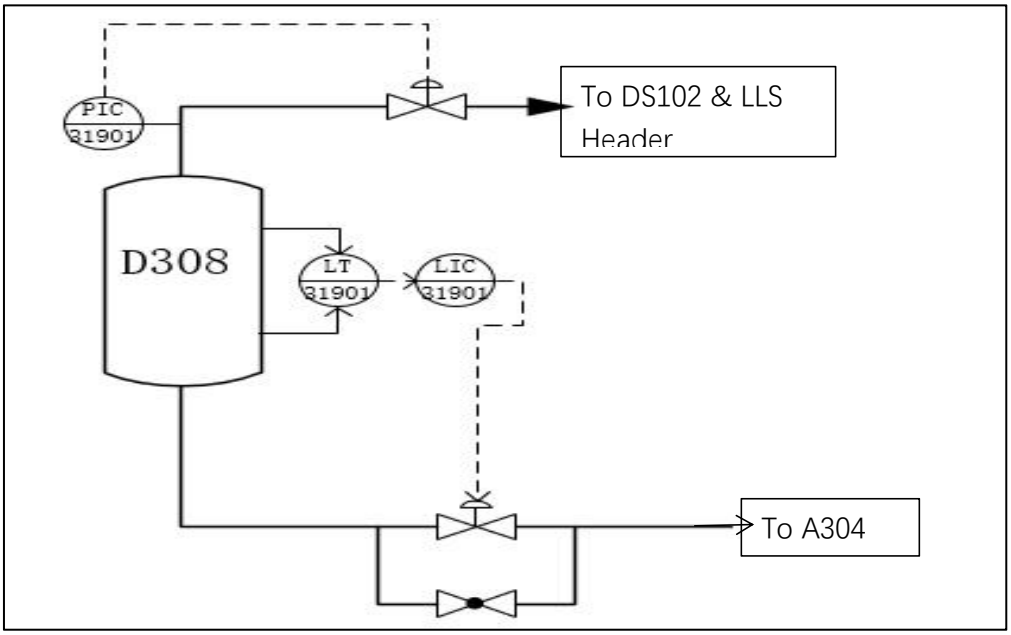
控制目标：设定的 D-308 液面波动范围±5%。

3)Relevant parameters: flow rates FIC-23401 and 23402 from E-220 to D-308, flow rate FIC-32003 from E-312 to D-308, flow rate FIC-30501 from D-303 to D-308, D-308 bottom valve LIC-31901, top pressure PIC-31901.

相关参数：E-220 进 D-308 流量 FIC-23401,23402，E-312 进 D-308 流量 FIC-32003，D-303 进 D-308 流量 FIC-30501，D-308 底部阀 LIC-31901，顶部压力 PIC-31901。

4)Control mode: It is controlled by adjusting the opening of liquid level control valve LIC-31901 and condensation water feed rates FIC-23401, FIC-23402, FIC-32003 and FIC-30501 of D-308.

控制方式:一般采用调节液面控制阀 LIC-31901 开度和 D-308 凝结水进料量 FIC-23401,FIC-23402，FIC-32003，FIC-30501 来控制。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Unbalanced feeding and discharging 进出料不平衡	Control D-308 liquid level generally by adjusting the opening of the liquid level control valve LIC-31901 and the condensate feed rate FIC-23401, FIC-23402, FIC-32003 and FIC-30501; when LIC-31901 is turned up, the liquid level drops; otherwise, it rises; when the flow rate into D-308 decreases, the liquid level drops; otherwise, it rises. 一般采用调节液面控制阀 LIC-31901 开度和凝结水进料量

	FIC-23401,23402，FIC-32003，FIC-30501 来控制 D-308 液面；LIC-31901 开大，液面下降，反之上升；进 D-308 流量下降，液面下降，反之上升。
D-308 pressure PIC-31901 D-308 压力 PIC-31901	When PIC-31901 becomes high, the liquid level drops; otherwise, it rises. PIC-31901 变大，液面下降，反之上升。

6)Troubleshooting: 异常调节：

Influence factor 影响因素	Adjustment method 调整方法
Fault in liquid level meter LIC-31901 液位计 LIC-31901 故障	Contact the outdoor operator to confirm the liquid level meter on site and contact the instrument personnel for handling. 联系外操确认现场液位计，联系仪表处理。
Fault in regulating valve LV-31901 调节阀 LV-31901 故障	First switch to manual control, then control the liquid level by the side-line of the regulating valve LV-31901 and contact the instrument personnel for handling. 先改手动，然后调节阀 LV-31901 副线控制液面，并联系仪表处理。
Abrupt change of D-308, PIC-31901 D-308，PIC-31901 突变	Switch PIC-31901 to manual control, adjust and stabilize the pressure, and control and stabilize the liquid level. PIC-31901 改手动，调稳压力，控制稳液面。

(3) D-308 pressure PIC-31901

D-308 压力 PIC-31901

1)Control range: about 0.5MPa.

控制范围：0.5MPa 左右。

2)Control objective: control D-308 at about 0.48~0.52MPa.

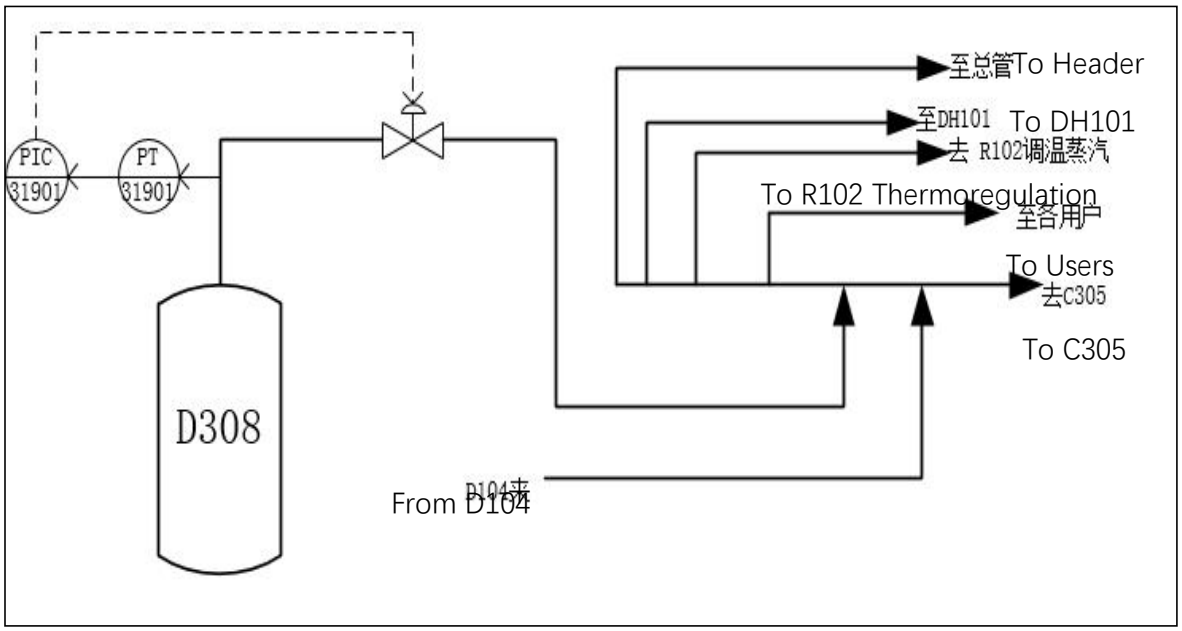
控制目标：D-308 控制在 0.48～0.52MPa 左右。

3)Relevant parameters: overhead pressure PIC-31901, D-308LLS to LLS header pressure PI-13401, D-104 pressure.

相关参数：顶部压力 PIC-31901、D-308LLS 至 LLS 总管压力 PI-13401、D-104 的压力。

4)Control mode: PIC-31901 switch control.

控制方式：采用 PIC-31901 开关控制。



5)Normal regulation: 正常调节：

Influence factor 影响因素	Adjustment method 调整方法
LLS header pressure LLS 总管压力	When LLS header pressure is low, turn down PIC-31901; otherwise, turn up PIC-31901. LLS 总管压力低，PIC-31901 关小，反之 PIC-31901 开大。
DH-101 use level DH-101 用量	When DH101 use level is high, turn up PIC-13901; when LLS header pressure is low, turn down PIC-31901. DH101 用量大，PIC-13901 开大，LLS 总管压力低，PIC-31901 关小。
Use level to other users 去其他各用户用量	When the use level to other users is high, the pressure drops, turn down PIC-31901. 去各用户用量大，压力降低，PIC-31901 关小。
D-308 steam production D-308 产汽量	When D-308 steam production becomes small, LLS header pressure drops, turn down PIC-31901; when D-308 steam production becomes large, turn up PIC-31901. D-308 产汽量变小，LLS 总管压力低,PIC-31901 关小，D-308 产汽量变大，PIC-31901 开大。
D-104 steam production D-104 产汽量	When D-104 steam production becomes small, LLS header pressure drops, turn down PIC-31901. D-104 产汽量变小，LLS 总管压力低，PIC-31901 关小。
Thermoregulation steam 调温蒸汽	When the use level of thermoregulation steam is high, LLS header pressure drops, turn down PIC-31901. 调温蒸汽用量大，LLS 总管压力低，PIC-31901 关小。

6)Troubleshooting: 异常调节:

Influence factor 影响因素	Adjustment method 调整方法
D-308 overhead safety valve bounce D-308 顶安全阀跳	Promptly turn down PIC-31901, and resume normal operation of the safety valve. If the resumption is impossible, cut off the safety valve. 迅速关小 PIC-31901,并恢复安全阀正常，如果无法恢复，切除安全阀。
D-104 overhead safety valve bounce D-104 顶安全阀跳	When the LLS header pressure is low, turn down PIC-31901, and resume normal operation of the safety valve. If the resumption is impossible, cut off the safety valve. LLS 总管压力低，PIC-31901 关小,并恢复安全阀正常，如果无法恢复，切除安全阀。
Large LLS pipeline leakage LLS 管线泄漏量大	When the LLS leakage is large, LLS header pressure drops, turn down PIC-31901 and contact the maintenance personnel for handling. LLS 泄漏量大，LLS 总管压力低，PIC-31901 关小,联系维修处理。
LLS header interruption LLS 总管中断	Turn down PIC-31901 and maintain D-308 normal pressure. 关小 PIC-31901，维持 D-308 正常压力。
DH-101 use level DH-101 用量	When PIC-13501 fully opens suddenly, the header pressure drops, turn down PIC-31901. PIC-13501 突然全开，总管压力下降，PIC-31901 关小。
ST-101LLS safety valve bounce ST-101LLS 安全阀跳	Promptly turn down PIC-31901, and promptly resume ST-101LLS safety valve. If the resumption is impossible, cut off the safety valve. 迅速关小 PIC-31901，迅速恢复 ST-101LLS 安全阀，如果无法恢复，切除安全阀。
PIC-31901 fault PIC-31901 故障	First switch to manual control, then control the pressure by the side-line of the regulating valve PIC-31901 and contact the instrument personnel for handling. 先改手动，然后调节阀 PIC-31901 副线控制压力，并联系仪表处理。
Fault in regulating valve LV-31901 causing zero liquid level 调节阀 LV-31901 故障导致液位空	Close the manual valve of regulating valve LV-31901 on site and contact the instrument personnel for handling. Control the liquid level by the side-line of the regulating valve first, and then put the regulating valve into use after the liquid level becomes normal and the regulating valve is repaired. 现场关闭 LV-31901 调节阀手阀，联系仪表处理。起初液位通过调节阀副线控制，待液位正常且调节阀修复后投用调节阀。

Influence factor 影响因素	Adjustment method 调整方法
D503 steam trap is faulty, and the pressure of D308 is abnormal due to the string of steam. D503 疏水器故障，串蒸汽造成 D308 压力异常	Depending on the on-site liquid level of D503, turn down or close the bottom drain valve to adjust the amount of trap. 视 D503 现场液位情况，关小或关闭底部排液阀，调整疏水器量

(4) D-301 material level LIC-30101

D-301 料位 LIC-30101

1)Control range: 7~15%.

控制范围: 7～15%。

2)Control objective: too low material level causes low material level self-holding. Prevent flexigas into T-401 or main air into flexigas system. Material level control: 7%~15%.

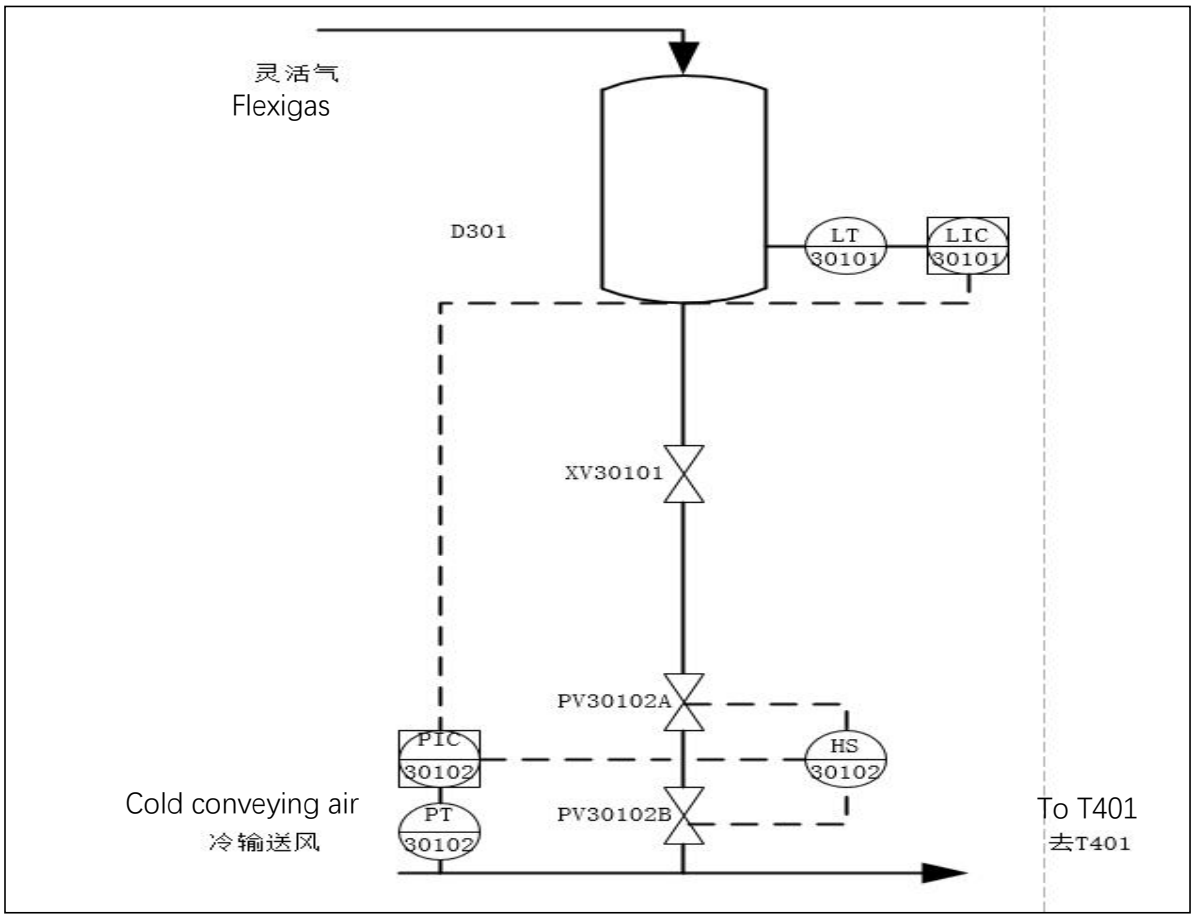
控制目标: 料位过低导致低料位自保。防止灵活气进入 T-401 或者主风进入灵活气系统。料位控制 7%～15%。

3)Relevant parameters: D-301 differential pressure PDI-30101, temperature TLC-30106, flow rate of flexigas into D-301, density and grain size of coke powder in flexigas.

相关参数：D-301 差压 PDI-30101,温度 TLC-30106,灵活气进 D-301 流量，灵活气里焦粉密度以及粒度大小，R102 料位高度。

4)Control mode: only one set of actuator of the actuated valve, with one manual PV-30102A for standby and one hydraulic control PV-30102B. When the material level is at 30%, PV-30102B closes; when the material is at 60%, PV-30102B opens.

4)控制方式：驱动阀门执行机构只有一套，一个手动 PV-30102A 备用，一个液动控制 PV-30102B。当料位 9%时，PV-30102B 关,当料位 13%时，PV-30102B 开



5)Normal regulation: 正常调节：

Influence factor 影响因素	Adjustment method 调整方法
D-301 differential pressure PDI-30101 D-301 差压 PDI-30101	The higher the differential pressure is, the higher the cyclone efficiency will be and the faster the D-301 material level will rise. When the material level is at 60%, PV-30102B opens; when the material level is at 30%, PV-30102B closes; otherwise, the material level rises more slowly. 差压越大，旋风效率越高，D-301 料位上升越快,当料位 60%时，PV-30102B 开，当料位 30%时，PV-30102B 关，反之越慢。
Density of coke powder in flexigas 灵活气里焦粉密度	The reason why the density of coke powder in flexigas becomes large may be that the differential pressure between R-101 and R-102 fluctuates during operation, causing coke powder loss and into D-301. Well balance the differential pressure of three devices and accelerate the coke discharge rate. 灵活气里焦粉密度变大，可能是操作过程中 R-101 与 R-102 差压波动，导致焦粉跑损进入 D-301，平衡好三器差压，加快卸焦速度。

6)Troubleshooting: 异常调节:

Influence factor 影响因素	Adjustment method 调整方法
PV-30102AB full open PV-30102AB 全开	Promptly close the cold conveying air FIC-30103, and contact the operator to manually close PV-30102A. Upon closing of PV-30102A, FIC-30103 resumes to normal, contact the instrument personnel for inspecting PV-30102B. 迅速关冷输送风 FIC-30103，并联系外操手动关 PV-30102A，PV-30102A 关后，FIC-30103 回复正常，联系仪表检查 PV-30102B。
XV-30101 fault closing XV-30101 故障关	Contact the instrument personnel for handling. 联系仪表处理。
XV-30101 low material level self-holding XV-30101 低料位自保	After the material level is above 25%, reset for self-holding. 待料位在 25%以上后，复位自保。
Fault in nitrogen heater EH-301 氮气加热器 EH-301 故障	When cold nitrogen passes in continuously, prevent blocking of the aeration orifice from causing blocked fluidization. Promptly contact the instrument personnel for handling. 冷氮气持续通入，防止松动点堵住，流化不畅。迅速联系仪表处理。
Conveying air fault 输送风故障	Switch to nitrogen conveying on site. 现场改氮气输送。
Fault in conveying air FIC-30103 输送风 FIC-30103 故障	First switch to manual control, then control by the side-line of the regulating valve FV-30103 and contact the instrument personnel for handling. 先改手动，然后调节阀 FV-30103 副线控制，并联系仪表处理。
LIC-30101 fault LIC-30101 故障	If the fault is at 0, XV-30101 self-holding is enabled, contact the instrument personnel for handling the material level meter, and reset for self-holding after resuming to normal. 如果故障为 0，XV-30101 自保，联系仪表处理料位计，恢复正常后自保复位。
PV-30102AB differential pressure PV-30102AB 差压	When PV-30102AB differential pressure is low, ES-302 prevents air into flexigas by closing XV-30101. PV-30102AB 差压低，ES-302 通过关闭 XV-30101 防止空气进入灵活气。

Influence factor 影响因素	Adjustment method 调整方法
Failed discharge of coke powder 焦粉卸不出	Appropriately close PV-1092C or PV-10902AB to increase D-301 pressure, and turn down the conveying air flow rate. The cause may be the coke powder and mud, increase the hot nitrogen temperature and flow rate. 可以适当关 PV-1092C 或 PV-10902AB 提高 D-301 压力，关小输送风流量。也可能是焦粉和泥 D301 下部堵塞或卸焦线堵塞，加大热氮气温度和流量，处理通输送管线。
R102 coke powder high level R102 焦粉料位高	Unload the coke, reduce the material level 卸焦，降低料位
R102 coke powder has small particle size R102 焦粉粒径小	Adjust the amount of gasification and increase the particle size of coke powder 调整气化量，增大焦粉粒径

(5) D-301 nitrogen temperature: TIC-30105

D-301 氮气温度：TIC-30105

1)Control range: 190~240℃.

控制范围：190～240℃。

2)Control objective: control the temperature of nitrogen into D301 at about 215±10℃.

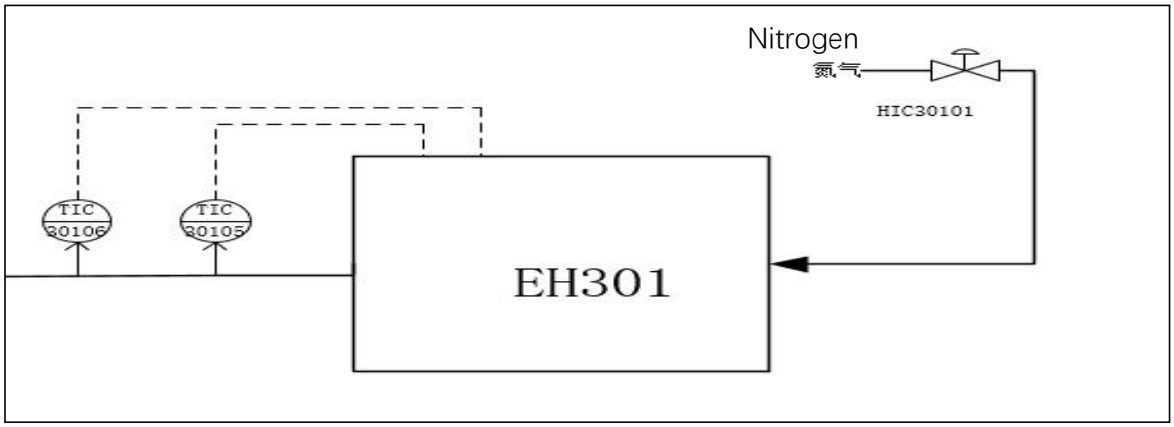
控制目标：控制其进 D301 温度在 215±10℃左右。

3)Relevant parameters: temperature of nitrogen into EH-301, EH-301 work efficiency, hot nitrogen flow rate FIC-30102.

相关参数：氮气进 EH-301 的温度，EH-301 的工作效率，热氮气流量 FIC-30102。

4)Control mode: in general, control its power by outlet TIC-30105 and control its outlet temperature TIC-30105.

控制方式：一般用出口 TIC-30105 控制其功率，控制其出口温度 TIC-30105。



5)Normal regulation: 正常调节：

Influence factor 影响因素	Adjustment method 调整方法
Nitrogen inlet temperature 氮气入口温度	When the nitrogen inlet temperature is low, TIC-30105 automatically acts on EH-301, and EH-301 power becomes high; when the inlet temperature is high, TIC-30105 automatically acts on EH-301, and EH-301 power becomes low. 氮气入口温度低，TIC-30105 自动作用 EH-301，EH-301 功率变大；入口温度高，TIC-30105 自动作用 EH-301，EH-301 功率变小。
D-301 nitrogen usage D-301 氮气使用量	When D-301 nitrogen usage is large, TIC-30105 automatically acts on EH-301, the power becomes high; when the hot nitrogen usage reduces, TIC-30105 temperature becomes high accordingly, TIC-30105 automatically acts on EH-301, and EH-301 power becomes low. D-301 氮气使用量大，TIC-30105 自动作用 EH-301，调大功率；热氮气使用量减少，TIC-30105 温度相应高，TIC-30105 自动作用 EH-301，EH-301 功率变小。

6)Troubleshooting: 异常调节:

Influence factor 影响因素	Adjustment method 调整方法
EH-301 failure EH-301 坏	Close EH-301 inlet and outlet valves, switch to EH-301 side-line, contact the maintenance personnel for handling; pay attention to the temperature of D-301 cone section. 关 EH-301 进出口罚，改走 EH-301 副线，联系维修处理；注意 D-301 椎体段温度。
HIC-30101 failure HIC-30101 坏	Cut off HV-30101, switch to the side-line, control the outlet temperature TIC-30105 and its flow rate, and contact the instrument personnel for handling. 切除 HV-30101，该走副线，控制出口温度 TIC-30105 及其流量，联系仪表处理。
TIC-30105 failure TIC-30105 坏	Switch EH-101 to manual control, regulate it by referring to the temperature TI-30103 of D-301 cone section, or observe its body temperature. EH-101 改手动，可以参考 D-301 椎体段温度 TI-30103 来调节，也可观察其本体温度。
EH-301 overtemperature EH-301 温度超高	EH-301 body temperature is generally no more than 530℃, regulate its power. As specifically determined by the process package provided by the manufacturer.

	EH-301 本体温度一般不超过 530 摄氏度，调节其功率。具体情况由厂家提供工艺包确定。
System nitrogen with water 系统氮气带水	Strengthen D508 and branch pipeline dehydration 加强 D508 与分支管线脱水

Note: its body temperature is no more than 530℃, referring to the value provided by my last employer. It is actually determined according to the process package.

注：其本体温度不超过 530 摄氏度，参考本人上家单位给定。实际根据工艺包定

(6) D-302 liquid level LIC-30201

D-302 液位 LIC-30201

1)Control range: 30~70%.

控制范围：30～70%。

2)Control objective: D-302 liquid level is controlled within above range during normal operation, and the set liquid level fluctuation range of D-302 ±5%.

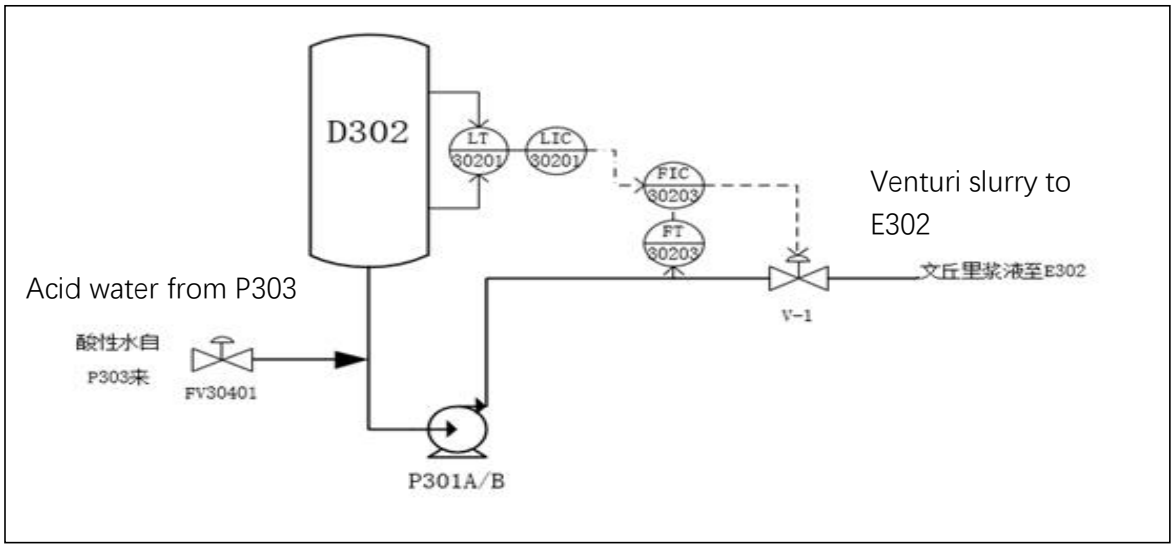
控制目标：正常操作中 D-302 液位控制在上述范围内，设定的 D-302 液面波动范围±5%。

3)Relevant parameters: temperature TI-30101 and flow rate of flexigas into D-302, inlet flow rate FIC-30401 from P-303 to P-301, flow rate FIC-30202 from P-301 back to D-302, flow rate FIC-30203 to E-302.

相关参数：灵活气进 D-302 的温度 TI-30101 及流量，P-303 至 P-301 入口流量 FIC-30401，P-301 返 D-302 流量 FIC-30202 以及至 E-302 的流量 FIC-30203。

4)Control mode: normally control D-302 flow rate by controlling the flow rate of the flowmeter FIC-30203 by using LIC-30201.

控制方式：正常情况下，采用 LIC-30201 控制流量计 FIC-30203 的流量来控制 D-302 的流量。



5)Normal adjustment: 正常调整:

Influence factor 影响因素	Adjustment method 调整方法

Influence factor 影响因素	Adjustment method 调整方法
Unbalanced feeding and discharging 进出料不平衡	Stabilize materials, and generally control D-302 liquid level LIC-30201 by the regulating valve FV-30203 at P-301 outlet. When FV-30203 is turned up, D-302 liquid level drops; otherwise it rises. 稳定各物料，一般采用 P-301 出口调节阀 FV-30203 控制 D-302 液位 LIC-30201。FV-30203 开大，D-302 液位下降；反之上升。
Flexigas fluctuation 灵活气波动	When the flexigas temperature TI-30101 rises, the flow rate becomes large and D-302 liquid level drops; otherwise, it rises. Control D-302 liquid level by the switch of regulating valve FV-30203. 灵活气温度 TI-30101 上升，流量变大，D-302 液位下降；反之升高。用调节阀 FV-30203 开关控制 D-302 液位
Fluctuation in the flow rate from P-303 to pump P-301 P-303 至泵 P-301 流量波动	Stabilize the flow rate FIC-30401 from P-303 to pump P-101. When flow rate FIC-30401 becomes large, LIC-30201 liquid level rises; otherwise, it drops. 稳定 P-303 至泵 P-301 流量 FIC-30401,FIC-30401 流量变大，LIC-30201 液位升高，反之下降。

6)Troubleshooting: 异常调节:

Influence factor 影响因素	Adjustment method 调整方法
P-301 failure or inlet blocking P-301 坏或入口堵	When P-301 automatically starts the emergency pump, make drainage for the cut pump and contact the maintenance personnel to dismantle the filter screen. P-301 自启备用泵，被切泵切除，排水，联系维修拆过滤网。
P-303 failure or inlet blocking P-303 坏或入口堵	When P-303 automatically starts the emergency pump, make drainage for the cut pump and contact maintenance personnel to dismantle the filter screen. P-303 自启备用泵，被切泵切除，排水，联系维修拆过滤网。
Flexigas interruption 灵活气中断	When D-302 liquid level drops, close FIC-30203 and FIC-30401, control and stabilize the liquid level. D-302 液面下降，关 FIC-30203,FIC-30401，控制稳液面。
FV-30203 failure FV-30203 坏	First switch to manual control, then control by the side-line of the regulating valve FV-30203 and contact the instrument personnel for handling. 先改手动，然后调节阀 FV-30203 副线控制，并联系仪表处理。
LIC-30203	Contact the operator to calibrate the liquid level meter on site and contact

Influence factor 影响因素	Adjustment method 调整方法
inaccuracy LIC-30203 不准	the instrument personnel for handling. 联系外操现场对液位计，并联系仪表处理。

(7) D-302 slurry circulating rate FI-C30202

D-302 浆液循环量 FI-C30202

1)Control range: 250~320t/h.

控制范围：250～320t/h。

2)Control objective: maintain the minimum water-gas ratio 2:1000.

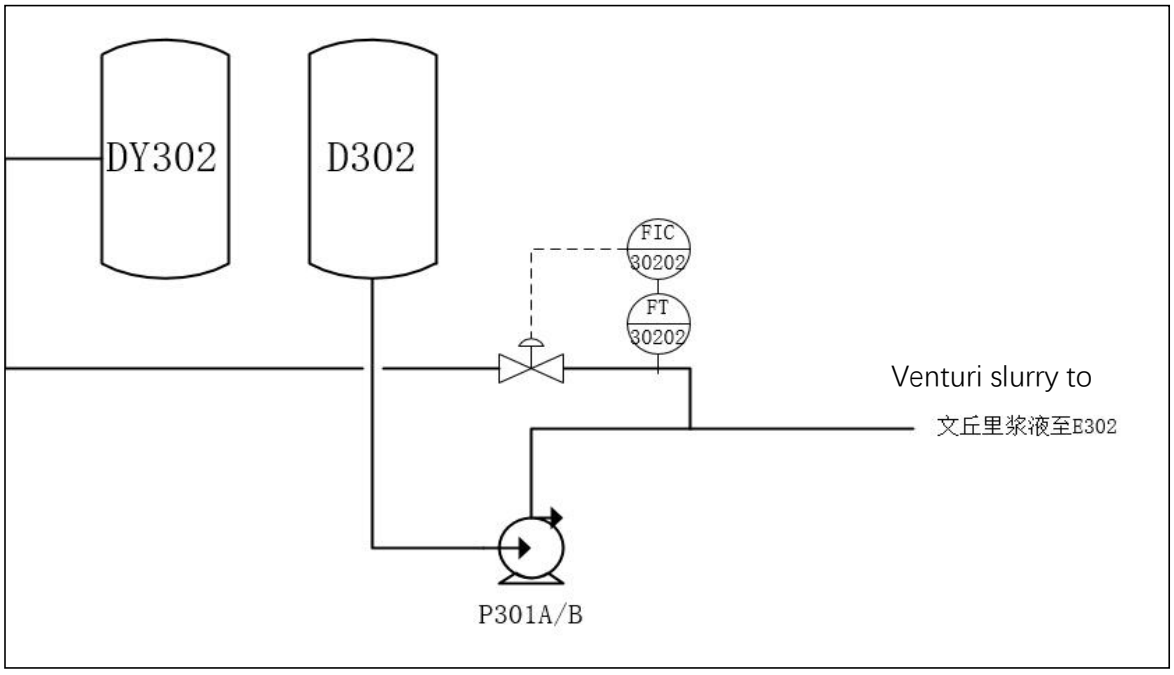
控制目标：维持最小的水气比 2：1000。

3)Relevant parameters: flexigas flow rate, D-302 liquid level LIC-30201, FIC valve opening.

相关参数:灵活气流量，D-302 液面 LIC-30201，FIC 阀门开度。

4)Control mode: control the water-gas ratio at 0.00175~0.00270m³/h by FIC-3020.

控制方式：FIC-30202 控制水气比 0.00175～0.00270m³/h。



5)Normal adjustment: 正常调整:

Influence factor 影响因素	Adjustment method 调整方法
Flexigas change 灵活气变化	When the flexigas flow rate becomes large, turn up FIC-30202; otherwise, turn down it; properly control the water-gas ratio. 灵活气流量变大，FIC-30202 开大，反之关小；控制好水气比。

6)Troubleshooting; 异常调整:

Influence factor 影响因素	Adjustment method 调整方法
Flexigas interruption 灵活气中断	Turn down FIC-30202, and at least maintain 40% opening. FIC-30202 关小，至少保持 40%的开度。
P-301 failure or inlet blocking P-301 坏或入口堵	When P-301 automatically starts the emergency pump, make drainage for the cut pump and contact the maintenance personnel to dismantle the filter screen. P-301 自启备用泵，被切泵切除，排水，联系维修拆过滤网。
FIC-30202 failure FIC-30202 坏	First switch to manual control, then control by the side-line of the regulating valve FV-30202 and contact the instrument personnel for handling. 先改手动，然后调节阀 FV-30202 副线控制，并联系仪表处理。
P-303 failure or inlet blocking P-303 坏或入口堵	When P-303 automatically starts the emergency pump, make drainage for the cut pump and contact maintenance personnel to dismantle the filter screen. Properly maintain the water-gas ratio. P-303 自启备用泵，被切泵切除，排水，联系维修拆过滤网。维持好水气比。
Too high coke powder content in flexigas 灵活气焦粉含量高	When the coke powder content in flexigas is more than 15w%, put fresh water to dilute the system. 灵活气焦粉含量大于 15w%时，投新鲜水对系统进行稀释。

(8) Control of C-302 overhead temperature C-302 顶部温度的控制

1)Control range: control C-302 overhead outlet temperature at 45~65℃.

控制范围：控制 C-302 顶出口温度 45～65℃。

2)Control objective: control C-103/2 bottom temperature at the reference value ± 5℃ for better condensation of the water carried in the flexigas.

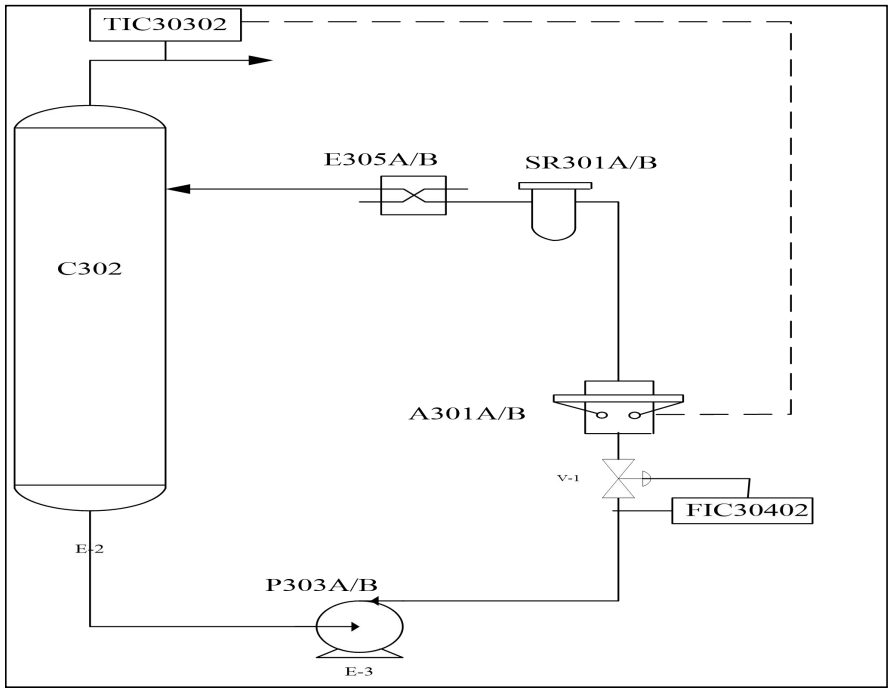
控制目标：控制 C-103/2 底温度在基准值± 5℃，为更好冷凝灵活气中夹带的水。

3)Relevant parameters: flow rate and temperature of circulating return water to C-302; air cooler A-301 speed; temperature and flow rate of flexigas into C-302; flow rate and temperature of overhead purified water.

相关参数：返 C-302 循环回水量、温度；空冷 A-301 转速；进 C-302 灵活气温度及流量;塔顶净化水流量、温度。

4)Control mode: generally control the overhead temperature TIC-30302 by adjusting the air cooler A-301 speed.

控制方式：一般采用调节空冷 A-301 转速，从而控制塔顶温度 TIC-30302



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
A-301 air cooler speed A-301 空冷转速	Control the air cooler speed by adjusting TIC-30302. When the speed increases, C-302 overhead temperature drops. 调节 TIC-30302，从而控制空冷转速，转速增大，C-302 顶温度下降。
Flow rate of circulating return water to C-302 返 C-302 循环回水量	Adjust the opening of flow control valve FIC-30402. When the opening increases, C-302 overhead temperature drops. 通过调节 FIC-30402 控制流量阀开度，开度增大，C-302 顶温度下降。
Temperature of flexigas into C-302 进 C-302 灵活气温度	Control and stabilize the flexigas temperature. When the temperature of flexigas into C-302 drops, C-302 overhead temperature drops. 前路控稳进灵活气温度，如进 C-302 灵活气温度下降，C-302 顶温度。下降。
Flow rate of flexigas into C-302 进 C-302 灵活气流量	When the flow rate of flexigas into C-302 decreases, C-302 overhead temperature drops. 进 C-302 灵活气流量下降，C-302 顶温度下降。
Temperature of circulating return water to C-302 返 C-302 循环回温度	When the circulating return water temperature is low, C-302 overhead temperature drops. 循环回水温度底，C-302 顶温度下降。

Influence factor 影响因素	Adjustment method 调整方法
Flow rate of C-302 overhead purified water C-302 塔顶净化水流量	When there is flow rate of the overhead intermittent purified water, C-302 overhead temperature drops. 当塔顶间歇净化水有流量时，C-302 顶温度下降。
Environmental factors 环境因素影响	It is raining and air cooling, and the ambient temperature is high and air cooling is improved. 下雨降空冷，环境温度高提空冷。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling 处理
C-302 overhead overtemperature C-302 顶超温	P-303A/B sudden stop P-303A/B 突停	Contact the operator to start P-303 emergency pump. 联系外操开 P-303 备泵。
	Fault in regulating valve FIC-30402 调节阀 FIC-30402 故障	Contact the instrument personnel for handling and control by the side-line. 联系仪表处理，开副线控制。
	Fault in air cooler A-301 空冷 A-301 故障	Contact rush repair personnel and appropriately increase the circulating reflux rate. 联系抢修,适当增大循环回流量。
	E-305A/B blocking E-305A/B 堵塞	Cut off the heat exchanger and contact rush repair personnel. 切除换热器，联系抢修。
	SR-301A/B, SR-308A/B blocking SR-301A/B、SR-308A/B 堵	Cut off and clean the filter. 切过滤器，清洗切出的过滤器。
	TIC-30302 instrument malfunction TIC-30302 仪表失灵	Contact the instrument personnel for handling. 联系仪表处理。

Out-of-control handling: if C-302 overhead temperature exceeds the control range, pay attention to adjusting the temperature of flexigas into R-301, prevent the carried water from inactivating R-301 catalyst, and control and stabilize C-302, C-303 and D-302 liquid level and circulating rate.

失控处理：若 C-302 顶温度超出控制范围，则注意调整进 R-301 灵活气温度，防止带水使 R-301 催化剂失活，及控稳 C-302、C-303、D-302 液位及各循环量。

(9) Control of C-302 liquid level C-302 液位的控制

1)Control range: control C-302 liquid level at 30~70%.

控制范围：控制 C-302 液位 30～70%。

2)Control objective: control the bottom temperature of C-302 liquid level at the reference value ±5% to guarantee the circulating return water flow rate and prevent the gas inlet from submerging.

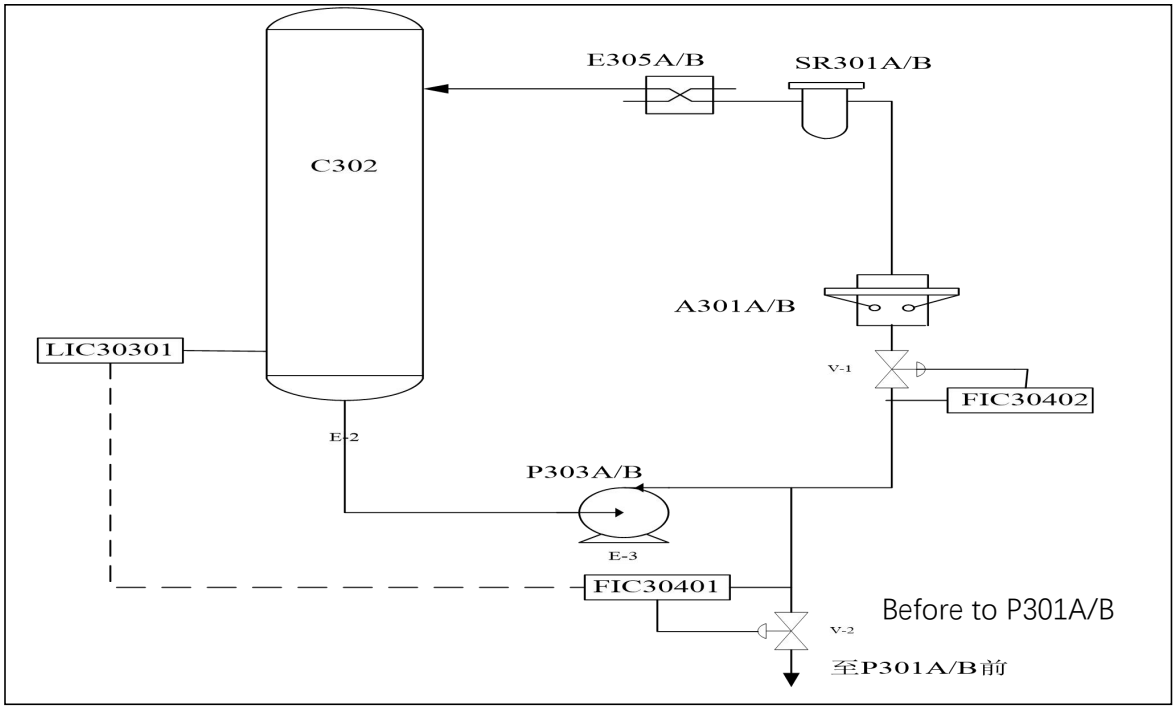
控制目标：控制 C-302 底液位在基准值±5%，保证循环回水量及防止进气口淹没。

3)Relevant parameters: flow rate from P-303 to P-301; flow rate and temperature of circulating reflux to C-302; air cooler A-301 speed; temperature and flow rate of flexigas into C-302; temperature of flexigas out of overhead and flow rate of overhead purified water.

相关参数：P-303 至 P-301 流量；返 C-302 循环回流量、温度；空冷 A-301 转速；进 C-302 灵活气温度及流量，出塔顶灵活气温度，塔顶净化水流量。FIC30701 流量

4)Control mode: cascade control of C-302 liquid level LIC-30301 and flow control valve FIC-30401 from P-303 to P-301.

控制方式：C-302 液位 LIC-30301 与 P-303 至 P-301 流控阀 FIC-30401 串级控制。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法

Influence factor 影响因素	Adjustment method 调整方法
Flow rate from P-303 to P-301 P-303 至 P-301 流量	Adjust the opening of FIC-30401 valve. When the opening is large, C-302 liquid level drops. 调节 FIC-30401 阀开度，开度大，C-302 液位降低。
Flow rate of circulating return water to C-302 返 C-302 循环回水量	Adjust the opening of FIC-30402 flow valve. When the opening increases, the steam condensation volume becomes large and C-302 liquid level rises. 调节 FIC-30402 流量阀开度，开度增大，蒸汽冷凝量大，C-302 液位上升。
Air cooler A-301 speed 空冷 A-301 转速	When the air cooler A-301 speed increases, the steam condensation volume in the flexigas becomes large and C-302 liquid level rises. 空冷 A-301 转速增大，灵活气中蒸汽冷凝量大，C-302 液位上升。
Temperature of flexigas into C-302 进 C-302 灵活气温度	If the temperature of flexigas into C-302 drops, the carried steam is easy to be condensed and C-302 liquid level rises. 如进 C-302 灵活气温度下降，夹带蒸汽易冷凝，C-302 液位上升。
Carried water content in flexigas into C-302 进 C-302 灵活气带水量	When the carried water content in flexigas into C-302 decreases, the total condensation volume is small and C-302 liquid level drops. 进 C-302 灵活气带水量下降，总冷凝量少，C-302 液位下降。
C-302 overhead temperature C-302 顶温度	When C-302 overhead temperature rises, the steam condensation volume is small and C-302 liquid level drops. C-302 顶温度上升，蒸汽冷凝量少，C-302 液位下降。
Flow rate of C-302 overhead purified water C-302 塔顶净化水流量	When there is flow rate of the overhead intermittent purified water, C-302 liquid level rises. 当塔顶间歇净化水有流量时，C-302 液位上升。
Temperature of circulating return water to C-302 返 C-302 循环回水温度	When the temperature of circulating return water to C-302 is high, C-302 liquid level drops. 返 C-302 循环回水温度高，C-302 液位下降。
FIC30701 flow FIC30701 流量	The flow of FIC30701 increases along the technological transformation line, while C302 increases, and vice versa. FIC30701 流量走技改线量增加，C302 液位增加，反之下降。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling 处理
Too low liquid level 液位过低	P-303A/B stops suddenly, causing it impossible to condense the water carried in flexigas P-303A/B 突停，导致灵活气中夹带水无法被冷凝	Contact the operator to start P-303 emergency pump. 联系外操开 P-303 备泵。
	Fault in regulating valve FIC-30402 调节阀 FIC-30402 故障	Contact the instrument personnel for handling and control by the side-line. 联系仪表处理，开副线控制。
	Fault in air cooler A-301 空冷 A-301 故障	Contact rush repair personnel for the air cooler and appropriately increase the circulating reflux rate. 联系抢修空冷,适当增大循环回流量。
	E-305A/B blocking E-305A/B 堵塞	Cut off the heat exchanger and contact rush repair personnel. 切除换热器，联系抢修。
	SR-301A/B, SR-308A/B blocking SR-301A/B、SR-308A/B 堵	Cut off and clean the filter. 切过滤器，清洗切出的过滤器。
	Fault in LI-30801 instrument indication LI-30801 仪表显示故障	Contact the instrument personnel for handling. 联系仪表处理。
Too high liquid level 液位过高	Regulating valve FIC-30401 调节阀 FIC-30401	Contact the instrument personnel for handling and control by the side-line. 联系仪表处理，开副线控制。
	Fault in LI-30801 instrument indication LI-30801 仪表显示故障	Contact the instrument personnel for handling. 联系仪表处理。

Out-of-control handling: if C-302 liquid level is too low, supplement overhead purified water. If the liquid level is too high, increase the delivery rate. If the liquid level is high to the flexigas inlet, it is required to suspend work for handling.

失控处理：若 C-302 液位过低，则可塔顶补净化水，如液位过高则加大外送量，如液位高至灵活气进气口则需停工处理。

(10) COS reactor inlet temperature control COS 反应器入口温度控制

1)Control range: control COS inlet temperature range at 120~135℃.

控制范围：控制 COS 入口温度范围 120～135℃。

2)Control objective: control COS inlet temperature at the reference value ± 5℃ to prevent too low temperature of flexigas which will lead to water carrying in flexigas to deactivate R-301 catalyst, and too high temperature of flexigas which will lead to reverse reaction.

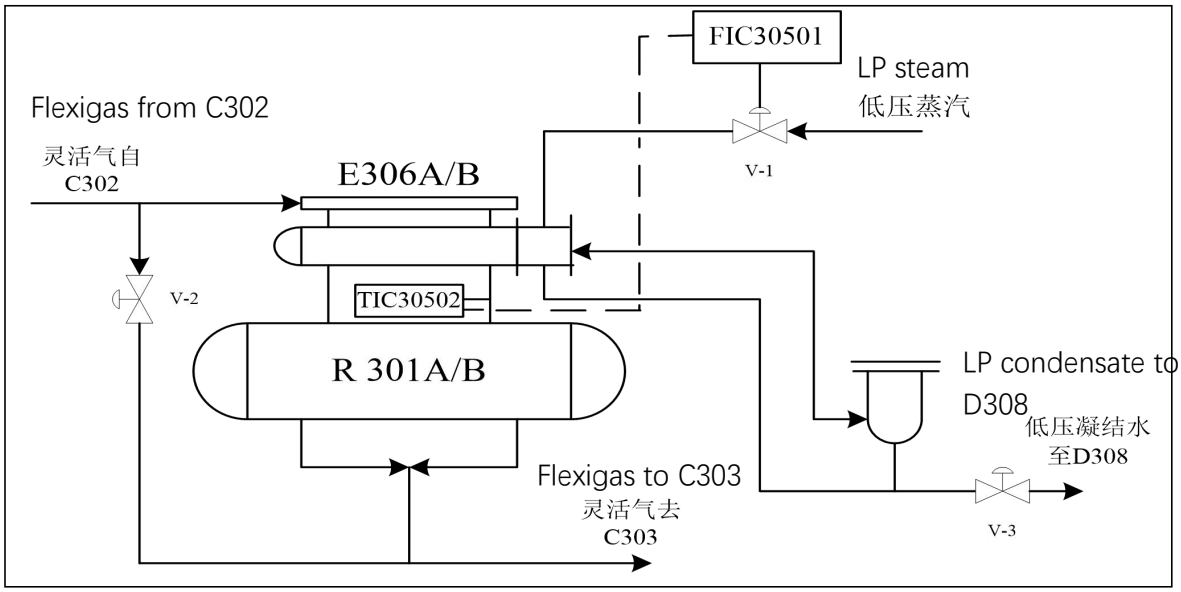
控制目标：控制 COS 入口温度在基准值±5 ℃，防止温度过灵活气低带水使 R-301 催化剂失活，温度过高反应逆向进行。

3)Relevant parameters: LP steam flow rate, temperature and pressure; circulating reflux rate to C-302; air cooler A-301 speed; temperature and flow rate of flexigas into C-302; temperature and flow rate of flexigas into E-306; condensate level and opening of bypass valve into R-301.

相关参数：低压蒸汽流量、温度及压力；返 C-302 循环回流量；空冷 A-301 转速；进 C-302 灵活气温度及流量，进 E-306 灵活气温度及流量，凝结水液位，进 R-301 旁通阀开度。

4)Control mode: cascade control of COS inlet temperature TIC-30502 and LP steam flow control valve FIC-30501.

控制方式：COS 入口温度 TIC-30502 与低压蒸汽流控阀 FIC-30501 串级控制。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Opening of flow control valve FIC-30501 流控阀 FIC-30501 开度	Adjust the opening of LP steam flow control valve FIC-30501. When the opening is large, COS inlet temperature rises. 调节低压蒸汽流控阀 FIC-30501 开度，开度大，COS 入口温度升高。
Heat source steam pressure 热源蒸汽压力	Contact the dispatcher to balance the system 1.0MPa steam pressure. COS inlet temperature drops when the steam pressure drops. 联系调度平衡系统 1.0MPa 蒸汽压力，下调蒸汽压力，COS 入口温度

Influence factor 影响因素	Adjustment method 调整方法
	下降。
Heat source steam temperature 热源蒸汽温度	Contact the dispatcher to balance the system 1.0MPa steam temperature. COS inlet temperature drops when the steam temperature drops. 联系调度平衡系统 1.0MPa 蒸汽温度，下调蒸汽温度，COS 入口温度下降。
Temperature of flexigas into E-306 进 E-306 灵活气温度	When the temperature of flexigas into E-306 drops, COS inlet temperature drops. 进 E-306 灵活气温度下降，COS 入口温度下降。
Flow rate of flexigas into E-306 进 E-306 灵活气流量	When the flow rate of flexigas into E-306 decreases, COS inlet temperature rises. 进 E-306 灵活气流量下降，COS 入口温度上升。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling 处理
Too low COS inlet temperature COS 入口温度过低	Fault in LP steam flow control valve FIC-30501 低压蒸汽流控阀 FIC-30501 故障	Contact the instrument personnel for handling and control by the side-line. 联系仪表处理，开副线控。
	Water carried in LP steam 低压蒸汽带水	Contact the dispatcher to balance the main steam pressure and temperature, and perform steam dewatering. 联系调度，平衡主蒸汽压力及温度，蒸汽脱水。
	Full condensate tank D-303 凝结水罐 D-303 满	Open and empty the bottom of tank D-303 to drain the condensate to appropriate liquid level. 将罐 D-303 底放空打开，排冷凝水至合适液位。
	E-306 tube bundle leakage E-306 管束漏	Cut off the heat exchanger, contact rush repair personnel and reverse heat exchanger E-306 and reactor R301. 切除换热器，联系抢修，倒换热器 E-306 及反应器 R301。

Phenomenon 现象	Cause 原因	Handling 处理
	Malfunction of temperature control instrument TIC-30502 温控仪表 TIC-30502 失灵	Contact the instrument personnel for handling. 联系仪表处理。
Too high COS inlet temperature COS 入口温度过高	Open bypass valve into R-301 进 R-301 旁通阀开	Handle based on the causes for opening of the bypass valve and turn down the heat source steam. 根据旁通阀开的原因处理，同时关小热源蒸汽。
	Malfunction of temperature control instrument TIC-30502 温控仪表 TIC-30502 失灵	Contact the instrument personnel for handling. 联系仪表处理。

Out-of-control handling: when LP steam fault causes too low COS inlet temperature, cut off R301 and take the equilibrium line to prevent deactivation of catalyst water.

失控处理：低压蒸汽故障导致 COS 入口温度过低则切除 R301 走平衡线，防止催化剂水失活。

(11)Control of C-303 overhead temperature

C-303 顶部温度的控制

1)Control range: control C-303 overhead temperature range at 35~45℃.

控制范围：控制 C-303 顶温度范围 35～45℃。

2)Control objective: control C-303 overhead temperature at the reference value ±5℃ for C-304 to absorb hydrogen sulfide.

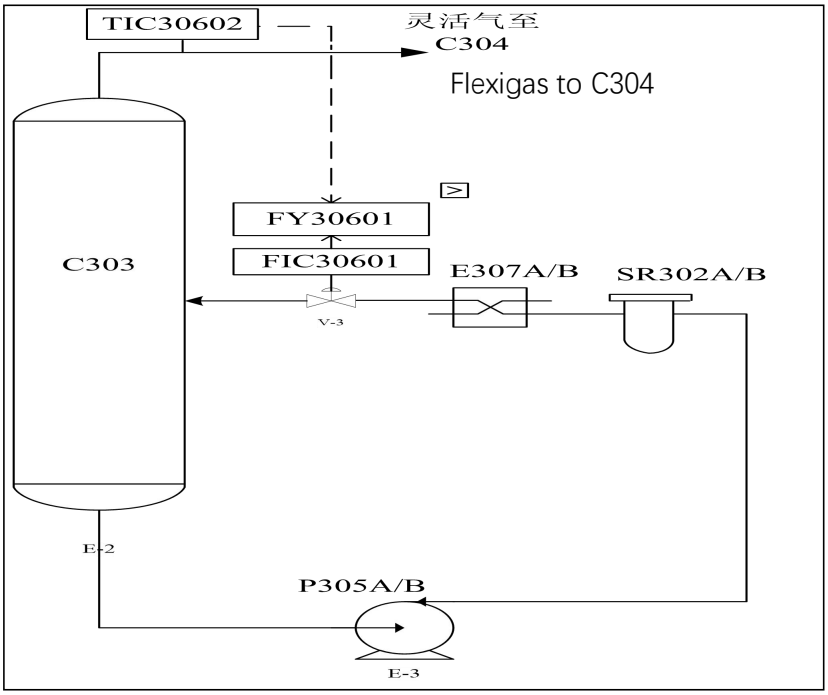
控制目标：控制 C-303 顶温度在基准值±5℃，以利于 C-304 吸收硫化氢。

3)Relevant parameters: flow rate and temperature of circulating return water to C-303 lower section; P-306A/B draw-off rate; normal injection rate of incoming purified water; injection rate of intermittent purified water at C-303 overhead; inlet temperature and flow rate of C-303 flexigas.

相关参数：返 C-303 下段循环回水量、温度；P-306A/B 抽出量；外来净化水正常注入量；C-303 塔顶间歇净化水注入量，C-303 灵活气进气温度及流量。

4)Control mode: cascade control of C-303 overhead temperature TIC-30602 and flow control valve FIC-30601 for circulating return water to C-303 lower section, and setting the flow rate and temperature level to guarantee the maximum flow rate.

控制方式：C-303 顶温度 TIC-30602 与返 C-303 下段循环回水流制阀 FIC-30601 串及控制，同时又设定流量与温度的高选控制保证最低流量。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Flow rate of circulating return water to C-303 lower section 返 C-303 下段循环回水量	Adjust the opening of flow control valve FIC-30601 for circulating return water to C-303 lower section. When the opening is large, C-303 overhead temperature drops. 调节返 C-303 下段循环回水流制阀 FIC-30601 开度，开度大，C-303 顶温降。
P-306A/B draw-off rate P-306A/B 抽出量	Adjust the opening of control valve FIC-30602 for P-306 overhead draw-off rate. When the opening is large, C-303 overhead temperature drops. 调节 P-306 顶抽出量控制阀 FIC-30602 开度，开度大，C-303 顶温降。
Normal injection rate of incoming purified water 外来净化水正常注入量	Adjust the opening of flow control valve FIC30603 for incoming purified water. When the opening is large, C303 overhead temperature drops. 调节外来净化水流控阀 FIC30603 开度，开度大，C303 顶温降。
C-303 intake gas temperature C-303 进气温度	When C-303 intake gas temperature rises, C-303 overhead temperature rises. C-303 进气温度上升，C-303 顶温上升。

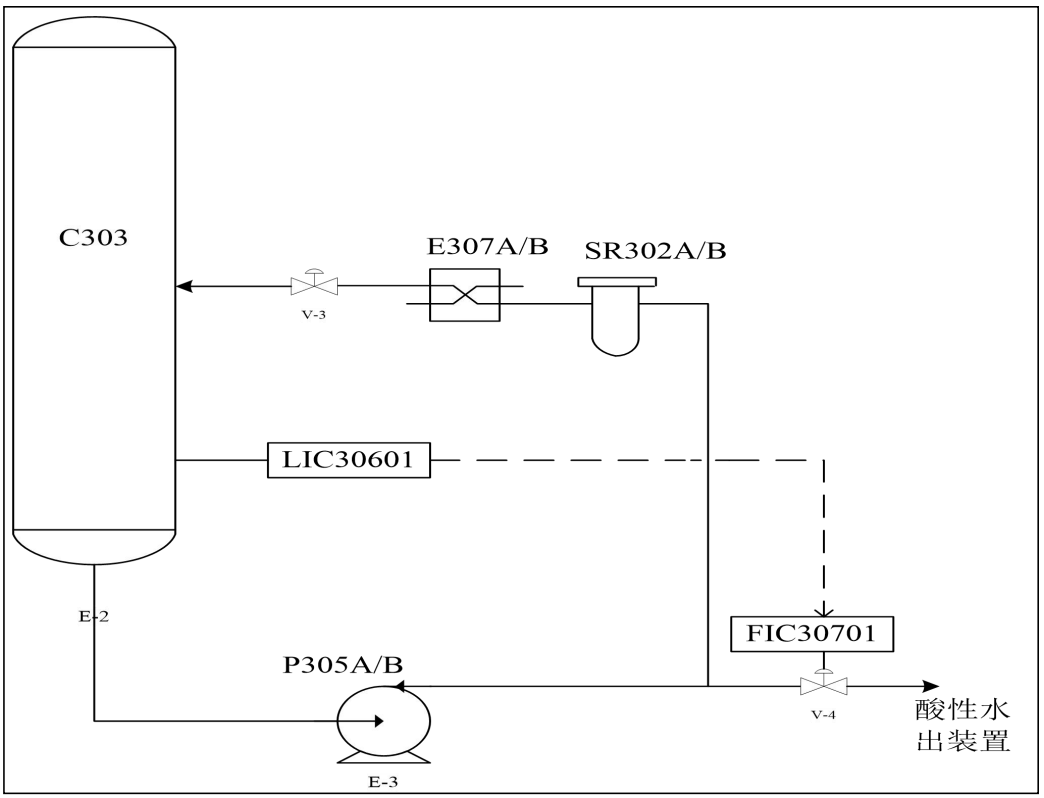
Influence factor 影响因素	Adjustment method 调整方法
C-303 intake gas flow rate C-303 进气流量	When C-303 intake gas flow rate is large, C-303 overhead temperature rises. C-303 进气流量大，C-303 顶温上升。
Intermittent flow rate of C-303 overhead purified water C-303 顶净化水间歇流量	When there is intermittent flow rate of C-303 overhead purified water, C-303 overhead temperature drops. C-303 顶净化水间有间歇流量时，C-303 顶温降。
Temperature of circulating return water to C-303 lower section 返 C-303 下段循环回水温度	When the temperature of circulating return water to C-303 lower section is high, C-303 overhead temperature rises. 返 C-303 下段循环回水温度高，C-303 顶温上升。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling 处理
C-303 overhead overtemperature C-303 顶超温	Fault in three-way inflow control valve 三路进水流控阀故障	Contact the instrument personnel for handling and control by the side-line. 联系仪表处理，开副线控。
	Blocking of filters SR-302, SR-303, SR-304 过滤器 SR-302、SR-303、SR-304 堵	Cut off and clean the filters. 切换过滤器，清洗切出的过滤器。
	P-305A/B, P-306A/B fault P-305A/B、P-306A/B 故障	Contact the operator to start the emergency pump and contact maintenance personnel to handle the faulty pumps. 联系外操开备用泵，联系维修处理故障泵。
	E-307A/B blocking E-307A/B 堵	Cut off the heat exchanger and contact rush repair personnel. 切除换热器，联系抢修。
	Interruption of incoming purified water 外来净化水中断	Increase P-306 draw-off rate for a short time, promptly contact the dispatcher to resume supply. 短期加大 P-306 抽出量，迅速联系调度恢复供应。

Out-of-control handling: too high C-303 overhead temperature will affect the absorption effect of C-304 on hydrogen sulfide, increase the injection rate of fresh ammonia solution to C-304.
失控处理：C-303 顶温过高，将影响 C-304 对硫化氢的吸收效果，则加大 C-304 新鲜氨液注入量。

(12)Control of C-303 bottom level
C-303 底液位的控制
1)Control range: control C-303 bottom level at 30~70%.
控制范围：控制 C-303 底液位控制 30～70%。
2)Control objective: control C-303 bottom level at the reference value ±5% to provide lower circulating reflux and prevent the flexigas inlet from submerging.
控制目标：控制 C-303 底液位在基准值+5%，以提供下部循环回流及防止淹没灵活气进气口。
3)Relevant parameters: delivered acid water at C-303 bottom; flow rate and temperature of circulating return water to C-303 lower part; normal injection rate of incoming purified water; injection rate of intermittent purified water at C-303 overhead; P-306 draw-off rate; column middle liquid level; inlet flow rate and temperature of flexigas.
相关参数：C-303 底外送酸性水量；返 C-303 下部循环回水量、温度；外来净化水正常注入量；C-303 塔顶间歇净化水注入量、P-306 抽出量，塔中部液位，入口灵活气流量跟温度。
4)Control mode: cascade control of C-303 bottom level LIC-30601 and flow control valve FIC-30701 for delivered acid water at C-303 bottom.
控制方式：C-303 塔底液位 LIC-30601 与 C-303 底外送酸性水流控阀 FIC-30701 串及控制。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Delivered acid water at C-303 bottom C-303 底外送酸性水量	Adjust the opening of flow control valve FIC-30701 for delivered acid water at C-303 bottom. When the opening is large, C-303 bottom level drops. 调节 C-303 底外送酸性水流控阀 FIC-30701 开度，开度大，C-303 底液位降。
Flow rate of circulating return water to C-303 返 C-303 下部循环回水量	Adjust the opening of flow control valve FIC-30601 for circulating return water to C-303 lower part. When the opening is large, C-303 bottom level rises. 调节返 C-303 下部循环水量控阀 FIC-30601 开度，开度大，C-303 底液位升。
Normal injection rate of incoming purified water 外来净化水正常注入量	Adjust the opening of flow control valve FIC-30603 for incoming purified water. When the opening is large, C-303 bottom level rises. 调节外来净化水流控阀 FIC-30603 开度，开度大，C-303 底液位升。
Intermittent flow rate of C-303 overhead purified water C-303 顶净化水间歇流量	When there is intermittent flow rate of C-303 overhead purified water, C-303 bottom level rises. Acid water out of unit C-303 顶净化水间有间歇流量时，C-303 底液位升。
P-306 draw-off rate P-306 抽出量	Adjust the opening of flow control valve FIC-30602 out of P-306. When the opening is large, C-303 bottom level rises. 调节出 P-306 流控阀 FIC-30602 开度，开度大，C-303 底液位升。
Temperature of circulating return water to C-303 lower part 返 C-303 下部循环回水温度	When the temperature of circulating return water to C-303 lower part is high, C-303 bottom level is low. 返 C-303 下部循环回水温度高，C-303 底液位底。
Water carried in flexigas into column 进塔灵活气带水量	When the volume of water carried in flexigas into column is large, the liquid level rises. 进塔灵活气带水量大，液位升高。
Temperature of flexigas into column 进塔灵活气温度	When the temperature of flexigas into column is high, the liquid level is low. 进塔灵活气温度高，液位底。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling 处理
Too low liquid level 液位过低	Fault in flow control valve for incoming purified water and circulating return water to column at lower part 外来净化水、下部循环返塔流控阀故障	Contact the instrument personnel for handling and control by the side-line. 联系仪表处理，开副线控。
	Blocking of filter SR-302 过滤器 SR-302 堵	Cut off and clean the filters. 切换过滤器，清洗切出的过滤器。
	Interruption of incoming purified water 外来净化水中断	Promptly contact the dispatcher to resume supply of purified water. 迅速联系调度恢复净化水供应。
	Malfunction of liquid level indicator LI-30601 液位指示 LI-30601 失灵	Contact the instrument personnel for handling. 联系仪表处理。
Too high liquid level 液位过高	Fault in delivery flow control valve 外送流控阀故障	Contact the instrument personnel for handling and control by the side-line. 联系仪表处理，开副线控。
	P-305A/B fault P-305A/B 故障	Contact the operator to start the emergency pump and contact maintenance personnel to handle the faulty pumps. 联系外操开备用泵，联系维修处理故障泵。
	Malfunction of liquid level indicator LI-30601 液位指示 LI-30601 失灵	Contact the instrument personnel for handling. 联系仪表处理。

Out-of-control handling: when C-303 bottom level is too low, increase the injection rate of incoming purified water; when the liquid level is too high and it is possible to submerge the gas intake height, suspend the work.

失控调节：C-303 底液位过低时，可加大外来净化水注入量；液位过高，有淹没进气高度时停工处理。

(13) Control of C-303 upper liquid level C-303 上部液位的控制

1)Control range: control C-303 upper liquid level at 30~70%.

控制范围：控制 C-303 上部液位控制 30～70%（现在无液位显示）。

2)Control objective: control C-303 upper liquid level at the reference value ±5%.

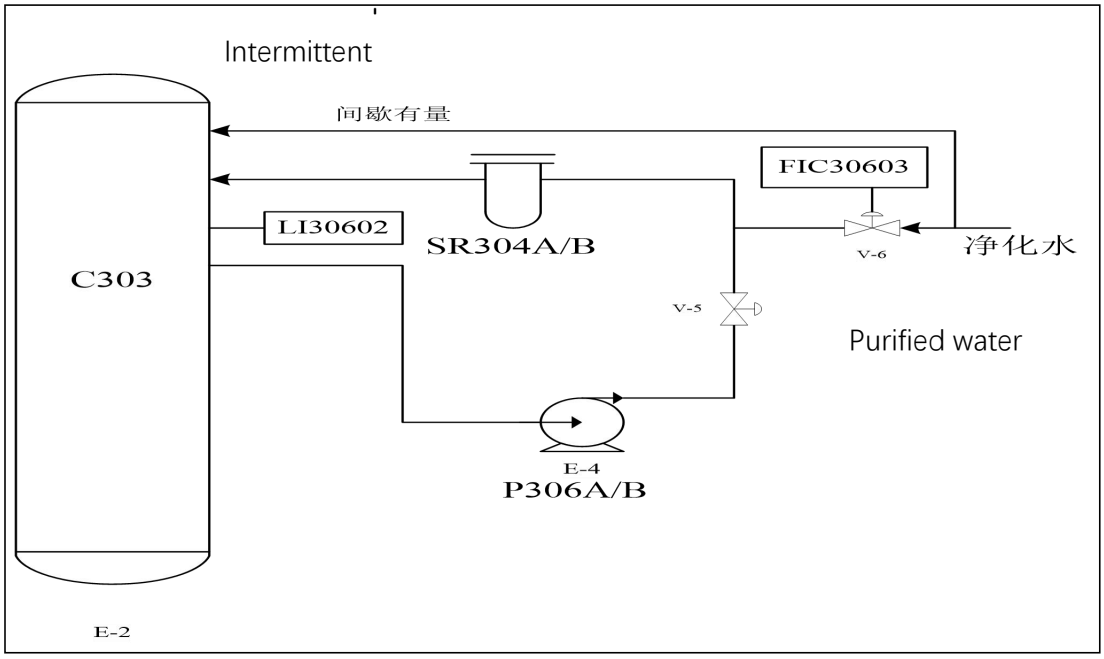
控制目标：控制 C-303 上部液位在基准值±5%。

3)Relevant parameters: P-306 draw-off rate; normal injection rate of incoming purified water; injection rate of intermittent purified water at C-303 overhead.

相关参数：P-306 抽出量；外来净化水正常注入量；C-303 塔顶间歇净化水注入量。

4)Control mode: cascade control of C-303 upper liquid level LI-30602 and flow control valve FIC-30603 for incoming purified water.

控制方式：C-303 上部液位 LI-30602 与外来净化水流控阀 FIC-30603 串及控制。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
P-306 draw-off rate P-306 抽出量	Adjust the opening of flow control valve FIC-30602 out of P-306. When the opening is large, C-303 upper liquid level drops. 调节出 P-306 流控阀 FIC-30602 开度，开度大，C-303 上部液位降低。
Normal injection rate of incoming purified water 外来净化水正常注入量	Adjust the opening of flow control valve FIC-30603 for incoming purified water. When the opening is large, C-303 upper liquid level rises. 调节外来净化水流控阀 FIC-30603 开度，开度大，C-303 上部液位升高。
Intermittent flow rate of C-303 overhead purified water C-303 顶净化水间歇流量	When there is intermittent flow rate of C-303 overhead purified water, C-303 upper liquid level rises. C-303 顶净化水间有间歇流量时，C-303 上部液位升。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling 处理
Too low liquid level 液位过低	Fault in upper two-way inflow control valve 上部两路进水流控阀故障	Contact the instrument personnel for handling and control by the side-line. 联系仪表处理，开副线控。
	Malfunction of liquid level indicator LI-30602 液位指示 LI-30602 失灵	Contact the instrument personnel for handling. 联系仪表处理。
Too high liquid level 液位过高	Blocking of filter SR-304 过滤器 SR-304 堵	Cut off and clean the filters. 切换过滤器，清洗切出的过滤器。
	P-306A/B fault P-306A/B 故障	Contact the operator to start the emergency pump and contact maintenance personnel to handle the faulty pumps. 联系外操开备用泵，联系维修处理故障泵。
	Malfunction of liquid level indicator LI-30602 液位指示 LI-30602 失灵	Contact the instrument personnel for handling. 联系仪表处理。

Out-of-control handling: when C-303 upper liquid level is too low, stop P-306 to prevent pump vacuumizing and increase the injection rate of incoming purified water.

失控处理：C-303 上部液位过低，停 P-306，防止泵抽空，加大外来净化水注入量。

(14) Control of C-304 bottom level LIC-31203

C-304 底部液位 LIC-31203 控制

1)Control range: control the liquid level at 30~70%.

控制范围：控制液位在 30～70%。

2)Control objective: control it at the reference value ±5%.

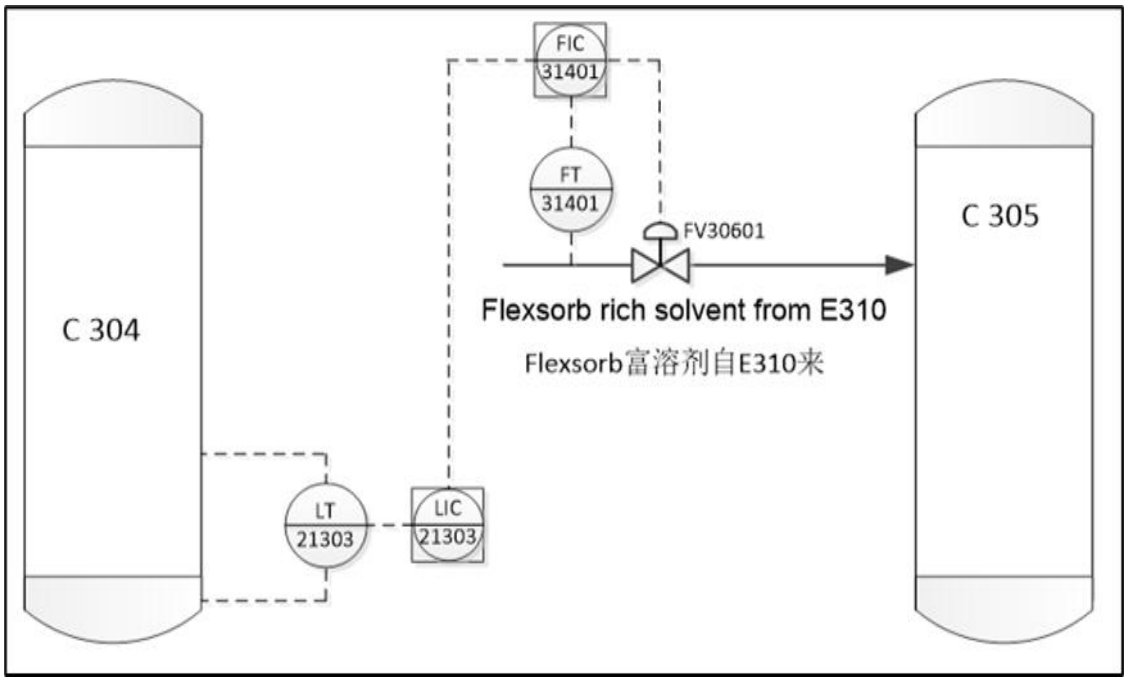
控制目标：控制在基准值±5%。

3)Relevant parameters: flow rate FIC-31401 of rich solvent to regenerator; flow rate FIC-31201 of lean solvent into desulfurizer; water carried in flexigas from secondary contact cooling column.

相关参数：富溶剂去再生塔的流量 FIC-31401；贫溶剂进脱硫塔的流量 FIC-31201；自二级接触冷却塔来的灵活气中携带水量。

4)Control mode: generally control by flow control valve FIC-31401 for rich solvent to regenerator.

控制方式：一般采用 C304 塔底液位 LIC21303 与 C304 富溶剂去再生塔流量 FIC-31401 串级控制。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Opening of FIC-31401 valve FIC-31401 阀开度	When the valve opens, the rich solvent to regenerator increases and the liquid level drops; otherwise, it rises. 开阀，去再生塔的富溶剂增多，液位下降，反之，则上升。
Opening of FIC-31201 valve FIC-31201 阀开度	When the valve opens, the lean solvent to desulfurizer increases and the liquid level rises; otherwise, it drops. 开阀，进脱硫塔的贫溶剂增多，液位上升，反之，则下降。
Opening of FIC-31202 valve FIC-31202 阀开度	When the valve opens, the lean LP boiler water to desulfurizer increases and the liquid level rises; otherwise, it drops. 开阀，进脱硫塔的低压锅炉水增多，液位上升，反之，则下降。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling 处理
Fluctuation in C-304 bottom level C-304 塔底液位波动	LIC-31203, FIC-31401 instrument malfunction LIC-31203、FIC-31401 仪表失灵	Switch to manual or side-line control, and contact the instrument personnel for maintenance. 切手动或副线控制，联系仪表维修。
	PS303 chain start PS303 连锁启动	Restore the interlocking control of C304 feeding, turn off the small discharge. 恢复连锁控制 C304 进料，关小出料。

Phenomenon 现象	Cause 原因	Handling 处理
Gradual rising of C-304 bottom level C-304 塔底液位逐渐上升	When the temperature of flexigas from secondary contact cooling column rises suddenly, the carried water suddenly increases. 自二级接触冷却塔来灵活气温度突然升高，带水量突然增大	Adjust the circulating water of the secondary contact cooling column and lower the temperature of flexigas to reduce the carried water. 对二级接触冷却塔循环水量进行调节，降低灵活气温度，以减少带水量。
	SR-312 blocking causing reduced delivery SR-312 堵塞导致送出量减小	Inspect the differential pressure of filters, and timely replace them. 检查过滤器压差，及时更换。
	Fault in P-310 running pump P-310 运行泵故障	Timely switch to emergency pump, find out the causes, and contact bench workers for maintenance. 及时切备泵，查明原因联系钳工进行维修。
	Fault in FV-31401 valve, locked at low valve position FV-31401 阀故障，在低阀位锁死	Switch to side-line control and maintain or replace the valve. 切副线控制，对阀进行维修或更换。
	Fault in FV-31201 valve, locked at high valve position FV-31201 阀故障，在高阀位锁死	Switch to side-line control and maintain or replace the valve. 切副线控制，对阀进行维修或更换。
	Fault in FV-31204 valve, locked at high valve position FV-31204 阀故障，在高阀位锁死	Switch to side-line control and maintain or replace the valve. 切副线控制，对阀进行维修或更换。
Gradual lowering in C-304 bottom level C-304 塔底液位逐渐降低	Reduction or interruption in addition of lean solution 贫液补入量减少或中断	Inspect T-302 liquid level and the operating conditions of lean solution feed pump P-308 to timely resume to normal. 检查 T-302 液面和贫溶液进料泵 P-308 运行状况，及时恢复。
	Fault in FV-31401 valve, locked at high valve position FV-31401 阀故障，在高阀位锁死	Switch to side-line control and maintain or replace the valve. 切副线控制，对阀进行维修或更换。
	Fault in FV-31201 valve, locked at low valve position FV-31201 阀故障，在低阀位锁死	Switch to side-line control and maintain or replace the valve. 切副线控制，对阀进行维修或更换。

Out-of-control handling: when both pumps at column bottom P-310 are in fault, the bottom level continuously rises to pass the flexigas inlet: reduce the intake of lean solution, and reduce the

handling capacity of flexigas, perform rush repair for the pumps, resume the operating conditions as appropriate. If the repair is not completed for a long time, this part should be suspended.

失控处理：塔底 P-310 两台泵均故障，塔底液面不断上升，没过灵活气进入口：要减少贫液进入量，同时降低灵活气处理量，对泵进行抢修，视情况恢复工况，若长时间未修复，此部分做停工处理。

(15) Control of C-304 upper liquid level LIC-31202

C-304 上部液位 LIC-31202 控制

1)Control range: control the temperature at 30~70%.

控制范围：控制温度在 30～70%。

2)Control objective: control it at the reference value ±5%.

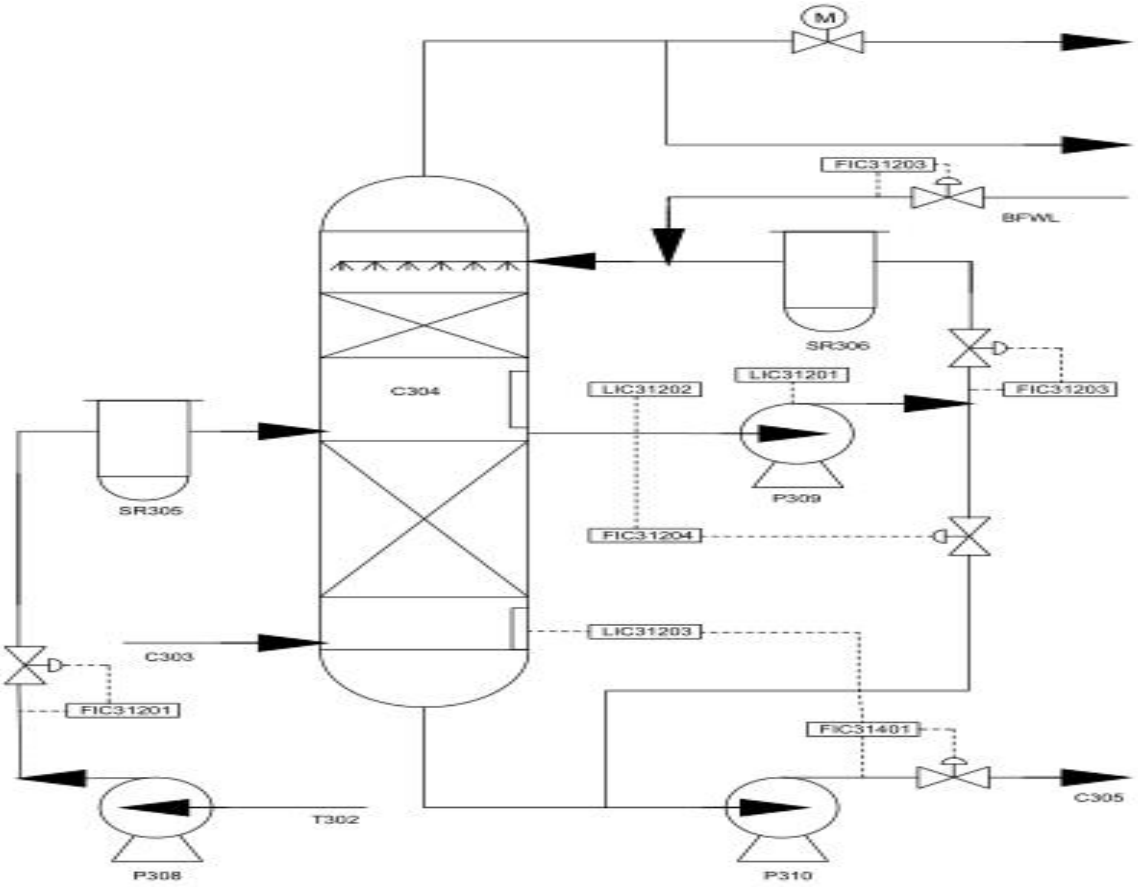
控制目标：控制在基准值±5%。

3)Relevant parameters: flow rate FIC-31204 from P-309 outlet to P-310 inlet; make-up flow rate FIC-31202 of LP boiler water; carried amine solution in flexigas from lower part.

相关参数：P-309 出口去 P-310 入口的流量 FIC-31204；低压锅炉水补入流量 FIC-31202；自下部来灵活气中携带胺液量。

4)Control mode: generally control by flow control valve FIC-31204.

控制方式：一般采用流控阀 FIC-31204 与 LIC31202 串级控制.



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Opening of FIC-31204 valve FIC-31204 阀开度	When the valve opens, the delivered rate increases and the liquid level drops; otherwise, it rises. 开阀，出去的量增多，液位下降，反之，则上升。
Opening of FIC-31202 valve FIC-31202 阀开度	When the valve opens, the added rate increases and the liquid level rises; otherwise, it drops. 开阀，补入量增多，液位上升，反之，则降低。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling 处理
Fluctuation in C-304 upper liquid level C-304 上部液位波动	LIC-31202 instrument malfunction LIC-31202 仪表失灵	Switch FV-31204 to manual or side-line control, and contact the instrument personnel for handling. FV-31204 改手动或副线控制，联系仪表处理。

Phenomenon 现象	Cause 原因	Handling 处理
Lowering of C-304 upper liquid level C-304 上部液位降低	Reduction or interruption in addition of LP boiler water flow rate 补入的低压锅炉水流量减少或中断	Inspect the valve position and the operating conditions of the LP boiler water pump P108 on site to timely resume to normal. 现场检查阀位以及低压锅炉水泵 P108 运行状况，及时恢复。
	FV-31202 fault, locked at low valve position FV-31202 故障，在低阀位锁死	Switch to side-line control and maintain or replace the valve. 切副线控制，对阀进行维修或更换。
	FV-31204 fault, locked at high valve position FV-31204 故障，在高阀位锁死	Switch to side-line control and maintain or replace the valve. 切副线控制，对阀进行维修或更换。
	SR-306 blocking causing reduced circulating rate SR-306 堵塞导致循环量减小	Inspect the differential pressure of filters, and timely replace them. 检查过滤器压差，及时更换。
Rising of C-304 upper liquid level C-304 上部液位上升	Fault in P-309 running pump P-309 运行泵故障	Timely switch to emergency pump, find out the causes, and contact bench workers for maintenance. 及时切备泵，查明原因联系钳工进行维修。
	FV-31202 fault, locked at high valve position FV-31202 故障，在高阀位锁死	Switch to side-line control and maintain or replace the valve. 切副线控制，对阀进行维修或更换。
	FV-31204 fault, locked at low valve position FV-31204 故障，在低阀位锁死	Switch to side-line control and maintain or replace the valve. 切副线控制，对阀进行维修或更换。

Out-of-control handling: when both pumps of P-309 are in fault, the liquid level rises, causing air resistance, and even changing the heater pressure to affect the regenerating part under serious circumstance: close FV-31202.

失控处理：P-309 两台泵均故障，液面上升，造成气阻，严重时，会使加热器压力发生变化，影响反再部分：关闭 FV-31202。

(16) Control PIC-31202 of C-304 flexigas pressure (differential pressure PIDC-10902A and PIDC-10902B of reactor and heater)

C-304 灵活气压力的控制 PIC-31202（反应器、加热压差 PIDC-10902A、PIDC-10902B）

1)Control range: control PI-31202 of C-304 flexigas pressure: 0.115~0.135MPa, differential pressure of reactor and heater.

控制范围：C-304 灵活气压力的控制 PI-31202 0.115～0.135MPa 反应器、加热器压差。

2)Control objective: keep the differential pressure of reactor - heater constant in the fluctuation in the whole FLEXIGAS production process, with the specific control value to be given by the production schedule.

控制目标：目的是在整个 FLEXIGAS 生产过程的波动中保持反应器—加热器压差恒定，具体控制数值根据生产方案给定。

3)Relevant parameters: reaction pressure and heater pressure

相关参数：反应压力、加热器压力、加热器至 C304 压降。

4)Control mode: control Rx-Hx differential pressure mainly by operating the control valve at C-304 overhead. When the differential pressure is high, turn up PDV-10902A; when the differential pressure is low, turn down it.

控制方式：Rx-Hx 差压主要通过操作 C-304 顶部的控制阀进行控制，差压大时开大 PDV-10902A，差压小时关小。

FXG LP protection:

FXG 低压保护：

With the drop of FXG header pressure, the differential pressure of PDIC-10902A will drop. When the measured differential pressure of PDIC-10902A drops, the controller PDIC-10902A provides low differential pressure protection for refinery equipment by operating PDV-10902A.

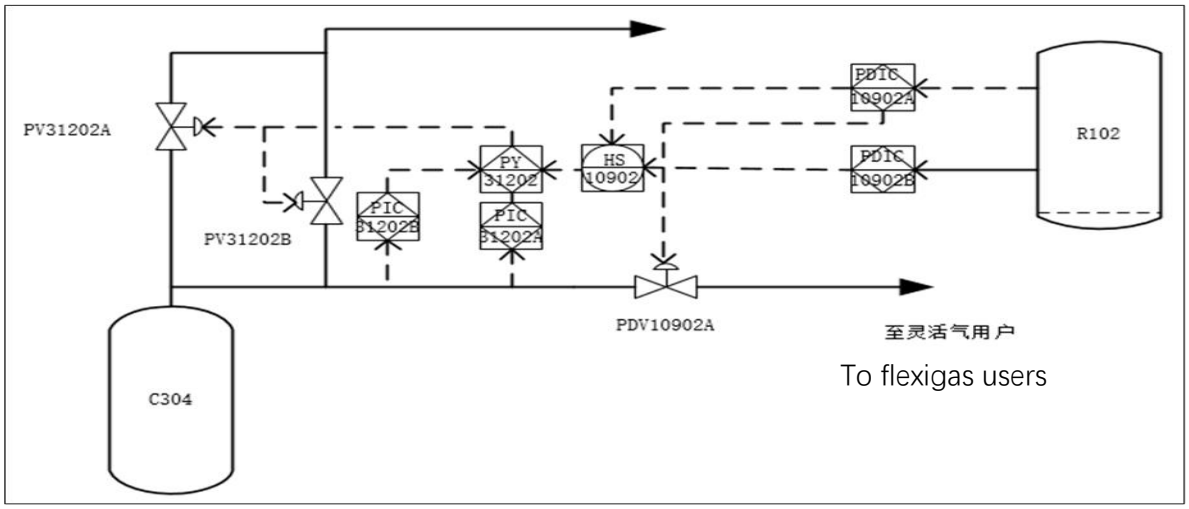
随着 FXG 总管压力的降低，PDIC-10902A 的差压将降低。当 PDIC-10902A 测得的差压下降时，控制器 PDIC-10902A 通过操纵 PDV-10902A 为炼油厂设备提供低差压保护。

FXG HP protection:

FXG 高压保护:

With rising of FXG header pressure, control FXG header pressure by PV-31202 when its rising velocity is slow and by PV-31202B when its rising velocity is fast.

随着 FXG 总管压力的上升，FXG 总管压力上升速度较慢时使用 PV-31202 控制 FXG 总管压力，FXG 总管压力上升速度较快时使用 PV-31202B 控制 FXG 总管压力。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Main air volume 主风量	When the main air flow rate increases, the heater pressure rises; otherwise, it drops. 主风流量增大，加热器压力上升，反之加热器压力下降。
FXG header pressure FXG 总管压力	When the pressure control valve PDV-10902A for FXG header is turned up, the heater pressure drops and the differential pressure becomes low; when the valve is turned down, the heater pressure rises and the differential pressure becomes high. FXG 总管压控阀 PDV-10902A 开大，加热器压力下降，差压变小，阀关小加热器压力升高，差压变大。

6)Troubleshooting: 异常调节:

Phenomenon 现象	Cause 原因	Handling 处理
Reaction pressure fluctuation causing differential pressure fluctuation 反应压力波动导致差压波动	Change in the total feed rate of the reactor (including sludge redistillation) and reaction depth 反应总进料量（包含污泥回炼）及反应深度变化	When the total feed rate increases, the reaction pressure rises, and timely contact the unit personnel to adjust the speed and properly control the reaction pressure. When the speed increases, the pressure drops; otherwise, the pressure rises. 总进料增加，反应压力上升，及时联系机组调整转速控制好反应压力。转速提高，压力下降，反之上升。
	Water carried in raw materials 原料带水	Contact the dispatcher, inform the tank farm to intensify dehydration or replace the tank, and inform the reaction personnel to reduce the temperature and rate in the case of serious water carrying. 联系调度，通知罐区加强脱水或换罐，带水严重时，反应岗位降温降量。

Phenomenon 现象	Cause 原因	Handling 处理
	Change of raw material atomizing steam, stripping steam, stirring steam of scrubber, grinding steam of reactor, anti-coking steam of reactor 原料雾化蒸汽、汽提蒸汽、洗涤塔搅拌蒸汽、反应器磨碎蒸汽、反应器防焦蒸汽等量的变化	Adjust and stabilize the steam rate. When the valve position is turned up, the steam rate is high; otherwise, the steam rate is low. 将蒸汽的量调节稳定，阀位开大，蒸汽量大，反之蒸汽量小。
	Too large cold reflux rate at fractionator overhead 分馏塔顶冷回流量过大	Contact fractionation personnel to reduce the cold reflux rate. 联系分馏岗位减少冷回流量。
	Change of the opening of flare valve at gas compressor inlet 气压机入口放火炬阀开度变化	If the reaction pressure cannot be controlled, timely regulate it by the flare at the gas compressor inlet. When the flare valve is turned up, the reaction pressure drops; otherwise, it rises. 如反应压力控制不了，及时通过气压机入口放火炬来调节，放火炬阀开大，则反应压力下降，反之上升。
	Fault or rate change in anti-flying regulating valve 反飞动调节阀故障或量变化	Timely cut off the anti-flying regulating valve, switch to side-line, and contact the instrument personnel for handling. 及时将反飞动调节阀切除改走副线并联系仪表处理。
	Fluctuation in the large and small flare valve position 大小放火炬阀阀位波动	Timely switch the flare valve to manual locking on site, and contact the instrument personnel or bench workers for handling. 及时将放火炬阀改现场手动关闭，联系仪表或钳工处理。

Phenomenon 现象	Cause 原因	Handling 处理
	Change of reaction temperature 反应温度变化	When the total feed rate, regenerator temperature, pressure and gas compressor speed remain unchanged, both the reaction temperature and the reaction pressure rise; otherwise, they drop. 总进料量不变、再生器温度、压力不变、气压机转速不变，反应温度上升，反应压力也随之上升，反之下降。
	Fault in compressing liquid valve of gas compressor 气压机压液阀故障	The fault in compressing liquid valve of gas compressor may cause the gas channeling of HP oil at the gas compressor into D-201, the rising of the fractionator overhead pressure and thus the rising of the reaction pressure. 气压机压液阀故障，可导致气压机处的高压油气窜至 D-201,造成分馏塔顶压力升高，进而使反应压力升高。
	Impact of rich absorption oil back to fractionator 富吸收油返分馏塔影响	Rich absorption oil back to the column shall be steady, and it is prohibited to press the reabsorber empty and let dry gas channel into the fractionator. 富吸收油返塔要平稳，严禁再吸收塔压空，干气窜入分馏塔。
	Substantial reduction in the rate of HHKO, HKGO, LKGO and MPA causing the start of its emergency steam HHKO、HKGO、LKGO、MPA 量大幅减小导致其事故蒸汽开启	Rapidly recover the rate of HHKO, HKGO, LKGO and MPA, and regulate the reaction pressure by the gas compressor speed. 快速恢复 HHKGO、HKGO、LKGO、MPA 量，并通过气压机转速调节反应压力。
	Change of nitrogen rate for sludge redistillation 污泥回练氮气量的变化	Adjust and stabilize the nitrogen rate. When the valve position is turned up, the steam rate is high; otherwise, the steam rate is low. 将氮气的量调节稳定，阀位开大，蒸汽量大，反之蒸汽量小。

Phenomenon 现象	Cause 原因	Handling 处理
Pressure fluctuation in the heater and the flexigas processing section causing differential pressure fluctuation 加热器及灵活气处理部分压力波动导致差压波动	Fault in the stationary blade control system of main fan 主风机静叶控制系统故障	Contact related parties for handling. 联系相关单位处理。
	Low D-103 liquid level triggering start of vapor and water spray of the heater D-103 液位低触发开启加热器喷汽喷水	Control D-103 liquid level to normal. 将 D-103 液位控制正常。
	Increasing D101 coke discharge rate causing higher D101 return gas rate D101 卸焦量增大导致 D101 返气量变大	Regulate the heater pressure by the opening of the pressure control valve PDV-10902A of FXG header. 通过FXG总管压控阀PDV-10902A开度来调节加热器压力。
	Change of the thermoregulation air and steam rate of the heater 加热器调温风和调温蒸汽量的变化	Properly control the thermoregulation air and steam rate. 控制好调温风和调蒸汽的量。
	Change of the gasification rate causing change of the thermoregulation air and steam rate of the vaporizer 气化率发生变化导致气化器调温风和调温蒸汽量发生变化	Regulate the heater pressure by the opening of the pressure control valve PDV-10902A of FXG header. 通过FXG总管压控阀PDV-10902A开度来调节加热器压力。

Phenomenon 现象	Cause 原因	Handling 处理
	Rising of overhead temperature of the vaporizer causing the rising of the quenching forging temperature of the heater to trigger PS-107 to start overhead vapor and water spray of the heater, causing the rising of the heater pressure 气化器顶部温度升高导致加热器急冷锻温度升高触发 PS-107 开启加热器顶部喷汽喷水导致加热器压力升高	Control the overhead temperature of the vaporizer by adjusting the thermoregulation air and steam of the vaporizer, and regulate the heater pressure by the opening of the pressure control valve PDV-10902A of FXG header. 调整气化器调温风和调温蒸汽控制气化器顶部温度，通过 FXG 总管压控阀 PDV-10902A 开度来调节加热器压力。
	Fault and shutdown of main fan 主风机故障停机	Trigger the interlocking, see the emergency plan for detailed handling method. 触发联锁详细处理方法见应急预案。
	Increasing pressure drop of filler in primary and secondary water scrubbers and FXG desulfurizer 一、二级水洗及 FXG 脱硫塔填料压降变大	Flush the filler with purified water and resume the differential pressure. 用净化水冲洗填料，恢复差压。
	Increasing R-301AB differential pressure R-301AB 差压变大	Switch to standby reactor 切换至备用反应器。
	Fault in safety valve of flexigas header 灵活气总管安全阀故障	Switch to the standby safety valve, and contact the maintenance personnel. 切换至备用安全阀，联系检修。

Phenomenon 现象	Cause 原因	Handling 处理
	The amount of flexible gas in downstream devices fluctuates greatly。 下游装置灵活气用量幅度波动	Contact the dispatcher to stabilize the heater pressure by adjusting the opening of the torch。 联系调度通过调整放火炬稳定加热器压力。
	DY302 pressure drop becomes larger DY302 压降变大	Adjust DY302 angle or self-circulation amount 调整 DY302 角度或自循环量

(17) Control of C-305 overhead temperature

C-305 顶部温度的控制

1)Control range: control C-305 overhead temperature at 110~135℃.

控制范围：控制 C-305 顶部温度 110～135℃。

2)Control objective: control at the set C-305 overhead temperature ±5℃.

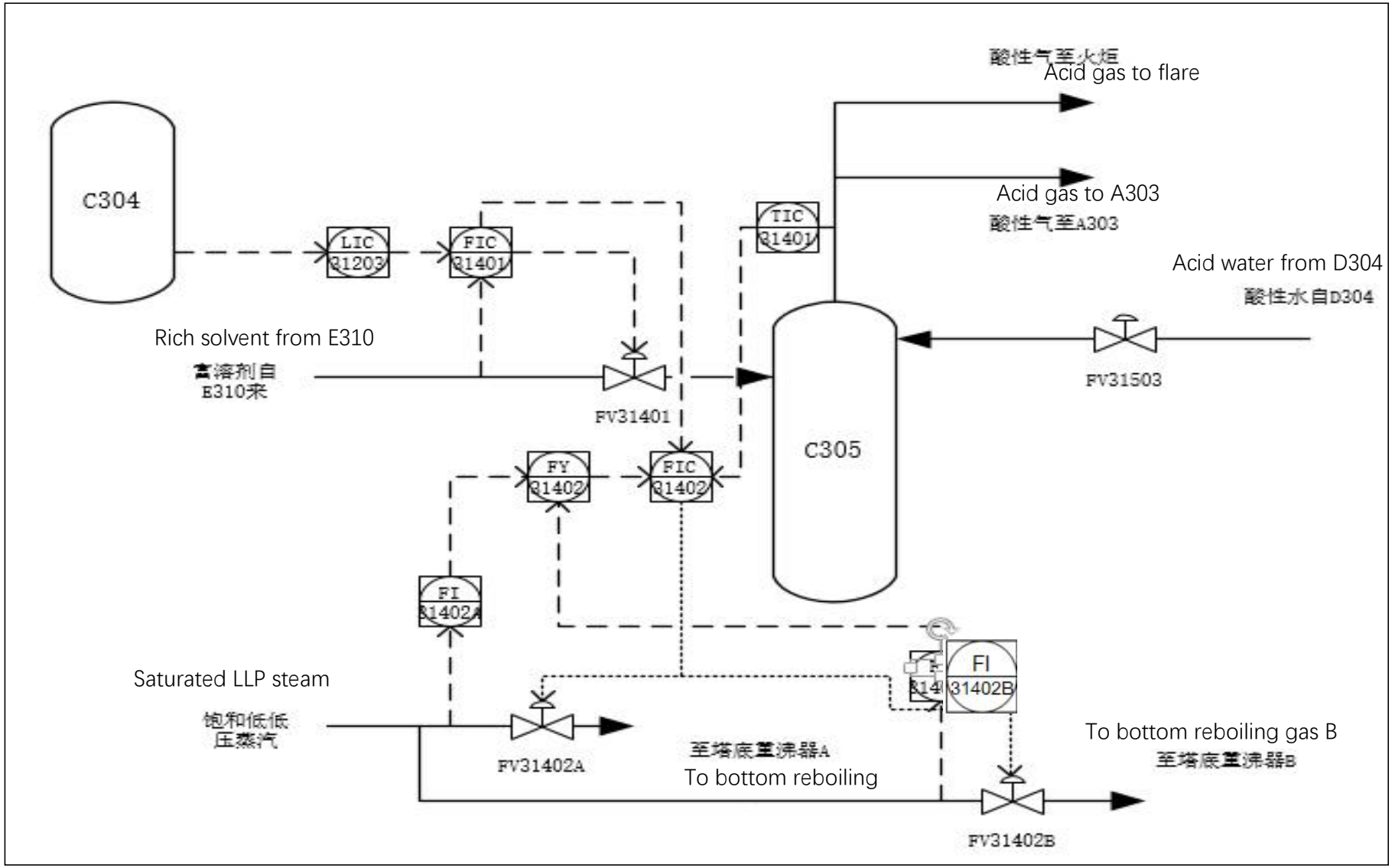
控制目标：控制 C-305 顶部温度设定±5℃。

3)Relevant parameters: feed rate and temperature of rich FLEXSORB® of regenerator, E-311AB saturated LLP steam rate, C-305 overhead reflux rate and temperature.

相关参数：再生塔富 FLEXSORB®进料量及温度、E-311AB 饱和低低压蒸汽量、C-305 顶部回流量及温度。

4)Control mode: control the steam supply of each heat exchanger as per the flow rate proportion according to the feed of rich FLEXSORB® of the regenerator.

控制方式：根据再生塔富 FLEXSORB®进料按流量比例控制两台换热器中每台的供汽量。


酸性气至火炬
Acid gas to flare
C304
LIC
31203
FIC
31401
TIC
31401
Acid gas to A303
酸性气至A303
Acid water from D304
酸性水自D304
Rich solvent from E310
富溶剂自
E310来
FV31401
FV31503
C305
FY
31402
FIC
31402
FI
31402A
Saturated LLP steam
饱和低低
压蒸汽
FV31402A
至塔底重沸器A
To bottom reboiling
FI
31402B
To bottom reboiling gas B
至塔底重沸器B
FV31402B

5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调 整方法
Feed rate of rich amine solution of regenerator 再生塔富胺液进料量	When the feed rate of rich amine solution of regenerator increases, the overhead temperature drops; otherwise,, it rises. 再生塔富胺液进料量增大塔顶温度会降低，反之升高。
Feed temperature of rich amine solution of regenerator 再生塔富胺液进料温度	When the feed temperature of rich amine solution of regenerator rises, the overhead temperature rises; otherwise, it drops. The feed temperature may be regulated by three-way valve TV-31301. 再生塔富胺液进料温度升高塔顶温度升高，反之降低，可通过三通阀 TV-31301 调节进料温度。
E-311AB saturated LLP steam rate E-311AB 饱和低低压蒸汽量	When E-311AB saturated LLP steam rate increase, the temperature inside the column rises; otherwise, it drops. E-311AB 饱和低低压蒸汽量增大则塔内温度升高，反之降低。

6)Troubleshooting: 异常调节:

Phenomenon 现象	Cause 原因	Handling method 处理方法
C-305 overhead overtemperature C-305 顶部温度过高	Blocking of feed filter SR-312 of rich amine solution of regenerator or not timely switching after E-310AB blocking causing decreasing feed rate of rich amine solution 再生塔富胺液进料过滤器SR-312堵塞或 E-310AB 堵塞切换不及时导致富胺液进料量变小	Contact maintenance personnel and timely switch to corresponding filter or heat exchanger. 联系检修并及时切换相应过滤器或换热器。
	Stop of feed pump for rich amine solution of regenerator causing feed stop 再生塔富胺液进料泵停泵导致进料停	Contact maintenance personnel for handling and start the emergency pump to resume feed. 联系检修处理，启动备用泵恢复进料。

Phenomenon 现象	Cause 原因	Handling method 处理方法
	No bottom level of the desulfurizer or blocking of the filter at the feed pump inlet of rich amine solution of regenerator causing pump evacuation 脱硫塔塔底无液位或再生塔富胺液进料泵入口过滤器堵塞等原因导致泵抽空	Find out the specific reason to resume feed. 找出具体原因恢复进料。
	Fault in the regulating valve for feed of rich amine solution of regenerator causing decreasing feed rate 再生塔富胺液进料调节阀故障导致进料量变小	First switch to manual or side-line operation, and contact the instrument personnel for handling. 先改手动或副线操作，联系仪表处理。
	Fault in the regulating valve for E-311AB saturated LLP steam causing increasing steam rate E-311AB 饱和低低压蒸汽调节阀故障导致蒸汽量变大	First switch to manual or side-line operation, and contact the instrument personnel for handling. 先改手动或副线操作，联系仪表处理。
	Reduction or interruption of overhead reflux rate 塔顶回流量变小或中断	Timely resume the overhead reflux rate. 及时恢复塔顶回流量。
	Rising of the overhead reflux rate and temperature 塔顶回流量温度升高	Inspect the air cooling and water cooling of overhead reflux, and regulate the overhead reflux temperature. 检查塔顶回流空冷水冷调节顶回流温度。
Too low C-305 overhead temperature C-305 顶部温度过低	Fault in the regulating valve for feed of rich amine solution of regenerator causing increasing feed rate 再生塔富胺液进料调节阀故障导致进料量变大	First switch to manual or side-line operation, and contact the instrument personnel for handling. 先改手动或副线操作，联系仪表处理。

Phenomenon 现象	Cause 原因	Handling method 处理方法
	Fault in the regulating valve for E-311AB saturated LLP steam causing decreasing steam rate E-311AB 饱和低低压蒸汽调节阀故障导致蒸汽量变小	First switch to manual or side-line operation, and contact the instrument personnel for handling. 先改手动或副线操作，联系仪表处理。
	Interruption of saturated LLP steam 饱和低低压蒸汽中断	Resume saturated LLP steam. 恢复饱和低低压蒸汽。
	Internal scaling of E-311AB heat exchanger causing sharp drop of heat exchange efficiency E-311AB 换热器内部结垢导致换热效率急剧下降	Contact the maintenance personnel for the heat exchanger. 联系检修换热器。
	Too large overhead reflux rate 顶回流量过大	Regulate the overhead reflux rate by FV-31503. 通过 FV-31503 调节顶回流量。
	Too low C-305 pressure C-305 压力过低	Control the pressure in the column by the FV-31501AB acid gas regulating valve. 通过 FV-31501AB 酸性气调节阀控制塔内压力。

(18) Control of C-305 bottom level

C-305 底液位的控制

1)Control range: control C-305 bottom level at 30~70%.

控制范围：控制 C-305 底液位 30～70%。

2)Control objective: control the liquid level the reference value ±5%.

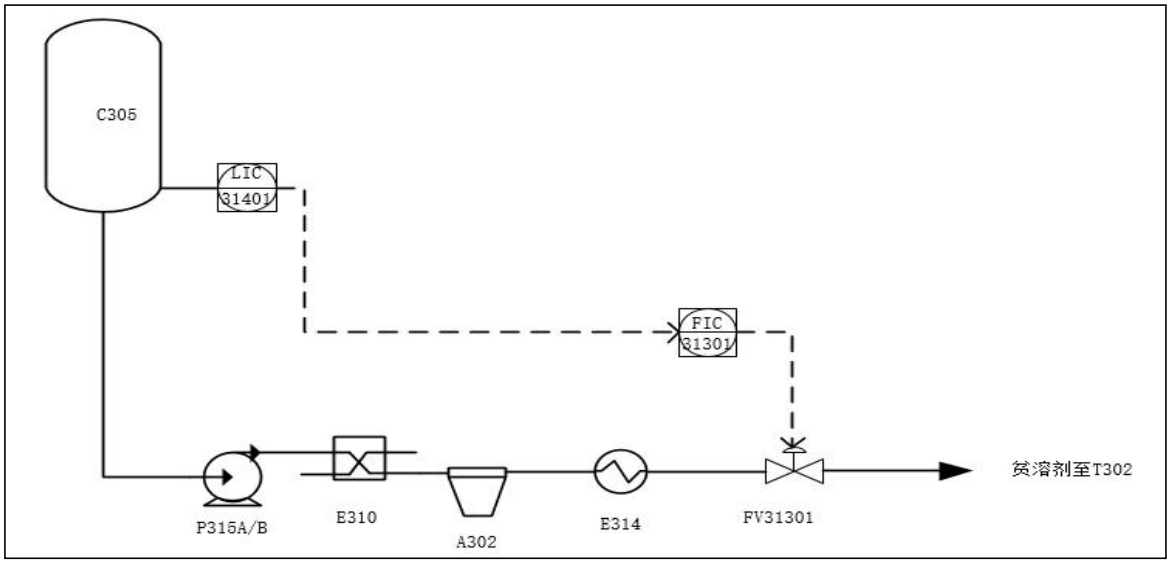
控制目标：控制控制液面基准值±5%。

3)Relevant parameters: feed rate FT-31401 of rich amine solution of regenerator, overhead reflux rate FT-31503, LP boiler feed water rate FT-31501, flow rate FT-31301 of lean solvent to T-302, C-305 liquid level LIC-31401.

相关参数：再生塔富胺液进料量 FT-31401、顶回流量 FT-31503、低压锅炉给水量 FT-31501、贫溶剂去 T-302 流量 FT-31301、C-305 液面 LIC-31401。

4)Control mode: control C-305 liquid level LIC-31401 by the flow control valve FV-31301 for lean solvent to T-302.

控制方式：采用贫溶剂去 T-302 流量控制阀 FV-31301 控制 C-305 液面 LIC-31401.



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Flow rate of lean solvent to T-302 贫溶剂去T-302流量	Control C-305 liquid level LIC-31401 by the flow control valve FV-31301 for lean solvent to T-302. When the regulating valve is turned up, the liquid level drops; otherwise, it rises. 采用贫溶剂去 T-302 流量控制阀 FV-31301 控制 C-305 液面 LIC-31401 调节阀开大则液面降低、反之则升高。

6)Troubleshooting: 异常调节:

Phenomenon 现象	Cause 原因	Handling method 处理方法
Substantial rising of C-305 bottom level C-305 底液位大幅上升	Stop of bottom pump P-315AB or filter blocking causing pump evacuation 塔底泵 P-315AB 停泵或因过滤器堵塞引起泵抽空	Switch to emergency pump. 切换至备用泵。
	Blocking of the flow path of lean solvent to T302 贫溶剂去 T302 流程不通	Inspect and contact relevant personnel to unblock the flow path. 检查联系，倒通流程。
	Internal leakage of overhead reflux in the cooler causing increasing cold reflux rate 顶回流冷却器内漏导致冷回流量变大	Cut off the cooler with leakage. 将泄漏的冷却器切除。

Phenomenon 现象	Cause 原因	Handling method 处理方法
	Fault in liquid level meter 液位计仪表故障	Contact the instrument personnel for handling. 联系仪表处理。
	Full opening of overhead reflux make-up valve 顶回流补水阀全开	Turn down the valve. 关小阀门。
	ES304 starts abnormally ES304 异常启动	Recovery interlock 恢复联锁
Substantial lowering of C-305 bottom level C-305 底液位大幅下降	Interruption or sharp reduction in feed of rich amine solution of regenerator 再生塔富胺液进料中断或急剧减少	Inspect and resume the correct flow path. 检查恢复正确流程。
	Full opening of the flow control valve for lean solvent to T-302 or of the side-line valve 贫溶剂去 T-302 流量控制阀全开或者副线阀全开	Resume the regulating valve and side-line valve position to normal opening. 恢复调节阀和副线阀阀位至正常开度。
	Fault in liquid level meter 液位计仪表故障	Contact the instrument personnel for handling. 联系仪表处理。
Drastic fluctuation in C-305 bottom level C-305 底液位大幅波动	Steam leakage in the bottom reboiler channeling into the column 塔底重沸器漏蒸汽窜入塔内	Disable the heat exchanger with leakage and contact the maintenance personnel. 停用泄漏换热器并联系检修人员检修。
	Fault in liquid level meter 液位计仪表故障	Contact the instrument personnel for handling. 联系仪表处理。

(19) Control of the feed temperature of C-305 rich solution

C-305 富液进料温度的控制

1)Control range: control the feed temperature of C-305 rich solution at 95~110℃.

控制范围：C-305 富液进料温度的控制在 95～110℃。

2)Control objective: control the feed temperature of rich solution of regenerator at the set value ±5℃.

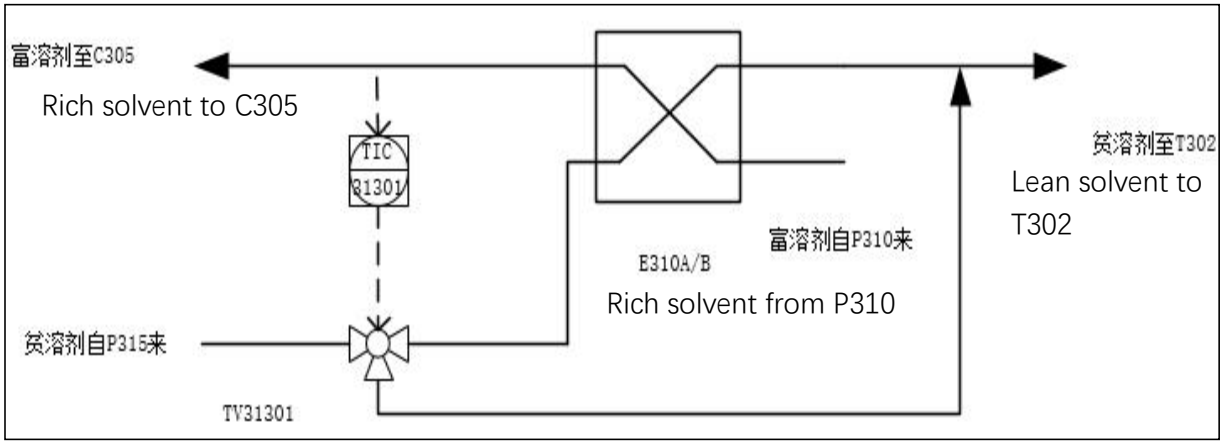
控制目标：再生塔富液进料温度在设定值±5℃。

3)Relevant parameters: outlet temperature of rich solvent pump P-308, rich solvent feed rate FT-31401, outlet temperature of regenerator bottom pump P-315, flow rate FT-31301 of lean solvent to T-302.

相关参数：富溶剂泵 P-308 出口温度、富溶剂进料量 FT-31401、再生塔底泵 P-315 出口温度、贫溶剂去 T-302 流量 FT-31301。

4)Control mode: control by the three-way valve TV-31301 for lean solvent.

控制方式：采用贫溶剂三通阀 TV-31301 控制。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Heat exchange between lean solvent and rich solvent 贫溶剂与富溶剂的换热	Control the feed temperature of rich solvent to C-305 by the three-way control valve TV-31301 for lean solvent. When the three-way valve is turned up, the feed temperature drops; otherwise, it rises. 采用贫溶剂三通控制阀 TV-31301 控制富溶剂去 C-305 的进料温度，三通阀开大则进料温度降低，反之则升高。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
Too low feed temperature of rich solution of regenerator 再生塔富液进料温度过低	Fault in three-way control valve TV-31301 三通控制阀 TV-31301 故障	Contact the instrument personnel for handling. 联系仪表处理。
	Lowering of the heat exchange efficiency of E-310 heat exchanger E-310 换热器换热效率下降	Switch to the standby heat exchanger. 切换至备用换热器。

	P315 outlet flow is reduced or interrupted. P315 出口流量降低或中断。	Activate the pump to stabilize the P315 outlet flow 启备泵，稳定 P315 出口流量
Drastic fluctuation or too high feed temperature of rich solution of regenerator 再生塔富液进料温度大幅波动或过高	Instrument fault 仪表故障	Contact the instrument personnel for handling. 联系仪表处理。

(20)Control of acid gas pressure 酸性气压力的控制

1)Control range: control the acid gas pressure at 0.1~0.13MPa.

控制范围：酸性气压力控制在 0.1～0.13MPa。

2)Control objective: control the acid gas pressure at the reference value ±5KPa.

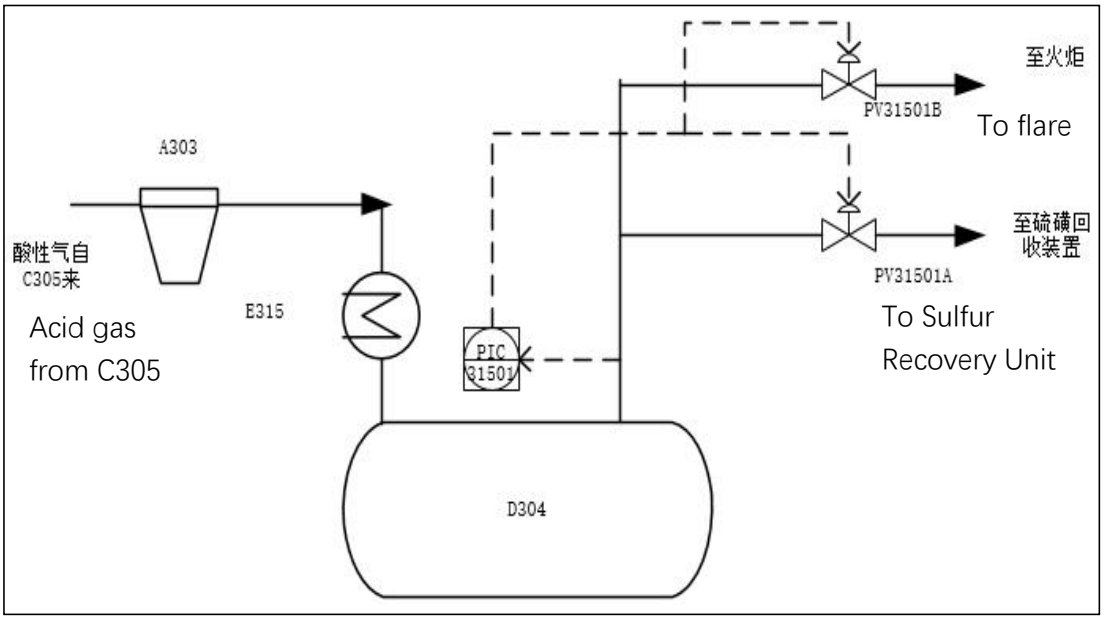
控制目标：控制酸性气压力在基准值±5 KPa。

3)Relevant parameters: C-305 overhead temperature, C-305 overhead pressure, A-303 and E-315 post-cooling temperature, C-305 overhead reflux rate.

相关参数：C-305 顶部温度、C-305 顶部压力、A-303 和 E-315 冷后温度、C-305 塔顶回流量。

4)Control mode: control the acid gas pressure by the pressure control valve PV-31501A for acid gas to sulfur recovery unit and the pressure control valve PV-31501B for acid gas to acid gas flare.

控制方式：采用酸性气至硫磺回收装置压控阀 PV-31501A 配合酸性气至酸性气火炬压控阀 PV-31501B 控制酸性气压力。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Change of acid gas rate 酸性气量变化	When the acid gas rate increases, turn up the pressure control valve for acid gas to sulfur recovery unit; otherwise, turn down the pressure control valve. 酸性气量增大则开大酸性气至硫磺回收装置压控阀，反之则关小压控阀。
Opening of pressure control valve 压控阀开度	When the opening of pressure control valve increases, the pressure drops; otherwise, the pressure rises. 压控阀开度增大压力降低，反之压力升高。
C-305 overhead pressure C-305 顶部压力	When C-305 overhead pressure rises, turn up the pressure control valve for acid gas to sulfur recovery unit; otherwise, turn down the pressure control valve. C-305 顶部压力升高则开大酸性气至硫磺回收装置压控阀，反之则关小压控阀。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
Fluctuation in acid gas pressure 酸性气压力波动	Shutdown or load decreasing of sulfur recovery unit 硫磺回收装置停工或者降低负荷	Start acid gas flare valve for pressure relief. 开启酸性气放火炬阀泄压。
	Malfunction of pressure control valve for acid gas to sulfur recovery unit 酸性气至硫磺回收装置压控阀失灵	First switch to manual or side-line operation, and contact the instrument personnel for handling. 先改手动或副线操作，联系仪表处理。
	Insufficient air cooling or water cooling load 空冷或水冷负荷不够	Increase air cooling or water cooling load. 增加空冷或水冷负荷。
	Fault in the overhead safety valve of regenerator 再生塔顶安全阀故障	Cut off the safety valve, contact the maintenance personnel for verification, and then reassembly it. 切除安全阀，联系检修进行校验后回装。。
	Leakage of regenerator bottom reboiler 再生塔底重沸器漏	Cut off the reboiler with leakage, and contact maintenance personnel. 切除泄漏的重沸器，联系检修。

(21) Control of acid gas temperature 酸性气温度的控制

1)Control range: control the acid gas temperature at 40~60℃.

控制范围：酸性气温度控制在 40～60℃。

2)Control objective: control the acid gas temperature at reference value ±5℃.

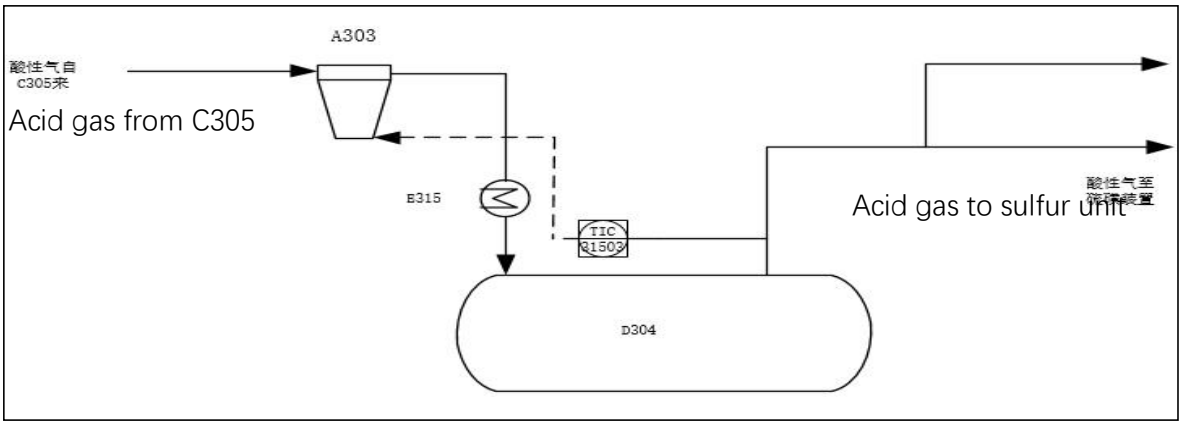
控制目标：控制酸性气温度在基准值±5℃。

3)Relevant parameters: C-305 overhead temperature, A-303 and E-315 post-cooling temperature, C-305 overhead pressure.

相关参数：C-305 顶部温度、A-303 和 E-315 冷后温度、C-305 顶部压力。

4)Control mode: adjust the load of A-303 and E-315 to adjust the acid gas temperature.

控制方式：调整 A-303 和 E-315 的负荷调整酸性气温度。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
A-303 load A-303 负荷	When A-303 load increases, the acid gas temperature drops; otherwise, it rises. A-303 负荷增大酸性气温度降低，反之升高。
E-315 load E-315 负荷	When E-315 load increases, the acid gas temperature drops; otherwise, it rises. E-315 负荷增大酸性气温度降低，反之升高。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
Rising of acid gas temperature 酸性气温度升高	Rising or drop of C-305 overhead temperature C-305 塔顶温度升高或降低	Control the overhead temperature within the normal range, and regulate it by air cooling and water cooling load. 控制塔顶温度在正常范围，并通过空冷和水冷的负荷进行调节。

Phenomenon 现象	Cause 原因	Handling method 处理方法
	Insufficient air cooling or water cooling load 空冷或水冷负荷不够	Increase air cooling or water cooling load. 增加空冷或水冷负荷。
	Fault in A-303 air cooler A-303 空冷故障	Contact maintenance personnel. 联系检修。。
	Fault in E-315 water cooler E-315 水冷故障	Switch to side-line and maintain the heat exchanger. 切换到副线检修换热器。

(22) Control D-304 liquid level

D-304 液位的控制

1)Control range: D-304 liquid level is controlled to be 30~70%.

控制范围：D-304 液位控制在 30～70%。

2)Control objective: ±5% of the D-304 liquid level control fluctuation range that has been set.

控制目标：设定的 D-304 液面控制波动范围±5%。

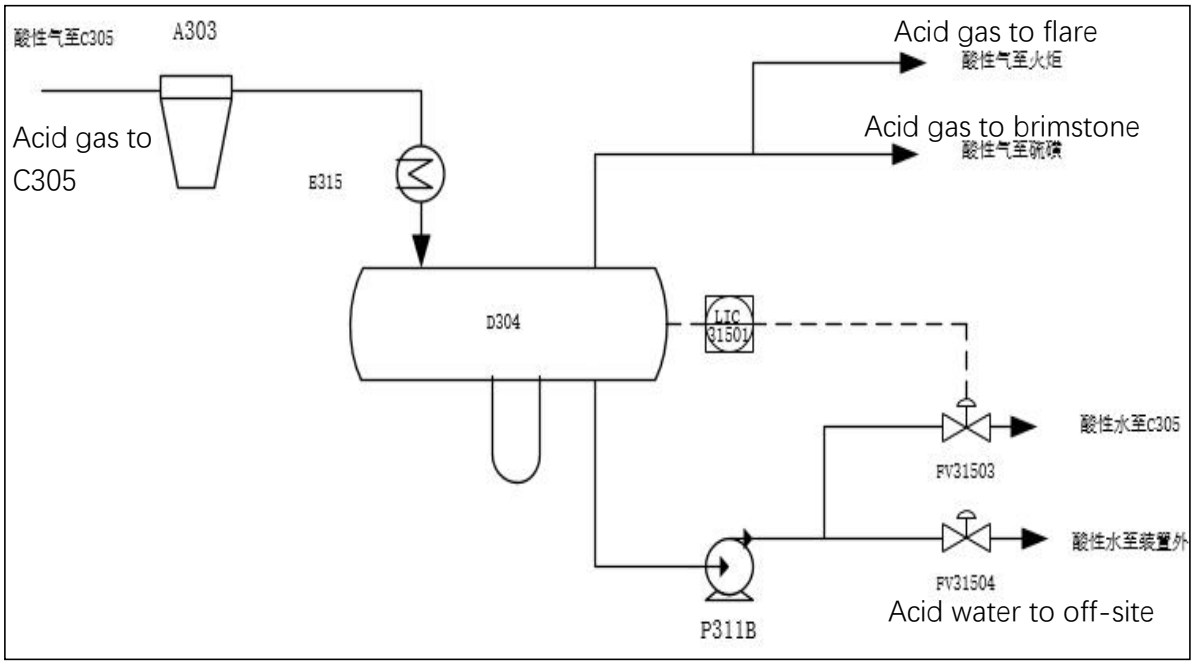
3)Relevant parameters: temperature at top of C-305, post-cooling temperature of A-303 and E-315, flow rate of acid water to C-305.

相关参数：C-305 顶部温度、A-303 和 E-315 冷后温度、酸性水去 C-305 流量。

4)Control mode: adjust flow rate of acid water to C-305.

控制方式：调整酸性水去 C-305 流量。

5)Normal adjustment: 正常调整：



Influence factor 影响因素	Adjustment method 调整方法
Volume of acid water to acid water header 酸性水去酸性水集合管的量	FV-31504 injects a fixed quantity of acid water into the acid water header, and adjusts D-304 liquid level through the flow rate to C-305. FV-31504 将固定数量的酸性水冲入酸水集管中，通过去 C-305 的量来调整 D-304 液位。
Flow rate of acid water returning to C-305. 酸性水返回 C-305 的流量	Flow rate to C-305 is controlled by the regulating opening of the regulating valve FV-31503; the liquid level drops when the valve opening widens, and vice versa. 去 C-305 的流量通过调节阀 FV-31503 的阀位开度控制，阀位开度变大液面下降，反之液面上升。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
D-304 liquid level fluctuates D-304 液面波动	Internal leakage of E-314 water cooler E-314 水冷内漏	Switch to side-line and maintain the heat exchanger. 切换到副线检修换热器。
	Fault of FV-31504 regulating valve FV-31504 调节阀故障	First switch to manual or side-line operation, and contact the instrument personnel for handling. 先改手动或副线操作，联系仪表处理。
	Fault of FV-31503 regulating valve FV-31503 调节阀故障	First switch to manual or side-line operation, and contact the instrument personnel for handling. 先改手动或副线操作，联系仪表处理。
	Fault of P-311 regenerator reflux pump P-311 再生塔回流泵故障	Switch to emergency pump 切换到备用泵。

(23) Control of T-302 liquid level

T-302 液位的控制

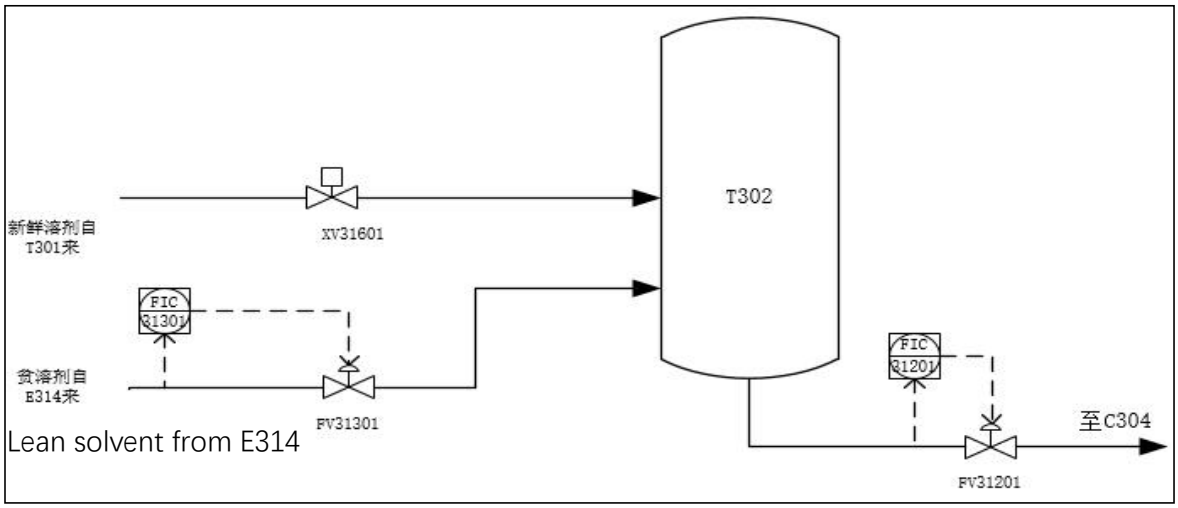
1)Control range: T-302 liquid level is controlled to be 30~70%.

控制范围：T-302 液位控制在 30～70%。

2)Control objective: the set liquid level fluctuation range of T-302 ±5%

控制目标：设定的 T-302 液位的控制波动范围±5%。

3)Relevant parameters: flow rate (FT-31301) of lean solvent from C-305; flow rate (FT-31602) of fresh solvent from T-301; flow rate (FT-31201) of lean solvent to C-304
相关参数：贫溶剂自 C-305 来量 FT-31301，新鲜溶剂自 T-301 来量 FT-31602，地下溶剂量，贫溶剂至 C-304 量 FT-31201。
4)Control mode: T-302 liquid level is mainly controlled through flow rate of lean solvent to C-304 and flow rate of lean solvent from C-305.
控制方式：T-302 液位主要通过贫溶剂去 C-304 流量和贫溶剂自 C-305 来流量控制。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Flow rate of lean solvent to C-304 贫溶剂去 C-304 流量	Opening of the control valve FV-31201 for flow rate of lean solvent to C-304 widens, T-302 liquid level drops, and vice versa. 贫溶剂去 C-304 流量控制阀 FV-31201 开大则 T-302 液位降低，反之液位升高。
Flow rate of lean solvent from C-305 贫溶剂自 C-305 来流量	Opening of the control valve FV-31301 for flow rate of lean solvent from 305 widens, T-302 liquid level rises, and vice versa. 贫溶剂自 C-305 来的流量控制阀 FV-31301 开大则 T-302 液位升高，反之液位降低。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
T-302 liquid level fluctuates	Fresh solvent causes extra high liquid level to T-302 新鲜溶剂导致 T-302 液面超高	Stop flow of fresh solvent to T-302. 停新鲜溶剂进 T-302。

Phenomenon 现象	Cause 原因	Handling method 处理方法
T-302 液面波动	Underground solvent causes extra high liquid level to T-302 地下溶剂导致 T-302 液面高	Stop underground solvent to T-302. 停地下溶剂进 T-302。
	P-308 fault P-308 故障	Switch to emergency pump 切换到备用泵。
	Flow path of lean solvent to C-304 blocked 贫溶剂去 C-304 流程不通	Check and open up the flow path. 检查并打通流程。
	Fault of the regulating valve FV-31201 for lean solvent to C-304 贫溶剂去 C-304 调节阀 FV-31201 故障	First switch to manual or side-line operation, and contact the instrument personnel for handling. 先改手动或副线操作，联系仪表处理。
	Fault of the regulating valve FV-31301 for lean solvent from C-305 贫溶剂自 C-305 来调节阀 FV-31301 故障	First switch to manual or side-line operation, and contact the instrument personnel for handling. 先改手动或副线操作，联系仪表处理。
	Flow path of lean solvent from C-305 blocked 贫溶剂自 C-305 来流程不通	Check and open up the flow path. 检查并打通流程。
	E-310 equipment leakage E-310 设备泄漏	Switch to stand-by heat exchanger, contact relevant personnel for maintenance. 切换到备用换热器，联系检修。
	E-314 equipment leakage E-314 设备泄漏	Switch to equipment side-line, and contact relevant personnel for maintenance. 改走设备副线，联系检修。
	Differential pressures of the filter SR-312, SR-307, SR-310 and SR-311 are high. 过滤器 SR-312、SR-307、SR-310、SR-311 差压过高	Switch to the standby filter, and contact relevant personnel for cleaning the filter. 切换到备用过滤器、联系清过滤器。
	D-306 leakage or high differential pressure D-306 泄漏或差压高	Switch to the side-line, contact relevant personnel for maintenance. 切换到副线，联系检修。

(24) T-302 pressure control

T-302 压力的控制

1)Control range: pressure corresponding to the T-302 liquid level is controlled to be ().

控制范围：T-302 液位的压力控制在（）。

2)Control objective: the set pressure fluctuation range of T-302 ±10%.

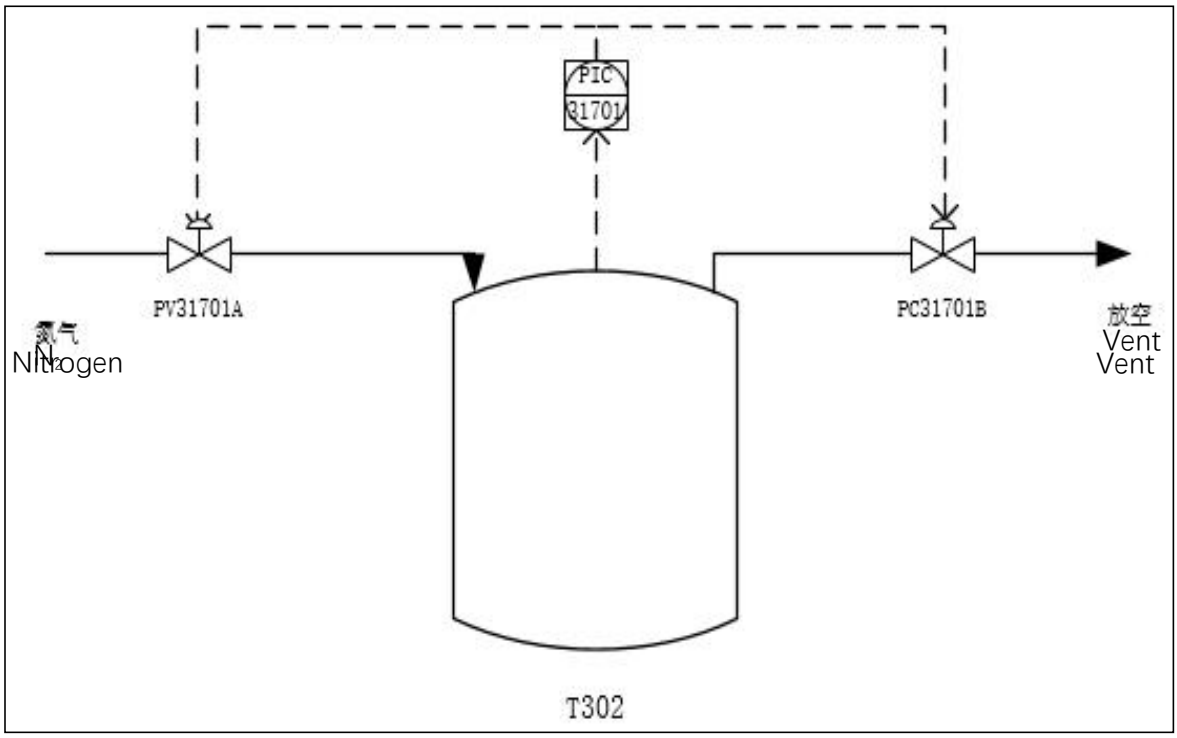
控制目标：设定的 T-302 压力的控制波动范围±10%。

3)Relevant parameters: flow rate (FT-31301) of lean solvent from C-305; flow rate (FT-31602) of fresh solvent from T-301; flow rate (FT-31201) of lean solvent to C-304, volume of nitrogen injected to T-302, volume of gas discharged from T-302 to the atmosphere.

相关参数：贫溶剂自 C-305 来量 FT-31301、新鲜溶剂自 T-301 来量 FT-31602、地下溶剂量、贫溶剂至 C-304 量 FT-31201、T-302 氮气注入量、T-302 气体放大气量。

4)Control mode: T-302 pressure is mainly controlled in a split-ranging way through the pressure control valve PV-31701A for nitrogen injection volume and the pressure control valve PV-31701B for the gas discharged from T-302 to the atmosphere.

控制方式：T-302 压力主要通过氮气注入量压控阀 PV-31701A 和 T-302 气体放大气压控阀 PV-31701B 分程控制。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Volume of nitrogen injected to T-302	Pressure inside the tank increases as the nitrogen pressure control valve of T-302 turns up, and vice versa. T-302 氮气压控阀阀开大则罐内压力升高，反之压力降低。

T-302 氮气注入量	
Gas discharges from T-302 to the atmosphere T-302 气体排大气	Pressure inside the tank decreases as the pressure control valve for the gas discharged from T-302 to the atmosphere turns up, and vice versa. T-302 气体排大气压控阀开大则罐内压力下降，反之压力升高。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
T-302 pressure fluctuates T-302 压力波动	Fault of nitrogen pressure control valve of T-302 T-302 氮气压控阀故障	First switch to manual or side-line operation, and contact the instrument personnel for handling. 先改手动或副线操作，联系仪表处理。
	Pressure control valve for gas discharged from T-302 to the atmosphere T-302 气体排大气压控阀	First switch to manual or side-line operation, and contact the instrument personnel for handling. 先改手动或副线操作，联系仪表处理。
	Pressure of the nitrogen pipe network fluctuates greatly 氮气管网压力波动大	Contact the dispatcher or utility personnel for ensure stable pressure of the nitrogen pipe network. 联系调度或公用工程保证氮气管网压力平稳。

(25) Control temperature of lean solution 贫液温度的控制

1)Control range: temperature of the lean solution is controlled to be 30~50℃.

控制范围：贫液的温度控制在 30～50℃。

2)Control objective: the set temperature control fluctuation range of lean solution ±5℃

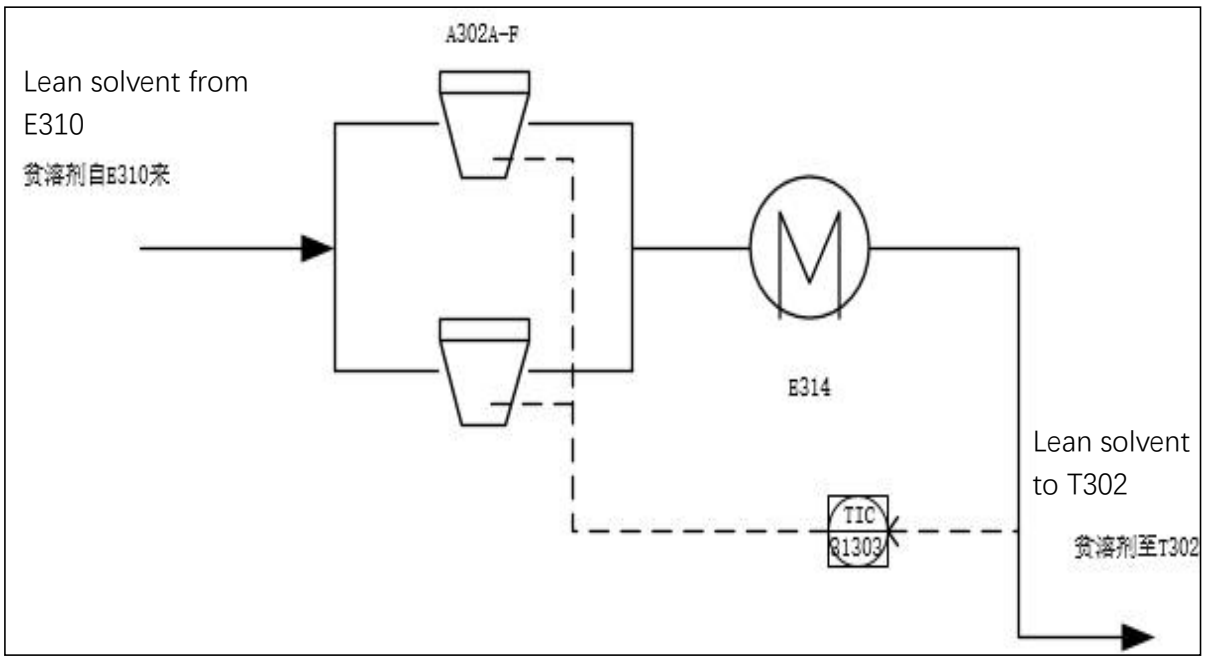
控制目标：设定的贫液温度控制波动范围±5℃。

3)Relevant parameters: temperature (TI-31408) at bottom of C-305; temperature (TI-31303) of the lean solution after exchanging heat via E-310, A-302 and E-314.

相关参数：C-305 塔底温度 TI-31408、贫液经 E-310、A-302 和 E-314 换热后温度 TI-31303。

4)Control mode: temperature of the lean solution is regulated by changing load of the air cooler A-302.

控制方式：贫液温度通过改变空冷 A-302 负荷来调节贫液温度。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
A-302 load A-302 负荷	Increasing A-302 load makes temperature of the lean solution drop; decreasing A-302 load makes temperature of the lean solution rise. 增加 A-302 负荷则贫液温度降低，降低 A-302 负荷则贫液温度上升。
E-314 load E-314 负荷	Increasing E-314 load makes temperature of the lean solution drop; decreasing E-314 load makes temperature of the lean solution rise. 增加 E-314 负荷则贫液温度降低，降低 E-314 负荷则贫液温度上升。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling method 处理方法
Temperature of the lean solution rises 贫液温度上升	A-302 fault A-302 故障	Start air coolers that have not been started; if all air coolers have been started, adjust E-314 load, and contact relevant personnel for the maintenance of A-302. 启用未启用的空冷，如果空冷全部启用，调整 E-314 负荷，联系检修 A-302。
	E-314 fault E-314 故障	Switch E-314 to side-line control, and contact relevant personnel for maintenance.

		E-314 改副线操作，联系检修。

(26) Control of E-312 liquid level

E-312 液位的控制

1)Control range: keep E-312 liquid level to be 30~70%.

控制范围：控制 E-312 液位 30～70%。

2)Control objective: keep E-312 liquid level to be reference value ±5%, to prevent extra low level leading to evaporation to dryness.

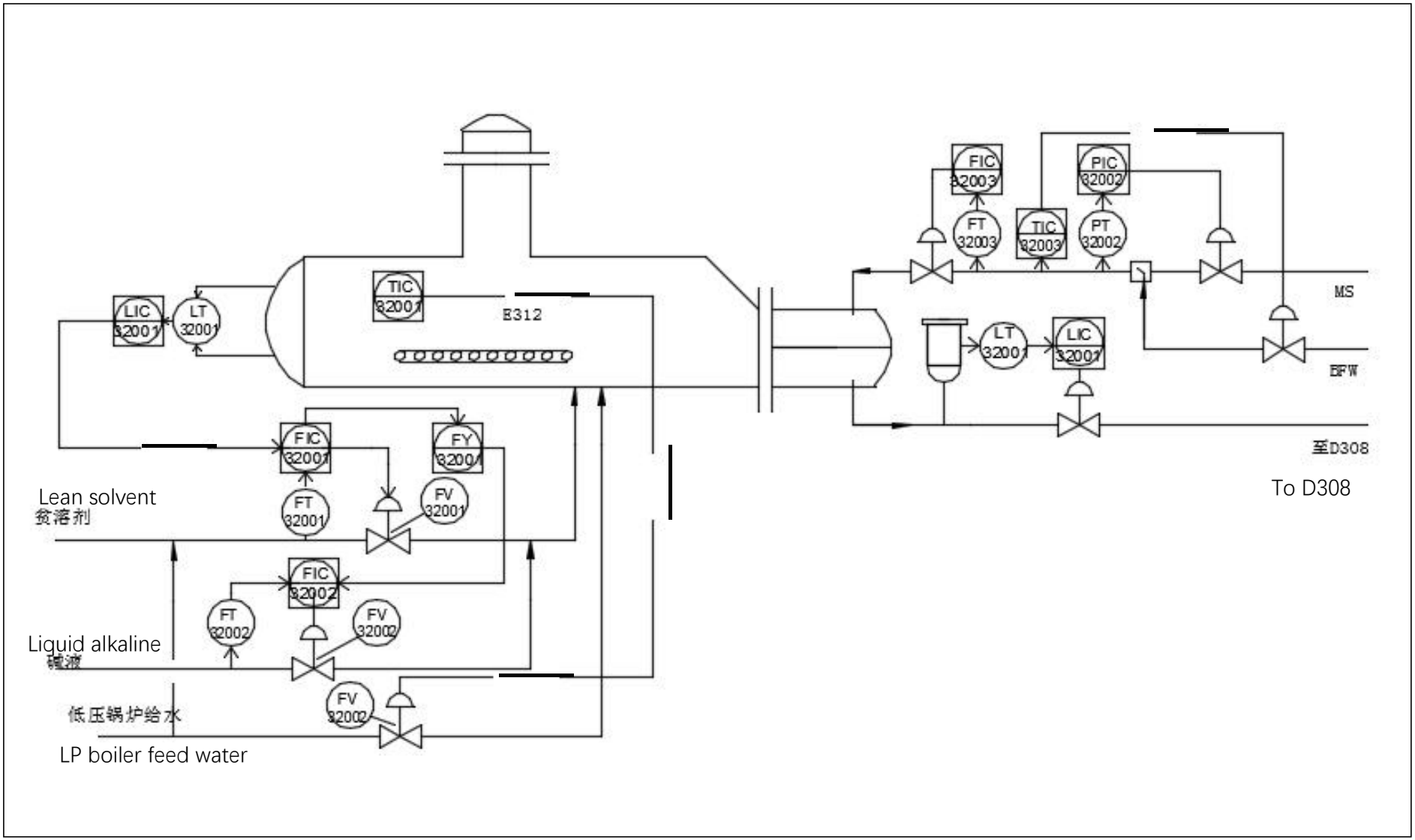
控制目标：控制 E-312 液位在基准值±5%，防止液位过低被蒸干。

3)Relevant parameters: draw-off rate (FIC-32001) from the regenerator to E-312; volume (FIC-32002) that makes up for the deaerated water; regenerator pressure (PIC-31501); temperature (TIC-32003) and flow rate (FIC-32003) of the heat source steam; temperature (TIC-32001) of residual liquid discharged to T-303 and E-312.

相关参数：再生塔至 E-312 抽出量 FIC-32001，补除氧水量 FIC-32002，再生塔压力 PIC-31501，热源蒸汽温度 TIC-32003 和流量 FIC-32003，残液排放至 T-303，E-312 温度 TIC-32001。

4)Control mode: the liquid level regulation and control valve (LIC-32001) is generally selected to act on the regenerator and control the draw-off flow rate valve (FIC-32001) and deaerated water rate valve (FIC-32002).

控制方式：一般采用调节液位控制阀 LIC-32001 作用到再生塔抽出流量阀 FIC-32001 和补除氧水量阀 FIC-32002 控制。


FIC 32003
PIC 32002
FT 32003
TIC 32003
PT 32002
MS
BFW
LT 32001
LIC 32001
至D308
To D308
TIC 32001
E312
LIC 32001
LT 32001
FIC 32001
FY 32001
FT 32001
FV 32001
Lean solvent
贫溶剂
FIC 32002
FT 32002
FV 32002
Liquid alkaline
碱液
低压锅炉给水
FV 32002
LP boiler feed water

5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Opening of the draw-off valve (FIC32001) from regenerator to E-312 再生塔至 E-312 抽出阀 FIC32001 开度	E-312 liquid level rises as the flow rate (FIC-32001) of draw-off from bottom of the regenerator increases, and vice versa. 再生塔底抽出流量 FIC-32001 增加，E-312 液位上升，反之亦然。
Opening width of the deaerated water makeup valve (FIC-32002) 补除氧水阀 FIC-32002 开度	E-312 liquid level rises as the flow rate (FIC-32002) of deaerated water makeup water increases, and vice versa. 补除氧水流量 FIC-32002 增加，E-312 液位上升，反之亦然。
Regenerator pressure PIC31501 再生塔压力 PIC31501	E-312 liquid level rises as pressure (PIC-31501) of the regenerator drops, and vice versa. 再生塔压力 PIC-31501 下降，E-312 液位上升，反之亦然。
Temperature (TIC32003) of heat source steam 热源蒸汽温度 TIC32003	E-312 liquid level rises as temperature (TIC-32003) of the heat source steam drops, and vice versa. 热源蒸汽温度 TIC-32003 下降，E-312 液位上升，反之亦然。
Flow rate (FIC-32003) of heat source steam 热源蒸汽流量 FIC-32003	E-312 liquid level rises as flow rate (FIC-32003) of the heat source steam drops, and vice versa. 热源蒸汽流量 FIC-32003 下降，E-312 液位上升，反之亦然。
Temperature control valve (TIC-32001) of E-312 E-312 温控阀 TIC-32001	E-312 liquid level rises as temperature (TIC-32001) of E-312 rises, and vice versa. E-312 温度 TIC-32001 高，E-312 液位上升，反之亦然。
Volume of residual liquid discharged to T-303 残液排放至 T-303 多少	E-312 liquid level rises as less residual liquid is discharged to T-303, and vice versa. 残液排放至 T-303 少，E-312 液位上升，反之亦然。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling 处理

Phenomenon 现象	Cause 原因	Handling 处理
E-312 liquid level fluctuates E-312 液位波动	Failure of the draw-off valve (FIC-32001) from the regenerator to E-312, deaerated water makeup valve (FIC-32002), temperature control valve (TIC-32001) of E-312, heat source steam temperature valve (TIC-32003) and heat source steam flow rate valve (FIC-32003) 再生塔至 E-312 抽出阀 FIC-32001，补除氧水阀 FIC-32002，E-312 温控阀 TIC-32001，热源蒸汽温度阀 TIC-32003，热源蒸汽流量阀 FIC-32003 失灵	Switch to manual or side-line adjustment, and contact the instrument personnel for repair. 改手动或副线调节，联系仪表修理。
	Forget to switch off the manual valve when the residual liquid is discharged. 排残液的时候忘记关手阀	Judge and find out causes rapidly, to confirm whether it is switched off on the site. 迅速判断查找原因，确认是否现场关闭。
	Liquid level of the condensate water tank (D-307) is full 凝结水罐（D-307）液面满	Fully open and vent the bottom of drum D-307, to drain the condensate. 将罐 D-307 底放空全开，排尽冷凝水。
	E-312 tube bundle leaks E-312 管束漏	Find out the cause, disconnect the reboiler, and contact relevant personnel for emergency repair. 查明原因，切除重沸器，联系抢修。
	Pipeline for discharging foreign materials from E-312 is blocked. E-312 排放杂质管线堵塞	Dredge the pipeline as soon as possible. 尽快疏通管线。

Out-of-control handling: remove E-312, or fully open or close the draw-off valve and water makeup valve depending on the circumstances if E-312 liquid level is beyond the control range.
失控处理：若 E-312 液位超出控制范围，则视情况切除 E-312,或者全开、全关抽出阀和补水阀。

(27) Control temperature of E-312
E-312 温度的控制

1)Control range: temperature of E-312 is controlled to be 182~192℃.

控制范围：控制 E-312 温度 182～192℃。

2)Control objective: keep E-312 temperature to be reference value ±5℃, to prevent decomposition of the amine solution at the temperature of over 204℃.

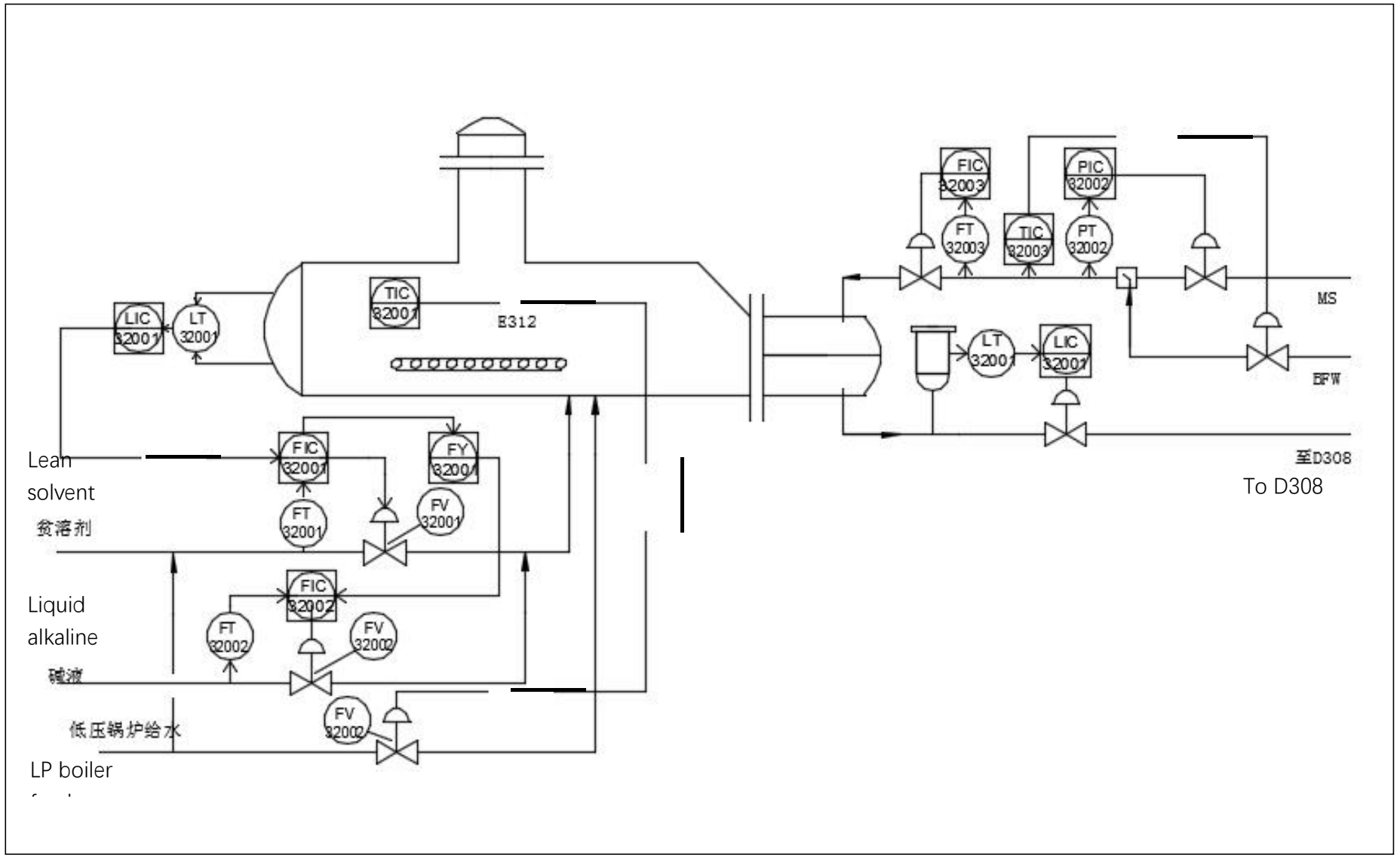
控制目标：控制 E-312 温度在基准值±5℃，防止温度超过 204℃造成胺液的分解。

3)Relevant parameters: draw-off rate (FIC-32001) from the regenerator to E-312; volume (FIC-32002) that makes up for the deaerated water; regenerator pressure (PIC-31501); temperature (TIC-32003) and flow rate (FIC-32003) of the heat source steam; Boiler makeup water of temperature control valve TIC-32001 of E-312.

相关参数：再生塔至 E-312 抽出量 FIC-32001，补除氧水量 FIC-32002，再生塔压力 PIC-31501，热源蒸汽温度 TIC-32003 和流量 FIC-32003，E-312 温度 TIC-32001 补锅炉水。

4)Control mode: control in the way of regulating the temperature control valve (TIC-32001).

控制方式：一般采用调节温控阀 TIC-32001 控制。


FIC 32003
PIC 32002
FT 32003
TIC 32003
PT 32002
MS
LIC 32001
LT 32001
TIC 32001
E312
LT 32001
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BFW
至D308
To D308
FIC 32001
FY 32001
Lean solvent
贫溶剂
FT 32001
FV 32001
FIC 32002
Liquid alkaline
碱液
FT 32002
FV 32002
低压锅炉给水
FV 32002
LP boiler

5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Opening of the draw-off valve (FIC32001) from regenerator to E-312 再生塔至 E-312 抽出阀 FIC32001 开度	E-312 temperature rises as the draw-off rate (FIC-32001) from bottom of the regenerator decreases, and vice versa. 再生塔底抽出流量 FIC-32001 减少，E-312 温度上升，反之亦然。
Opening width of the deaerated water makeup valve (FIC-32002) 补除氧水阀 FIC-32002 开度	E-312 temperature rises as the flow rate (FIC-32002) of deaerated water makeup water increases, and vice versa. 补除氧水流量 FIC-32002 减少，E-312 温度上升，反之亦然。
Regenerator pressure PIC31501 再生塔压力 PIC31501	E-312 temperature rises as pressure (PIC-31501) of the regenerator rises, and vice versa. 再生塔压力 PIC-31501 上升，E-312 温度上升，反之亦然。
Temperature (TIC32003) of heat source steam 热源蒸汽温度 TIC32003	E-312 temperature rises as temperature (TIC-32003) of the heat source steam rises, and vice versa. 热源蒸汽温度 TIC-32003 增加，E-312 温度上升，反之亦然。
Flow rate (FIC-32003) of heat source steam 热源蒸汽流量 FIC-32003	E-312 temperature rises as flow rate (FIC-32003) of the heat source steam increases, and vice versa. 热源蒸汽流量 FIC-32003 增加，E-312 温度上升，反之亦然。
Heat source steam pressure 热源蒸汽压力	Contact the dispatcher to regulate and balance the 3.5MPa steam pressure. E-312 temperature drops when the steam pressure reduces. 联系调度平衡系统 3.5MPa 蒸汽压力，下调蒸汽压力，E-312 温度下降。
Quantity of foreign substances in E3-12 E3-12 中杂质的多少	Foreign substances have not been discharged for a long time, so temperature rises. 杂质长时间不排，温度上升。
Boiler makeup water regulating valve of temperature control valve TIC-32001 of E-312 E-312 温度 TIC-32001 补锅炉水调阀。	E-312 temperature rises as boiler makeup water decreases, and vice versa. 补锅炉水减少，E-312 温度上升，反之亦然。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling 处理
Temperature of E-312 fluctuates E-312 温度波动	Failure of the draw-off valve (FI-32001) from the regenerator to E-312, deaerated water makeup valve (FIC-32002), temperature control valve (TIC-32001) of E-312, heat source steam temperature valve (TIC-32003) and heat source steam flow rate valve (FIC-32003) 再生塔至 E-312 抽出阀 FI-32001，补除氧水阀 FIC-32002，E-312 温控阀 TIC-32001，热源蒸汽温度阀 TIC-32003，热源蒸汽流量阀 FIC-32003 失灵	Switch to manual or side-line adjustment, and contact the instrument personnel for repair. 改手动或副线调节，联系仪表修理。
	Heat source steam with water 热源蒸汽带水	Contact the dispatcher to balance the main steam pressure and perform steam dewatering. 联系调度，平衡主蒸汽压力，蒸汽脱水。
	Liquid level of the condensate water tank (D-307) is full 凝结水罐（D-307）液面满	Fully open and vent the bottom of drum D-307, to drain the condensate. 将罐 D-307 底放空全开，排尽冷凝水。
	E-312 tube bundle leaks E-312 管束漏	Find out the cause, disconnect the reboiler, and contact relevant personnel for emergency repair. 查明原因，切除重沸器，联系抢修。
	Pipeline for discharging foreign materials from E-312 is blocked. E-312 排放杂质管线堵塞	Dredge the pipeline as soon as possible. 尽快疏通管线。

Out-of-control handling: remove E-312 depending on the circumstance if E-312 temperature is beyond the control range and incorporate it after the temperature becomes normal.

失控处理：若 E-312 温度超出控制范围，则视情况切除 E-312，待温度正常后再并入。

(28) Control of C-301 liquid level

C-301 液位的控制

1)Control range: C-301 liquid level is controlled to be 30~70%.

控制范围：控制 C-301 液位 30～70%。

2)Control objective: keep C-301 level to be reference value ±5%; extra high liquid level leads to bad stripping effect, and causes ammonia and hydrogen sulfide in the drainage exceed the limits.

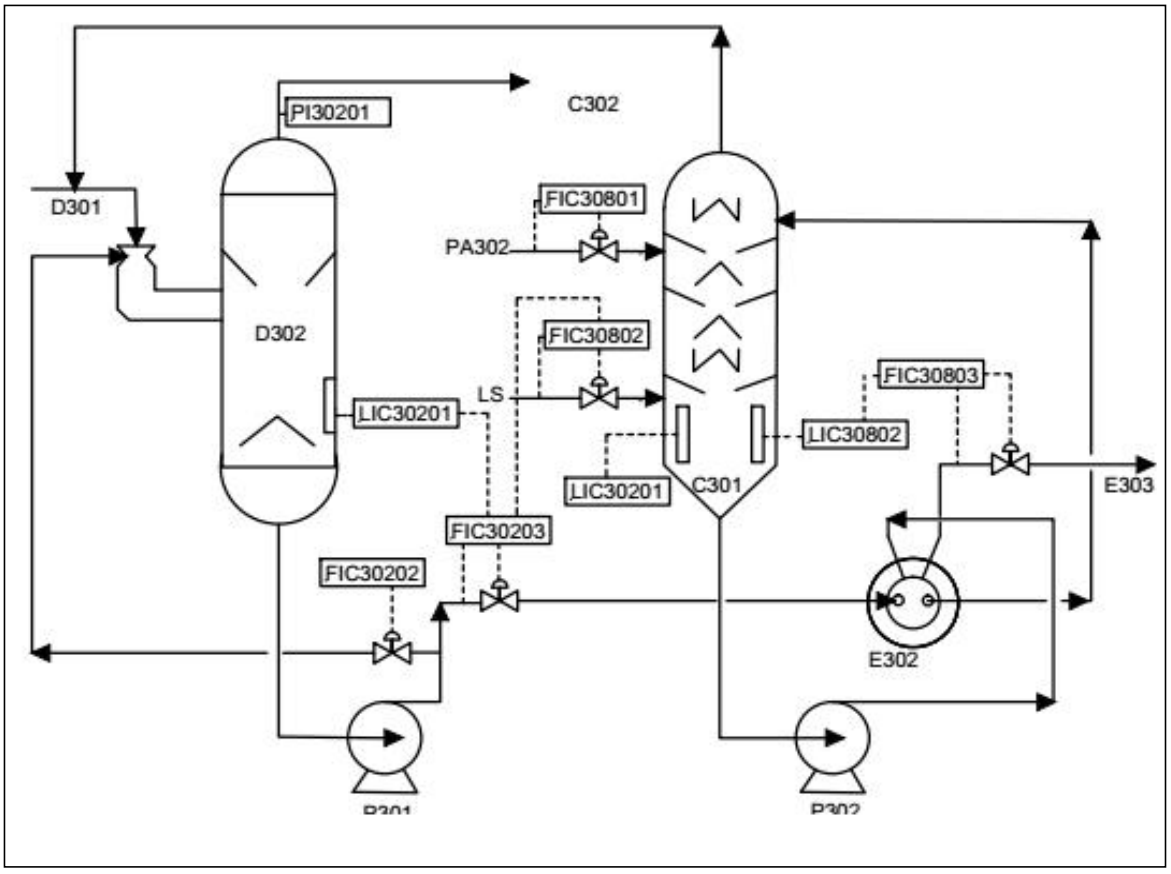
控制目标：控制 C-301 液位在基准值±5%，液位过高汽提效果不佳，造成排水中氨和硫化氢超标。

3)Relevant parameters: feed rate (FIC-30203) of C-301, volume (FIC-30801) of alkali injected into C-301, draw-off rate (FIC-30803) from bottom of C-301, temperature control for C-301 tower, pressure (PI-30201) of the venturi scrubber, liquid level (LIC-30201) of the venturi scrubber.

相关参数：C-301 进料量 FIC-30203，C-301 注碱量 FIC-30801，C-301 塔底抽出量 FIC-30803，C-301 塔的温度控制,文丘里洗涤器压力 PI-30201，文丘里洗涤器液位 LIC-30201。

4)Control mode: the bottom liquid level regulating and control valve (LIC-30802) of C-301 and bottom draw-off control valve (FIC-30803) are generally selected for control in a cascade way.

控制方式：一般采用调节 C-301 塔底液位控制阀 LIC-30802 与塔底抽出控制阀 FIC-30803 串级控制。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Feed rate (FIC30203) of C-301 C-301 进料量 FIC30203	C-301 liquid level rises as the feed rate (FIC-30203) of C-301 increases, and vice versa. C-301 进料量 FIC-30203 增加，C-301 液位上升，反之亦然。
Alkali injection rate (FIC30801) of C-301 C-301 注碱量 FIC30801	C-301 liquid level rises as alkali feed rate (FIC-30801) of C-301 increases, and vice versa. C-301 注碱量 FIC-30801 增加，C-301 液位上升，反之亦然。
Draw-off rate (FIC30803) from bottom of C-301 C-301 塔底抽出 FIC30803	C-301 liquid level rises as bottom draw-off rate FIC-30803 of C-301 increases, and vice versa. C-301 塔底抽出 FIC-30803 增加，C-301 液位上升，反之亦然。
Temperature control for C-301 tower C-301 塔的温度控制	C-301 liquid level drops as temperature of C-301 tower increases, and vice versa. C-301 塔的温度升高，C-301 液位下降，反之亦然。

6)Troubleshooting: 异常调节：

Phenomenon 现象	Cause 原因	Handling 处理
C-301 liquid level fluctuates C-301 液位波动	Failure of the feed rate control valve (FIC-30203) of C-301, alkali injection rate control valve (FIC-30801) of C-301, bottom draw-off rate control valve (FIC-30803) of C-301 and steam rate control valve (FIC-30802) of C-301. C-301 进料量控制阀 FIC-30203，C-301 注碱量控制阀 FIC-30801，C-301 塔底抽出量控制阀 FIC-30803，C-301 汽体蒸汽量控制阀 FIC-30802 失灵。	Switch to manual or side-line adjustment, and contact the instrument personnel for repair. 改手动或副线调节，联系仪表修理。
	Leakage of E-302 spiral heat exchanger E-302 螺旋式换热器漏	Find out causes, E-302 spiral heat exchanger changes to the side-line, and stop for the maintenance. 查明原因，E-302 螺旋式换热器走副线，停工检修。
	Failure of P-301, P-302 P-301,P-302 故障	Switch to the emergency pump and contact the bench worker for handling. 切换至备用泵，并联系钳工处理。

Phenomenon 现象	Cause 原因	Handling 处理
	The poor effect of the scale inhibitor causes the formation of calcium and magnesium ions in the upstream water to block the P302 inlet filter and pipeline 阻垢剂效果不好造成上游水中形成钙镁离子堵塞 P302 入口过滤器与管线	Find the cause of the fluctuation, switch the standby pump, and clean the inlet filter of the pump. 查找波动原因，切换备用泵，清理机泵入口过滤器。

Out-of-control handling: if C-301 liquid level is extra high, turn down the feed rate of C-301, and turn up the self-circulation control valve of the venturi scrubber as much as possible, and turn up the draw-off rate of C-301 (on the premise that the external drainage index is within the control range). Start two pumps for delivery in an emergency. Reduce the delivery rate if C-301 level is too low.

失控处理：若 C-301 液位过高，关小 C-301 进料量，尽量开大文丘里洗涤器自循环控制阀，另外开大 C-301 抽出量（前提外排水指标在控制范围内），紧急情况启两台泵外送，若 C-301 液位过低，则减少外送量即可。

(29) Control of stripping steam flow rate of C-301

C-301 汽提蒸汽流量的控制

1)Control range: the stripping steam flow rate of C-301 is controlled to be 5~9t/h.

控制范围：控制 C-301 汽提蒸汽流量 5～9t/h。

2)Control objective: control the stripping steam flow rate of C-301, and control the content of ammonia (<15ppm) and hydrogen sulfide (<5ppm) in the drainage to be within the range.

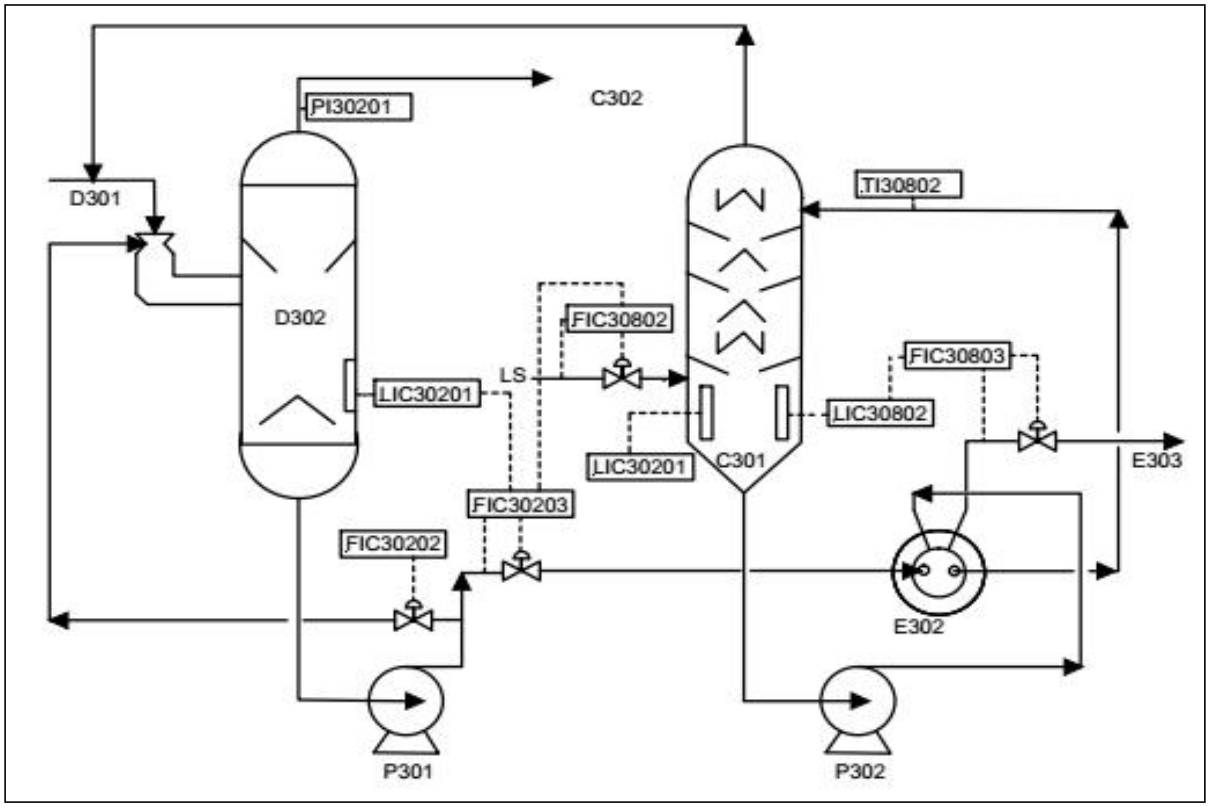
控制目标：控制 C-301 汽提蒸汽流量，控制外排水中氨<15ppm 和硫化氢<5ppm 的指标在范围内。

3)Relevant parameters: feed rate (FIC-30203) of C-301, liquid level (LIC-30201) of D-302, feed temperature of C-301.

相关参数：C-301 进料量 FIC-30203，D-302 液位 LIC-30201，C-301 进料温度。

4)Control mode: it is set through regulating the ratio between the feed rate control valve (FIC-30203) of C-301 and steam flow rate control valve (FIC-30802).

控制方式：一般采用调节 C-301 进料量控制阀 FIC-30203 和蒸汽流量控制阀 FIC-30802 之间的比率控制设定。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Feed rate (FIC30203) of C-301 C-301 进料量 FIC30203	The stripping steam rate of C-301 increases as the feed rate (FIC-30203) of C-301 increases, and vice versa. C-301 进料量 FIC-30203 增加，C-301 汽提蒸汽量增加，反之亦然。
D-302 liquid level (LIC30201) D-302 液位 LIC30201	The stripping steam rate of C-301 increases when the D-302 liquid level (LIC-30201) is high, and vice versa. D-302 液位 LIC-30201 高，C-301 汽提蒸汽量增加，反之亦然。
Heat source steam pressure 热源蒸汽压力	Contact the dispatcher to regulate and balance the system 1.0MPa steam pressure. The stripping steam rate of C-301 increases as the steam pressure drops. 联系调度平衡系统 1.0MPa 蒸汽压力，下调蒸汽压力，C-301 汽提蒸汽量增加。

6)Troubleshooting: 异常调节：

Phenomenon	Cause	Handling

现象	原因	处理
Stripping steam rate of C-301 fluctuates C-301 汽提蒸汽量波动	Feed rate (FIC-30203) of C-301, liquid level (LIC30201) of D-302 C-301 进料量 FIC-30203，D-302 液位 LIC30201	Switch to manual or side-line adjustment, and contact the instrument personnel for repair. 改手动或副线调节，联系仪表修理。
	Leakage of E-302 spiral heat exchanger E-302 螺旋式换热器漏	Find out causes, draw-off from bottom of C-301 tower goes to side-line, stop for the maintenance. 查明原因，C-301 塔底抽出走副线，停工检修。

Out-of-control handling: if the stripping steam flow rate of C-301 is beyond the control range, the rate shall be reduced; otherwise,, content of ammonia (<15ppm) and hydrogen sulfide (<5ppm) will be beyond the range.

失控处理：若 C-301 汽提蒸汽流量超出控制范围，则只能降量处理，否则外排水中氨<15ppm 和硫化氢<5ppm 的指标超出范围。

2.4.4 Process control for coke powder processing part 焦粉处理部分工艺控制操作法

(1) Pressure (PIC-40301) of bed coke bin 床层焦料仓压力 PIC-40301

1)Control range: control the overhead pressure (PIC-40301) of D-401 during startup period: 0.158~0.34MPa; during normal production: 0.054MPa/0.108MPa.

控制范围：D-401 顶部压力 PIC-40301 开工期间控制：0.158～0.34MPa ；正常生产期间：0.054MPa/0.108MPa。

2)Control objective: prevent transported air flowing back to D-401 during normal production, and allow the coke to be transferred to the coke transfer hopper (BN-401) for the convenience of loading; D-401 maintains at a relatively high pressure due to high pressure requirements at the coke-air mixing point when the gasification rate is low. During startup, high operating pressure needs to be maintained, to load the coke to the pressurized heater (R-102) in a better way.

控制目标：正常生产时，防止输送空气倒流入 D-401，并允许将焦炭转移至焦炭转料斗 BN-401，便于装车；低气化率时由于焦炭-空气混合点的高压要求，D-401 维持在的较高压力。开工期间，为了更好的将焦炭装载到受压加热器 R-102 中，需要控制较高的操作压力。

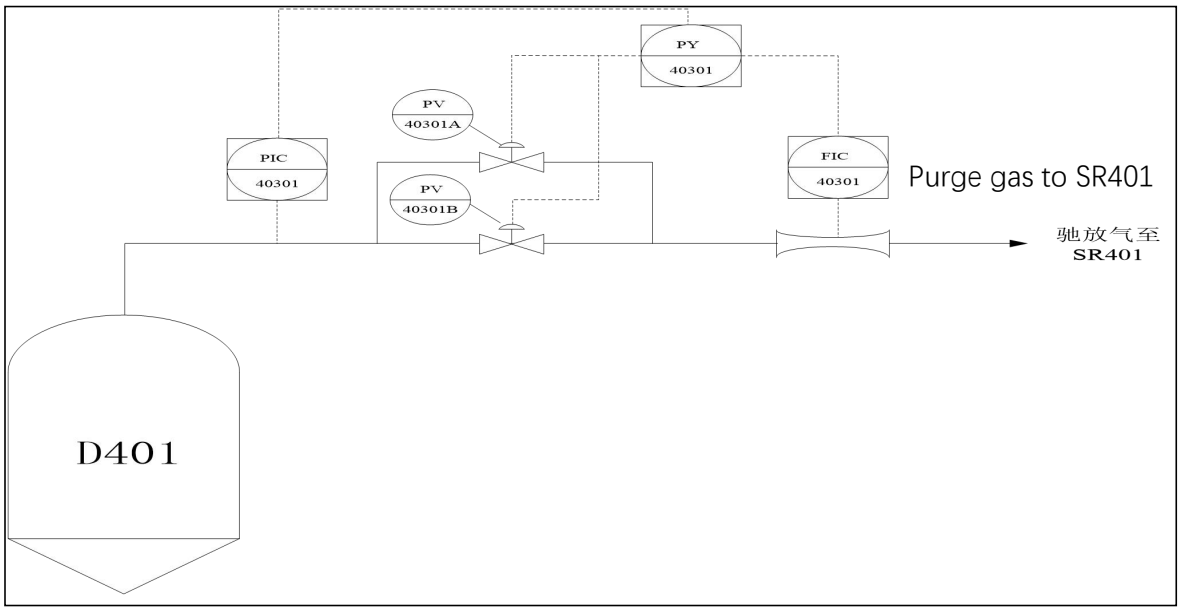
3)Relevant parameters: D-101 coke discharge conveying air; R-102 coke discharge conveying air; D-401 startup conveying air; purge gas vent valve; pressure drop of bag filter.

相关参数：D-101 卸焦输送风；R-102 卸焦输送风；D-401 开工输送风；驰放气放空阀；布袋式除尘器压降。

4)Control mode: as the main control valve, PV-40301A opens first; if the overhead pressure of D-401 is still high after PV-40301A is fully open, then PV-40301B will open. “Lower selectable”

is selected between PY-40301 and FIC-40301, to avoid the situation of exceeding SR-401 load after abrupt opening of PV-40301B.

控制方式：PV-40301A 是主要控制阀，首先打开；如果 PV-40301A 全开后，D-401 顶压力还是高，PV-40301B 就会打开。为防止 PV-40301B 突然打开后超出 SR-401 负荷，所以在 PY-40301 和 FIC-40301 之间选择“低选”。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
D-101 coke discharge conveying air D-101 卸焦输送风	Pressure (PIC-40301) of the bed coke bin rises as the conveying air (FIC-11208) of D-101 rises; pressure (PIC-40301) of the bed coke bin decreases as the conveying air (FIC-11208) of D-101 drops. D-101 输送风 FIC-11208 上升，床层焦料仓压力 PIC-40301 上升；D-101 输送风 FIC-11208 下降，床层焦料仓压力 PIC-40301 下降。
R-102 coke discharge conveying air R-102 卸焦输送风	Pressure PIC-40301 of the bed coke bin rises as the coke discharge conveying air FIC-11007 of R-102 rises; pressure PIC-40301 of the bed coke bin decreases as the conveying air FIC-11007 of R-102 drops. R-102 卸焦输送风 FIC-11007 上升，床层焦料仓压力 PIC-40301 上升；R-102 输送风 FIC-11007 下降，床层焦料仓压力 PIC-40301 下降。
D-401 startup conveying air D-401 开工输送风	Pressure (PIC-40301) of the bed coke bin rises as the startup conveying air (FIC-40302) of D-401 rises; pressure (PIC-40301) of the bed coke bin decreases as the startup conveying air (FIC-40302) of D-401 drops. D-401 开工输送风 FIC-40302 上升，床层焦料仓压力 PIC-40301 上升；D-401 开工输送风 FIC-40302 下降，床层焦料仓压力 PIC-40301 下降。

Influence factor 影响因素	Adjustment method 调整方法
Pressure difference of bag filter 布袋式过滤器压差	The pressure difference of the bag filter rises when the opening of the bed coke bin (PIC-40301) remains unchanged. Pressure of the bed coke bin rises; otherwise, pressure of the bed coke bin drops. 在床层焦料仓 PIC-40301 开度保持不变的情况下，布袋式过滤器压差上升，床层焦料仓压力上升，反之床层焦料仓压力下降。
Opening of purge gas vent valve 驰放气放空阀开度	If the purge gas vent valve turns up when the opening of the bed coke bin PIC-40301 remains unchanged, the pressure of the bed coke bin drops; otherwise, the pressure of the bed coke bin drops. 在床层焦料仓 PIC-40301 开度保持不变的情况下，驰放气放空阀开大，床层焦料仓压力下降，反之床层焦料仓压力下降。

6)Troubleshooting: 异常处理：

Phenomenon 现象	Cause 原因	Handling method 处理方法
Pressure of bed coke bin fluctuates 床层焦料仓压力波动	Fault of D-401 pressure control valve D-401 压控阀故障	Switch the pressure control valve PIC-40301 to manual control, and contact relevant personnel (bench worker, instrument personnel) for handling. 将压控阀 PIC-40301 改手动控制，并联系（钳工、仪表）处理。
	Coke discharge rate of D-101 fluctuates D-101 卸焦量波动	Stabilize the coke discharge rate of D-101 and regulate the volume of the conveying air, to ensure continuous coke discharge and prevent large fluctuation in the pressure of D-401 during coke discharge by D-101. 平稳 D-101 卸焦量，调节好输送风量，确保卸焦的连续性，防止 D-101 卸焦时造成 D-401 压力大幅波动。
	Coke discharge rate of R-102 fluctuates R-102 卸焦量波动	When coke powder in R-102 is discharged after shutdown, ensure smooth and steady coke discharge rate, regulate the volume of the conveying air, to ensure continuous coke discharge and prevent large fluctuation in the pressure of D-401 during coke discharge by R-102. 停工卸焦出 R-102 内焦粉时，确保卸焦量的平稳，调节好输送风量，确保卸焦的连续性，防止 R-102 卸焦时造成 D-401 压力大幅波动。

Phenomenon 现象	Cause 原因	Handling method 处理方法
	Purge gas vent valve becomes out of control 驰放气放空阀失控	Switch the purge gas vent valve PIC-40501 to manual control, and contact relevant personnel (bench worker, instrument personnel) for handling. 将驰放气放空阀 PIC-40501 改手动控制，并联系（钳工、仪表工）处理。
	Pressure difference of the bag filter reaches the upper limit 布袋式过滤器压差达上限	Pressure difference before and after the bag filter rises and reaches the alarm value. Switch to the stand-by filter. 布袋式过滤前后压差上升，达到报警值，切换至备用过滤器。

During startup, the control range of PIC-40301 is 0.158~0.34 MPa, and that of FIC-40301 of the corresponding bleeding rate is 915~277kg/h; during normal operation, the control range of PIC-40301 is 0.054MPa and that of FIC-40301 of the corresponding bleeding rate is 1,625kg/h; the control range is 0.108MPa when the gasification rate is 75% and that of FIC-40301 of the corresponding bleeding rate is 2,068 kg/h; during shutdown, the control range of PIC-40301 is 0.01MPa and that of FIC-40301 of the corresponding bleeding rate is 6,151kg/h.
开工期间，PIC-40301 的控制范围 0.158～0.34 MPa，对应放气率 FIC-40301 的控制范围 915～277kg/h ；正常运行，PIC-40301 的控制范围 0.054MPa，对应放气率 FIC-40301 的控制范围 1625kg/h ；75%气化率时，PIC-40301 的控制范围 0.108MPa，对应放气率 FIC-40301 的控制范围 2068 kg/h ；停工期间，PIC-40301 的控制范围 0.01MPa，对应放气率 FIC-40301 的控制范围 6151kg/h 。

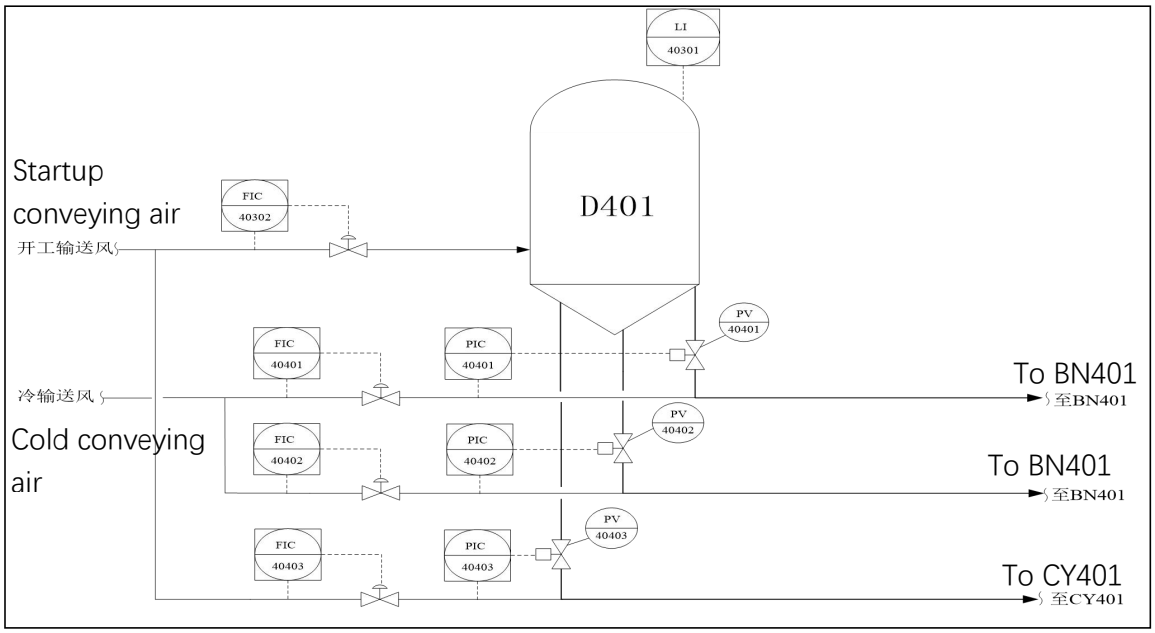
(2) Material level (LI-40301) of coke powder bin 焦粉料仓料位 LI-40301
1)Control range: material level (LI-40301) of D-401 to be 0~80%.
控制范围：D-401 料位 LI-40301 在 0～80%。
2)Control objective: during normal operation, they shall be controlled to be within the above range, to prevent extra high material level of the coke powder bin, resulting that the coke powder escapes to the purge gas, which affects normal operation of subsequent equipment.
控制目标：正常操作中应控制在上述范围内，防止焦粉料仓料位过高，造成焦粉跑损至驰放气中，影响后续设备的正常运行。
3)Relevant parameters: coke discharge rate of D-101, coke discharge volume of R-102, opening (PIC-40401/PIC-40402/PIC-40403) of D-401 coke discharge slide valve, coke

discharge conveying air rate of D-401, and feed coke powder to the hopper till pressure drop of the heater decreases.

相关参数：D-101 卸焦量、R-102 卸焦量、D-401 卸焦滑阀开度 PIC-40401/PIC-40402/PIC-40403、D-401 卸焦输送风量、焦粉加注料斗至加热器压降。

4)Control mode: the material level of the coke powder bin is controlled by PIC-40401/PIC-40402/PIC-40403. It only needs to use one of PIC-40401/PIC-40402 during normal production. Two coke discharge lines need to be put into service when the gasification rate is 75%. PIC-40403 can only be used during startup.

控制方式：焦粉料仓料位分别由 PIC-40401/PIC-40402/PIC-40403 来控制卸焦速率，PIC-40401/PIC-40402 在正常生产期间只需使用其中一个，当气化率在 75%时需投用两条卸焦线，PIC-40403 只在开工期间使用。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Coke discharge rate of D-101 D-101 卸焦量	D-101 discharges coke to the point when the material level (LI-40301) of D-401 rises. Open the PIC-40401 or PIC-40402 slide valve (put tow coke discharge line simultaneously when the gasification rate is 75%) when D-401 material level rises to about 50%, and control the pressure drop before and after the valve. D-101 卸焦至 D-401 料位 LI-40301 上升，当 D-401 料位上升至 50%左右时，将 PIC-40401 或 PIC-40402 滑阀打开（在 75%气化率时两条卸焦线同时投用），控制好阀前后压降。
Coke discharge	During shutdown, a large quantity of coke powder in the heater needs to be

rate of R-102 R-102 卸焦量	discharged to D-401 within 24h, and the material level (LI-40301) of D-401 rises. Open the PIC-40401 and PIC-40402 slide valve when the material level reaches the high limit, to transfer the coke powder to the loading system. 停工期间加热器内大量的焦粉需在 24h 内卸至 D-401，D-401 料位 LI-40301 上升，若料位达到高限值，打开 PIC-40401 和 PIC-40402 滑阀，将焦粉转至装车系统。

6)Troubleshooting: 异常处理：

Phenomenon 现象	Cause 原因	Handling 处理
Material level of coke powder bin fluctuates 焦粉料仓料位波动	Coke discharge rate of D-101 changes (gasification rate changes) D-101 卸焦量变化（气化率变化）	Adjust the coke gasification rate appropriately according to the production demands. Two coke discharge lines will be put into service when the gasification rate is relatively low. 根据生产需求调节合适焦炭气化率，在气化率较低时，投用两条卸焦线。
	R-102 discharges coke during shutdown 停工期间 R-102 卸焦	Control LI-40301 through regulating opening of the PIC-40401/PIC-40402 valve 通过调节 PIC-40401/PIC-40402 阀开度，控制好 LI-40301。
	D-401 conveying air stops due to fault D-401 输送风故障停	Improve gasification rate of the unit, reduce coke discharge rate of D-101 and find out faults. 提高装置气化率，减少 D-101 卸焦量，排查故障。
	Fault is indicated for the material level of the coke powder bin 焦粉料仓料位显示故障	Contact relevant personnel (bench worker, instrument personnel) for handling in a timely way. 及时联系（钳工、仪表）处理。
	Feed coke powder to the hopper till pressure drop of the heater decreases. 焦粉加注料斗至加热器压降低	Pressure drop of BN-402 and heater is low; PS401 starts in an interlocking way; PIC-40403 valve closes, and regulate the pressure drop to normal value. BN-402 与加热器压降低，PS401 联锁启动，PIC-40403 阀关闭，及时调节压降至正常值。
	PIC-40401/PIC-40402/PIC-40403 slide valve fault PIC-40401/PIC-40402/PIC-40403 滑阀故障	Switch to manual control, and contact relevant personnel (bench worker, instrument personnel) for handling in a timely way. 改手动控制，并及时联系（钳工、仪表）处理。

When coke is feeding during startup, it shall ensure that the differential pressure (PDT-40801ABC) between the heater and BN-402 is 0.007MPa~0.04 MPa, to prevent startup for self-holding.

在开工期间加焦期间，需保证加热器与 BN-402 的差压 PDT-40801ABC 在 0.007MPa～0.04 MPa，防止自保启动。

(3)Purge gas temperature (TI-40501)

驰放气温度 TI-40501

1)Control range: purge gas temperature 30~240℃.

控制范围：驰放气温度 30～240℃。

2)Control objective: during normal operation, the purge gas temperature shall be controlled to be within the above range, without exceeding the set value for ±10℃.

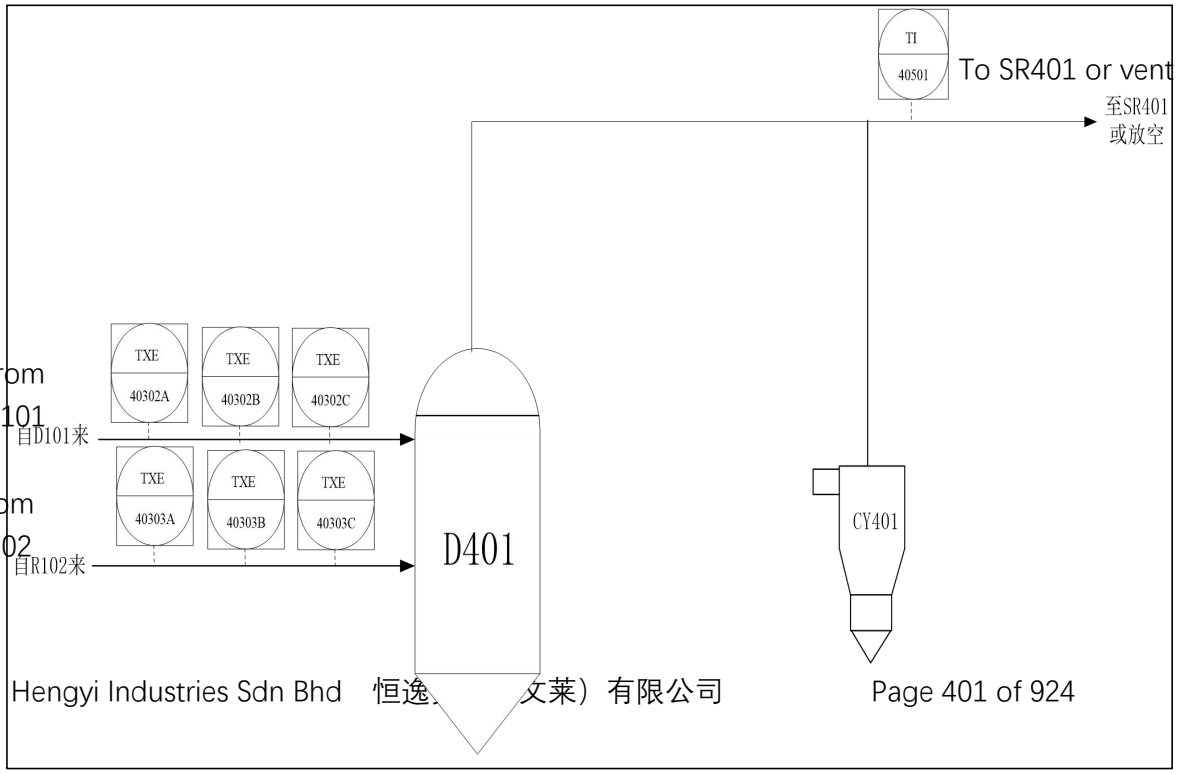
控制目标：正常操作中驰放气的温度应控制在上述范围，不超过设定值±10℃。

3)Relevant parameters: coke discharge temperature of D-101, R-102 coke discharge temperature, temperature of startup conveying air.

相关参数：D-101 卸焦温度，R-102 卸焦温度，开工输送风温度。

4)Control mode: during normal operation, control the coke discharge temperature of D-101 to be within 250℃; during shutdown, control the coke discharge temperature of R-102 to be within 250℃; when the coke is fed during startup, control the volume of the startup conveying air of D-401, to prevent overheating of TI-40501 which causes too large volume of main air.

控制方式：正常生产情况下，控制 D-101 卸焦温度在 250℃以内；停工期间，控制 R-102 卸焦温度在 250℃以内；开工加焦期间，控制好 D-401 的开工输送风量，防止因主风量过大，导致 TI-40501 超温。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Coke discharge temperature of D-101 changes D-101 卸焦温度变化	Turn up the cooling water the temperature (TE-11203ABC) of D-101 rises; turn down the cooling water when the temperature (TE-11203ABC) of D-101 drops. D-101 温度 TE-11203ABC 温度上升，开大降温水；D-101 温度 TE-11203ABC 温度下降，关小降温水。
Temperature of coke discharge temperature of R-102 changes R-102 卸焦温度变化	Turn up the cooling water when the temperature (TIC-11006) of R-102 rises; turn down the cooling water when the temperature (TIC-11006) of R-102 drops. R-102 底温度 TIC-11006 温度上升，开大降温水；R-102 底温度 TIC-11006 温度下降，关小降温水。
Temperature of startup conveying air changes 开工输送风温度变化	Regulate the conveying air appropriately according to the coke discharge rate, to prevent large volume of conveying air entering into the purge gas system after the coke discharge slide valve is closed; otherwise,, an alarm will be given for high temperature of TI-40501. 根据卸焦量调节合适输送风，防止卸焦滑阀关闭后，仍有大量的输送风进入驰放气系统，造成 TI-40501 高温报警。

6)Troubleshooting: 异常调整：

Phenomenon 现象	Cause 原因	Handling method 处理方法
Temperature of purge gas fluctuates 驰放气温度波动	Fault is indicated in instrument 仪表显示故障	Contact relevant personnel (bench worker, instrument personnel) for handling in a timely way. 及时联系（钳工、仪表）处理。
	Temperature at bottom of D-101 fluctuates greatly D-101 底温度大幅波动	During bed coke discharge, control the volume of atomizing steam/cooling water appropriately, to ensure stable temperature inside D-101. 卸床层焦时，控制合适的雾化蒸汽/降温水量，确保 D-101 内温度平稳。

Phenomenon 现象	Cause 原因	Handling method 处理方法
	Temperature of R-102 fluctuates greatly when coke is discharged during shutdown R-102 卸停工焦时温度大幅波动	When coke is discharged during shutdown, control the volume of the atomizing steam/cooling water appropriately, to ensure stable temperature at the bottom of R-102. 卸停工焦时，控制合适的雾化蒸汽/降温水量，确保 R-102 底部温度平稳。
	Volume of startup conveying air changes 开工输送风量变化	When D-401 feeds coke to R-102, control the volume of the conveying air appropriately, to prevent closing of the slide valve during coke feeding or a large quantity of conveying air entering into the purge gas system when coke feeding is obstructed, which will cause temperature of TI-40501 fluctuate or give a high temperature alarm. D-401 加焦至 R-102 时，控制合适的输送风量，防止加焦时滑阀关闭或加焦不畅时，大量的输送风进入驰放气系统，造成温度 TI-40501 波动或高温报警。

(4)Liquid level (LI-40901/LI-40902) of T-403/T-404

T-403/T-404 液位 LI-40901/LI-40902

1)Control range: liquid level (LI-40901/LI-40902) of T-403/T-404 to be 30~70%.

控制范围：T-403/T-404 液位 LI-40901/LI-40902 在 30～70%。

2)Control objective: during normal operation, T-403/T-404 liquid level shall be controlled to be within the above range, without exceeding the set value for ±10% (the specific control value shall be determined according to the location of the stirrer at the bottom of the tank).

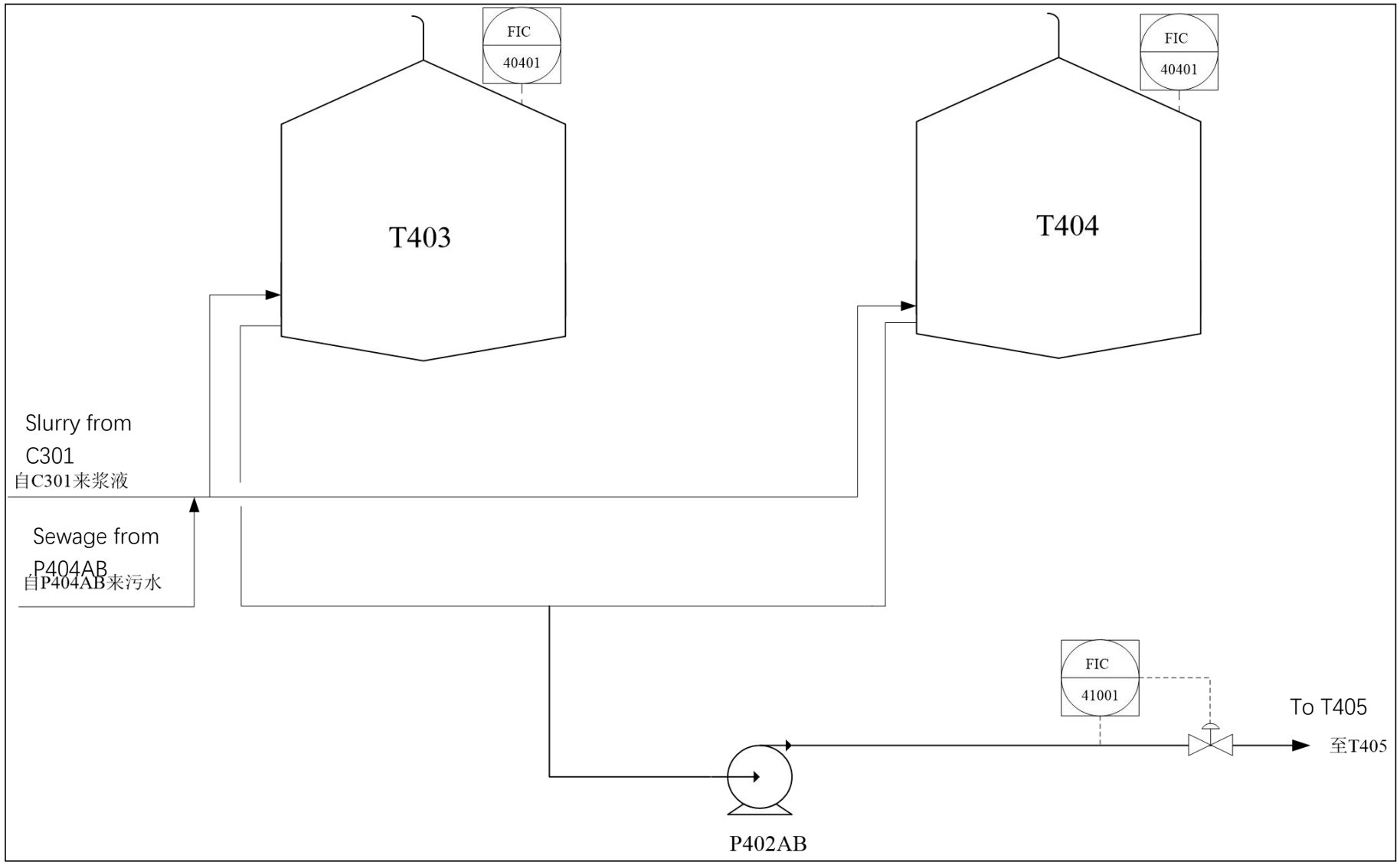
控制目标：正常操作中 T-403/T-404 液位应控制在上述范围内，不超过设定值±10%（具体控制数值应罐底搅拌器位置确定）。

3)Relevant parameters: change of flow rate of C-301 thin slurry flowing to T-403/404, change of flow rate of P-404AB sewage flowing to T-403/T-404 changes, change of flow rate of the thin slurry flowing to T-405.

相关参数：C-301 稀浆液至 T-403/404 流量变化，P-404AB 外送污水至 T-403/T-404 流量变化，稀浆液至 T-405 流量流量。

4)Control mode: the liquid level is controlled through the flow rate of FIC-41001 during normal production.

控制方式：在正常生产时通过 FIC-41001 流量控制液位


FIC
40401
T403
FIC
40401
T404
Slurry from
C301
自C301来浆液
Sewage from
P404AB
自P404AB来污水
FIC
41001
To T405
至T405
P402AB

5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Change of flow rate of thin slurry entering the storage tank 稀浆液进储罐流量变化	Under the circumstance of fixed delivery flow rate from the storage tank. The liquid level of the storage tank rises as the flow rate of the C-301 thin slurry flowing to the storage tank increases; the liquid level of the storage tank drops as the flow rate of the C-301 thin slurry flowing to the storage tank decreases. 在储罐外送流量一定的情况下。C-301 稀浆液至储罐流量增加，储罐液位上升；C-301 稀浆液至储罐流量下降，储罐液位降低。
Change of delivery flow rate of thin slurry from the storage tank 浆液储罐外送流量变化	Under the circumstance of fixed flow rate of thin slurry to the storage tank. The liquid level of the thin slurry storage tank drops as the delivery flow rate (FIC-41001) from the storage tank increases; the liquid level of the storage tank rises as the delivery flow rate FIC-41001 from the storage tank decreases. 在稀浆液进罐流量一定的情况下。稀浆液储罐外送流量 FIC-41001 增加，储罐液位降低；稀浆液储罐外送流量 FIC-41001 降低，储罐液位上升。
Change of flow rate from P-404AB to the thin slurry storage tank P-404AB 至稀浆液储罐流量变化	Under the circumstance that the flow rate of thin slurry to and from the storage tank remains unchanged. The liquid level of the storage tank rises as the flow rate from P-404AB to the thin slurry storage tank increases; the liquid level of the storage tank drops as the flow rate from P-404AB to the thin slurry storage tank drops. 在稀浆液进罐流量、储罐外送流量不变的情况下。P-404AB 至稀浆液储罐流量增加，储罐液位上升；P-404AB 至稀浆液储罐流量下降，储罐液位降低。

6)Troubleshooting: 异常调整：

Phenomenon 现象	Cause 原因	Handling method 处理方法
Change in T-403/T-404 liquid level T-403/T-404 液位变化	Fault is indicated in the liquid level meter 液位计仪表显示故障	Contact relevant personnel (bench worker, instrument personnel) for handling in a timely way. 及时联系（钳工、仪表）处理。
	Flow rate from C-301 to the slurry storage tank fluctuates greatly C-301 至浆液储罐流量大幅波动	Stabilize C-301 operating condition, to ensure stable flow rate of the delivery thin slurry. 平稳 C-301 工况，保证外送稀浆液流量的相对平稳。

	The delivery flow rate of slurry from T-403/T-404 fluctuates greatly T-403/T-404 外送浆液流量大幅波动	Regulate flow rate (FIC-41001) according to T-403/T-404 liquid level, to guarantee relative steady flow rate. 根据 T-403/T-404 的液位调节 FIC-41001 流量，保证该流量的相对平稳。
	Fault of the delivery regulating valve 外送调节阀故障	Switch to manual control, and contact relevant personnel (bench worker, instrument personnel) for handling in a timely way. 改手动控制，及时联系（钳工、仪表）处理。
	Change of flow rate from P-404AB to the thin slurry storage tank P-404AB 至稀浆液储罐流量变化	If the discharged sewage is not qualified, it shall guarantee stable flow rate of P-404AB recycling to the thin slurry storage tank. 若外排污水质量不合格，通过 P-404AB 回炼至稀浆液储罐时，保证回炼流量的稳定。

(5)Liquid level (LIC-41101) of T-406

T-406 液位 LIC-41101

1)Control range: liquid level (LIC-41101) of T-406 to be 25~70%.

控制范围：T-406 液位 LIC-41101 在 25～70%。

2)Control objective, during normal operation, T-406 liquid level shall be controlled to be within the above range, without exceeding the set value for ±5%

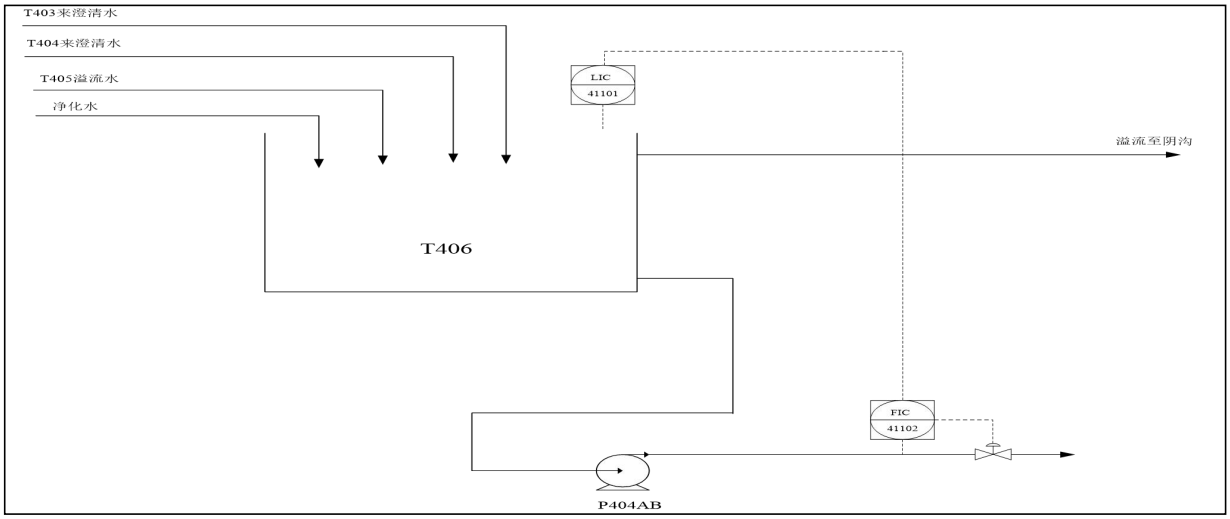
控制目标：正常操作中 T-406 液位应控制在上述范围内，不超过设定值±5%。

3)Relevant parameters: volume of clarified water; volume of purified water; delivery flow rate.

相关参数：澄清水量；净化水量；外送流量。

4)Control mode: during normal operation, T-406 liquid level is controlled through LIC-41101 and FIC-41102 in a cascade way.

控制方式：在正常生产时，通过 LIC-41101 与 FIC-41102 串级控制 T-406 液位。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Delivery flow rate 外送流量	FV-41102 valve turns down, T-406 liquid level rises; FV-41102 valve turns up, T-406 liquid level drops. FV-41102 阀关小，T-406 液位上涨；FV-41102 阀开大，T-406 液位下降。

6)Troubleshooting: 异常调整：

Phenomenon 现象	Cause 原因	Handling method 处理方法
T-406 liquid level fluctuates T-406 液位波动	Fault of regulating valve 调节阀故障	Switch to manual control, and contact relevant personnel (bench worker, instrument personnel) for handling in a timely way. 改手动控制，及时联系（钳工、仪表）处理。
	Flow rate of clarified water 澄清水流量	Stabilize the delivery flow rate of the equipment upstream (flow rate of C-301 thin slurry, flow rate FIC-41001) 平稳上游设备外送流量（C-301 稀浆液流量、FIC-41001 流量）。
	Purified water valve not closed or not closed tightly 净化水阀未关或关严	Change the blind plate to be closed state after normal startup. 开工正常后将盲板倒为封闭状态。

(6)Control material level (LIC-40801) of BN-402

BN-402 料位控制 LIC-40801

1)Control range: material level (LIC-40801) of BN-402 is controlled to be 10~80%.

控制范围：BN-402 料位控制 LIC-40801 在 10～80%。

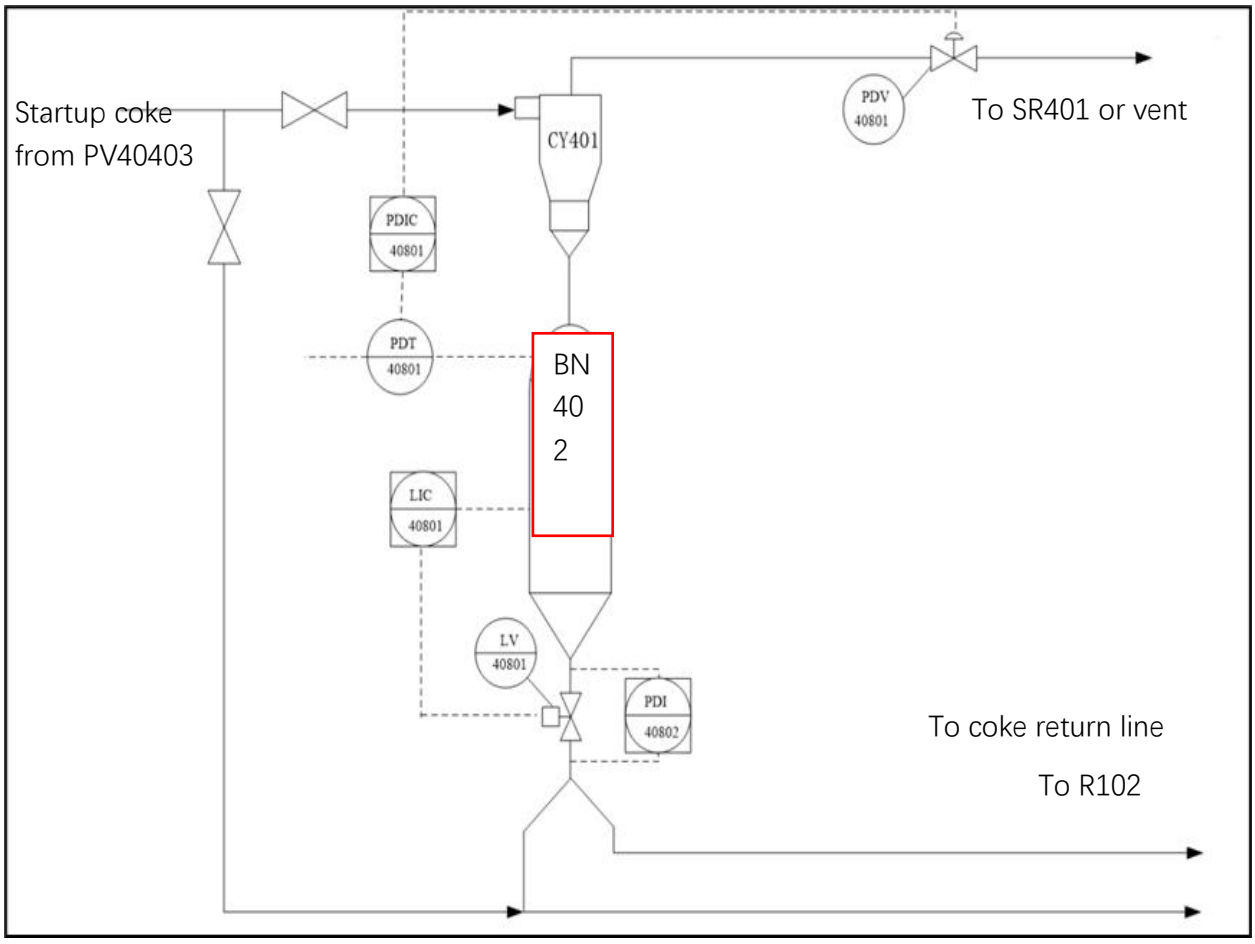
2)Control objective: when coke is fed during startup, the material level of BN-402 shall be controlled to be within the above range.

控制目标：开工加焦期间 BN-402 料位应控制在上述范围内。

3)Relevant parameters: coke powder rate from D-401 to BN-402 via CY-401 (change of opening of PV-40403 slide valve), pressure drop of CY-401, fluctuation of feeding slide valve of BN-402, blocked back flow path and obstructed feeding will affect the material level of BN-402.

相关参数：D-401 输送来的焦粉通过 CY-401 至 BN-402 量（PV-40403 滑阀开度的变化）、CY-401 的压降和 BN-402 的下料滑阀波动、后路不畅下料堵都会影响 BN-402 的料位。

4)Control mode: the material level LIC-40801 of BN-402 is a given value for the feeding slide valve LV-40801, which is used to control the delivery rate of coke powder from BN-402.
控制方式：BN-402 的料位 LIC-40801 作为下料滑阀 LV-40801 的给定，控制 BN-402 下料焦粉输送量。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Large opening of BN-402 feeding slide valve BN-402 下料滑阀开度大	High material level of BN-402 is controlled through turning up the feeding slide valve LV-40801, and vice versa. BN-402 料位高通过开大下料滑阀 LV-40801 控制，反之关小。
Change of delivery rate from D-401 D-401 输送来量的变化	The material level of BN-401 rises when there is high delivery rate from D-401. Turn up the feeding slide valve appropriately, and vice versa. D-401 输送量多 BN-401 料位上升，相应开大下料滑阀反之关小。

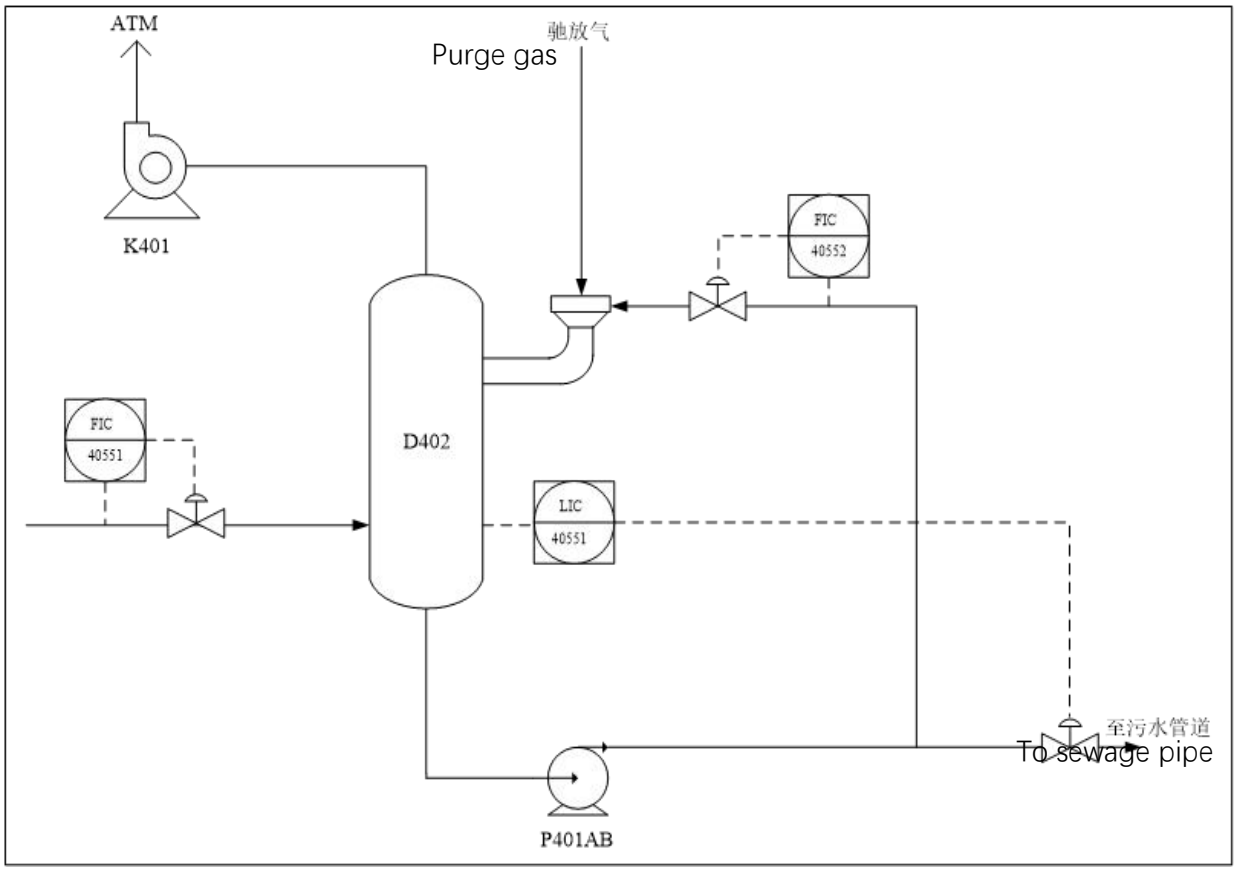
6)Troubleshooting: 异常调整：

Phenomenon 现象	Cause 原因	Handling method 处理方法

Material level of BN-402 rises BN-402 料位升高	LV-40801 slide valve closes due to failure LV-40801 滑阀失灵关闭	Switch to manual control. 现在改手动控制。
Material level of BN-402 rises BN-402 料位升高	Feeding obstructed, slide valve jammed 下料不畅、滑阀卡瑟	Treat the cone looseness on site and switch the slide valve to manual control. 现场处理椎体松动、改手动活动滑阀。
Material level of BN-402 drops BN-402 料位降低	PV-40403 slide valve closes due to failure PV-40403 滑阀失灵关闭	Switch to manual control 现场改手动控制。
Material level of BN-402 drops BN-402 料位降低	Delivery from D-401 to CY-401 is blocked D-401 至 CY-401 输送不畅	Regulate conveying air from D-401 to CY-401 in a timely way (FV-40403). 及时调节 D-401 至 CY-401 的输送风（FV-40403）。

Out-of-control handling: during startup, take two out of three for the differential pressure (PDT-40801) between R-102 and BN-401; close LV-40801/ PV-40403 after interlocking startup. Reducing PDV-40801 by half will lead to abnormal coke feeding. Bypassing for self-holding shall be done in a timely way, to restore the differential pressure and feed coke normally.
失控处理：开工期间 R-102 与 BN-401 差压 PDT-40801 有三取二，联锁启动后会关闭 LV-40801/ PV-40403。PDV-40801 减半造成不能正常加焦，应及时旁路自保、恢复差压、正常加焦。

(7)Control device LIC-40551 for D-402 liquid level
D-402 液位的控制 LIC-40551
1)Control range: control device LIC-40551 for D-402 liquid level is 30~70%.
控制范围：D-402 液位的控制 LIC-40551 在 30～70%。
2)Control objective: during normal operation, the D-402 liquid level shall be controlled to be within the above range, without exceeding the set value for ±5%.
控制目标：正常生产时 D-402 液位应控制在上述范围内，不超过设定值±5%。
3)Relevant parameters: flow rate (FIC-40551) of makeup water from pump P-404 to D-402, flow rate (FIC-40552) of DY-402 washing water, coke-containing sewage delivery rate for controlling D-402 liquid level.
相关参数：泵 P-404 至 D-402 的补水流量（FIC-40551）、DY-402 洗涤水流量（FIC-40552）、D-402 液位控制外排含焦污水量。
4)Control mode: the liquid level (LIC-40551) of D-402 is a given value for the delivery valve (LV-40551), which is used to control the D-402 liquid level. The liquid level drops when the control valve turns up; the liquid level rises when the control valve turns down.
控制方式：D-402 的液位 LIC-40551，作为外送阀 LV-40551 的给定，控制 D-402 液位。控制阀开大液位下降、控制阀关小液位上升。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Control valve (LV-40551) for delivery coke-containing sewage 外排含焦污水控制阀 LV-40551	The liquid level drops when the opening increases, and vice versa. 开度增大，液位降低；反之，升高。
Flow rate (FIC-40551) of makeup water for D-402 D-402 的补水流量（FIC-40551）	The liquid level rises when the flow rate increases, and vice versa. 流量增加，液位升高；反之，降低。
Flow rate (FIC-40552) of DY-402 washing water DY-402 洗涤水流量（FIC-40552）	Increase in flow rate will make the liquid level rise, and vice versa. 流量增大会使液位升高，反之，降低。

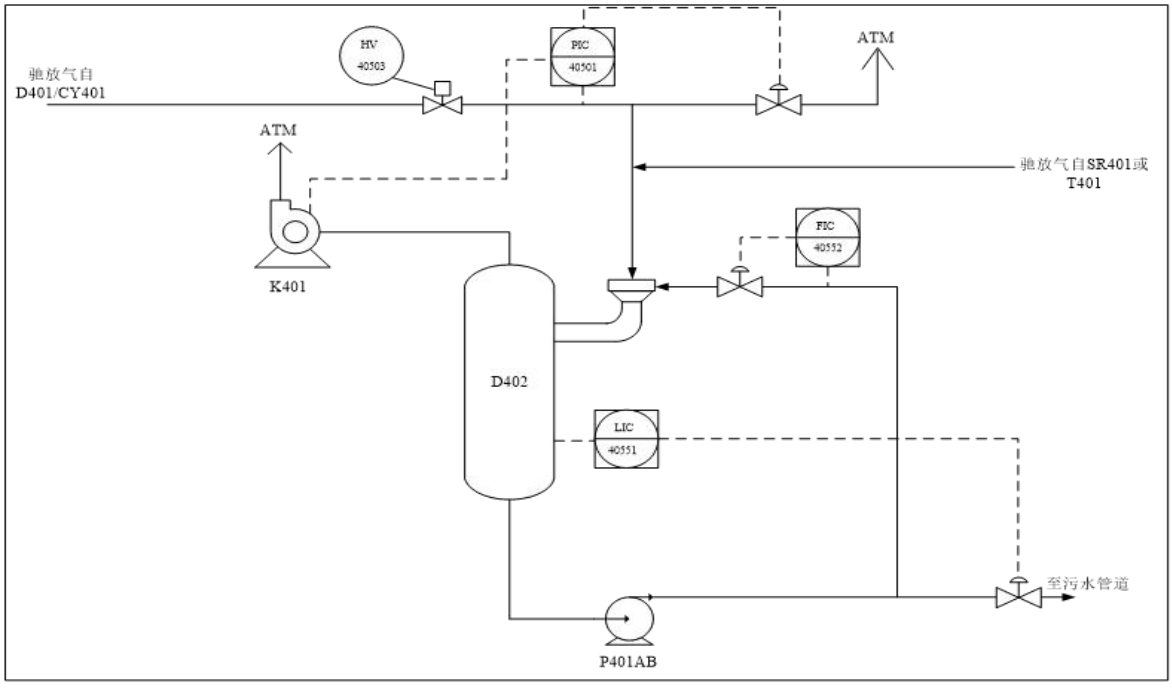
6)Troubleshooting: 异常调整：

Phenomenon 现象	Cause 原因	Handling method 处理方法

Phenomenon 现象	Cause 原因	Handling method 处理方法
D-402 liquid level is high D-402 液位高	It turns down when malfunction occurs to the control valve (LV-40551) for the delivery coke-containing sewage; flow rate of makeup water for D-402, flow rate of washing water for DY-402; fault flow rate increase makes the control valve fail; P-401 fault. 外排含焦污水控制阀 LV-40551 误动作关小；D-402 的补水流量、DY-402 洗涤水流量 故障流量增多控制阀失灵；P-401 故障。	Switch the control valve to manual control and turn up LV-40551. Regulate by the side-line on the site if the control valve fails; contact instrument personnel for handling in the case of instrument failure; switch to the emergency pump in a timely way in the case of machine and pump failure. Contact the bench worker for handling. 控制阀改手动控制，开大 LV-40551，如控制阀失灵，现场通过副线调节；仪表失灵 联系仪表处理；机泵故障及时切换至备用泵，联系钳工。
The D-402 liquid level is low. D-402 液位低	It turns up when malfunction occurs to the control valve (LV-40551) for the delivery coke-containing sewage; flow rate of makeup water for D-402, flow rate of washing water for DY-402; fault flow rate increase makes the control valve fail; P-401 fault. 外排含焦污水控制阀 LV-40551 误动作开大；D-402 的补水流量、DY-402 洗涤水流量 故障流量增多控制阀失灵；P-401 故障。	Switch the control valve to manual control and turn down LV-40551. Regulate by the side-line on the site if the control valve fails; contact instrument personnel for handling in the case of instrument failure; switch to the emergency pump in a timely way in the case of machine and pump failure. Contact the bench worker for handling. 控制阀改手动控制，关小 LV-40551，如控制阀失灵，现场通过副线调节；仪表失灵 联系仪表处理；机泵故障及时切换至备用泵，联系钳工。

Attention shall be paid to preventing is full of D-402, which makes water to be carried to K-401 and cause damage to K-401. Therefore, monitoring on D-401 liquid level shall be strengthened.
应注意要防止 D-402 液位满水带至 K-401，损坏 K-401。生产过程中加强 D-401 液位的监控。

(8)Control device (PIC-40501) for pressure at inlet of D-402
D-402 入口压力的控制 PIC-40501
1)Control range: control device (PIC-40501) for pressure at inlet of D-402 is controlled to be -0.34~0KPa
控制范围：D-402 入口压力的控制 PIC-40501 在-0.34～0KPa。
2)Control objective: during normal operation, pressure of D-402 shall be controlled to be within the above range, without exceeding the set value for ±0.1 KPa.
控制目标：正常生产时 D-402 压力应控制在上述范围内，不超过设定值得±0.1 KPa。
3)Relevant parameters: change in flow rate of purge gas, D-402 liquid level, number of turns of induced draft fan.
相关参数：驰放气量的变化、D-402 液位、引风机的转数。
4)Control mode: pressure (PIC-40501) at the inlet of D-402 is used to control the rotational speed of the induced draft fan and PV-40501. Reduce the variable frequency rotational speed of the induced draft fan firstly if the pressure is low. Still reduce the speed of the induced draft fan and start PV-40501 when the pressure is still low. Close PV-40501 and then start the induced draft fan when the pressure is high.
Purge gas from D401/CY401
控制方式：D-402 入口压力 PIC-40501 分成控制引风机的转速和 PV-40501。压力低则先降引风机变频转速，压力仍低停引风机开 PV-40501；压力高时先关 PV-40501，后开引风机。



5)Normal adjustment: 正常调整：

Influence factor 影响因素	Adjustment method 调整方法
Large flow rate of purge gas 驰放气量多	Regulate the frequency converter of the induced draft fan to improve the rotational speed. Start PV-40501 if the pressure at the inlet continues to rise. Otherwise, decrease the rotational speed. 调节引风机变频提高转速，入口继续升高开 PV-40501。反之，降低。
Rotational speed of the induced draft fan 引风机转速	Rotational speed of the induced draft fan rises, and pressure of the PIC-40501 drops. Otherwise, the pressure rises. 引风机转速升高，PIC-40501 压力降低。反之，升高。

6)Troubleshooting: 异常调整：

Phenomenon 现象	Cause 原因	Handling method 处理方法
Pressure at the inlet of D-402 is high. D-402 入口压力高	The D-402 liquid level is high; the induced draft fan cannot operate normally; failure occurs to the frequency converter. D-402 液位高、引风机不能正常工作、变频器故障。	Reduce the D-402 liquid level in a timely way; contact the bench worker to handle fault of the induced draft fan; start PV-40501. 及时降低 D-402 液位，引风机故障及时联系钳工处理、开 PV-40501。
Pressure at the inlet of D-402 is low. D-402 入口压力低	Malfunction occurs to PV-40501; flow rate of purge gas is low; fault of the bag filter; instrument fails. PV-40501 误动作，驰放气量少、布袋式过滤器故障，仪表失灵。	Switch the control valve to manual control; contact instrument personnel to handle instrument problems in a timely way. Switch the bag filter or bypass it timely if fault occurs to the bag filter. 控制阀处理问题及时改手动控制，仪表问题及时联系仪表处理，布袋式过滤器出现故障及时切换或改旁路。

At stage 1 of coke feeding during startup, the rate of bleeding gas flowing to the venturi scrubber (DY-402) of the heater decreases significantly, and is lower than the minimum flow rate required for DY-402. To meet the requirements for minimum flow rate of DY-402, additional pressurized air is used at D-401, and the conveying air of the transmission line flows to the coke powder bin T-401 and coke transfer hopper BN-401, to increase the bleeding gas rate. As for BN-401, air controllers FIC-40401 and FIC-40402 is put in the automatic mode

under the required set value. While slide valve controllers PIC-40401 and PIC-40402 are placed at 0% (manual mode). Likewise, FIC-30103 is placed in the automatic mode and in manual mode when PIC-30102 is 0% in T-401.

在开工加焦 1 阶段，流入加热器文丘里洗涤塔 DY-402 的放气速率明显较小，并且低于要求的 DY-402 的最小流量。为满足要求的 DY-402 最小流量，通过在 D-401 处使用附加的增压空气，并且将传输线的输送空气流入到焦炭细料筒仓 T-401 和焦炭转移料斗 BN-401，来增加放气速率。对于 BN-401，空气控制器 FIC-40401 和 FIC-40402 在所需设定值下置于自动模式，而滑阀控制器 PIC-40401 和 PIC-40402 放置在 0％置于手动模式。同样，FIC-30103 置于自动模式，PIC-30102 在 T-401 为 0％时置于手动模式。

(9)Nitrogen temperature (TIC-40304) of EH-401

EH-401 氮气温度 TIC-40304

1)Control range: 190~240℃.

控制范围；190～240℃。

2)Control objective: control the temperature after the nitrogen heater to be set value ±10℃.

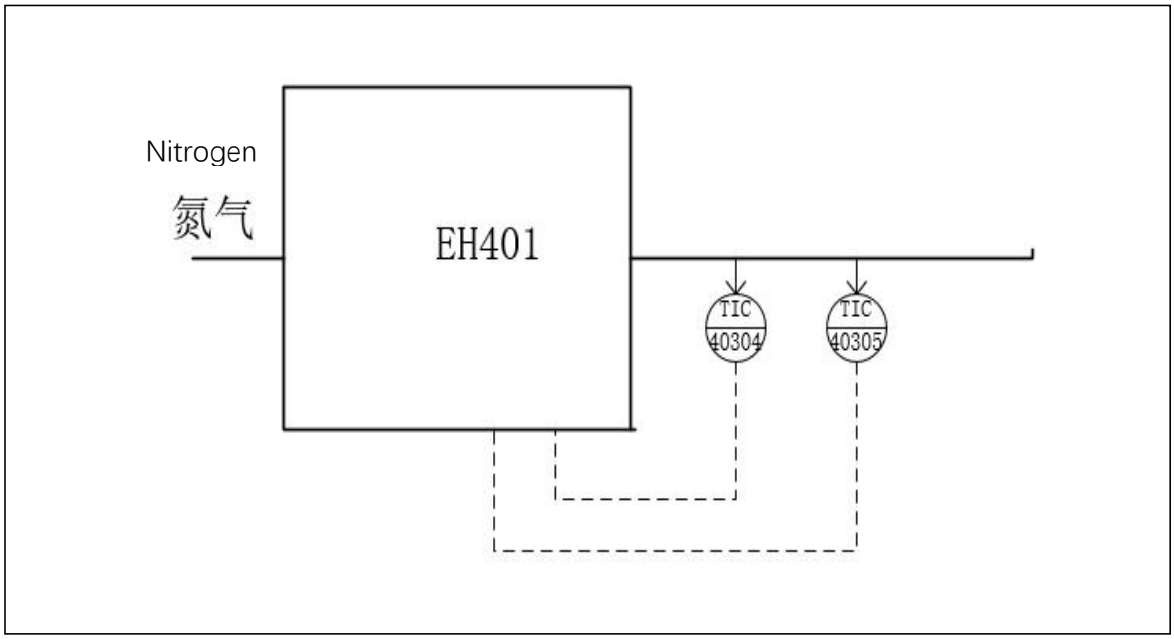
控制目标：控制氮气加热器后温度为设定值得±10℃。

3)Relevant parameters: flow rate of nitrogen entering the unit.

相关参数：氮气进装置流量。

4)Control mode: control its rate with TIC-40304 and regulate the outlet temperature (TIC-30105).

控制方式：用 TIC-40304 控制其功率，调节出口温度 TIC-30105。



5)Normal regulation: 正常调节：

Influence factor 影响因素	Adjustment method 调整方法

Influence factor 影响因素	Adjustment method 调整方法
Nitrogen inlet temperature 氮气入口温度	Temperature at the nitrogen inlet is low. EH-401 is used for the self-action of TIC-40304. Power of EH-401 becomes large; temperature at the inlet is high. EH-401 is used for the self-action of TIC-40304. Power of EH-401 becomes small. 氮气入口温度低，TIC-40304 自动作用 EH-401，EH-401 功率变大；入口温度高，TIC-40304 自动作用 EH-401，EH-401 功率变小。
Nitrogen consumption of D-401 D-401 氮气使用量	Nitrogen consumption of D-301 is large. EH-401 is used for the self-action of TIC-40304; turn up the power. Consumption of hot nitrogen reduces. Temperature (TIC-40304) is high. EH-401 is used for self-action of TIC-40304. Power of EH-401 becomes small. D-301 氮气使用量大，TIC-40304 自动作用 EH-401，调大功率；热氮气使用量减少，TIC-40304 温度相应高，TIC-40304 自动作用 EH-401，EH-401 功率变小。
Sealing of coke returning line of R-103 during startup 开工 R-103 返回焦管线密封	During startup, guarantee temperature and flow rate of hot nitrogen, without large regulation amplitude. The startup may fail in the case of problems. 开工过程中一定要保证热氮气温度以及流量，不能调节幅度过大，如果出现问题，可能大致开车失败。

6)Troubleshooting: 异常调节:

Influence factor 影响因素	Adjustment method 调整方法
EH-401 failure EH-401 坏	Close inlet and outlet manual valves, switch to EH-401 side-line, and contact the maintenance personnel for handling. 关进出口手阀，改走 EH-401 副线，联系维修处理。
TIC-40304 failure TIC-40304 坏	Switch TIC-40304 to manual control, and pay attention to body temperature. TIC-40304 改手动控制，注意本体温度。
EH-401 overtemperature EH-401 温度超高	Temperature of EH-401 body is generally not more than 530℃。 As specifically determined by the process package provided by the manufacturer. EH-401 本体温度一般不超过 530 摄氏度。具体情况由厂家提供工艺包确定。

Note: the body temperature shall not be more than 530℃, to be determined according to the actual process package.

注：其本体温度不超过 530℃，实际根据工艺包定。

2.4.5 Operation at site 现场作业操作法

(1)Quenched coke drum operation 急冷焦罐操作

Function of quenching tank D-101 is to cool coke fines discharged from heater, and then to transfer them to bed coke bin. During normal operation, the quenching tank is in batch operating mode, this is because quantity of discharged coke fines is small. Constant level in quenching tank during coke discharge is maintained by level control valve LV-11201 at quenching tank inlet, which is controlled by level controller LC-11201. Coke fines are cooled by spraying steam atomization water to prevent the bin from overheating. However, temperature must also be enough high to prevent wet coke from being muddy in fluidized bed and conveying line.

急冷罐 D-101 的作用是冷却加热器卸出的焦粉，然后再输送至床层焦料仓。在正常操作期间，急冷罐采用批次操作模式，这是因为焦粉卸出量较少。通过料位控制器 LC-11201 来控制急冷罐入口线上的料位控制阀 LV-11201 来维持卸焦过程中急冷罐料位的恒定。我们通过喷入蒸汽雾化水来冷却焦粉以避免料仓过热，温度控制在 180°-240°之间，以避免湿焦在流化床和输送管线中和泥。

The quenching tank is provided with six cooling water spraying nozzles, which are divided into two groups, where three nozzles are controlled by FC-11203, other three nozzles are controlled by FC-11204. During normal operation, only three nozzles controlled by FC-11203 are put into service. The nozzles controlled by FC-11204 are used only when quantity of coke discharge increases because the nozzles controlled by FC-11204 are designed to cool all coke fines produced in the lowest rate of gasification case. These cooling nozzles are provided with purging steam with restriction orifice to prevent coke fines from clogging.

急冷罐设有 6 个降温喷水管嘴，它们共分成两组，其中 3 个喷嘴由 FC-11203 控制，另三个由 FC-11204 控制。正常操作时只投用 FC-11203 控制的三个喷嘴，当卸焦量增大时才启用 FC-11204 控制的喷嘴，因为 FC-11204 控制的喷嘴是设计用来冷却最低气化率工况时所产生的所有焦粉的。这些降温喷嘴设有带限流孔板的吹扫蒸汽，以避免焦粉堵塞。

TC-11204 firstly starts FC-11203, and then starts FC-11204. FC-11203/11204 firstly opens atomization steam valve FV-11203B/11204B, and then opens cooling water valve FV-11203A/11204A. When more cooling load is required, the valves shall be opened in the following sequence: FV-11203B, FV11203A, FV-11204B, FV-11204A. This is to prevent water column from entering quenching tank. Quantity of atomization steam used to cool coke fines shall be set as 0.068kg steam/kg cooling water.

TC-11204 将先启动 FC-11203，后启动 FC-11204。FC-11203/11204 将先打开雾化蒸汽阀 FV-11203B/11204B，后打开降温水阀 FV-11203A/11204A。当需要更多的冷却负荷时，应按照以下顺序开启阀门：FV-11203B，FV11203A，FV-11204B，FV-11204A。这样做是为了防止水柱进入急冷罐。冷却焦粉的雾化蒸汽用量应该设定为 0.068kg 蒸汽/kg 冷却水。

Gas in quenching tank overhead (mainly steam) leaves the quenching tank, and returns to the heater. To prevent quenching tank from overpressure when separating it, the quenching tank is provided with relief valve PSV-1274. Shut-off valve at relief valve PSV-1274 inlet is interlocked with shut-off valve to ensure that one of relief valves is in open condition. In normal case, shut-off valve at heater inlet is normally opened, and shut-off valve at relief valve inlet is closed. The relief valve isn't required during normal operation. The relief valve is put into service only when the quenching tank shall be separated from the heater.

急冷罐顶部气体（主要是蒸汽）从急冷罐出来，返回至加热器。为了在急冷罐隔离时防止其超压，急冷罐上设置了安全阀 PSV-1274。安全阀 PSV-1274 入口的切断阀与加热器入口的切断阀是联锁的，以确保其中一个始终处于打开状态。正常情况下，加热器入口的切断阀是常开的，而安全阀入口的切断阀是关闭的。在正常操作时安全阀是不需要的，只有当急冷罐需要和加热器隔离时才需要投用安全阀。

1)Startup 开工

a. Fluidization steam FI-11206, atomization steam FV-11203B and FV11204B for quenching tank shall be in hot standby condition.

急冷罐用流化蒸汽 FI-11206、雾化蒸汽 FV-11203B 和 FV-11204B 保持热备状态。

b. Once the system is preheated fully, slowly open LV-11201 to send coke to quenching tank D-101. Open aeration steam FI-11101 of quenching tank feed standpipe, nitrogen aeration is used during startup.

一旦系统彻底预热后，慢慢打开 LV-11201 向急冷罐 D-101 送焦。缓慢开始通过 FV-11203A 和 FV-11204A 注入降温喷水来控制急冷罐床温。打开急冷罐进料立管松动蒸汽 FI-11101，开工期间采用氮气松动。

c. Get through the conveying flow process from product coke to bed coke bin according to the conveying procedures of dilute phase coke fines.

按照稀相焦粉输送程序打通产品焦至床层焦料仓的输送流程。

d. When the level in D-101 LC-11201 reaches 20%, slowly transfer coke fines to heat hot coke fines conveying line in order to prevent system coke fines from being muddy. Slowly inject cooling spraying water to control quenching tank bed temperature via FV-11203A and FV-11204A.

当 D-101 料位 LC-11201 达到 20%时，慢慢开始输送焦粉来加热焦粉输送管线以防止系统焦粉和泥。通过 FV-11203A 和 FV-11204A 注入降温喷水来控制急冷罐床温。

2)Shutdown 停工

a. Close cooling spraying water FV-11203A and FV-11204A.

关闭降温喷水 FV-11203A 和 FV-11204A。

b. Close LC-11201, stop hot coke feed to quenching tank, perform cleaning by explosion purging.

关闭 LC-11201，停止急冷罐热焦进料，爆破吹扫干净。

c. Stop aeration steam of standpipe hot coke feed to quenching tank.

停止急冷罐立管热焦进料的松动蒸汽。

d. Send all coke fines to bed coke bin, and clean quenching tank.

将所有焦粉送至床层焦料仓，清扫急冷罐。

e. Stop all steam to quenching tank. Only a little of fluidization steam and atomization steam are reserved to maintain hot standby condition of quenching tank.

停止去急冷罐的所有蒸汽，只保留少量流化蒸汽和雾化蒸汽，以保持急冷罐处于热备状态。

(2)Seal of gasifier coke return line 气化器返焦线密封

The gasifier coke return line must be sealed by coke fines as long as the level in the gasifier coke fines is lower than that in overflow pipe. This is to prevent empty blowing in conveying line. If this line isn't sealed by coke fines, gas velocity in the line will increase, resulting in severe abrasion in angle riser and vertical riser. In addition, high temperature Flexigas will also enter heater bed overhead from gasifier.

无论何时，只要气化器焦粉料位低于溢流管料位时，气化器返焦线必须用焦粉封住。这样做的目的是防止输送管线吹空。若没有焦粉密封该管线，管内气速会增加，会导致角型提升管和立式提升管磨蚀严重。此外，高温灵活气也会自气化器直接进入加热器床层顶部。

During startup, gasifier coke return line is sealed directly by coke fines in coke fines bin. After sealing, fill nitrogen to both ends to ensure dehydration of coke fines. During normal operation, if gasifier feed failed or coke feed line clogged resulting in decrease of level in gasifier, stop all aeration of gasifier coke return line, and seal this coke return line with coke fines backflow from gasifier and heater. When gasifier feed failed or feed coke failed, it isn't necessary to immediately seal gasifier coke return line because decrease of level in gasifier is slow. Generally, sealing is required only when duration of loss of gasifier feed exceeds 1 hour. level in gasifier may be increased rapidly by loosening the bed, if necessary, coke fines may be overflowed to coke return line.

开工期间，直接用焦粉料仓的焦粉密封气化器返焦线，密封后两端通入氮气保证焦粉脱水。在正常操作期间，如果气化器进料故障或进焦线堵塞，导致气化器料位下降，那么停止气化器返焦线的所有松动，并用气化器及加热器倒流的焦粉密封此返焦线。气化器进料故障或进料焦故障时，没有必要立即密封气化器返焦线，因为气化器料位下降很慢。通常，返回焦线密封根据气化器料位进行，只有当气化器进料中断超过 1 小时才需要密封。气化器料位可以通过疏松床层来快速提高，如果有必要，可以溢流焦粉至返焦线。

Sealing/unsealing operation of coke return line shall follow the following procedures. Sealing operation is based on coke fines not blew out from gasifier coke return line.

返焦线的密封/解封操作应遵循以下程序。密封操作是基于气化器返焦线中的焦粉未被吹出。

1)Unsealing 解封

a. Coke return line shall be unsealed by nitrogen to prevent coke fines from wetting. Unsealing shall be started from top aeration orifice of vertical riser or from instrument tap point, and performed gradually by nitrogen. Unsealing shall be first performed from the highest tap

point to the lowest tap point of RO-1475 (top restriction orifice), and then from the highest tap point to the lowest tap point of RO-1465 (bottom restriction orifice).
采用氮气来解封返焦线，以防止焦粉变湿。解封从立式提升管的顶部松动点或仪表引压点开始，逐次用氮气试行。解封先从 RO-1475（顶部限流孔板）的最高引压点到最低引压点，然后再从 RO-1465（底部限流孔板）最高引压点到最低引压点。

b. After all vertical risers are unsealed from aeration orifices and tap points, start to unseal angle riser in sequence from the highest point to the lowest point.
当所有立式提升管上的松动点及引压点解封后，开始解封角型提升管，顺序也是从最高点至最低点。

c. If temperature of coke return line increases rapidly (TI-11501), and readings from overflow pipe and riser instruments (LI-11501, PDI-11502, PDI-11503) decrease, it may be determined that coke fines circulation has started.
如果返焦线的温度快速上升(TI-11501)，溢流管及提升管仪表读数下降(LI-11501，PDI-11502，PDI-11503)，则可以确定焦粉循环已经开始。

d. Once the piping gets hot, aeration fluid shall be changed to steam from nitrogen. Firstly open steam supply, and then close nitrogen supply. Prior to operation, draining shall be performed from the position closest to aeration steam manifold of gasifier coke return line to ensure steam dehydration. Coke fines circulation shall be stabilized by adjusting aeration gas flow.
一旦管线变热，将松动介质由氮气改成蒸汽，先打开蒸汽再关闭氮气源。在操作之前，为确保蒸汽脱水，应在靠气化器返焦线松动蒸汽歧管处最近的地方排凝。调节松动气量来稳定焦粉循环。

2)Sealing 密封

a. Prior to sealing, convert aeration fluid to nitrogen, and then purge aeration head to remove steam in the head in order to prevent steam condensation after coke return line is shutdown. Once the lines is filled with nitrogen, transfer the steam supply blind of utility connection to blind position to ensure that steam shall not be leaked to conveying line.
在密封之前先将松动介质切换到氮气，然后吹扫松动总管，清除其中的蒸汽以防止返焦线停工后出现蒸汽冷凝。一旦管线充满氮气，将公用工程接口的蒸汽供应盲板转至盲位，以确保蒸汽不漏至传输线。

b. Close individual aeration orifices in angle riser in turn from the lowest point. Close aeration orifice at bottom of overflow pipe. When aeration orifices in all angle risers are closed, the conveying line is in sealing condition.
从最低点开始依次关闭角型提升管上的各个松动点。关闭溢流管底部的松动点。当所有角型提升管上的松动点关闭后，输送线将处于密封状态。

c. Close instrument tap point and aeration orifice of vertical riser, close the valve closest to conveying line.
关闭立式提升管的仪表引压点和松动点，关闭离输送线最近的阀门。

d. If temperature of conveying line decreases, it may be determined that sealing has been completed. If level in gasifier is too low, coke fines from gasifier isn't sealed adequately, main air flow to gasifier may be increased so that coke fines bed is raised to fill the line.
如果输送线的温度下降，则可以确定密封已完成。如果气化器中料位太低，从气化器来的焦粉不够密封，可以快速增加去气化器的主风量，将焦粉床层抬高来填充管线。

e. Once conveying line is filled and sealed, open nitrogen points at vertical riser top and conveying line inlet (gasifier side) to prevent steam from entering the line and condensation.
一旦输送线填满并密封，打开立式提升管顶部和输送线入口处（气化器侧）的氮气点，防止蒸汽进入管线并冷凝。

(3)Chunk discharge 块状焦卸出

1)Reactor chunk 反应器焦块

Opening of cold coke standpipe grating is 38 mm×100 mm. Therefore, chunk with size more than this opening size will accumulate at the bottom of reactor stripping section. These large chunks must periodically be discharged from the system by massive coke; otherwise the accumulated chunk will finally restrict circulation flow of cold coke. Frequency of coke discharge shall be determined based on experience, and generally once a day. When reaction feed failed, reaction temperature upset will cause that chunks on wall fall off. At this time, frequency of coke discharge shall be increased. If coke fines accumulation or unobstructed coke fines circulation is located, frequency of chunk coke discharge shall be increased.
冷焦立管格栅开孔为 38 mm×100 mm，因此尺寸大于该开孔的焦块就会聚集在反应器汽提段底部。这些大焦块必须通过块状焦卸出系统定期卸出，否则焦块聚集将最终限制冷焦的循环量。卸焦频次根据经验确定，通常一天一次。当反应进料故障，反应温度波动会引起器壁焦块脱落，这时需要增加卸焦频次。如果发现焦粉聚结或者焦粉循环不畅，则应提高块状焦卸焦频次。

Normal operating position of valves: MOV-10501/MOV-10502 are closed, MOV-10503/ MOV-10504 are slightly opened. Condensate water can accumulated between MOV-10501/ MOV-10502 in the coke discharge line, thus condensate water shall be drained before coke discharge through coke discharge. If condensate water isn't drained, condensate water will suddenly be vaporized when opening MOV-10501. This can result in rapid increase of level in reactor, which triggers the interlock PS-104 causing shutdown of reactor.
阀门的正常操作位置是：MOV-10501/ MOV-10502 关闭，MOV-10503/ MOV-10504 微开。卸焦线上 MOV-10501/ MOV-10502 之间可能有凝结水积累，所以经卸焦线卸焦之前应先排净管线中的凝结水。若不排凝结水，打开 MOV-10501 时冷凝水会突然蒸发，这可能导致反应器料位快速上升，进而触发联锁 PS-104 致使反应器停车。

The following is the coke discharge procedures:
以下是卸焦步骤：

a. Close bottom valves MOV-10503 and MOV-10504.
关闭底部阀门 MOV-10503 和 MOV-10504。

b. Open top valves MOV-10501 and MOV-10502, and fill coke fines to the lower line.
打开顶部阀门 MOV-10501 和 MOV-10502，让焦粉填入下部的管线中。
Note: This position is provided with electrical interlock. The purpose is to ensure that MOV-10501/10502 may be opened only when MOV-10503 is closed in order to prevent the material in the reactor is vented to atmosphere. Valve position of MOV shall be verified visually. Before opening MOV-10503, ensure that MOV-10501/10502 shall be closed fully.
注：此处设有电气联锁，目的是确保只有当 MOV-10503 关闭时 MOV-10501/10502 才能打开，以防将反应器内的物料卸至大气中。MOV 的阀位还需要外观确认。同样 MOV-10503 在打开之前，必须确保 MOV-10501/10502 完全关闭。
a.. Open bottom purging steam RO-1136 to perform purging for 15 minutes so that coke fines and oil vapor shall be blew back to the reactor.
打开底部吹扫蒸汽 RO-1136 吹扫 15 分钟，将细焦粉和油气吹回反应器。
b. Close top valves MOV-10501 and MOV-10502. This may requires use of valve seat purging steam. Check the valve position indicator, and ensure that the valve shall be fully closed.
关闭顶部阀 MOV-10501 和 MOV-10502，这很可能需要使用阀座吹扫蒸汽，微开阀座吹扫蒸汽，防止顶部阀 MOV-10501 和 MOV-10502 有少量焦粉卡涩，检查阀位指示器，确保阀门完全关闭。
c. Ensure that the upper valve is closed, and then vent the line through vent line.
确保上部阀门关闭，然后经放空线给管道泄压。
d. Open bottom valves MOV-10503 and MOV-10504, and discharge chunks to collection hopper.
打开底部阀门 MOV-10503 和 MOV-10504，将大块焦卸至收集料斗。
e. Generally, coke fines and chunk will be discharged automatically, however, if necessary, they may be blew out by upper purging steam.
通常，焦粉和块状焦会自动卸出，但如果必要的话可以用上部吹扫蒸汽吹出。
f. Once all coke fines and chunk are discharged fully, decrease the opening of bottom valve to about 5% (its purpose is to ensure that condensate water shall be drained fully).
一旦所有焦粉和块状焦卸尽，关闭底部阀门至开度的 5%左右（目的是保证排净冷凝水）。
g. Check discharged material for chunk, aggregation or refractory material, etc.
检查卸出的物料，看是否有焦块、聚结物或耐火材料等。
h. If there is excess chunk / aggregation in the hopper, repeat the coke discharge. In normal conditions, the discharged material is small.
如果料斗内有过量的焦块/聚结物则需要重复卸焦。正常情况下卸出的物料很少。
2)Chunk in heater 加热器焦块
Chunk coke discharge procedures for heater quenching section are similar to these for reactor. MOV-11001/11002/11003 are also provided with electrical interlocks. The purpose is to ensure that MOV-11001/11002 may be opened only when MOV-11003 is closed in order to prevent the material in the heater is vented to atmosphere. Valve position and conditions of these

valves shall be verified visually. Also, the interlock requires that MOV-11003 may be opened only when MOV-11001/11002 are fully closed. During normal operation, valve MOV-11001/11002 are in closed condition to play the role of double separation.
加热器急冷段的焦块卸焦程序与反应器的焦块卸焦程序类似。但是加热器的阀座吹扫蒸汽需要关闭，以防加热器底部产生热点。MOV-11001/11002/11003 也设有联锁，确保只有在 MOV-11003 关闭时 MOV-11001/11002 才可打开，以防将加热器内的物料卸到大气中。这些阀门的阀位状态也必须经过外观确认。同样，联锁要求 MOV-11001/11002 完全关闭之后 MOV-11003 才能打开。正常操作期间，阀门 MOV-11001/11002 处于关闭状态，以起到双重隔离作用。

(4)Maintenance of feed nozzle 进料喷嘴维护

Cleaning feed nozzle helps feed atomization. Poor feed atomization will cause formation of excess aggregation, finally resulting in too large coke fines particle, unobstructed coke fines circulation.
进料喷嘴清洁有助于进料雾化。进料雾化差将导致过多聚结物形成，最终将导致焦粉颗粒变大，焦粉循环不畅。

During normal cleaning, use iron bar to dredge feed nozzle. Time schedule of nozzle cleaning shall be established, and generally once a week. Frequently monitoring feed nozzle pressure may indicate clogging condition. When the nozzle is clogged, pressure gauge will indicate steam pressure, instead of normal oil pressure.
正常清洁过程是用铁杆疏通进料喷嘴。应该建立清洁喷嘴的时间计划表，通常一周一次。频繁的监测进料喷嘴压力能指示喷嘴堵塞情况，当喷嘴堵塞时，压力表将显示蒸汽压力而不是正常的油压。

1)Important notes of maintenance of feed nozzle 进料喷嘴维护的注意事项

Performance of feedstock system is critical to operation of this Unit. The following is important notes for maintenance of feedstock system:
原料系统的表现对本装置操作至关重要。以下是关于原料系统维护的注意事项：

a. Atomization steam to all nozzles shall be maintained continuously, regardless of operation of nozzles.
不论喷嘴是否投用，所有喷嘴都必须保持雾化蒸汽不中断。

b. If a feed nozzle is stopped temporarily, its feed must be shut off by double valves to prevent a little of unatomized vacuum residue from entering the reactor when it is shut off by single valve. This vacuum residue entering the system will result in formation of coking. Also, there is coking in the stripping section if vacuum residue at low temperature enters the reactor bed when feeding failed.
如果某个进料喷嘴暂停投用，其进料必须采用双阀切断，以防单阀切断时有少量未雾化减渣漏入反应器。此类减渣漏入系统将导致结焦形成。还有，当进料故障时若有减渣低温进入反应器床层时，汽提段就会结焦。

c. Field pressure gauges shall be under good operating conditions, because they are indicators of performance of feed nozzles. Pressure range of these pressure gauges shall be low as possible, and in accordance with pressure of atomization steam.
现场压力表应保持在良好的工作状态，因为它们是进料喷嘴性能表现的指示器。这些压力表的压力范围应尽可能低，与雾化蒸汽的压力一致。

d. Periodically check all atomization steam trap valves to ensure that steam shall not contain any condensate water.
定期检查所有雾化蒸汽疏水阀，以保证蒸汽不带任何凝结水。

e. Total atomization steam flow rate and pressure shall be monitored continuously. Flow rate of steam shall be controlled by critical pressure drop restriction orifice (RO). Atomization steam shall continuously be put into service, regardless of operation of nozzles. Flow rate of atomization steam is controlled by restriction orifice, therefore, if indication of field pressure gauge changes, it means that there is operation problem in the appropriate feed nozzle.
总的雾化蒸汽流量和压力应连续监控，蒸汽流量由临界压力降节流孔板(RO)控制。无论喷嘴是否投用，雾化蒸汽应始终持续投用。由于雾化蒸汽流量由限流孔板控制，因此现场压力表若出现变化则表明相应进料喷嘴出现操作问题。

f. Total feed flow to all nozzles shall be monitored continuously. In normal operation, there shall be no significant change in feedstock flow rate to every nozzle. If there is significant change (+/-10%) in one nozzle feed flow rate, flow rate or feed nozzle shall be checked.
去所有喷嘴的总进料量应连续监控。在正常操作时，流向每个喷嘴的原料量不应大幅变化。如果某个喷嘴进料量发生明显变化(+/-10%)，则需要考虑检查流量或进料喷嘴。

g. Nozzle shall be cleaned frequently in case of:
出现以下情况时需要更频繁地清理喷嘴：

It is judged that quantity of produced chunk is increased based on chunk conditions in the reactor and heater.
根据反应器和加热器出现大块焦情况判断出大块焦生成量增加。

Increase of chunk aggregated in J-tube of conveying line causes that coke fines circulation is difficult, and that J-tube shall be purged by explosion steam more frequently.
输送线 J 型管内焦块聚结量增加，导致焦粉循环困难，且需要更频繁地爆破蒸汽吹扫 J 型管。

It is judged that hydrocarbon carry-over is increased based on performance decrease of Flexigas treatment system/Flexigas scrubber system.
根据灵活气处理系统/灵活气洗涤塔系统性能下降判断出烃类携带量增加。

Coke fines aggregation causes that slurry oil filter of scrubber circulation is clogged more frequently.
焦粉聚结导致洗涤塔循环油浆过滤器更频繁地堵塞。

a. When cleaning the nozzle clogged partially, Putting atomization steam into service shall be maintained. Fully insert the cleaning bar until it reaches the reducer of nozzle outlet. Now, top end of cleaning bar shall project about 25mm from front end of the nozzle.

当清理部分堵塞的喷嘴时，雾化蒸汽应保持投用。完全插入清理杆直到触及喷嘴出口的大小头。此时，清理杆的顶端应伸出喷嘴前端约 25 毫米长。

b. Steam pressure will build up after the cleaning bar is inserted into nozzle, thus personal protection equipment shall be worn properly when cleaning the clogging.

因为清理杆插入喷嘴后，蒸汽压力憋高，所以清理堵塞的喷嘴时要配好安全防护设施。

2)Cleaning procedures of feed nozzle 进料喷嘴清理步骤

a. Shut off the valve in the feed head.

切断进料总管上的阀门。

b. Open vent valve (at outside of straight gate valve of nozzle closed) to vent the spool piece, then remove the plug, and connect to cleaning bar tool with stuffing box (connection must be tight to prevent material from misdirected flow when the valve is opened).

打开放空阀（在已关闭喷嘴等径闸阀的外部）给该管段泄压，然后拆除堵头，并连接带有填料函的清理杆工具 (连接必须紧密，防止阀门打开时物料倒窜)。

c. Close vent valve.

关闭放空阀。

d. Open straight gate valve of nozzle, then force to insert the cleaning bar tool until it reaches the reducer of passway nozzle outlet.

清理杆工具与堵头螺纹完全连接以后，打开喷嘴等径闸阀，然后用力插入清理杆工具，直到清理杆触及通道喷嘴出口的大小头。

e. Withdraw the cleaning bar until the bar end is fully withdrawn from the straight gate valve, then close the gate valve.

退出清理杆直至杆端完全退出等径闸阀，然后关闭闸阀。

f. Before removing the cleaning bar, firstly open vent valve to vent the pressure between the straight gate valve of nozzle and the packing gland.

在拆卸清理杆之前，先打开排气阀来卸掉喷嘴等径闸阀和填料压盖之间的压力。

g. Carefully remove the cleaning bar tool (it is hot), and then install pipe cap.

小心地拆除清理杆工具（会很烫）然后安装管帽。

h. Prior to open it, close feed shut-off valve.

打开之前关闭的进料切断阀。

3)Overhauling and maintenance procedures 大修维护程序

a. During shutdown overhauling, all feed nozzles and restriction orifices of atomization steam shall be replaced.

停工检修期间首先将进料喷嘴处的碱渣用蒸汽吹扫干净，防止喷嘴处堵塞，再考虑更换所有进料喷嘴和雾化蒸汽的限流孔板。

b. During every shutdown overhauling, remove atomization steam filters, clean and check them.

每次停工检修期间应拆出雾化蒸汽过滤器，进行清洗和检查。

c. Check feed line for cleaness with a camera.

用摄像机检查进料管线清洁情况。

(5)Coke fines sampling 焦粉采样

Coke fines in hot coke circulation line shall be subject to regular sampling and analysis of particle size distribution of coke fines. Frequency of sampling depends on the operating conditions. During the Start of Run, when rate of gasification is in low case, sampling shall be performed once a shift, as guideline of breaking steam nozzle. When the Unit is in normal operating mode, frequency of sampling may be reduced to once a week when breaking steam isn't required. Sampling facility of coke fines shall be provided with lock hopper, and similar to chunk discharge facility of reactor and heater. In the normal operating conditions, two top hand valves shall be closed, and purging gas shall be always put into service to maintain cleaness of sampling outlet line.

热焦循环线的焦粉需要定期采样分析焦粉的粒度分布。采样频次取决于操作条件。在开工初期当气化率处于较低工况时，应每班采取一次，以作为破碎蒸汽喷嘴的操作指导。当装置进入正常操作模式，不再需要投用破碎蒸汽时，采样频次可以减少到每周一次。焦粉采样设施配有闭锁料斗，与反应器和加热器的块焦卸焦设施类似。正常操作条件下顶部两道手阀关闭，吹扫气始终投用以保持采出线清洁。

Sampling procedures are as follows:

以下是采样步骤：

a. Maintain top shut-off valve (to hot coke line) closed. Open sampling pipe outlet valve (bottom valve) and intermediate shut-off valve. Open nitrogen to sampling pot, and perform purging and cleaning.

保持顶部切断阀（通向热焦线）关闭，打开采样管出口阀（底部阀）和中间切断阀，打开通往采样罐的氮气并吹扫干净。

b. Close sampling pipe outlet valve and intermediate shut-off valve, and then slowly open top shut-off valve (to hot coke line). Nitrogen will be blown into hot coke line for several minutes through two connections. Make sure that nitrogen consumption shall not be too more; otherwise obstructed fluidization of coke fines in hot coke line may be caused.

关闭采样管的出口阀和中间切断阀，然后慢慢打开顶部切断阀（通向热焦线），氮气会经两个接口吹入热焦管线几分钟。注意氮气用量不要过多，否则可能导致热焦线的焦粉流化不畅。

c. Close nitrogen valve, and open intermediate shut-off valve with inlet to sampling pipe. A little of nitrogen may be required to send coke fines into the sampling pipe.

关闭氮气阀门，打开入口去采样管的中间切断阀，可能需要少量氮气将焦粉带入采样管。

d. After several seconds, open nitrogen purging intermediate hand valve body, close intermediate shut off hand valve, and then close the upper shut-off valve.

几秒钟后，打开氮气吹扫中间手阀阀体，关闭中间切断手阀，然后关闭上部切断阀。

e. Open outlet valve of sampling pipe. Coke fines sample is flowed by gravity and discharged to the sampling pot. Because the sampling pot is hot, carefully handle it.

打开采样管的出口阀，通过重力自流将焦粉样品卸出至采样罐。因为采样罐很烫，要小心经管。

f. Prior to sample analysis, it shall be cooled adequately.

样品分析之前要让它充分冷却。

Note: If aeration gas flow is very low, particle size distribution of coke fines sample will not be affected even if Putting aeration into service. If aeration gas flow is very high, the particle size of sampled coke fines will be big since fine coke fines have been removed. Thus sampling may be performed with and without aeration gas flow respectively, to determine effect of aeration gas flow on sampling. If the result shows that there is no difference between the samples, aeration shall be put into service when sampling.

注意：如果松动气量很低，那么即使投用松动也不会影响焦粉样品的粒度分布；如果松动气量太大，由于细焦粉会被脱除，因而采出的样品焦粉颗粒会较大。因此可以在松动气量有和无的时候分别采样以确定松动气量对采样的影响。如果结果显示样品无差异，则以后采样时就让松动气投用。

Caution: Do not open three valves at the same time. Due to uneven thermal expansion, the particle size of coke fines is uneven, and valves can be clogged, causing that they cannot be operated.

小心：不要同时打开三道阀门，由于热膨胀不均匀，焦粉颗粒不均匀， 阀门可能会堵塞导致不能使用。

(6) Cleaning of circulation oil slurry filter 循环油浆过滤器的清洗

Circulation slurry oil system of scrubber is provided with filter STR-101A/B, whose functions are to protect circulation slurry oil and feed pumps of scrubber, and to prevent feed nozzle from clogging. Big coke fines particles will be captured in this filter, which must be cleaned regularly. With continuous increase of pressure drop across the filter, the filter may achieve off-line back flush, which flushes the coke fines captured on the filter basket wall to the bottom so that some filtering area may be restored. If this cannot make pressure drop across the filter to be reduced within the allowable range, the filter must be cleaned in mechanical cleaning method.

过滤器 STR-101A/B 设置在洗涤塔循环油浆系统，作用是保护洗涤塔循环油浆泵和进料泵，并防止进料喷嘴堵塞。大焦粉颗粒将在此处捕集，必须定期清洗。随着过滤器上压降不断增加，过滤器可以实现离线反冲洗，将过滤篮壁上捕集的焦粉颗粒冲洗到底部，以便恢复一些过滤面积。如果这样不能使过滤器压降减少到允许范围内，就必须使用机械方法来清洗过滤器。

2.4.6 Service instruction of pump 机泵的使用规程

Pump is a kind of fluid machinery that converts the mechanical energy into liquid energy, delivers liquid and increases the pressure. It can be divided into vane pump, positive displacement pump and jet pump according to the working principle. All of the vane pumps of this unit are of centrifugal type and mainly structured as single-stage pump, multistage pump,

high speed pump, self-priming pump, submerged pump and magnetic pump; the positive displacement pump is used in the form of the hydraulic diaphragm metering pump, pneumatic diaphragm pump, plunger pump and screw pump; the gland ejector of steam turbine uses the jet pump.

泵是将机械能转化为液体的能量，用来对液体进行输送并增压的流体机械。按工作原理可分为叶片式泵、容积式泵及喷射式泵等，本装置中叶片式泵全部采用离心式泵，结构型式主要有单级泵、多级泵、高速泵、自吸泵、液下泵及磁力泵等；容积式泵采用液压隔膜式计量泵、气动隔膜泵、柱塞泵、螺杆泵等；汽轮机的汽封抽气器采用喷射泵。

Operation method of centrifugal pump 离心泵的操作法

(1)Preparation before starting the pump 开泵前的准备工作

1)Clean the pump and surrounding area, and check and clean the sundries in the bearing box bracket of double-support pump; check whether the pump body, anchor bolt, pipeline valve, flange bolt and pressure gauge joint are loose;

清扫泵及周边卫生，检查清扫双支撑泵轴承箱托架中的杂物；检查泵体、地脚螺栓、管线阀门、法兰螺栓、压力表接头等有无松动；

2)Check whether the grounding wire of motor is installed, whether the coupling is connected and whether the protective cover is firm, and prevent the protective cover from contacting with the coupling;

检查电机接地线是否装好，联轴器是否联好，护罩是否牢固，严禁护罩与联轴器接触；

3)Add lubricating oil as required (oil level: 1/2-2/3 of the liquid level meter of bearing box);

按规定加好润滑油，油位在轴承箱液面计 1/2～2/3 处；

4)Open the cooling water inlet/outlet hand valve, adjust the water quantity and confirm the circulation is normal;

打开冷却水出、入口手阀，调整好水量，确认循环正常；

5)For the pumps using the PLAN52 and 53B (washing scheme), check and add white oil to the 1/2-2/3 of the liquid level meter, and put the system in use;

对于采用 PLAN52、53B 方案的泵，检查、加注白油至液面计 1/2～2/3 处，投用系统；

6)Pump priming: close the pump outlet valve and blow-off valve, fully open the inlet valve, slightly open the blow-off valve and close it after exhausting the air in pump. Open the isolation valve of outlet pressure gauge;

灌泵：关闭泵出口阀、排空阀，全开入口阀，稍开泵排空阀排尽泵内气体后关闭。打开出口压力表隔离阀；

7)Check whether leakage occurs at the dynamic/static sealing points;

检查各动静密封点有无泄漏；

8)The hot oil pump shall be in the hot standby state (see Section 6 for the detailed preheating operation);

对于热油泵，应处于热备用状态（预热操作详见第 6 小节）；

After installation, overhaul or long-term shutdown of self-priming pump, conduct pump priming from the drainage opening before start till the pump is filled with water;
对于自吸泵，安装检修完或长时间停运后，启动前应先从引流口进行灌泵，至泵体内灌满水；
Before starting the high speed pump, establish the lubricating oil system till the oil pressure rises to 0.4MPa stably;
对于高速泵启动前先建立润滑油系统，待油压上升稳定至 0.4MPa；
9)Activate turning by more than 540°manually in the rotating direction, and check whether the rotor rotates flexibly without jamming and has eccentric weight or abnormal metal friction sound;
沿转动方向手动盘车 540°以上，检查转子转动是否灵活、有无卡涩、偏重或金属磨擦声等异常；
10)Contact with the electrician for power transmission.
联系电工送电。

(2)Starting pump 开泵操作
1)Confirm the inlet valve is fully opened, the outlet valve is fully closed (prevent overload during motor start) and the outlet valve of high speed pump is opened slightly;
确认入口阀全开，出口阀全关（防止电机启动过载），高速泵出口阀微开；
2)Start the motor (start the fan blade first for variable frequency motor), check the rotating direction, and check whether the pump and motor have abnormal sound, whether the vibration is controlled within standard value and whether leakage occurs at the sealing points;
启动电机（变频电机先开风叶），检查转向，检查泵和电机有无异常杂音，振动是否在标准值内，有无密封点泄漏；
3)When the outlet pressure of pump is equal to the operation pressure within 3min, open the outlet valve gradually, and control the outlet pressure and flow of pump; if the discharge pressure of the magnetic pump P-233AB cannot reach a normal value within 10s, stop the pump immediately and conduct pump priming again for exhaust; check whether the oil pressure of lubricating oil system of high speed pump is normal;
在 3 分钟内，当泵出口压力等于操作压力时，逐步开大出口阀，控制泵的出口压力和流量；对于磁力泵 P-233AB，若 10 秒内达不到正常排放压力，应立即停泵，重新进行灌泵排气； 对于高速泵，检查润滑油系统油压是否正常；
4)Check whether the motor current is controlled within the rated value, if the pump runs under rated flow and the motor is overload, stop pump for inspection;
检查电机电流是否在额定值以内，如果泵在额定流量下运转，而电机超负荷，应停泵进行检查；
5)After pump starting, pay close attention to the operating condition within the first 8 hours (the observation time shall be 24h for the pump which has just undergone major repair).
开泵运转后，前 8 小时内，密切关注泵运转情况（对于刚大修后的泵，该时间为 24 小时）。
6)Precautions 注意事项

a. The bearing box of centrifugal pump shall not operate without oil so as to prevent journal sticking, leakage and fire of pump.
离心泵严禁轴承箱无油运转，以免发生泵抱轴、泄漏着火事故。
b. The centrifugal pump shall not rotate reversely, idle run without liquid and exhausted so as to prevent part damage.
离心泵严禁倒转、无液体空转、抽空，以免零件损坏。
c. Preheat the hot oil pump before start, so as to prevent parts deformation and accident due to temperature difference.
热油泵启动前必须预热，以免温差过大导致泵零部件变形从而造成事故。
d. The started centrifugal pump shall not operate for a long time when the outlet valve is not opened, and the run time shall be less than 3min.
离心泵启动后，在出口阀未开的情况下，严禁长时间运行，运行时间应小于 3 分钟。
e. Don't adjust the flow of centrifugal pump with inlet valve.
离心泵严禁使用泵入口阀进行流量调节。
f. Don't adjust with inlet/outlet hand valve if the medium of pumps such as vacuum residual pump contains solid particles, and the valves shall be fully opened or closed in principle.
对于减渣泵等介质中含固体颗粒的泵，泵出入口手阀不得用于调节，原则上必须全开或全关。

(3)Stopping pump 停泵操作
1)Close the outlet valve of pump gradually;
逐渐关闭泵出口阀；
2)When the outlet valve is fully closed, shut down the motor and the fan blade of variable frequency motor;
当出口阀全关时，停电机，停变频电机风叶；
3)After shutting down the hot oil pump, open the preheating line valve for preheating, and turn down the cooling water and activate turning on time;
热油泵停运后，开预热线阀门进行预热，可以适当调小冷却水，同时应注意按时盘车；
4)During pump repair, close the outlet and inlet valves of pump tightly (close the preheating line valve and oil sealing valve of hot oil pump tightly, stop injecting seal oil before closing the inlet valve and avoid pressure buildup). After pump cooling, open the blow-off valve slowly to discharge the pressure and liquid in the pump, close the cooling water valve and contact with the electrician to cut off power. Wait for repair.
需要修泵时，关严泵出、入口阀等（热油泵关严预热线阀和封油阀，关死入口阀应先停注封油，避免憋压）。待泵冷却后，慢慢打开排空阀将泵内压力和存液放净，关闭冷却水阀，联系电工断电。等待修理。

(4)Routine maintenance 日常维护
1)Keep the pump and surroundings clean;

保持泵体和泵区的环境卫生；

2)Check and record the outlet pressure, flow and motor current of pump regularly according to the specified operation index. Solve the problem if pump is exhausted, contact with the team leader to switch the spare pump if necessary and shut down the pump for inspection;

按规定的操作指标经常检查泵出口压力、流量及电机电流，并进行记录。发现泵抽空立即处理，必要时，联系班长切换至备用泵，停泵检查；

3)Regularly check the operation of pump, and confirm whether the bearing has abnormal sound. Generally, the bearing temperature is not greater than 70℃, the vibration is ≯0.06mm and the temperature rise of motor is ≯80℃;

经常检查泵的运转情况，各轴承有无杂音，轴承温度一般不超过 70℃，振动≯0.06mm，电机温升≯80℃；

4)Regularly inspect the liquid level, quality and oil temperature of lubricating oil, and solve the problem at once if there is emulsification, deterioration and oil leakage;

定期检查润滑油的液位、品质和油温，如发现有乳化变质、漏油等情况，应立即处理；

5)Regularly check the oil seal and cooling water system, control the oil seal pressure, and don't run hot oil pump without cooling water and seal oil;

经常检查封油和冷却水系统，控制好封油压力，热油泵严禁中断冷却水和封油运行；

6)Inspect the leakage condition of shaft seal regularly. Mechanical seal: the light oil pump is ≯10 drip/min, and the heavy oil pump is ≯5 drip/min;

经常检查轴封泄漏情况。机械密封：轻油泵≯10 滴/分，重油泵≯5 滴/分；

7)Regularly check the circulation of buffer spacer fluid of mechanical seal. The rise and fall of oil level indicates the seal is leaked. Supplement oil in time if the oil level falls and observe closely. If the oil level falling is out of control, switch to the spare pump immediately and shut down the pump for inspection;

经常检查机械密封缓冲隔离液循环情况，油位上升或下降均表明密封存在泄漏，油位下降应及时补油并密切观察，若油位下降无法控制，则立即切换至备用泵运行，停泵检查处理；

8)If the hydrocarbon pump leaks with medium overflow, switch to the spare pump immediately and contact for overhaul; if the outlet pressure of magnetic pump fluctuates, switch to the spare pump immediately and shut down the pump for inspection; if the oil pressure of the lubricating oil system of high speed pump fluctuates, shut down it for inspection;

对于烃类泵，发现泄漏，介质逸出，则立即切至备用泵运行，联系检修；对于磁力泵，若泵出口压力波动，应立即切换至备用泵，停泵检查；对于高速泵，润滑油系统油压波动时应停泵检查；

9)Activate turning of spare pump by 180°per day as required in the principle of "white for single and red for double";

备用泵每天按规定盘车 180°，盘车线“单白双红”原则；

10)Switch the pump periodically and replace the lubricating oil as required.

按规定定期切换泵和更换润滑油。

(5)Pump switching 泵的切换

Switching of two power frequency pumps 两台工频泵切换

1)Prepare before starting pump, and start the spare pump motor according to the normal startup procedure;

做好开泵前的准备工作，按正常开泵程序启动备用泵电机；

2)When the outlet pressure, motor current and bearing of spare pump are normal, open the outlet valve gradually, and close the outlet valve of operating pump gradually. Try to keep the pressure and flow stable during switching;

待备用泵出口压力、电机电流及泵轴承运行正常，逐渐开大备用泵出口阀，同时逐渐关小运转泵出口阀。切换过程中，尽量保持压力和流量平稳；

3)When the outlet valve of original operating pump is fully closed, shut down it following procedure.

直至原运转泵出口阀关死，按停泵步骤停用原运行泵。

Switch the power frequency pump to the variable frequency pump 工频泵切换到变频泵

1)Prepare before starting the pump. Change the output of frequency regulator output of variable frequency pump into 100-105% and start the motor of variable frequency pump;

做好开泵前的准备工作。然后将变频泵的变频调节器输出改为 100-105%，启动变频泵电机；

2)Switch the two power frequency pumps in the same method and shut down the pumps till it is successful;

按两台工频泵切换相同方法操作，直到成功后停运工频泵；

3)Change the control valve regulator into manual mode, cascade the flow control circuit and frequency regulator, increase the output of control valve regulator to over 100% gradually, and the flow controller will control the required flow by reducing the frequency conversion output automatically or manually;

将控制阀调节器改为手动控制，流量控制回路与变频调节器串级，逐渐给大控制阀调节器的输出到 100%以上，此时流量控制器自动或手动控制关小变频输出来控制需要的流量；

4)Open the subline of control valve after the variable frequency pump works normally.

变频泵运行正常后，开控制阀副线。

Switch the variable frequency pump to the power frequency pump 变频泵切换到工频泵

1)Prepare before starting the pump. Close the subline of site control valve, change the frequency regulator into manual mode, cascade the flow control circuit and control valve, increase the output of frequency converter to over 100% gradually, i.e., enable the variable frequency pump work under power frequency, and the flow controller will control the required flow by turning down regulator automatically or manually;

做好开泵前的准备工作。将现场控制阀副线关闭，将变频调节器改为手动控制，流量控制回路与控制阀串级，逐渐给大变频调节器的输出到 100%以上，即让变频泵在工频下工作，流量控制器自动或手动控制关小调节阀来控制需要的流量；

2)Switch the two power frequency pumps in the same method;

接下来按两台工频泵切换相同方法操作；

3)When shutting down the variable frequency pump in emergency, start the spare power frequency pump; since the subline of site control valve is generally opened, the clamping quantity (generally 2-3 circles) of outlet valve shall not be too large; close the subline of control valve after the pump works normally, and keep the flow normal by slowly opening the outlet valve and closing the control valve.

运行变频泵紧急停泵时，可紧急启动备用工频泵，此时现场控制阀副线一般都是开的，因此泵出口阀卡量（一般 2-3 扣），不能过大，泵运行正常后关闭控制阀副线，然后通过缓慢开大出口阀和关小控制阀手段来使流量正常。

(6)Preheating of hot oil pump 热油泵预热

1)Preheating of hot oil pump refers that hot oil enters from the outlet pipeline and passes by the pump and inlet pipeline, so the temperature difference between hot oil pump and conveying medium is below 50℃, and the hot oil pump is in the hot standby state and meets the start conditions;

热油泵预热是指热油从泵出口管线进入，经过泵体、泵入口管线，使热油泵泵体与输送介质温差在 50℃以下，使之处于热备用状态，满足热油泵的启动条件；

2)During preheating, the inlet valve is fully opened, the outlet valve is slightly opened or the preheating line hand valve is opened for preheating. Control the temperature rise speed to be lower than 50℃, and pull a steam strip outside for auxiliary preheating in general case, so as to speed up the preheating;

预热时，入口阀全开，出口阀略开或打开预热线手阀进行预热。温升速度控制小于 50℃，特殊情况下，外部可拉根蒸汽带进行辅助预热，以提高和加快预热速度；

3)During preheating and temperature rise, prevent excessive oil and reversed running of impeller, and activate turning regularly to prevent bending due to uneven heating of shaft;

预热升温过程中，油量不能过大，严禁叶轮发生倒转，经常盘车，防止轴因受热不均而造成弯曲；

4)Lead the seal oil to the front of pump for dehydration, and check whether it is leaked. When the temperature of pump rises to 200℃, add the seal oil, and the pressure is generally 0.05-0.10MPa higher than that of seal cavity;

将封油引至泵前脱好水，检查有无泄漏。待泵体温度上升至 200℃时，投入封油，压力一般高于密封腔压力 0.05～0.10MPa；

5)During preheating, if the operating pump is exhausted, stop preheating and start again after stopping exhaustion.

在预热时，若运转泵抽空，应停止预热，待制止抽空方可继续进行。

(7)Accident treatment 事故处理

Shut down or switch the pump immediately in case of the followings:

遇到下列情况之一时，应立即停泵或切换泵：

1)When the pump is exhausted and cannot recover.

泵抽空无法恢复正常时。

2)When the end face seal is severely leaked and endangers safety production.

端面密封严重泄漏，危及安全生产时。

3)When the bearing temperature rises suddenly (higher than 70℃).

轴承温度急剧升高，超过 70℃时。

4)When the pump or motor vibrates violently and has obvious abnormal sound.

泵体或电机强烈振动，有明显杂音时。

5)When the motor is overload and the current exceeds the rated value and cannot be reduced.

电机负荷过大，电流超过额定值不能降低时。

6)When the coupling between motor and pump has failure.

电机与泵联轴器出现故障时。

7)When the motor is on fire.

电机着火时。

Note: during pump shutdown and switching, contact with the team leader and responsible operator closely.

注意：停泵、切换泵过程中，应与班长、岗位操作员密切联系。

(8)Failure analysis and solution 故障分析和处理方法

Table 23: Failure analysis and solution

表 23：故障分析和处理方法

Failure 故障	Cause 原因	Solution 处理
Pump is exhausted 抽空	The tower tank is low in liquid level or empty 塔罐液面低或空	Adjust the operation 调整操作
	The medium is vaporized with moisture 介质带水汽化	Strengthen dehydration 加强脱水
	There is air in the pump 泵内有气体	Exhaust with blow-off valve 用排空阀排气
	The seal oil contains water and the seal oil is excessive 封油带水、封油量过大	Strengthen dehydration of seal oil and adjust the injection amount 封油加强脱水，调整注入量
The flow is low and the lift is	Pump is exhausted 抽空	Find out causes for treatment 找出抽空原因并处理

Failure 故障	Cause 原因	Solution 处理
insufficient 流量低、杨程不够	The inlet pipeline or impeller is blocked 入口管线或叶轮堵塞	Clear up 清理
	The rotating direction is incorrect 转向不对	Change the original rotating direction of motor 改变原电机转向
	The impeller is in corrosion and abrasion, and the clearance of ring gets enlarged 叶轮磨损腐蚀，口环间隙增大	Carry out disintegration for overhaul 解体检修
Pump overload 泵过载	The density and viscosity of medium are increased 介质比重粘度增大	Test the medium 化验介质
	The pump deviates from the operation point results from change of process condition 工艺条件变化，使泵偏离运行点	Adjust the process operation so that the pump can work in normal range 调整工艺操作，使其工作在正常范围
	The rotating parts are in frication 转动部位发生磨擦	Finish the friction portion 修整磨擦部位

Table 23: Failure analysis and solution (Continued)

表 23：故障分析和处理方法（续）

Failure 故障	Cause 原因	Solution 处理
Heating of the pump body 泵体发热	The pump is exhausted 泵抽空	Find out causes for treatment 找出抽空原因并处理
	The pump flow is relative small 泵流量偏小	Increase the flow and check 增大流量，检查
	The rotor and static part are in frication 转子和静止部分摩擦	Carry out disintegration for overhaul 解体检查
Failure 故障	Cause 原因	Solution 处理
Bearing overheating 轴承过热	The lubricating oil (grease) shortage 润滑油（脂）不足	Add lubricating oil (grease) 加润滑油（脂）

Failure 故障	Cause 原因	Solution 处理
	The alignment of pump is poor 泵对中不好	Correct the concentricity 校正同心度
	The lubricating oil (grease) deterioration 润滑油（脂）变坏	Replace lubricating oil (grease) 换润滑油（脂）
	Vibration 振动	Treated follow vibration causes 按振动原因处理
	The circulating water is not accessible 循环水未通	Inject the circulating water 通循环水
The pump vibrates with abnormal sound 泵振动有杂音	The pump with air or exhaustion 泵内有气体或抽空	Exhaust the pump through outlet or conduct pump priming again 出口放空排气或重新灌泵
	Rotor imbalance 转子不平衡	Overhaul 检修
	Excessive bearing clearance and decentration 轴承间隙过大、偏心	Replace the bearing 更换轴承
	The impeller is in looseness or has sundries 叶轮松动或有杂物	Inspect 检查

Failure 故障	Cause 原因	Solution 处理
Pump is exhausted 抽空	The tower tank is low in liquid level or empty 塔罐液面低或空	Adjust the operation 调整操作
	The medium is vaporized with moisture 介质带水汽化	Strengthen dehydration 加强脱水
	There is air in the pump 泵内有气体	Exhaust with blow-off valve 用排空阀排气
	The seal oil contains water and the seal oil is excessive 封油带水、封油量过大	Strengthen dehydration of seal oil and adjust the injection amount 封油加强脱水，调整注入量
The flow is low	Pump is exhausted	Find out causes for treatment

Failure 故障	Cause 原因	Solution 处理
and the lift is insufficient 流量低、杨程不够	抽空	找出抽空原因并处理
	The inlet pipeline or impeller is blocked 入口管线或叶轮堵塞	Clear up 清理
	The rotating direction is incorrect 转向不对	Change the original rotating direction of motor 改变原电机转向
	The impeller is in corrosion and abrasion, and the clearance of ring gets enlarged 叶轮磨损腐蚀，口环间隙增大	Carry out disintegration for overhaul 解体检修
Pump overload 泵过载	The density and viscosity of medium are increased 介质比重粘度增大	Test the medium 化验介质
	The pump deviates from the operation point results from change of process condition 工艺条件变化，使泵偏离运行点	Adjust the process operation so that the pump can work in normal range 调整工艺操作，使其工作在正常范围
	The rotating parts are in frication 转动部位发生磨擦	Finish the friction portion 修整磨擦部位
Heating of the pump body 泵体发热	The pump is exhausted 泵抽空	Find out causes for treatment 找出抽空原因并处理
	The pump flow is relative small 泵流量偏小	Increase the flow and check 增大流量，检查
	The rotor and static part are in frication 转子和静止部分摩擦	Carry out disintegration for overhaul 解体检查
Failure 故障	Cause 原因	Solution 处理
Bearing overheating 轴承过热	The lubricating oil (grease) shortage 润滑油（脂）不足	Add lubricating oil (grease) 加润滑油（脂）
	The alignment of pump is poor 泵对中不好	Correct the concentricity 校正同心度

Failure 故障	Cause 原因	Solution 处理
	The lubricating oil (grease) deterioration 润滑油（脂）变坏	Replace lubricating oil (grease) 换润滑油（脂）
	Vibration 振动	Treated follow vibration causes 按振动原因处理
	The circulating water is not accessible 循环水未通	Inject the circulating water 通循环水
The pump vibrates with abnormal sound 泵振动有杂音	The pump with air or exhaustion 泵内有气体或抽空	Exhaust the pump through outlet or conduct pump priming again 出口放空排气或重新灌泵
	Rotor imbalance 转子不平衡	Overhaul 检修
	Excessive bearing clearance and decentration 轴承间隙过大、偏心	Replace the bearing 更换轴承
	The impeller is in looseness or has sundries 叶轮松动或有杂物	Inspect 检查
	The pump is eccentric or the shaft is bending 机泵不同心或轴弯曲	Overhaul 检修
	The anchor bolt and connecting part is in looseness 地脚螺栓及联接部分松动	Fasten 紧固
Hermetic seal leakage 密封泄漏	The mechanical seal is damaged 机械密封损坏	Disintegrate and replace 解体更换
	The pressure of seal oil is improper 封油压力不当	Regulate as required 按规定调节
	The pre-tightening force of spacer is uneven or the gasket fails 垫片预紧力不均匀或垫片失效	Fasten bolt or disintegrate for overhaul 紧固螺栓或解体检修
	The pump is exhausted 泵抽空	Follow the exhaustion treatment 按抽空处理
	The bearing is abraded and the	Carry out disintegration for overhaul

Failure 故障	Cause 原因	Solution 处理
	rotor is eccentric 轴承磨损、转子偏心	解体检修
	The pump is eccentric 机泵不同心	Alignment 找正
	The shaft of pump is wrongly connected 机泵串轴	Treat according to specific reasons 根据原因处理
Failure 故障	Cause 原因	Solution 处理
Wrong connection of shaft 串轴	The flow is unstable 流量不稳定	Adjust the operation 调整操作
	The large clearance of thrust bearing 止推轴承间隙大	Replace the bearing 更换轴承
Motor heating 电机发热	Excessive load of pump 机泵负载大	Adjust the operation 调整操作
	The winding inside the motor is short-circuited 电机内绕组短路	Overhaul 检修
	The motor fan is damaged 电机风扇坏	Replace the fan 更换风扇

Operation method of positive displacement pump 容积泵的操作法

(1)Preparation before starting the pump 开泵前的准备工作

1)Clean the pump and surrounding area, and check and clean the sundries in the bearing box bracket of double-support pump;

清扫泵及周边卫生，检查清扫双支撑泵轴承箱托架中杂物；

2)Check whether the pump, anchor bolt, pipeline valve, flange bolt and pressure gauge joint are loose;

检查泵体、地脚螺栓、管线阀门、法兰螺栓、压力表接头等有无松动；

3)Check whether the grounding wire of motor is installed, whether the coupling is connected and whether the protective cover is firm, and prevent the protective cover from contacting with the coupling;

检查电机接地线是否装好，联轴器是否联好，护罩是否牢固，严禁护罩与联轴器接触；

4)Add lubricating oil as required (oil level: 1/2-2/3 of the liquid level meter of bearing box or gearbox);

按规定加好润滑油，油位在轴承箱或齿轮箱液面计 1/2～2/3 处；

in case of the hydraulic diaphragm pump, fill 46# hydraulic oil to 1/2-2/3 of the liquid level meter from the fuel filler of connector before starting the pump; remove the safety valve of pump head, fill 46# hydraulic oil while turning, exhaust the air and reinstall the safety valve;

对于液压式隔膜泵，首次开泵前应先通过连接体加油口加注 46#液压油至液面计 1/2～2/3；然后拆下泵头安全阀，边盘车边加注 46#液压油，排尽气体，回装安全阀；

5)Check whether the suction pipeline is unblocked and leaks air or liquid;

检查吸入管道是否畅通，有无漏气、漏液现象；

(2)Starting pump 开泵操作

1)Open the inlet valve, open the emptying valve slightly and close it after exhausting the air in the pump;

打开入口阀，稍开放空阀，排尽泵体内气体后关闭；

2)Open the outlet valve of pump and the hand valve of outlet pressure gauge;

打开泵出口阀、出口压力表手阀；

3)For the rotary pump (unit lubrication pump), activate turning to check whether there is hindering and jamming, start the motor to operate the pump and adjust the flow through the pipeline regulating valve; for the hydraulic diaphragm metering pump, unscrew the locking screw on the regulating seat, adjust the regulating hand wheel to "0", inch the motor to start metering pump and identify whether there is abnormal sound in the pump; if there is no abnormal phenomenon, rotate the regulating hand wheel, adjust the flow to 30% slowly, exhaust the air in the pipeline (or reflux) and ensure there is no air in the pipeline. When the pressure of pressure gauge approaches to the preset pressure, slowly regulate the outlet valve till it reaches to the required (not more than the rated pressure) pressure. Keep the pump run in this state for about 20s, slowly rotate the regulating hand wheel and shutoff valve, keep the required pressure of pressure gauge and tighten the locking screw when the flow meets the requirement.

对于回转式泵（机组润滑油泵），盘车检查有无阻碍和卡涩现象，启动电机，泵投入运行，通过管路调节阀调整流量；对于液压隔膜式计量泵，拧松调量座上的丝杆锁紧螺钉，将调量手轮调至“0”位，点动电机启动计量泵，辨别泵体内是否有异常噪音；如没有异常现象，转动调量手轮，慢慢将流量调到 30%，排出管道内的空气（或打回流），确保管路中没有空气。当压力表的压力接近预定压力时缓慢调节出口阀，直到达到所需要（不能超过额定压力）压力为止。让泵保持此种状态，运行 20 秒左右，然后再慢慢转动调量手轮，同时也慢慢调节截止阀，使压力表的压力保持所需压力，使流量达到所需要求后，拧紧丝杆锁紧螺钉。

4)Check whether the motor current is controlled within the rated value, if the pump runs under rated flow but the motor is overload, stop pump for inspection;

检查电机电流是否在额定值以内，如果泵在额定流量下运转，而电机超负荷，应停泵进行检查；

5)After pump starting, pay close attention to the operating condition within 8h (the observation time shall be 24h for the pump which has just undergone major repair).

开泵运转后，前 8 小时内，密切关注泵运转情况（对于刚大修后的泵，该时间为 24 小时）。

6)Precautions 注意事项

a. Prevent operation of bearing box and gearbox without oil so as to avoid journal sticking of pump and secondary accident.

严禁轴承箱、齿轮箱无油运转，以免发生泵抱轴及其次生事故。

b. Don't start motor when the outlet valve of positive displacement pump is not opened, so as to prevent part damage and motor overload burn.

容积泵出口阀未开，不得启动电机，以免零件损坏、电机过载烧毁。

c. Don't start the tripped pump directly without inspection.

对于电机跳闸的泵，未经检查不得直接再次启动泵。

(3)Stopping pump 停泵操作

1)Shut down the motor firstly;

先停电机；

2)Close the inlet and outlet valves of pump;

将泵入口、出口阀关死；

3)Close all valves of overhauling pump tightly, open the emptying valve slowly and discharge the medium in the pump.

需要检修的泵，关严所有阀门，缓慢开放空阀，放净泵内介质。

(4)Routine maintenance 日常维护

1)Keep the pump and surroundings clean;

保持泵体和泵区的环境卫生；

2)Regularly check the lubrication of all portions, especially the worm, worm wheel and connecting rod of reciprocating pump for the purpose of preventing heating or oil leakage, and the oil temperature shall not be higher than 65℃;

经常检查各部位润滑情况，注意检查往复泵蜗杆蜗轮、连杆等各部位润滑情况，防止发热或漏油，油温不得超过 65℃；

3)Regularly check the shaft seal of rotary pump, and treat it in time if there is leakage or the stuffing box is in looseness;

经常检查回转泵轴封等密封情况，如果发生泄漏或填料箱松动，应及时处理；

4)Regularly check the operation of pump, and confirm whether the bearing has abnormal sound. Generally, the bearing temperature is not greater than 70℃, the vibration is ≯0.06mm and the temperature rise of motor is ≯80℃, and shutdown the pump timely if abnormal;

经常检查泵的运转情况，各轴承有无杂音，轴承温度一般不超过 70℃，振动≯0.06mm，电机温升≯80℃，如有异常，及时停泵检查；

5)If the pressure of pump outlet rises suddenly, shut down the pump, find the reasons and solve the problem before operation again;

若泵出口压力突然升高，必须停泵，待查明原因，处理好后再投入运行；

6)Check the pressure gauge of double-diaphragm pump head, and it indicates that the diaphragm is broken if there is pressure indication;

检查双隔膜泵泵头压力表，如果有压力指示，表明隔膜破裂；

7)Regularly check whether the anchor bolt and the connection between outlet and inlet pipelines are loose, and check the tightening force of plunger stuffing and bearing vibration.

经常检查地脚螺栓及出、入口管线联接是否有松动，检查柱塞填料紧力、轴承振动情况。

(5)Pump switching 泵的切换

1)Prepare and inspect before starting the pump;

做好开泵前检查准备工作；

2)Start the spare pump according to the startup procedures, and prevent large fluctuation of flow;

按照开泵步骤启动备用泵，控制流量不出现大幅波动；

3)After the spare pump operates normally, shut down the operating pump according to the shutdown procedures.

待备用泵运转正常后，按停泵操作步骤停运行泵。

(6)Failure handling 故障处理

Table 24: Failure handling

表 24：故障处理

Failure 故障	Cause 原因	Solution 处理方法
No output after start 启动后不上量	The valve of suction pipe is not fully opened 吸入管阀门未全开	Open the pipeline valve of suction pipeline 打开吸入管线阀门
	The suction port is blocked 吸入口堵	Cleaning 清洗

	The suction pipeline leakage 吸入管线漏气	Check the connecting portion of suction pipeline 检查吸入管线联接部位
The flow is insufficient and the outlet pressure is low 流量不够，出口压力低	Air enters the cylinder 缸内进入空气	Exhaust air 排出空气
	Check valve is loose 单向阀不严	Contact for overhaul 联系检修
	The safety valve is not sealed tightly or fails 安全阀处密封不严或失效	Tighten the safety valve again or stabilize the pressure 重新拧紧安全阀，或定压
	The plunger stuffing is not sealed tightly 柱塞填料密封不严	Tighten the packing gland or replace the stuffing 拧紧填料压盖，或更换填料
	The plunger is in abrasion 柱塞磨损	Overhaul or replace 检修或更换
	The suction or exhaust pipe leakage 吸入、排出管泄漏	Check the suction and exhaust pipeline 检查吸入和排出管线

Table 24: Failure handling (Continued)

表 24：故障处理（续）

Failure 故障	Cause 原因	Solution 处理方法
The pump has impact sound 泵产生冲击声	Air enters the cylinder 缸内进入空气	Exhaust air 排出空气
	The large resistance of suction pipe 吸入管阻力大	Check whether the valve of suction pipe is fully opened and whether the suction pipe is blocked 检查吸入管阀门是否全开，吸入管是否堵塞
	The large clearance of bearing 轴承间隙大	Overhaul and replace the bearing 检修更换轴承
	The large clearance of regulating or transmission mechanism 调节或传动机构间隙大	Adjust clearance or change parts 调整间隙或更换零件
Heating of the pump body 泵体发热	The excessive tightness of stuffing 填料压得过紧	Adjust the tightness of stuffing appropriately 适当调整填料松紧程度
	The oil is insufficient or the oil line is blocked 油量不足或油路阻塞	Supplement or remove the oil line blocking in time 及时补充或清除油路阻塞
	The small clearance between screw rotor and pump 螺杆转子与泵体间隙小	Overhaul 检修
The outlet pressure rises 出口压力升高	Blocking of outlet pipeline 出口管线堵塞	Cleaning pipeline 清洗管线
	The outlet valve failure 出口阀故障	Replace the outlet valve 更换出口阀
The bearing and gearbox are overheating 轴承、齿轮箱过热	The lubricating oil (grease) shortage 润滑油（脂）不足	Add lubricating oil (grease) 加润滑油（脂）
	The alignment of pump is poor 泵对中不好	Correct the concentricity 校正同心度

Table 24: Failure handling (Continued)

表 24：故障处理（续）

Failure 故障	Cause 原因	Solution 处理方法
The bearing and gearbox are overheating 轴承、齿轮箱过热	The lubricating oil (grease) deterioration 润滑油（脂）变坏	Replace lubricating oil (grease) 换润滑油（脂）
	Vibration 振动	Treated follow vibration causes 按振动原因处理
The pump vibrates with abnormal sound 泵振动有杂音	The pump with air or exhaustion 泵内有气体或抽空	Exhaust the pump through outlet or conduct pump priming again 出口放空排气或重新灌泵
	Rotor imbalance 转子不平衡	Overhaul 检修
	Excessive bearing clearance and decentration 轴承间隙过大、偏心	Replace the bearing 更换轴承
	The screw rotor and pump are in frication 螺杆转子与泵体摩擦	Overhaul 检修
	The pump is eccentric or the shaft is bending 机泵不同心或轴弯曲	Overhaul 检修
	The anchor bolt and connecting part is in looseness 地脚螺栓及联接部分松动	Fasten 紧固
The mechanical seal of rotary pump leakage 回转泵机封泄漏	The mechanical seal is damaged 机械密封损坏	Disintegrate and replace 解体更换
	The pump is exhausted 泵抽空	Follow the exhaustion treatment 按抽空处理
	The bearing is abraded and the rotor is eccentric 轴承磨损、转子偏心	Carry out disintegration for overhaul 解体检修
	The pump is eccentric 机泵不同心	Alignment 找正

Table 24: Failure handling (Continued)

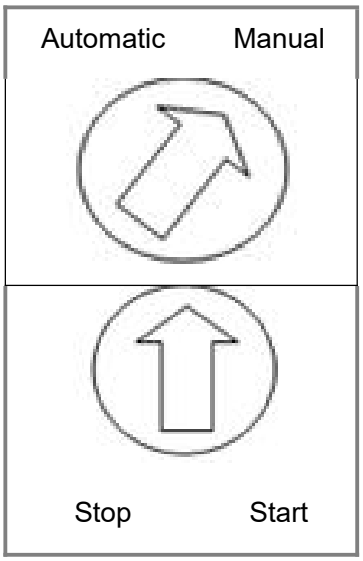
表 24：故障处理（续）

Failure 故障	Cause 原因	Solution 处理方法
The shaft of rotary pump is connected wrongly 回转泵串轴	The flow is unstable 流量不稳定	Adjust the operation 调整操作
	The large clearance of thrust bearing 止推轴承间隙大	Replace the bearing 更换轴承
Motor heating 电机发热	The load of pump is large or the back pressure rises 机泵负载大或背压升高	Adjust the operation 调整操作
	The winding inside the motor is short-circuited 电机内绕组短路	Overhaul 检修
	The motor fan is damaged 电机风扇坏	Replace the fan 更换风扇

Switching method of unit oil pump 机组油泵切换法

(1)Instructions of the operating column on site 现场操作柱说明

The on-site operating column of the unit oil pump motor is shown on the right, and the operation and precautions are as follows:



1) The upper part is the self-start interlock switch, while the lower part is the start/stop switch.

2) Automatic: the motor accepts the instrument signal to start or stop, and the unit oil pump is not set to automatically stop;

Manual: the bypass instrument signal can be started or stopped manually;

Stop: the motor can be stopped whether in automatic or manual condition.

3) The stop/start switch of the spare pump must be in the middle position. Otherwise, it may cause the low oil pressure unable to self-start (unable to bounce back to the middle position because of its quality problems) if it is not located in middle position

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机组油泵电机现场操作柱如右图所示，操作及注意事项如下：

1）上部分为自启动联锁开关，下部分为启动/停止开关。

2）自动：该电机接受仪表信号启停，机组油泵未设置自动停止；
手动：旁路仪表信号，人工启停；
停止：无论处于自动还是手动状态，均能停止电机。

3）备用泵的停止/启动开关必须在中间位置，否则的话有可能造成低油压时无法自启动（因质量问题无法弹回中间位置），当不在中间位置

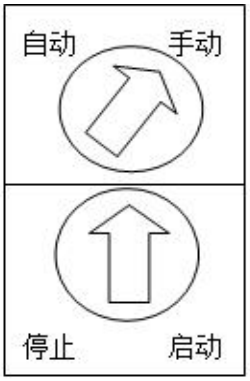


Figure 4: Instruction for operating column of unit oil pump

图 4：机组油泵操作柱说明

(2)Normal switching of lubrication pump 润滑油泵正常切换

1)Inform the equipment director or equipment operator to arrive on the site;

通知设备主管或设备员到现场；

2)The external operator shall check on the site before starting the spare pump (refer to the inspection before starting centrifugal pump) and confirm whether the outlet/inlet valves are fully opened;

外操到现场做好开备用泵前检查（参考离心泵开泵前检查工作），确认出入口阀全开；

3)The internal operator shall increase the given value of regulator of lubricating control valve to about 350KPa, change the regulator of adjusting oil control valve and the regulator of lubricating oil control valve into manual control after the lubricating oil pressure reaches the value, and inform the external operator for switching operation;

内操把润滑油控制阀调节器给定值提高到 350KPa 左右，待润滑油压力达到这一值后，把调节油控制阀调节器和润滑油控制阀调节器改手动控制，通知外操可以进行切换操作；

4)The external operator shall pull the self-start interlock switch of spare pump from automatic to manual, and inform the internal operator to start the spare pump;

外操把备用泵自启动联锁开关从自动扳至手动，通知内操后启动备用泵；

5)After the oil pressure of spare pump is normal (generally 30s), pull the self-start interlock switch from manual to automatic, shut down the original operating pump and pay attention whether the outlet pressure of pump is fluctuated. The internal operator shall also pay attention to the pressure fluctuation and inform the external operator rapidly if the pressure cannot be maintained;

待备用泵油压正常后（一般半分钟），把自启动联锁开关从手动扳至自动，停原运行泵，并注意泵出口压力有无波动，内操也需注意压力波动情况，若不能维持迅速通知外操；

6)Since the oil pressure is high during operation of the two pumps, check whether the lubricating oil system has leakage points after switching;

因两台泵运行时油压高，切换完毕后，需检查润滑油系统有无泄漏点；

7)The internal operator shall control the lubricating oil pressure and regulating oil pressure to the normal value, change the control valve into automatic control, pay close attention to the opening of valve position in certain time and find the abnormal condition in time.
内操控制润滑油压及调节油压至正常值，控制阀改自动控制，一定时间内密切关注阀位开度的变化情况，及时发现异常。

(3)Operation of spare pump of lubrication pump after self-start 润滑油泵备用泵自启动后操作
1)The external operator shall check on the site rapidly;
外操迅速到现场检查情况；
2)The internal operator shall change the regulator of lubricating oil control valve into manual control, open it to the valve position (a little larger than the original valve position), change the regulator of adjusting oil control valve into manual control, close it to the valve position (a little smaller than the original valve position) (since the lubricating oil control valve is closed gradually and the high pressure oil control valve is opened gradually after operation of two pumps);
内操把润滑油控制阀调节器改手动控制，并开大至比原先阀位再略大一点的阀位上，接着把调节油控制阀调节器改手动控制，并关小至比原先阀位再略小一点的阀位上（因两台泵运行后，润滑油控制阀关小了，高压油控制阀开大了）；
3)The internal operator and external operator shall communicate to confirm the self-start reason;
内外操联系，确定自启动原因；
4)If the original operating pump has no problem, shut down the spare pump; if the original operating pump has problem, shut down the original operating pump;
若原运行泵无问题，则停备用泵；若原运行泵有问题，停原运行泵；
5)After switching, check whether the lubricating oil system has leakage points;
切换完毕后，检查润滑油系统有无泄漏点；
6)The internal operator shall control the lubricating oil pressure and adjusting oil pressure to the normal value and change the control valve into automatic control.
内操控制润滑油压及调节油压至正常值，控制阀改自动控制。

(4)Precautions 注意事项
a. The run time of two pumps shall be as short as possible so as to prevent leakage;
两台泵运行时间尽可能短，以防憋漏；
b. Before pump shutdown, pull the self-start interlock from manual to automatic before shutting down the motor;
停泵前，必须先将该泵自启动联锁从手动扳至自动，再停电机；
c. The outlet hand valve of spare pump shall be fully opened, but the hand valve of oil return tank shall be fully closed.

备用泵出口手阀必须全开，回油箱手阀必须全关。

2.4.7 Service instruction of slide valve 滑阀的使用规程

Overview, principle and structure of slide valve: 滑阀的概况、原理与结构：

Slide valve is one of the key equipment of flexicoking unit, the control valve of reaction gasification system and the key special valve that integrates machinery, electrics and instrument into a whole. The valve plate slides on the guide rail vertical to the channel direction and adjusts the flow by changing the flow area. The electro-hydraulic actuator is the core part of slide valve and composed of the ISA controller, servo cylinder, oil pump, manual mechanism, hydraulic system and the displacement sensor as the feedback element. See the table below for the slide valves (17 sets in total) of 1,000,000t/year flexicoking unit:

滑阀是灵活焦化装置关键设备之一，是反应气化系统的控制阀，是集机械、电气、仪表于一体的关键特阀。阀板垂直于通道方向在导轨上滑动，通过改变流通面积从而达到调节流量的目的。电液执行机构则是滑阀的核心部件，是由 ISA 控制器、伺服油缸、油泵、手动机构、液压系统以及作为反馈元件的位移传感器等组成。100 万吨/年灵活焦化装置的滑阀共计 17 台统计见下表：

Table 25: Slide valves list

表 25：装置滑阀一览表

S/N 序号	Process tag No. 工艺位号	Name 名称	Medium 介质	Design pressure MPa 设计压力 MPa	Design temperature℃ 设计温度℃ (Shell/inner part) （壳体/内件）	Quantity 台数
1	LV-11201	Single-acting slide valve of quenching tank feeding 急冷罐给料单动滑阀	Quenching coke 急冷焦	0.823	649/649	1
2	HV-10801	Flushing coke single-acting slide valve 冲洗焦单动滑阀	Flushing coke 冲刷焦	0.859	343/649	1
3	PV-11201A	Coke-delivery single-acting slide valve of quencher 急冷器外送焦单动滑阀	Quenching coke 急冷焦	0.902	343/343	1

S/N 序号	Process tag No. 工艺位号	Name 名称	Medium 介质	Design pressure MPa 设计压力 MPa	Design temperature℃ 设计温度℃ (Shell/inner part) （壳体/内件）	Quantity 台数
4	PV-11201B	Coke-delivery single-acting slide valve of quencher 急冷器外送焦单动滑阀	Quenching coke 急冷焦	0.902	343/343	1
5	PV-30102A	Coke-unloading single-acting slide valve of dry coke powder 干焦粉卸焦单动滑阀	Three-spin coke powder 三旋焦粉	1.0	343/343	1
6	PV-30102B	Coke-unloading single-acting slide valve of dry coke powder 干焦粉卸焦单动滑阀	Three-spin coke powder 三旋焦粉	1.0	343/343	1
7	TV-10510	Hot coke single-acting slide valve 热焦单动滑阀	Hot coke 热焦	0.878	343/649	1
8	LV-10502	Cold coke single-acting slide valve 冷焦单动滑阀	Cold coke 冷焦	0.732	343/566	1
9	HV-11401	Coke-feeding single-acting slide valve of gasifier 气化器进料焦单动滑阀	Gasified feeding coke 气化进料焦	0.885	343/649	1
10	TV-11003	Quenching coke single-acting slide valve 急冷焦单动滑阀	Quenching coke 急冷焦	0.769	343/649	1

S/N 序号	Process tag No. 工艺位号	Name 名称	Medium 介质	Design pressure MPa 设计压力 MPa	Design temperature℃ 设计温度℃ (Shell/inner part) （壳体/内件）	Quantity 台数
11	HV-11001	Stop and unloading single-acting slide valve on the upper section of heater 加热器上段停工卸焦单动滑阀	Bed unloading coke of heater 加热器床层卸料焦	0.767	649/649	1
12	PV-11610	Stop and unloading single-acting slide valve of gasifier 气化器停工卸焦单动滑阀	Bed unloading coke of gasifier 气化器床层卸料焦	0.687	649/649	1
13	PV-11001	Stop and unloading single-acting slide valve on the lower section of heater 加热器下段停工卸焦单动滑阀	Stop unloading coke of heater 加热器停工卸料焦	0.713	343/343	1
14	PV-40401	Loading single-acting slide valve of bed coke 床层焦装车单动滑阀	Bed coke 床层焦	1.0	310/310	1
15	PV-40402	Loading single-acting slide valve of bed coke 床层焦装车单动滑阀	Bed coke 床层焦	1.0	310/310	1
16	PV-40403	Single-acting slide valve of start coke powder adding tank 开工焦粉添加罐单动滑阀	Start coke 开工焦	1.0	310/310	1

S/N 序号	Process tag No. 工艺位号	Name 名称	Medium 介质	Design pressure MPa 设计压力 MPa	Design temperature℃ 设计温度℃ (Shell/inner part) （壳体/内件）	Quantity 台数
17	LV-40801	Coke-loading single-acting slide valve 加焦单动滑阀	Start coke 开工焦	1.0	310/310	1
-	Total 共计	-	-	-	-	17

The slide valve actuator of 1,000,000t/year flexicoking unit is the ICM series products produced by Link Fortune. To facilitate arrangement and save investment, some electro-hydraulic actuator is in the form of one-drive-two or one-drive-three, that is, one electro-hydraulic actuator controls multiple slide valves, and there are 13 electro-hydraulic actuators in total. See the table below:

100 万吨/年灵活焦化装置滑阀执行机构采用北京林克富华公司生产的 ICM 系列产品，为了便于布置和节省投资，个别电液执行机构采取一带二或一带三的形式，即一台电液执行机构控制多台滑阀，共计 13 台电液执行机构，统计见下表：

Table 26: Electro-hydraulic actuator list

表 26：装置电液执行机构一览表

No. 编号	Tag No. 位号	Name 名称	Control features 控制特征	The whole unit model 整机型号
1	LV-11201	Single-acting slide valve of quenching tank feeding 急冷罐给料单动滑阀	Mechanical manual 机械手动	ICM-RFC/S-100X300-C*311C
2	HV-10801	Flushing coke single-acting slide valve 冲洗焦单动滑阀	Mechanical manual 机械手动	ICM-RFC/S-100X300-C*311H
3	PV-11201A	Coke-delivery single-acting slide valve of quencher 急冷器外送焦单动滑阀	One-drive-two mechanical manual 一带二机械手动	ICM-RFC/S-100X300-C*312
4	PV-11201B	Coke-delivery single-acting slide valve of quencher 急冷器外送焦单动滑阀		

Table 26: Electro-hydraulic actuator list

表 26（续）：装置电液执行机构一览表

No. 编号	Tag No. 位号	Name 名称	Control features 控制特征	The whole unit model 整机型号
5	PV-30102A	Coke-unloading single-acting slide valve of dry coke powder 干焦粉卸焦单动滑阀	One-drive-two mechanical manual 一带二机械手动	ICM-RFC/S-100X300-C*312
6	PV-30102B	Coke-unloading single-acting slide valve of dry coke powder 干焦粉卸焦单动滑阀		
7	TV-10510	Hot coke single-acting slide valve 热焦单动滑阀	Mechanical manual 机械手动	ICM-RFC/S-125X700-C*313
8	LV-10502	Cold coke single-acting slide valve 冷焦单动滑阀	Mechanical manual 机械手动	
9	HV-11401	Coke-feeding single-acting slide valve of gasifier 气化器进料焦单动滑阀	Mechanical manual 机械手动	
10	TV-11003	Quenching coke single-acting slide valve 急冷焦单动滑阀	Mechanical manual 机械手动	ICM-RFC/S-100X700-C*314
11	HV-11001	Stop and unloading single-acting slide valve on the upper section of heater 加热器上段停工卸焦单动滑阀	Hydraulic manual 液压手动	ICM-RFC/S-100X300-C*315
12	PV-11610	Stop and unloading single-acting slide valve of gasifier 气化器停工卸焦单动滑阀	Hydraulic manual 液压手动	

13	PV-11001	Stop and unloading single-acting slide valve on the lower section of heater 加热器下段停工卸焦单动滑阀	Hydraulic manual 液压手动	

Table 26: Electro-hydraulic actuator list

表 26（续）：装置电液执行机构一览表

No. 编号	Tag No. 位号	Name 名称	Control features 控制特征	The whole unit model 整机型号
14	PV-40401	Loading single-acting slide valve of bed coke 床层焦装车单动滑阀	One-drive-three hydraulic manual 一带三液压手动	ICM-RFC/S-100X300-C*317
15	PV-40402	Loading single-acting slide valve of bed coke 床层焦装车单动滑阀		
16	PV-40403	Single-acting slide valve of start coke powder adding tank 开工焦粉添加罐单动滑阀		
17	LV-40801	Coke-loading single-acting slide valve 加焦单动滑阀	Hydraulic manual 液压手动	ICM-RFC/S-125X700-C*316

Form of slide valve 滑阀的形式

The electro-hydraulic actuator of flexicoking unit has three forms,

灵活焦化装置电液执行机构共三种形式，

(1)"One-drive-one" electro-hydraulic actuator: the field control includes mechanical manual and hydraulic manual, wherein the mechanical manual operator can control the valve position with mechanical hand wheel after the valve position is locked. The hydraulic manual is not equipped with mechanical hand wheel, and the operator controls the valve position by inching solenoid valve and handle.

“一带一”型电液执行机构：现场控制特征有机械手动和液压手动两种模式，其中机械手动操作工在阀位锁定后可用机械手轮对阀位进行控制。液压手动不设机械手轮操作工通过手柄通过点动电磁阀对阀位进行控制。

(2)"One-drive-two" electro-hydraulic actuator: the two actuators are controlled with one control cabinet, when one actuator is controlled by the controller, the other actuator is in the field mechanical manual mode. The field control is mechanical manual, wherein the mechanical

manual operator can control the valve position with mechanical hand wheel after the valve position is locked.

“一带二”型电液执行机构：其通过一台控制柜对两套执行机构进行控制，当控制器控制一台执行机构时，另一台执行机构处于现场机械手动模式。现场控制特征为机械手动模式，其中机械手动操作工在阀位锁定后可用机械手轮对阀位进行控制。

(3)"One-drive-three" electro-hydraulic actuator: the three actuators are controlled by one control cabinet, the field control is hydraulic manual mode, and the operator controls the valve position by solenoid valve and handle.

“一带三”型电液执行机构：其通过一台控制柜同时对三套执行机构进行控制，现场控制特征为液压手动模式，操作工通过手柄通过点动电磁阀对阀位进行控制。

Note: the hydraulic manual control has hand pump, and it can supply power for the hydraulic system through manual pump after system decompression.

注：其中液压手动控制方式配有手动泵，当系统失压失后可通过手动泵为液压系统提供动力。

Control mode of slide valve actuator 滑阀执行机构控制方式

(1)Pressure control 压力控制功能

The pump can be set as intermittent operation mode, continuous operation mode or adaptive operation mode according to different frequencies of valve action by electro-hydraulic actuator. Since the principles of hydraulic power units of electro-hydraulic actuator are basically the same, the following are the instructions based on the hydraulic principle of "One-drive-one" system.

电液执行机构根据阀门动作的频度不同，可以将泵设置为间歇运行方式、连续运行方式或自适应运行方式。由于各型式的电液执行机构液压动力单元原理基本相同， 以下参照“一带一”系统的液压原理进行说明。

1)Intermittent operation mode of pump 泵的间歇式工作方式

Intermittent operation mode of pump: ISA controller controls the operation and stop of motor-pump automatically according to the pressure change of system. The intermittent operation mode of pump is excellent for the low frequency of valve action, for example, the device is in the stable operation status.

泵的间歇工作方式：ISA 控制器根据系统的压力变化，自动控制电机-泵的运行和停止。泵的间歇式工作方式，特别适用于阀门动作频度较低的工况，如装置处于平稳运行状态。

2)Continuous operation mode of pump 泵的连续式工作方式

Continuous operation mode of pump: under continuous operation mode of pump, ISA controller can turn on or off the unloading solenoid valve automatically according to the pressure change of system, so that the pump can be switched between pressure compensation and unloading alternately.

泵的连续运行方式：泵连续运行，ISA 控制器根据系统压力的变化，自动使卸荷电磁阀通电或断电，从而使泵处于补压-卸荷的交替变化之中。

3)Adaptive operation mode of pump 泵的自适应工作方式

Adaptive operation mode of pump: ISA controller can choose the work mode (intermittent operation or continuous operation) most suitable for the current condition automatically according to the interval of pump start/shutdown or pressure compensation/unloading.

泵的自适应运行模式： ISA 控制器根据起泵/停泵或补压/卸荷间隔，自动选择更加适合当前工况的工作模式（间歇运行或连续运行）。

4)Automatic operation of spare pump 备用泵自动投用

When two-way power supply coexists: if the main pump cannot increase the pressure to the set value in specified time, it will stop automatically and the spare pump will start automatic operation.

当双路电源并存时：如果主泵在规定时间内未能将压力升至设定值，则主泵自动停止，备用泵开始自动运行。

5)Operation of hand pump 手动泵操作

The electro-hydraulic actuator has hand pump under the hydraulic manual mode so as to supply power when there is no power supply.

在液压手动方式的电液执行机构中配置有手动泵，在无电源时可以通过手动泵为执行机构动作提供动力。

(2)Regulation and control of valve position 阀位的调节控制

1)Normal regulation mode: the valve element of electro-hydraulic proportional valve (PSV) is driven to act by power, generates hydraulic flow, controls the action of cylinder, forms a position closed loop through displacement sensor and finally maintains the stable position. The operation is the main operation mode.

正常调节模式：经过功率驱动至电液比例阀，驱动比例阀阀芯动作，产生液压流量，控制油缸动作，并通过位移传感器形成位置闭环，最终使阀位处于稳定位置。此操作作为主要操作方式。

2)Standby regulation mode: the valve element of reversing valve is driven to act by power, generates hydraulic flow, controls the action of cylinder, forms a position closed loop through displacement sensor and finally maintains the stable valve position. The control precision of standby regulation mode is ≤1mm. The local regulation and control process are basically same, only the local control signal is generated in the ISA controller. Remote regulation→ local regulation is undisturbed switching. Generally, enable the local operation authorization command to be valid during remote regulation→ local regulation. Otherwise, the local regulation state cannot be realized

备用调节模式：经过功率驱动至电磁换向阀，驱动电磁阀阀芯动作，产生液压流量，控制油缸动作，并通过位移传感器形成位置闭环，最终使阀位处于稳定位置。备用调节模式的控制精度≤1mm。本地调节控制过程基本一样，只是本地控制信号由 ISA 控制器内部产生。远程调节→本地调节为无扰动切换。一般地， 远程调节→本地调节时，必须使本地操作授权指令有效，否则无法进入本地调节状态

(3)Locking of valve position 阀位的锁位

When the following alarm occurs, if the "Locking item" in the set menu has corresponding locking position, the valve position will be locked immediately:

在出现以下报警时， 如果设置菜单中“锁位项目”具有相应的锁位设置， 阀位将立即锁位：

1)Signal loss 信号丢失

2)Feedback loss 反馈丢失

3)Tracking loss 跟踪丢失

4)Low system pressure 系统压力低

When locking occurs, the PSV will be powered off, so is the into oil line of cylinder so as to realize locking.

发生锁位时，比例阀断电，切断了通过比例阀进入油缸的油路，从而实现锁位。

(4)Inching control of valve position 阀位的点动控制

During tracking loss and self-lock of system, when the input loss, no feedback loss, power loss and system pressure occurred, and press "Inch" to unlock automatically. After inching control, the regulation circuit will be cut off immediately, and the actuator acts through the inching control circuit.

当系统发生跟踪失调自锁，在输入消失、反馈消失、动力失电、系统压力等故障均未发生时，按“点动”按钮自动解锁。进行点动控制后，调节回路被立即切断，执行机构动作依靠点动控制回路实现。

(5)Operation principle of mechanical manual 机械手动的操作原理

The mechanical operation of actuator enables the actuator to release all hydraulic and electric control circuits and drive the valve by shaking hand wheel.

执行机构的机械操作， 是使执行机构脱开所有液压和电气控制回路，通过摇动手轮驱动阀门动作。

(6)Hydraulic manual operation principle based on hand pump 基于手动泵的液压手动操作原理

When the power supply fails or the hydraulic system cannot set up suitable pressure, establish the system pressure through hand pump and drive the actuator to act by controlling the handle on the solenoid valve.

当电源故障或液压系统无法建立合适的压力时，可以通过手动泵建立系统压力，同时通过操作点动电磁阀上的手柄，可以驱动执行机构动作。

(7)Integrated alarm 综合报警功能

1)The liquid level of oil tank is lower than the alarm value;

油箱液面低于报警值；

2)The differential pressure of fine filter exceeds the alarm value;

精滤器压差超过报警值；

3)The system pressure is lower than the alarm value.

系统压力低于报警值。

4)The boosting fails or abnormal.

升压失败或异常。

5)The temperature of lubricating oil is higher than the alarm value.

润滑油温度高于报警值。

When any one of the above failures occur, the actuator still works and sends alarm to the instrument room, which will be displayed on the site.

上述任一故障出现时执行机构仍然正常工作，同时向仪表室报警，现场对应显示。

(8)Self-protection 自保功能

When the system receives the self-protection (ESD) signals, ISA controller will deploy all resources to realize reliable self-protection, as shown in the figure below.

当系统接收到自保（ESD）信号时，ISA 控制器将调动所有资源保证自保的可靠实现，如下图。

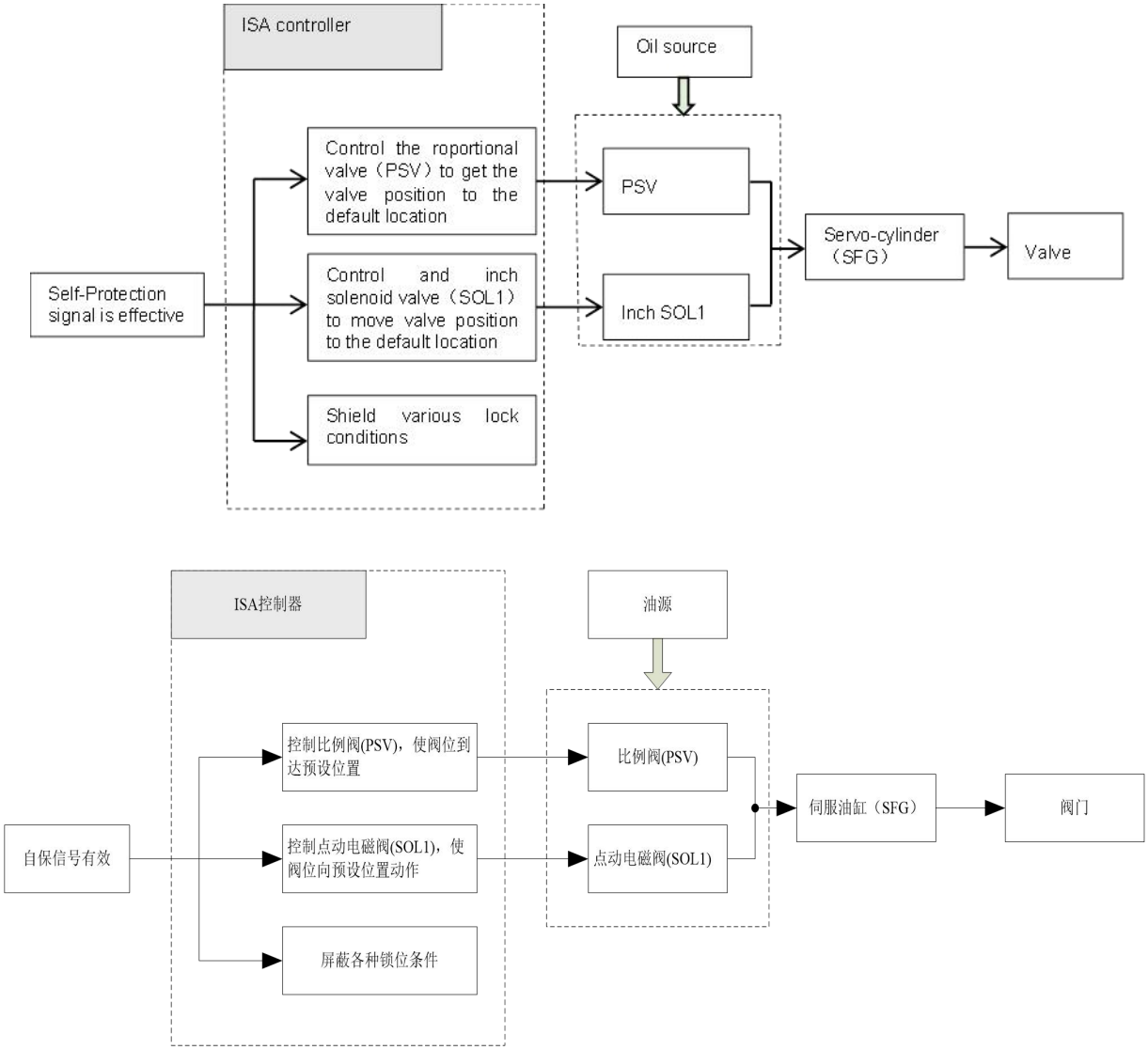


Figure 5: Self-protection control block diagram

图 5：自保控制框图

Operation of slide valve 滑阀的操作

(1)Operation of valve body 阀体部分的操作

Cleaning ports of guide rail and valve rod are arranged on both sides of bonnet flange and stuffing box, and cleaning air or steam are injected into normal operation room to prevent coke powder from blocking the valve plate and valve rod. The stuffing box on the bonnet is the serial-connected stuffing seal structure, that is, two kinds of stuffing in different materials and specifications are connected and installed in one stuffing box, wherein the standby stuffing is inside, and the working stuffing is outside. During normal operation, the standby stuffing is sleeved on the valve rod loosely and not compressed tightly. When the working stuffing fails or is replaced, inject liquid from the injection port outside the standby stuffing of stuffing box, fill the standby stuffing tightly for sealing, and replace the working stuffing outside conveniently when the valve can be adjusted normally.

阀盖法兰两侧和填料函上分别设有导轨和阀杆的吹扫口，正常操作室通入吹扫风或蒸汽，以防焦粉阻塞阀板和阀杆。阀盖上的填料函采用串联填料密封结构，即在一个填料函内串联装入两种不同材料和规格的填料，内侧为备用填料，外侧是工作填料。正常操作时，备用填料松套在阀杆上，并不压紧，当工作填料失效或需要更换时，可通过填料函上备用填料外注入口向内注入液体填充，将备用填料充实并压紧，使该填料起到密封作用，在阀门正常调节状况下，可方便地更换外侧工作填料。

Note: pay the following content when switching the slide valve:

注意：在对滑阀的不同操作进行切换时应注意两点：

1)Avoid unnecessary pressure release.

避免不必要的泄压。

Pressure release may not only delay the remote control time of instrument room of slide valves, result in sealing portion leakage due to the impact of slide valve hydraulic oil line system and its piping, but also influence the oil level of slide valve and environment hygiene when the hydraulic oil of accumulator flushes into the oil tank in a high speed and the hydraulic oil overflows from the tank.

泄压，一是会延误投用滑阀的仪表室遥控操作的时间，二是会对滑阀液压油路系统及其管件造成冲击而引起密封部位的泄漏，三是蓄压器液压油高速冲进油箱中造成液压油从油箱中溢出，而影响滑阀的油位和环境的卫生。

2)Prevent the maloperation of valve position of slide valve.

防止滑阀的阀位误动作。

When switching the slide valve, any maloperation of valve position may result in unnecessary fluctuation of device, and the consequence may be very serious. Therefore, keep calm when switching slide valve, and avoid maloperation of valve position. Two reasons may result in the maloperation of slide valve position:

在对滑阀的操作进行切换时造成滑阀的阀位任何误动作都会造成装置操作不必要的波动，有时这种波动产生的后果是非常严重的。所以，在对滑阀的操作进行切换时要保持清醒的头脑，避免滑阀的阀位误动作。容易产生滑阀的阀位误动作的情况有两种：

a. Switching from the mechanical hand wheel to other slide valves may easily result in maloperation of valve position, or when switching the clutch when the manual reversing valve is not set as "Stop".

机械手轮操作切换到其他滑阀的操作的过程比较容产生滑阀的阀位误动作，如果手动换向阀没有置“停”便切换离合器，滑阀的阀位就可能会发生误动作。

b. When switching the local remote control and remote control of control room, the difference of input signals may result in unnecessary disturbance and self-lock of slide valve. Therefore, the difference shall be eliminated before switching the remote control and local control to avoid maloperation of valve position.

就地遥控和控制室遥控操作互相切换时，两者的输入信号的差异会引起滑阀不必要的扰动和自锁，为避免这种阀位误动作，在远程、就地相互切换前，应先消除该差异。

(2) Main interface and alarm information of iSA controller iSA 控制器主界面与报警信息

1)Main interface of iSA controller iSA 控制器主界面

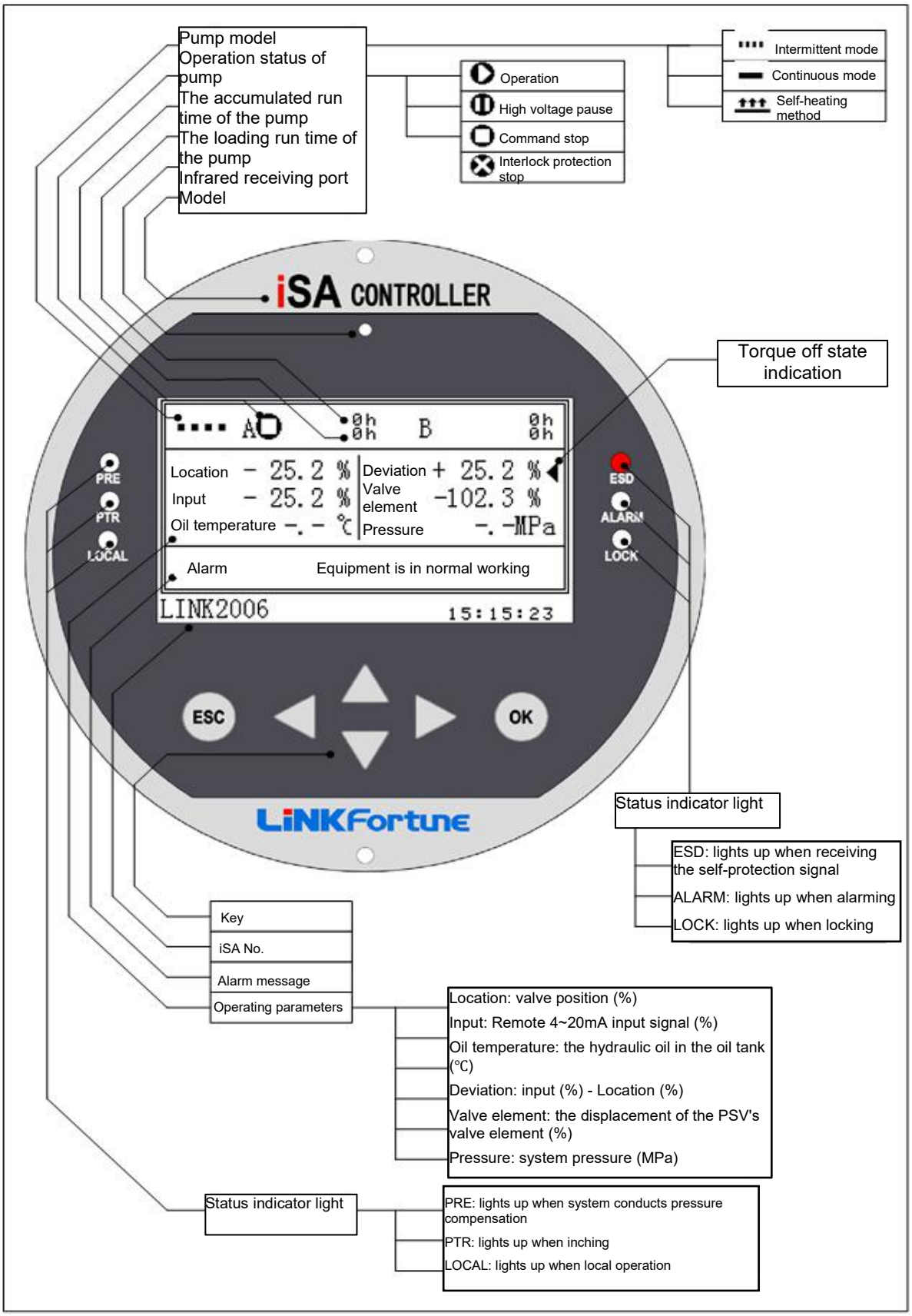


Figure 6: Main interface diagram of iSA controller

图 6：iSA 控制器主界面图

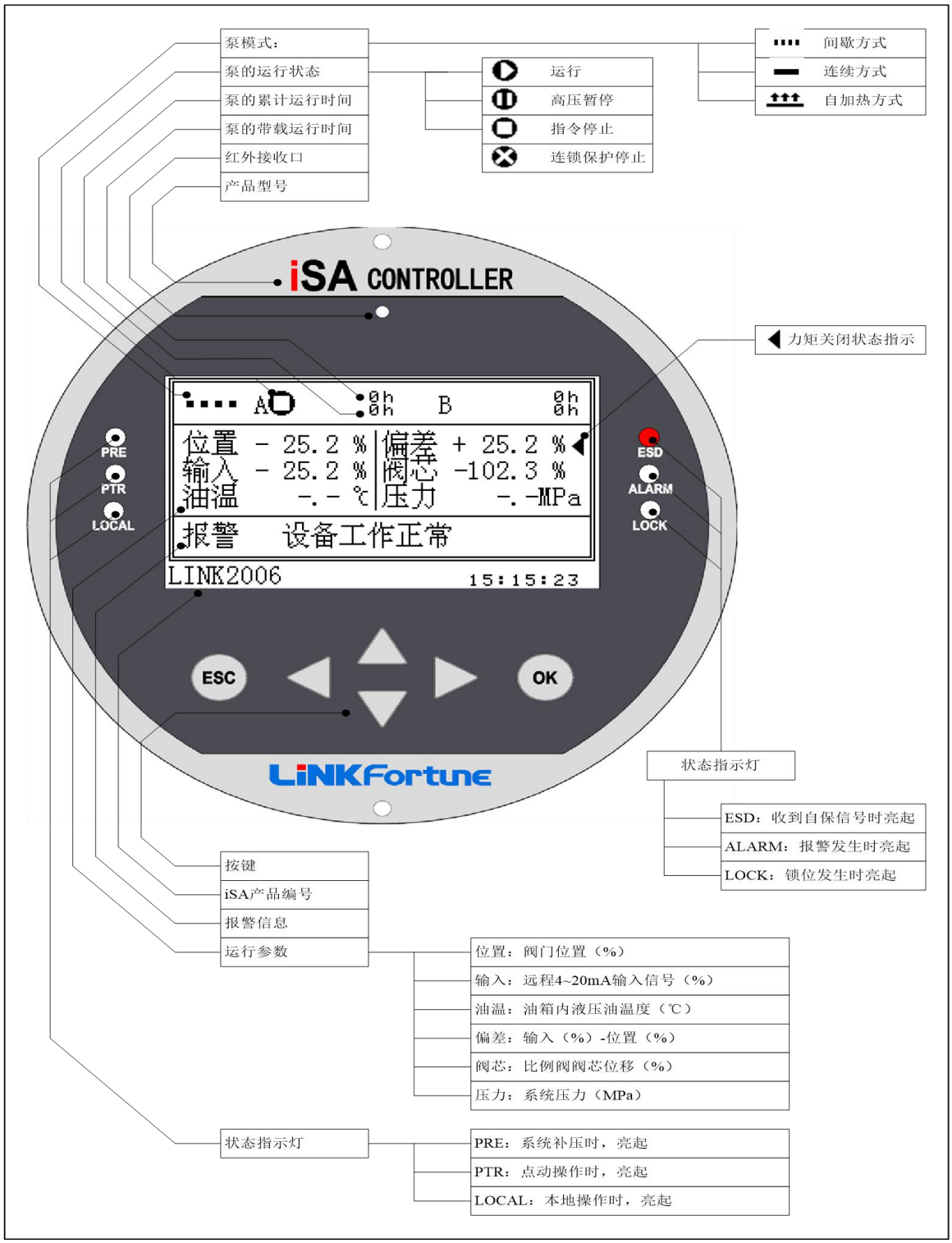


Figure 6: Main interface diagram of iSA controller (Continued)

图 6：iSA 控制器主界面图（续）

2)Valve position display page and alarm page 阀位显示页面和报警页面

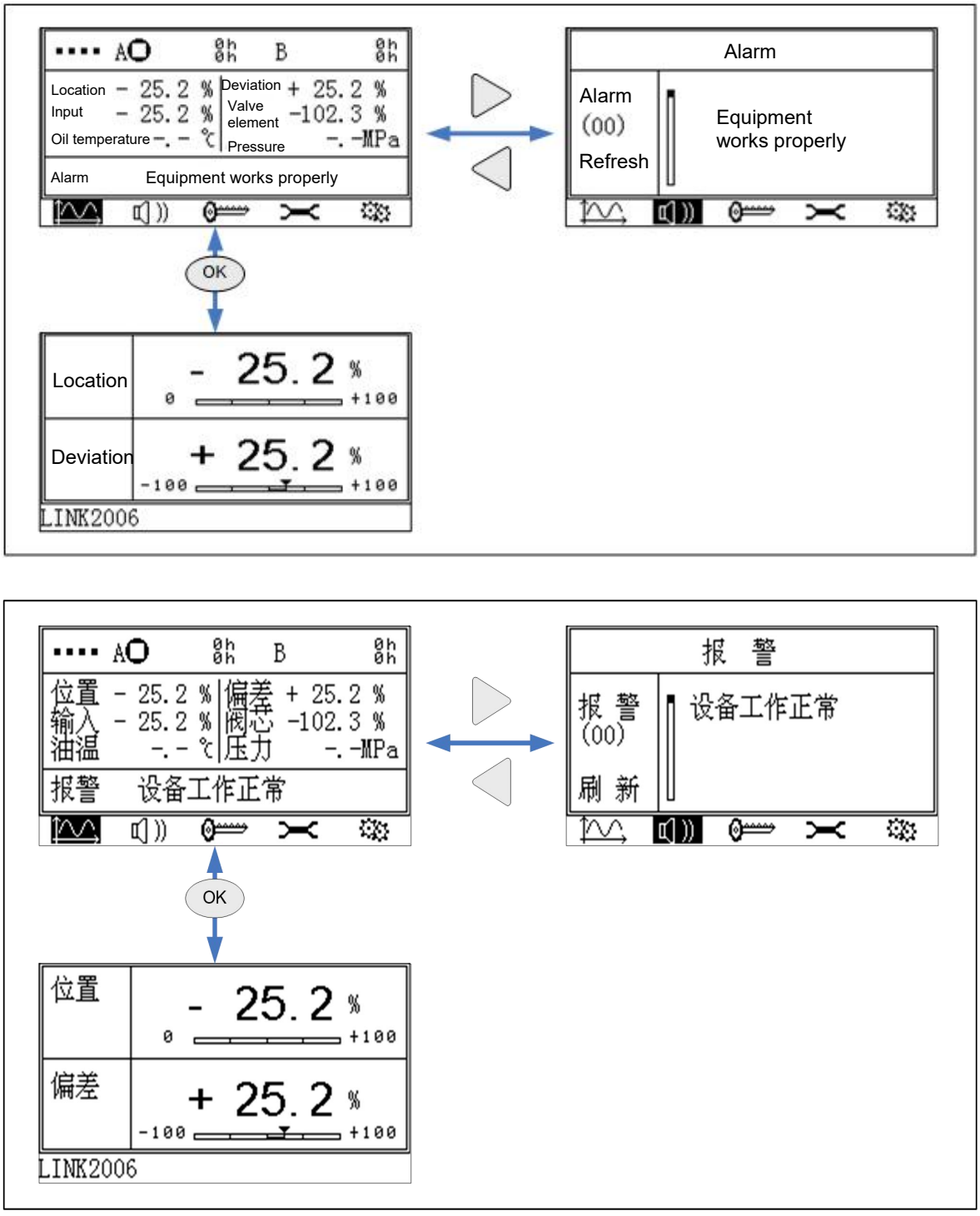


Figure 7: Valve position information interface of iSA controller

图 7：iSA 控制器阀位信息界面

3)Check alarm information 查看报警信息

In the ICM system, to ensure the stable operation of system, display the following alarm information through LCD:

ICM 系统中，为了系统的稳定运行，通过 LCD 可以显示以下报警信息：

Table 27: Alarm information of iSA controller

表 27：iSA 控制器阀报警信息

Alarms 报 警	Description 说 明
Low system pressure 系统压力低	The system pressure is lower than the low-low pressure set value 系统压力低于低低压设定值
High system pressure 系统压力高	The system pressure is higher than the high-high pressure set value 系统压力高于高高压设定值
Boosting abnormity 升压异常	The system pressure cannot be boosted to the high pressure set value 系统压力无法升到高压设定值
Boosting failure 升压失败	The system pressure cannot be boosted to the low-low pressure set value 系统压力无法升到低低压设定值
Low liquid level 液位低	The oil level of tank is lower than the set height 油箱液位低于设定高度
High oil temperature 油温高	The oil temperature is higher than 70℃ 油温高于 70℃
Low oil temperature 油温低	The oil temperature is lower than the set value (generally -15℃) 油温低于设定值（一般为-15℃）
Signal loss 信号丢失	Ultralimit of input signal: ≤2.4mA or≥21.6mA 输入信号超限：≤2.4mA 或≥21.6mA
Tracking loss 跟踪丢失	In the set time (tracking time), the deviation is always larger than the set limit (tracking bandwidth), or the position deviated reversely 在设定的时间（跟踪时间）内，偏差始终大于设定限度（跟踪带宽），或位置反向偏离
Feedback loss 反馈丢失	Single displacement sensor - signal ultralimit of displacement sensor: ≤2.4mA or≥21.6mA 单位移传感器——位移传感器信号超限： ≤2.4mA 或≥21.6mA
Circuit-A 380V power supply failure A 路 380V 供电故障	Circuit-A 380VAC power supply loss, phase lose or phase dislocation A 路 380VAC 电源丢失、缺相或错相
Circuit-B 380V power supply failure B 路 380V 供电故障	Circuit-B 380VAC power supply loss, phase lose or phase dislocation B 路 380VAC 电源丢失、缺相或错相
Pressure signal loss 压力信号丢失	Signal ultralimit of pressure sensor: ≤2.4mA or≥21.6mA 压力传感器信号超限： ≤2.4mA 或≥21.6mA

Table 27: Alarm information of iSA controller

表 27(续)：iSA 控制器阀报警信息

Alarms 报 警	Description 说 明
Illegal local inching 非法本地点动	When there is no local operation authorization signal, set local regulation/inching option switch at "Inching" 没有本地操作授权信号的情况下，本地调节/点动选择开关置于“点动”
The high differential pressure of filter 过滤器差压高	The differential pressure of filter is ≥0.5MPa 过滤器差压≥0.5MPa
RAM Error 内存错误	Internal parameter error of ISA controller ISA 控制器内部参数错误

The above alarm will be transmitted to the control room through system alarm channel in the form of dry contact. The following are the browse and operation methods of alarm display information.

以上报警发生时，都会通过系统报警通道，以干触点形式传送给控制室。以下为报警显示信息的浏览和操作方法。

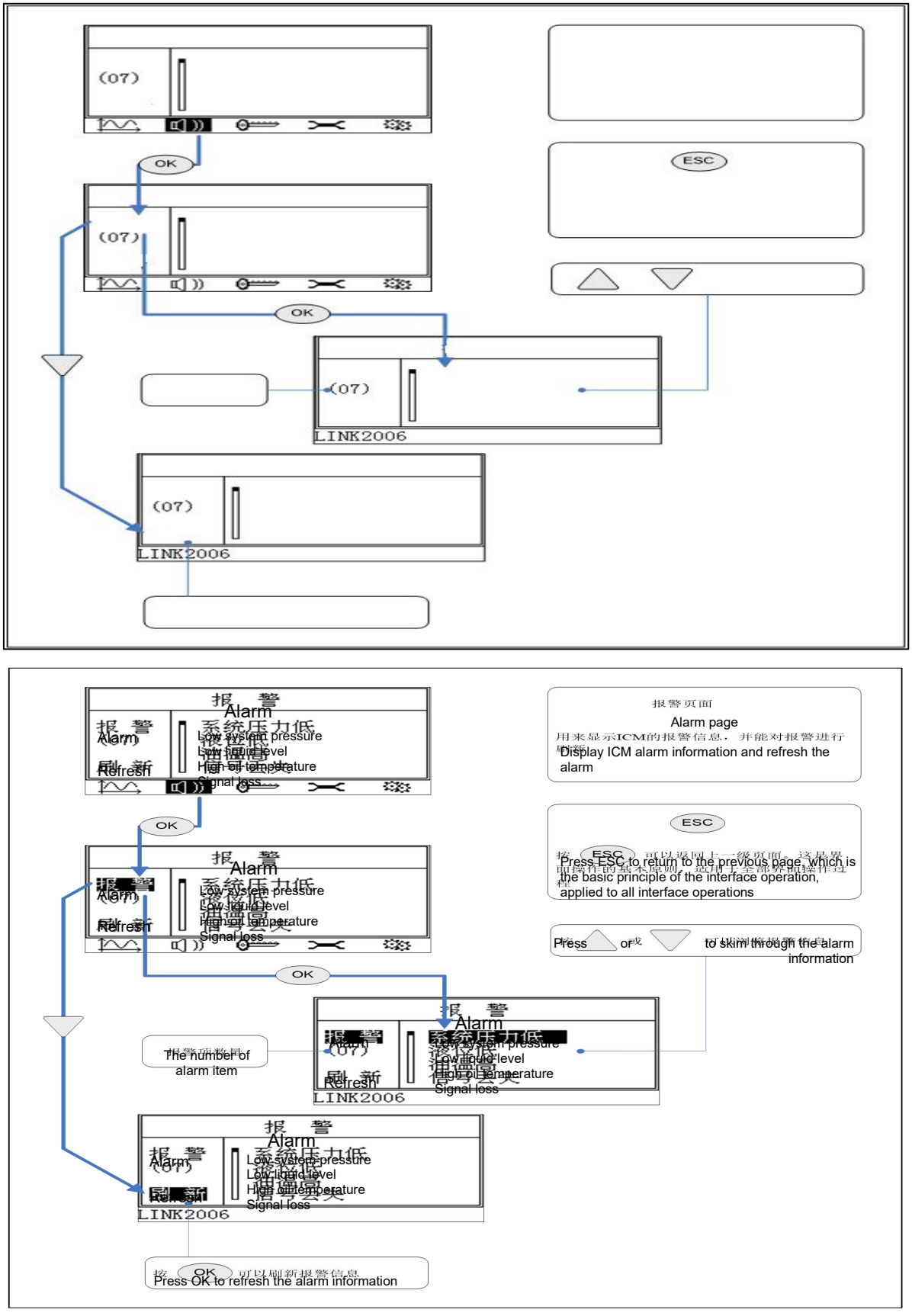


Figure 8: Alarm information view workflow of iSA controller

图 8：iSA 控制器报警信息查看流程

(3)Local remote regulation switching 本地远程调节切换

1)Users login 用户登录

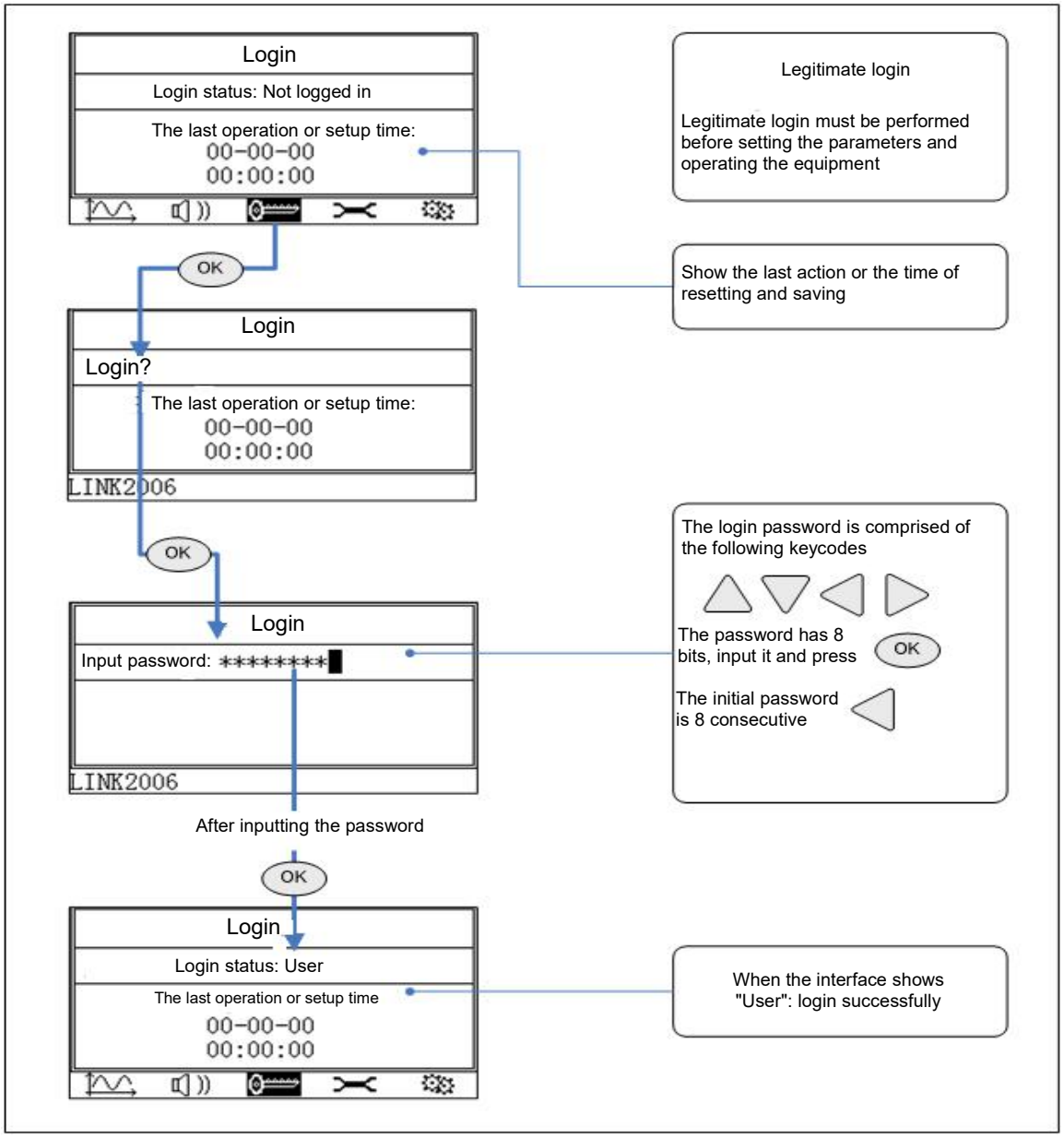


Figure 9: User login workflow of iSA controller (Continued)

图 9：iSA 控制器用户登录流程（续）

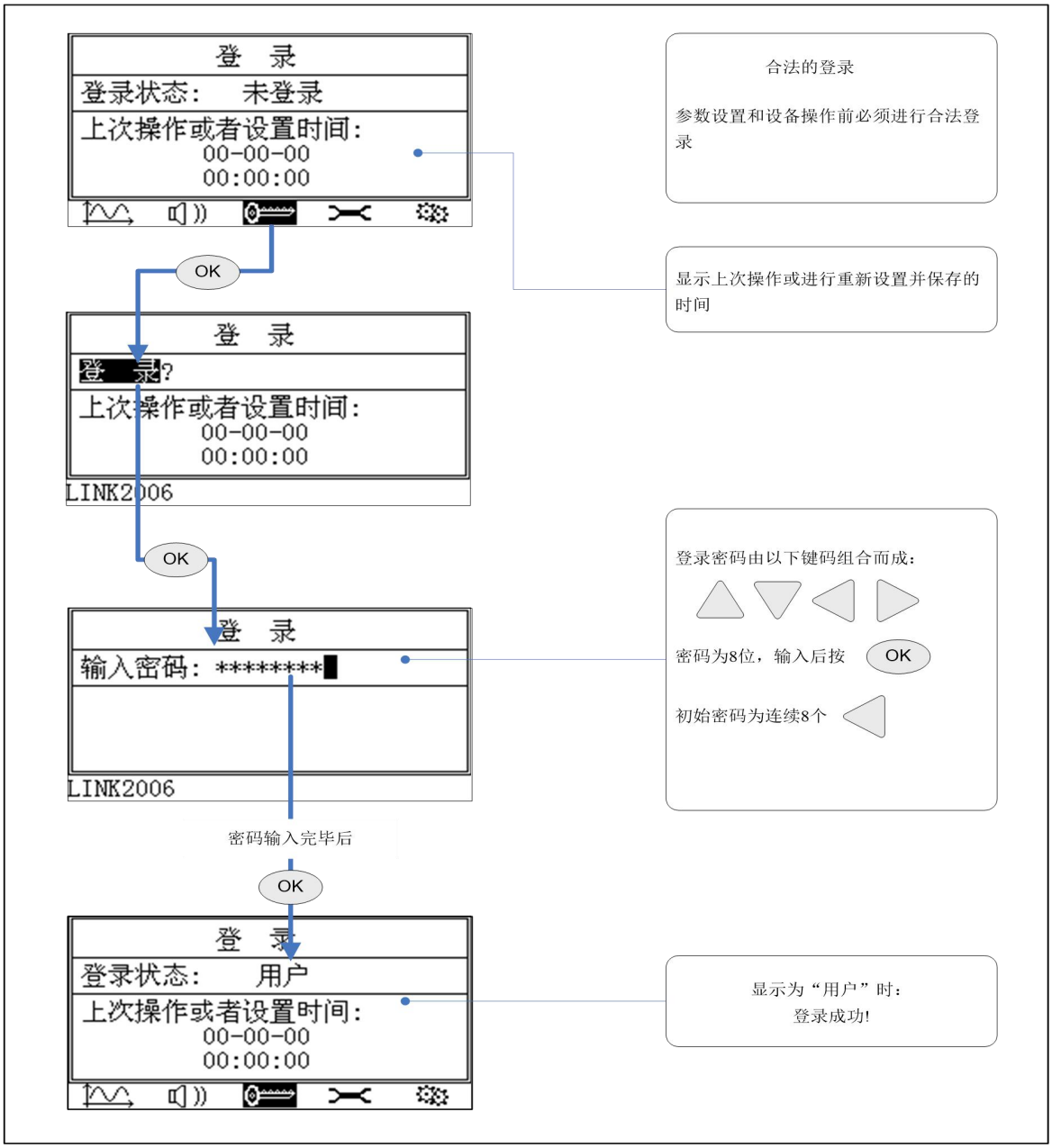


Figure 9: User login workflow of iSA controller

图 9：iSA 控制器用户登录流程

2)Local regulation 本地调节

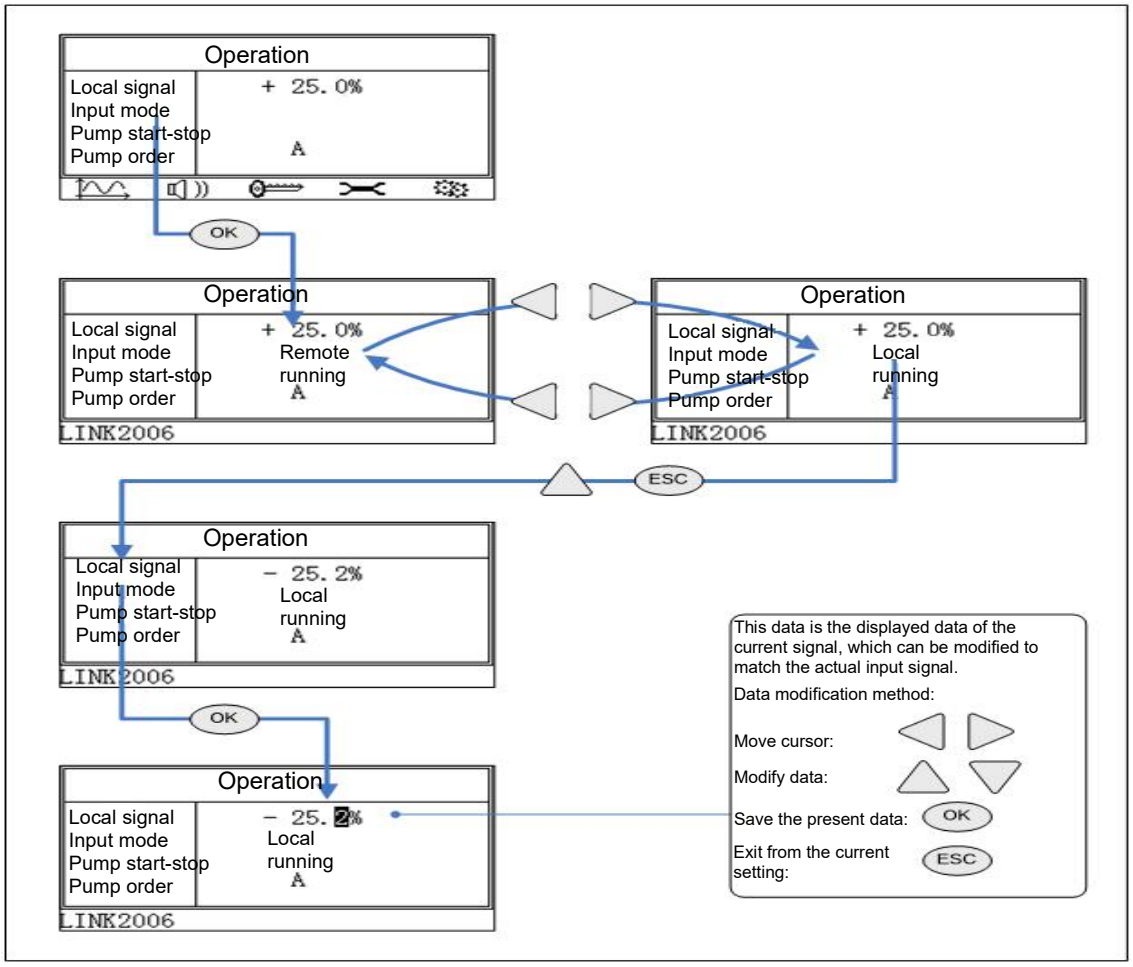


Figure 10: Local and remote switching workflow of iSA controller (Continued)

图 10：iSA 控制器本地远程切换流程（续）

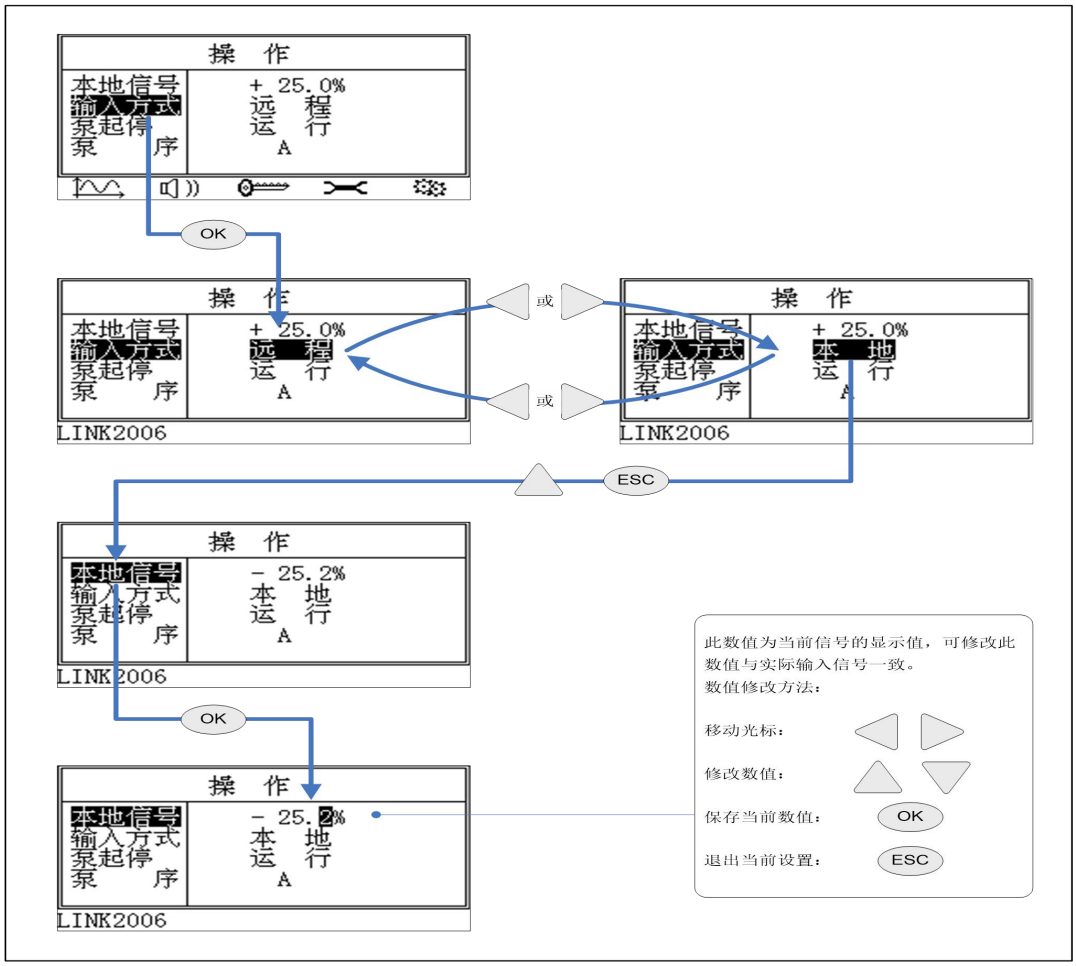


Figure 10: Local and remote switching workflow of iSA controller

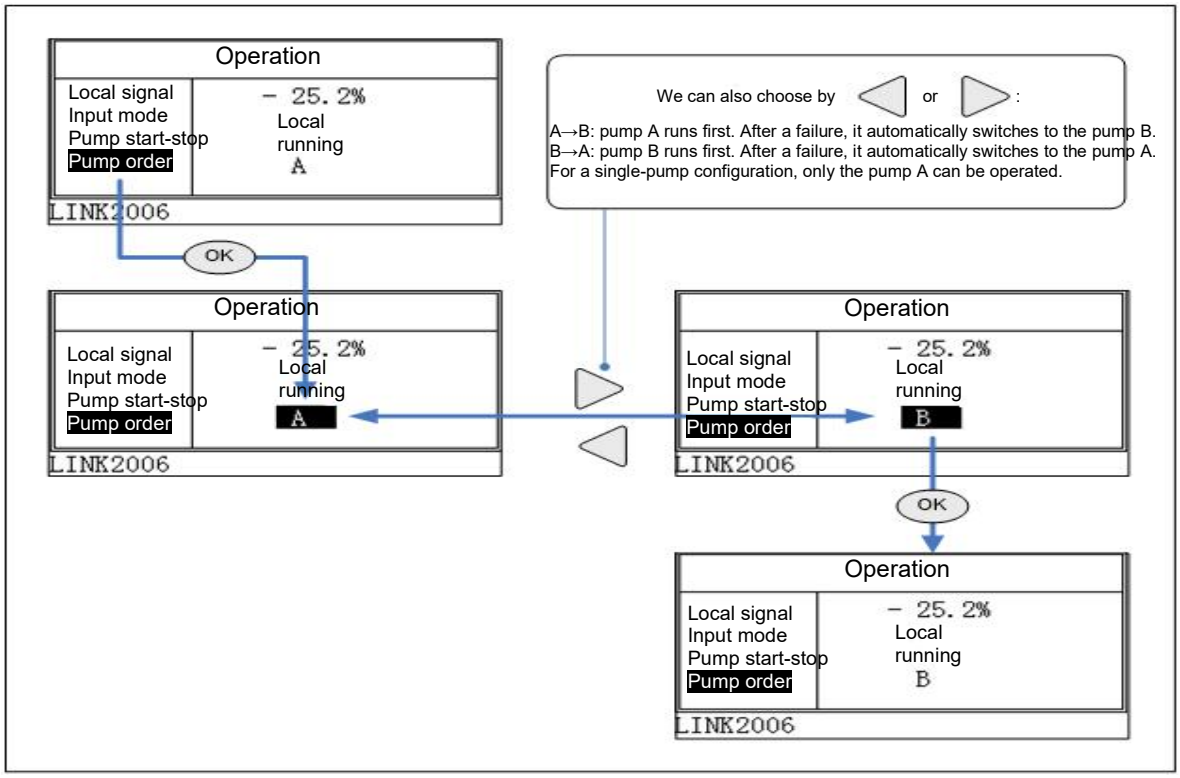
图 10：iSA 控制器本地远程切换流程

Local regulation can be realized only when the local operation authorization command is valid and the login is legal. The switching between remote and local is undisturbed switching.

只有在本地操作授权指令有效并合法登录后才能进行本地调节操作。远程→本地的切换是无扰动切换。

(4) Oil pump operation 油泵操作

1)Pump sequence selection 泵序选择



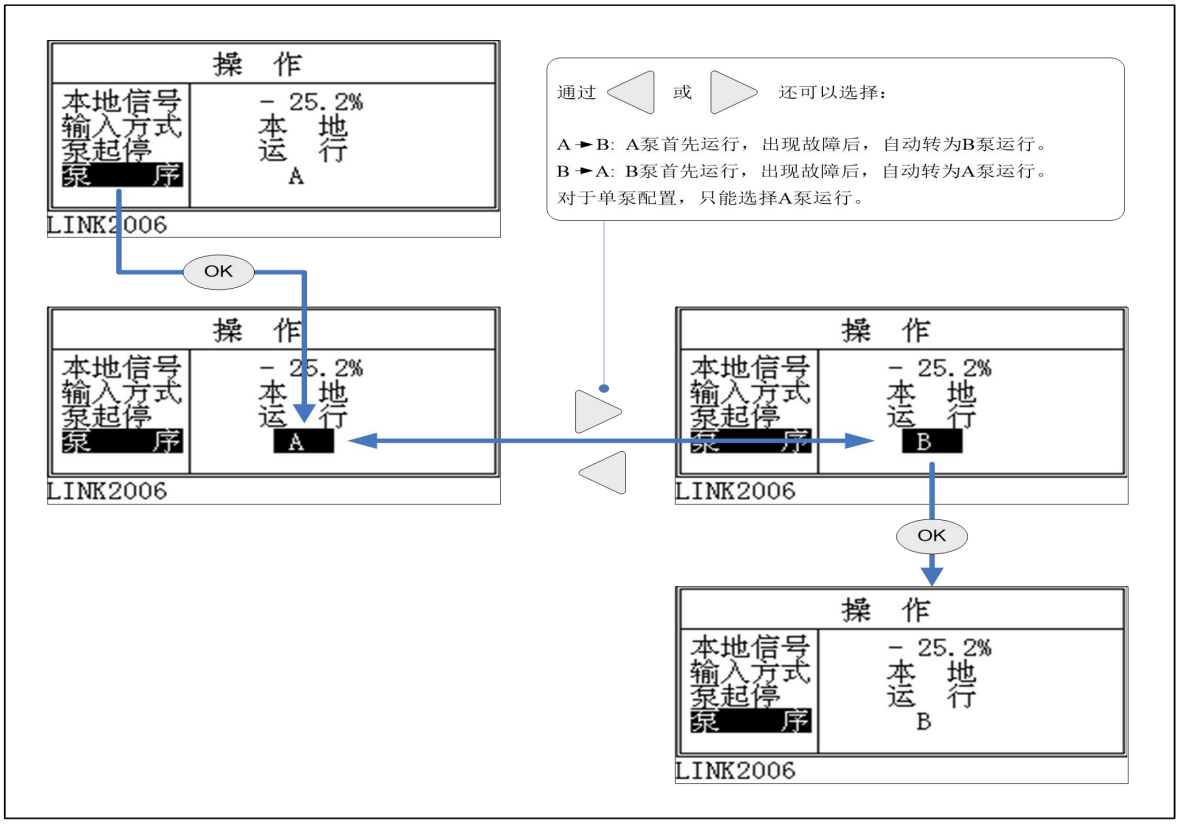
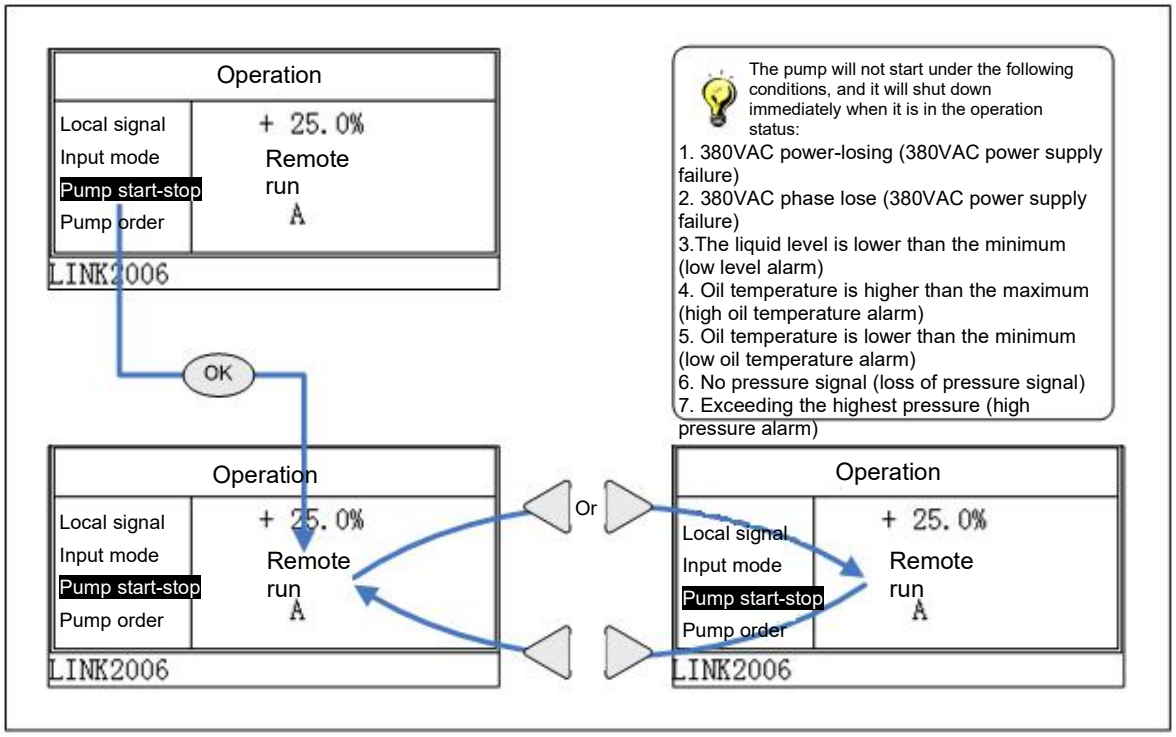


Figure 11: A/B oil pump switching workflow of start sequence of iSA controller

图 11：iSA 控制器 A/B 油泵启动顺序切换流程

2)Pump start/stop 泵启停



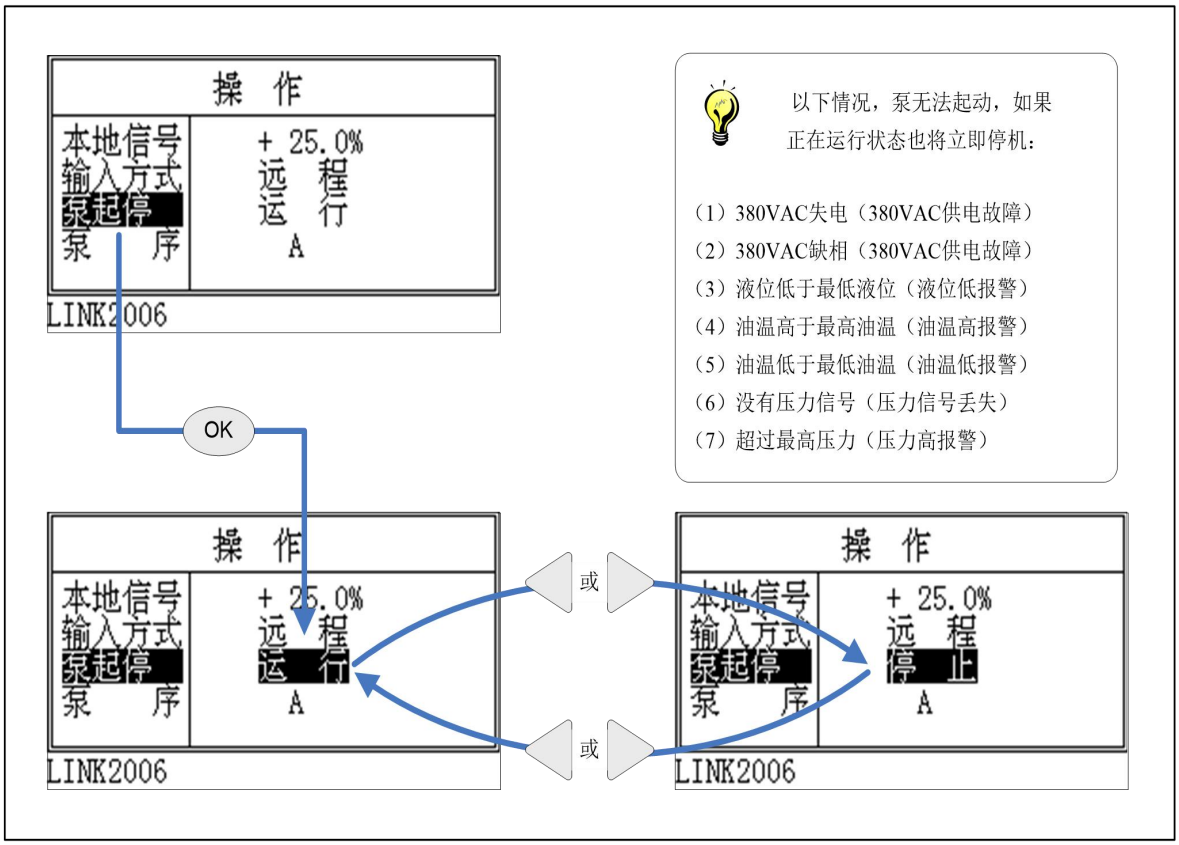
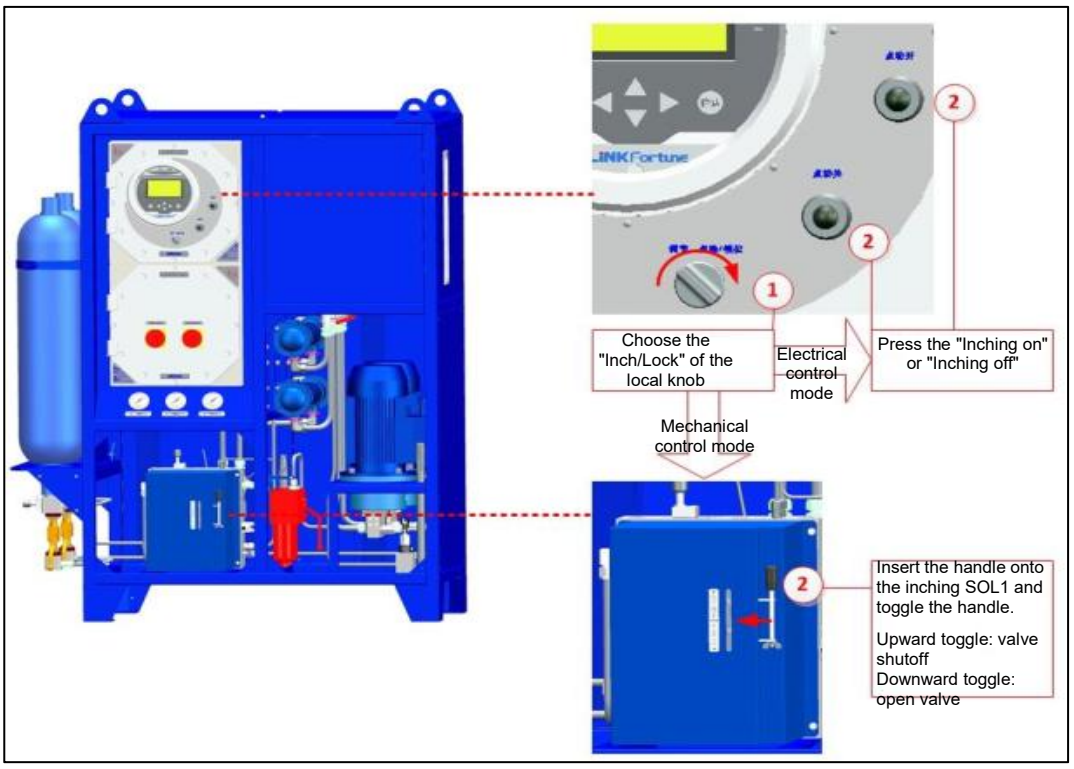


Figure 12: Site start/stop workflow of iSA controller oil pump

图 12：iSA 控制器油泵现场启停流程

(1) Switching of field operation mode 现场操作方式切换

1)Local inching 本地点动操作



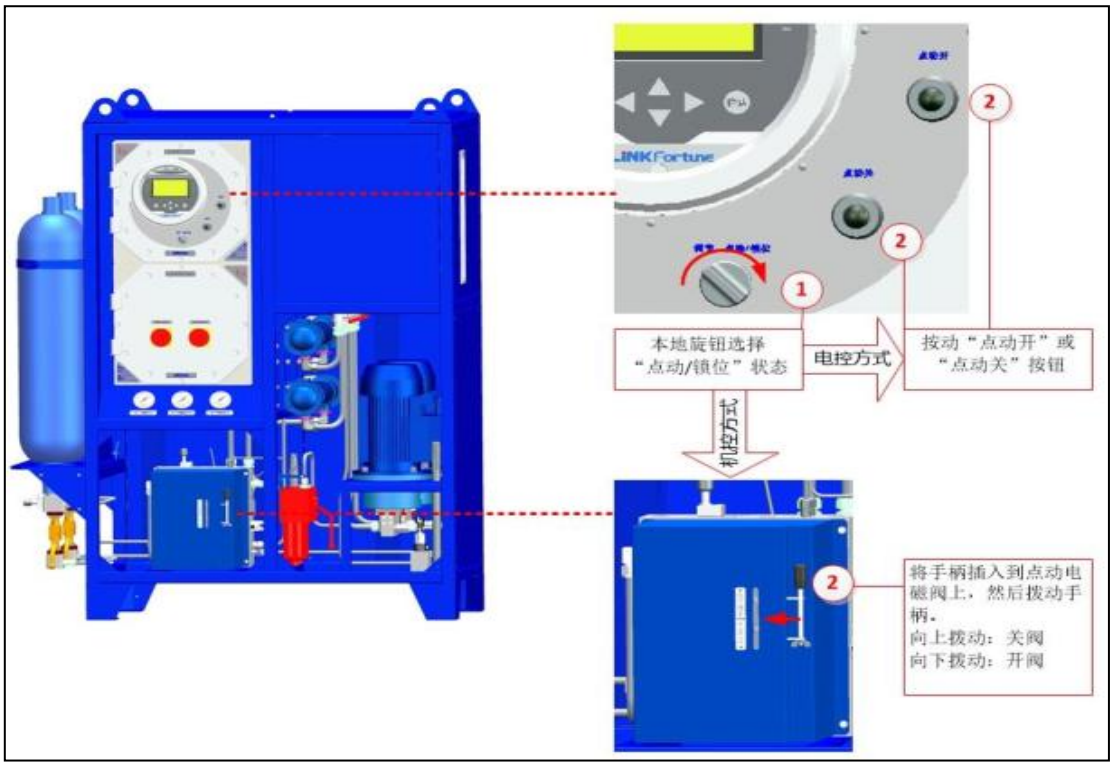


Figure 13: Site inching control workflow of iSA controller oil pump

图 13：iSA 控制器油泵现场点动控制流程

(2) Mechanical manual operation 机械手动操作

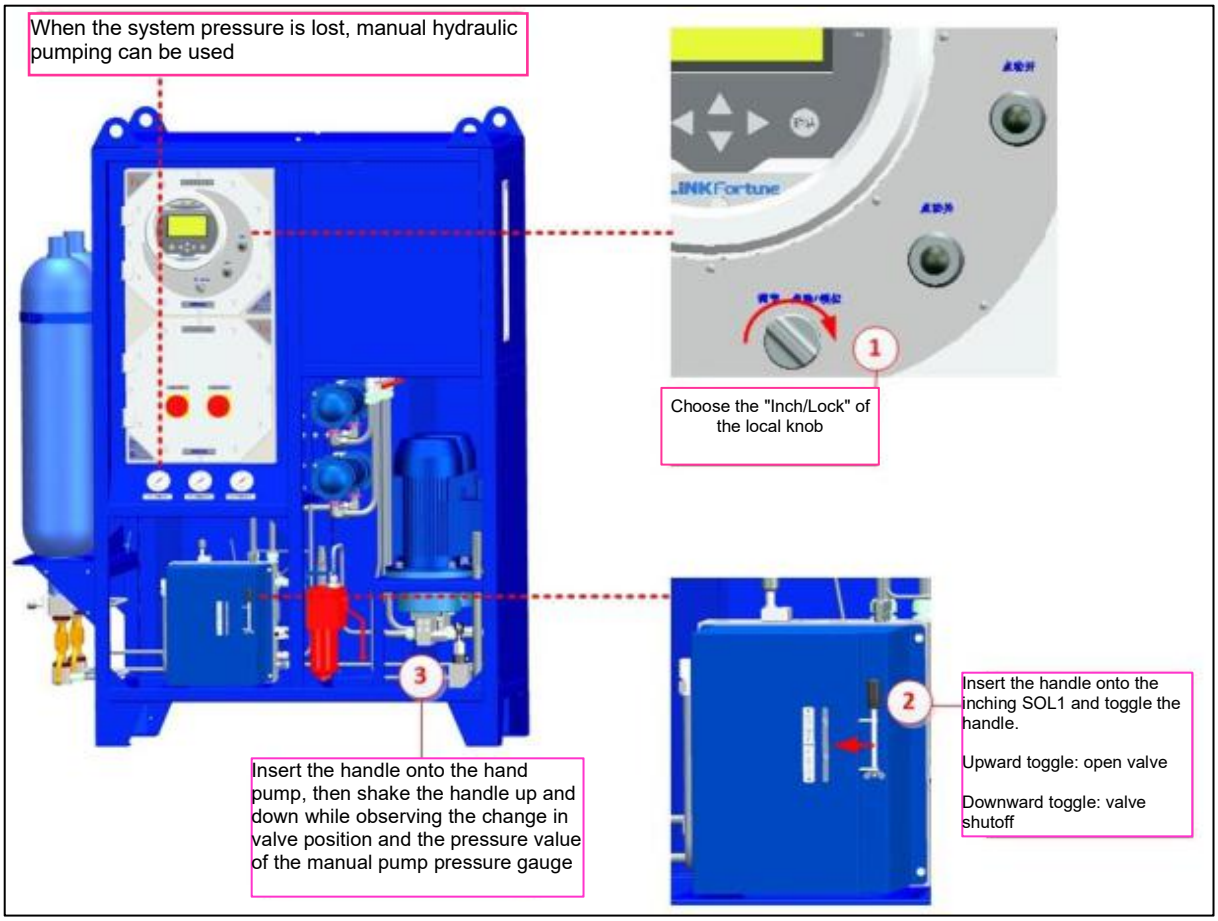
Figure 14: Site mechanical manual switching workflow of iSA controller oil pump

图 14：iSA 控制器油泵现场机械手动切换流程

Figure 14: Site mechanical manual switching workflow of iSA controller oil pump (Continued)

图 14：iSA 控制器油泵现场机械手动切换流程（续）

3)Hydraulic manual operation 机液压手动操作



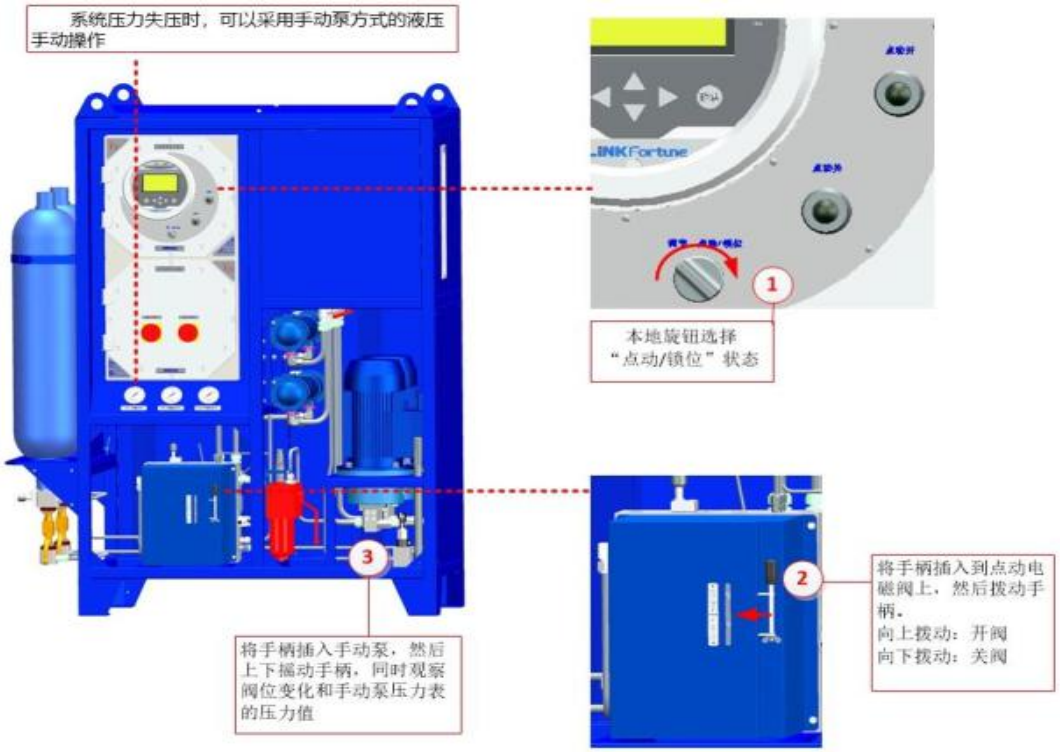


Figure 15: Hydraulic manual operation workflow of iSA controller

图 15：iSA 控制器液压手动操作流程

(4)Use and switching of one-drive-two system actuator 一带二系统执行机构的投用和切换

The use and switching of one-drive-two system (PV11201A/B and PV30102A/B) actuator are shown as follows:

一带二系统（PV11201A/B 和 PV30102A/B）执行机构的投用和切换如下所示：

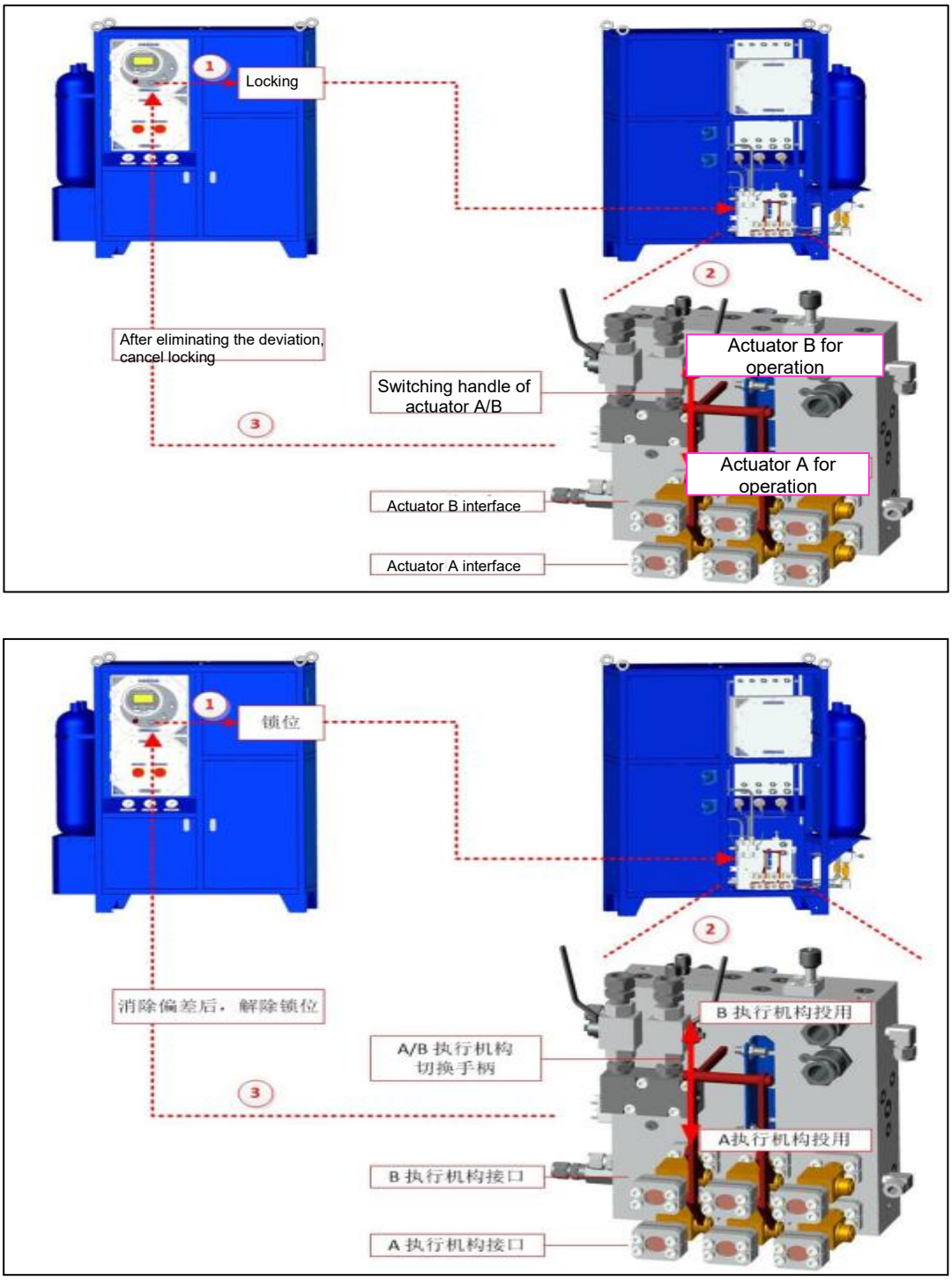


Figure 16: Use and switching of workflow of one-drive-two system actuator

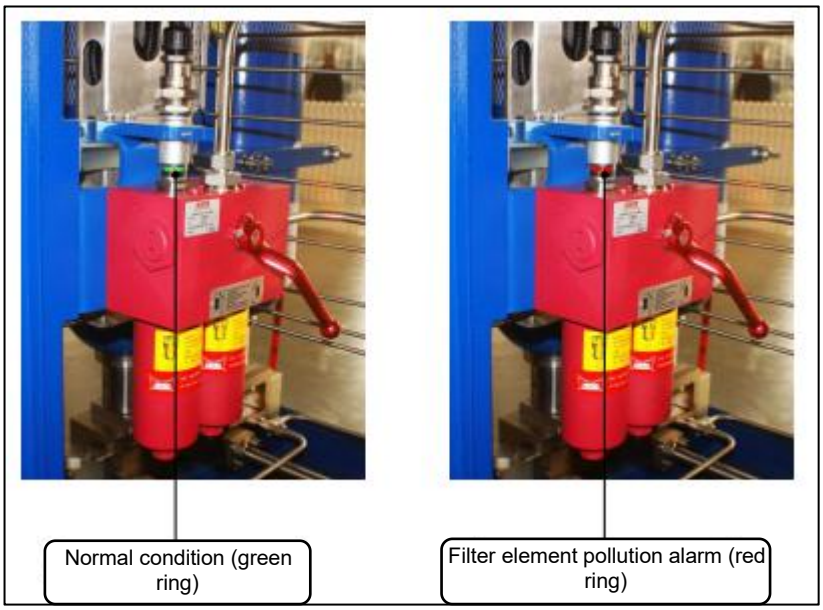
图 16：一带二系统执行机构的投用和切换流程

(6)Other operation methods 其它操作方法

1)Pollution alarm and switching of oil filter 油过滤器的污染报警与切换

The filter 358 is provided with a visual alarm device. When the ring is changed from green into red, it indicates that the oil filter element is polluted and shall be replaced.

在过滤器 358 上，带有可目视的报警装置，当环标由绿色变为红色时代表油滤芯已经被污染需进行更换。



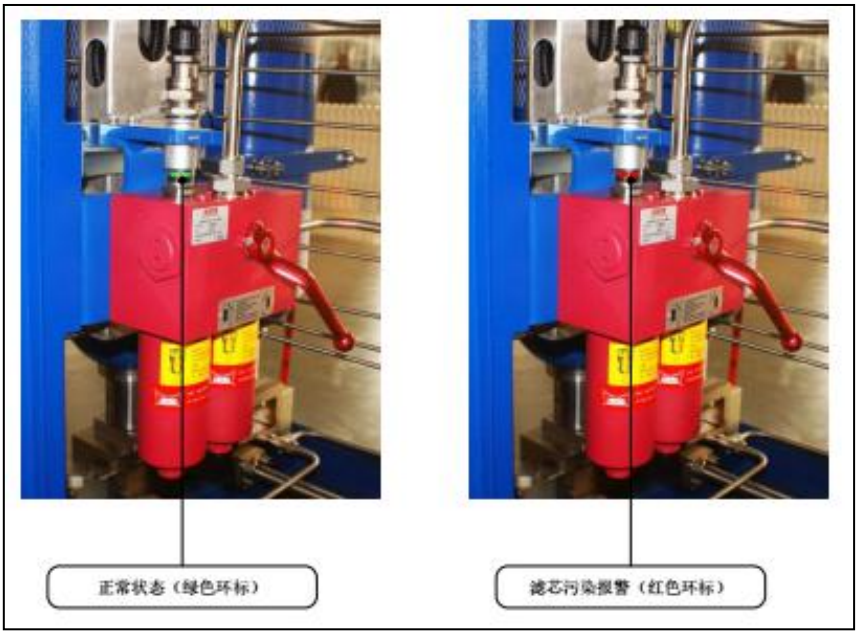
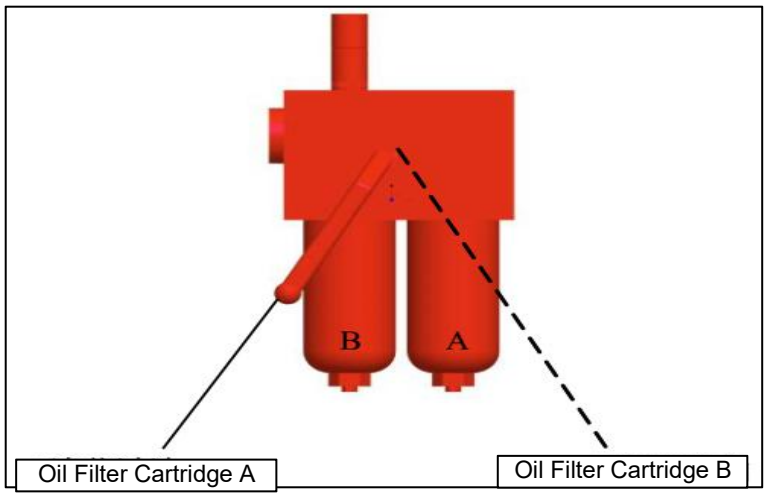


Figure 17: Pollution alarm diagram of oil filter

图 17：油过滤器污染报警示意



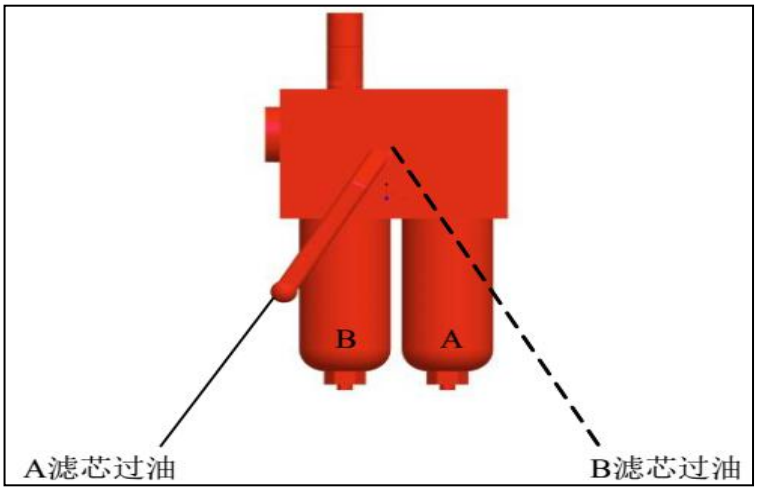


Figure 18: Oil filter switching diagram

图 18：油过滤器切换示意

When replacing the filter cartridge, pay attention to the correspondence between the position of handle and the filter cartridge, as shown in the figure below. Replace according to the operation instruction on the filter shell.

更换滤芯时，要注意手柄的位置与滤芯的对应关系，如下图。更换时，应按过滤器壳体上的操作说明进行操作。

2)Fill hydraulic oil 加注液压油

Fill hydraulic oil method:

When we fill the hydraulic oil, the surrounding environment of the fuel filler and the filler pipe must be clean.

(1) Refueling shall be carried out when the pump is in shutdown with removed system pressure.

(2) The hydraulic oil of the same brand number and the same manufacturer as the original hydraulic oil should be used.

(3) It should be refueled with a 10μm oil filter vehicle.

(4) Loosen the upper lid of the air filter in an anticlockwise direction, insert the filler pipe into the air filter port, and start to refuel to the high liquid level.

(5) Remove the filler pipe and cover the air filter's upper lid.

Figure 19: Fill hydraulic oil workflow

加注液压油方法：

加注液压油时，必须保证加油口周围环境及加油管清洁。

（1）加油应在停泵状态，并卸掉系统压力时进行。
（2）应使用与原液压油同牌号、同厂家的液压油。
（3）应使用10μm滤油车加油。
（4）逆时针松开空气滤清器上盖，将加油管插入空气滤清器口内，开始加油至高液位标志。
（5）撤掉加油管，并盖好空气滤清器上盖。

图 19：加注液压油流程

3)Pressure testing and inflation of accumulator 蓄能器测压与充气

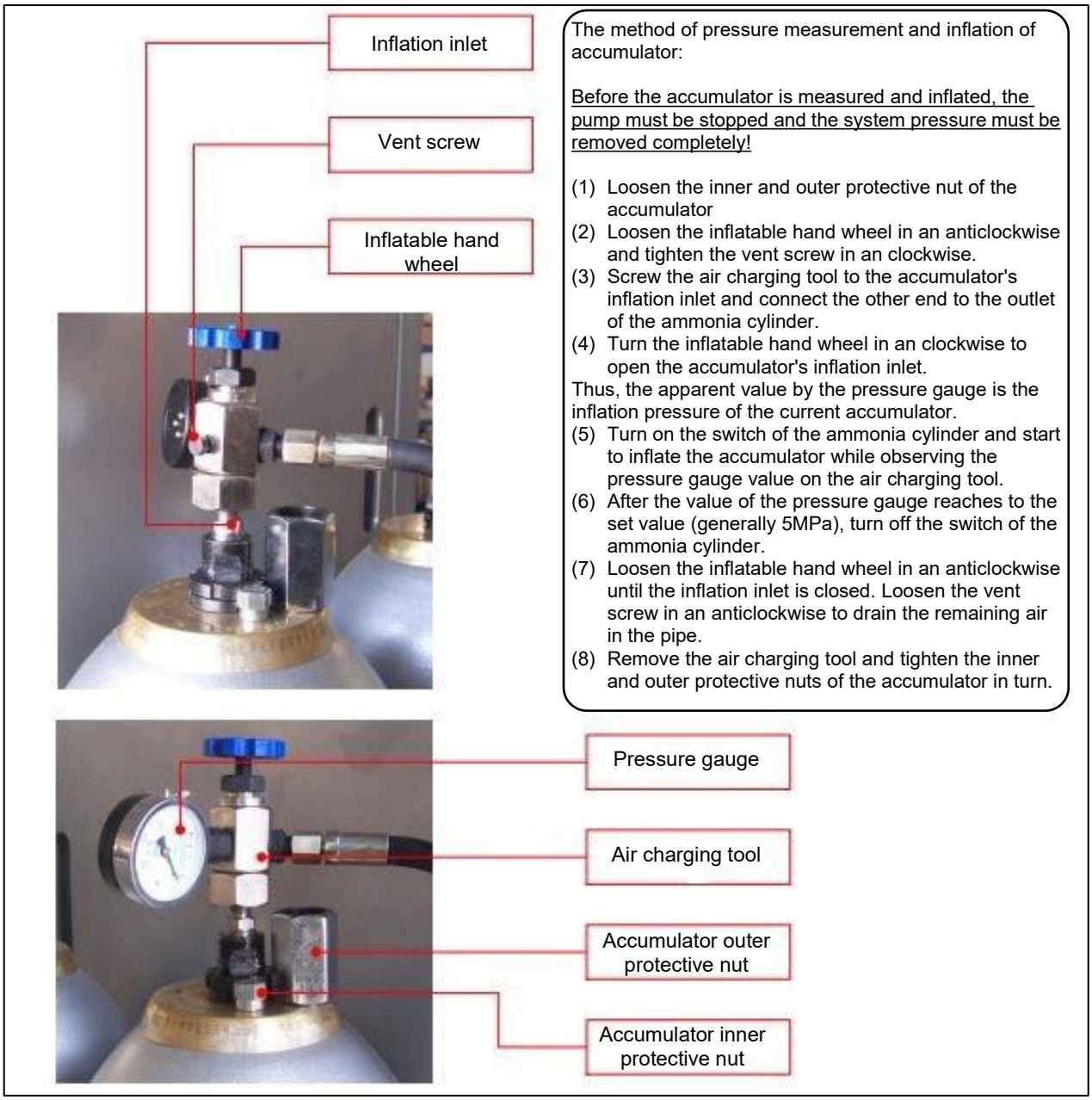


Figure 20: Pressure testing and inflation flow of accumulator (Continued)

图 20：蓄能器测压与充气流程（续）

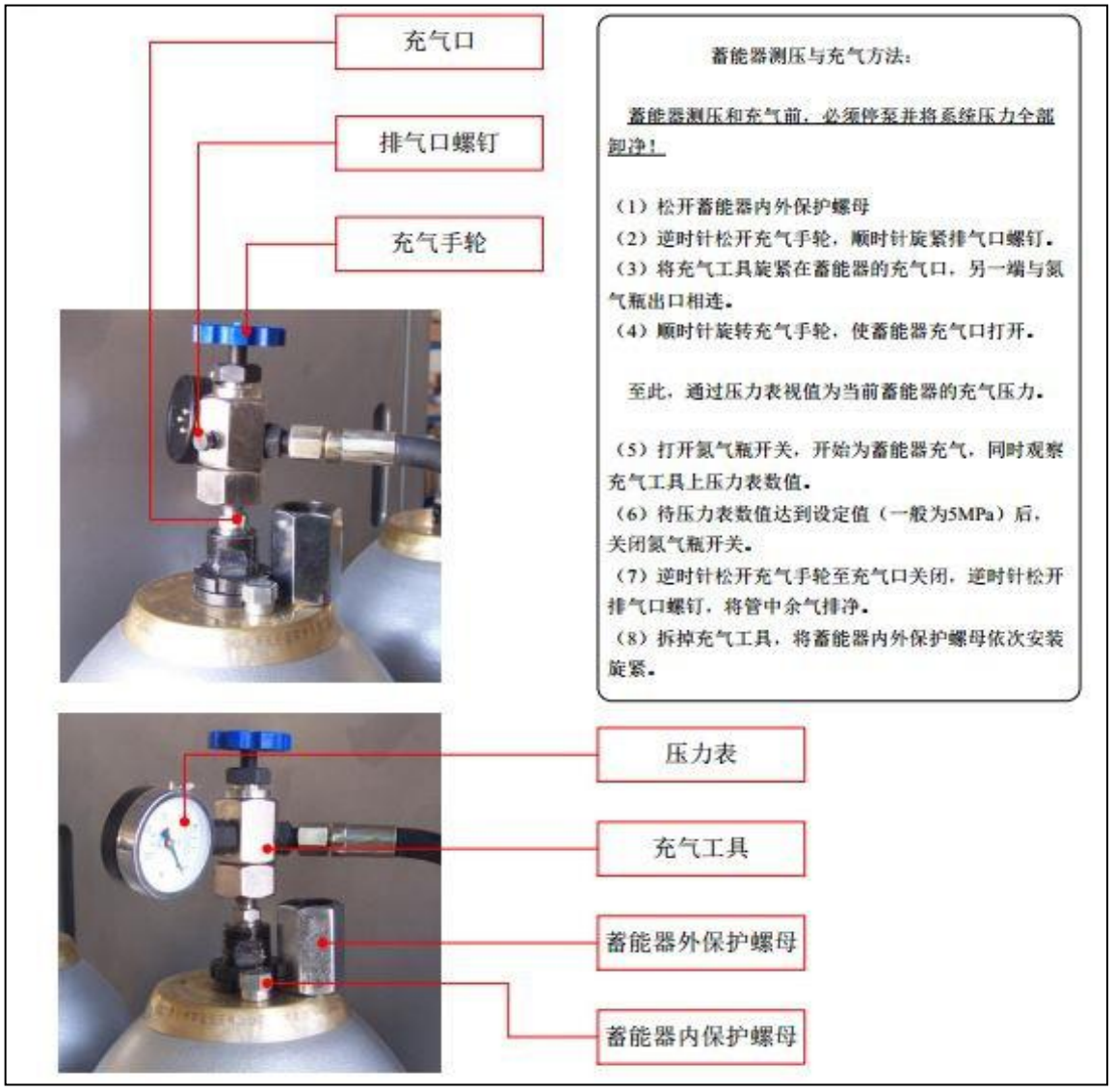


Figure 20: Pressure testing and inflation flow of accumulator

图 20：蓄能器测压与充气流程

4)Calibration 校准

a. Signal calibration 信号校准

The purpose of signal calibration is to keep the consistency between the internal control signals of iSA controller and the control signals of remote DCS.

信号校准的目的是使 iSA 控制器的内部控制信号与远程 DCS 的控制信号一致。

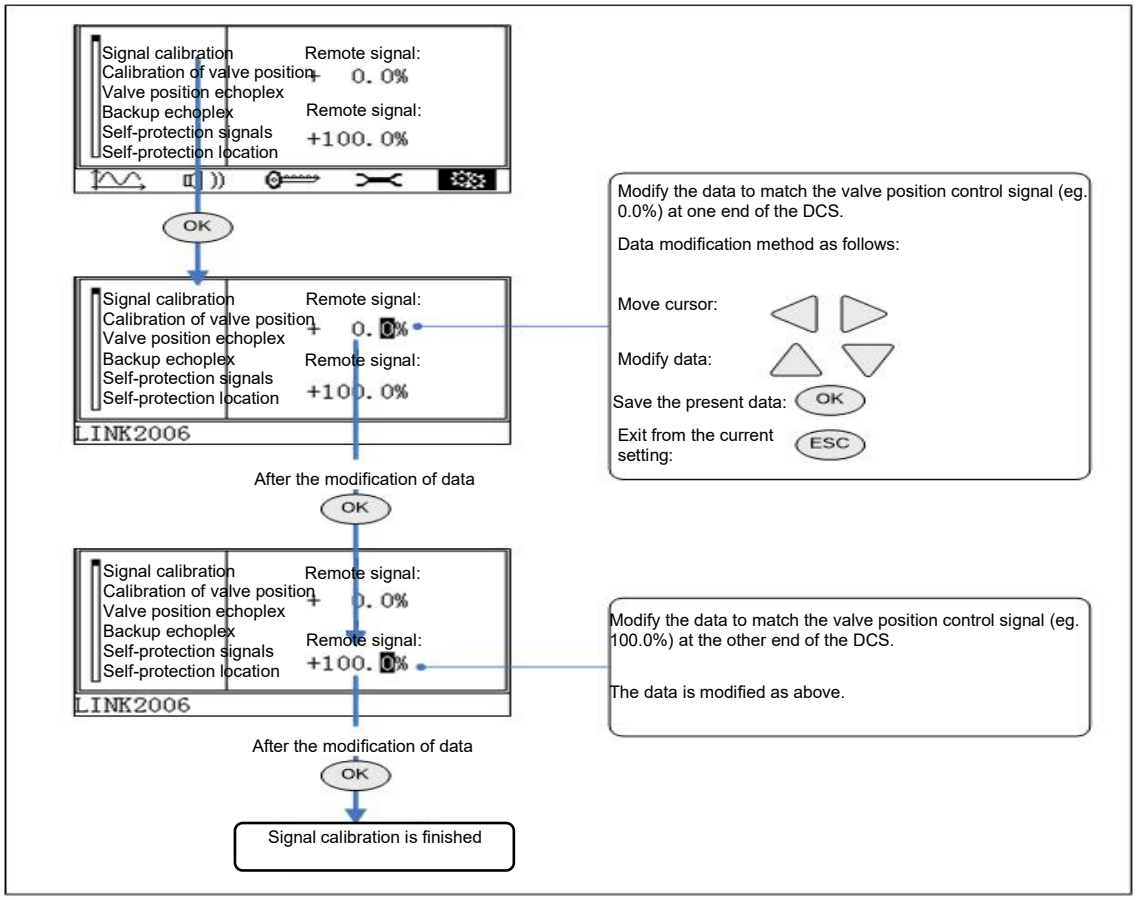


Figure 21: Signal calibration workflow

图 21：信号校准流程（续）

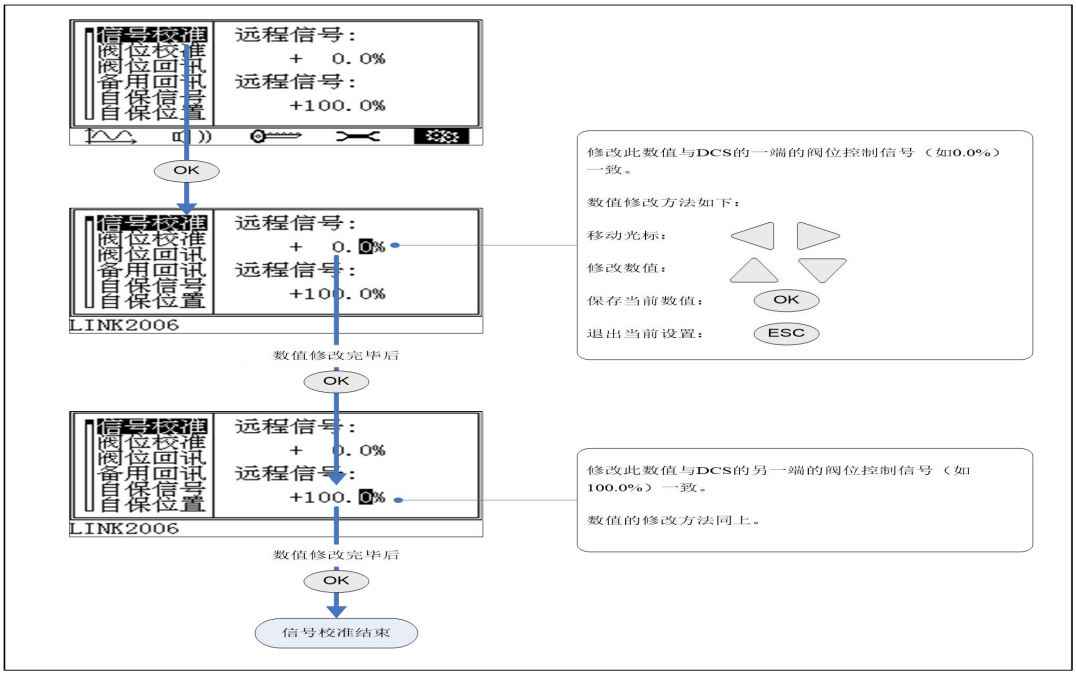


Figure 21: Signal calibration workflow (Continued)

图 21：信号校准流程（续）

b. Calibration of valve position 阀位校准

The purpose of signal calibration is to keep the consistence between the fully-open/close position of valve and the requirement.

信号校准的目的是使阀门的全开或全关位置与要求一致。

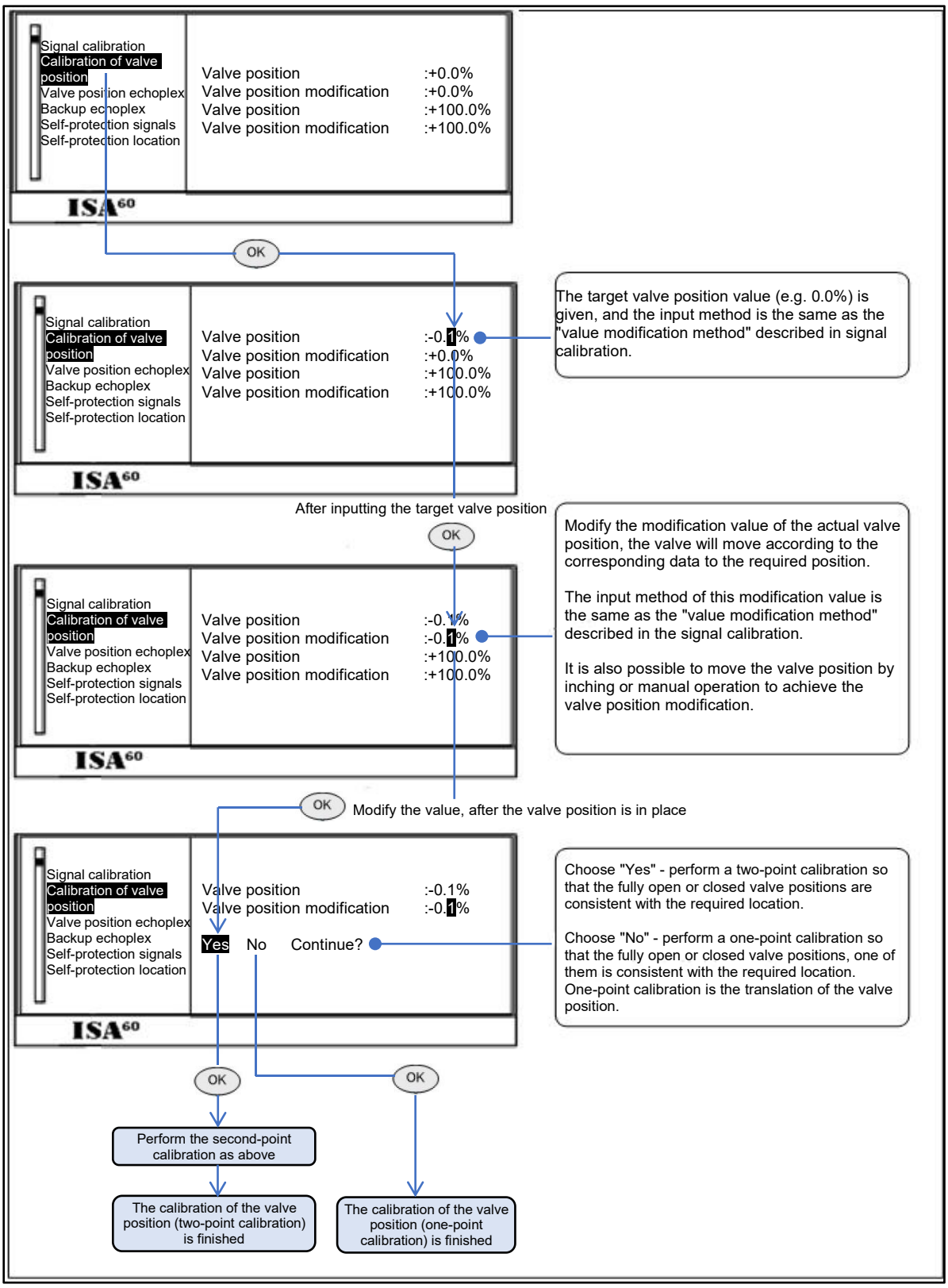


Figure 22: Calibration workflow of valve position

图 22：阀位校准流程

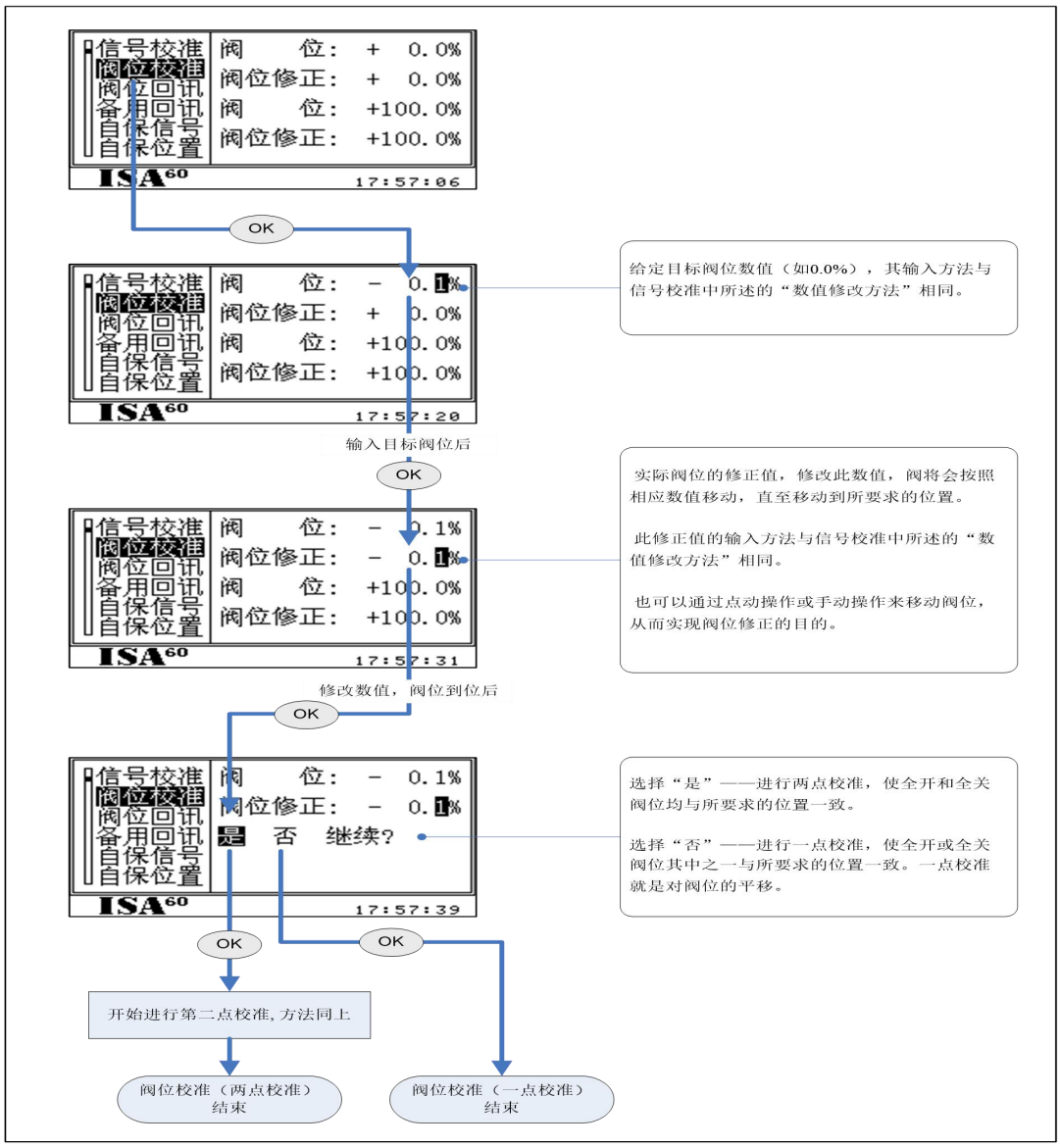


Figure 22: Calibration workflow of valve position (Continued)

图 22：阀位校准流程（续）

c. Echoplex calibration of valve position 阀位回讯校准

The purpose of echoplex calibration of valve position is to keep the correspondence between the valve position indication on the control room DCS and the fully-open/close position of valve.

阀位回讯校准的目的是使控制室 DCS 上的阀位指示与阀门全开或全关位置对应。

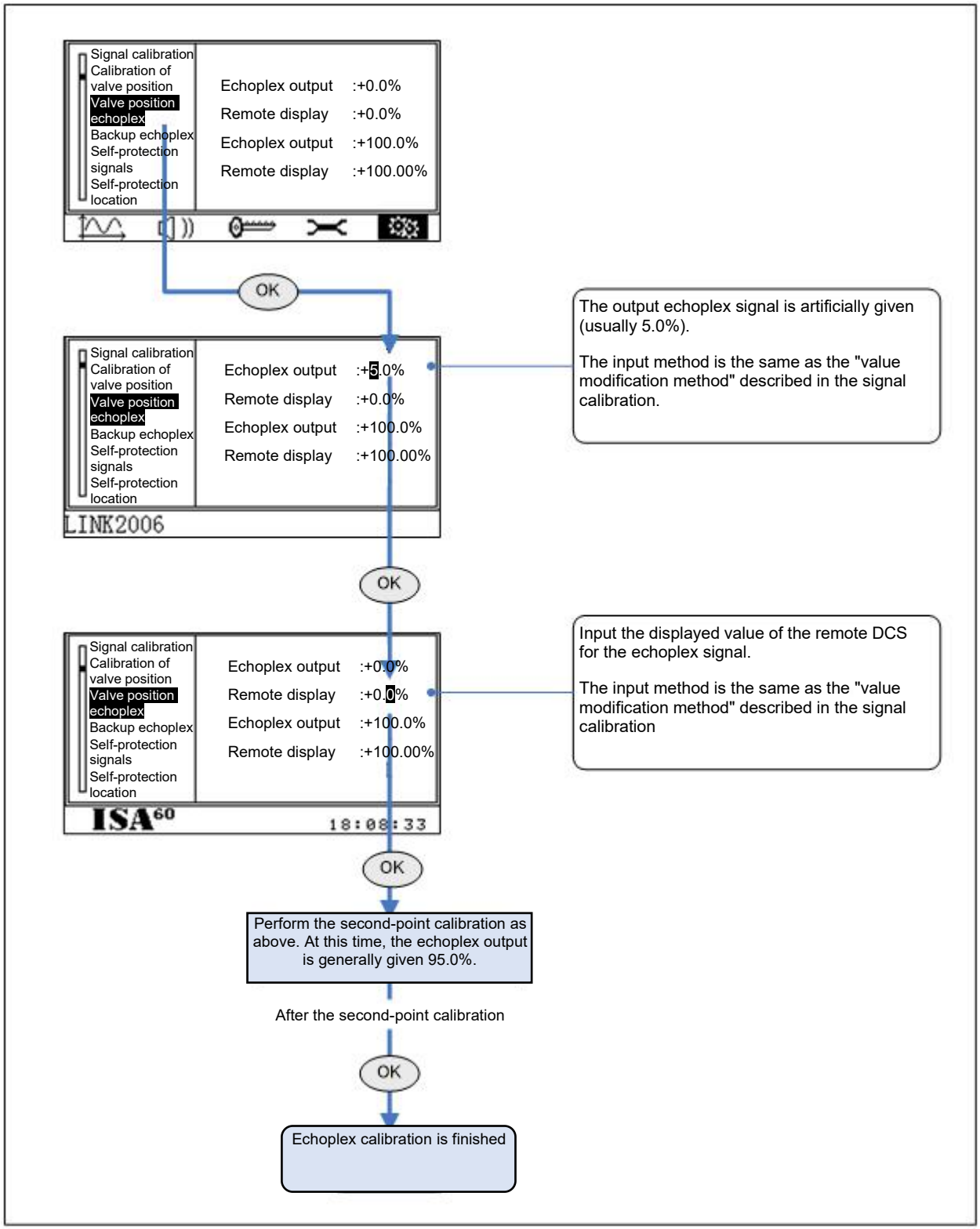


Figure 23: Echoplex calibration workflow of valve position

图 23：阀位回讯校准流程

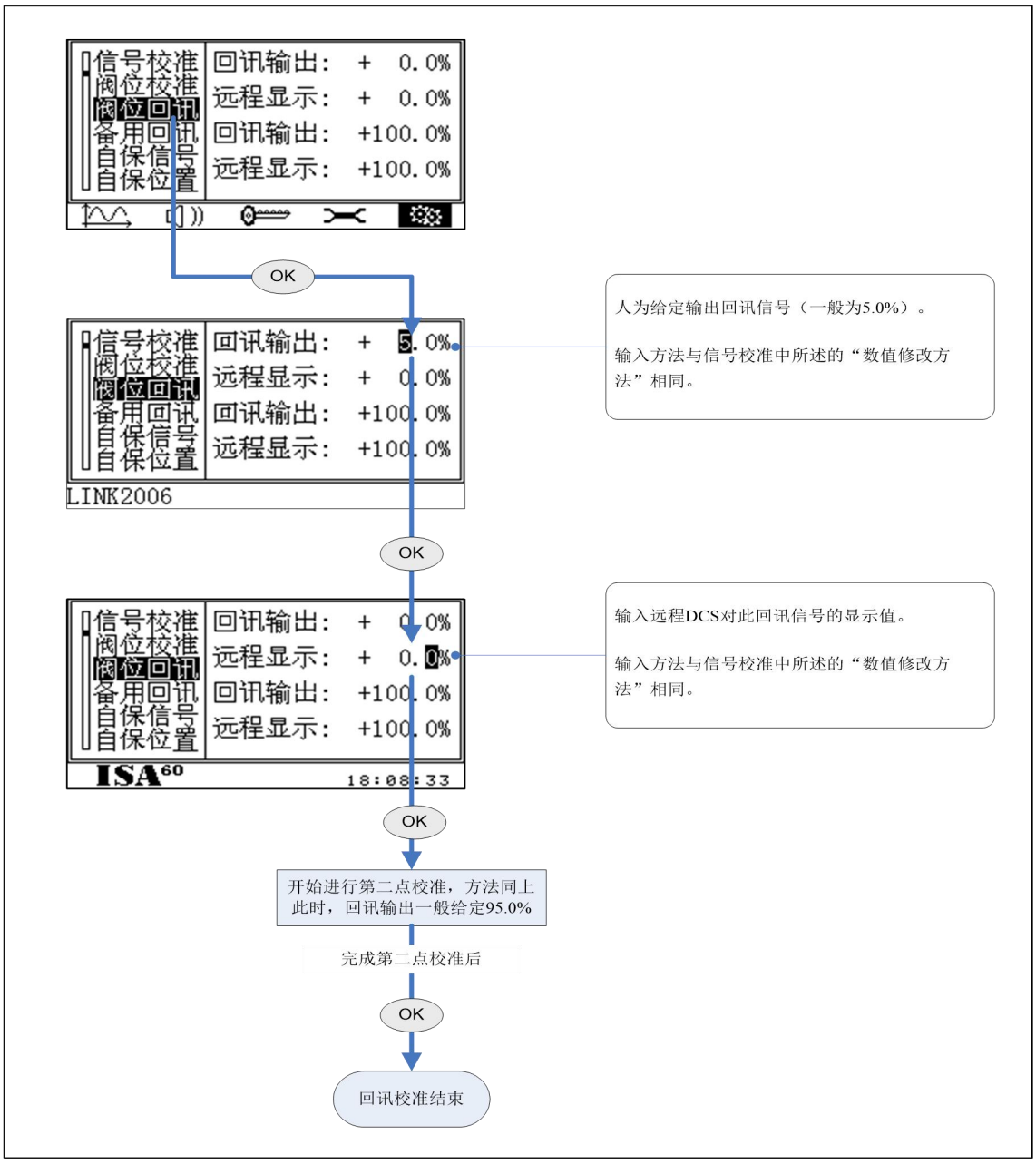


Figure 23: Echoplex calibration workflow of valve position (Continued)

图 23：阀位回讯校准流程（续）

d. Selection and calibration of standby echoplex 备用回讯的选择与校准

The standby echoplex can be the echoplex of another location or the echoplex of system pressure.

备用回讯可以选择为另一路位置回讯，也可以选择为系统压力回讯。

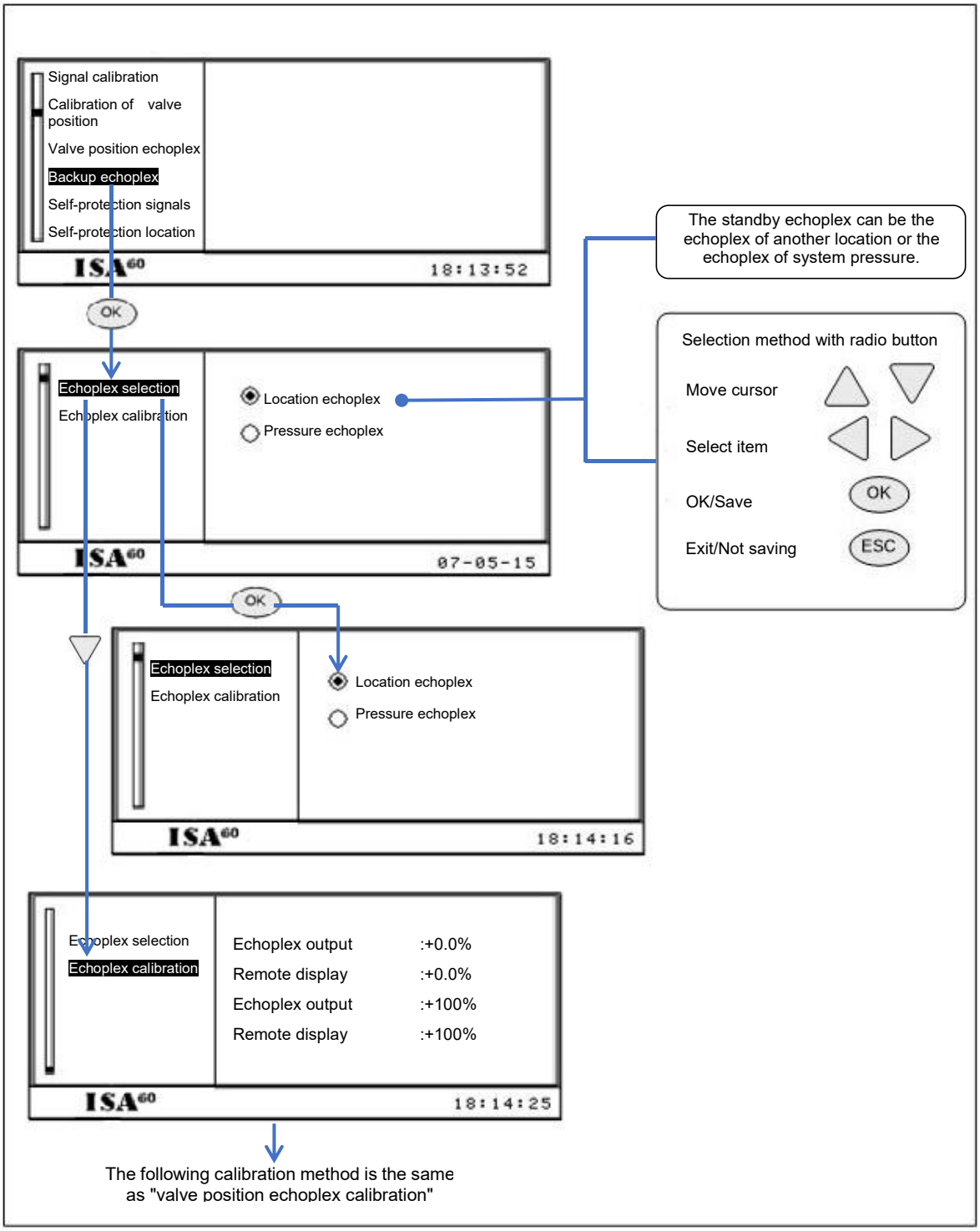


Figure 24: Selection and calibration workflow of standby echoplex

图 24：备用回讯的选择与校准流程

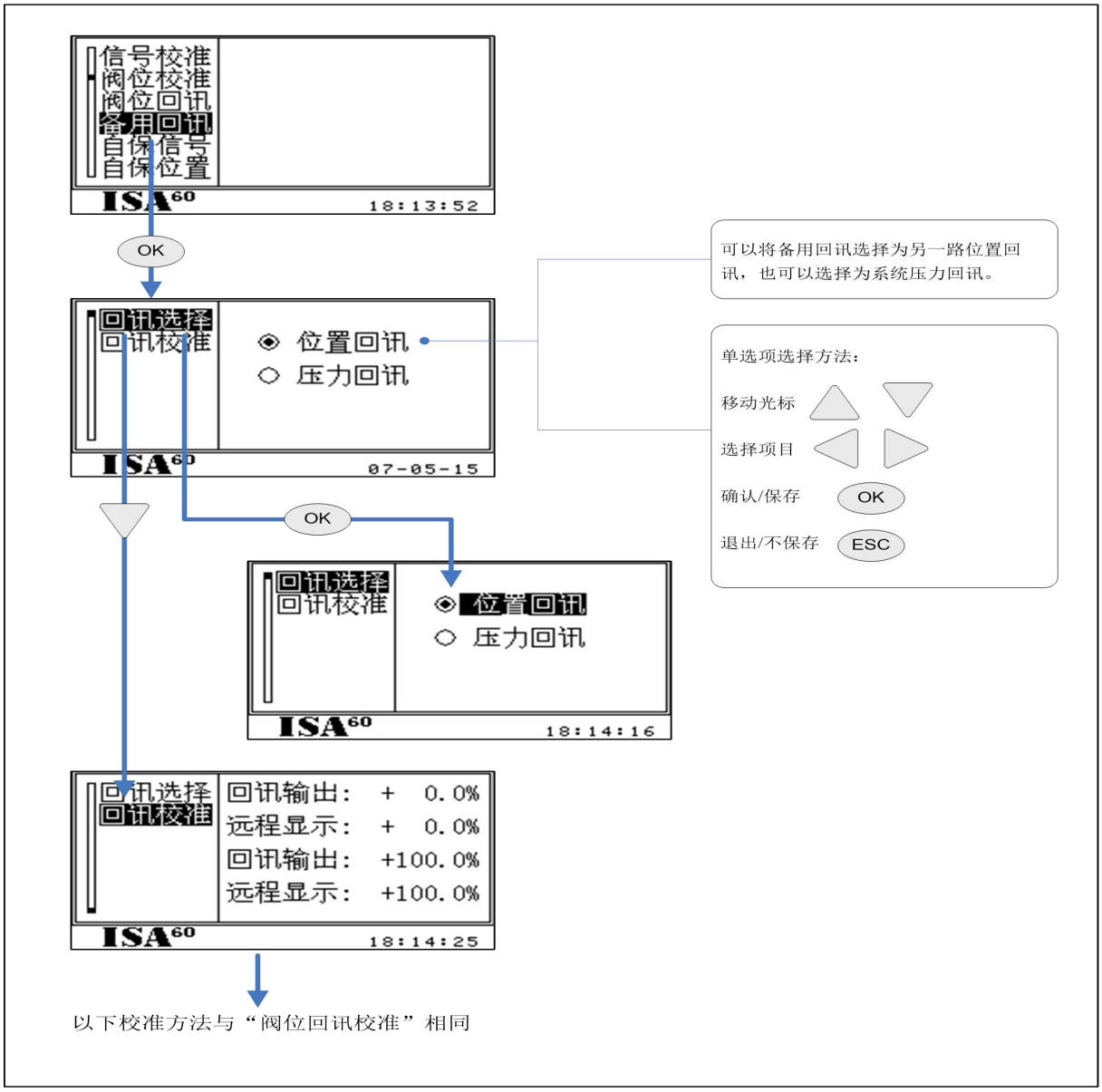


Figure 24: Selection and calibration workflow of standby echoplex (Continued)

图 24：备用回讯的选择与校准流程（续）

e. Self-protection signals 自保信号

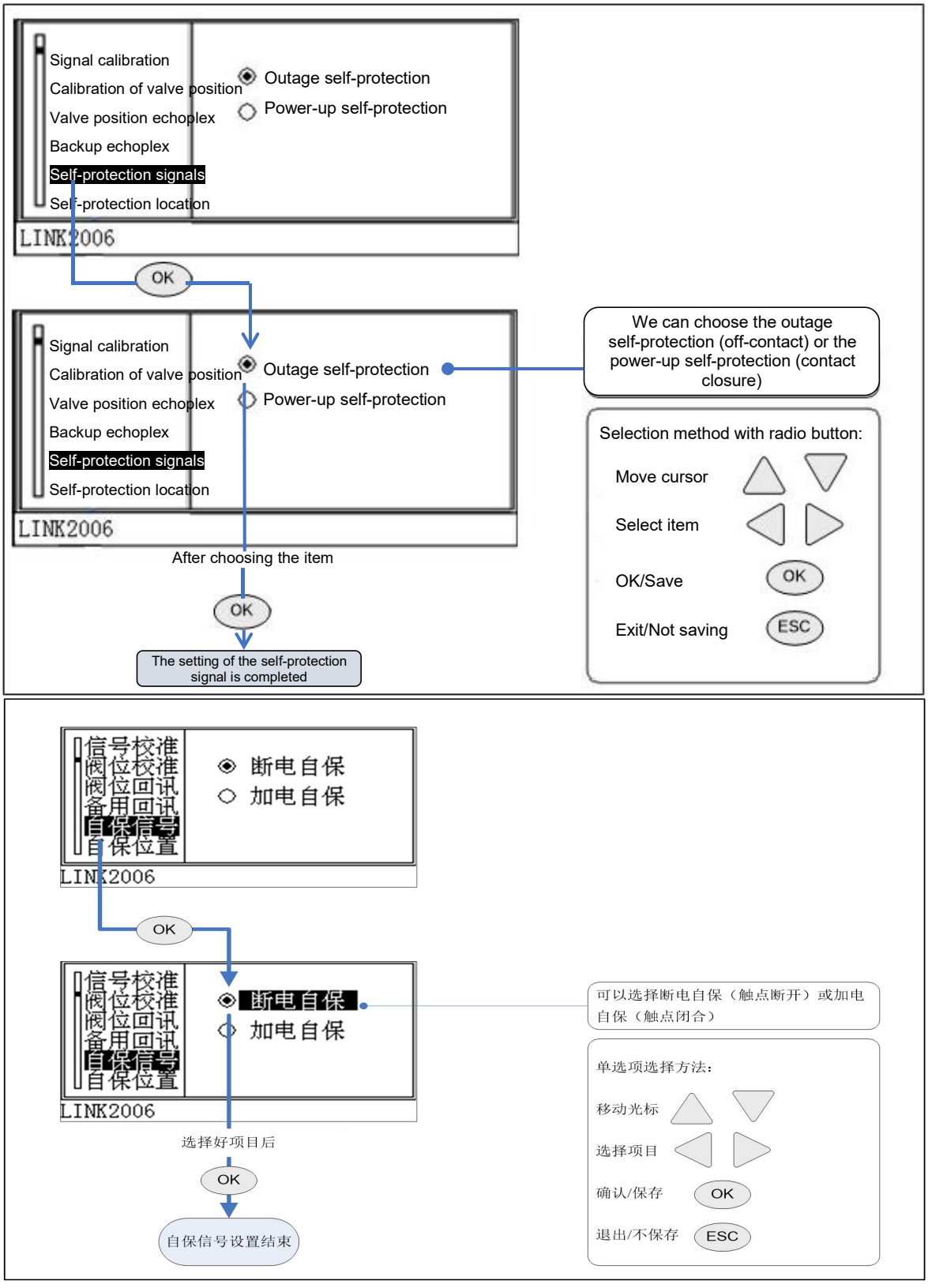


Figure 25: Switching flow of self-protection signals

图 25：自保信号方式切换流程

f. Self-protection location and buffering capacity 自保位置与缓冲量

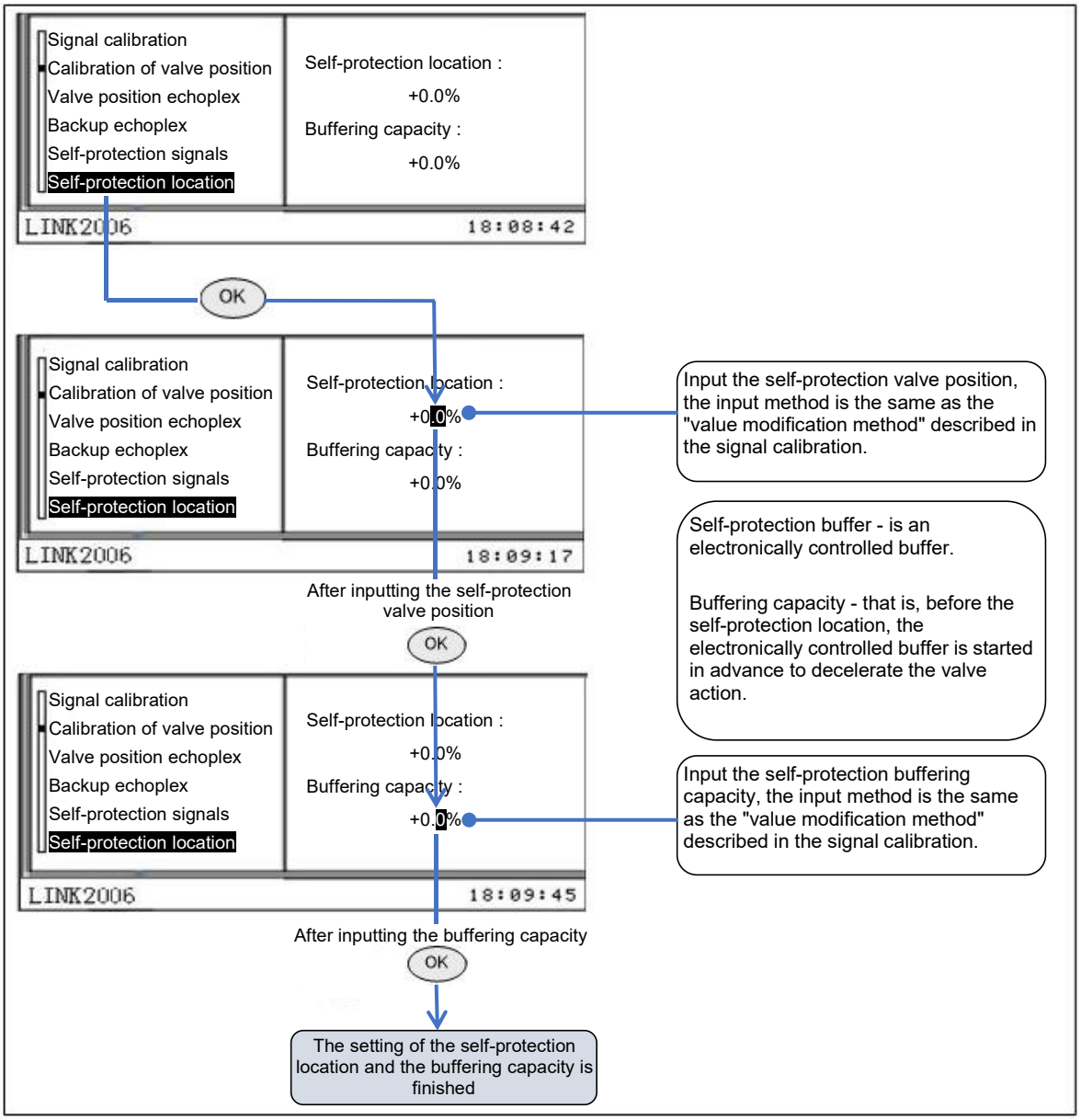


Figure 26: Set workflow of self-protection position and buffering capacity

图 26：自保位置与缓冲量调设置流程

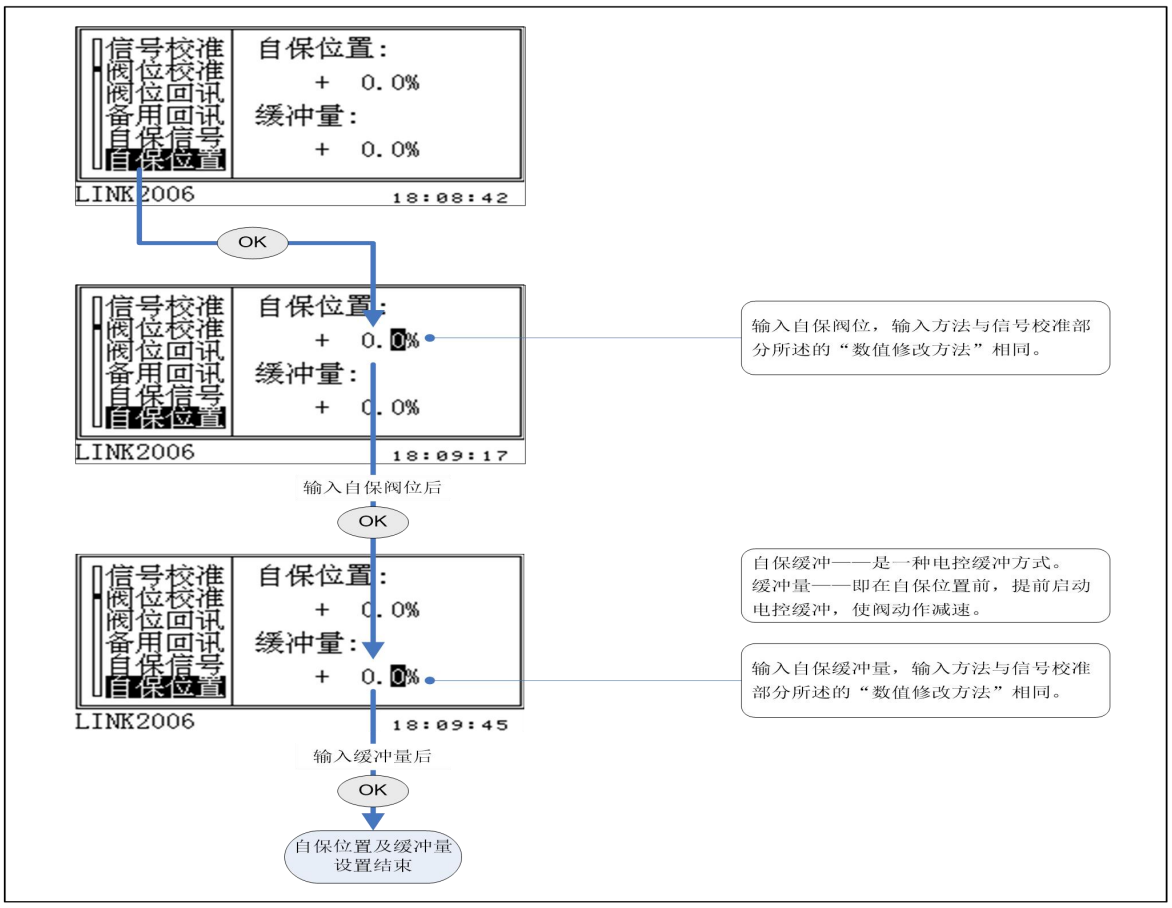


Figure 26: Set workflow of self-protection position and buffering capacity (Continued)

图 26：自保位置与缓冲量调设置流程（续）

g. Tracking loss 跟踪丢失

Tracking loss refers to the alarm state that the deviation between valve position and control signal is always larger than the set value (tracking bandwidth) in specified time (tracking time). According to the setting, the tracking loss can trigger the lock of actuator.

跟踪丢失是指在设定的时间（跟踪时间）内，阀位与控制信号的偏差始终大于设定值（跟踪带宽）的一种报警状态。根据设定，跟踪丢失可以触发执行机构锁位。

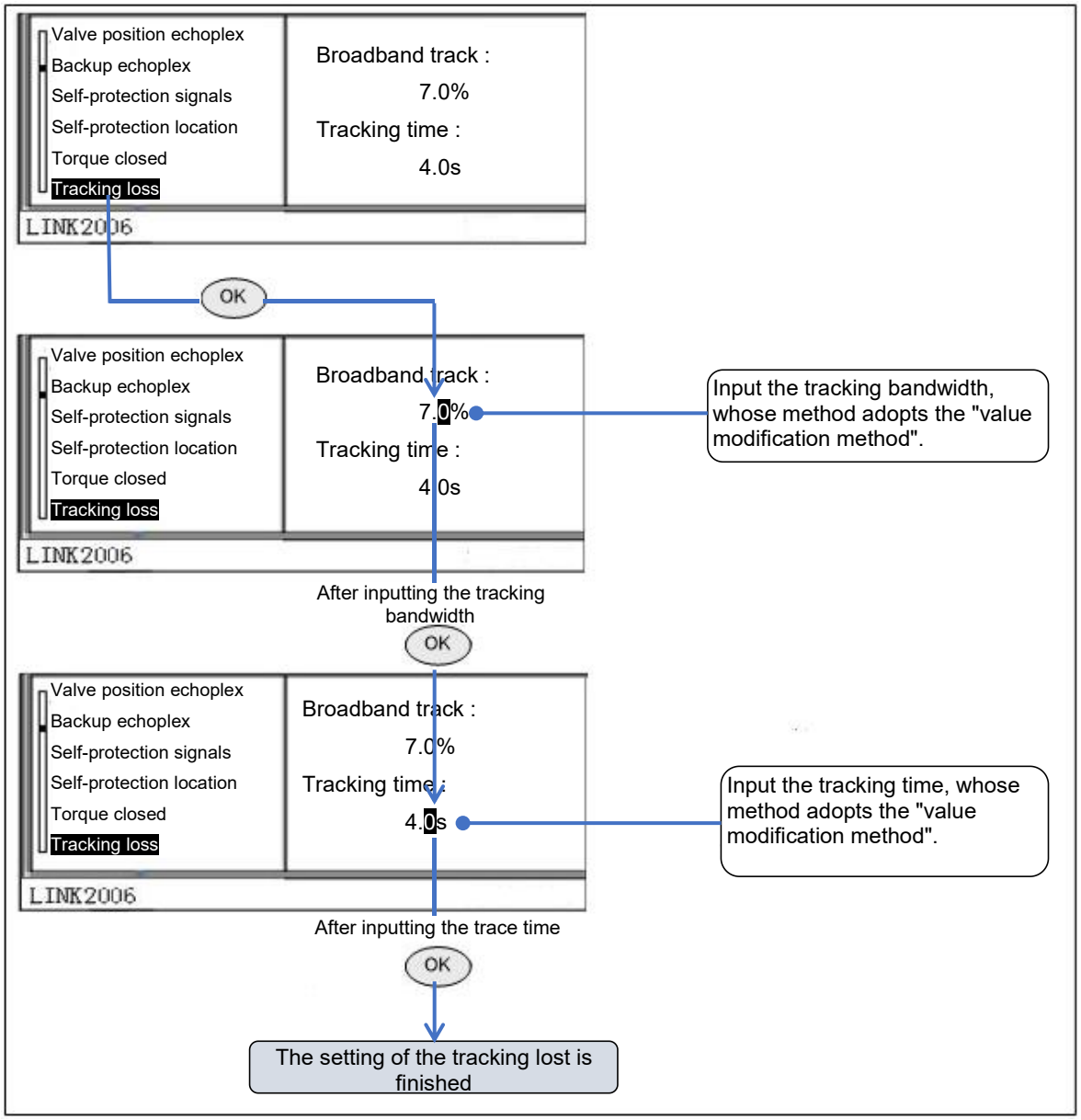


Figure 27: Set workflow of lock trigger parameters

图 27：锁位触发参数设置流程

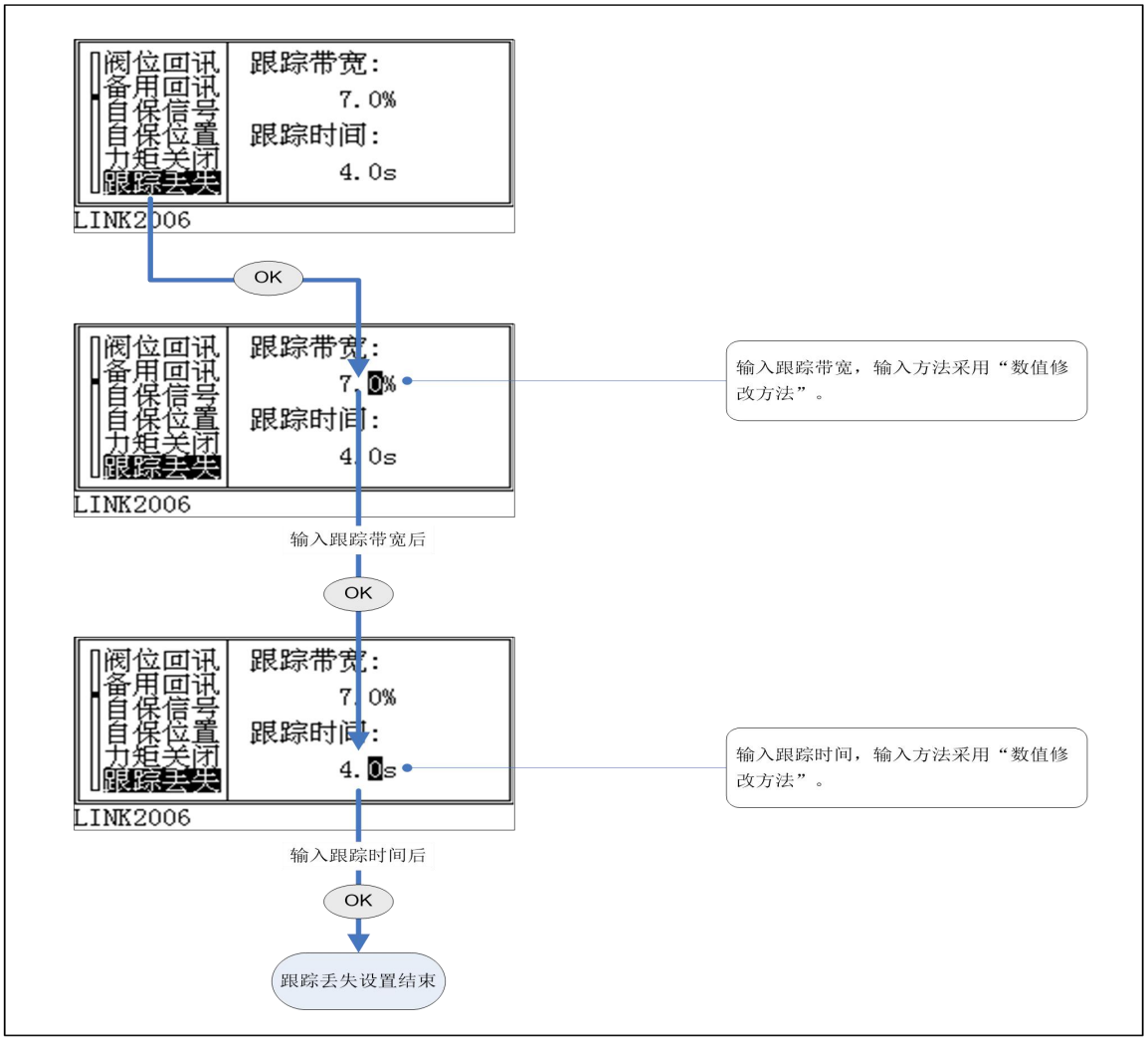


Figure 27: Set workflow of lock trigger parameters (Continued)

图 27：锁位触发参数设置流程（续）

h. Deviation zeroing 偏差归零

Deviation zeroing is used for eliminating the display deviation value when the electro-hydraulic actuator reaches the steady position. Pay special attention that this function cannot be used when the actuator fails to reach the steady position (such as the lock, valve jamming and mechanical limit). Otherwise, the valve position may be deviated.

偏差归零用于消除电液执行机构到达稳态位置后的显示偏差值。特别注意，在没有到达稳态位置时（如锁位、阀门卡涩、受到机械限位限制等）不可使用此项功能，否则将会导致阀位偏离。

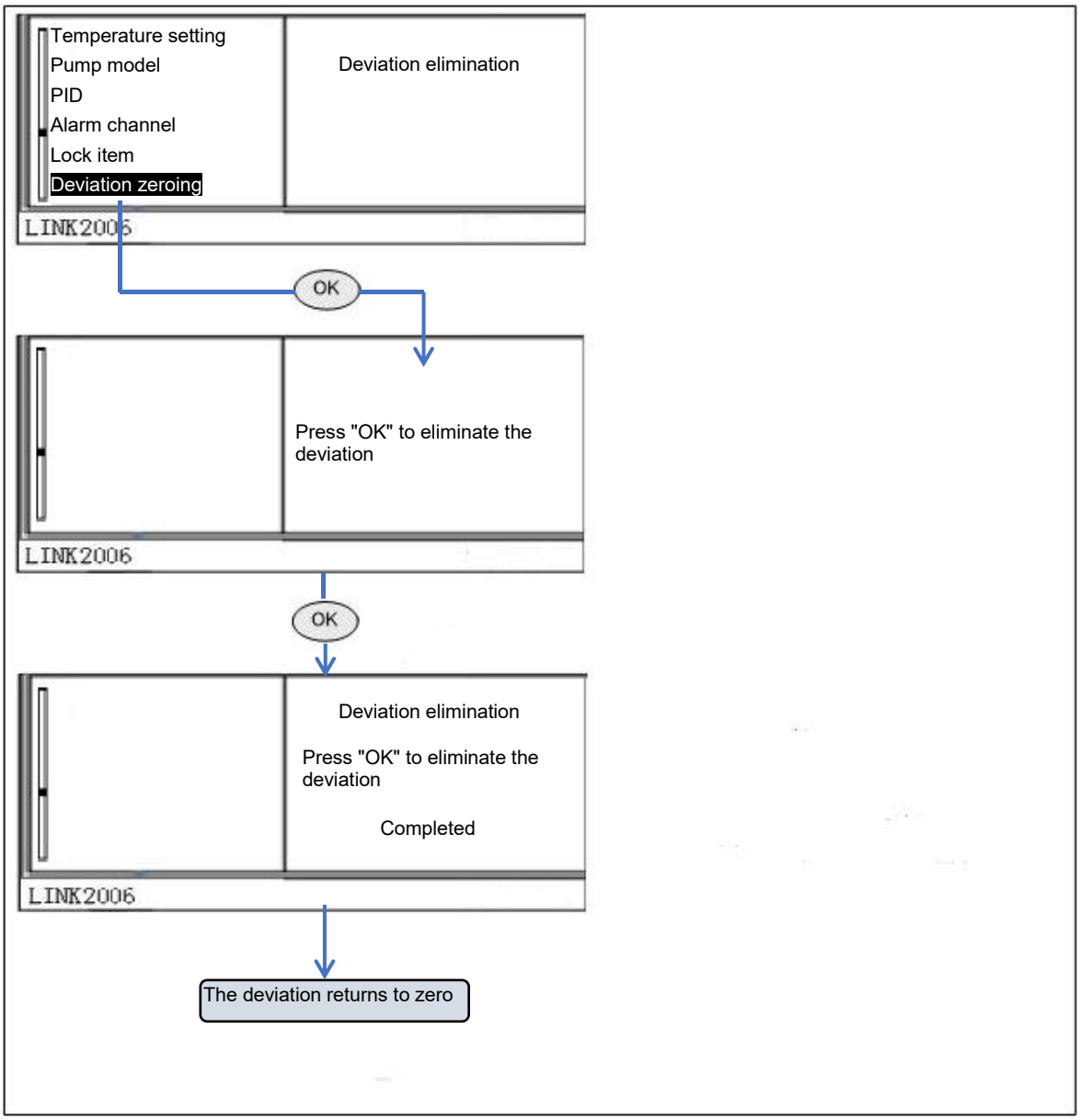


Figure 28: Operation workflow of deviation zeroing

图 28：偏差归零操作流程

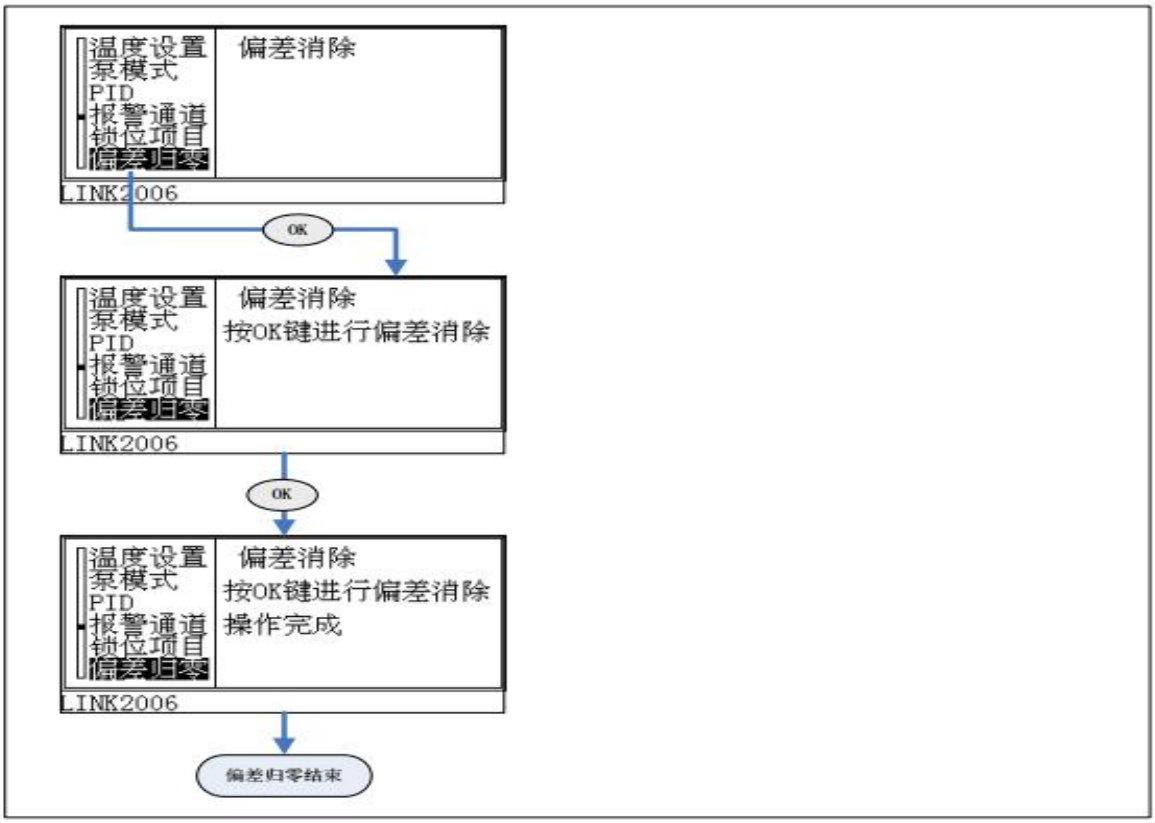


Figure 28: Operation workflow of deviation zeroing (Continued)

图 28：偏差归零操作流程（续）

Routine maintenance of electro-hydraulic actuator of slide valve:

滑阀电液执行机构的日常维护：

To give full play to the advantages of electro-hydraulic actuator, improve the reliability, ensure good working state and play the required efficiency, the user shall maintain the electro-hydraulic actuator scientifically according to the following requirements.

为了发挥电液执行机构的优点，提高使用的可靠性，使之处于良好的工作状态，发挥应有的效能，使用者应按照以下要求对电液执行机构进行科学维护。

(1)Daily inspection and maintenance 日常巡检维护

1)The operator shall be familiar with the function of each element in the hydraulic system of the electro-hydraulic actuator, be familiar with the working principle of the hydraulic system, and master its various operating methods. The operator shall inspect the equipment operating conditions regularly subject to the daily inspection requirements below, observe whether the equipment is running normally, make records and handle it in time.

操作者必须熟悉电液执行机构液压系统中每个元件的作用，熟悉液压系统工作原理，掌握其各种操作方法。操作人员应按下面日检要求定期检查设备运行情况，观察设备运行是否正常，作好记录并及时处理。

2)The operator shall inspect the working conditions of the electro-hydraulic actuator per shift, including the working pressure of hydraulic system, adjustment working condition, and whether the deviation and location are consistent with the indication of actual valve position. The deviation is generally around 0%. In case the deviation is not 0%, zero setting can be made according to the workflow when the stable location is reached.

操作员每班都要检查电液执行机构的工作情况，即液压系统工作压力，调节工况，偏差、位置显示与实际阀位指示是否一致。偏差显示一般在 0%左右，如果发现偏差不为 0%，当达到稳定位置可按照流程进行归零。

3)In case the oil temperature is below 5℃ or above 60℃, the heating source or cold source shall be adjusted in time to keep the oil temperature within the normal range. The normal working temperature of oil is 5℃-60℃ with the lowest of 5℃ and the highest of 60℃.

如果油温低于 5℃或高于 60℃时，应及时调整加热源或冷源，使油温保持在正常范围之内。油液正常工作温度为 5℃～60℃，油液最低温度为 5℃，油液最高温度为 60℃。

In case abnormal running or excessive noise occurs to the motor and hydraulic pump, the operator shall enable the spare pump and contact the service personnel for inspection.

如果电机和液压泵运转有异常现象或噪音过大，应切换至备用泵，联系维修人员检查处理。

4)In case the oil level is below the lowest liquid level, the operator shall contact the relevant personnel to replenish the oil to avoid pumping being exhausted, thus causing oil pollution. The following points shall be noted when replenishing oil:

发现油液位低于最低液位时，联系有关人员补油。以免造成泵吸空，引起油液污染，补油时应注意以下几点：

a. The oil to be replenished shall be consistent with the brand number of original oil.

所补的油液必须和原来的油液牌号相符。

b. The oil to be replenished shall be qualified for inspection by the quality inspection department (the inspection items mainly cover such indexes as viscosity, acidity, water content, flash point and specific gravity).

所补的油液须经质检部门检验合格（检验项目主要包括粘度、酸度、含水量、闪点和比重等指标）。

c. The oil to be replenished shall be filtered through an oil filter with filtration pore not larger than 10um before being injected into the oil inlet of the oil tank, and the new oil in the oil drum shall not be directly added to the fuel tank.

所补的油液必须经过≤10um 滤油器过滤，方可从油箱的注油口注入，不能将油桶中的新油直接加入油箱。

d. All tools used shall be cleaned, and protective measures shall be taken to prevent dust in the atmosphere when refueling on site, especially preventing coke powder from entering the oil tank with oil, causing oil contamination.

在现场加油时，所用工具必须清洗干净，同时还须采取保护措施，防止大气中的粉尘，特别是焦粉随油液侵入油箱，造成油液污染。

e. The normal oil pressure of the system is 6.5-12MPa. The displayed value of the normal pressure gauge shall be consistent with the displayed value on iSA controller. The hydraulic oil system operation condition shall be checked if the system oil pressure is too low.
系统油压正常值为 6.5～12MPa，正常情况压力表显示值应与 iSA 控制器显示值保持一致。当发现系统油压过低时，应在检查液压油系统运行状况。

Table 28: Daily inspection items of iSA controller

表 28：iSA 控制器日常巡检项目

Item 项目	Normal value 正常值
Pressure gauge display - system pressure gauge 压力表显示——系统压力	It is generally 6.5-12MPa according to the set value 依照设定值，一般为 6.5～12MPa
Parameter display - location 参数显示——位置	0-100%, consistent with the actual valve position 0～100%，与实际阀位对应
Parameter display - input 参数显示——输入	0-100%, consistent with the actual signal 0～100%，与实际信号对应
Parameter display - PSV 参数显示——比例阀	Close to 0% 接近 0%
Parameter display - pressure 参数显示——压力	Consistent with pressure gauge 与压力表对应
Deviation 偏差	Close to 0% 接近 0%
Oil temperature 油液温度	5℃-60℃
Liquid level 液位	Between the mark of high liquid level and low liquid level 高液位标志和低液位标志之间
Leakage condition 渗漏情况	No leakage 无渗漏
ISA alarm ISA 报警	No alarm 无任何报警
Alarm for oil filter differential pressure 油滤差压报警	No alarm 无报警
Operation status of pump 泵的运行状态	Pump-stop symbol without interlock protection: ⊗ 无联锁保护停泵符号：⊗
Whether there is any other abnormality 有无其它异常	No other abnormality 无其它异常

(2)Precautions 注意事项

1)The operator is not allowed to arbitrarily move the manual reversing valve to operate handle, adjust the hand wheel and inch the button in the normal working process of the electro-hydraulic actuator, or system malfunction may occur.

电液执行机构在正常工作过程中，操作员不准随意乱动手动换向阀操作手柄、调节手轮及点动按钮，以免造成系统误动作。

2)In case any failure occurs to electro-hydraulic actuator, the operator shall immediately notify the maintenance department to analyze the cause and eliminate it in time if can't handle failure. In case a lock occurs to the actuator, the operator shall switch it to manual mechanical operation, and notify the maintenance department to analyze and eliminate it in time.

电液执行机构出现故障，操作员查明故障部位不能处理时，应立即通知维修部门分析原因，及时排除。当执行机构出现锁位时，应将其切换至手动机械操作，同时通知维修部门及时分析排除。

3)When restarting the electro-hydraulic actuator that has been shut down for more than four hours, the pump shall idle for 5min-10min, and then the boosting can be made.

电液执行机构停机四小时以上，重新起动时，让泵空转 5 分钟～10 分钟，然后再升压运行。

4)The electro-hydraulic actuator shall be kept clean to prevent dust and contaminants from entering the oil tank.

电液执行机构应保持清洁，防止灰尘和污染物进入油箱。

5)The switching between various operating modes shall be available without disturbance during the operation of the electro-hydraulic actuator.

电液执行机构运行过程中，各种操作方式之间的切换必须进行无扰动切换。

On-site switching program content of slide valve includes start preparation and switching of slide valve

滑阀现场切换程序内容，包括滑阀的启动准备和切换

(1)Preparation for slide valve start 滑阀启动前的准备

1)Preparation before start (such as listening rod, flashlights, thermometers, vibration pens, wrenches, screwdrivers, and wire cutters)

启动前的准备工作（如听音棒、手电筒、测温仪、测振笔、扳手、螺丝刀、钢丝钳等）

2)Check the state of iSA controller

确认 iSA 控制器状态

a. Check that the iSA controller does not have any alarms

确认 iSA 控制器无任何报警

b. Check that the field input/output deviation is close to 0%.

确认现场输入/输出偏差接近 0%。

c. Check that the value displayed on iSA controller is consistent with that on local meter

确认 iSA 控制器显示值与就地仪表显示一致

3)Status of the hydraulic oil system:

液压油系统的状态：

a. Check that the hydraulic oil level and oil temperature are normal

确认液压油液位及油温正常

b. Check that the color of hydraulic oil filter is green

确认液压油过滤器色标为绿色指示

c. Check that the lubrication pump operates normally and qualified for acceptance

确认润滑油泵运行正常，验收合格

4)Check the status of the site:

确认现场状态：

a. Check that no leakage occurs at site

确认现场无渗漏情况

b. Check that no other abnormalities occur at site

确认现场无其他异常情况

5)Check the status of the mechanical part:

确认机械部分状态：

a. The actuator is operating normally without any jamming

执行机构运转正常，无卡涩

b. Field valve position indication is consistent with iSA controller

现场阀位指示与 iSA 控制器一致

(2)On-site switching of the slide valve: four states for slide valve switching include: remote/inching, remote/hydraulically manual, remote/mechanically manual, one belt with two switching

滑阀的现场切换：滑阀的切换内容共有四种状态：远程 /点动、远程/液压手动 、远程/机械手动 、一带二切换

1)Remote/inching switching 远程 /点动切换

a. Control room authorization 控制室授权

b. Switch the iSA controller knob from "Adjust" to "Inch/Lock".

将 iSA 控制器旋钮从“调节”切换至“点动/锁位”状态。

c. Insert the handle onto the hand pump and shake the handle up and down and observe the valve position and manual pump pressure values.

将手柄插入手动泵，上下摇动手柄观察阀位和手动泵压力值 。

d. Insert the handle onto the solenoid valve and toggle the handle up and down to switch the valve to the required location, with the opening down and the closing up.

将手柄插入点动电磁阀，上下拨动手柄将将阀开关到需要的位置，其中向下为开，向上为关。

2)Remote/hydraulic manual switching 远程 /液压手动切换

a. Control room authorization 控制室授权

b. Switch the iSA controller knob from "Adjust" to "Inch/Lock".

将 iSA 控制器旋钮从“调节”切换至“点动/锁位”状态。

c. Electrical control mode: press the "Inch on" or "Inch off" to switch the valve to the required location.

电控方式：按“点动开”或“点动关”按钮将阀开关到需要的位置。

d. Mechanical control mode: Insert the handle onto the solenoid valve and toggle the handle up and down to switch the valve to the required location, with the opening down and the closing up.

机控方式：将手柄插入点动电磁阀，上下拨动手柄将将阀开关到需要的位置，其中向下为开，向上为关 。

3)Mechanical manual operation 机械手动操作

a. Control room authorization

控制室授权

b. Switch the iSA controller knob from "Adjust" to "Inch/Lock".

将 iSA 控制器旋钮从“调节”切换至“点动/锁位”状态。

c. Switch the clutch handle to "Manual".

将离合手柄旋切至“手动状态”。

d. Switch the cylinder manual valve 505 to the "Manual".

将油缸手动阀 505 旋至“手动”状态。

e. Rotate the mechanical hand wheel to the required valve position.

旋转机械手轮至需要的阀位。

4)One belt with two switching 一带二切换

a. Control room authorization 控制室授权

b. Switch the iSA controller knob from "Adjust" to "Inch/Lock".

将 iSA 控制器旋钮从“调节”切换至“点动/锁位”状态。

c. Select the actuator that needs remote control after the integrating blocks and toggle handle as indicated.

在集成块后选择需要远程控制的执行机构并根据指示推动切换手柄。

d. Switch the knob from "Inch/Lock" to "Adjust" after removing deviation between the display and the actual valve position.

对照显示和实际阀位消除偏差后将旋钮从“点动/锁位”切换至“调节”位置。

e. Complete the switch to remotely adjust the valve and check the valve position.

完成切换远程调节该阀并核对阀位。

(3)Failure handling of slide valve (See the table below) 滑阀的故障处理（见下表）

Table 29: Failure handling of slide valve

表 29：滑阀的故障处理

Failure 故障	Cause 原因	Solution 处理方法
System pressure fails to rise (alarm due to low system pressure) 系统压力升不上去（系统压力低报警）	1 Oil shortage occurs to the system. 系统供油不足。	
	1) The suction oil filter or suction pipe is blocked. 吸入滤油器或吸油管被阻塞。	Cleaning. 清洗。
	2) The hydraulic oil is degraded, hyperviscosity or placed for a long time; 液压油变质，粘度过大或长期放置；	Change the oil. 换油。
	3) The liquid level is too low and the pump is exhausted. 液面太低，泵抽空。	Oil make-up. 补油。
System pressure fails to rise (alarm due to low system pressure) 系统压力升不上去（系统压力低报警）	4) The oil pump rotates in a wrong direction and the motor line is connected in a reversed manner. 油泵转动方向不对，电机线接反。	Reconnect the wire. 重新接线。
	2 Serious inner leakage occurs to the system, resulting in a pressure release. 系统内漏严重，造成泄压。	
	1) The relief valve has failures such as internal spring damage and pressure release. 溢流阀有故障，如内部弹簧损坏，泄压。	Replace the relief valve. 更换溢流阀。
	2) Serious inner leakage occurs to the pump, the side abrasion of the distribution plate and the rotor is serious, resulting in large clearance. 泵内漏严重，配流盘与转子侧面磨损严重，间隙过大。	Identify the cause and replace it. 查明原因，予以更换。
	3) Inner leakage occurs to the hydraulic valve. 液压阀内漏。	Repair or replace. 修复或更换。
	3 The shutoff valve 101A is not closed completely. 截止阀 101A 未关死闭。	Close 101A. 关死 101A。

Table 29: Failure handling of slide valve (Continued)

表 29：滑阀的故障处理（续）

Failure 故障	Cause 原因	Solution 处理方法
The actuator does not act after the system receives the signal 系统接受信号后执行机构不动	1 No alarm occurs in the system, and the servo valve may not be put into operation. 系统无报警，可能伺服阀未投入工作。	Check whether the servo valve has any signal. 检查伺服阀上是否有讯号。
	2 The system is designed with a lock for alarm. 系统有报警锁位。	Unlock. 解锁。
The actuator moves in one direction until it reaches the lock position 执行机构向某一方向移动直至锁位	1 The PSV is out of control with failure. 比例阀故障失控。	Replace the PSV. 更换比例阀。
	2 The servo valve does not have any signal input, it is not put into operation, and the valve has zero offset. 伺服阀上无信号输入，未投入工作，且阀有零偏。	Identify the cause and recover the signal. 查明原因，恢复信号。
Lock position is not reliable 锁位不可靠	1 Hydraulic lock 381 failure 液压锁 381 故障	Repair or replace. 修复或更换。
	2 Loop failure indicating three-phase loss without any contact signal output, and SOL2 is not powered up. 三项丢失回路故障，无触点讯号输出，SOL2 未得电。	Check the servo amplifier. 检查伺服放大器。
	3 Manual reversing valve 505 is not placed in the middle seal. 手动换向阀 505 未置于中封位。	Put 505 in the middle seal. 使 505 处于中封位。
Actuator vibrates with Abnormal sound 执行机构颤动、声音异常	1 Servo valve failure. 伺服阀故障。	Replace the servo valve. 更换伺服阀。
	2 The incoming air in the system is not exhausted. 系统中串入空气未排出。	Exhaust. 排气。

Table 29: Failure handling of slide valve (Continued)

表 29：滑阀的故障处理（续）

Failure 故障	Cause 原因	Solution 处理方法
	3 The cylinder wall is in abrasion or the piston seal ring is damaged. 油缸壁磨损或活塞密封环损坏。	Overhaul the cylinder. 检修油缸。
	4 The amplifier gain is too high. 放大器增益过高。	Reduce system gain. 降低系统增益。
Hydraulic system temperature rises too fast 液压系统温升过快	1 The cooling water is interrupted suddenly or the circulation is not smooth, the cooling water pressure is low, resulting in the water supply shortage. 冷却水突然中断或循环不畅通，冷却水压力低，供水量不足。	Identify the reasons and deal with them specifically. 查明原因，具体处理。
	2 Serious inner leakage occurs to the hydraulic parts. 液压件内漏严重。	Repair or replace. 修复或更换。

2.4.8 Centrifugal fan operating procedures 离心式风机操作规程

The equipment of centrifugal blower of flexicoking unit is shown in the following table:
灵活焦化装置离心鼓风机的设备见下表：

Table 30: Fan list

表 30：风机清单

S/N 序号	Process No. 工艺编号	Name 名称	Model 型号
1	K-201A/B	Heating furnace blower 加热炉鼓风机	-
2	K-202	Heating furnace induced draft fan 加热炉引风机	-
3	K-401	Induced draft fan for coke powder 焦粉引风机	-
4	K-402	Induced draft fan for truck loading 装车引风机	-
5	K-403	Exhaust fan of fume hood 通风柜排气扇	-

(1)Start 启动

1)Preparation before start 启动前的准备工作

a. The specified lubricating oil is applied to the bearing according to three-stage filtration system, and the oil level is at 2/3-1/2 of the oil pointer.

按三级过滤制向轴承内加入规定的润滑油，油面至油标的 2/3－1/2 处。

b. Check that moisture-proof electrical heater of the main motor is working well and the motor lubricating grease is regularly filled.

确认主电机防潮电加热器工作状态良好，确认电机润滑脂定期加注。

c. Check that the self-protection interlock test is qualified.

确认自保联锁试验合格。

d. Activate turning to inspect the fan for collision and friction.

盘车，检查风机有无碰撞和摩擦现象。

e. Prepare oil pots, tools, temperature and vibration testing instruments, and listening needles.

准备好油壶、工具、测温测振仪器、听针等。

2)Start 启动

a. Check that fan vent of the field emptying valve opening is 100% and the echoplex is normal.

确认风机出口现场放空阀开度为 100%且回讯正常。

b. Check that the fan inlet valve opening is 10%.

确认风机入口阀开度为 10%。

c. Check that the fan outlet butterfly valve is closed.

确认风机出口蝶阀关闭。

d. Check that the motor is powered.

确认电机已送电。

e. Turn the remote/local button to the remote transmission.

将远程/就地按钮打到远程档。

f. Notify internal operator to press "PERMISSIVE".

通知内操按下允许启动按钮。

g. The operator inches the fan within 20S after the yellow light is on.

操作人员在黄灯亮后 20S 内点动风机。

h. Check the fan is turning correctly.

确认风机转向正确。

i. Gradually open the fan inlet butterfly valve (check that the fan current is below the rated current), make fine tuning on the emptying valve, and adjust the outlet pressure to 70KPa.

逐渐开大风机入口蝶阀（确认风机电流在额定电流以下），微调放空阀，调节出口压力达到 70KPa。

3)Inspection after start 启动后检查

a. Check that whether the bearing temperature, vibration, sound, lubrication, and leakage are normal during operation;

确认在运转期间，检查轴承温度、振动、声音，润滑，泄漏是否正常；

b. Check that the current value is within the rated range;

确认电流值在额定范围内；

c. Contact the internal operator to check that the fan inlet air volume and outlet pressure are normal.

与内操联系确认风机入口风量及出口压力正常。

d. The blower supplies air to the sulfur furnace

鼓风机向制硫炉供风

e. After checking, the workflow is smooth and the system is not under pressure;

确认后流程畅通，且系统没有压力；

f. Slowly open the outlet manual butterfly valve of fan to the 10% of valve position;

缓慢打开风机出口手动蝶阀至 10%阀位；

g. Open the outlet butterfly valve slowly to the 100% of valve position after confirming that the air entering system, and slowly turn down the anti-surge emptying valve to fully closed (note: avoid fan surge, and keep the outlet pressure stable at 70KPa);

确认系统进风后，缓慢打开出口蝶阀至 100%阀位，同时缓慢关小防喘振放空阀直至全关（注意：避免风机喘振，保持出口压力稳定在 70KPa）；

h. Adjust the air volume and outlet air pressure according to the process requirements;

根据工艺要求调节风量、出口风压;

i. Check that the motor current is within the rated range;

确认电机电流在额定范围内;

4)Final state after startup 启动后最终状态

a. Check that there is no abnormal vibration

确认无异常振动

b. Check that the bearing temperature is normal

确认轴承温度正常

c. Check that the lubricating oil temperature is normal

确认润滑油温度正常

d. Check that the current value is within the rated range

确认电流指示值在额定范围内

e. Check that outlet air pressure and temperature are normal

确认出口压力、温度正常

f. Check that the operation is stable and there is no abnormal sound

确认运行平稳，无异音

(2)Stop 停车

1)Check that the fan has been removed and the outlet butterfly valve is closed

确认风机已切除系统，出口蝶阀已关闭

2)Check that the blower emptying valve has been opened to more than 80%

确认鼓风机放空阀已开至 80%以上

3)Slowly turn down the inlet butterfly valve to roughly 20% of the valve position, so that no fan surge occurs.

缓慢关小入口蝶阀至 20%阀位左右，以不发生风机喘振为要求

4)Press the "Local/Remote shutdown"

按下就地/远程停机按钮

5)Close the fan inlet butterfly valve after the fan stops rotating

待风机停止转动后，关闭风机入口蝶阀

6)Check that the fan is in the stop

确认风机处于停状态

7)Check that the bearing temperature with no rising after the fan stops, the lubricating oil level is normal without abnormal sound

确认风机停车后轴承温度不再上升，润滑油位正常无异音

(3) Switch K-201A/B normally 正常切换 K-201A/B

1)Start spare machine follow the procedure;

正常步骤启动备用机；

a. The emptying valve of air blower and spare air blower in use is switched from "Automatic" to "Manual";

在用鼓风机、备用鼓风机放空阀由“自动”改为“手动”；

b. Slowly turn up the inlet butterfly valve of the standby acid gas reactor blower, and control the outlet pressure to be greater than that of the blower in use by 1-2KPa;

缓慢开大备用酸性气反应炉鼓风机入口蝶阀，控制出口压力大于在用鼓风机出口压力 1-2KPa 左右；

c. Gradually open the spare fan outlet valve, and gradually turn down the fan running outlet valve; turn down the field emptying valve located standby machine outlet gradually, at the same time, turn up the emptying valve located running machine outlet;

逐渐打开备用风机出口阀，同时逐渐关小运行风机出口阀；逐渐关小备用机出口现场放空阀，同时逐渐开大运行机出口现场放空阀；

d. Check that there is no change in the air volume entering the fan outlet;

确认风机出口入炉风量没有变化；

e. Check that the motor running current is less than the rated current;

确认电机运行电流小于额定电流；

f. Check that the vibration, sound and bearing temperature of the spare fan and the running fan are normal;

确认备用风机及运转风机各部振动、声音、轴承温度情况正常；

g. Two fans run simultaneously for 30min;

两台风机同时运行 30 分钟；

h. Close the original fan outlet into the system butterfly valve;

关闭原风机出口并入系统蝶阀；

i. Stop the original machine by the normal procedure.

按正常停车步骤停原运行机。

2)Precautions 注意事项

a. Ensure that the motor running current is less than the rated current during adjusting the fan;

调节风机过程中保证电机运行电流小于额定电流；

b. Pay attention to whether the current and voltage are stable with no over travel and large fluctuation;

注意观察电流、电压是否稳定，不能超程与大幅度跳动；

c. Guarantee the level and quality of lubricating oil;

保证润滑油油位、油质；

d. Check the operation of the fan bearing and the motor, whether there is abnormal sound and ultra-temperature;

检查风机轴承和电机的运转情况，声音是否正常，温度是否超高；

e. Do the maintenance of the spare unit such as turning, and ensure that the standby unit is ready for standby;

做好备用机组的盘车等维护工作，保证备用机组正常备用；

f. The fan protection interlock for operation in time after the fan is running normally;

风机运转正常后及时将风机保护联锁投用；

g. Pay attention to the rise of the motor temperature (especially the larger motor) immediately after stopping the fan, and use a compressed air tape to cool the air if necessary.

刚停风机后，应注意电机温度的回升（特别是较大的电机 ），必要时可用压缩风胶带吹风冷却。

(4) Failure analysis and solutions of centrifugal fan 离心风机故障分析及消除方法

Table 31: Failure analysis and solutions of centrifugal fan

表 31：离心风机故障分析与消除方法

S/N 序号	Failure 故障现象	Failure cause 故障原因	Solution 处理方法
1	Violent vibration occurs to bearing box 轴承箱剧烈振动	1. The fan shaft and the motor shaft are misaligned 风机轴与电机轴不对中 2. Friction happens to casing/ air inlet and fan blade 机壳或进风口与风叶摩擦	1. Realignment 重新找正 2. Readjustment 重新调整 3. Inspect the foundation 检查基础
S/N 序号	Failure 故障现象	Failure cause 故障原因	Solution 处理方法

1	Violent vibration occurs to bearing box 轴承箱剧烈振动	3. Insufficient or insecure foundation stiffness 基础刚度不够或不牢固 4. Flange rivet looseness located inside shaft plate hole of impeller or deformation of the impeller 叶轮轴盘孔铆钉松动或叶轮变形 5. Looseness between the connection of bearing box and foundation 轴承箱与基础联接松动 6. The fan inlet and outlet air ducts are not properly installed 风机进出口风道安装不良 7. Abrasion or fouling of vane 叶片磨损或积垢 8. Wrong steering 转向不对	4. Overhaul of the impeller 叶轮检修 5. Inspect the connecting bolt 检查联接螺栓 6. Inspect the air duct and handle it 检查风道并处理 7. Replace or clean the vane 更换或清理叶片 8. Contact the electrician to adjust 联系电工调整
2	Bearing with excessive temperature rise 轴承温升过高	1. The vibration of bearing box is violent 轴承箱振动剧烈 2. The lubricating oil is degraded and the oil quantity is less or more 润滑油变质、油量偏少偏多 3. Bearing box cover and pedestal connected to joint bolt with a too high or too low tightening force 轴承箱的盖、座联接螺栓紧力过大或过小 4. Bearing installation is misaligned 轴承安装不同心 5. Shaft crooks 轴弯曲	1. Dismantle and inspect the bearing 拆检轴承 2. Inspect the supplemental lubricating oil or replace it 检查补充润滑油或更换 3. Readjustment 重新调整 4. Re-overhaul 重新检修 5. Replace the shaft 更换轴
S/N 序号	Failure 故障现象	Failure cause 故障原因	Solution 处理方法

3	Motor with excessive current or temperature rise 电机电流过大或温升过高	1. The blower damper inside the air-intake casing is not closed when starting 开车时进气管道内调节门未关 2. Power supply failure 电源故障 3. Defected coupling alignment 联轴器找正不良 4. It is affected by bearing box vibration 受轴承箱振动影响	1. To operate in accordance with the operation specification strictly 严格按操作规程操作 2. Contact the electrician to handle 联系电工处理 3. Realignment 重新找正 4. (See 1) (见 1)

2.4.9 Aerostatic press operation method 气压机操作法

Aerostatic press K-201 is the key equipment of the flexicoking unit, the main function of which is to compress and boost the rich gas coming out from the top of the fractionation tower and transport to absorption stabilization system. The machine inlet pressure is adopted to adjust the unit speed to achieve the purpose of smooth control of the system pressure.

气压机 K-201 是灵活焦化装置的关键设备，它的主要作用是把分馏塔顶部出来的富气进行压缩升压输送至吸收稳定系统。用机入口压力调节机组转速从而达到控制系统压力平稳的目的。

The aerostatic press unit consists of a centrifugal compressor with three-stage compression and intermediate-cooled, a steam turbine and its quick-closing speed regulation system, a dry gas sealing system, a lubricating oil system and related auxiliary equipment, such as gas cooler with intermediate oil between the section one and section two, separator, naphtha pump, and acid pump.

气压机组包括一个三段压缩中间冷却的离心式压缩机、一台汽轮机及其速关调速系统、干气密封系统、润滑油系统及其相关辅助设备如一二段中间油气冷却器、分离器、石脑油泵、酸性水泵等。

Aerostatic press: The aerostatic press manufactured by Shenyang Blower (Group) Co., Ltd. is adopted, namely centrifugal compressor (i.e., the movement of gas in the compressor is performed in a radial direction perpendicular to the axis). The high-speed rotating impeller delivers the energy of the steam turbine to the gas, increases the rich gas pressure and velocity, and then converts the velocity into pressure energy in the diffuser of the casing. The centrifugal compressor features uniform exhaust, pulse-free, oil-free, flat performance curve, wide operating range, low failure rate, small routine maintenance workload and long operating cycle.

气压机：气压机采用沈阳鼓风机厂制造的离心式压缩机（即气体在压缩机中的运动沿垂直于轴的径向进行）。通过高速旋转的叶轮把汽轮机的能量传递给气体，使富气压力和速度升高，随后在机壳的扩压器内，将速度能转换为压力能。离心式压缩机排气均匀、无脉冲、无油，性能曲线平坦，操作范围较宽，且故障率低，日常维护工作量小，运行周期长。

Steam turbine: NG40/32 steam turbine with a multi-stage impulse back pressure type manufactured by Hangzhou Steam Turbine Co., Ltd., which mainly consists of steam inlet section, intermediate cylinder, exhaust section, rotor, speed regulation system and protection system. The radial bearing is four-wedge bearing, and the thrust bearing is tiltable tile type.
汽轮机：NG40/32 型汽轮机为杭州汽轮机厂制造的多级冲动背压式，主要由进汽段、中间汽缸、排汽段、转子以及调速系统、保护系统组成。径向轴承采用四油楔轴承，推力轴承为可倾瓦块式。
Auxiliary equipment includes:
辅助设备包括：
a. Turning gear 盘车装置
b. Lubricating oil tank 润滑油箱
c. Oil pump 油泵
d. Double cooler 双联冷却器
e. Lubricating oil filter 润滑油过滤器
f. Top oil tank 高位油箱
g. Energy storage box 蓄能箱
h. Section one gas cooler E-211A/B 一段气体冷却器 E-211A/B
i. Section one gas-liquid separator D-202 一段气液分离器 D-202
j. Section two gas cooler E-212A/B 二段气体冷却器 E-212A/B
k. Section two gas-liquid separator D-203 二段气液分离器 D-203
l. Section three gas cooler E-213A/B 三段气体冷却器 E-213A/B
m. Section three gas-liquid separator D-204 三段气液分离器 D-204

Principal control points: 主要控制点：
(1)Aerostatic press inlet and outlet pressure and speed control 气压机出入口压力及转速控制
1)Inlet pressure and speed control: seven speed probes are mounted on the steam turbine support, of which SE-64301 is connected to the tachometer for local display, and SE-64303A/B/C are connected to the SIS system for over-speed protection, SE-64302A/B/C are connected to the CCS system for speed control. 505 speed control system is adopted for this unit. The regulating valve switch of steam turbine is controlled by the inlet pressure controller of aerostatic press PIC-20401 through TRICON. When the unit is on or off, the unit speed can be controlled by the TRICON system or the "Up/Down" of on-site operation cabinet.
入口压力及转速控制：在汽轮机的支座上装有七个转速探头，其中 SE-64301 接到转速表用于就地显示，SE-64303A/B/C 三个接到 SIS 系统用于超速保护，SE-64302A/B/C 三个接到 CCS 系统用于转速控制。本机组采用的是 505 转速控制系统。用气压机入口压力控制器 PIC-20401 通过 TRICON 控制汽轮机调节汽阀开关。机组开、停机时，可通过 TRICON 系统或现场操作柜升、降按钮来控制机组转速。
2)Outlet pressure control: the machine outlet pressure is controlled by the PIC-22901 on top of re-absorption tower C-205.

出口压力控制：机出口压力由再吸收塔 C-205 顶 PIC-22901 控制。

(2)Aerostatic press anti-surge control 气压机防喘振控制

Grade 1 anti-surge valve FV-22107, grade 2 anti-surge valve FV-22108, grade 3 anti-surge valve FV-22109. It is automatically controlled by the TRICON system during normal operation.

一级防喘振阀 FV-22107、二级防喘振阀 FV-22108、三级防喘振阀 FV-22109。正常操作时由 TRICON 系统自动控制。

(3)Entrance flare-discharging control system 入口放火炬控制系统

1)Aerostatic press inlet flare-discharging valvelet PV-20402B, large valve PV-20402A is controlled by pressure regulator PIC-20402 on top of the fractionation tower. In case any sudden failure occurs to compressor, it automatically opens to ensure that the reaction pressure is not too high.

气压机入口放火炬小阀 PV-20402B、大阀 PV-20402A 由分馏塔顶压力调节器 PIC-20402 分程控制。当压缩机突然故障时，自动打开以保证反应压力不超高。

2)The stable reaction pressure is ensured by large and small valve of flare-discharging when start and shutdown.

在开、停机时，通过操作入口放火炬大、小阀来保证反应压力平稳。

(4)Unit lubricating oil pressure control 机组润滑油压力控制

1)Control mode: when the PV value in the control loop is higher/lower than the set SP value, the OP output value of PIC-65702 will decrease/increase in the automatic state, and the field control valve position will follow the instrument electrical converter to turn down/up, so that the pressure of the lubricating oil header after the valve is lowered/increased to maintain the lubricating oil pressure of the bearing pad within the design range.

控制方式：PIC-65702 在自动状态下，当控制回路中的 PV 值高于/低于设定 SP 值时，其 OP 输出值将减小/增大，通过仪表电气转换器，使现场控制阀阀位跟着关小/开大，从而控制阀后润滑油总管压力下降/上升，以保持供轴瓦的润滑油压力在设计范围内。

2)Exception handling: see the table below for details

异常处理：见下表

Table 32: Exception handling

表 32：异常处理

Phenomenon	Cause	Solution

现象	原因	处理方法
Pressure fluctuates during normal operation 正常运行时，压力出现波动	Control valve failure 控制阀失灵	Change the subline on site and contact the instrument for processing. 现场改副线，联系仪表处理。
	Primary instrument failure 一次表失灵	Change the mode of control valve to manual and contact the instrument for processing. 控制阀改手动，联系仪表处理。
	Spare pump self-start 备泵自启	Check the cause of the spare pump self-starting and stop a lubrication pump. 查清备泵自启原因，停一台润滑油泵。
	The outlet pressure of the lubrication pump fluctuates 润滑油泵出口压力波动	Inspect the lubrication pump and field pressure control valve of pump outlet. 检查润滑油泵和泵出口现场压控阀。
The pressure is still low after the control valve output is fully opened in normal operation 正常运行时，控制阀输出全开后压力仍偏低	Control valve failure 控制阀失灵	Change the subline on site and contact the instrument for processing. 现场改副线，联系仪表处理。
	Primary instrument failure 一次表失灵	Change the mode of control valve to manual and contact the instrument for processing. 控制阀改手动，联系仪表处理。
	The outlet pressure of the lubrication pump is low 润滑油泵出口压力偏低	Inspect the lubrication pump, field pressure control valve, safety valve and lubricating oil tank temperature. 检查润滑油泵、现场压控阀、安全阀和润滑油箱温度。
	Increase lubricating oil consumption in the rear 后路润滑油使用量增加	Inspect the oil quantity of each bearing pad, the oil filling valve of oil tank with a high level, and the oil return tank crossover valve of lubricating oil header. 检查各轴瓦进油量、高位油罐充油阀、润滑油总管回油箱跨线阀。
In normal operation, the pressure display suddenly becomes zero or a bad value	Control valves failure and all-off 控制阀失灵全关	Self-protection will open the control valve subline, keep the lubricating oil supply when shutdown. 停机自保动作，开控制阀副线，保持停机润滑油供给。
	Primary instrument failure	Change the mode of control valve to manual

occurs. 正常运行，压力显示突然为零或出现坏值。	一次表失灵	and contact the instrument for processing. 控制阀改手动，联系仪表处理。
	The main oil pump jumps, the spare pump does not self-start 主油泵跳车，备泵没有自启	Shutdown and self-protection, namely emergency stop. 停机自保动作，紧急停机。

Aerostatic press unit interlock logic 气压机机组联锁逻辑

(1)Lubricating oil system start conditions 润滑油系统启动条件

1)Gas pressure isolated by dry gas sealed (PIA-65104)≥0.25MPa;

干气密封隔离气压力（PIA-65104）≥0.25MPa；

(2)Start condition of dry gas seal pressure compensation 干气密封补压启动条件

1)PDIA-65105≥0.2MPa (G), SV-65101 is closed;

PDIA-65105≥0.2MPa（G）时，SV-65101 关；

2)PDIA-65105≤0.1MPa (G), SV-65101 is closed;

PDIA-65105≤0.1MPa（G）时，SV-65101 开；

(3)Activate turning conditions 盘车启动条件

1)Lubricating oil pressure (PISA-61350) is greater than 0.2MPa;

润滑油压力（PISA-61350）大于 0.2MPa；

2)Unit speed (SI-62302) is 0;

机组转速（SI-62302）为 0；

3)Adjust turning motor to self-control mode;

盘车电机投自控；

4)Dry gas sealing system is put into use.

干气密封系统投用。

Note: the turning shall not be done prior to confirming that the unit has been completely stopped.

注意：必须在人为确认机组完全停止后方可盘车。

(4)Self-starting protection of lubricating oil spare pump 润滑油备用泵自启动保护

1)The main and spare pumps can be set arbitrarily.

主、备泵可任意设定。

2)If the pump A is the main pump, the pump B shall be set to self-start mode during normal operation. When the lubricating oil pressure (PS-61350 or PISA-62301) is less than 0.18MPa, the pump B will start automatically.

若以 A 泵为主泵，则在正常操作时，应设 B 泵为自启动方式，当检测到润滑油压力（PS-61350 或 PISA-62301）低于 0.18MPa 时，B 泵自动启动。

(5)Stopping conditions of lubricating oil spare pump 润滑油备用泵停泵条件

1)The main and spare pumps are running at the same time;

主、备泵同时运行；

2)Lubricating oil pressure is normal;

润滑油压力正常；

3)Adjust main and spare pumps to be all automatic control.

主、备泵均投自控。

(6)Lubricating oil electrical heating start condition 润滑油电加热启动条件

1)The temperature of the lubricating oil tank is low;

润滑油箱温度低；

2)The liquid level of the lubricating oil tank is normal;

润滑油箱液位正常；

3)Adjust lubricating oil electrical heater to be automatic control and started manually.

润滑油电加热器投自控，手动启动。

(7)Unit start logic 机组启动逻辑

1)Check that whether the following conditions are met before starting:

启动前，确认下列各项条件满足：

a. Steam turbine 1# main steam valve all-off;

汽轮机 1#主汽门全关；

b. Steam turbine 2# main steam valve all-off;

汽轮机 2#主汽门全关；

c. Central control emergency stopping, steam turbine on-site parking and resetting;

中控紧急停车、汽轮机就地停车复位；

d. The central control is available for start;

中控允许启动；

e. Adjust the oil pressure to normal;

调节油压力正常；

f. Lubricating oil pressure is normal;

润滑油压力正常；

g. Lubricating oil temperature≥25℃;

润滑油温度≥25℃；

h. The differential pressure between the main seal gas of dry gas seal of the high and low pressure cylinders and the pre-buffer gas is normal;

高、低压缸干气密封主密封气与前置缓冲气差压正常；

i. Anti-surge valves of compressor fully-open;

压缩机防喘振阀全开；

j. The shaft vibration of high pressure cylinder of the compressor is normal;

压缩机高压缸轴振动正常；

k. The shaft vibration of low pressure cylinder of the compressor is normal;

压缩机低压缸轴振动正常；

l. The axial translation of high pressure cylinder of the compressor is normal;

压缩机高压缸轴位移正常；

m. The axial translation of low pressure cylinder of the compressor is normal;

压缩机低压缸轴位移正常；

n. The steam turbine shaft vibration is normal;

汽轮机轴振动正常；

o. The steam turbine axial translation is normal;

汽轮机轴位移正常；

p. Exhaust steam pressure of steam turbine is normal;

汽轮机排汽压力正常；

q. The steam turbine speed is normal;

汽轮机转速正常；

r. The lubricating oil header is normal.

润滑油总管正常。

2)Unit start mode description 机组启动方式说明

Start the standby indicator light to illuminate the green light after all the above conditions are met, click the "Permissive", unlock the steam turbine quick-closing system lockout, remove the site panel, operate the quick-closing component, and open the main steam valve. The steam turbine can be chosen to controlled automatically or remotely at that time.

以上条件全部满足后，启动待命指示灯亮绿灯，点击允许启动按钮，汽轮机速关系统闭锁解除，去现场操作盘，操作速关组件，打开主汽门。此时可选择汽轮机自动或远程控制。

a. Automatic control: automatically operate the steam turbine through the controlling system;

自动控制：通过控制系统，自动操作汽轮机开机；

b. Remote control: the steam turbine is turned on according to the speed-up curve by operating the speed "Up /Down".

远程控制：通过操作升速、降速按钮，按照升速曲线操作汽轮机开机。

(8)Emergency shutdown logic 紧急停机逻辑

1)Interlock shutdown will be implemented when the following situations happened:

当发生下列情况时，将实行联锁停机：

a. Speed of steam turbine ≥12,086r/min (Two-out of three)

汽轮机转速≥12086r/min （三取二）

b. Too low lubricating oil pressure≤0.12MPa (Two-out of three)

润滑油压过低≤0.12MPa （三取二）

c. Steam turbine exhaust pressure≤0.2MPa(a) (Two-out of three)

汽轮机排气压力≤0.2MPa(a) （三取二）

d. Steam turbine axial translation≥+0.6mm or ≤-0.6mm (Two-out of three)

汽轮机轴位移≥+0.6mm 或≤-0.6mm （三取二）

e. Steam turbine bearing vibration≥100μm (one-out of four)

汽轮机轴承振动≥100μm （四取一）

f. Steam turbine bearing temperature≥110℃ (one-out of four)

汽轮机轴承温度≥110℃ （四取一）

g. The vibration of aerostatic press low pressure cylinder bearing≥88.9μm (one-out of four)

气压机低压缸轴承振动≥88.9μm（四取一）

h. The vibration of aerostatic press high pressure cylinder bearing≥88.9μm (one-out of four)

气压机高压缸轴承振动≥88.9μm（四取一）

i. Low pressure cylinder of aerostatic press axial translation≥+0.6mm or ≤-0.6mm (Two-out of three)

气压机低压缸轴位移≥+0.6mm 或≤-0.6mm （三取二）

j. High pressure cylinder of aerostatic press axial translation≥+0.6mm or ≤-0.6mm (Two-out of three)

气压机高压缸轴位移≥+0.6mm 或≤-0.6mm （三取二）

k. Dry gas seal differential pressure of low pressure cylinder PDIA-65102ABC≤20KPa (two-out of three)

低压缸干气密封差压 PDIA-65102ABC≤20KPa （三取二）

l. Dry gas seal differential pressure of high pressure cylinder PDIA-65106ABC≤20KPa (two-out of three)

高压缸干气密封差压 PDIA-65106ABC≤20KPa （三取二）

m. Manual shutdown 手动停机

2)The following commands and feedback signals are issued upon the shutdown signal occurring:

停机信号发生后，发出以下指令及反馈信号：

a. Turn off the steam turbine quick-closing valve, the red light is on (normal green light);

关汽轮机速关阀，红灯亮（正常绿灯）；

b. Turn off the section one anti-surge valve FV-22107 of aerostatic press;

关气压机一段防喘振阀 FV-22107；

c. Turn off the section two anti-surge valve FV-22108 of aerostatic press;

关气压机二段防喘振阀 FV-22108；

d. Turn off the section three anti-surge valve FV-22109 of aerostatic press;

关气压机三段防喘振阀 FV-22109；

3)Emergency shutdown self-protection interlock logic 紧急停机自保联锁逻辑

(9)List of alarm and interlock set values 报警、联锁整定值一览表

Table 33: List of alarm and interlock set values

表 33：报警、联锁整定值一览表

S/N 序号	Installation location and use 安装位置及用途	Operational value 操作值	Alarm limit 报警限	Alarm value 报警值	Stopping value 停车值	Notes 备注
1	Steam turbine regulates oil pressure 汽轮机调节油压力	0.8MPa	L	0.65	-	Start spare pump 启动备泵
2	Lubricating oil manifold pressure 润滑油集合管压力	0.25MPa	L	0.18MPa	-	Start spare pump 启动备泵
			LL	0.15MPa	0.12MPa	Shutdown 停机
3	Lubricating oil filter differential pressure 润滑油过滤器差压	＜0.15MPa	H	0.15MPa	-	Shall switch 须切换
4	Lubricating oil tank level 润滑油箱液位	-	L	730mm	-	Distance from the top of the oil tank 距油箱顶
5	Lubricating oil temperature after cooler 冷却器后润滑油油温	35℃～45℃	H	55℃	-	-

Table 33: List of alarm and interlock set values

表 33：报警、联锁整定值一览表

S/N 序号	Installation location and use 安装位置及用途	Operational value 操作值	Alarm limit 报警限	Alarm value 报警值	Stopping value 停车值	Notes 备注
6	Steam turbine exhaust pressure 汽轮机排气压力	0.45MPa(a)	L	0.3(a)	0.2(a)	-
			H	0.8(a)	-	-

7	Steam turbine speed 汽轮机转速	r/min	H	6000	6237	-
8	Bearing of aerostatic press temperature 气压机各缸轴承温度	＜95℃	H	105℃	-	-
			HH	115℃	-	-
9	Bearing pad of aerostatic press vibration 气压机各缸轴瓦振动	＜50μm	H	63μm	-	-
			HH	100μm	110μm	-
10	Cylinder of aerostatic press axial translation 气压机各缸轴位移	＜±300μm	H	±400μm		-
			HH	±500μm	±600μm	Shutdown 停机
11	Grade 1 gas-liquid separator liquid level LA-22201 一级气液分离器液位 LA-22201	50%	H	600mm	-	-
		-	L	100mm	-	-
12	Grade 1 gas-liquid separator liquid level LA-22202 一级气液分离器界位 LA-22202	＜50%	H	400mm	-	-
		-	L	100mm	-	-
13	Grade 2 gas-liquid separator liquid level LA-22301 二级气液分离器液位 LA-22301	50%	H	600mm	-	-
		-	L	100mm	-	-

Table 33: List of alarm and interlock set values

表 33：报警、联锁整定值一览表

14	Grade 2 gas-liquid separator liquid level LA-22302 二级气液分离器界位 LA-22302	＜50%	H	400mm		
		-	L	100mm	-	-

15	N_2 flow of main seal gas for dry gas seal 干气密封主密封气 N_2 流量	＜7Nl/min	H	≥7Nl/min	-	-
16	Differential pressure between main seal gas and pre-buffer gas for dry gas seal 干气密封主密封气与前置缓冲气差压	0.4MPa	L	0.1MPa	-	-
			LL		0.02MPa	Shutdown 停机
17	Isolator pressure for dry gas seal 干气密封隔离器压力	-	L	≤0.2MPa	-	-
18	Differential pressure of low pressure N_2 and compressor balance line for dry gas seal 干气密封低压 N_2 与压缩机平衡线差压	-	L	≤0.2MPa	-	-
19	N_2 filter differential pressure for dry gas seal 干气密封 N_2 过滤器差压	＜0.05MPa	H	≥0.08MPa	-	-

Steam turbine - aerostatic press unit operation content 汽轮机-气压机机组操作内容

(1)Preparation and commissioning before start 启动前的准备和调试工作

Preparations for start (such as listening rod, flashlights, hand-held tachometers, thermometers, wrenches, screwdrivers, and record sheets).

做好启动前的准备工作（如听音棒、手电筒、手持转速表、测温仪、扳手、螺丝刀、记录表等）。

1)General preparations 一般准备工作

Equipment state: 械设备状态：

a. Check that the overhaul of steam turbine, aerostatic press, and turning gear is completed, and the acceptance is qualified;

确认汽轮机、气压机、盘车装置检修完毕，验收合格；

b. Check that the overhaul of steam turbine speed regulation system has been completed and the acceptance is qualified;

确认汽轮机调速系统检修完毕，验收合格；

c. Check that the overhaul of gland ejection and cooler is completed, and the acceptance is qualified;
确认汽封抽气、冷却器检修完毕，验收合格；
d. Check that the overhaul of the first, second and third grade intercoolers is completed, and the pressure test is accepted;
确认一二三级中间冷却器检修完毕，试压验收合格；
e. Check that the overhaul of dry gas seal has been completed and the test pressure is accepted;
确认干气密封检修完毕，试压验收合格；
f. Check that the overhaul of oil pump motor has been completed, the single test is qualified and the steering is correct.
确认油泵电机检修完，单试合格，转向正确。
State of lubricating oil system: 润滑油系统状态：
a. Check that the oil tank cleaning is qualified;
确认油箱清扫合格；
b. Check that the oil tank has been injected to L-TSA46 steam turbine oil, the liquid level is normal, and the bottom is free from water;
确认油箱加入 L-TSA46 汽轮机油，液位正常，底部无水；
c. Check that the steam heater of oil tank is normal;
确认油箱蒸汽加热器正常；
d. Check that the chemical test and analysis of lubricating oil are qualified;
确认润滑油化验分析合格；
e. Check that the accumulator is filled with nitrogen pressure with 0.144MPa;
确认蓄能器充氮气压力 0.144MPa；
f. Check that the oil transportation is qualified, and no oil leakage occurs to the oil system;
确认油运合格，油系统无漏油；
g. Check that the oil line is smooth and the windows are clear;
确认油路畅通，各视窗清晰；
h. Check that each safety valve is qualified and installed correctly.
确认各安全阀校验合格，安装正确。
State of special valve and system pipe: 特阀、系统管道状态：
a. Check that the inlet pipeline system of the aerostatic press is cleaned, the acceptance is qualified with the sealed manhole;
确认气压机入口管路系统清扫干净，验收合格，人孔封好；
b. Check that the inlet/outlet electric valves of aerostatic press each section and those at the inlet of the steam turbine have been adjusted, which are flexible and easy to use;
确认气压机各段出入口电动阀、汽轮机入口隔断电动阀调校完毕，灵活好用；

c. Check that anti-surge valves at the outlet of each section of the aerostatic press have been adjusted, which are flexible and easy to use;

确认气压机各段出口防喘振阀调校完毕，灵活好用；

d. Check that the hand valve switch of unit system is flexible and easy to use;

确认机组系统手阀开关灵活好用；

State of water, steam, and wind system: 水、汽、风系统状态：

a. Check that the lubricating oil cooler and the gland steam cooler cooling water are introduced to the front of the valve;

确认润滑油冷却器、汽封冷却器冷却水引至阀前；

b. Check that the bearing oil seal nitrogen and dry gas seal nitrogen of steam turbine are introduced to the valve and the dehydration is completed;

确认汽轮机轴承油封氮气、干气密封氮气引至阀前，脱水完成；

c. Check that 1.0MPa steam is introduced to the front of the gland ejector hand valve of steam turbine for condensate drain.

确认 1.0MPa 蒸汽引至汽轮机汽封抽气器手阀前排凝。

Instrument and electrical system: 仪表、电气系统：

a. Check that the on-site pressure gauge and thermometer are installed according to the specification number and the calibration is qualified;

确认现场压力表、温度计按规格号安装好，校验合格；

b. Check that each control valve is calibrated;

确认各控制阀调校合格；

c. Check that the control and self-protection logic instruments are in correct commissioning and checked correctly;

确认各控制、自保逻辑仪表调试正确，核对无误；

d. Check that the instrument system is fully put into operation;

确认仪表系统全部投用；

e. Check whether each pump knob is in the "off" or "Manual";

确认各泵旋钮均处于“off”、手动位置；

f. Check whether the lubrication pump motor is powered on

确认润滑油泵电机送电

g. Check that whether the turning motor is powered on

确认盘车电机送电

h. Check that each electric valve is powered on

确认各电动阀送电

On-site confirmation: 现场确认：

a. Confirm that the place around the unit is clean and the site is free of debris;

确认机组周围卫生清扫干净，现场无杂物；

b. Check that the on-site fire-fighting facilities are complete;

确认现场消防设施完备；

c. Check that the valve wrench, walkie-talkie and other boot tools are ready.

确认阀门扳手、对讲机等开机工具齐全。

2)Put dry gas sealing system into use 投用干气密封系统

a. Close the isolation hand valve to the unit dry gas seal frame, and close the emptying valve of each filter;

关闭去机组干气密封架前的隔离手阀，关闭各过滤器的放空阀；

b. Open the condensate drain valve in front of the nitrogen pressure reducing valve and close it after full exhaustion of fluid;

打开氮气减压阀前排凝阀，充分脱液后关闭；

c. Regulate the nitrogen pressure reducing valve with downstream pressure 2.5MPa;

调节氮气减压阀，阀后压力调节至 2.5MPa；

d. Open the seal N_2, and isolate the air into the isolation valve in front of the dry gas seal frame;

打开密封 N_2、隔离空气进干气密封架前隔离阀；

e. Adjust the differential pressure control valve, set the pressure difference to be 0.2MPa, and the nitrogen flow shall be less than 7Nl/min;

调节压差控制阀，压差给定值为 0.2MPa ，此时氮气流量应小于 7Nl/min；

f. Open the communication valve between the sealed nitrogen filter groups, and close it until the spare filter is full of nitrogen;

打开密封氮气过滤器组间连通阀，待备用过滤器充满氮气后关闭；

g. Regulate the pressure control valve, and adjust the air pressure entering the unit isolation chamber to 0.05MPa.

调节压控阀，进入机组隔离腔的空气压力调节至 0.05MPa。

Precautions: the seal N_2 shall be clean and free of liquid, and the pipeline shall be blown and drained prior to being put into operation.

注意事项：密封 N_2 必须是清洁的，不带液的，投运前，必须进行管线吹扫及排液。

3)Lubricating oil system for operation 投用润滑油系统

a. Start oil filter for dehydration and shut down when completed;

启动滤油机脱水后关闭；

b. Open the outlet/inlet hand valves of the two pumps;

打开两台泵的出、入口手阀；

c. Open the outlet valve of tank gauge;

打开油箱液位计引出阀；

d. Open the front and rear shutoff valves of the lubricating oil pressure control valve, close the bypass valve, switch the regulator to manual mode, and maintain the control valve at a certain opening degree (about 50%);

打开润滑油油压控制阀前、后截止阀，关闭旁通阀，调节器投手动，并使控制阀保持一定开度（50%左右）；

e. Close the oil-filled communication valves of the two sets of oil coolers, close the drain valve to oil tank of the two sets of oil coolers, close the condensate drain valve at bottom, open the water return valve of the oil cooler (normally open), and close the inlet valve of the oil cooler, and switch handle to point to one of the groups;

关闭两组冷油器的充油连通阀，关闭两组冷油器去油箱的排放阀，关闭底部排凝阀，打开冷油器的回水阀（常开），关闭冷油器的进水阀，切换手柄指向其中一组；

f. Close the oil-filled communication valve of the two sets of lubricating oil filters, the drain valve to oil tank, the condensate drain valve at bottom, and switch handle to point to one of the groups;

关闭两组润滑油过滤器的充油连通阀、去油箱排放阀、底部排凝阀，切换手柄指向其中一组；

g. Open the front and rear shutoff valves of the lubricating oil pressure control valve, close the bypass valve, and switch regulator to automatic mode with a set pressure of 0.329MPa (the total pipe pressure is guaranteed to be 0.25MPa);

打开润滑油压力控制阀的前、后截止阀，关闭旁通阀，调节器投自动，压力给定值为 0.329MPa（保证总管压力为 0.25MPa）；

h. Close the oil filling valve of accumulator and the quick oil filling valve of top oil tank;

关闭蓄能器充油阀，关闭高位油箱快速充油阀；

i. Start the steam heater of oil tank if the oil temperature is below 25℃;

若油温低于 25℃，启动油箱蒸汽加热器；

j. The self-starting interlock switches of the lubrication pump are turned to the manual position;

润滑油泵自启动的联锁开关均打至手动位；

k. The oil seal nitrogen of steam turbine bearing for operation to confirm that the exhausting is smooth;

投用汽轮机轴承油封氮气，确认排气畅通；

l. The turning of oil pump is flexible without jamming, determine that one of them is the main pump and start it up;

油泵盘车灵活，无卡涩，确定其中一台为主泵，启动；

m. Conduct exhausting at the introducing point of the lubricating oil pressure and close it when oil bleeding;

润滑油油压引压点处排气，见油后关闭；

n. Open the oil filling communication valve between the two sets of oil coolers and the drain valve to the oil tank, close the oil drain valve after oil return happens, turn the switch handle of oil cooler to the other side, and close the oil filling valve;

打开两组冷油器间充油连通阀和去油箱排放阀，待见回油后，关闭排油阀，将冷油器切换手柄转向另一侧，关充油阀；

o. Open the oil filling communication valve between the two sets of lubricating oil filter and the drain valve to the oil tank, close the drain valve after oil return happens, turn the switch handle to the other side, and close the oil filling communication valve;

打开两组润滑油过滤器间的连通阀和去油箱排放阀，待见回油后，关闭排放阀，将切换手柄转向另一侧，关闭充油连通阀；

p. Open the quick oil filling valve to the top oil tank, and close the oil filling valve after oil returning; The operator shall not stay far away from the site to prevent oil bleeding from the top of top oil tank which is conducted quick oil filling.

打开去高位油箱快速充油阀，见回油后关闭充油阀；向高位油箱快速充油时，人不能远离现场，以防高位油箱顶部冒油。

q. Open the oil filling valve of accumulator;

打开蓄能器充油阀；

r. Disable oil tank heater if the oil temperature reaches 40℃ and enable oil cooler to control the oil temperature between 35℃ and 45℃;

若油温达到 40℃，停用油箱加热器，启用油冷却器，控制油温在 35℃～45℃之间；

s. Contact the bench worker to adjust the lubricating oil pressure before entering the bearing: Radial bearing oil pressure of steam turbine: 0.09MPa-0.13MPa; Thrust bearing oil pressure of steam turbine: 0.025MPa-0.05MPa; Radial bearing oil pressure of aerostatic press: 0.08MPa-0.18MPa; Thrust bearing oil pressure of aerostatic press: 0.05MPa-0.10MPa;

联系钳工调整润滑油进轴承前油压值： 汽轮机径向轴承油压：0.09MPa～0.13MPa；汽轮机推力轴承油压：0.025MPa～0.05MPa；气压机径向轴承油压：0.08MPa～0.18MPa；气压机推力轴承油压：0.05MPa～0.10MPa；

t. Inspect the oil filter regularly, the pressure difference is greater than 0.15MPa, and switch the filter and clean it;

经常检查油过滤器，压差大于 0.15MPa，切换过滤器并清洗；

u. Contact the laboratory to sample and analyze whether the various indicators of the lubricating oil are within the required range;

联系化验室，采样分析润滑油各项指标是否在要求范围内；

Note: before commissioning of the unit which has undergone the major repair, conduct the closed self-running of the oil system first. When doing so, bypass the bearing inlet and return oil pipes.

注意：机组大修后投运，油系统应先进行外跑油，外跑油时把轴承进、回油管短接。

4)Self-starting pump interlock commissioning of lubricating oil system 润滑油系统自启泵联锁调试

a. The interlock option switch of spare pump is turned to "Automatic", and the pump is manually stopped at the site. The spare pump shall be self-starting and sound and light alarm;

备用泵联锁选择开关打至“自动”，现场手动停运行泵，备泵应自启动，并声光报警；

b. Reset the main and auxiliary pumps and repeat the above steps;

重新设定主、辅泵，并重复上述步骤；

c. The interlock option switch of spare oil pump is turned to the "Automatic" to lower the set value of the oil pressure control valve. When the manifold pressure is lower than 0.18MPa, the

spare pump shall be self-starting and sound and light alarm. The oil pressure is adjusted to the normal value, and the spare pump is stopped (reducing the manifold pressure can also be achieved by opening the bypass valve or the oil return tank valve behind the check valve);
备用油泵联锁选择开关打至“自动”位置，降低油压控制阀的给定值，当集合管油压低于 0.18MPa 时，备泵应自启动，并声光报警。油压调整至正常值，停备泵（降低集合管油压也可通过打开旁通阀或单向阀后回油箱阀来实现）；
Note: pay attention to whether the pressure of the lubricating oil header is lowered when stopping a pump.
注意：停掉一台泵时，注意观察润滑油总管压力有无下降。
d. Reset the main and spare pumps and repeat the above steps;
重新设定主、备泵，并重复上述步骤；
5)Test whether the main valve action is sensitive 试验各主要阀门动作是否灵敏
a. Test a steam turbine quick-closing valve;
试验汽轮机速关阀；
b. Test a steam turbine regulating steam valve;
试验汽轮机调节汽阀；
6)Steam line preheating 蒸汽管线预热
a. Vent the steam heating pipe before opening the steam turbine steam inlet shut-off valve;
打开汽轮机蒸汽入口切断阀前放空，蒸汽暖管；
b. Open the condensate drain points behind the steam outlet valve of the steam turbine and warm pipe;
打开汽轮机蒸汽出口阀后各排凝点，暖管；
c. Use a gland ejector and a cooler.
投用汽封抽气器、冷却器。
7)Interlock test for emergency shutdown 紧急停机联锁试验
a. Determine one lubrication pump as the main pump and start, and the spare pump is switched to the "Automatic";
确定一台润滑油泵为主泵，启动，备用泵投“自动”位；
b. Unit interlock reset;
机组联锁复位；
c. Check correct valve positions after resetting;
确认复位后各阀位置正确；
d. Operate the steam turbine quick-closing assembly and apply the starting oil, inject the quick-closing oil after the oil pressure is stabilized, close the starting oil when the quick-closing oil pressure is stabilized at 0.8MPa. The quick-closing valve is gradually opened;
操作汽轮机速关组件，投用启动油，待油压稳定后，投用速关油，待速关油压稳定在 0.8MPa 左右，再关闭启动油，此时速关阀逐渐全开；
8)Lubricating oil pressure low-low shutdown test 润滑油压力低低停机试验

a. Put the on-site option switch of spare pump into the "Manual";
将备用泵现场选择开关投“手动”位置；
b. Adjust the set value of the pressure control valve of the lubricating oil header so that the total pressure of the manifold is 0.12MPa, and the unit is shut down urgently;
调节润滑油总管压控阀设定值，使总管压力为 0.12MPa，机组紧急停机；
c. Check the sound and light alarm of "Low pressure of lubricating oil" and "Aerostatic press shutdown";
确认“润滑油压力低”、“气压机停机”声光报警；
d. Check that the anti-surge valve at the outlet of the aerostatic press is fully open;
确认气压机出口防喘振阀处于全开位置；
e. Check that the steam turbine quick-closing valve and the regulating steam valve are fully closed;
确认汽轮机速关阀、调节汽阀全关；
9)Speed, axial translation, vibration test 转速、轴位移、振动试验
a. The instrument is connected to the signal of steam turbine and the main fan axial translation, vibration, speed analog;
联系仪表分别依次给汽轮机和主风机轴位移、振动、转速模拟信号；
b. Check the unit "Aerostatic press shutdown" as indicated by the sound-light alarm;
确认机组“气压机停机”声光报警；
c. Check that the anti-surge valve at the outlet of the aerostatic press is fully open;
确认气压机出口防喘振阀处于全开位置；
d. Check that the steam turbine quick-closing valve and the regulating steam valve are fully closed;
确认汽轮机速关阀、调节汽阀全关；
10)Manual shutdown test at operating room 操作室手动停机试验
a. Turn on the "Aerostatic press emergency shutdown" knob to the input position;
旋动“气压机紧急停机”旋钮至投入位置；
b. Check the unit "Aerostatic press shutdown" as indicated by the sound-light alarm;
确认机组“气压机停机”声光报警；
c. Check that the anti-surge valve at the outlet of the aerostatic press is fully open;
确认气压机出口防喘振阀处于全开位置；
d. Check that the steam turbine quick-closing valve and the regulating steam valve are fully closed;
确认汽轮机速关阀、调节汽阀全关；
Note: the solo test run of the steam turbine can be carried out after the above tests are finished.
注意：上述试验全部完成后才可进行汽轮机单机试车。

Solo test run and over-speed test of the steam turbine 汽轮机单机试车、超速试验

a. Confirm that the steam turbine-aerostatic press coupling is disconnected;
确认汽轮机—气压机联轴器断开；
b. The lubrication pump outlet pressure is ≥0.5MPa, the lubricating oil pressure of the header is 0.25MPa, and the spare pump is automatically used;
润滑油泵出口压力≥0.5MPa，总管润滑油压 0.25MPa，备泵投自动；
c. The oil pressure of each bearing meets the requirements, the oil temperature is ≥25℃, and the oil temperature is controlled after the starting: 35-45℃;
各轴承油压满足要求，油温≥25℃，启动后控制油温：35~45℃；
d. The lubricating oil pressure control valve is automatically used;
润滑油压控制阀投自动；
e. Refer to the normal starting procedure, slightly open the shut-off valve at the steam turbine inlet;
参考正常开机步骤，稍开汽轮机入口切断阀；
f. Operate the emergency security device handle hook, the quick-stop component manual shutdown valve, and the remote stop button after the rated speed is reached and the operation is stable;
升至额定转速后，待运行稳定后，分别操作危急保安装置手柄挂钩、速关组件手动停机阀、远程停机按钮；
g. Check whether the quick-closing valve and the adjusting steam valve are closed quickly (for the multi-project test, the heating curve of the steam turbine can be skipped and the rated value can be directly reached in case of repeated startup-shutdown);
检查速关阀、调节汽阀是否迅速关闭（多项目试验时，反复开停机可跳过暖机曲线直接升速至额定值）；
h. For the pressure-out operation, check whether the operating pressure of the safety valve meets the specified value;
憋压操作，检查安全阀动作压力是否符合规定值；
i. Speed up through continuous manual operation until it shutdowns due to the electronic tripping, and record the final rotate speed for the tripping operation;
继续手动升速至电子跳闸停机，记录最终跳闸转速；
j. For the mechanical trip test, the bypassed electronic trip is interlocked, speed up and record the final rotate speed for the tripping operation after the above test is completed;
机械跳闸试验在上述试验完成后，旁路电子跳闸联锁，升速记录最终跳闸转速；
k. The operation quick-closing component knob is closed fully, close the shut-off valve at the turbine steam inlet, and start the turning motor after the test is completed. Stop the turning motor when the temperature of the steam turbine casing falls below 90℃, and the temperature difference between the lubricating oil flowing in and out of the bearings is less than 5℃. Adjust the lubricating oil spare pump to the "Manual" state, stop the main oil pump, and contact the bench worker to reload the coupling.

试验完成后，操作速关组件旋钮全关，关闭汽轮机蒸汽入口切断阀，启动盘车电机，当汽轮机壳体降至 90℃以下，且进、出轴承润滑油温差小于 5℃时，停盘车电机，润滑油备泵投“手动”，停主油泵，联系钳工回装联轴器。

11)After the test, valves of each system should be in the service position 试验完各系统阀位应在开车位置

a. Anti-surge valves of three sections of the aerostatic press are fully open;
气压机三段防喘振阀均全开；

b. Electric valves at the inlet and outlet of the aerostatic press are fully open;
气压机段出入口电动阀全开；

c. The adjusting steam valves of the steam turbine are fully closed on site;
汽轮机调节汽阀现场全关；

d. The steam turbine quick-closing valves are fully closed;
汽轮机速关阀全关；

e. Coupling recovery;
联轴器恢复；

f. The adjusting steam valve of the steam turbine signal to 0% (4mA);
汽轮机调节汽阀信号给 0%（4mA）；

(2)Checking and confirmation before starting 启动前的检查确认工作

1)Before the unit is started, the team should confirm whether the following works have been done:
机组开机前，由班组再次确认下列工作已经完成：

Dry gas sealing system 干气密封系统

a. Check that there is one filter for normal use and another one for backup mounted in front of the dry gas seal frame;
确认干气密封架前过滤器一投一备；

b. Check the sealed nitrogen pressure is 0.25-0.3MPa;
确认密封氮气压力 0.25－0.3MPa；

c. Check the front and rear dry gas seal differential pressure gauge ≥2bar;
确认前后端干气密封差压表≥2bar；

d. Check that the pressure of the bearing isolation air is 0.05MPa;
确认轴承隔离空气 0.05MPa；

e. Check that the isolation air of the purified dry gas is used.
确认净化干气隔离气投用。

Lubricating oil system 润滑油系统

a. Check that the lubrication pump outlet pressure is ≥1.2MPa, and the spare pump is adjusted to the automatic operation state;
确认润滑油泵出口压力≥1.2MPa，备泵打自动；

b. Lubricating oil temperature≥25℃;

润滑油温≥25℃；

c. The lubricating oil pressure of the header is 0.25-0.26MPa;

总管润滑油压 0.25-0.26MPa；

d. The top oil tank oil is filled with oil;

高位油箱液位充满油；

e. The radial bearing oil pressure of the compressor is 0.09-0.13MPa;

压缩机径向轴承油压 0.09～0.13MPa；

f. The thrust bearing oil pressure of the compressor is 0.025-0.05MPa;

压缩机推力轴承油压 0.025～0.05MPa；

g. The radial bearing oil pressure of the steam turbine is 0.08-0.18MPa;

汽轮机径向轴承油压 0.08～0.18MPa；

h. The steam turbine thrust bearing oil pressure is 0.5-0.1MPa;

汽轮机推力轴承油压 0.5～0.1MPa；

i. The lubricating oil pressure control valves are automatically controlled at 329KPa;

润滑油压控阀自动控制在 329KPa；

Process system validation 工艺系统确认

a. The hand valve and the control valve at the compressor outlet are fully closed;

压缩机出口手阀、控制阀全关；

b. The compressor condensate drain valve is fully closed;

压缩机各排凝阀全关；

c. The inlet flare-discharging valves are flexible and easy to use;

入口放火炬阀灵活好用；

d. The shutoff valves at the front and the rear of the safety valves of the compressor outlet are fully open;

压缩机出口安全阀前后截止阀全开；

e. Replacement valves of unit N_2 are fully closed;

机组 N_2 置换阀全关；

f. The cooling water for the intercooler of the compressor is used;

压缩机中间冷却器冷却水投用；

g. The liquid control LV1501 of the intermediate liquid-separating tank is automatically controlled at 50%, and the subline is confirmed to be closed.

中间分液罐液控 LV1501 自动控制在 50%，副线确认关闭。

h. Open the inter-stage electric gate valves of the compressor;

打开压缩机级间电动闸阀；

i. Open the anti-surge line control valves and the hand valves of the compressor;

打开压缩机防喘振线控制阀及手阀；

j. Open the hand valves that discharge the condense to the liquid-separating tank line at the compressor inlet, etc.;
打开压缩机入口等处排凝至分液罐管线的手阀；
Confirm the steam system is used 蒸汽系统投用确认
a. Make sure that the starter of the speed controller is turned on clockwise to the end and the main steam valves are fully closed;
确认调速器启动装置顺时针旋到底，主汽门全关；
b. Check that the steam turbine bearings are used in the air-isolation environment;
确认汽轮机轴承隔离空气投用；
c. Check that the turning is used;
确认盘车投用；
d. Slowly open the two isolation valves of the main steam until they are full opened;
缓慢打开主蒸汽两道隔离阀至全开；
e. Each trap of the main steam system are slightly opened and the system is drained;
主蒸汽系统各疏水阀略开，脱水；
f. Slightly open the main steam emptying valve, heat the pipe and the steam temperature is ≮ 280℃;
主蒸汽放空阀略开，暖管，蒸汽温度≮280℃；
g. Check that the shutoff valve of the back pressure relief valve is fully open;
确认背压安全阀截止阀全开；
h. Slowly open the two isolation valves of the back pressure until they are full opened;
缓慢打开背压两道隔离阀至全开；
i. Each trap of the back pressure system is drained and the heating pipe is slightly open;
背压系统各疏水阀放空略开暖管；
j. The gland ejection cooler is used.
汽封抽汽冷却器投用。
Enter the interlock shutdown screen and confirm the self-protection interlock 进入联锁停机画面确认自保联锁
a. If the lubricating oil pressure is low-low, interlock (two-out of three) for operation;
润滑油压力低低联锁（三取二），投用；
b. If the exhaust steam pressure of steam turbine is low-low, interlock for operation;
汽轮机排汽压力低低联锁，投用；
c. If the axial translation of compressor is high-high, interlock (two-out-of-two) for operation;
压缩机轴位移高高联锁（二取二），投用；
d. If the axial translation of steam turbine is high-high, interlock (two-out-of-two) for operation;
汽轮机轴位移高高联锁（二取二），投用；
e. If the speed of steam turbine is high-high, interlock (two-out of three) for operation;
汽轮机转速高高联锁（三取二），投用；

f. If the quick-closing oil pressure is low-low, interlock for operation;
速关油压力低低联锁，投用；
g. Check that the ESD control console manual shutdown switch is in the normal position (remove).
确认 ESD 操作台手动停机开关在正常位置（切除）。

(3) Unit start 机组启动
1)Enter the startup program screen to check the startup conditions 进入启动程序画面检查启动条件
Confirm that the following start conditions are met after 900 seconds (you can also click the pre-check bypass button without delaying for 900 seconds) when the aerostatic press interlock resets:
气压机联锁复位，900 秒后（也可以点击预检查旁路按钮不用延时 900 秒）确认启动条件达到：
a. Steam turbine 1# main steam valve all-off;
汽轮机 1#主汽门全关；
b. Steam turbine 2# main steam valve all-off;
汽轮机 2#主汽门全关；
c. Memory reset;
存储器复位；
d. Process allows start;
工艺允许启动；
e. Adjust the oil pressure to normal;
调节油压力正常；
f. Lubricating oil pressure is normal;
润滑油压力正常；
g. Lubricating oil temperature≥25℃;
润滑油温度≥25℃；
h. Anti-surge valves at each section are fully open;
各段防喘振阀全开；
i. Electric valves of each section are fully open;
各段出入口电动阀全开；
j. The hydraulic turning is at the prohibited position;
液压盘车在禁止位置；
k. The dry gas sealing system is operating normally.
干气密封系统运行正常。
l. Enter the emergency shutdown screen to check and confirm that there is no shutdown signal after each condition is met and the "Startup standby" indicator light is on;
各个条件已满足，“启动待命”指示灯亮，进入紧急停机画面检查确认无停机信号；

m. Click the "PERMISSIVE" and the steam turbine quick-closing system lockout is unlocked.
点击“允许启动”按钮，汽轮机速关系统闭锁解除。

2)The steam turbine starts, the turbine heating speeds up, and the aerostatic press gradually delivers the rich gas to the absorption and stabilization system
汽轮机启动、暖机升速，气压机逐步送吸收稳定系统

a. Fully open the shut-off valve at the steam turbine inlet, introduce the steam to the front of the quick-closing valve, and perform condensate drain and turn down the emptying valve of the inlet pipeline;
全开汽轮机入口切断阀，引蒸汽至速关阀前，排凝，关小入口管线放空阀；

b. Fully open the compressor inlet valve to check for leaks at each sealing point;
全开压缩机入口阀，检查各密封点有无泄漏情况；

c. Start the turning motor and check for abnormal sound at the flow passage, shaft seal and main oil pump;
启动盘车电机，检查通流部分、轴封、主油泵等处有无不正常响声；

d. Operate the quick-closing components, slowly open the quick-closing valve, fully open the condensate draining valves and confirm if they are unblocked and control the temperature rise of the turbine heating at 50℃/h before the steam pipeline mounted in front of the quick-closing valve is condensate-drained and preheated.
待速关阀前蒸汽管线排凝预热完，操作速关组件，缓慢开启速关阀，机体各排凝全开，并确认畅通，控制暖机温升控制在 50℃/h；

e. The steam turbine is "automatically turned on" (it can also be manually turned on according to the speed-raising curve);
汽轮机投“自动开机”（也可手动按照升速曲线开机）；

f. When the speed exceeds the that of the turning, the tooth of the turning gear are disengaged, the handle is locked, and the turning motor is stopped;
转速超过盘车转速时，盘车齿脱开，手柄锁住，停盘车电机；

3)Unit speedup: 机组升速：

a. When there is abnormal sound or vibration on the shaft system of the unit, the speed should be reduced and the unit should be checked after the critical area is avoided;
当机组轴系出现不正常的响声或振动时，应降低转速，避开临界区，检查；

b. When the oil system is not normal, the speed should be reduced and the unit should be checked after the critical area is avoided;
当油系统出现不正常的现象，应降低转速，避开临界区，检查；

c. When the thermal expansion of the steam turbine changes significantly, the speed should be reduced and the unit should be checked after the critical area is avoided;
当汽轮机热膨胀发生显著变化时，应降低转速，避开临界区，检查；

d. The conditions of the temperature rise of each bearing and the expansion and vibration of each part. The temperature difference between the upper and the lower cylinders should not exceed 50℃.

各轴承的温升及各部位的膨胀、振动情况，上下半汽缸的温差，应不超过 50℃。

e. Pay close attention to the operating points of the unit during the speed raising process, and stop the speed raising process if there is any abnormality;

升速过程中密切关注机组运行工况点，若出现异常，停止升速；

f. Open the compressor outlet hand valve after the rated speed is reached;

待升至额定转速后，打开压缩机出口手阀；

g. Check that the signal from DCS displayed in TRICON is of 100%;

确认 TRICON 中显示 DCS 来信号为 100%；

h. Switch the anti-surge control mode to semi-automatic, and the semi-automatic control indicating light turns to green;

将防喘振控制方式切至半自动，半自动控制亮绿灯；

i. Limit the anti-surge control valve and set the manual output as 100%;

将防喘振控制阀限位，手动输出设定 100%；

j. The anti-surge valve is released and the green light is on after the release button is clicked to turn off;

点击关释放按钮，防喘振阀已释放亮绿灯；

k. Open the outlet and stabilize the system control valve after the outlet pressure is stable, and gradually close the anti-surge valve, and pay close attention to the operating points of the unit to avoid surge;

待出口压力稳定后，打开出口并稳定系统控制阀，同时逐步关小防喘振阀，密切关注机组工况点，避免发生喘振；

l. Adjust the outlet back pressure of the steam turbine to be higher than 5% of the pipe network pressure, and notify the dispatcher to prepare for the grid connection;

调整汽轮机出口背压高出管网压力 5%，通知调度准备并网；

m. Slowly open the isolation valve of the back pressure exhaust pipeline (the bypass valve should be opened firstly), gradually close the blow-off valve and control the exhaust steam temperature rise not to exceed 5C/min, and keep the back pressure stable; °

缓慢开启背压排汽管路的隔离阀（应先开启旁路阀），同时逐渐关闭排空阀，控制排汽温升不超过 5°C/min，保持背压稳定；

n. Close emptying valves at the main steam pipeline, the back pressure exhaust pipeline and the cylinder;

关闭主蒸汽管路、背压排汽管路、汽缸等处放空阀；

o. Adjust the front-mounted buffer gas pressure control valve of the dry gas seal after the unit outlet pressure is stable until the downstream pressure reaches to 0.2MPa, and confirm that the dry gas seal parameters are normal;

待机出口压力稳定后，调整干气密封前置缓冲气压控阀，使阀后压力达到 0.2MPa，确认干气密封各参数正常；

p. The reaction pressure automatic control is used;

投反应压力自动控制；

q. Pay attention to liquid levels of D-202, 203 and 204 and drain the condensate in time after the load is applied;

提负荷后经常关注 D-202、203、204 液位，及时排除凝液；

r. Adjust the temperature of E-211, 212, 213 after being cooled at around41℃;

调整 E-211、212、213 冷后温度，在 41℃左右；

s. Apply the liquid level control after liquid level of D-202, 203, 204 rise to 50%;

D-202、203、204 液位上升至 50%，投液位控制；

t. Apply the position control and open upstream valve after liquid level of D-202, 203, 204 rise to 50%;

D-202、203、204 界位上升至 50%，开上游阀，投用界位控制；

u. Check the operation status of the unit thoroughly (time ≥10min).

全面检查机组运行状态（时间≥10min）。

4)Precautions 注意事项

a. Pay close attention to the oil temperature and pressure of the lubricating oil system of the unit through internal and external operations during the entire startup process.

整个开机过程中，内外操应密切关注机组润滑油系统各油温、油压；

b. Pay close attention to the vibration, displacement and temperature of each bearing of the unit, check the operation sound on site, and inspect the operating condition of the unit with the hearing needle and the hand-held temperature vibration measuring devices;

密切关注机组各轴承振动、位移、温度，现场检查运行声音，利用听针、手持式测温测振仪等检查机组运行情况；

c. Check that the on-site auxiliary equipment is operating normally, the seal is leak-free, and the dry gas seal is operating normally.

确认现场辅助设备运行正常，密封无泄漏，干气密封运行正常。

(4)Unit shutdown procedures 机组停机规程

1)Normal shutdown, 正常停机，

a. Check that the pressure and the temperature at the inlet/the outlet of the aerostatic press unit are normal;

确认气压机组出入口压力、温度正常；

b. Check that the pressure and the temperature of the aerostatic press unit lubricating oil system are normal;

确认气压机组润滑油系统压力、温度正常；

c. Check that the speed, the vibration and the axial translation of the aerostatic press unit are normal;

确认气压机组转速、振动、轴位移正常；

d. Check that the valve position of the aerostatic press unit is adjusted properly.

确认气压机组各阀位调节正常。

e. Inform the dispatcher, the shift leader and related operators to prepare for the shutdown;

通知调度、班长及相关岗位作好停机准备；

f. Pay close attention to the operating points;

密切注意运行点；

g. Each operators should be well coordinated, the speed should be gradually reduced according to the processing capacity of the device and the pressure of the absorption and stabilization system, and operating point of the aerostatic press should be closely monitored;

各岗位协调好，根据装置处理量及吸收稳定系统压力情况逐渐降转速，密切关注气压机工况点位置；

h. Automatic or manual operation of the anti-surge valve to control the operating point away from the surge area;

自动或手动操作防喘振阀，控制工况点远离喘振区；

i. The pressure at the top of the fractionation tower is reduced steadily, and the anti-surge valve is opened gradually. After the feeding of the reactor is stopped, press the "Normal stop" of the TRICON system (press the "YES" when confirming to stop the unit);

分馏塔顶压力不断降低，防喘振阀逐渐开大，待反应器切断进料后，按 TRICON 系统“正常停车”键（停机确认按 YES 键）；

j. Check that all anti-surge valves of each section of the aerostatic press are fully open;

确认气压机各段防喘振阀全开；

k. Check that the steam turbine quick-closing valve and the regulating steam valve are fully closed.

确认汽轮机速关阀、调节汽阀全关。

l. Record unit idling time;

记录机组惰走时间；

m. Activate turning after confirming that the unit is completely stopped;

确认机组完全停下来后开启盘车；

n. The steam system trap is slightly open for dewatering;

蒸汽系统疏水阀略开疏水；

o. Close the two isolation valves of the main steam system;

关闭主蒸汽系统二道隔离阀；

p. Close the two isolation valves of the back pressure steam system and open the back pressure emptying valve of the main fan.

关闭背压蒸汽系统二道隔离阀，并打开主风机背压放空阀。

Note: after shutdown, the outlet electric gate valves of each section should be closed immediately to prevent the unit from being reversed and damaging the dry gas seal due to the leakage of the check valve.

注意：停机后，应迅速关闭各段出口电动闸阀，防止因单向阀内漏导致机组倒转而损坏干气密封。

2)Self-protection emergency interlock shutdown 自保紧急联锁停机

For the following situations, the unit is stopped through the self-protection interlock action:

机组在发生下列情况时，自保联锁动作停机：

a. Unit overspeed (two-out of three: SE-62305, SE-62306 and SE-62307) (n≥6,237r/min)

机组超速（SE-62305、SE-62306、SE-62307 三取二）（n≥6237r/min）

b. Excessively low steam turbine exhaust pressure (two-out of three: PISA-62101, PISA-62102, and PISA-62103)

汽轮机排气压力过低（PISA-62101、PISA-62102、PISA-62103 三取二）

c. Excessive steam turbine axial translation (two-out of three: ZISA-62201, ZISA-62202, and ZISA-62203) (≥±0.8mm)

汽轮机轴位移超限（ZISA-62201、ZISA-62202、ZISA-62203 三取二）（≥±0.8mm）

d. Excessively large steam turbine bearing vibration (one-out of four: VISA-62201, VISA-62202, VISA-62203 and VISA-62204)

汽轮机轴承振动过大（VISA-62201、VISA-62202、VISA-62203、VISA-62204 四取一）

e. Overtemperature of steam turbine bearing (one-out of four: TISA-62202, TISA-62204, TISA-62206 and TISA-62208)

汽轮机轴承温度过高（TISA-62202、TISA-62204、TISA-62206、TISA-62208 四取一）

f. Excessive aerostatic press axial translation (two-out of three: ZISA-61301, ZISA-61302 and ZISA-61303) (≥±0.8mm)

气压机轴位移超限（ZISA-61301、ZISA-61302、ZISA-61303 三取二）（≥±0.8mm）

g. Excessively large aerostatic press bearing vibration (one-out of four: VISA-61301, VISA-61302, VISA-61303 and VISA-61304)

气压机轴承振动过大（VISA-61301、VISA-61302、VISA-61303、VISA-61304 四取一）

h. Overtemperature of aerostatic press bearing (one-out of four: TISA-61211, TISA-61213, TISA-61215, and TISA-61217)

气压机轴承温度过高（TISA-61211、TISA-61213、TISA-61215、TISA-61217 四取一）

i. Excessively low lubricating oil pressure (two-out of three: PISA-61351, P ISA-61352 and P ISA-61353) (≤0.12MPa)

润滑油压过低（PISA-61351、P ISA-61352、P ISA-61353 三取二）（≤0.12MPa）

j. Low pressure differential of the cylinder dry gas seal (two-out of three: PDIA-65102A, B, and C) (≤0.02MPa)

低压缸干气密封差压低（PDIA-65102A、B、C 三取二）（≤0.02MPa）

k. Low pressure differential of the cylinder dry gas seal (two-out of three: PDIA-65106A, B, and C) (≤0.02MPa)

高压缸干气密封差压低（PDIA-65106A、B、C 三取二）（≤0.02MPa）

3)Manual emergency shutdown 手动紧急停机

Press the "Manual emergency shutdown" for the following situation encountered by the unit:

机组在发生下列情况时，可按“手动紧急停机”按钮：

a. Strong vibration of the unit, smoking and friction at the bearing and shaft seal;

机组发生强烈振动，轴承、轴封处冒烟及发出摩擦声；

b. The bearing temperature rises and exceeds the alarm value, which cannot be eliminated;

轴承温度升高，超过报警值而无法消除；

c. The lubricating oil system is seriously leaked and the oil tank level cannot be maintained;

润滑油系统严重泄漏，油箱液位无法维持；

d. Dry gas seal leaks, and a large amount of rich gas leaks into the atmosphere;

干气密封泄漏，富气大量漏至大气；

e. Self-protection interlock conditions are met and the unit is not shut down due to system failure;

自保联锁条件具备，系统故障未停机；

f. The unit must be stopped due to other emergency situations.

其它紧急情况必须停机组。

When one of the above situations is found, it is necessary to judge correctly and check the failure location, record the accurate data, stop the unit first in an emergency, and then report to the shift leader and relevant departments.

发现以上情况之一时，必须正确判断、检查故障部位，记录准确的数据，紧急情况下先停机，然后向班长及有关部门汇报。

The manual emergency shutdown can be realized by pressing the shutdown switch on the operating panel, the emergency shutdown button of the field operating cabinet, the emergency shutdown valve of the quick-closing control component and the emergency security device handle.

手动紧急停机可通过按操作面板上的停机开关、现场操作柜的紧急停机按钮、速关控制组件紧急停机阀和危急保安装置手柄实现。

g. Close the electric gate valve at the compressor outlet;

关闭压缩机出口电动闸阀；

h. Check whether the data of front-mounted devices of the dry gas seal is normal;

检查干气密封架前各数据正常；

i. Slightly open each steam trap and main steam emptying valve;

略开各蒸汽疏水阀门和主蒸汽放空阀；

j. Turn the start hand wheel clockwise to the end;

把启动装置手轮顺时针旋到底；

k. After the unit is stopped, activate turning and confirm that it is normal by the external operator;

机组停转后外操开盘车，确认盘车正常；

l. Check the liquid level of the intermediate liquid-separating tank by the internal operator, and notify the external operator to stop the pump after the control valve is fully closed;

内操检查中间分液罐液位，控制阀全关后通知外操停泵；

m. Check the cause of the emergency shutdown and troubleshoot.

检查紧急停机原因，排除故障。

(5)Confirm the system indication after the unit is shutdown 机组停机后，系统指示确认

a. The red light (green light for normal condition) is on if anti-surge valves are fully open;

防喘振阀全开亮红灯，（正常绿灯）；

b. The red light is on when the unit is stopped;

机组停机亮红灯；

(6)Emergency start operation procedure after the trip of the aerostatic press unit

气压机组跳车后紧急开机操作规程

a. Check whether the lubricating oil pressure is normal or not

确认润滑油压正常与否

b. Check the operating condition of the lubrication pump, stop the spare pump if two pumps are in operation

检查润滑油泵运行情况，如两台泵运行停备泵

c. Close the electric gate valve at the compressor outlet

关闭压缩机出口风动闸阀

d. Open the outlet flare-discharging valve of compressor (≯2 buckles, there will be impulse starting if it is too large)

打开压缩机出口放火炬阀（≯2 扣，过大的话易冲转）

e. Check whether the data of front-mounted devices of the dry gas seal is normal

检查干气密封架前各数据正常

f. Slightly open each steam trap and main steam emptying valve

略开各蒸汽疏水阀门和主蒸汽放空阀

g. Turn the start hand wheel clockwise to the end

把启动装置手轮顺时针旋到底

h. After the unit is stopped, activate turning and confirm that it is normal by the external operator

机组停转后外操开盘车，确认盘车正常

i. Check the liquid level of the each section of intermediate liquid-separating tank by the internal operator, and notify the external operator to stop the pump after the control valve is fully closed

检查各段中间分液罐液位，控制阀全关后通知外操停泵

j. Press the "Start" after confirming that the unit is failure-free

确认机组无故障后按开机

(7)Normal operation after shutdown 停机后常规操作

a. All electric valves at the inlet and the outlet of each section of the aerostatic press are fully closed;

全关气压机各段出入口电动阀；

b. Start the turning gear after the unit is completely stopped;

机组完全停止后，启动盘车装置；

c. Continue cooling down until it is fully closed by closing the DN300 bypass valve;

利用关小 DN300 旁通阀继续降温，直至全关；

d. Open the steam turbine casing to discharge condense after the steam turbine outlet temperature drops to 150℃;

待汽轮机出口温度降至 150℃，打开汽轮机壳体排凝；

e. Deactivate the turning gear when the temperature of the steam turbine casing falls below 90℃, and the temperature difference of the lubricating oil between the inlet and the outlet bearings is less than 5℃;

当汽轮机壳体温降降至 90℃以下，且进、出轴承润滑油温差小于 5℃时，停盘车装置；

f. Stop the steam sealing and extraction device of the steam turbine (close the hand valve of the shaft sealing steam inlet and sealing cooling device, the steam valve, and the cooling water inlet and outlet valves), open the shaft sealing steam and atmospheric exhausting hand valve.

停汽轮机汽封抽气装置（关轴封汽进汽封冷却装置手阀，关蒸汽阀，关冷却水进、出口阀），打开轴封汽排大气手阀。

g. Compressor nitrogen replacement;

压缩机氮气置换；

h. Stop the lubricating oil system after the bearing oil return temperature is lower than 40℃;

轴承回油温度低于 40℃后，停润滑油系统；

i. Turn off the isolation air of the steam turbine bearing;

关汽轮机轴承隔离气；

j. Stop dry gas sealing system

停干气密封系统；

k. Cut off the unit control system;

切断机组控制系统；

l. Pump out the condensed oil in the rich gas inlet liquid-separating tank and the intermediate gas-liquid separator, and deactivate the pump after the extraction;

富气入口分液罐及中间气液分离器中凝缩油用泵打净，抽空后停泵；

m. Close the inlet and the outlet water valves of the intermediate cooler;

关闭中间冷器进、出口水阀；

n. Control and hand valves of the liquid and the interface levels of the intermediate liquid-separating tank;
中间分液罐液位、界位控制阀卡一道手阀；
o. Deactivate the water, electricity, instrument, wind, steam and other systems.
停水、电、仪、风、汽等各个系统。

(8)Routine operation & maintenance 正常运行维护
General requirement of routine operation & maintenance 正常运行维护常规要求
1)Strictly implement the system of post responsibility, inspect carefully according to the requirements, record the operating parameters of the unit seriously, and find problems in time which should be handled properly;
严格执行岗位责任制，按要求细心检查，认真记录机组各运行参数，做到及时发现问题，并妥善处理；
2)Abide by the operating procedures and control the operation indicators of the unit strictly, check the rich gas flow and the outlet pressure regularly to prevent the aerostatic press from working in the surge and the rotating stall areas;
严格遵守操作规程和严格控制机组各项操作指标，经常检查富气流量、出口压力等情况，严防气压机在喘振区和旋转失速区工作；
3) Check the changes of the lubricating oil pressure and the bearing temperature frequently. Calibrate the digital display on the meter and the reading of the thermometer, and contact the instrument technician to accurately calibrate the meter if there is any discrepancy;
经常检查润滑油油压和轴承温度的变化。对仪表数字显示与温度计读数进行校对，如有不符，应联系仪表工精确校正；
4) Check the lubricating oil tank frequently to make sure the liquid level not below the specified value. Dewater frequently to prevent emulsification. Regular analysis through chemical tests;
经常检查润滑油箱，使之不低于规定值。经常脱水，防止乳化。定期化验分析；
5) Check the lubricating oil filter differential pressure and the oil outlet temperature of the oil cooler frequently and handle timely if the specified value is exceeded;
经常检查润滑油过滤器差压和油冷器油出口温度，超过规定值时，及时进行处理；
6) Check the trend of each vibration value and axial translation frequently. The cause should be checked and analyzed, and necessary measures should be taken if the amplitude is gradually increased, indicating the conditions of bearing abrasion or rotor imbalance;
经常检查各振动值和轴位移的趋向，如振幅逐渐增大，表示轴承磨损或转子不平衡，应检查并分析原因，采取必要措施；
7) Check the steam pressure frequently to ensure that the aspirator of the steam turbine works normally;
经常检查蒸汽压力，保证汽轮机抽气器正常工作；

8) Inspect regularly whether the steam turbine quick-closing valve, the regulating steam valve, the emptying valve of the main fan, the outlet check valve and expansion joints work normally;
定期检查汽轮机速关阀、调节汽阀、主风机放空阀、出口单向阀以及各膨胀节等工作是否正常；
9) Periodical condensate drain of the steam turbine casing
汽轮机壳体定期排凝；
10) Activate the turning for the spare lubricating oil pump as required.
润滑油备用油泵按要求盘车。

(9)The precautions in operation 操作中应注意的问题
1) Problems which should be paid attention to during the operation of the aerostatic press
气压机操作中应注意的问题
a. Forbid operation in surge area. When the unit is in operation, the operating points should be kept away from the surge area, and the anti-surge valve should be always located at the automatic control position;
严禁在喘振区工作。机组在运行时，工况点应远离喘振区，防喘振阀一直被设置在自动控制位置；
b. Report in time if the nitrogen pressure at the high or the low pressure terminal of the dry gas seal monitor is below 0.25MPa, the differential pressure of the high or the low pressure terminal is less than 0.2MPa, and the flow rate at the high or the low pressure terminal shows zero or overrange value.
干气密封监控高压端或低压端氮气压力低于 0.25MPa，高压端或低压端差压低于 0.2MPa，高压端或低压端流量显示为零或超量程时，及时汇报。
2) Rate of rise (fall) of the temperature for the steam turbine The heating rate of the steam turbine should be ≯100℃/h, and the cooling rate should be ≯150℃/h, so that the parts of the machine can be expanded (or contracted) evenly;
汽轮机关于升（降）温速率：汽轮机升温速率应≯100℃/h，降温速率应≯150℃/h，以使机器各零部件均匀膨胀（或收缩）；
3) Electric barring gear: turning gear is prohibited when the unit is in operation status.
电动盘车器：机组运行状态时，禁止操作。
4) Inspect regularly whether the lubricating oil contains water, is emulsified or deteriorated. The lubricating oil should be replaced in time if it fails to meet the requirement.
定期检查润滑油是否带水，有无乳化、变质现象，若不合要求，应及时换油。

(10) Aerostatic press special equipment operating procedures 气压机专项设备操作规程
1) Lubrication pump switching operation 润滑油泵切换
See Part Four of the "Pump Operation Method". 见“泵的操作法”第四部分。
2) Turning operation steps 盘车操作步骤
Initial status confirmation: Check that the on-site unit speed is 0; Check that the lubricating oil pressure is normal and the system operates normally.

初始状态确认：确认现场机组转速为 0；确认润滑油油压正常，系统运行正常。

3) Operate the turning 进行盘车

a. Activate the turning by pushing turning handle to and engage the turning motor gear;

把盘车手柄推至盘车电机齿轮咬合进行盘车；

b. Activate the turning motor;

开启盘车电机；

c. Pay attention to the bearing temperature and vibration changes at any time, and contact the external operator for any abnormal situation.

随时注意轴承温度和振动变化情况，有异常情况与外操人员联系进行处理。

(11) Lubricating oil accumulator switching operation and application steps

润滑油蓄能器切出、投用操作步骤

1) Initial status confirmation: Check that the lubricating oil pressure is normal and the system operates normally.

初始状态确认：确认润滑油油压正常，系统运行正常。

2) The putting-into-use operation of the lubricating oil accumulator

润滑油蓄能器切出操作

a. Confirm the switching instruction issued by the equipment operator for the lubricating oil accumulator. Send the switching instruction to the internal and external operators;

确认设备员润滑油蓄能器切出的指令。向内外操发出切出指令；

b. Contact the internal operator to be ready for switching to the lubricating oil accumulator, and pay attention to the pressure;

联系内操润滑油蓄能器准备切出，请注意压力；

c. Slowly close the oil filling valve, contact the internal operator to keep the pressure steady, and observe the accumulator pressure. Check the pressure gauge is normal and easy to use;

把充油阀缓慢关闭，联系内操保持压力的平稳，同时观察蓄能器压力。确认压力表正常好用；

d. Close the oil filling valve fully, slowly open the field pressure release valve of the accumulator, contact the internal operator to keep the pressure stable, and pay attention to the internal leakage;

把充油阀全关，缓慢开蓄能器现场泄压阀，联系内操保持压力平稳，注意内漏；

e. After checking that the pressure is released, send it to the bench worker for handling.

确认泄压完后，交付钳工处理。

3) The putting-into-use operation of the lubricating oil accumulator

润滑油蓄能器投用操作

a. Check the instruction of the putting-into-use operation for the accumulator by the equipment operator. Send the adoption instruction to the internal and external operators;

确认设备员蓄能器投用的指令。向内外操发出投用指令；

b. Contact the internal operator to be ready for putting the accumulator into use;

联系内操蓄能器准备投用；

c. Check that the pressure gauge is working properly and close the on-site pressure release;

确认压力表正常好用，关闭现场泄压阀；

d. Open the oil filling valve of the accumulator slowly, observe the change of the accumulator pressure, and master the increasing speed;

缓慢开蓄能器充油阀，观察蓄能器压力的变化，掌握好上升的速度；

e. Pay attention to the pressure by the internal operator, contact the external operator to fully open the accumulator oil filling valve slowly;

内操注意压力，联系外操缓慢全开蓄能器充油阀；

f. Inspect the pipeline for leakage thoroughly.

全面检查管路有无泄漏。

(12) Lubricating oil filter switching operation steps 润滑油过滤器切换操作步骤

1) Initial status confirmation: Check that the lubricating oil pressure is normal and the system operates normally.

初始状态确认：确认润滑油油压正常，系统运行正常。

2) Preparation before switching 切换前的准备

a. Check the instruction of the switching for the lubricating oil filter issued by the technician and send this instruction to internal and external operators;

确认技术人员发出润滑油过滤器切换操作的指令，向内外操发出此指令；

b. Check that the switch position of each valve of the spare filter is correct;

检查备用过滤器的各阀开关位置是否正确；

c. Contact the internal operator and indicate switching operation of the filter is for ready;

联系内操已准备好过滤器的切换；

d. Increase the set value of the lubricating oil control valve regulator to around 1.2MPa.

将润滑油控制阀调节器给定值提高到 1.2MPa 左右。

3) Switching operation 切换操作

a. Contact the internal operator to be ready for the switching operation of the lubricating oil filter;

联系内操准备切换润滑油过滤器；

b Open the emptying valve of the oil return tank at the top of the spare filter;

打开备用过滤器顶回油箱放空阀；

c. Open the oil filling valve slowly and fill the spare filter with the oil;

缓慢打开充油阀，向备用过滤器充油；

d. Close the emptying valve of the oil return tank at the top of the spare filter when the oil flows through the oil return window without air bubble;

待回油视窗有油流过，无气泡时，关闭备用过滤器的回油箱放空阀；

e. Contact the internal operator, start the switching operation and pay attention to the lubricating oil pressure;
联系内操，切换开始，注意润滑油压力；
f. Turn the switching handle slowly until it is in position;
缓慢转动切换手柄，手柄转到位；
g. Close the oil filling valve and check the lubricating oil system for leakage at the end of the switching;
关闭充油阀，切换结束，检查润滑油系统有无泄漏点；
h. If the original filter needs to be cleaned, the filter should be overhauled after the operation of condensate drain and pressure release. During the pressure release, it is necessary to prevent the oil pressure from falling due to the internal leakage of the switching valve;
若原过滤器需清洗，则排凝泄压后交付检修。泄压过程中要防止由于切换阀内漏造成油压下降；
i. Inform the internal operator that the switching operation for the lubricating oil filter is completed;
通知内操润滑油过滤器切换完毕；
j. Adjust the lubricating oil pressure and high oil pressure to normal values.
调节润滑油油压及高压油压至正常值。
k. Note: switch slowly to avoid the oil pressure fluctuation;
注意：切换操作缓慢进行，避免油压波动；
l. Pay close attention to the oil pressure changes through internal operator;
内操密切关注油压变化；
m. After the end of the switching operation, check for leakage by the external operator carefully.
切换完成后，外操仔细检查有无泄漏点。

(13) Lubricating oil pressure control and subline valves switching operation
润滑油压控制阀、副线阀切换操作
1) Change the control valve to the subline valve 控制阀改副线
a. Initial status confirmation: Putting the subline valve of the lubricating oil control valve into use, and the oil pressure is closed by the control valve.
初始状态确认：润滑油控制阀副线阀关闭，油压由控制阀调节。
b. Check the instruction of the switching lubricating oil control valve to be subline issued by the technician and send this instruction to internal and external operators.
确认技术人员发出润滑油控制阀改副线的指令，向内外操发出此指令。
c. Change the lubricating oil control valve regulator to the manual control mode after the set point of the lubricating oil control valve regulator is increased to around 350KPa.
将润滑油控制阀调节器给定值提高到 350KPa 左右，待润滑油压力达到这一值后，把润滑油控制阀调节器改手动控制。
d. Check that the on-site lubricating oil system operates properly.

检查确认现场润滑油系统运行正常。

e. Contact the internal operator to be ready for changing the lubricating oil control valve to the subline operation mode.

联系内操准备将润滑油控制阀改副线操作。

f. Notify the external operator that it is ready for the switching operations.

通知外操可以进行切换操作。

g. Open the subline valve slightly to increase the pressure of the lubricating oil header pipe a bit.

略微打开副线阀，使润滑油总管压力稍有提高。

h. Turn down the control valve to restore the pressure of the lubricating oil header pipe.

关小控制阀阀位，使润滑油总管压力恢复原样。

i. Strengthen the communication between internal and external operators, repeat the above two steps, and keep the pressure of the lubricating oil stable during the switching process.

加强内外操的通讯联系，重复以上两个步骤，切换过程中保持润滑油压力平稳。

j. Notify the external operator to close the upstream valve of the control valve slowly when the control valve is fully closed.

当控制阀全关后，通知外操可以缓慢关此控制阀的上游阀。

k. Close the upstream valve of the control valve slowly until it is fully closed.

缓慢缓慢关闭控制阀上游阀，至全关为此。

l. Notify the internal operator that the switching operation is completed.

通知内操切换完毕。

m. Check the lubricating oil system for leaks.

检查润滑油系统有无泄露点。

2) Steps for putting the lubricating oil control valve into use 润滑油控制阀投用操作步骤

a. Initial status confirmation: Putting the subline valve of the lubricating oil control valve into use, and the oil pressure is closed by the control valve.

初始状态确认：润滑油控制阀副线阀投用，油压由控制阀关闭。

b. Check the instruction of the adoption for the lubricating oil control valve issued by the technician and send this instruction to internal and external operators.

确认技术人员发出润滑油控制阀投用操作的指令，向内外操发出此指令。

c. Check that the lubricating oil control valve is a fail close valve, and contact the external operator to check and adjust the valve until it can be used normally.

确认润滑油控制阀是风关阀，联系外操调试此阀正常。

d. Check that the lubricating oil control valve regulator is manually controlled.

确认润滑油控制阀调节器为手动控制。

e. Check that the on-site lubricating oil system operates properly.

检查确认现场润滑油系统运行正常。

f. Put the lubricating oil control valve into use

润滑油控制阀投用

g. Contact the internal operator to prepare for putting the lubricating oil control valve into use.

联系内操准备将润滑油控制阀投用。

h. Open the downstream valve of the control valve and open the upstream valve of the control valve slightly.

打开控制阀下游阀，略微打开控制阀上游阀。

i. Observe whether the lubricating oil header pipe pressure is increased or not.

观察润滑油总管压力是不是会提高。

j. Close the subline valve of the control valve slowly if the pressure is increased, and stop closing the valve when the pressure is restored to the original value.

如果压力上来缓慢关闭控制阀副线阀，使压力恢复至原压力时停止关阀。

k. Strengthen the communication between internal and external operators, and repeat the above two steps until the upstream valve pressure does not rise.

加强内外操的通讯联系，重复以上两个步骤，直到打开上游阀压力不会上升。

l. Open the control valve slightly to increase the pressure.

略微打开控制阀，使压力上升。

m. Slightly turn down the subline valve to restore the pressure to normal.

略微关小副线，使压力恢复到正常。

n. Repeat the above two steps until the subline valve of the control valve is fully closed, and then the switching operation is completed.

重复以上两个步骤直到控制阀副线阀全关，切换完成。

o. Notify the internal operator that the switching operation is completed.

通知内操切换完毕。

p. Check the lubricating oil system for leaks.

检查润滑油系统有无泄漏点。

q. Adjust the oil pressure of the lubricating oil to the normal value, and change the control valve to the automatic control mode.

调节润滑油油压至正常值，控制阀改自动控制

r. Precautions: switch slowly to avoid the oil pressure fluctuation; pay attention to oil pressure changes by the internal operator; pay attention to check the lubricating oil system for leakpoints after the switching operation is completed by the external operator.

注意事项：切换要缓慢进行，避免油压波动；内操注意油压变化；外操切换后，注意检查润滑油系统有无泄露点。

(14) Oil filter operation steps 滤油机操作步骤

1) Initial status confirmation: The oil filter is shutdown during the normal production, and the state is determined by the technician according to the actual situation during abnormal working conditions.

初始状态确认：正常生产时滤油机为停运状态，异常工况时技术员根据实际另定。

2) Activate the oil filter and prepare for the work 运行滤油机准备工作

a. Check the daily work schedule, and operate the oil filter once per shift for 15 minutes;
确认日常工作安排，每班运行滤油机一次，时间为 15 分钟；

b. Make sure the oil filter equipment is in good condition.
确认滤油机设备为完好状态。

3) Oil filter process change and confirmation 滤油机流程更改与确认

a. Check that the oil filter outlet valve is in open;
确认滤油机出口阀为打开；

b. Check that the oil filter inlet valve and the lubricating oil tank extraction valve are closed;
确认滤油机入口阀和润滑油箱润滑油抽出阀为关闭；

c. Make sure that the filter of the oil filter and the inlet and outlet valves of the water filter are not closed, and the subline valve is not open.
确认滤油机的过滤器及滤水器出入口阀无关闭，副线未打开。

4) Start the oil filter 启动滤油机

a. Open the oil filter inlet valve and the lubricating oil tank extraction valve;
打开滤油机入口阀和润滑油箱润滑油引出阀；

b. Turn on the oil filter motor switch;
开启滤油机电机开关；

c. Check if the oil pump motor of the oil filter works normally;
检查滤油机油泵电机工作是否正常；

d. Check whether the outlet pressure and the inlet negative pressure of the oil filter are extremely high;
查看滤油机出口压力及入口负压是否过高；

e. Check the interface level of the dehydration bag of the oil filter, and dewater in time when the interface level is high.
查看滤油机脱水包界位，界位高时及时脱水。

5) Oil filtering process is completed 滤油结束

a. Operate the oil filter for 15 minutes, and check that there is no significant amount of water in the dewatering bag, and the interface level is not increased obviously after the dewatering valve is closed;
滤油机运行 15 分钟，确认脱水包内无大量水并关闭脱水阀后界位无明显上升；

b. Turn off the oil filter motor switch;
关闭滤油机电机开关；

c. Close the oil filter outlet valve and the lubricating oil tank extraction valve after the inlet and the outlet pressures of the oil filter return to zero.
滤油机出入口压力回零后，关闭滤油机出口阀及润滑油箱润滑油抽出阀。

6) Oil filter operation precautions 滤油机操作注意事项

a. The operator must confirm that the oil filter outlet valve is open before starting the oil filter, and must not leave the site when the oil filter is running. b. Stop the oil filter immediately and report to the technician when it is found that the inlet and the outlet pressures of the oil filter are abnormal.
启动滤油机前必须确认滤油机出口阀为打开状态，滤油机运行时操作人员不得离开现场。b. 当发现滤油机出入口压力异常时，应立即停运滤油机并向技术人员汇报。
c. Operate the oil filter continuously and report to the technician when it is found that there is no interface level after being dewatered for a long time, and a large amount of water is dewatered during the operation of the oil filter.
当发现运行滤油机，脱水包长时间脱水仍无界位，且脱出大量水时，继续运行滤油机并汇报技术人员。

(15) Unit abnormality treatment 机组异常处理
1) Stop supplying 3.5MPa steam or the pressure drops 停 3.5MPa 蒸汽或压力下降
Phenomenon: 现象：
a. Fully open the regulating steam valve of the steam turbine, and the steam flow rate is decreased (or the pressure is decreased), and the speed of the steam turbine is decreased;
汽轮机调节汽阀全开，蒸汽流量下降（或压力下降），汽轮机转速降低；
b. The rich gas flow rate is reduced and the turbine inlet pressure is increased.
富气流量降低，机入口压力上升。
Treatment: 处理：
a. Pay close attention to the position of the unit operating point, and open the anti-surge valve manually if necessary;
密切关注机组工况点位置，必要时手动打开防喘振阀；
b. Reduce the pressure for handling the situation if the inlet pressure of the turbine rises continuously; open the inlet flare-discharging valve and shut down the unit if it is still unable to maintain the pressure.
机入口压力不断上升，反应降量处理；仍无法维持，打开入口放火炬阀，停机组。
2) Deactivate the instrument fan 停仪表风
Phenomenon: 现象：
a. Fully open the surge valves of each section and the main air blower is operated safely;
各段喘振阀全开，主风机安全运行；
b. Fully open the lubricating oil control valve and the lubricating oil pressure is increased.
润滑油控制阀全开，润滑油压力升高。
Treatment: 处理：
a. Find the cause and restore the supply of air in time.
查找原因，及时恢复供风。
3) Stop the circulating water 停循环水

Phenomenon: 现象：

a. temperatures at the outlet of the lubricating oil cooler and that of the bearing rise;

润滑油冷油器出口温度上升，轴承温度上升；

b. The rich gas temperature increases and the steam consumption of the steam turbine increases.

富气温度上升，汽轮机蒸汽耗量上升。

Treatment: 处理：

a. Replace the circulating water with the fresh water.

循环水改用新鲜水。

b. The external cooling method can be applied if it is impossible to switch to the fresh water, and perform emergency shutdown if it is still unable to maintain the temperature.

无法改用新鲜水，可采用外部降温办法，仍无法维持，则紧急停机。

4) Shut down power 380V 停 380V 电

Phenomenon: stop operating the lubrication pump

现象：润滑油泵停运。

Treatment: 处理：

a. Check if the auxiliary oil pump is started. Adjust the oil pressure to the normal value in time if it is started and contact the electrician for inspection.

检查辅助油泵是否已启动，如果启动，及时调整油压至正常值，并联系电工检查。

b. If the auxiliary oil pump is not self-started, start the pump manually and check. If it is still not started, the unit will be in the self-protection interlocking state and stop.

若辅助油泵未自启动，则手动开泵检查，如果仍然未启动，则机组将自保联锁停机。

5) Aerostatic press surge 气压机喘振

Phenomenon: 现象：

a. The outlet pressure of the turbine changes, the flow of the rich gas fluctuates greatly, and the temperature of rich gas rises.

机出口压力忽高忽低，富气流量大幅度波动，富气温度升高；

b. The steam consumption of the steam turbine fluctuates frequently;

汽轮机蒸汽耗量频繁波动；

c. The unit vibrates, and there is surge shock sound at the inlet and the outlet.

机组振动，进、出口有喘振冲击声。

Treatment: 处理：

a. Open the anti-surge valve of the system manually if it does not open automatically;

若系统未自动打开防喘振阀，手动打开；

b. If the surge is severe and the anti-surge effect is poor, reduce the outlet pressure at the top of the re-absorption tower or open the flare-discharging valve at the top of the absorption tower.

若喘振剧烈，防喘振效果不佳，则降低再吸收塔顶出口压力，或打开吸收塔顶放火炬阀。

6) Unit failure and cause analysis 机组故障及原因分析

Table 34: Unit failure and cause analysis

表 34：机组故障及原因分析

S/N 序号	Failure content 故障内容	Possible reasons 可能的原因
1	Low lubricating oil header pressure 润滑油总管压力降低	1) Low oil level of oil tank. 油箱油位低。
		2) Blocking of oil pump suction pipe. 油泵吸入管堵。
		3) Air leakage of oil pump suction pipe. 油泵吸入管漏进空气。
		4) Oil pump failure 油泵故障
		5) Increasing pressure drop of oil filter. 油过滤器压降增加。
		6) Failure of safety valve or oil return valve, and excessive return oil. 安全阀或回油阀失灵，大量回油。
		7) Leaking points of oil line. 油路存在泄漏点。

Table 34: Unit failure and cause analysis (Continued)

表 34：机组故障及原因分析（续）

S/N 序号	Failure content 故障内容	Possible reasons 可能的原因
2	Spare pump self-start 备泵自启动	1) Low lubricating oil header pressure 润滑油总管压力降低
		2) Failure of main oil pump motor or power supply. 主油泵电机或电源故障。
		3) Malfunction of pressure switch. 压力开关误动作。
3	Too-low oil pressure and self-protection shutdown 油压过低，自保停机	1) Power failure (dual power off). 电源故障（双电源均断电）。
		2) Severe oil leakage of system. 系统漏油严重。
		3) Malfunction of instrument. 仪表误动作。

4	Bearing with overtemperature 轴承温度过高	1) Reduction of oil intake (inlet blocking). 进油量减少（进口堵）。
		2) Oil deterioration (containing water, sludge, etc.). 油质变坏（含水、油泥等）。
		3) Instrument failure (wrong indication) 仪表失灵（指示错误）
5	Water in lubricating oil 润滑油中带水	1) Leakage of oil cooler. 油冷却器漏。
		2) The oil contains steam to condensate into water due to the loose shaft seal of steam turbine. 汽轮机轴封不严，使蒸汽进入油中冷凝成水。
6	Reduction of outlet pressure of main fan 主风机出口压力下降	1) Too-high inlet temperature. 入口温度太高。
		2) Leakage of outlet pipeline. 出口管线漏。
		3) Automatic opening of emptying valve due to failure of anti-surge system. 反喘振系统失灵，使放空阀自动打开。
		4) Failure of pressure gauge. 压力表失灵。

Table 34: Unit failure and cause analysis (Continued)

表 34：机组故障及原因分析（续）

S/N 序号	Failure content 故障内容	Possible reasons 可能的原因
6	Reduction of outlet pressure of main fan 主风机出口压力下降	5) Failure of three-device system. 三器系统故障。
		6) Abrasion or soot formation of movable vane. 动叶磨损或积灰。
7	Reduction of main fan emission 主风机排量降低	1) Too-large sealing clearance. 密封间隙过大。
		2) Blocking of inlet air filter. 入口空气过滤器堵塞。
		3) Failure of flow regulation system instrument. 流量调节系统仪表失灵。
		4) Failure of servo cylinder system. 伺服油缸系统故障。

		5) Failure of flow indicator. 流量指示表失灵。
8	Surge of main fan 主风机喘振	1) Blocking of outlet pipeline system. 出口管路系统堵塞。
		2) Failure of anti-surge system. 反喘振系统失灵。
		3) Malfunction of flow regulation system. 流量调节系统误动作。
9	Reverse flow of main fan 主风机逆流	1) Sudden rising of gasifier pressure, and failure or malfunction of check valve and reverse flow control. 气化器压力突然上升，且单向阀、逆流控制失灵或误动作。
10	Overspeed 超速	1) Sudden reduction of load of main fan. 主风机负荷突然减小。
		2) Fracture of coupling. 联轴器断裂。
11	Excessive vibration 振动过大	1) Decentraction of two rotors (characterized by large bearing vibration near the coupling and high oil temperature). 两转子之间不同心（表现为靠联轴节处轴承振动大，油温高）。
		2) Imbalance of rotor (deformation; uneven abrasion or catalyst adhesion on movable vane of flue gas turbine). 转子不平衡（变形；烟气透平动叶不均匀磨损或粘催化剂）。

Table 34: Unit failure and cause analysis (Continued)

表 34：机组故障及原因分析（续）

S/N 序号	Failure content 故障内容	Possible reasons 可能的原因
11	Excessive vibration 振动过大	3) Resonance (torsional vibration or bending vibration between units, and resonance between unit and foundation). 共振（机组之间产生扭振或弯振，机组与基础之间共振等）。
		4) Friction or contact between seal and shaft. 密封与轴摩擦或接触。
		5) Bearing abrasion with excessive clearance 轴承磨损，间隙过大。
		6) Operation of main fan in surge or stall area. 主风机在喘振区或失速区运行。
		7) Movement of anchor bolt or stay bolt. 地脚螺栓或支撑螺栓动。
12	Excessive axial displacement	1) Bearing worn abrasion or damage. 推力轴承磨损或损坏。

	轴向位移过大	2) Movement of installation position of axial translation monitor. 轴位移监测器安装位置移动。
		3) Instable operation of main fan or steam turbine. 主风机或汽轮机操作不稳定。
13	High bearing temperature 轴承温度高	1) Oil shortage. 油量不足。
		2) Oil deterioration. 油质变坏。
		3) Shaft vibration. 轴振动。
		4) Bearing failure 轴承故障
		5) Failure of thermometer. 温度计失灵。

2.4.10 Main fan operation method 主风机操作法

The main fan unit is the key equipment of flexicoking unit and mainly supplies wind for gasifier burning, temperature regulation of heater and coke powder delivery. The main fan unit includes: steam turbine and axial-flow air compressor; Auxiliary equipment such as quick-closing speed regulation system of steam turbine, exhaust cooling system of gland, static blade servo system of main fan and lubricating oil station; and related process pipelines, piping, auxiliary pipelines and instrument;

主风机机组是灵活焦化装置的关键设备，主要任务是提供气化器烧焦、加热器调温及焦粉输送用风。主风机机组包括：蒸汽轮机、轴流式空气压缩机；汽轮机速关调速系统、汽封抽气冷却系统、主风机静叶伺服系统、润滑油站等辅助设备；以及与它们相关的工艺管线、管件与辅助管线、仪表等。

Main fan: the main fan is an axial-flow compressor (the flowing direction of gas in the compressor is roughly parallel to the rotating shaft) (model: AV56-18, adjustable all- stationery blade), the performance characteristics are wide flow and pressure regulation range and higher efficiency. The compressor is mainly composed of rotor, stationary blade casing, adjustment cylinder and support, casing, bearing seat, stationery blade regulation mechanism, coupling and base and mainly including two basic parts: 1) The rotating part that takes rotation shaft as the main body, called rotor; 2) The fixed part that takes the casing and the stationery parts on the casing as the main body, called stator. The unit is driven by steam turbine and connected with flexible coupling. The thrust bearing is arranged on the intake side, and the fixing points of casing are arranged on the exhaust side. The number of axial-flow compressor stage is 18

主风机：主风机选用轴流式压缩机（气体在压缩机内的流动方向大致平行于旋转轴），型号为AV56-18，全静叶可调，其性能特点是流量、压力调节范围宽广，同时能保持较高的效率。压缩机主要由转子、静叶承缸、调节缸及支撑、机壳、轴承座、静叶调节机构、联轴器及底座等组成，总体分为两大基本部分：一是以转轴为主体的可以旋转的部分，简称为转子；二是以机壳及装在机壳上各静止部件为主体的固定部分，简称为静子或定子。机组采用蒸汽轮机驱动，采用挠性联轴器联接，止推轴承设置在进气侧，机壳固定点设置在排气侧。轴流压缩机级数为 18 级

Steam turbine: steam turbine is the rotating prime motor acted by means of steam, converts the heat energy of steam into mechanical energy that drives the steam turbine rotor to rotate, so as to drive other machinery. The unit is back-pressure steam turbine, that is, the exhaust pressure (back pressure) is higher than the atmospheric pressure. The structural composition mainly includes: rotating part-rotor and vane; stationery part-cylinder and steam room.

蒸汽轮机：汽轮机是利用蒸汽来做功的旋转式原动机，将蒸汽的热能转化为推动汽轮机转子旋转的机械能，从而驱动其他机械。本机组采用背压式汽轮机，即排汽压力（背压）高于大气压力。其结构组成主要为：转动部分—转子、叶片；静止部分—汽缸、蒸汽室。

Auxiliary equipment of unit:

机组辅助设备：

a. Diaphragm coupling 膜片式联轴器

b. Turning gear 盘车装置

c. Lubricating oil station 滑油站

d. Main oil tank 主油箱

e. Oil pump 油泵

f. Oil cooler 油冷却器

g. Oil filter 油过滤器

h. Pneumatic diaphragm pressure regulation valve 气动薄膜式压力调节阀

i. Self-reliance pressure regulating valve of pump outlet 泵出口自力式调压阀

j. Top oil tank 高位油箱

k. Three-valve threshold of top oil tank 高位油箱三阀组

l. Accumulator 蓄能器

m. Pump outlet safety valve 泵出口安全阀

n. Air filter of main fan 主风机空气过滤器

o. Intake silencer of man fan 主风进气消声器

p. Exhaust silencer of man fan 主风排气消声器

q. Outlet exhaust silencer of main fan 主风出口放空消声器

r. Inlet exhaust silencer of steam turbine 汽轮机入口放空消声器

s. Anti-surge valve 反喘振阀

t. Outlet check valve of main fan (DN800) 主风出口单向阀（DN800）

Principal control point 主要控制点

(1) Speed control of steam turbine 汽轮机转速控制

Seven speed probes are mounted on the steam turbine support, of which SE713 is connected to the tachometer for local display, and SE-717A/B/C are connected to the SIS system for over-speed protection, SE-715A/B/C are connected to the CCS system for rotation speed control. The unit 505 is speed control circuit. The speed sensor is passive electromagnetic speed sensor. 505 also receives the steam turbine speed signals of two electromagnetic speed sensors, the speed PID control amplifier compares the signal and speed given value and outputs the actuating signals (4-20mA) to the signal low-selecting bus. The given value of speed circuit can be adjusted through the command of speed controller panel and remote contact input. If the speed is increased to the speed regulation range (2250rpm-3150rpm), and the speed value can be given again through the remote speed given value (from PLC system).
在汽轮机的支座上装有七个转速探头，其中 SE713 接到转速表用于就地显示，SE-717A/B/C 三个接到 SIS 系统用于超速保护，SE-715A/B/C 三个接到 CCS 系统用于转速控制。本机组 505 采用的是转速控制回路。转速传感器选用的是无源电磁式转速传感器。505 同时接收二个电磁式转速传感器的汽轮机转速信号,转速 PID 控制放大器将该信号与转速给定值进行比较后输出执行信号(4-20mA 电流)通过信号低选总线。转速回路的给定值可以通过调速器面板、远程触点输入等指令来调整。如果转速已经升在调速范围内（2250rpm-3150rpm），可以通过远程转速给定（来自 PLC 系统）来重新给定转速值。

To ensure high-efficiency and stable operation of main fan, the speed regulation system shall adjust the speed value to be 5,500r/min automatically.
为使主风机高效率平稳运行，调速系统自动调节，将转速值恒定在 5500r/min。

(2) Flow control of main fan 主风机流量控制

The flow regulation system of main fan is composed of two parts, that is, the stationery blade positioning and flow control are cascaded. The former is composed of position servo controller, electro-hydraulic servo valve, servo cylinder, position sensor and displacement transmitter to form a small inner closed loop of cascade regulation system; the latter is composed of actual flow measurement circuit, flow regulator, stationery blade positioning system and the axial-flow compressor unit with stationery blade regulation mechanism to form a large outer closed loop. The flow change of main fan is realized by adjusting the angle of stationery blade of axial-flow compressor: the master control room, compares the command signal of flow regulator with the measured flow value of Venturi tube, sends difference signal to the stationery blade positioning system of main fan, does reciprocating motion through servo motor, drives the stationery blades on the vane casing to rotate through guide ring, crank and slide block and adjusts the flow.
主风流量调节系统由两大部分组成，即静叶定位与流量控制两个部分串级工作。前者由位置伺服控制器、电液伺服阀、伺服油缸、位置传感器、位移变送器等组成串级调节系统的小内闭环；后者由实际流量测量回路、流量调节器、静叶定位系统和带有静叶调节机构的轴流压缩机组成大外

闭环。主风流量的变化是通过调节轴流压缩机静叶角度实现的：主控室流量调节器的指令信号和文丘利管的实测流量值比较，将差值信号送给主风机静叶定位系统，再通过伺服马达做往复运动，从而通过导向环、曲柄、滑块带动安装在叶片承缸上的各级静叶旋转，达到调节流量的目的。
The position servo controller HIC-61144 receives the output of flow regulator FI-11801 as the given value, the actual value comes from the output of displacement transmitter ZJ-61144, and the output signal of position controller adjusts the angle of stationery blade of compressor. During stable operation of unit, the deviation between given value and actual value is zero, there is no control current passing by the servo valve, and the angle between the servo cylinder and stationery blade keeps unchanged. When the air volume of main fan is increased, the given value of flow regulator will also be increased and output the positive deviation signal to the servo valve. The servo valve will deliver high pressure oil to the servo cylinder proportionally and drive the piston to move toward the opening direction of stationery blade. The feed signals of displacement sensor (measure the cylinder stroke) will be increased with the increasing angle of stationery blade. When the difference between feed signal and given signal is zero, the output of controller will also be zero, the servo valve will be back to the balance position, and the piston and stationery blade will stay at the changed position.
位置伺服控制器 HIC-61144 接受流量调节器 FI-11801 的输出作为其给定值，其实际值来自位移变送器 ZJ-61144 的输出，位置控制器的输出信号调节压缩机静叶角度。机组稳定运行时给定值与实际值两者偏差为零，伺服阀无控制电流通过，伺服油缸及静叶角度不变。当主风量需求增大，流量调节器给定值增加，最终输出正偏差信号给伺服阀，此时伺服阀将有比例地输出高压油至伺服油缸，带动活塞向静叶开大方向移动，静叶角度增大，与此同时位移传感器测得的（测量油缸行程）反馈信号随之增大，当与给定信号差值为零时，控制器输出为零，伺服阀回到平衡位置，活塞及静叶将停留在变化后的位置上。

(3) Anti-surge control of main fan 主风机防喘振控制
Surge is the inherent characteristic of turbine compressor. When reducing the flow along the equal-opening characteristic line, the axial-flow compressor may not work stably with the further rotation and separation along the blade height; all gas flow and pressure in the axial-flow compressor and pipeline will fluctuate periodically in low frequency and large amplitude manner. Once there is low-frequency and large-amplitude airflow pulsating, the continuous stable flowing of the whole compressor will be damaged completely, accompanied by strong mechanical vibration, and such unstable condition of compressor is called surge. The whole machine will be damaged if the surge of compressor is not prevented in time or shut down.
喘振是透平压缩机的固有特性。当轴流压缩机沿着等开度特性线减小流量时，随着沿叶高旋转分离的产生和进一步发展就有可能产生轴流压缩机的不稳定工作现象：轴流压缩机和管路中全部气体流量和压力将周期性地低频率、大振幅的上下波动。这种频率低、振幅大的气流脉动一经产生，

则流经整个压缩机的连续稳定流动被完全破坏，并伴随以强烈的机械振动，压缩机的这种不稳定工况称为喘振。当压缩机发生喘振时，如不及时防止或停机，将导致整个机器的毁坏。

Note: the axial-flow compressor shall not operate under the above condition in any case.
注意：无论在任何情况下，不允许轴流压缩机在上述状况下运行。

(1) Split control of anti-surge emptying valve of main fan 主风机防喘振放空阀的分程控制

The two anti-surge emptying valves FV-11802 and FV-11803 (10" and 14") of the main fan are controlled in split ranging. When opening the main fan, the small emptying valve (FV-11802) will be opened firstly; when opening the small emptying valve to 80%, the big emptying valve will be opened; when closing the main fan, the big emptying valve (FV-11803) will be closed firstly; when closing the big emptying valve to 6%, the small emptying valve will be closed.
主风机两只防喘振放空阀 FV-11802、FV-11803（10″、14″）为分程控制，打开时放空小阀（FV-11802）先打开，当小阀开至 80%开度时大阀开始打开；关闭时放空大阀（FV-11803）先关闭，当大阀关至 6%开度时小阀开始关闭。

Table 35: Split control output comparison of anti-surge valve of main fan
表 35：主风机防喘振阀分程控制输出对照表

Controller output 控制器输出	Big emptying valve 大阀	Small emptying valve 小阀
100%	Full-open 全开	Full-open 全开
80%	Closing: 94% 94%关度	Full-open 全开
75%	Full-close 全关	Closing: 20% 20%关度
0%	Full-close 全关	Full-close 全关

(2) Control mode of emptying valve 放空阀的控制方式

a. Manual method 手动方式

The opening of anti-surge valve can be adjusted manually regardless of the output of automatic part, and the output of controller will track the manual set value.
可任意手动调节防喘振阀开度而不管自动部分的输出情况，控制器的输出会跟踪手动设定值。

Note: the unit may be in the surge state during operation under this mode, and anti-surge protection will act.
注意：这种方式在正常运行时可能使机组进入喘振状态，反喘振保护动作。

b. Automatic 自动方式

The output of anti-surge regulator comes from the automatic part, and manual output will track the automatic output.

防喘振调节器输出来自自动部分，手动输出跟踪自动输出。

c. Semi-automatic 半自动方式

The output of anti-surge control of main fan is generated from high selection of automatic part and manual part, that is, the manual output can only be opened larger than the automatic part rather than closed smaller. To protect the unit, the anti-surge valve shall be in the automatic operation mode in any case, but the regulator also has the manual adjustment function. The manual adjustment is valid only when the manual set signal is higher than the automatic output signal, or it will be invalid. Therefore, the emptying valve will not be closed and result in accident due to error delivery of large given signal under manual operation.

主风机防喘振控制的输出由自动部分和手动部分的高选生成，即手动输出只能开得比自动部分更大而不能关得更小。为了保护机组，防喘振阀在任何时间都设置在自动操作模式，但调节器也具有手动调节功能。当手动设定信号高于自动输出信号时，手动调节才有效，否则无效。这样可以保证手动操作时即使误给大信号也不会使放空阀关闭而造成事故。

(3) Reverse flow protection control 逆流保护控制

Reverse flow protection is the second protective measures except for the anti-surge system, the measurement signal comes from the differential pressure PDIS-61141 of inlet throat and formed by the following "Three-level" protection.

逆流保护是继喘振保护系统之后的第二个保护性措施，测量信号来自入口喉部差压 PDIS-61141，由以下“三级”保护构成。

1) First-level protection 第一级保护

When there is surge signal, the system will send surge alarm, the anti-surge regulation valve will work; if the surge signal disappears within 3s after regulation and never occurs within 20s, the second-level protection will not be started.

当出现喘振信号后，系统发出喘振报警，反喘振调节阀起作用，调节后若 3 秒内喘振信号消失，并在此后的 20 秒内不再出现，则不进入第二级保护。

2) Second-level protection 第二级保护

After anti-surge regulation, if the surge signal still exists after 3s or disappears within 3s but occurs again within 20s, the main fan will be in the safe operation status, and the system will send the reverse flow alarm.

进行反喘振调节后，若 3 秒后喘振信号仍存在，或在 3 秒内消失但之后的 20 秒内再次出现，则主风机进入安全运行状态，系统发出逆流报警。

3) Third-level protection 第三级保护

If the reverse flow cannot be eliminated when the main fan is in the safe operation status, the unit will be shutdown in emergency automatically when the continuous time is more than 5s.

若主风机进入安全运行状态后，逆流工况仍不能消除，当持续时间超过 5 秒，机组自动紧急停机。

Note:

说明：

a. The anti-surge valve is provided with a manual blowoff button so that the surge valve can be opened rapidly in emergency.

防喘振阀另设一手动放空按钮，遇紧急情况时，可按此按钮快速打开喘振阀。

b. Function of manual reclosing button: when a certain command does not act, press the button to execute again.

人工再投入按钮作用：当某一项指令未动作时，可按此按钮再次执行。

4) Reverse flow test 逆流试验

The test position of "Reverse flow test" switch is equal to provide a "Reverse flow signal" to the reverse flow protection logic system. Therefore, simulate the continuous time of "Reverse flow" by adjusting the placement time of switch on "Test", simulate the number of "Reverse flow" pulse signals by adjusting the rotating times of "Test", and verify whether the working state of reverse flow protection system is normal.

“逆流试验”开关的试验位置相当于给逆流保护逻辑系统提供一个“逆流信号”，因此可由开关置于“试验”位置的时间长短模拟“逆流”的持续时间，由旋向“试验”位置的次数模拟“逆流”脉冲信号的个数，并依次校验相应逆流保护系统的工作状态是否正常。

"Reverse flow test" will be used during logic commissioning. Don't click this button during normal operation (the operation authority is set as the highest level).

“逆流试验”按钮是在逻辑调试时用的，正常运行时，禁止点击此按钮（已设置操作权限为最高级）。

(4) Unit lubricating oil pressure control 机组润滑油压力控制

1) Control mode: when the PV value in the control loop is higher/lower than the set SP value, the OP output value of PIC-61309 will decrease/increase in the automatic state, and the field control valve position of PV-61309 will follow the instrument electrical converter to turn down/up, so that the pressure of the lubricating oil header after the valve is lowered/increased to maintain the lubricating oil pressure of the bearing pad within the design range.

控制方式：PIC-61309 在自动状态下，当控制回路中的 PV 值高于/低于设定 SP 值时，其 OP 输出值将减小/增大，通过仪表电气转换器，使现场控制阀 PV-61309 阀位跟着关小/开大，从而控制阀后润滑油总管压力下降/上升，以保持供轴瓦的润滑油压力在设计范围内。

2) Exception handling 异常处理

Table 36: Exception handling

表 36：异常处理

Phenomenon 现象	Cause 原因	Solution 处理方法

Pressure fluctuates during normal operation 正常运行时，压力出现波动	Control valve failure 控制阀失灵	Change the subline on site and contact the instrument for processing. 现场改副线，联系仪表处理。
	Primary instrument failure 一次表失灵	Change the mode of control valve to manual and contact the instrument for processing. 控制阀改手动，联系仪表处理。
	Spare pump self-start 备泵自启	Check the cause of the spare pump self-starting and stop a lubrication pump. 查清备泵自启原因，停一台润滑油泵。
	The outlet pressure of the lubrication pump fluctuates 润滑油泵出口压力波动	Inspect the lubrication pump and field pressure control valve of pump outlet. 检查润滑油泵和泵出口现场压控阀。
The pressure is still low after the control valve output is fully opened in normal operation 正常运行时，控制阀输出全开后压力仍偏低	Control valve failure 控制阀失灵	Change the subline on site and contact the instrument for processing. 现场改副线，联系仪表处理。
	Primary instrument failure 一次表失灵	Change the mode of control valve to manual and contact the instrument for processing. 控制阀改手动，联系仪表处理。
	The outlet pressure of the lubrication pump is low 润滑油泵出口压力偏低	Inspect the lubrication pump, field pressure control valve, safety valve and lubricating oil tank temperature. 检查润滑油泵、现场压控阀、安全阀和润滑油箱温度。
	Increase lubricating oil consumption in the rear 后路润滑油使用量增加	Inspect the oil quantity of each bearing pad, the oil filling valve of high oil tank, and the oil return tank crossover valve of lubricating oil header. 检查各轴瓦进油量、高位油罐充油阀、润滑油总管回油箱跨线阀。
In normal operation, the pressure display suddenly becomes zero or a bad	Control valves failure and all-off 控制阀失灵全关	Self-protection will open the control valve subline, keep the lubricating oil supply when shutdown. 停机自保动作，开控制阀副线，保持停机润滑油供给。
	Primary instrument failure 一次表失灵	Change the mode of control valve to manual and contact the instrument for processing. 控制阀改手动，联系仪表处理。

value occurs. 正常运行，压力显示突然为零或出现坏值。	The main oil pump jumps, the spare pump does not self-start 主油泵跳车，备泵没有自启	Shutdown and self-protection, namely emergency stop. 停机自保动作，紧急停机。

Main fan unit interlock logic 主风机机组联锁逻辑

(1) Starting condition of the turning 盘车启动条件

1) Lubricating oil pressure (PISA-61350) is greater than 0.2MPa;

润滑油压力（PISA-61350）大于 0.2MPa；

2) Unit speed (SI-62302) is 0;

机组转速（SI-62302）为 0；

3) Adjust turning motor to self-control mode;

盘车电机投自控。

Note: the turning shall not be done prior to confirming that the unit has been completely stopped.

注意：必须在人为确认机组完全停止后方可盘车。

(2) Self-starting protection of lubricating oil spare pump 润滑油备用泵自启动保护

1) The main and spare pumps can be set arbitrarily.

主、备泵可任意设定。

2) If the pump A is the main pump, the pump B shall be set to self-start mode during normal operation. When the lubricating oil pressure (PS-61350 or PISA-62301) is less than 0.18MPa, the pump B will start automatically.

若以 A 泵为主泵，则在正常操作时，应设 B 泵为自启动方式，当检测到润滑油压力（PS-61350 或 PISA-62301）低于 0.18MPa 时，B 泵自动启动。

(3) Stopping conditions of lubricating oil spare pump 润滑油备用泵停泵条件

1) The main and spare pumps are running at the same time;

主、备泵同时运行；

2) Lubricating oil pressure is normal;

润滑油压力正常；

3) Adjust main and spare pumps to be all automatic control.

主、备泵均投自控。

(4) Lubricating oil electrical heating start condition 润滑油电加热启动条件

1) The temperature of the lubricating oil tank is low;

润滑油箱温度低；

2) The liquid level of the lubricating oil tank is normal;
润滑油箱液位正常；
3) Adjust lubricating oil electrical heater to be automatic control and started manually.
润滑油电加热器投自控，手动启动。

(5) Unit start logic 机组启动逻辑
1) Before start, confirm whether the following conditions are satisfied (green light on indicates satisfied):
启动前，确认下列各项条件满足（亮绿灯表示满足）：
a. Steam turbine 1# main steam valve all-off;
汽轮机 1#主汽门全关；
b. Steam turbine 2# main steam valve all-off;
汽轮机 2#主汽门全关；
c. Memory reset;
存储器复位；
d. Process allows start;
工艺允许启动；
e. Adjust the oil pressure to normal;
调节油压力正常；
f. Lubricating oil pressure is normal;
润滑油压力正常；
g. Lubricating oil temperature≥25℃;
润滑油温度≥25℃；
h. The outlet check valve of main fan is fully closed;
主风机出口单向阀全关；
i. 1# anti-surge valve (small) is fully opened;
1#防喘振阀（小）全开；
j. 2# anti-surge valve (big) is fully opened;
2#防喘振阀（大）全开；
k. The turning is in normal;
盘车状态正常；
2) Unit start mode description 机组启动方式说明
Start the standby indicator light to illuminate the green light after all the above conditions are met, click the "PERMISSIVE", unlock the steam turbine quick-closing system lockout, remove the site panel, operate the quick-closing component, and open the main steam valve. The steam turbine can be chosen to controlled automatically or remotely at that time.
以上条件全部满足后，启动待命指示灯亮绿灯，点击允许启动按钮，汽轮机速关系统闭锁解除，去现场操作盘，操作速关组件，打开主汽门。此时可选择汽轮机自动或远程控制。

a. Automatic control: automatically operate the steam turbine through the controlling system;
自动控制：通过控制系统，自动操作汽轮机开机；
b. Remote control: the steam turbine is turned on according to the speed-up curve by operating the speed "Up /Down".
远程控制：通过操作升速、降速按钮，按照升速曲线操作汽轮机开机。

(6) Control logic of safety operation 安全运行控制逻辑

The safety operation refers to the unit stops supplying air temporarily to the outside during normally operation due to the operation need or own reasons and works in the "Self-protection operation" state under rated speed without shutting down the main fan.
所谓安全运行是指机组在正常运行中，因装置操作需要或机组本身的原因，暂时切断向外供风，不停主风机的一种“自保运行”状态，机组仍在额定转速下运行。
1) Reasons for safety operation:
导致安全运行的原因：
a. The low-flow self-protection of main fan acts;
装置主风低流量自保动作；
b. The main fan is in the reverse flow;
主风机进入逆流状态；
c. Manual safety operation of main fan.
主风机手动安全运行。
2) Safe operation status of unit:
机组安全运行状态：
a. Open the 1# and 2# anti-surge valve forcibly and rapidly;
1#、2#防喘振阀强制快速打开；
b. The outlet check valve is closed forcibly;
出口单向阀强制关闭；
c. The angle of stationery blade is closed to 22°forcibly.
静叶角度强制关到 22°。
3) After command sending, the feedback signal acts as follows:
指令发出后，反馈信号动作如下：
a. If the fully-open yellow indicator light of emptying valve (small) is on, which indicates the small emptying valve is fully opened;
放空阀（小）全开指示灯亮黄灯，表示放空阀小阀已全开；
b. If the fully-open yellow indicator light of emptying valve (big) is on, which indicates the big emptying valve is fully opened;
放空阀（大）全开指示灯亮黄灯，表示放空阀大阀已全开；
c. If the closing yellow indicator light of outlet check valve is on, which indicates the check valve is closed;

出口单向阀关指示灯亮黄灯，表示单向阀已关；

d. If the check valve is not closed or the anti-surge valve is not opened, the alarm light will be on; press "Manual reclosing" to execute the command again.

若单向阀未关闭，或防喘振阀未打开，则报警灯亮，此时按“人工再投入”按钮，再次执行命令。

4) If the above feedback action is normal, press the safety operation reset and reverse flow reset button to enter the automatic operation logic.

上述反馈动作正常，安全运行复位和逆流复位按钮后，即可进入自动操作逻辑。

(7) Automatic operation logic 自动操作逻辑

After startup, the speed is 5,500rpm; reset the memory and click the automatic operation button:

启机结束，转速 5500rpm，复位存储器，点击自动操作按钮则：

1) If the outlet damping check valve is unlocked, the solenoid valve of check valve is powered on and started;

出口阻尼单向阀解锁，表示单向阀的电磁阀得电，开启；

2) If the stationery blade regulator lockout is unlocked, the regulator can be adjusted;

静叶调节器闭锁解除，表示调节器可调；

3) If the 1# and 2# anti-surge valve lockout is unlocked, the valve can be adjusted.

1#、2#防喘振阀闭锁解除，表示阀门可调。

(8) Emergency shutdown logic 紧急停机逻辑

1) Interlock shutdown will be implemented when the following situations happened:

当发生下列情况时，将实行联锁停机：

a. Speed of steam turbine ≥6,237r/min (Two-out of three)

汽轮机转速≥6237r/min（三取二）

b. Too low lubricating oil pressure≤0.12MPa (Two-out of three)

润滑油压过低≤0.12MPa （三取二）

c. Steam turbine exhaust pressure≤0.2MPa(a) (Two-out of three)

汽轮机排气压力≤0.2MPa(a) （三取二）

d. Steam turbine axial translation≥+0.6mm or ≤-0.6mm (Two-out of three)

汽轮机轴位移≥+0.6mm 或≤-0.6mm （三取二）

e. Steam turbine bearing vibration≥100μm (one-out of four)

汽轮机轴承振动≥100μm （四取一）

f. Steam turbine bearing temperature≥110℃ ° (one-out of four)

汽轮机轴承温度≥110°C （四取一）

g. Bearing vibration of main fan ≥117μm (one-out of four)

主风机轴承振动≥117μm （四取一）

h. Main fan bearing temperature≥110℃ ° (one-out of four)

主风机轴承温度≥110°C （四取一）

i. Main fan axial translation≥+0.6mm or ≤-0.6mm (Two-out of three)

主风机轴位移≥+0.6mm 或≤-0.6mm （三取二）

j. Continuous reverse flow time: more than 10s

持续逆流时间大于 10 秒

k. Manual shutdown

手动停机

2) The following commands and feedback signals are issued upon the shutdown signal occurring:

停机信号发生后，发出以下指令及反馈信号：

a. Open the emptying valve (small), the red light is on (the green light is on if normal);

开放空阀（小），红灯亮（正常绿灯）；

b. Open the emptying valve (big), the red light is on (the green light is on if normal);

开放空阀（大），红灯亮（正常绿灯）；

c. Turn off the turbine quick-closing valve, the red light is on (normal green light);

关透平速关阀，红灯亮（正常绿灯）；

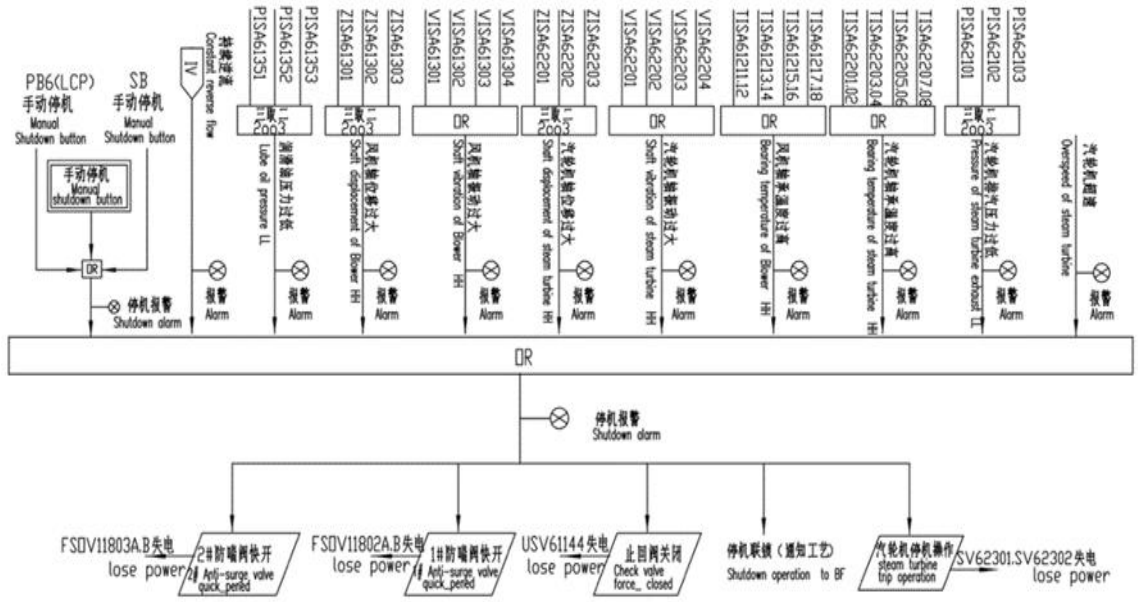
d. Close the damping check valve, the red light is on (the green light is on if normal);

关阻尼单向阀，红灯亮（正常绿灯）；

3) Emergency shutdown self-protection interlock logic

Figure 29: Emergency shutdown self-protection interlock logic

图 29：紧急停机自保联锁逻



(9) List of alarm and interlock set values 报警、联锁整定值一览表

Table 37: List of alarm and interlock set values

表 37：报警、联锁整定值一览表

S/N 序号	Installation location and use 安装位置及用途	Operating value 操作值	Alarm limit 报警限	Alarm value 报警值	Stopping value 停车值	Notes 备注
1	Steam turbine regulates oil pressure 汽轮机调节油压力	0.8MPa	L	0.65	-	Start spare pump 启动备泵
2	Lubricating oil manifold pressure 润滑油集合管压力	0.25MPa	L	0.18MPa	-	Start spare pump 启动备泵
			LL	0.15MPa	0.12MPa	-

Table 37: List of alarm and interlock set values

表 37（续）：报警、联锁整定值一览表

S/N 序号	Installation location and use 安装位置及用途	Operating value 操作值	Alarm limit 报警限	Alarm value 报警值	Stopping value 停车值	Notes 备注
3	Lubricating oil filter differential pressure 润滑油过滤器差压	＜0.15MPa	H	0.15MPa	-	Shall switch 须切换
4	Lubricating oil tank level 润滑油箱液位	-	L	730mm	-	Distance from the top of the oil tank 距油箱顶
5	Lubricating oil temperature after cooler 冷却器后润滑油油温	35℃～45℃	H	55℃	-	-
6	Steam turbine exhaust pressure 汽轮机排气压力	0.45MPa(a)	L	0.3(a)	0.2(a)	-
			H	0.8(a)		-
7	Steam turbine speed 汽轮机转速	r/min	H	6000	6237	-
8	Bearing temperature of unit 机组各轴承温度	＜95℃	H	95℃		-
			HH	100℃	110℃	-

9	Bearing pad vibration of unit 机组各轴瓦振动	＜ 50μm	H	72μm		-
			HH	100μm	110μm	-
10	Unit axial translation 机组轴位移	＜ ±300μm	H	±400μm	-	-
			HH	±500μm	±600μm	-
11	Differential pressure of inlet filter of main fan 主风机入口过滤器差压	＜ 600Pa	H	600Pa	-	-

Startup regulations of steam turbine-main fan unit 汽轮机－主风机机组开机规程

(1) Preparation and commissioning before start: preparations for start (such as listening rod, flashlights, hand-held tachometers, thermometers, wrenches, screwdrivers, and record sheets).

启动前的准备和调试工作：做好启动前的准备工作（如听音棒、手电筒、手持转速表、测温仪、扳手、螺丝刀、记录表等）。

1) General preparations 一般准备工作

Equipment state:

机械设备状态：

a. Check that the overhaul of steam turbine, main fan, and turning gear is completed, and the acceptance is qualified;

确认汽轮机、主风机、盘车装置检修完毕，验收合格；

b. Check that the overhaul of steam turbine speed regulation system has been completed and the acceptance is qualified;

确认汽轮机调速系统检修完毕，验收合格；

c. Check that the overhaul of gland ejection and cooler is completed, and the acceptance is qualified;

确认汽封抽气、冷却器检修完毕，验收合格；

d. Check whether the inlet filter is overhauled, cleaned and accepted;

确认入口过滤器检修完毕，清扫干净，验收合格；

e. Check whether the silencer system is checked and accepted;

确认消音器系统检查完毕，验收合格；

f. Check that the overhaul of oil pump motor has been completed, the single test is qualified and the steering is correct.

确认油泵电机检修完，单试合格，转向正确。

State of lubricating oil system:

润滑油系统状态：

a. Check that the oil tank cleaning is qualified;

确认油箱清扫合格；

b. Check that the oil tank has been injected to L-TSA46 steam turbine oil, the liquid level is normal, and the bottom is free from water;

确认油箱加入 L-TSA46 汽轮机油，液位正常，底部无水；

c. Check that the steam heater of oil tank is normal;

确认油箱蒸汽加热器正常；

d. Check that the chemical test and analysis of lubricating oil are qualified;

确认润滑油化验分析合格；

e. Check that the accumulator is filled with nitrogen pressure with 0.144MPa;

确认蓄能器充氮气压力 0.144MPa；

f. Check that the oil transportation is qualified, and no oil leakage occurs to the oil system;

确认油运合格，油系统无漏油；

g. Check that the oil line is smooth and the windows are clear;

确认油路畅通，各视窗清晰；

h. Check that each safety valve is qualified and installed correctly.

确认各安全阀校验合格，安装正确。

State of stationery blade actuator system:

静叶执行机构系统状态：

a. Check that the oil tank cleaning is qualified;

确认油箱清扫合格；

b. Check that the gearbox is filled with T68 gear oil, the liquid level is normal and there is no water at the bottom;

确认变速箱加入 T68 齿轮油，液位正常，底部无水；

c. Check that the chemical test and analysis of oil are qualified;

确认油化验分析合格；

State of special valve and system pipe:

特阀、系统管道状态：

a. Check that the inlet pipeline system of main fan is cleaned, the acceptance is qualified with the sealed manhole;

确认主风机入口管路系统清扫干净，验收合格，人孔封好；

b. Check whether the outlet check valve of main fan is calibrated, flexible and normal;

确认主风机出口单向阀调校完毕，灵活好用；

c. Check whether the outlet electric valve of main fan is powered on, flexible and normal;

确认主风机出口电动阀送电，灵活好用；

d. Check that anti-surge valves at the outlet of main fan have been adjusted, which are flexible and easy to use;

确认主风机出口防喘振阀调校完毕，灵活好用；

e. Check that the hand valve switch of unit system is flexible and easy to use;
确认机组系统手阀开关灵活好用；
f. Check whether the inlet shut-off valve of steam turbine is fully opened and there is no medium in the condensate drain behind the valve.
确认汽轮机入口切断阀全关，阀后排凝无介质。

State of water, steam, and wind system:
水、汽、风系统状态：
a. Check that the lubricating oil cooler and the gland steam cooler cooling water are introduced to the front of the valve;
确认润滑油冷却器、汽封冷却器冷却水引至阀前；
b. Check whether the oil seal nitrogen of steam turbine bearing is led to the front of valve and dehydrated;
确认汽轮机轴承油封氮气引至阀前，脱水完成；
c. Check that 1.0MPa steam is introduced to the front of the gland ejector hand valve of steam turbine for condensate drain.
确认 1.0MPa 蒸汽引至汽轮机汽封抽气器手阀前排凝。

Instrument and electrical system:
仪表、电气系统：
a. Check that the on-site pressure gauge and thermometer are installed according to the specification number and the calibration is qualified;
确认现场压力表、温度计按规格号安装好，校验合格；
b. Check that each control valve is calibrated;
确认各控制阀调校合格；
c. Check that the control and self-protection logic instruments are in correct commissioning and checked correctly;
确认各控制、自保逻辑仪表调试正确，核对无误；
d. Check that the instrument system is fully put into operation;
确认仪表系统全部投用；
e. Check that each pump knob is in the "off" or "manual";
确认各泵旋钮均处于“off”、手动位置；
f. Check that the lubrication pump motor power supply
确认润滑油泵电机电源
g. Check the power supply of electric actuator of stationery blade
确认静叶电动执行器电源
h. Check that the power supply of the turning motor
确认盘车电机电源

i. Check the power supply of mist exhaust motor of oil tank

确认油箱排雾电机电源

j. Check the power supply of outlet electric valve

确认出口电动阀电源

On-site confirmation:

现场确认：

a. Check that the unit surroundings is cleaned and the site is free of debris;

确认机组周围卫生清扫干净，现场无杂物；

b. Check that the on-site fire-fighting facilities are complete;

确认现场消防设施完备；

c. Check that the valve wrench, walkie-talkie and other boot tools are ready.

确认阀门扳手、对讲机等开机工具齐全。

2) Lubricating oil system for operation

投用润滑油系统

a. Start oil filter for dehydration and shut down when completed;

启动滤油机脱水后关闭；

b. Open the outlet/inlet hand valves of the two pumps;

打开两台泵的出、入口手阀；

c. Open the outlet valve of tank gauge;

打开油箱液位计引出阀；

d. Open the front and rear shutoff valves of the lubricating oil pressure control valve, close the bypass valve, switch the regulator to manual mode, and maintain the control valve at a certain opening degree (about 50%);

打开润滑油油压控制阀前、后截止阀，关闭旁通阀，调节器投手动，并使控制阀保持一定开度（50%左右）；

e. Close the oil-filled communication valves of the two sets of oil coolers, close the drain valve to oil tank of the two sets of oil coolers, close the condensate drain valve at bottom, open the water return valve of the oil cooler (normally open), and close the inlet valve of the oil cooler, and switch handle to point to one of the groups;

关闭两组冷油器的充油连通阀，关闭两组冷油器去油箱的排放阀，关闭底部排凝阀，打开冷油器的回水阀（常开），关闭冷油器的进水阀，切换手柄指向其中一组；

f. Close the oil-filled communication valve of the two sets of lubricating oil filters, the drain valve to oil tank, the condensate drain valve at bottom, and switch handle to point to one of the groups;

关闭两组润滑油过滤器的充油连通阀、去油箱排放阀、底部排凝阀，切换手柄指向其中一组；

g. Open the front and rear shutoff valves of the lubricating oil pressure control valve, close the bypass valve, and switch regulator to automatic mode with a set pressure of 0.329MPa (the total pipe pressure is guaranteed to be 0.25MPa);

打开润滑油压力控制阀的前、后截止阀，关闭旁通阀，调节器投自动，压力给定值为 0.329MPa（保证总管压力为 0.25MPa）；

h. Close the oil filling valve of accumulator and the quick oil filling valve of top oil tank;

关闭蓄能器充油阀，关闭高位油箱快速充油阀；

i. Start the steam heater of oil tank if the oil temperature is below 25℃;

若油温低于 25℃，启动油箱蒸汽加热器；

j. The self-starting interlock switches of the lubrication pump are turned to the manual position;

润滑油泵自启动的联锁开关均打至手动位；

k. The oil seal nitrogen of steam turbine bearing for operation to confirm that the exhausting is smooth;

投用汽轮机轴承油封氮气，确认排气畅通；

l. The turning of oil pump is flexible without jamming, determine that one of them is the main pump and start it up;

油泵盘车灵活，无卡涩，确定其中一台为主泵，启动；

m. Conduct exhausting at the introducing point of the lubricating oil pressure and close it when oil bleeding;

润滑油油压引压点处排气，见油后关闭；

n. Open the oil filling communication valve between the two sets of oil coolers and the drain valve to the oil tank, close the oil drain valve after oil return happens, turn the switch handle of oil cooler to the other side, and close the oil filling valve;

打开两组冷油器间充油连通阀和去油箱排放阀，待见回油后，关闭排油阀，将冷油器切换手柄转向另一侧，关充油阀；

o. Open the oil filling communication valve between the two sets of lubricating oil filter and the drain valve to the oil tank, close the drain valve after oil return happens, turn the switch handle to the other side, and close the oil filling communication valve;

打开两组润滑油过滤器间的连通阀和去油箱排放阀，待见回油后，关闭排放阀，将切换手柄转向另一侧，关闭充油连通阀；

p. Open the quick oil filling valve to the top oil tank, and close the oil filling valve after oil returning;

打开去高位油箱快速充油阀，见回油后关闭充油阀；

Note: the operator shall not stay far away from the site to prevent oil bleeding from the top of top oil tank which is conducted quick oil filling.

注意：向高位油箱快速充油时，人不能远离现场，以防高位油箱顶部冒油。

q. Open the oil filling valve of accumulator;

打开蓄能器充油阀；

r. Disable oil tank heater if the oil temperature reaches 40℃ and enable oil cooler to control the oil temperature is 35℃-45℃;

若油温达到 40℃，停用油箱加热器，启用油冷却器，控制油温在 35℃～45℃之间；

s. Contact the bench worker to adjust the lubricating oil pressure before entering the bearing: radial bearing oil pressure of steam turbine: 0.09MPa-0.13MPa; thrust bearing oil pressure of steam turbine: 0.025MPa-0.05MPa; radial bearing oil pressure of main fan: 0.08MPa-0.18MPa; thrust bearing oil pressure of main fan: 0.05MPa-0.10MPa;
联系钳工调整润滑油进轴承前油压值：汽轮机径向轴承油压：0.09MPa～0.13MPa；汽轮机推力轴承油压：0.025MPa～0.05MPa；主风机径向轴承油压：0.08MPa～0.18MPa；主风机推力轴承油压：0.05MPa～0.10MPa；
t. Inspect the oil filter regularly, the pressure difference is greater than 0.15MPa, and switch the filter and clean it;
经常检查油过滤器，压差大于 0.15MPa，切换过滤器并清洗；
u. Contact the laboratory to sample and analyze whether the various indicators of the lubricating oil are within the required range;
联系化验室，采样分析润滑油各项指标是否在要求范围内；
Note: before commissioning of the unit which has undergone the major repair, conduct the closed self-running of the oil system first. When doing so, bypass the bearing inlet and return oil pipes.
注意：机组大修后投运，油系统应先进行外跑油，外跑油时把轴承进、回油管短接。
3) Self-starting pump interlock commissioning of lubricating oil system
润滑油系统自启泵联锁调试
a. The interlock option switch of spare pump is turned to "Automatic", and the pump is manually stopped at the site. The spare pump shall be self-starting and sound and light alarm;
备用泵联锁选择开关打至“自动”，现场手动停运行泵，备泵应自启动，并声光报警；
b. Reset the main and auxiliary pumps and repeat the above steps;
重新设定主、辅泵，并重复上述步骤；
c. The interlock option switch of spare oil pump is turned to the "automatic" to lower the set value of the oil pressure control valve. When the manifold pressure is lower than 0.18MPa, the spare pump shall be self-starting and sound and light alarm. The oil pressure is adjusted to the normal value, and the spare pump is stopped (reducing the manifold pressure can also be achieved by opening the bypass valve or the oil return tank valve behind the check valve); Note: pay attention to whether the pressure of the lubricating oil header is lowered when stopping a pump.
备用油泵联锁选择开关打至“自动”位置，降低油压控制阀的给定值，当集合管油压低于 0.18MPa 时，备泵应自启动，并声光报警。油压调整至正常值，停备泵（降低集合管油压也可通过打开旁通阀或单向阀后回油箱阀来实现）；注意：停掉一台泵时，注意观察润滑油总管压力有无下降。
d. Reset the main and spare pumps and repeat the above steps;
重新设定主、备泵，并重复上述步骤；
4) Test whether the main valve action is sensitive 试验各主要阀门动作是否灵敏
a. Test a steam turbine quick-closing valve;

试验汽轮机速关阀；

b. Test a steam turbine regulating steam valve;

试验汽轮机调节汽阀；

c. Test the stationery blade servo valve of main fan.

试验主风机静叶伺服阀。

d. Note: a. When the stationery blade works from 22° to 79°, the working time shall be more than 5s; Test the correspondence between the angles of three stationery blades (22°, 48° and 79°) and the scale on the site.

注意：a. 静叶从 22°运行至 79°时，时间应大于 5 秒；并试验三个静叶角度（22°、48°、79°）与现场标尺对应情况。

5) Steam line preheating 蒸汽管线预热

a. Vent the steam heating pipe before opening the steam turbine steam inlet shut-off valve;

打开汽轮机蒸汽入口切断阀前放空，蒸汽暖管；

b. Open the condensate drain points behind the steam outlet valve of the steam turbine and warm pipe;

打开汽轮机蒸汽出口阀后各排凝点，暖管；

c. Use a gland ejector and a cooler.

投用汽封抽气器、冷却器。

6) Interlock test for emergency shutdown 紧急停机联锁试验

a. Determine one lubrication pump as the main pump and start, and the spare pump is switched to the "Automatic";

确定一台润滑油泵为主泵，启动，备用泵投“自动”位；

b. Check unit interlock reset;

确认机组联锁复位；

c. Check correct valve positions after resetting;

确认复位后各阀位置正确；

d. Operate the steam turbine quick-closing assembly and apply the starting oil, inject the quick-closing oil after the oil pressure is stabilized, close the starting oil when the quick-closing oil pressure is stabilized at 0.8MPa. The quick-closing valve is gradually opened;

操作汽轮机速关组件，投用启动油，待油压稳定后，投用速关油，待速关油压稳定在 0.8MPa 左右，再关闭启动油，此时速关阀开启；

e. Check whether the quick-closing valve is fully opened;

确认速关阀全开到位；

7) Lubricating oil pressure low-low shutdown test 润滑油压力低低停机试验

a. Put the on-site option switch of spare pump into the "Manual";

将备用泵现场选择开关投“手动”位置；

b. Adjust the set value of the pressure control valve of the lubricating oil header so that the total pressure of the manifold is 0.12MPa, and the unit is shut down urgently;

调节润滑油总管压控阀设定值，使总管压力为 0.12MPa，机组紧急停机；

c. Check the sound and light alarm of "Low pressure of lubricating oil" and "Main fan shutdown";

确认“润滑油压力低”、“主风机停机”声光报警；

8) Speed, axial translation, vibration test 转速、轴位移、振动试验

a. The instrument is connected to the signal of steam turbine and the main fan axial translation, vibration, speed analog;

联系仪表分别依次给汽轮机和主风机轴位移、振动、转速模拟信号；

b. Check the unit "Main fan shutdown" as indicated by the sound-light alarm;

确认机组“主风机停机”声光报警；

9) Manual shutdown test at operating room 操作室手动停机试验

a. Turn on the "Main fan emergency shutdown" knob to the input position;

旋动“主风机紧急停机”旋钮至投入位置；

b. Check the unit "Main fan shutdown" as indicated by the sound-light alarm;

确认机组“主风机停机”声光报警；

10) Reverse flow protection test 逆流保护试验

a. Connect the instrument to send reverse flow signal;

联系仪表给逆流信号；

b. Check the unit "Main fan shutdown" as indicated by the sound-light alarm;

确认机组“主风机停机”声光报警；

11) Confirm the interlock and shutdown action 联锁停机动作确认

a. Check that the anti-surge valve at the outlet of the main fan is fully open;

确认主风机出口防喘振阀处于全开位置；

b. Confirm whether the outlet check valve of main fan is closed forcibly;

确认主风机出口单向阻逆阀强制关闭；

c. Check that the steam turbine quick-closing valve and the regulating steam valve are fully closed;

确认汽轮机速关阀、调节汽阀全关；

d. During reverse flow test, check whether the angle of stationery blade of fan is 22°.

逆流试验时，确认风机静叶角度在 22°。

Note: the solo test run of the steam turbine can be carried out after the above tests are finished.

注意：上述试验完成后才可进行汽轮机单机试车。

12) Solo test run and over-speed test of the steam turbine 汽轮机单机试车、超速试验

a. Check that the steam turbine-aerostatic press coupling is disconnected;

确认汽轮机—气压机联轴器断开；

b. The lubrication pump outlet pressure is ≥0.5MPa, the lubricating oil pressure of the header is 0.25MPa, and the spare pump is automatically used;

润滑油泵出口压力≥0.5MPa，总管润滑油压 0.25MPa，备泵投自动；

c. The oil pressure of each bearing meets the requirements, the oil temperature is ≥25℃, and the oil temperature is controlled after the starting: 35-45℃;
各轴承油压满足要求，油温≥25℃，启动后控制油温：35~45℃；
d. The lubricating oil pressure control valve is automatically used;
润滑油压控制阀投自动；
e. Refer to the normal starting procedure, slightly open the shut-off valve at the steam turbine inlet;
参考正常开机步骤，稍开汽轮机入口切断阀；
f. Operate the emergency security device handle hook, the quick-closing component manual shutdown valve, and the remote stop button after the rated speed is reached and the operation is stable;
升至额定转速后，待运行稳定后，分别操作危急保安装置手柄挂钩、速关组件手动停机阀、远程停机按钮；
g. Check whether the quick-closing valve and the adjusting steam valve are closed quickly (for the multi-project test, the heating curve of the steam turbine can be skipped and the rated value can be directly reached in case of repeated startup-shutdown);
检查速关阀、调节汽阀是否迅速关闭（多项目试验时，反复开停机可跳过暖机曲线直接升速至额定值）；
h. For the pressure-out operation, check whether the operating pressure of the safety valve meets the specified value;
憋压操作，检查安全阀动作压力是否符合规定值；
i. Speed up through continuous manual operation until it shutdowns due to the electronic tripping, and record the final rotate speed for the tripping operation;
继续手动升速至电子跳闸停机，记录最终跳闸转速；
j. For the mechanical trip test, the bypassed electronic trip is interlocked, speed up and record the final rotate speed for the tripping operation after the above test is completed;
机械跳闸试验在上述试验完成后，旁路电子跳闸联锁，升速记录最终跳闸转速；
k. The operation quick-closing component knob is closed fully, close the shut-off valve at the turbine steam inlet, and start the turning motor after the test is completed. Stop the turning motor when the temperature of the steam turbine casing falls below 90℃, and the temperature difference between the lubricating oil flowing in and out of the bearings is less than 5℃. Adjust the lubricating oil spare pump to the "Manual" state, stop the main oil pump, and contact the bench worker to reload the coupling.
试验完成后，操作速关组件旋钮全关，关闭汽轮机蒸汽入口切断阀，启动盘车电机，当汽轮机壳体降至 90℃以下，且进、出轴承润滑油温差小于 5℃时，停盘车电机，润滑油备泵投“手动”，停主油泵，联系钳工回装联轴器。
13) After the test, valves of each system should be in the service position
试验完各系统阀位应在开车位置

a. Anti-surge valves are fully open;
防喘振阀全开；
b. The outlet check valve of main fan is fully closed;
主风机出口单向阀全关；
c. The outlet electric valve of main fan is fully closed;
主风机出口电动阀全关；
d. The adjusting steam valves of the steam turbine are fully closed on site;
汽轮机调节汽阀现场全关；
e. The steam turbine quick-closing valves are fully closed;
汽轮机速关阀全关；
f. The adjusting steam valve of the steam turbine signal to 0% (4mA);
汽轮机调节汽阀信号给 0%（4mA）；
g. When the angle of stationery blade is 22°, switch the stationery blade actuator to "Automatic" and the flow regulator of main to "Manual", and fully close the signal (4mA).
静叶角度 22°，静叶执行器投自动，主风流量调节器投手动，信号给至全关（4mA）。

(2) Checking and confirmation before starting 启动前的检查确认工作
1) Before the unit is started, the team should confirm whether the following works have been done:
机组开机前，由班组再次确认下列工作已经完成：
a. The pressure gauge and thermometer are installed well and indicated accurately;
压力表、温度计安装好且指示准确；
b. Water, electricity, gas and wind are ready;
水、电、汽、风具备；
c. Lubricating oil accumulator skin is filled with nitrogen pressure with 0.144MPa;
润滑油蓄能器皮囊充氮气压力 0.144MPa；
d. Power on the two lubrication pump motors, electric actuator, turning motor, ventilation motor and outlet electric valve;
两台润滑油泵电机、电动执行器、盘车电机、通风电机、出口电动阀电源送上；
e. The liquid levels of lubricating oil tank and the gearbox of stationery blade actuator are normal;
润滑油箱液位、静叶执行机构变速箱液位正常位；
f. The interlock commissioning is qualified (consult with the equipment operator).
联锁调试合格（询问设备员）。
2) The control valve is qualified after commissioning 控制阀确认调试合格
a. The lubricating oil pressure PIC-61309 is qualified after commissioning;
润滑油油压 PIC-61309 调试合格；
b. FIC-11803 is qualified after commissioning;

FIC-11803 调试合格；

c. The angle 0-100% of stationery blade corresponds to the field scale 34-106mm.

静叶角度 0-100%对应现场刻度 34~106mm。

3) Lubricating oil system 润滑油系统

a. Select main oil pump and start. The lubrication pump outlet pressure is ≥0.5MPa, the lubricating oil pressure of the header is 0.25MPa, and the spare pump is automatically used;

选择主油泵，启动，润滑油泵出口压力≥0.5MPa，总管润滑油压 0.25MPa，备泵投自动；

b. Lubricating oil temperature of manifold ≥25℃;

总管润滑油温≥25℃；

c. The oil pressure of unit lubricating points is normal and the oil return is unblocked;

机组各润滑点油压正常，回油通畅；

d. The accumulator of lubricating oil for operation and the differential pressure of oil filter are normal;

润滑油蓄能器投用，油过滤器差压正常；

e. The top oil tank is filled with oil, and the oil level of large oil tank is normal;

高位油箱充满油，大油箱油位正常；

f. The lubricating oil pressure controller is automatically used;

润滑油压控制器投自动；

g. The pressure of quick-closing oil is normal, and the pressure of control oil is 1.5MPa.

速关油油压正常，控制油油压 1.5MPa。

4) Position of main valves 主要阀门位置

a. The angle of stationery blade is 22°, and the site scale is 37mm;

静叶角度 22°，现场刻度 37mm；

b. Switch the flow regulator of main fan to be manual (output: 0%);

主风流量调节器手动，输出 0%；

c. Switch the steam valve regulator of steam turbine to be manual (output: 0%);

汽轮机调节汽阀调节器手动，输出为 0%；

d. The outlet electric valve of main fan is fully opened.

主风出口电动阀全关。

5) Steam turbine system 汽轮机系统

a. Check whether the start device of speed controller is rotated to the end clockwise;

确认调速器启动装置顺时针旋到底；

b. Check that the steam turbine bearings are used in the air-isolation environment;

确认汽轮机轴承油封隔离空气投用；

c. Slightly open the main steam outlet/inlet emptying valve, heat the pipe and the steam temperature is ≮280℃;

主蒸汽出入口放空阀略开，暖管，使蒸汽温度≮280℃；

d. The shutoff valve of the back pressure relief valve is fully open;

背压安全阀截止阀全开；

e. The traps of main steam system are slightly opened and dehydrated, and the condensate drain valve of cylinder is fully opened;

主蒸汽系统各疏水阀略开，脱水，缸体排凝阀全开；

f. The oil seal nitrogen and the exhaust cooler of gland are put into use.

油封氮气投用，汽封抽汽冷却器投用。

6) Enter the self-protection interlock screen and check the use of self-protection

进入自保联锁画面检查自保投用情况

a. If the lubricating oil pressure is low-low, shut down for self-protection;

润滑油压低低停机自保投入；

b. If the axial translation of steam turbine is high-high, shut down for self-protection;

汽轮机轴位移高高停机自保投入；

c. If the front shaft vibration of steam turbine is high-high, shut down for self-protection;

汽轮机前轴振动高高停机自保投入；

d. If the rear shaft vibration of steam turbine is high-high, shut down for self-protection;

汽轮机后轴振动高高停机自保投入；

e. If the exhaust pressure of steam turbine is low, shut down for self-protection;

汽轮机排气压力低停机自保投入；

f. If the axial translation of main fan is high-high, shut down for self-protection;

主风机轴位移高高停机自保投入；

g. If the front shaft vibration of main fan is high-high, shut down for self-protection;

主风机前轴振动高高停机自保投入；

h. If the rear shaft vibration of main fan is high-high, shut down for self-protection.

主风机后轴振动高高停机自保投入。

7) Check the use of ESD hard switch 检查 ESD 硬开关投入情况

a. Pull the manual shutdown button to the normal position;

手动停机按钮扳至正常位；

b. Pull the emergency shutdown button to the normal position;

紧急停机按钮扳至正常位；

c. Pull the manual emptying button to the normal position;

手动放空按钮扳至正常位；

d. Pull the manual safety operation button to the normal position.

手动安全运行按钮扳至正常位。

(3) Unit start 机组的启动

1) Enter the startup program screen to check the startup conditions: Confirm that the following start conditions are met after 900 seconds (you can also click the pre-check bypass button without delaying for 900 seconds) when the main fan interlock resets:

进入启动程序画面检查启动条件：主风机联锁复位，900 秒后（也可以点击预检查旁路按钮不用延时 900 秒）确认启动条件达到：

a. Steam turbine 1# main steam valve all-off;

汽轮机 1#主汽门全关；

b. Steam turbine 2# main steam valve all-off;

汽轮机 2#主汽门全关；

c. Memory reset;

存储器复位；

d. Process allows start;

工艺允许启动；

e. Adjust the oil pressure to normal;

调节油压力正常；

f. Lubricating oil pressure is normal;

润滑油压力正常；

g. Lubricating oil temperature≥25℃;

润滑油温度≥25℃；

h. The outlet check valve of main fan is fully closed;

主风机出口单向阀全关；

i. 1# anti-surge valve (small) is fully opened;

1#防喘振阀（小）全开；

j. 2# anti-surge valve (big) is fully opened;

2#防喘振阀（大）全开；

k. The turning is in normal;

盘车状态正常；

l. Enter the emergency shutdown screen to check and confirm that there is no shutdown signal after each condition is met and the "Startup standby" indicator light is on;

各个条件已满足，“启动待命”指示灯亮，进入紧急停机画面检查确认无停机信号；

m. Click the "PERMISSIVE" and the steam turbine quick-closing system lockout is unlocked.

点击“允许启动”按钮，汽轮机速关系统闭锁解除。

2) After starting the steam turbine, the main fan will enter the safety operation state

汽轮机启动，主风机进入安全运行

a. Fully open the shut-off valve at the steam turbine inlet, introduce the steam to the front of the quick-closing valve, and perform condensate drain and turn down the emptying valve of the inlet pipeline;

全开汽轮机入口切断阀，引蒸汽至速关阀前，排凝，关小入口管线放空阀；

b. Start the turning motor and check for abnormal sound at the flow passage, shaft seal and main oil pump;

启动盘车电机，检查通流部分、轴封、主油泵等处有无不正常响声；

c. Operate the quick-closing components, slowly open the quick-closing valve, fully open the condensate draining valves and confirm if they are unblocked and control the temperature rise of the turbine heating at 50℃/h before the steam pipeline mounted in front of the quick-closing valve is condensate-drained and preheated.

待速关阀前蒸汽管线排凝预热完，操作速关组件，缓慢开启速关阀，机体各排凝全开，并确认畅通，控制暖机温升控制在 50℃/h；

d. The steam turbine is "automatically turned on" (it can also be manually turned on according to the speed-raising curve);

汽轮机投“自动开机”（也可手动按照升速曲线开机）；

e. When the speed exceeds the that of the turning, the tooth of the turning gear are disengaged, the handle is locked, and the turning motor is stopped;

转速超过盘车转速时，盘车齿脱开，手柄锁住，停盘车电机；

f. When there is abnormal sound or vibration on the shaft system of the unit, the speed should be reduced and the unit should be checked after the critical area is avoided;

当机组轴系出现不正常的响声或振动时，应降低转速，避开临界区，检查；

g. When the oil system is not normal, the speed should be reduced and the unit should be checked after the critical area is avoided;

当油系统出现不正常的现象，应降低转速，避开临界区，检查；

h. When the thermal expansion of the steam turbine changes significantly, the speed should be reduced and the unit should be checked after the critical area is avoided;

当汽轮机热膨胀发生显著变化时，应降低转速，避开临界区，检查；

i. The conditions of the temperature rise of each bearing and the expansion and vibration of each part. The temperature difference between the upper and the lower cylinders should not exceed 50℃.

各轴承的温升及各部位的膨胀、振动情况，上下半汽缸的温差，应不超过 50℃。

j. After the speed is increased to the rated value, the main fan will enter the safe operation status;

转速升至额定值后，主风机进入安全运行状态；

k. Adjust the outlet back pressure of the steam turbine to be higher than 5% of the pipe network pressure, and notify the dispatcher to prepare for the grid connection;

调整汽轮机出口背压高出管网压力 5%，通知调度准备并网；

l. Slowly open the isolation valve of the back pressure exhaust pipeline (the bypass valve should be opened firstly), gradually close the blow-off valve and control the exhaust steam temperature rise not to exceed 5℃/min, and keep the back pressure stable;

缓慢开启背压排汽管路的隔离阀（应先开启旁路阀），同时逐渐关闭排空阀，控制排汽温升不超过 5℃/min，保持背压稳定；

m. Close emptying valves at the main steam pipeline, the back pressure exhaust pipeline and the cylinder;

关闭主蒸汽管路、背压排汽管路、汽缸等处放空阀；

n. Check the operation status of the unit thoroughly (time ≥10min).

全面检查机组运行状态（时间≥10min）。

3) Automatic operation of main fan 主风机自动操作

a. It is allowed to click "Automatic operation" after the automatic operation light is on;

允许自动操作灯亮后点击“自动操作”按钮；

b. Check whether the outlet check valve of main fan is opened;

确认主风机出口单向阀打开；

c. After the outlet check valve lockout of main fan, the stationery blade lockout and 1# and 2# anti-surge valve lockout are unlocked, the green light will be on;

主风机出口单向阀闭锁解除，静叶闭锁解除，1#、2#防喘振阀闭锁解除，相应绿灯亮；

d. Check whether the operation point is on the right of safety line (surge line) and whether the green indicator light is on;

确认运行点在安全线（喘振线）右侧，指示灯亮绿灯；

e. Switch the anti-surge control mode into semi-automatic, and set the manual output value as 100%;

将防喘振控制模式投半自动，手动输出值设定为 100%；

f. Set the manual output value or control "Down" to close the emptying valve to the required angle;

设定手动输出值或操作降按钮把放空阀关至需要的角度；

g. Enlarge the angle of stationery blade, close the emptying valve, increase the air volume and pressure according to the situation and increase the load of unit gradually. After increasing load, the internal and external operators shall confirm the operating condition of unit again and prepare parallel ventilation;

调整操作开大静叶角度，关放空阀，根据情况提风量、压力，逐步提高机组负荷。提负荷后内外操再次进行机组运行情况确认，准备并风；

4) Precautions of unit start 机组启动注意事项

a. Pay close attention to the oil temperature and pressure of the lubricating oil system of the unit through internal and external operations during the entire startup process.

整个开机过程中，内外操应密切关注机组润滑油系统各油温、油压；

b. Pay close attention to the vibration, displacement and temperature of each bearing of the unit, check the operation sound on site, and inspect the operating condition of the unit with the hearing needle and the hand-held temperature vibration measuring devices;

密切关注机组各轴承振动、位移、温度，现场检查运行声音，利用听针、手持式测温测振仪等检查机组运行情况；

c. Check whether the field auxiliary equipment works normally and sealed without leakage.

确认现场辅助设备运行正常，密封无泄漏。

(4) Unit shutdown procedures 机组停机规程

1) Check normal shutdown 正常停机确认操作

a. Check that the pressure and the temperature at the inlet/the outlet of the fan unit are normal;
确认主风机组出入口压力、温度正常；

b. Check that the pressure and the temperature of the main fan unit lubricating oil system are normal;
确认主风机组润滑油系统压力、温度正常；

c. Check whether the oil level and temperature of stationery blade actuator of main fan unit are normal;
确认主风机组静叶执行器油位、温度正常；

d. Check that the speed, the vibration and the axial translation of the main fan unit are normal;
确认主风机组转速、振动、轴位移正常；

e. Check that the valve position of the main fan unit is adjusted properly.
确认主风机组各阀位调节正常。

2) Normal shutdown operation 正常停机操作

a. All posts shall coordinate, reduce the angle of stationery blade gradually and pay close attention to the operating point of main fan;
各岗位协调好，逐渐关小静叶角度，密切关注主风机工况点位置；

b. Control the anti-surge emptying valve automatically or manually, control the operating point of main fan, pay attention to the steam consumption of steam turbine and adjust the opening of steam valve;
自动或手动操作防喘振放空阀，控制主风机工况点，同时关注汽轮机耗汽量及调节汽阀开度；

c. After cutting off the inlet air, click "Shutdown";
待反应需切断进风后，点击“停机”按钮；

3) Self-protection interlock shutdown 自保联锁停机

For the following situations, the unit is stopped through the self-protection interlock action:
机组在发生下列情况时，自保联锁动作停机：

a. Unit overspeed (two-out of three: SE-62305, SE-62306 and SE-62307) (n≥6,237r/min)
机组超速（SE-62305、SE-62306、SE-62307 三取二）（n≥6237r/min）

b. Excessively low steam turbine exhaust pressure (two-out of three: PISA-62101, PISA-62102, and PISA-62103)
汽轮机排气压力过低（PISA-62101、PISA-62102、PISA-62103 三取二）

c. Excessive steam turbine axial translation (two-out of three: ZISA-62201, ZISA-62202, and ZISA-62203) (≥±0.8mm)
汽轮机轴位移超限（ZISA-62201、ZISA-62202、ZISA-62203 三取二）（≥±0.8mm）

d. Excessively large steam turbine bearing vibration (one-out of four: VISA-62201, VISA-62202, VISA-62203 and VISA-62204)
汽轮机轴承振动过大（VISA-62201、VISA-62202、VISA-62203、VISA-62204 四取一）

e. Overtemperature of steam turbine bearing (one-out of four: TISA-62202, TISA-62204, TISA-62206 and TISA-62208)
汽轮机轴承温度过高（TISA-62202、TISA-62204、TISA-62206、TISA-62208 四取一）
f. Excessive main fan axial translation (two-out of three: ZISA-61301, ZISA-61302 and ZISA-61303) (≥±0.8mm)
主风机轴位移超限（ZISA-61301、ZISA-61302、ZISA-61303 三取二）（≥±0.8mm）
g. Excessively large main fan bearing vibration (one-out of four: VISA-61301, VISA-61302, VISA-61303 and VISA-61304)
主风机轴承振动过大（VISA-61301、VISA-61302、VISA-61303、VISA-61304 四取一）
h. Overtemperature of main fan bearing (one-out of four: TISA-61211, TISA-61213, TISA-61215, and TISA-61217)
主风机轴承温度过高（TISA-61211、TISA-61213、TISA-61215、TISA-61217 四取一）
i. Excessively low lubricating oil pressure (two-out of three: PISA-61351, P ISA-61352 and P ISA-61353) (≤0.12MPa)
润滑油压过低（PISA-61351、P ISA-61352、P ISA-61353 三取二）（≤0.12MPa）
j. Continuous reverse flow time: more than 5s
持续逆流时间大于 5 秒
4) Manual emergency shutdown 手动紧急停机
Press the "Manual emergency shutdown" for the following situation encountered by the unit:
机组在发生下列情况时，可按“手动紧急停机”按钮：
a. Strong vibration of the unit, smoking and friction at the bearing and shaft seal;
机组发生强烈振动，轴承、轴封处冒烟及发出摩擦声；
b. The bearing temperature rises and exceeds the alarm value, which cannot be eliminated;
轴承温度升高，超过报警值而无法消除；
c. The lubricating oil system leaks severely;
润滑油系统严重泄漏；
d. The unit must be stopped due to other emergency situations.
其它紧急情况必须停机组。
When one of the above situations is found, it is necessary to judge correctly and check the failure location, record the accurate data, stop the unit first in an emergency, and then report to the shift leader and relevant departments.
发现以上情况之一时，必须正确判断、检查故障部位，记录准确的数据，紧急情况下先停机，然后向班长及有关部门汇报。
5) Confirm the system indication after the unit is shutdown 机组停机后，系统指示确认
a. The red light will be on if the emptying valve (small) is fully opened, (the green light will be on when normal);
放空阀（小）全开亮红灯，（正常绿灯）；

b. The red light will be on if the emptying valve (big) is fully opened, (the green light will be on when normal);
放空阀（大）全开亮红灯，（正常绿灯）；
c. The red light will be on if the outlet check valve of main fan is fully closed, (the green light will be on when normal);
主风机出口单向阀全关亮红灯，（正常绿灯）；
6) After shutdown, confirm the action of unit field valve 停机后，机组现场阀门动作确认
a. The angle of stationery blade of main fan is 22°;
主风机静叶角度 22°；
b. Anti-surge valves of main fan fully-open;
主风机防喘振阀全开；
c. The outlet check valve of main fan is fully closed;
主风机出口单向阀全关；
d. Steam turbine quick-closing valve and the regulating steam valve are fully closed.
汽轮机速关阀、调节汽阀全关。
7) Normal operation after shutdown 停机后常规操作
a. Close the outlet electric valve of main fan;
关闭主风机出口电动阀；
b. Start the turning gear after the unit is completely stopped;
机组完全停止后，启动盘车装置；
c. Continue cooling down until it is fully closed by closing the DN300 bypass valve;
利用关小 DN300 旁通阀继续降温，直至全关；
d. Open the steam turbine casing to discharge condense after the steam turbine outlet temperature drops to 150℃;
待汽轮机出口温度降至 150℃，打开汽轮机壳体排凝；
e. Deactivate the turning gear when the temperature of the steam turbine casing falls below 90℃, and the temperature difference of the lubricating oil between the inlet and the outlet bearings is less than 5℃;
当汽轮机壳体温降降至 90℃以下，且进、出轴承润滑油温差小于 5℃时，停盘车装置；
f. Deactivate the lubricating oil system;
停润滑油系统；
g. Cut off the unit control system;
切断机组控制系统；
h. Deactivate the water, electricity, instrument, wind, steam and other systems;
停水、电、仪、风、汽等各个系统；

(5) Routine operation & maintenance 正常运行维护
1) General requirement of routine operation & maintenance 正常运行维护常规要求

a. Strictly implement the system of post responsibility, inspect carefully according to the requirements, record the operating parameters of the unit seriously, and find problems in time which should be handled properly;
严格执行岗位责任制，按要求细心检查，认真记录机组各运行参数，做到及时发现问题，并妥善处理；
b. Abide by the operating procedures and control the operation indicators of the unit strictly, check the main fan flow and the outlet pressure regularly to prevent the main fan from working in the surge and the rotating stall areas;
严格遵守操作规程和严格控制机组各项操作指标，经常检查主风流量、出口压力等情况，严防主风机在喘振区和旋转失速区工作；
c. Check the changes of the lubricating oil pressure and the bearing temperature frequently. Calibrate the digital display on the meter and the reading of the thermometer, and contact the instrument technician to accurately calibrate the meter if there is any discrepancy;
经常检查润滑油油压和轴承温度的变化。对仪表数字显示与温度计读数进行校对，如有不符，应联系仪表工精确校正；
d. Regularly check the liquid level of lubricating oil tank and stationery blade electric actuator tank, so as to prevent it from being lower than the specified value. Dewater frequently to prevent emulsification. Regular analysis through chemical tests;
经常检查润滑油箱、静叶电动执行器油箱液位，使之不低于规定值。经常脱水，防止乳化。定期化验分析；
e. Check the lubricating oil filter differential pressure and the oil outlet temperature of the oil cooler frequently and handle timely if the specified value is exceeded;
经常检查润滑油过滤器差压和油冷器油出口温度，超过规定值时，及时进行处理；
f. Check the trend of each vibration value and axial translation frequently. The cause should be checked and analyzed, and necessary measures should be taken if the amplitude is gradually increased, indicating the conditions of bearing abrasion or rotor imbalance;
经常检查各振动值和轴位移的趋向，如振幅逐渐增大，表示轴承磨损或转子不平衡，应检查并分析原因，采取必要措施；
g. Check the steam pressure frequently to ensure that the aspirator of the steam turbine works normally;
经常检查蒸汽压力，保证汽轮机抽气器正常工作；
h. Regularly check the pressure drop of inlet air filter of main fan, and treat it in time if the differential pressure is exceeded;
经常检查主风机入口空气过滤器压降，若超压差，应及时处理；
i. Inspect regularly whether the steam turbine quick-closing valve, the regulating steam valve, the emptying valve of the main fan, the outlet check valve and expansion joints work normally;
定期检查汽轮机速关阀、调节汽阀、主风机放空阀、出口单向阀以及各膨胀节等工作是否正常；
j. Periodical condensate drain of the steam turbine casing

汽轮机壳体定期排凝；

k. Activate the turning gear for the spare lubricating oil pump as required.

润滑油备用油泵按要求盘车。

2) Precautions during operation of main fan 主风机操作中应注意的问题

a. Forbid operation in surge area. During operation of axial-flow main fan, surge is strictly prohibited. Otherwise, vane torsion and other major accidents will occur. Therefore, the emptying valve is always set at the automatic operation position;

严禁在喘振区工作。轴流式主风机在运行时，绝对禁止发生喘振，否则将发生叶片扭断等重大事故。所以，放空阀一直被设置在自动操作位置；

b. Prevent the air with dust entering the main fan. The efficiency of main fan may be reduced after the vane collects dust, so it is necessary to ensure the normal working of inlet air filter.

必须保证进入主风机的空气无灰尘。主风机叶片集尘后，效率会下降，因此要保证入口空气过滤器的工作正常。

3) Precautions during operation of steam turbine The heating rate of the steam turbine should be ≯100℃/h, and the cooling rate should be ≯150℃/h, so that the parts of the machine can be expanded (or contracted) evenly;

汽轮机操作中应注意的问题：汽轮机升温速率应≯100℃/h，降温速率应≯150℃/h，以使机器各零部件均匀膨胀（或收缩）；

4) Electric barring gear: turning gear is prohibited when the unit is in operation status.

电动盘车器：机组运行状态时，禁止操作。

5) Inspect regularly whether the lubricating oil contains water, is emulsified or deteriorated. The lubricating oil should be replaced in time if it fails to meet the requirement.

定期检查润滑油是否带水，有无乳化、变质现象，若不合要求，应及时换油。

(6) Operation regulation of special equipment 专项设备操作规程

1) Inspection and operation of stationery blade of main fan 主风机静叶检查及操作

The actuator of stationery blade is the ICM electric actuator and have the automatic and manual control functions. The handle wheel is used for controlling the actuator and other valves or equipment manually when there is no power supply without the need of switching the actuator from electric to manual. Rotate the output shaft rightward when rotating the hand wheel clockwise (see toward the valve from the actuator).

静叶执行机构采用 ICM 电动执行器，可采用自动和手动方式进行控制。手轮操作用于执行器没有电源的情况下手动操作执行器及对应的阀门或其它设备，不需要对执行器进行从电动到手动的离合切换操作，顺时针转动手轮时使输出轴右转 (从执行器向阀门方向看)。

2) Lubrication pump switching operation 润滑油泵切换

See Part Four of the "Pump Operation Method" for detail.

详见“泵的操作法”第四部分。

3) Turning operation steps 盘车操作步骤

a. Check whether the site speed of main fan is 0;
确认主风机现场转速为 0；
b. Check that the lubricating oil pressure is normal and the system operates normally.
确认润滑油油压正常，系统运行正常。
c. Activate the turning by pushing turning handle to and engage the turning motor gear;
把盘车手柄推至盘车电机齿轮咬合进行盘车；
d. Activate the turning motor;
开启盘车电机；
e. Pay attention to the bearing temperature and vibration changes at any time, and contact the external operator for any abnormal situation.
随时注意轴承温度和振动变化情况，有异常情况与外操人员联系进行处理。

(7) Lubricating oil accumulator switching operation and application steps
润滑油蓄能器切出、投用操作步骤
1) Initial status confirmation: Check that the lubricating oil pressure is normal and the system operates normally.
初始状态确认：确认润滑油油压正常，系统运行正常。
2) The putting-into-use operation of the lubricating oil accumulator 润滑油蓄能器切出操作
a. Confirm the switching instruction issued by the equipment operator for the lubricating oil accumulator. Send the switching instruction to the internal and external operators;
确认设备员润滑油蓄能器切出的指令。向内外操发出切出指令；
b. Contact the internal operator to be ready for switching to the lubricating oil accumulator, and pay attention to the pressure;
联系内操润滑油蓄能器准备切出，请注意压力；
c. Slowly close the oil filling valve, contact the internal operator to keep the pressure steady, and observe the accumulator pressure. Check the pressure gauge is normal and easy to use;
把充油阀缓慢关闭，联系内操保持压力的平稳，同时观察蓄能器压力。确认压力表正常好用；
d. Close the oil filling valve fully, slowly open the field pressure release valve of the accumulator, contact the internal operator to keep the pressure stable, and pay attention to the internal leakage;
把充油阀全关，缓慢开蓄能器现场泄压阀，联系内操保持压力平稳，注意内漏；
e. After checking that the pressure is released, send it to the bench worker for handling.
确认泄压完后，交付钳工处理。
3) The putting-into-use operation of the lubricating oil accumulator 润滑油蓄能器投用操作
a. Check the instruction of the putting-into-use operation for the accumulator by the equipment operator. Send the adoption instruction to the internal and external operators;
确认设备员蓄能器投用的指令。向内外操发出投用指令；
b. Contact the internal operator to be ready for putting the accumulator into use;

联系内操蓄能器准备投用；

c. Check that the pressure gauge is working properly and close the on-site pressure release;

确认压力表正常好用，关闭现场泄压阀；

d. Open the oil filling valve of the accumulator slowly, observe the change of the accumulator pressure, and master the increasing speed;

缓慢开蓄能器充油阀，观察蓄能器压力的变化，掌握好上升的速度；

e. Pay attention to the pressure by the internal operator, contact the external operator to fully open the accumulator oil filling valve slowly;

内操注意压力，联系外操缓慢全开蓄能器充油阀；

f. Inspect the pipeline for leakage thoroughly.

全面检查管路有无泄漏。

(8) Lubricating oil filter switching operation steps 润滑油过滤器切换操作步骤

1) Initial status confirmation: Check that the lubricating oil pressure is normal and the system operates normally.

初始状态确认：确认润滑油油压正常，系统运行正常。

2) Preparation before switching:

切换前的准备：

a. Check the instruction of the switching for the lubricating oil filter issued by the technician and send this instruction to internal and external operators;

确认技术人员发出润滑油过滤器切换操作的指令，向内外操发出此指令；

b. Check that the switch position of each valve of the spare filter is correct;

检查备用过滤器的各阀开关位置是否正确；

c. Contact the internal operator and indicate switching operation of the filter is for ready;

联系内操已准备好过滤器的切换；

b. Increase the set value of the lubricating oil control valve regulator to around 1.2MPa.

将润滑油控制阀调节器给定值提高到 1.2MPa 左右。

3) Switching operation:

切换操作：

a. Contact the internal operator to be ready for the switching operation of the lubricating oil filter;

联系内操准备切换润滑油过滤器；

b. Open the emptying valve of the oil return tank at the top of the spare filter;

打开备用过滤器顶回油箱放空阀；

c. Open the oil filling valve slowly and fill the spare filter with the oil;

缓慢打开充油阀，向备用过滤器充油；

d. Close the emptying valve of the oil return tank at the top of the spare filter when the oil flows through the oil return window without air bubble;

待回油视窗有油流过，无气泡时，关闭备用过滤器的回油箱放空阀；

e. Contact the internal operator, start the switching operation and pay attention to the lubricating oil pressure;

联系内操，切换开始，注意润滑油压力；

f. Turn the switching handle slowly until it is in position;

缓慢转动切换手柄，手柄转到位；

g. Close the oil filling valve and check the lubricating oil system for leakage at the end of the switching;

关闭充油阀，切换结束，检查润滑油系统有无泄漏点；

h. If the original filter needs to be cleaned, the filter should be overhauled after the operation of condensate drain and pressure release. During the pressure release, it is necessary to prevent the oil pressure from falling due to the internal leakage of the switching valve;

若原过滤器需清洗，则排凝泄压后交付检修。泄压过程中要防止由于切换阀内漏造成油压下降；

i. Inform the internal operator that the switching operation for the lubricating oil filter is completed;

通知内操润滑油过滤器切换完毕；

j. Adjust the lubricating oil pressure and high oil pressure to normal values.

调节润滑油油压及高压油压至正常值。

k. Note: switch slowly to avoid the oil pressure fluctuation; Pay close attention to the oil pressure changes through internal operator; After the end of the switching operation, check for leakage by the external operator carefully.

注意：切换操作缓慢进行，避免油压波动；内操密切关注油压变化；切换完成后，外操仔细检查有无泄漏点。

(9) Unit abnormality treatment 机组异常处理

1) Stop supplying 3.5MPa steam or the pressure drops 停 3.5MPa 蒸汽或压力下降

Phenomenon: the steam flow (or pressure) of steam turbine and the flow of main fan are reduced.

现象：汽轮机蒸汽流量下降（或压力下降），主风流量降低。

Treatment:

处理：

a. Pay close attention to the position of the unit operating point, and open the anti-surge valve manually if necessary;

密切关注机组工况点位置，必要时手动打开防喘振阀；

b. If the air volume of main fun cannot be maintained, shut down manually.

主风量无法维持，则手动停机。

2) Deactivate the instrument fan 停仪表风

Phenomenon:

现象：

a. The anti-surge valve is fully opened, the outlet check valve of main fun is fully closed, and the main fan works safely;

防喘振阀全开，主风机出口单向阀全关，主风机安全运行；

b. Fully open the lubricating oil control valve and the lubricating oil pressure is increased.

润滑油控制阀全开，润滑油压力升高。

Treatment: find the cause and restore the supply of air in time.

处理：查找原因，及时恢复供风。

3) Stop the circulating water 停循环水

Phenomenon: temperatures at the outlet of the lubricating oil cooler and that of the power oil tank rise.

现象：润滑油冷油器出口温度上升，动力油箱温度上升。

Treatment:

处理：

a. Replace the circulating water with the fresh water.

循环水改用新鲜水。

b. If fresh water cannot be used, shut down in emergency.

无法改用新鲜水，则紧急停机。

4) Shut down power 380V 停 380V 电

Phenomenon: shut down the lubrication pump and power off the stationery blade actuator.

现象：润滑油泵停运、静叶执行器断电。

Treatment:

处理：

a. Check if the auxiliary oil pump is started. Adjust the oil pressure to the normal value in time if it is started and contact the electrician for inspection.

检查辅助油泵是否已启动，如果启动，及时调整油压至正常值，并联系电工检查。

b. If the auxiliary oil pump is not self-started, start the pump manually and check. If it is still not started, the unit will be in the self-protection interlocking state and stop.

若辅助油泵未自启动，则手动开泵检查，如果仍然未启动，则机组将自保联锁停机。

5) Surge of main fan 主风机喘振

Phenomenon:

现象：

a. The outlet pressure of main fun is unstable, and the flow of main fan fluctuates greatly.

主风机出口压力忽高忽低，主风流量大幅度波动。

b. The inlet temperature rises rapidly.

入口温度迅速升高。

c. The unit vibrates, and there is surge shock sound at the inlet and the outlet.

机组振动，进、出口有喘振冲击声。

Treatment:

处理：

a. Open the emptying valve (when there is surge, the emptying valve will open automatically).

打开放空阀（喘振工况时，放空阀自动打开）。

b. If the anti-surge regulation fails, the unit will be in the safe operation status automatically.

若反喘振调节失败，机组自动进入安全运行状态。

c. If the fault cannot be removed after the unit is in the safe operation status, conduct self-protection interlock shutdown after 10s.

进入安全运行状态后仍不能消除，持续 10 秒钟后自保联锁停机。

(10) Unit failure and cause analysis 机组故障及原因分析

Table 38: Unit failure and cause analysis

表 38：机组故障及原因分析

S/N 序号	Failure content 故障内容	Possible causes 可能的原因
1	Low lubricating oil header pressure 润滑油总管压力降低	1) Low oil level of oil tank. 油箱油位低。
		2) Blocking of oil pump suction pipe. 油泵吸入管堵。
		3) Air leakage of oil pump suction pipe. 油泵吸入管漏进空气。
		4) Oil pump failure 油泵故障
		5) Increasing pressure drop of oil filter. 油过滤器压降增加。
		6) Failure of safety valve or oil return valve, and excessive return oil. 安全阀或回油阀失灵，大量回油。
		7) Leaking points of oil line. 油路存在泄漏点。
2	Spare pump self-start 备泵自启动	1) Low lubricating oil header pressure 润滑油总管压力降低
		2) Failure of main oil pump motor or power supply. 主油泵电机或电源故障。
		3) Malfunction of pressure switch. 压力开关误动作。
3	Too-low oil pressure and self-protection	1) Power failure (dual power off). 电源故障（双电源均断电）。

	shutdown 油压过低，自保停机	2) Severe oil leakage of system. 系统漏油严重。
		3) Malfunction of instrument. 仪表误动作。

Table 38: Unit failure and cause analysis (Continued)

表 38：机组故障及原因分析（续）

S/N 序号	Failure content 故障内容	Possible causes 可能的原因
4	Bearing with overtemperature 轴承温度过高	1) Reduction of oil intake (inlet blocking). 进油量减少（进口堵）。
		2) Oil deterioration (containing water, sludge, etc.). 油质变坏（含水、油泥等）。
		3) Instrument failure (wrong indication) 仪表失灵（指示错误）
5	Water in lubricating oil 润滑油中带水	1) Leakage of oil cooler. 油冷却器漏。
		2) The oil contains steam to condensate into water due to the loose shaft seal of steam turbine. 汽轮机轴封不严，使蒸汽进入油中冷凝成水。
6	Reduction of outlet pressure of main fan 主风机出口压力下降	1) Too-high inlet temperature. 入口温度太高。
		2) Leakage of outlet pipeline. 出口管线漏。
		3) Automatic opening of emptying valve due to failure of anti-surge system. 反喘振系统失灵，使放空阀自动打开。
		4) Failure of pressure gauge. 压力表失灵。
		5) Failure of three-device system. 三器系统故障。
		6) Abrasion or soot formation of movable vane. 动叶磨损或积灰。
7	Reduction of main fan emission 主风机排量降低	1) Too-large sealing clearance. 密封间隙过大。
		2) Blocking of inlet air filter. 入口空气过滤器堵塞。

		3) Failure of flow regulation system instrument. 流量调节系统仪表失灵。
		4) Failure of servo cylinder system. 伺服油缸系统故障。
		5) Failure of flow indicator. 流量指示表失灵。

Table 38: Unit failure and cause analysis (Continued)

表 38：机组故障及原因分析（续）

S/N 序号	Failure content 故障内容	Possible causes 可能的原因
7	Reduction of main fan emission 主风机排量降低	6) Soot formation of movable vane. 动叶片积灰。
8	Surge of main fan 主风机喘振	
		1) Blocking of outlet pipeline system. 出口管路系统堵塞。
		2) Failure of anti-surge system. 反喘振系统失灵。
		3) Malfunction of flow regulation system. 流量调节系统误动作。
9	Reverse flow of main fan 主风机逆流	1) Sudden rising of gasifier pressure, and failure or malfunction of check valve and reverse flow control. 气化器压力突然上升，且单向阀、逆流控制失灵或误动作。
10	Overspeed 超速	1) Sudden reduction of load of main fan. 主风机负荷突然减小。
		2) Fracture of coupling. 联轴器断裂。
11	Excessive vibration 振动过大	1) Decentraction of two rotors (characterized by large bearing vibration near the coupling and high oil temperature). 两转子之间不同心（表现为靠联轴节处轴承振动大，油温高）。
		2) Imbalance of rotor (deformation; uneven abrasion or catalyst adhesion on movable vane of flue gas turbine). 转子不平衡（变形；烟气透平动叶不均匀磨损或粘催化剂）。
		3) Resonance (torsional vibration or bending vibration between units, and resonance between unit and foundation). 共振（机组之间产生扭振或弯振，机组与基础之间共振等）。
		4) Friction or contact between seal and shaft. 密封与轴摩擦或接触。

		5) Bearing abrasion with excessive clearance 轴承磨损，间隙过大。
		6) Operation of main fan in surge or stall area. 主风机在喘振区或失速区运行。
		7) Movement of anchor bolt or stay bolt. 地脚螺栓或支撑螺栓动。

Table 38: Unit failure and cause analysis (Continued)

表 38：机组故障及原因分析（续）

12	Excessive axial displacement 轴向位移过大	1) Bearing worn abrasion or damage. 推力轴承磨损或损坏。
		2) Movement of installation position of axial translation monitor. 轴位移监测器安装位置移动。
		3) Instable operation of main fan or steam turbine. 主风机或汽轮机操作不稳定。
13	High bearing temperature 轴承温度高	1) Oil shortage. 油量不足。
		2) Oil deterioration. 油质变坏。
		3) Shaft vibration. 轴振动。
		4) Bearing failure 轴承故障

2.4.11 Belt Filter Press1070-PA405 Operating Procedure 带式压滤机 1070-PA405 操作规程

2.4.11.1 Function and Task 作用和任务

Belt filter press 1070-PA405 is an important equipment of the flexicoking unit. It serves to dewater coke slurry originating from the slurry concentration tank T-405 to produce filter cakes with about 45% solid content which are loaded via sludge discharge hopper onto trucks and transported outside. A flue gas discharge system comprising a top cover, piping and an exhaust fan is provided above the filter press to remove malodor in the area.

带式压滤机 1070-PA405 是灵活焦化装置的重要设备，用于浆料浓缩罐 T-405 来的焦炭浆的脱水，以产生约 45%固含量的滤饼，经过排泥斗装车外运。在压滤机上方设置一个由顶盖、管道、排气扇组成的烟气排放系统，以清除该区域恶臭。

2.4.11.2 Scope of Equipment 管辖范围

Belt filter press 1070-PA405 mainly comprises a frame, a drive, a materials distribution device, a sway correcting device, a tensioning device, a flushing device, a material unloading device, a press roller system, a sump and electrical components.
压滤机 PA405 主要由机架、传动装置、布料装置、纠偏装置、张紧装置、冲洗装置、卸料装置、压榨辊系、集液槽、电气等部件组成。

2.4.11.3 Description of Flow Path and Principle 流程、原理概述

2.4.11.3.1 Wet coke is delivered to the agitator at inlet of the belt filter press through the feed pump. After it is mixed evenly, it is sent to the pre-concentration belt for gravity dehydration to remove about 60-80% of moisture. The dehydrated wet coke cakes are carried by the operating filter belt to the wedge-shaped dewatering area. The wedge-shaped zone forms a triangular space and the two filter belts gradually approach to each other in the area. Wet coke is gradually squeezed between the two filter belts. Due to the pressure effect, moisture in the wet cokes is discharged. A ∅800 large roller with perforations lies at the junction of the filter belts and serves to further stabilize and dehydrate the wet cokes. The filtrate inside the roller is discharged outside the equipment via the drain holes at both ends of the roller. In this section, the solid content of the wet cokes is further increased, transforming them from a semi-solid to a solid state. After the wet cokes pass through the wedge-shaped area, they enter the pressure dewatering area. The wet cokes are sandwiched between the two filter belts and moves up and down around the roller in a S-shape. Under the effect of the pressure and shear force generated by the tension of the filter belts and the pressing of the roller, moisture between the flocs and the wet coke particles is further removed. The shear force results from the difference in the radius between the two filter belts passing through each of the rollers. Under the action of the shear force, wet cokes will squeeze and shear the flocs, thus removing moisture of the filter cakes sufficiently. In the high-pressure dewatering area, three pairs of dewatering rollers are arranged. The upper and lower filter belts and the three pairs of rollers make a contact angle of more than 180 degrees. When filter cakes reach the end of the shearing area, they are turned over and sheared for several times such that all the filter cakes are removed of free water, achieving a solid content of 45%.
湿焦经进料泵输送至带式压滤机入口搅拌器，混合均匀后，前往预浓缩带进行重力脱水，脱除约60~80%的水分。脱水后的湿焦滤饼随着滤带的运转被带至楔形脱水区，楔形区是一个三角形的空间，两滤带在该区逐渐靠拢，湿焦在两条滤带间逐步受到挤压，由于压力作用使湿焦中的水分排出，滤带交汇点是φ800 带孔眼的大辊筒使湿焦进一步稳定和脱水。辊筒内部滤液由辊筒两端的泄水孔排出机外。在此段内湿焦的含固量进一步提高，由半固态向固态转变。湿焦经楔形区后，进入压力脱水区，湿焦被夹在两条滤带之间绕辊作 S 形上下移动，在滤带张力与压榨辊的压榨下滤带张紧而产生的压力和剪切力的作用下，进一步脱去絮体和湿焦颗粒间的水分，剪切力源于两滤带经过每个辊筒的半径差，在剪切力的作用下湿焦将絮体挤压磋切，使滤饼充分脱水。在高压

脱水区设置了三对脱水辊筒上下滤带与三对辊筒接触角度均大于 180 度，当滤饼达到剪切区终端时，几经翻转剪切后足以排出的所有滤饼中的游离水，滤饼含固率达到 45%。

2.4.11.3.2 The entire dewatering process of the belt filter press is a continuous process. It may be simplified to:
Flocculation mixing – materials distribution - gravity dewatering – preloading dewatering - press dewatering – discharge of filter cakes
带式压滤机的整个脱水过程是连续进行的。可简化为：
絮凝混合——布料——重力脱水——预压脱水——压榨脱水——滤饼卸料。

2.4.11.4 Main Structural Features and Materials 主要结构特征及材料

2.4.11.4.1 Frame 机架

2.4.11.4.1.1 The frame is constructed of welded square steels. It serves to support other components.
机架由方钢焊接而成，起到支承其它部件的作用。
2.4.11.4.1.2 The sump is used to collect the filtrate. The collected filtrate is discharged to the pit through the drain of the liquid collecting pan at the bottom of the filter press.
集液槽起收集滤液的作用，收集后的滤液通过压滤机底部的集液盘排水口排放至地沟。

2.4.11.4.2 Materials distribution device 布料装置

The materials distribution device is installed in the gravity dewatering section and is comprised a feeding pipe, a baffle plate, a rubber sealing plate, a material arranging plate and a mud rake. The wet coke is allowed to the gravity dewatering section via the feeding piping and is removed of most free water. The side baffles and rubber sealing plates prevent materials from flowing to the outside of the filter belt. A mud rake is provided above the filter cloth to separate the free water contained in the wet cokes, thereby improving the effect of the gravity dewatering. A material limiting plate is provided between the feeding piping and the mud rake. It allows uniform thickness of the filter layer along the width direction of the filter belt. By adjusting the height of the limiting plate in vertical direction, the thickness of the materials layer can be adjusted.
布料装置安装在重力脱水段，由进料管、挡板、橡胶密封板、理料板及泥耙组成。湿焦经进料管进入后在此处脱去大部分游离水。侧面的挡板和橡胶密封板可阻止物料流至滤带外侧。滤布上方设有泥耙，可将包在湿焦内的自由水分离出来，提高重力脱水效果。在进料管和泥耙之间有一块限料板，它使分布在滤带宽度方向上的滤层厚度均匀，调整其上下高度可调节料层厚度。

2.4.11.4.3 Sway correcting device 纠偏装置

2.4.11.4.3.1 The device is comprised of sway correcting rollers, a cylinder, a slide, guide rails, an sensing arms, an sensing pneumatic switch and their mounting plates.
本装置由纠偏辊、气缸、滑块、导轨、感应臂、感应气动开关及其安装板等零件组成。
1.4.3.2 During operation, the filter belt will sway from left to right. When the baffle sways to certain degree, the sensing arm moves under the action of the filter belt and approaches the pneumatic control valve. As a result, the reversing valve in the sway correcting pneumatic circuit changes the direction and the piston rod in the cylinder acts. Thus, the sway correcting rollers make a certain angle with the running direction of the filter cloth, thereby correcting the sway of filter cloth and bringing it back to the normal position.
滤带在运行过程中会左右跑偏，挡板跑偏到一定距离时，感应臂在滤带作用下移动，使得接近气控阀，纠偏气压回路中响应换向阀换向，气缸活塞杆动作，纠偏辊与滤布运行方向成一定角度，从而纠正滤布跑偏，使其回到正常位置。

2.4.11.4.4 Tensioning device 张紧装置
It is mainly comprised of tensioning support, cylinder and wear strip. Its function is to tension the upper and lower filter belts and apply a certain pressure onto the filter materials such that they are pressed to be removed of moisture.
主要由张紧架、气缸及耐磨条组成。其作用是张紧上、下滤带，向过滤物料施加一定的压力使之压榨脱水。

2.4.11.4.5 Flushing device 冲洗装置
It consists of three water inlet pipes, three nozzle holders, nozzles, cleaning cover, baffle plate, etc. The flushing water has a certain pressure to clean the filter cloth and does not affect the dehydration of the next cycle.
由三根进水管、三喷嘴座、喷嘴、清洗罩、挡板等组成，冲洗水具有一定的压力，使滤布清洗干净，不影响下一循环的脱水。

2.4.11.4.6 Pressing roller system 压榨辊系
The surface of each roll is applied with a special anti-corrosion coating. The bearing housing is sealed and is waterproof and dustproof. The bearings are double-row roller self-aligning bearings and are lubricated with grease.
各辊表面均覆盖有特殊的防腐涂层。轴承座采用密封形式，能防水防尘。轴承均为双列滚子调心轴承，用润滑脂润滑。

2.4.11.4.7 Unloading device 卸料装置

The upper and lower filter belts are provided with discharge devices at the main drive rollers for unloading the dewatered filter cakes and discharging them outside the unit through the discharge plate. The mud scraping plate is constructed of PP so that the filter belts are not susceptible to damage by it. The cutting edge shall be in the tangential direction relative to diameter of the main pressing drive roller and the degree of pressing can be adjusted appropriately, which is beneficial for the filter cakes to fall off completely.
上下滤带在主传动辊处均设置卸料装置，用于卸除脱水后的滤饼，并经卸料板排除机外。刮泥板材质为 PP，不易损伤滤带。刀刃应在压紧主传动辊直径的切线方向上，其紧密程度可以调节至适当，有利于滤饼彻底脱落。

2.4.11.4.8 Drive 传动装置

The drive is mainly comprised of a drive roller, a speed reducer and a synchronizing gear. The outer surface of the drive roller is covered with a wear-resistant rubber layer to increase the coefficient of friction. The synchronization of the upper and lower filter belts is achieved by means of the synchronizing gear. The speed reducer incorporates a variable frequency adjustment which allows the output speed of the speed reducer to be adjusted from time to time.
传动装置主要由传动辊、减速机和同步齿轮构成。传动辊外表面包耐磨橡胶层，以增加摩擦系数。上下滤带的同步通过同步齿轮实现。减速机采用变频调节，可任意调节减速机的输出转速。

2.4.11.4.9 Mixer 混合器

The mixer is of stirred mixing type and a feeding tube is welded at its bottom. Wet coke is stirred in the mixer and rise in a spiral fashion such that the wet coke and the agent can be thoroughly mixed.
混合器为搅拌混合型，底部焊有进料管，湿焦在混合器内经过搅拌成螺旋线上升，湿焦和药剂得到充分混合。

2.4.11.5 Technical Parameters 技术参数

2.4.11.5.1 Operating conditions of filter press 压滤机操作条件

Table 1: List of operating conditions of filter press
表 1：压滤机操作条件

<table>
<tr><td>Feeding materials
进料</td><td colspan="4">Concentrated coke powder slurry
浓缩焦粉浆料</td></tr>
<tr><td rowspan="2"></td><td colspan="4">Normal speed (without solid)
正常速率（无固体）</td></tr>
<tr><td>Feeding rate of</td><td>Slurry rate</td><td>Slurry rate</td><td>wt% coke</td><td>Continuous</td></tr>
</table>

PA-405 PA-405 的进料速率	泥浆率	泥浆率	wt%焦炭	operating hours 操作连续时间
	m³/h	kg/h	wt%	hours/day
	25	26030	10.0	4
	17	18155	15.4	4
	25	25407	5.0	8
Feeding rate of PA-405 PA-405 的进料速率	25*	25707	7.7	
	50%wt% coke 带 50%wt%的焦炭			
	25	26030	10.0	6
	17	18155	15.4	6
	25	25707	5.0	12

Note: * stands for the emergency condition where the mud concentrating tank is removed out of service while diluting mud tank (T-403/T-404) is put into service.
注：*表示当泥浆浓缩罐停止使用，用稀释泥浆罐（T-403/T-404）操作时的紧急状况。

2.4.11.5.2 Main operating data 主要操作数据

The speed of the filter belts of the gravity belt filter press in concentration section and press filtering section is 3.6~22m/min and 1.3~7.5m/min respectively. They are driven by two motors respectively , and the processing capacity meets the process requirement (15~25m3/h).
重力带式压滤机浓缩段滤带速度为：3.6~22 m/min，压滤段滤带速度为 1.3~7.5 m/min，分别由两台电机驱动，处理量满足工艺要求 15~25m³/h。

2.4.11.6 Consumption indicators 消耗指标

Table 2: List of consumption indicators

表 2：压滤机消耗指标

Item 项目	Conditions 条件	Application 用途	Normal value 正常值	Remarks 备注
Electrical 电	380V，50Hz 3P	Motor of press filtering unit 压滤机主机电机	2.2 kW	-
		Motor of concentrator 浓缩机电机	0.75 kW	-

Item 项目	Conditions 条件	Application 用途	Normal value 正常值	Remarks 备注
		Motor of mixer 搅拌机电机	0.55 kW	-
		Electrical gate valve 电动插板阀	0.55 kW	-
		Exhaust fan 排气风机	1.5 kW	-
Circulating water 循环水	P=0.4MPaG，30℃	Flushing of filter belt 滤带冲洗	20 m3/次	For shutdown 停机用
Purified air 净化风	P=0.6MPaG	Air for cylinder 气缸用风	0.9 m3/次	For start-up 开机用

2.4.11.7 Control System 控制系统

2.4.11.7.1 Main control mode 主要控制方式

The electric control system of the filter press is provided with field manual and DCS remote control mode and the start/shutdown operation is mainly based on the field control.

压滤机电气控制系统具备现场手动和 DCS 远程控制模式，开停操作以现场控制为主。

2.4.11.7.2 Interlock logic 联锁逻辑

The filter press control system is equipped with overload protection, emergency stop and filter belt over-limit position function. In any of the following cases, the system is shut down automatically:

压滤机控制系统设有过载保护、急停、滤带超极限位置功能。当出现以下情况时，系统自动停机：

2.4.11.7.2.1 The motor fails when the system equipment is operating continuously.

当系统设备连续运转时，出现电机故障。

2.4.11.7.2.2 The filter belt correcting device fails, and the filter belt sways out of the allowable range (40mm left and right respectively).

滤带纠偏装置失灵，滤带跑偏超出允许范围（左右各 40mm）。

2.4.11.7.2.3 In other emergency conditions, the emergency stop button on the door of the electrical control cabinet may be operated.

其余紧急情况，可操作电气控制柜柜门上的紧急停机按钮。

2.4.11.8 Start-up 开机

2.4.11.8.1 Before start-up, make everything ready. Check if the main unit and the auxiliary equipment are all normal, if they are clean and free of foreign matter, if the bolts are tightened and if the lubrication points are properly oiled.

开机前做好准备工作，检查主机和辅机是否一切正常，是否干净无异物；各螺栓是否拧紧；各润滑点是否正常注油。

2.4.11.8.2 Check if the flocculants is properly prepared.

检查絮凝剂是否配置好。

2.4.11.8.3 Check that the purifying air pressure is not less than 0.55MPaG, the tensioning pressure regulating range is generally 0.25-0.4MPaG, and the correcting pressure regulating range is generally 0.4-0.6MPaG. The air pressure adjustment is performed using the knob on the pressure regulating valve. When it is adjusted, first pull up the knob and rotate it clockwise to increase the air pressure. The pressure value is indicated by the pressure gauge. After the pressure is adjusted, fix the pressure knob in place. Note that the pressure shall be adjusted slowly and evenly to the desired value, and the knob shall not be adjusted quickly and suddenly.

检查净化风压力，应不小于 0.55MPaG，张紧压力调压范围一般为 0.25~0.4MPaG，纠偏压力调节范围一般为 0.4~0.6MPaG。气压调节通过调压阀上的旋钮进行，调节时先向上拔起旋钮，顺时针旋转使气压增加，压力值由压力表显示，调节好后需将压力旋钮定位。注意，调节压力需缓慢均匀地调节至所需值，不应突然快速调节旋钮。

2.4.11.8.4 Switch on the power supply of the speed regulating switch so that the main unit speed is increased from zero to the required operating speed slowly.

启动调速开关电源，使主机转速由 0 转开始慢慢地调至所需的运行速度。

2.4.11.8.5 Open the wet coke feeding valve and feed the flocculants at the same time so as to achieve the desired flocculation effect.

打开湿焦进料阀，同时投用絮凝剂，使湿焦达到预期的絮凝效果。

2.4.11.9 Shutdown 停机

2.4.11.9.1 Close the wet coke feeding valve and stop feeding the flocculants.
关闭湿焦进料阀，停用絮凝剂。

2.4.11.9.2 While the main unit is operating, start up the flushing water to rinse the filter belt for about 15 minutes.
主机保持运行，启动冲洗水，将滤带冲洗干净，约 15 分钟。

2.4.11.9.3 Stop the flushing water and shut down the main unit.
关闭冲洗水，停主机。

2.4.11.9.4 Close the purifying air main valve.
关闭净化风总阀。

2.4.11.9.5 Turn off the power supply switch.
关闭电源开关。

2.4.11.9.6 After shutdown, the wet coke left inside the piping should be emptied or backwashed to prevent blocking of the piping.
停机后，停留在管道中的湿焦需放空或反冲洗处理，以防管道堵塞。

2.4.11.10 Precautions 注意事项

2.4.11.10.1 Before start-up, it is necessary to carefully check if there is any debris on the filter belt and if the position of the sway limit detection plate is correct. Starting up the unit casually would result in damage of the filter belt.
开机前必须仔细检查滤带上是否有杂物，及超偏极限探测板位置是否正确；盲目开机会损坏滤带。

2.4.11.10.2 During operation of the unit, it is not allowed to contact the operating parts, such as filter belt, sway correcting device, press roller, etc.
机器运转时不得触及运行部件，如滤带、纠偏装置、压辊等。

2.4.11.10.3 The position of the limit travel switch of the filter belt must not be adjusted arbitrarily. Failure to observe this would affect the normal operation of the equipment.
滤带极限行程开关的位置不得随意调整，否则会影响机器正常运转。

2.4.11.10.4 During operation of the system, if the filtrate becomes turbid, it is necessary to check the materials flocculation and the equipment sealing in order to identify the cause of any leakage.

系统运行时如发现滤液浑浊，则需检查物料絮凝及机器密封情况，查出漏料原因。

2.4.11.10.5 When the machine is turned on for the first time every day, manually move the filter belt to correct the detection arm to check whether the correction system is sensitive and reliable. If it is found to be ineffective, adjust the correction air pressure and even replace the pneumatic valve.
每天第一次开机运行时，人工移动滤带纠偏探测臂，检查纠偏系统运作是否灵敏、可靠，如发现不起作用，应及时调节纠偏气压，甚至更换气动阀。

2.4.11.10.6 After the work is completed, flush the frame, driving rollers, tray holes and filter belts clean, ensuring that no foreign matter is adhered to these points. During flushing, care shall be exercised not to expose the electrical parts and bearing housing to flushing water. The wet cokes inside the piping shall be discharged or back flushed so as to protect the piping from being blocked.
工作结束后，将机架、各传动辊、各托盘孔、滤带等部位冲洗干净，不应有杂质粘附，冲洗时应避免电气部分和轴承座区域。 管道中的湿焦应放空或反冲洗处理，以防管道堵塞。

2.4.11.11 Daily Maintenance and Servicing 日常维护保养

2.4.11.11.1 Daily Maintenance by Field Operators 外操日常维护

1)、 Always check if the water outlet of the sump is blocked. If it is blocked, stop the unit and manually flush and clear it.
经常检查集液槽出水口是否堵塞，如果堵塞，应停机，进行人工冲洗、疏通。
2)、 Check that the air supply pressure is not lower than 0.55MPaG.
检查气源压力不小于 0.55MPaG。
3)、 Check that the bearing temperature is within the standard range, the bearing temperature rise does not exceed the ambient temperature by 28°C, the bearing housing temperature is not higher than 65°C, the motor bearing temperature is not higher than 75°C.
检查轴承温度在指标范围内，轴承温升不超过环境温度 28℃，轴承箱最高不大于 65℃，电机轴承温度不大于 75℃。
4)、 Check if the oil level of the speed reducer is at 1/2-2/3 and check the quality of the lubricating oil.
检查减速机油位是否在 1/2－2/3 处，检查润滑油品质。
5)、 Check that the system has no abnormal sound and is free of any leakage.
检查系统无异常声响，无跑、冒、滴、漏。

2.4.11.11.2 Daily maintenance by indoor operators 内操日常维护

1)、 Check if the operating status of the filter press, concentrator, mixer and exhaust fan, etc. is correct.
检查压滤机主机、浓缩机、搅拌机、排气风机等设备运行状态是否正确。
2）、 Check if the control instruments and remote control valves operate correctly.
检查控制仪表、远程控制阀动作是否正确。
3）、 Check if the alarm interlock systems, such as overload protection, emergency stop, and filter belt over-limit position, are normal.
检查过载保护、急停、滤带超极限位置等报警联锁系统是否正常。

2.4.11.12 Accident Handling 事故处理

In case of any abnormality, press the red emergency stop button on the control cabinet door to cut off the power supply thereby stopping the unit. Only after the fault is eliminated can the power supply be restored and the emergency stop button be reset.
当发生异常时，按下控制柜柜门上的红色急停按钮切断电源实现停机，待故障排除后才能接通电源并复位急停按钮。

2.4.11.13 Causes of and Solution to Abnormal Phenomenon 异常现象原因分析及处理方法

Table 3: List of causes of and solution to abnormal phenomenon

表 3：异常现象原因分析及处理方法

No. 序号	Abnormal phenomenon 异常现象	Cause analysis 原因分析	Solution 处理方法
1	Filter belt sways frequently. 滤带纠偏频繁	（1）The tension of the filter belt is insufficient; 滤带张紧力不够； （2）The tensioning cylinder operates abnormally; 张紧气缸动作异常； （3）The sway correcting cylinder operates with too much stroke; 纠偏气缸动作幅度大； （4）The materials are not distributed evenly; 布料不均匀； （5）The filter belt is	（1）Adjust the tensioning pressure to tension the filter belt; 调节张紧压力，张紧滤带； （2）Check if the cylinder operates flexibly and if jamming occurs at the hinge joint; 张紧气缸动作是否灵活，铰接处有无卡阻现象； （3）Reduce the spacing of the limiting bolts; 缩小限位螺栓间距； （4）Adjust the incoming material treatment plate such that materials are distributed on the filter belt evenly; 调整进料处理料板，使物料均匀分布在滤

		deformed. 滤带变形。	带上； （5）Replace the filter belt. 更换滤带。
No. 序号	Abnormal phenomenon 异常现象	Cause analysis 原因分析	Solution 处理方法
2	Sway out-of-limit of filter belt, trigging alarm 滤带超偏报警	（1）The total air supply pressure is abnormal; 总气源压力异常； （2）The sway correcting pressure is too small; 纠偏压力过小； （3）The air path seal is not tight and air leakage occurs. 气路密封漏气； （4）The control elements become abnormal; 控制元件异常； （5）The tension of the filter belt is abnormal; 滤带张紧程度异常； （6）The filter belt is deformed. 滤带变形。	（1）Check the air supply; 检查气源； （2）Increase the sway correcting pressure appropriately and it shall not exceed 0.3MPaG as practical as possible; 适当增大纠偏压力，但尽量不要超过0.3MPaG； （3）Check the air leaking point and fix or replace the all the relevant elements; 检查漏气点，更换相应元件； （4）Check the positions of the air control valve and sensing arm and that the pneumatic system works normally. 检查气控阀、感应臂位置、气动幻想工作是否正常； （5）If the tension is insufficient, increase the tensioning pressure. If the upper and lower filter belts have inconsistent tension, adjust them gradually. 若张紧力不够，则提高张紧压力；若上下滤带张紧程度不一致，则逐步调节； （6）If the filter belt is deformed severely, then the tension on both sides are different, replace the filter belt. 如果滤带变形严重，两边松紧程度不同，

			则更换滤带。

No. 序号	Abnormal phenomenon 异常现象	Cause analysis 原因分析	Solution 处理方法
3	The filter belt is not flushed clean. 滤带冲洗不干净	（1）The flushing water pressure is low; 冲洗水压力低； （2）The flushing water nozzles are blocked; 冲洗水喷嘴堵塞； （3）The mud scraping plate does not scrap mud completely; 刮板刮泥不彻底； （4）The flocculants concentration is too high, and the excess agent adheres to the filter bag, making it difficult to rinse the filter belt clean. 絮凝剂浓度过高，多余药剂粘附在滤袋上，使滤带不易冲洗干净。	（1）Check if the flushing water piping is blocked; 检查冲洗水管路是否堵塞； （2）Clean or replace the nozzles; 清洗或更换喷嘴； （3）Adjust the gap between the scraping plate and the filter belt and the tension of the spring. If the dry scraping plate is abraded seriously, replace a new scraping plate. 调整刮板与滤带间的间隙和弹簧的拉紧程度；若干刮板磨损严重，更换新刮板； （4）Brush the filter cloth clean and reduce the concentration of the flocculants. 将滤布用毛刷刷干净，同时降低絮凝剂浓度。
4	Materials are leaking from the gravity dewatering area or pre-pressing dewatering area 滤带重力脱水区或预压脱水区跑料	（1）The inlet material flow is excessive and does not match the belt velocity; 进料流量太大，与带速不匹配； （2）The flocculation effect of the materials is not satisfactory; 物料絮凝效果不好； （3）The rubber plates on the gravity dewatering area	（1）Reduce the inlet materials flow and increase the belt velocity appropriately; 减少进料流量，适当提高带速； （2）Adjust the chemical dosing amount or carry out flocculation test; 调整加药量，或做絮凝试验； （3）Replace the sealing rubber plates. 更换密封橡胶板。

		are worn out. 重力脱水区橡胶板磨损。	
No. 序号	Abnormal phenomenon 异常现象	Cause analysis 原因分析	Solution 处理方法
5	Poor gravity dewatering effect is poor. 重力脱水效果差	（1）The filter belt is not flushed clean. 滤带冲洗不干净； （2）Poor flocculation effect. 絮凝效果差。	（1）Refer to point 3 for solution; 参照本节第三点处理； （2）Adjust the chemical dosing amount or carry out flocculation test; 调整加药量，或做絮凝试验。
7	Unit is stopped suddenly, triggering alarm. 突然停机报警	（1）Motor is overloaded; 电机过载； （2）The sway of filter belt is out of limit. 滤带超偏。	（1）Contact the maintenance department to inspect it. 联系维修部门检查； （2）Refer to point 2 for solution. 参照本节第二条处理。
8	The speed reducer is halted. 减速机闷车	（1）The handling flow is excessive and the distributed materials is too thick; 处理流量过大，布料太厚； （2）The filter belt gets stuck due to foreign matters; 滤带被异物卡住； （3）The rollers don’t rotate flexibly; 辊筒转动不灵活； （4）The tension of the filter belt is excessive. 滤带张紧力过大。	（1）Reduce the inlet material flow; 减小进料量； （2）Inspect the filter belt and remove any foreign matters; 检查并清除异物； （3）Check if the roller bearings are damaged; 检查辊筒轴承是否损坏； （4）Reduce the tensioning pressure appropriately. 适当减小张紧压力。
9	The unit fails to start up. 主机不启动	（1）The purifying air pressure is insufficient; 净化风压力不足； （2）The sway of filter belt is out of limit, triggering alarm; 滤带超偏报警； （3）The electrical lines fail. 电气线路故障。	（1）Check the purifying air piping and eliminate any fault; 检查净化风管路，排除故障； （2）Refer to point 2 to inspect the filter belt and eliminate any fault; 参照本节第二条检查并排除故障； （3）Contact the electricians to inspect and eliminate any fault.

			联系电工检查排除故障。

2.4.12 Dry Coke Loading Unit 1070-PA404 Operating Procedure 干焦装载单元 1070-PA404 操作规程

2.4.12.1 Function and Task 作用和任务

Dry coke loading unit PA-404 serves to load two types of coke: coke powder and bed coke.
干焦装载单元 PA-404 用于装载两种类型的焦炭：干焦粉和床层焦。

2.4.12.2 Scope 管辖范围

The dry coke loading unit includes CH-401 common chute, CNVR-401 coke powder conveyor, DC-401 vacuum cleaner, K-402 coke powder induced draft fan, FDR-402 coke rotary feed valve, SR-403 air moisture separator , LA-401 loading chute, CNVR-403 bed coke air conveying inclined chute and piping, fittings and instruments connected with the equipment.
干焦装载单元包括 CH-401 公共滑槽、CNVR-401 焦粉输送机、DC-401 收尘器、K-402 焦粉引风机、FDR-402 焦炭旋转给料阀、SR-403 空气湿气分离器、LA-401 装载滑槽、CNVR-403 床层焦空气输送斜槽以及与设备相连的管线管件、仪表等。

2.4.12.3 General Description of Flow Path 流程概述

2.4.12.3.1 Flow path outside the unit 单元外部流程

This unit serves to load two types of coke onto trucks at a common loading station: T401 coke powder and D401 bed coke. Coke powder and bed coke shall be separated and loaded at different times. Each truck is allowed to transport only one type of coke each time.
本单元用于 T401 焦粉和 D401 床层焦两种类型焦炭的装车，在一个共用装载站完成装车。焦粉和床层焦要分开且不同时间完成装载。卡车每次只运输一种焦炭。

2.4.12.3.2. Coke powder loading process 焦粉装载流程

When the tanker arrives at the truck scale (WS-401) located below the coke powder bin T-401 and is parked (with the bulk head aligned with the tanker's inlet as practical as possible), allow the bulk loader (LA-401) to enter the working status. First, start up the dust collector (DC-401) and then the unloading device below the dust collector: the impeller feeder (FDR-402) and the screw conveyor (CNVR-401). Start up the winch to lower the bulk head such that it abuts against the opening of the tanker. Once the bulk head is lowered into position, the slack rope switch acts and issues signal to the unloading valve which is loaded with materials. Then, open the valve and the starts the material loading.

当罐车到达位于焦粉仓T-401下方的汽车衡（WS-401）停好位置后（尽量使散装头对准罐车的进口），散装机（LA-401）进入工作状态。先开启收尘器（DC-401），然后是收尘器下方的卸料装置：叶轮给料机（FDR-402）和螺旋输送机（CNVR-401）。启动卷扬机使散装头下降与罐车口贴合后，下降到位后，松绳开关动作，给信号对应装载物料的卸料阀，开启阀门，装车开始。

2.4.12.3.3 Bed coke loading process 床层焦装载流程

When bed coke is loaded, the pneumatic switch valve under the corresponding bed coke bin, the air supply device of air delivery chute of pneumatic flow valve and the pneumatic valve at the outlet of the common tank (CH-401) are opened to allow the materials to flow into the tanker. As the materials are loaded continuously, heavy signal feedback from the truck scale is provided to adjust the opening of the pneumatic flow valve. When the tanker is almost full, adjust the pneumatic flow valve to reduce the materials flowing speed. When the set weight is reached, the pneumatic switch valve under the bed coke bin is closed quickly and the feeder and screw conveyor are shut down. At this time, as some materials still remains in the common tank, start up the wall vibrator (the vibration time is set according to the site conditions) for a certain period of time. Thereafter, close the pneumatic flow valve, the air supply device of the chute and the pneumatic switch valve under the common tank and shut down the wall vibrator. After the bulk head rises to the specified position, shut down the dust collector. So far, the loading is completed.

当装载床焦时，对应床焦仓下的气动开关阀和气动流阀空气输送斜槽供气装置以及公共槽（CH-401）出口的气动阀门开启，物料流动进入罐车，随着物料的不断装入，汽车衡有重量信号反馈来调节气动流阀的开度，罐车要装满时，调节气动流阀降低下料速度，当达到设定的重量时，床焦仓下的气动开关阀快速切断以及给料机和螺旋输送机关闭。此时由于公共槽内还留有部分有物料，启动公共槽的仓壁振动器（根据现场情况设定振动时间）一段时间后，关闭气动流阀，斜槽的供气装置和公共槽下的气动开关阀及仓壁振动器。散装头上升，到达位置后，关闭收尘器，装车结束。

2.4.12.3.4 Flow path of common parts(e.g., bulk loader, dust collector)散装机、收尘器等公用部分流程

（1）After the material is full, the level gauge of the bulk loader will issue alarm and the unloading material valve will be closed.

散装机的料位计在料满后，报警，关闭卸料阀门。

（2）During the loading process, as the dust collector continuously draws in dusty air, the differential pressure between the inlet and outlet of the dust collector will increase to the set value of the differential pressure gauge, and the pulse valves of the dust collector will operate in sequence to spray compressed air towards the filter bags in order to remove dust adhered to the filter bags. If the material discharge is obstructed, or material unloading is blocked, the dust inside the dust hopper will reach a high level, the level gauge will alarm and the wall vibrator of the dust hopper of the dust collector will be started up (time adjustable) until the

material level drops.在装车过程中，由于收尘器不断的吸入含尘气体，收尘器进出口差压增大到差压计设定的值，收尘器脉冲阀依次动作，向滤袋喷吹压缩空气来清除附集在滤袋上的灰尘。由于下料不畅，或者卸料堵料，导致灰斗的灰尘达到高位，料位计报警，收尘器灰斗的仓壁振动器启动（时间可调），直到料位下降。

2.4.12.4 Main structural features and materials 主要结构特征及材料

2.4.12.4.1 Loading chute LA-401 装载滑槽 LA-401

1）、The motor and speed reducer on the winch drive the wire rope winding drum such that the loading head moves up and down. The lifting height is limited by the travel switch and an AC brake for is equipped for braking purpose. The telescopic tube of the loading head has a double-layer structure, with the inner tube being used for material discharge. The annular passage between the inner and outer tubes is used for air pumping such that the dust-containing air in the bulk loading truck is sucked into the bag type dust collector for purification. The bag type dust collector has its own fan and it operates under a negative pressure and the dust inside it is cleaned on pulse basis. The purified air is discharged into the atmosphere, and the collected dust falls back into the tanker. The rotary blade level gauge operates sensitively and has eliminated the problem of the failure of the traditional micro-pressure level gauge. It is located at the top of the loading head. When the chute is full of dry coke, the rotary blades of the level gauge is subjected to resistance from the powder materials and then issues alarm. Upon receiving the alarm signal, the unloading valve is automatically closed and then the loading is stopped.

卷扬装置上的电机、减速器驱动钢丝绳卷扬筒，使装车头作升降运动，升降高度由行程开关限位，并配以交流制动器制动。装车头的伸缩管为双层结构，内管下料，内外管之间的环形通道抽气，将散装车内的含尘气体抽吸到袋式除尘器内净化。袋式除尘器自带风机，负压操作，脉冲清灰，净化后的气体排入大气，收下的粉尘又回落到罐车内。阻旋式料位仪，动作灵敏，解决了传统微压式料位计失灵的情况，设在装车头顶端，当干焦装满车槽时，料位计旋转叶片受到来自粉料的阻力而报警，卸料器阀门受到报警信号立即自动关阀，停止装车。

2）、 Type: Telescopic concentric metal cone, with an internal dust-collecting fabric bellow; includes a truck load detector for automatic shut-off and material discharge protection.

型式：伸缩式同心金属锥体，内部为收尘织物波纹管，包括用于自动关闭和下料保护的卡车负载检测器。

3）、 Specifications: Loading capacity: 150t/h; telescopic distance of loading head: 1600mm; telescopic speed of loading head: 8m/min; winch: 380V / 1.1kW.

规格：装载能力：150t/h；装载头伸缩距离：1600mm；装载头伸缩速度：8m/min；卷扬机：380V/1.1kW。

2.4.12.4.2 Common chute CH-401 公共滑槽 CH-401

The common chute is located below the T-401. Coke powder and the bed coke shall be separated and loaded at different times. A truck is allowed to transport only one type of coke each time.
公共滑槽位于 T-401 下面，焦粉和床层焦要分开且不同时间完成装载。卡车每次应当只运输一种焦炭。
Size: Φ 4000 / 1000; straight section height 2500mm.
规格：Φ4000 / 1000；直段高 2500mm。

2.4.12.4.3 Air conveying chute for bed coke CNVR-403 床层焦空气输送斜槽 CNVR-403
1）、 The material inlet end is connected to BN-401 for conveying bed coke, and the discharge end is connected to the common chute CH-401.
进料端连接于 BN-401，用于输送床层焦，卸料端连接于公共滑槽 CH-401。
2）、 Size: width 300mm, length 10.44m, slope 10°, loading capacity: 60t/h
规格：宽度 300mm，长度约 10.44m，斜度 10°，装载能力：60t/h。

2.4.12.4.4 Dust collector DC-401, induced draft fan K-402 for coke dust, coke powder conveyor CNVR-401, coke rotary feeder FDR-402 收尘器 DC-401，焦炭粉尘引风机 K-402，焦粉输送机 CNVR-401，焦炭旋转进料器 FDR-402
1）、 Type: The dust collector and induced draft fan are used to remove fine powder and deliver the fine powder back to the common chute through the rotary coke feeding valve and the coke powder conveyor. The filtered exhaust air is discharged to the atmosphere. In addition to receiving the air flow from the PA-404, the vacuum cleaner and associated equipment shall be sized to accommodate the nitrogen flow delivered from the coke powder bin and the coke feeding hopper.
型式:收尘器及引风机用来清除细粉,并通过焦炭旋转给料阀和焦粉输送器将细粉连续送回公共滑槽。将过滤的废气排放到大气中。除了来自 PA-404 内的流量之外，吸尘器和相关设备的尺寸还应考虑到来自焦粉料仓和焦炭输送料斗的输送氮气气量。
2）、 Dust collector DC-401, induced draft fan K-402 收尘器 DC-401、引风机 K-402
（1）The HMC type dust collector has its air inlet disposed on the ash hopper. When dust-containing air enters the ash hopper via the air inlet, it first impact the baffle plate at the end of the air inlet pipe. Due to the effect of inertia, coarse-particle dust in the air directly enters the ash hopper, which plays a role of dust pre-collection. The air flow allowed to the ash hopper then turns upwards and flows through the filter bag incorporating metal frames and the dust is collected on the outer surface of the filter bag. The purified air enters the clean chamber at upper part of the filter bag chamber and is collected into the outlet pipe before it is discharged. The indoor dust collection bags are arranged into a number of rows and clean up the dust collection bag at the specified time interval. When the pulse valve is open, high pressure air is injected into the filter bag to remove dust from the surface of the filter bag. The pulsed blowing width and cleaning cycle of each row of filter

bags are automatically and continuously controlled by a dedicated cleaning program controller. The dust-laden gas enters the filter chamber through the ash hopper (or the lower open flange) and the coarser particles fall directly into the ash hopper or ash bin.

HMC 型除尘器的进风口设在灰斗上，当含尘气体从进风口进入灰斗后首先碰上进风管端部的挡板，由于惯性作用，使气体中粗颗粒粉尘直接进入灰斗，起到预收尘的作用。进入灰斗的气流随后折而向上通过内部装有金属骨架的滤袋，粉尘被收集在滤袋的外表面，净化后的气体进入滤袋室上部的清洁室，汇集到出风管排出。室内收尘袋分为若干排，按照给定的时间间隔对排收尘袋进行清灰。当脉冲阀开启时，即向滤袋内喷入高压空气，以清除滤袋表面上的粉尘。各排滤袋的脉冲喷吹宽度和清灰周期，由专用的清灰程序控制器自动连续控制。含尘气体由灰斗（或下部敞开式法兰）进入过滤室，较粗颗粒直接落入灰斗或灰仓。

3、Type: dust collector: bag type dust collector (rapping device provided at the material discharge port); induced draft fan: centrifugal fan.

型式：收尘器：袋式收尘器（下料口配备震打装置）；引风机：离心风机。

4）、Size: processing air flow: 3900-5000 m^3/h; filtration area: 48m^2; number of filter bags: 64

规格：处理风量：3900-5000m^3/h；过滤面积：48m^2；滤袋条数：64 条。

5）、 Rotary feed valve FDR-402 旋转给料阀 FDR-402

（1）Type: rotary feed valve

型式：星型给料阀

（2）Size: Motor power: 0.75kW

规格：电机功率：0.75kW。

6）、 Coke powder conveyor CNVR-401 焦粉输送器 CNVR-401

（1）Type: conveyor

型式：螺旋输送机

（2）Size: conveying flow: 8m^3/h; motor power: 1.5kW

规格：输送量：8m^3/h；电机功率：1.5kW。

7）、 Air moisture separator SR-403 空气湿气分离器 SR-403

（1）、 Type: Heatless regeneration drying type

型式：无热再生干燥型

（2）、 Size: Processed air flow: 20Nm^3/min

规格：处理气量：20Nm^3/min

2.4.12.5 Technical Parameters 技术参数

Table 1: Data sheet of technical parameters

表 1：技术参数

Working condition 工况	Coke powder 焦粉	Bed coke 床焦
	Load coke powder from T-401 onto trucks	Load bed coke from BN-401 onto trucks

	将焦粉从T-401加载到卡车	将床焦从BN-401加载到卡车
Loading rate 加载率		
Flow per day (t) 每一天流 (t)	15.9	22.2 (normal) / 212 (maximum) 22.2（正常）/ 212（最大）
Loading on five days per week basis (t/d) 对于每周5天的装载（t / d） Loading on six days per week basis (t/d) 对于每周6天的装载（t / d）	22.3	31.1 (normal) / 296.8 (maximum) 31.1（正常）/296.8 （最大）
Truck loading rate 卡车		
Truck loading rate (t/h) 卡车装载率（t / h）	50.0 The loading rate of coke powder is lower than that of bed coke as it is more difficult to load fine powder and control level. 焦炭粉加载速率低于床焦炭加载速率，因为细粉加载时粉末和料位控制更加困难。	60.0
Quantity of trucks per week 每周卡车数量	6	5 (normal) / 42 (maximum) 5（正常）/ 42（最大）
Basic capability of truck (m^3/t) 卡车基础能力（m^3 / t）	45 / 21.6	45/36.0

2.4.12.6 Consumption Indicators 消耗指标

Table 2: Data sheet of consumption indicators

表 2：消耗指标

Item 项目	Condition 条件	Application 用途	Rated value 额定值	Remarks 备注
Electrical 电	380V，50Hz 3P	Impeller feeder 叶轮给料机	0.75 kW	
		Screw conveyor 螺旋输送机	1.5 kW	
		Telescopic chute	1.1 kW	

Item 项目	Condition 条件	Application 用途	Rated value 额定值	Remarks 备注
		伸缩滑槽		
		Coke powder induced draft fan 焦粉引风机	4 kW	

2.4.12.7 Control System 控制系统

2.4.12.7.1 Main control mode 主要控制方式

The electrical control system has field manual and automatic functions. In normal operation, field automatic mode is employed. Manual control is used for the system commissioning.
电气控制系统具备现场手动和自动的功能，正常运行时采用现场自动的方式，手动控制用于系统调试。

2.4.12.7.2 Control logic 控制逻辑

1）、 When the truck arrives at the loading position, select the appropriate loading procedure based on the type of coke to be loaded. LG-401 is a loading program for coke powder and LG-402 is a loading program for bed coke. Once started, the program logic controls and executes the load sequence. For loading of each truck, repeat the LG-401 and LG-402 general dry coke loading program according to the following steps: verify the truck position, extend the telescopic loading chute LA-401, activate the dust collection system, open the dry coke transfer channel, and start the equipment for loading. Once the truck is filled to the predetermined level (determined by the spare level probe on the WI-4196 or LA-401), close the dry coke transfer channel and stop the conveying equipment, stop the dust collection system, and retract the telescopic load chute. The telescopic chute is extended and retracted by controlling the hanger of the discharge chute lifter.
当卡车处于装载位置时，根据要装载的焦炭类型来选择适当的装载程序。LG-401 是焦粉的装载程序，LG-402 是床焦的装载程序。一旦启动，程序逻辑控制并执行加载序列。对于每次卡车的装载，重复 LG-401 和 LG-402 的通用干焦炭装载程序，有如下步骤：验证卡车位置，延伸散装机伸缩头 LA-401，启动除尘系统，打开干焦炭传送通道阀门，并启动设备进行装载，一旦卡车填充到预定料位（由 WI-4196 或 LA-401 上的料位探头确定），关闭干焦炭传输通道和停止设备传输，停止收尘系统，收回伸缩式装载斜槽。散装机通过控制下料槽升降器的悬挂器延伸和缩回。

2）、 Coke powder loading logic LG-401 焦粉装载逻辑 LG-401

During dry coke powder loading operation, dry coke powder is loaded from T-401, nitrogen flows through the pneumatic chute in the T-401 to increase the fluidity of the coke powder, nitrogen passes through the bottom ring pneumatic chute continuously and is opened/closed by the LG-401. The flow of nitrogen to the middle or top ring pneumatic chutes is intermittent.

在干焦粉装载操作期间，干焦粉从料仓 T-401 装载,氮气流过 T-401 中的气动滑槽以提高焦炭粉的流动性，由 LG-401 打开/关闭。通向中间和顶环气动滑槽的氮气流是间歇的。

3）、 Bed coke loading logic LG-402 床层焦装载逻辑 LG-402

The LG-402 starts up the bed coke conveyor CNVR-403, transferring the bed coke to the common chute CH-401.

LG-402 启动床焦气力输送机 CNVR-403，将床焦转移到公共滑槽 CH-401 上。

2.4.12.7.3 Interlock logic 联锁逻辑

The control system is equipped with overload protection and emergency stop protection. In case of any of the following cases, the system is shut down automatically:

控制系统设有过载保护、急停保护功能。当出现以下情况时，系统自动停机：

（1）The motor fails when the system equipment operates continuously.

当系统设备连续运转时，出现电机故障。

（2）Any logic action feedback is abnormal.

当任一逻辑动作反馈异常时。

（3） For other emergencies, the emergency stop button on the door of the electrical control cabinet may be operated.

其余紧急情况，可操作电气控制柜柜门上的紧急停机按钮。

2.4.12.8 Operation 操作

2.4.12.8.1 Automatic Operation 自动操作

1)、 Make ready for start-up of the unit. Check if the bolts are tightened and the lubrication points are properly oiled;

开机前做好准备工作，检查各螺栓是否拧紧；各润滑点是否正常注油；

2）、 Check that the drive unit is properly energized;

检查确认驱动装置已正确接电；

3）、 Confirm that the field switch and remote control can operate normally;

确认现场开关及远程控制能正常操作；

4）、 After the truck is in place, select the field automatic control and select the appropriate starting logic according to the type of loading;

卡车就位后，选择现场自动控制，根据装载类型，选择相应逻辑启动；

5）、 Check the operation of each equipment. In case of abnormality, the unit shall be immediately “stopped” for inspection;

检查各设备动作情况，出现异常应立即“停机”检查；

6）、 When the level probe at the loading chute detects that the loading level of a truck has reached, the system will be automatically stopped.

当装载滑槽料位探头检测到卡车达到装载料位时，系统自动停止。

2.4.12.8.2 Manual Operation 手动操作

Note: Manual operation is mainly intended for the system commissioning or checking the operation of various parts of the system. Turn the control mode knob to “Manual”, refer to the automatic operation logic program, and manually operate the components through the touch screen. Before commissioning or inspection, close the coke discharge manual isolation valve.
注意：手动操作主要用于系统调试或系统各部件动作情况检查。将控制方式旋钮旋转至“手动”，参照自动操作逻辑程序，通过触控屏手动操作各部件。调试或检查前，应先将器壁阀关闭。

1）、 Commissioning of coke powder induced draft fan K-402 焦粉引风机 K-402 调试

Before starting up the unit, open the venting valve of the dust collector avoid excessive negative pressure of the dust collector while the fan is operating.
开机前打开收尘器排空阀，避免风机运转时造成收尘器超负压。

2）、 Commissioning of rotary feed valve FDR-402 旋转给料阀 FDR-402 调试

The rotary feed valve shall be manually turned before commissioning. If there is any jamming, it shall be disassembled to inspect in order to avoid damage to the motor and speed reducer.
星型给料阀调试前应手动盘车，若存在卡涩现象，应解体检查，避免电机及减速机的损坏。

3）、 Commissioning of coke powder conveyor CNVR-401 焦粉输送机 CNVR-401 调试

（1）、 The screw conveyor shall be started under no load, that is, it is started when no material is present inside the housing. Feeding material to the screw conveyor is only allowed after it is started up.
螺旋机应无负载起动，即在机壳内没有物料时起动，起动后方能向螺旋机给料。

（2）、 When the screw conveyor is initially fed with materials, gradually increase the feeding rate until the rated conveying capacity is reached. The material feeding shall be uniform. Failure to comply with this would lead to accumulation and blocking of the conveyed materials and the overloading of the drive, resulting in premature damage of the unit.
螺旋机初始给料时，应逐步增加给料速度至达到额定输送能力，给料应均匀，否则容易造成输送物料的积塞，驱动装置的过载，使整台机器过早损坏。

（3）、 In order to ensure the screw conveyor is started under no load, stop feeding to the conveyor before it is stopped. Do not operate it before all the materials inside the housing are conveyed.
为了保证螺旋机无负载起动的要求，输送机在停车前应停止加料，等机壳内物料完全输尽后方可停止运转。

（4）、 During operation, always check the working status of each part of the screw conveyor. Check if the fastening parts get loose. If the parts get loose, immediately tighten the screws to re-tighten them.

在使用中经常检视螺旋机各部位的工作状态，注意各紧固机件是否松动，如果发现机件松动，则应立即拧紧螺钉，使之重新紧固。

（5）、 Special attention shall be paid to observe if the screws between the spiral tube and the coupling shaft get loose. If any screw is found to get loose, stop the conveyor immediately and tighten it.

应当特别注意螺旋管与联接轴间的螺钉是否松动，如发现此现象应立即停止，矫正之。

（6）、 The cover of the screw conveyor shall not be removed while the machine is operating to prevent any accidents.

螺旋机的机盖在机器运转时不应取下，以免发生事故。

（7）、 If any abnormality occurs during operation of the screw conveyor, check and eliminate it. Never operate the conveyor forcibly.

螺旋机运转中发生不正常现象均应加以检查，并消除之，不得强行运转。

4）、 Commissioning of control valve 控制阀调试

Commission the control valve position to ensure that is can move to the desired position sensitively, thereby avoiding premature wear-out of the valve plate due to its failure to open to the desired position.

控制阀调试阀位，动作灵敏到位，避免应开不到位造成阀板过早磨损。

5）、 Loading chute LA-401 and dust collector DC-401 装载滑槽 LA-401 与收尘器 DC-401

（1）、 First check if the various joints are correct, if the mechanical connection is tight, if the electrical connection is secure. Oil the mechanical moving parts in advance.

先检查各连接处是否正确，机械连接是否密封，电气连接是否紧固，机械运动部位预加油。

（2）、 Confirm that the power supply is on.

确认已接通电源。

（3）、 When the truck arrives at the loading position, press the “Descend” button (inching is possible) such that the loading head abuts against inlet of the truck tank. The power supply of the lifting motor of the screw lifting device is automatically disconnected and the loading head is automatically stopped. At this point, the gas filling system, the dust collector, and the level gauge begin to work.

当汽车进入到装料位置后，按“下降”钮（可点动），使装车头下降与汽车料罐进口贴合，螺旋升降装置自动断开升降电机电源，装车头被自动停机；此时充气系统、除尘器和料位仪开始工作。

（4）、 Press the “Loading” button to enter the loading status. At this time, the unloader valve on side or at the bottom of the bin is opened and the materials are discharged.

按“装车”钮进入装车状态，此时库侧或库底卸料器阀打开，物料泻出。

（5）、 After the trunk tank is full, the level gauge issues alarm (audible), the unloader valve, the air conveying chute fan, and the dust collecting fan are automatically closed and stopped

sequentially. If the truck tank does not need to be full, you can also operate the “unloading” knob to stop unloading.
汽车满罐后，料位仪报警（响铃），卸料器阀门、空气输送斜槽风机、收尘风机被自动依次关闭。如果汽车不需满罐时，也可手动“卸料”旋钮关闭卸料。
（6）、 Press the “Up” button (inching is possible) to raise the loading head to the desired position. If it rises to the limit position, the unit will be stopped automatically
按“上升”按钮（可点动），装车头上升到所需位置。若上升到极限位置时会自动停机。

6）、 Bed coke air conveying chute CNVR-403 and air moisture separator SR-403
床层焦空气输送斜槽 CNVR-403 与空气湿气分离器 SR-403
When the conveying capacity of the chute is reduced, adjust the conveying air flow appropriately, and check if the conveying air contains moisture causing agglomeration of coke powder and consequent blocking of the piping and equipment.
斜槽输送量降低时，可适当调整输送风量，同时检查输送风是否含水造成焦粉结块堵塞管线设备。

2.4.12.8.3 Precautions 注意事项

2.4.12.8.3.1 During field automatic operation, check the operation of each device frequently. If any abnormality is found, stop the unit immediately.
现场自动操作时，经常检查各设备运行情况，发现异常及时停机。
2.4.12.8.3.2 During field manual operation, refer to the automatic operation logic. Do not change the sequence of operations without permission to prevent blocking of the piping and equipment.
现场手动操作时，参照自动操作逻辑，不得随意改变动作顺序，避免造成管线及设备堵塞。
2.4.12.8.3.3 When the conveying chute is used, first start the fan and then feed the material; when it is to be stopped, stop feeding the material first and then stop the fan. When the unit is stopped for a long time, the materials on the air permeable layer shall be cleaned to prevent any damped material from being attached to the air permeable layer and affecting the air passage.
输送斜槽使用时先开风机，后进料；停止使用时先停下料，后停风机。长时间停车时，应将透气层的物料清除干净，以免物料受潮附着在透气层上而影响风通过。
2.4.12.8.3.4 After the air permeable layer of the chute is used for a period of time, open the inspection door cover to observe the operation. If the air permeable layer is damaged, make minor repair of it or replace it.
斜槽透气层使用一段时间后，应打开检查门盖进行观察，如损坏可进行局部修补或更换。
2.4.12.8.3.5 During the use of the chute, if the air permeable layer is excessively depressed for some reason thus affecting the normal conveying of the materials, a 12-hole perforated sheet with a thickness of 2 mm may be placed under the air permeable layer.

在斜槽使用中，如因某些原因透气层下凹过甚，影响物料正常输送时，可在透气层下面托一层 2 毫米厚，开有中 12 孔的多孔板。

2.4.12.8.3.6 Pay attention to the air exhaust dust collecting device of the maintenance chute to ensure that the air for material fluidizing can be smoothly discharged. Otherwise, the pressure of the upper chute will increase, resulting in drastic reduction of the conveying flow and even blocking of the entire chute.

注意维护斜槽的排风收尘装置，使气化物料的空气畅通排出，否则上槽压力增加，会使输送急剧降低，甚至整个斜槽堵塞。

2.4.12.8.4 Daily Maintenance and Servicing 日常维护保养

2.4.12.8.4.1 Daily Maintenance by Field Operators 外操日常维护

1）、 Check if the lubricating oil level of the speed reducer is at 1/2-2/3, check the quality of the lubricating oil. If there is any problem with the oil quality or the oil level is not as specified, replenish lubricating oil according to the third-level filtration requirements.

检查减速机润滑油油位是否在 1/2－2/3 处，检查润滑油品质，有问题按三级过滤添加润滑油。

2）、 Check if the motor has abnormal noise and vibration, or damaged operation indicator.

检查电机有无异常声音及振动，操作指示灯是否损坏。

3）、 Check that the bearing temperature is within the specified limit, the bearing temperature rise does not exceed the ambient temperature by 28°C, the bearing housing temperature does not exceed 65°C and the motor bearing temperature is not higher than 75°C.

检查轴承温度在指标范围内，轴承温升不超过环境温度 28℃，轴承箱最高不大于 65℃，电机轴承温度不大于 75℃。

4）、 Check if the electrically controlled device of the dust collector is operating normally, and adjust the dust cleaning time if necessary to ensure the cleaning efficiency.

检查收尘器电控清灰装置运转是否正常，必要时调整清灰时间，以保证清灰效率。

5）、 Observe the dust emission concentration from time to time. If dust emission is found, check if the filter bag is damaged and the filter chamber is sealed properly.

随时观察烟尘的排放浓度，如发现冒灰，应及时检查滤袋破损情况和过滤室密封情况。

6）、 Check if the compressed air system of the dust collector is operating normally, and the air supply pressure is not less than 0.55MPaG.

检查收尘器压缩空气系统运行是否正常，气源压力不小于 0.55MPaG。

7）、 Check that uniform material flow is conveyed via the chute. Otherwise, material blocking may occur. Remove any deposited debris in the air permeable layer in time.

检查输送斜槽来料均匀，否则容易引起堵塞，及时清除透气层中的沉积杂物。

8）、 Clean the dust collector and check for air leakage.

清理除尘器，检查是否有漏风现象。

9）、 Check if the air delivered by the chute is clean.

检查斜槽送入的空气是否清洁。

10）、 Check the material inlet of the chute. If it is found that the air permeable layer is severely worn out or not unobstructed, adjust the position of the material feeding slide properly.

检查斜槽物料入料口处，如发现透气层磨损严重或有不畅通现象，应适当调整入料溜板的开度。

11）、 Check if the opening of the air inlet control valve of the chute is normal so as to prevent excessive air being draw in which would lead to increase of the load of the air exhaust device and compromise the efficiency.

检查斜槽进风控气阀开度是否正常，以免鼓入过量空气增加排风装置的负担，影响使用效果。

12）、 Before the dust collector is shut down, clean the filter bag of dust once and remove deposited dust on the bag.

除尘器停机前，应对滤袋清灰一次，清除袋上积灰。

13）、 When the screw conveyor is operating, check the working status of each part. When any part is found to get loose, tighten the screws immediately.

螺旋输送机工作时，应检查其各部位的工作状态，发现紧固件松动时，应立即拧紧。

14）、 Check if the bolts between the spiral tube and the coupling get loose. If any bolt gets loose, stop the unit immediately to handle the problem.

检查螺旋管与联轴器的螺栓是否松动，如有松动应立即停机处理。

15）、 Check that the system has no abnormal noise, vibration and leakage.

检查系统无异常声响、振动，无跑、冒、滴、漏。

2.4.12.8.4.2 Daily Maintenance by Indoor Operators 内操日常维护

1）、 Check that all alarm interlock systems are normal.

检查所有报警联锁系统是否正常。

2）、 Check if the control instruments and remote control valve are working properly.

检查控制仪表、远程控制阀动作是否正常。

2.4.12.9 Accident Handling 事故处理

2.4.12.9.1 In any of the following cases, the unit shall be stopped immediately:

运行过程中遇如下情况，应立即停机：

1）、 The bearing temperature rises sharply and even smokes.

轴承温度剧烈升高甚至冒烟。

2）、 The equipment vibrates violently and is accompanied by severe impact sounds.

设备剧烈振动，并伴有严重的撞击声。

2.4.12.10 Causes of and Solution to Abnormal Phenomenon 异常现象原因分析及处理方法

Table 3: List of causes of and solution to abnormal phenomenon

表 3：异常现象原因分析及处理方法

No. 序号	Abnormal phenomenon 异常现象	Cause analysis 原因分析	Solution 处理方法
1	The lifting motor of the loading chute does not operate. 装载滑槽升降电机不动作	（1）The power supply is interrupted. 电源断开 （2）The limiting mechanism is damaged due to collision. 限位机构撞坏 （3）The down taper tube is overloaded. 下降锥管过载 （4）Mechanical fault occurs. 机械故障	（1）Inspect the power supply and control line of the power cabinet. 检查电柜电源及控制线路 （2）Replace the limit switch. 更换限位开关 （3）Clean up accumulated dust on the telescopic tube. 清理伸缩管积灰 （4）Inspect and repair the steel wire guiding device and drive. 检查修复钢丝绳导向装置以及传动机构
2	Materials cannot be discharged at the time of truck loading. 装车时不卸料	（1）The fuse is blown. 保险丝熔断 （2）Coke inside the bin is agglomerated. 库内焦炭结块 （3）The material outlet is blocked. 出料口堵塞 （4）The unloader valve is not open such that materials inside the bin are not fluidized. 卸料器阀门没打开不对库内物料充气	（1）Replace the fuse. 更换保险丝 （2）Remove agglomerated coke inside the bin. 排除库内结块 （3）Clean up the material inlet. 清理出料口 （4）Check the electrical system. 检查电气

Table 3: List of causes of and solution to abnormal phenomenon（Continued）

表 3：异常现象原因分析及处理方法（续）

No. 序号	Abnormal phenomenon 异常现象	Cause analysis 原因分析	Solution 处理方法
3	The dust collector discharges gas laden with too dense dust. 除尘器排出太浓含尘气体	The fabric bag falls off or is broken. 布袋脱落或已破	（1）Clean up accumulated dust on the fabric bag of the dust collector. 清理除尘器布袋积灰 （2）Fasten loose and falling dust-collecting fabric bags 固定松动、脱落的收尘布袋 （3）Replace the dust-collecting fabric bags. 更换收尘布袋
4	The unit is not stopped after the materials are full. 料满后，不自动停机	（1）The electrical transfer switch has failed. 电气转换开关已坏 （2）The level fan does not work. 料位风机不工作	Replace or repair the equipment. 更换或修理

2.4.13 Daily overhaul of the equipment 设备日常维护规程

Equipment maintenance and servicing: refer to the routine inspection, physical inspection by internal operator, state monitoring, inspection, defect and failure handling, equipment contracting management, standby equipment maintenance, normalization and equipment overhaul during production.

设备维护保养：指在生产过程中进行的日常巡检、内操监盘、状态监测、检查、缺陷故障处理、设备承包管理、备用设备维护、规格化、设备检修等工作。

Routine maintenance and servicing: the daily maintenance of equipment under operation status or standby state. The medium inside the equipment is no need of pressure release and exhaust.

日常维护保养：设备在运行状态下或备用状态下所做的日常维保内容，设备内介质不需要泄压放空。

Regular maintenance and servicing: the periodic maintenance of equipment under operation status or standby state. The medium inside the equipment is no need of pressure release.

定期维护保养：指设备在运行状态下或备用状态下所做的周期性维保内容，设备内介质不需要泄压防控。

Regular overhaul: inspection and maintenance when the equipment is separated from the system and in the delivery overhaul state.

定期检修：是设备与系统隔离并处于交付检修状态下，进行的检查、维修工作。

2.4.13.1 Flexicoking main fan K-101 灵活焦化主风机 K-101

(1) Routine maintenance and servicing 日常维护保养

1) Check whether the inlet pressure of compressor is -2.5-0KPa and the temperature is 0-45℃; check whether the outlet pressure of compressor is 0-0.5MPa and the temperature is 0-100℃.

检查压缩机入口压力-2.5～0KPa，温度 0～45℃；检查压缩机出口压力 0～0.5 MPa，温度 0～100℃。

2) Check whether the angle of stationery blade of compressor corresponds to the DCS output value.

检查压缩机静叶角度与 DCS 输出值是否对应。

3) Check whether the actuator of outlet anti-surge valve of compressor is normal.

检查压缩机出口防喘振阀执行机构正常。

4) Check whether the intake pressure and temperature of steam turbine meets the requirement and whether the temperature is ≥360℃ and the pressure is ≥3.5MPa; Check whether the exhaust pressure and temperature of steam turbine meets the requirement and whether the temperature is ≥220℃ and the pressure is ≥1.0MPa.

检查汽轮机进汽压力、温度符合要求，温度≥360℃，压力≥3.5MPa；检查汽轮机排汽压力、温度符合要求，温度≥220℃，压力≥1.0MPa。

5) Check whether the speed of steam turbine is normal (5,500r/min).

检查汽轮机转速正常（5500r/min）。

6) Check whether the inlet/outlet pipeline of steam turbine and the expansion of expansion joint are normal.

检查汽轮机出入口管线以及膨胀节等部位的膨胀情况正常。

7) Check whether the temperature of bearing pad is normal (the temperature of bearing pad of steam turbine is <105℃ and compressor is <105℃).

检查轴瓦温度正常，汽轮机轴瓦温度<105℃，压缩机轴瓦温度<105℃。

8) Check whether the shaft vibration is normal (shaft vibration of steam turbine is <60μm; shaft vibration of compressor is <63.5μm).

检查轴振动正常，汽轮机轴振动<60μm，压缩机轴振动<63.5μm。

9) Check whether the axial translation is normal (axial translation of steam turbine is <0.56mm; axial translation of compressor is <0.5mm).

检查轴位移正常，汽轮机轴位移<0.56mm，压缩机轴位移<0.5mm。

10) Check whether the spare lubrication pump is in "Automatic", whether the outlet overline (oil return tank) hand valve is fully closed and whether the vibration and temperature of operating pump are normal.
检查备用润滑油泵在“自动”位置，其出口跨线（回油箱）手阀为全关状态，运行泵振动、温度正常。
11) Check whether the temperature of lubricating oil is 35-55℃, the outlet pressure of pump is ≥1.2MPa, the pressure of lubricating oil is ≥0.25MPa and the pressure of control oil is ≥0.85MPa.
检查润滑油温度在 35～55℃、泵出口压力≥1.2MPa，润滑油压力≥0.25MPa，控制油压力≥0.85MPa。
12) Check whether the oil inlet pressure of lubricating point is normal, whether the oil return is smooth (oil flow accounts for about 1/3 of pipe diameter) and whether the temperature is normal.
检查各润滑点进油压力正常，回油顺畅（油流占管径 1 / 3 左右），温度正常。
13) Check whether the liquid level of lubricating oil tank is ≥66% and whether the overflow of top oil tank is normal.
检查润滑油箱液位≥66%，高位油箱溢流正常。
14) Check whether the manifold accumulator of lubricating oil is in normal adoption and the pressure is 0.30MPa; Whether the primary oil accumulator of oil motor of speed regulation system is normal, and the pressure is 0.8MPa.
检查润滑油主管蓄能器投用正常，压力 0.30MPa；调速系统油动机一次油蓄能器投用正常，压力 0.8MPa。
15) Check whether the differential pressure of lubricating oil filter is ＜0.15MPa.
检查润滑油过滤器差压＜0.15MPa。
16) Check the vibration of pipeline.
检查管线震动情况。
17) Check whether the gland steam cooler and the steam volume of steaming pipe are normal.
检查汽封冷却器系统正常，汽封冒汽管处汽量正常。
18) Check whether the speed regulation system of steam turbine, the valve position of quick-closing valve and the oil pressure are normal.
检查汽轮机调速系统正常，速关阀阀位正常，各油压正常。
19) Check whether all alarm interlock systems are normal.
检查所有报警联锁系统正常。
20) Check whether there is abnormal sound and whether the system has the phenomena such as bubbling, dropping and leaking.
检查无异常声响，系统无跑、冒、滴、漏。

(2) Regular maintenance and servicing 定期维护保养

1) Periodic analysis of oil quality: conduct sampling analysis on the lubricating oil in the oil tank every month.
油质定期分析：每月对油箱润滑油采样分析。
2) Switch the lubrication pump periodically: switch 2 lubrication pumps regular every half a year *Management Policy on Turning and Regular Switching of Spare Pump*.
润滑油泵定期切换：每半年对 2 台润滑油泵进行定期切换《备用机泵盘车和定期切换管理制度》。
3) Periodic detection of accumulator: the normal accumulator shall be tested every six months; during shutdown overhaul of unit, test according to the *Special Management System of Large Unit*.
蓄能器定期检测：正常运行的蓄能器每六个月检测一次；每次机组停机检修时，应检测一次《大机组特护管理制度》。

(3) Periodic maintenance 定期维修
Periodic maintenance period: the periodic maintenance period shall be synchronous with the startup and shutdown of device. The periodic maintenance items are as follows:
定期维修周期：定期维修周期与装置开停工同步。定期维修项目内容如下：
1) Check the abrasion and overheating of support and thrust bearing.
检查支撑和推力轴承磨损及过热。
2) Check the scale depositing, corrosion and axial displacement of rotor.
检查转子积垢、腐蚀、轴向位移。
3) Check the labyrinth seal of gas.
检查气体迷宫密封状况。
4) Check the scale depositing, corrosion and abrasion of casing and end cover.
检查机壳和端盖积垢、腐蚀、磨损情况。
5) Replace the skin of accumulator.
更换蓄能器皮囊。
6) Inspection of stationery blade actuator and motor maintenance.
静叶执行器检查，电机保养。
7) Check and clean the lubricating oil filter.
润滑油过滤器检查清洗。
8) Align after replacing the flexible film and bolt of coupling.
联轴器挠性膜片、螺栓更换后找正。
9) Discharge oil in the oil tank, and clean and check the bottom.
油箱排油，底部清洗、检查。
10) Disassembly inspection of oil pump.
油泵解体检查。
11) Check the scaling and corrosion on the water side of oil cooler, and test pressure after reassembly.

油冷却器检查水侧结垢和腐蚀情况，回装后试压。

12) Check the abrasion of parts in the regulation valves.

检查各调节阀内部零件磨损情况。

13) Inspection of pressure, temperature, liquid level transmitter and indicator.

压力、温度、液位变送器、指示器的检查。

14) Field commissioning of unit alarm and interlock.

机组报警、联锁现场调试。

15) Inspection of quick-closing control system and quick-closing valve of steam turbine, and replacement of seal ring.

汽轮机速关控制系统、速关阀检查，密封圈更换。

2.4.13.2 Flexicoking slide valve 灵活焦化滑阀

(1) Routine maintenance and servicing 日常维护保养

1) Check whether the pressure of cleaning, sealing steam and nitrogen of slide valve are normal.

检查滑阀各吹扫、密封蒸汽、氮气压力正常。

2) Check whether the site valve position corresponds to the output value of system.

检查现场阀位与系统输出值是否对应。

3) Check whether there is hot spot on the slide valve body.

检查滑阀阀体部分有无热点。

4) Check whether the control clutch of slide valve is in the place.

检查滑阀控制离合器是否到位。

5) Check whether the actuator spare oil pump is in "Automatic", whether the outlet overline (oil return tank) hand valve is fully closed and whether the vibration and temperature of operating pump are normal.

检查执行机构备用油泵在“自动”位置，其出口跨线（回油箱）手阀为全关状态，运行泵振动、温度正常。

6) Check whether the temperature of hydraulic oil is 35-55℃, the outlet pressure of pump is ≥1.2MPa and the pressure of hydraulic oil is ≥0.25MPa.

检查液压油温度在 35～55℃、泵出口压力≥1.2MPa，液压油压力≥0.25MPa。

7) Check whether the liquid level of lubricating oil tank is ≥66% and whether the overflow of top oil tank is normal.

检查润滑油箱液位≥66%，高位油箱溢流正常。

8) Check whether the manifold accumulator of lubricating oil is in normal adoption and the pressure is 0.30MPa.

检查润滑油主管蓄能器投用正常，压力 0.30MPa。

9) Check whether the differential pressure of lubricating oil filter is ＜0.15MPa.

检查润滑油过滤器差压＜0.15MPa。

10) Check the vibration of pipeline.
检查管线震动情况。
11) Check whether all alarm interlock systems are normal.
检查所有报警联锁系统正常。
12) Check whether there is abnormal sound and whether the system has the phenomena such as bubbling, dropping and leaking.
检查无异常声响，系统无跑、冒、滴、漏。

(2) Regular maintenance and servicing 定期维护保养
1) Periodic analysis of oil quality: conduct sampling analysis on the hydraulic oil in the oil tank every month.
油质定期分析：每月对油箱液压油采样分析。
2) Switch the hydraulic pump periodically: switch 2 oil pumps regular every half a year *Management Policy on Turning and Regular Switching of Spare Pump*.
液压油泵定期切换：每半年对 2 台油泵进行定期切换《备用机泵盘车和定期切换管理制度》。
3) Periodic detection of accumulator: the normal accumulator shall be tested every six months;
蓄能器定期检测：正常运行的蓄能器每六个月检测一次。
4) Periodic switching of clutch: during normal operation, control the clutch manually once a month and ensure the switching is flexible and reliable.
离合器定期切换：正常运行每个月手动操作一次离合器，确保切换灵活可靠。

(3) Periodic maintenance 定期维修
Periodic maintenance period: the periodic maintenance period shall be synchronous with the startup and shutdown of device. The periodic maintenance items are as follows
定期维修周期：定期维修周期与装置开停工同步。定期维修项目如下
1) Check the erosive abrasion of parts such as the valve body, valve plate, valve seat, guide rail and bolt, repair or replace it.
检查阀体阀板、阀座、导轨、螺栓等部件冲刷磨损情况，修复或更换。
2) Replace the valve rod stuffing and other sealing parts, and check whether the stuffing gland of valve rod is compressed tightly before startup.
更换阀杆填料及其他密封件，开机前检查阀杆填料压盖是否压紧。
3) Check and repair the lining.
检查并修复衬里。
4) Conduct non-destructive detection on the weld of bearing shell.
对承压壳体焊缝进行无损检测。
5) Check and maintain the manual and hydraulic control clutch of slide valve.
检查保养滑阀手动、液压控制离合器。
6) Discharge oil in the oil tank, and clean and check the bottom.

油箱排油，底部清洗、检查。

7) Check and clean the lubricating oil filter.

润滑油过滤器检查清洗。

8) Replace the skin of accumulator.

更换蓄能器皮囊。

9) Check the scaling and corrosion on the water side of oil cooler, and test pressure after reassembly.

油冷却器检查水侧结垢和腐蚀情况，回装后试压。

10) Disassembly inspection of oil pump.

油泵解体检查。

11) Check the oil pump coupling of actuator, and align after repair and replacement.

检查执行机构油泵联轴器，修复、更换后找正。

12) Inspection of pressure, temperature, liquid level transmitter and indicator.

压力、温度、液位变送器、指示器的检查。

13) Field commissioning of system alarm and interlock.

系统报警、联锁现场调试。

2.4.13.3 Flexicoking aerostatic press K-201 灵活焦化气压机 K-201

(1) Daily maintenance and servicing (The Operation Department shall fill in the following values by comparing with the final data) 日常维护保养（下述具体数值请运行部对照终版资料填写）

1) Check whether the inlet pressure of compressor is 0-0.2MPa and the temperature is 0-45℃.

检查压缩机入口压力 0～0.2MPa，温度 0～45℃。

2) Check whether the section one outlet pressure of compressor is 0-0.5MPa and the temperature is 0-100℃; and whether section two outlet pressure is 0-0.5MPa and the temperature is 0-100℃; check whether the section three outlet pressure of compressor is 0-0.5MPa and the temperature is 0-100℃.

检查压缩机一段出口压力 0～0.5MPa，温度 0～100℃；二段出口压力 0～0.5MPa，温度 0～100℃；三段出口压力 0～0.5MPa，温度 0～100℃。

3) Check whether the intake pressure and temperature of steam turbine meets the requirement and whether the temperature is ≥360℃ and the pressure is ≥3.5MPa.

检查汽轮机进汽压力、温度符合要求，温度≥360℃，压力≥3.5MPa。

4) Check whether the exhaust pressure and temperature of steam turbine meets the requirement and whether the temperature is ≥220℃ and the pressure is ≥1.0MPa.

检查汽轮机排汽压力、温度符合要求，温度≥220℃，压力≥1.0MPa。

5) Check whether the speed of steam turbine is normal (5,000-10,895r/min).

检查汽轮机转速正常（5000～10895r/min）。

6) Check whether the inlet/outlet pipeline of steam turbine and the expansion of expansion joint are normal.

检查汽轮机出入口管线以及膨胀节等部位的膨胀情况正常。

7) Check whether the temperature of bearing pad is normal (the temperature of bearing pad of steam turbine is <105℃ and compressor is <105℃).

检查轴瓦温度正常，汽轮机轴瓦温度<105℃，压缩机轴瓦温度<105℃。

8) Check whether the shaft vibration is normal (shaft vibration of steam turbine is <60μm; shaft vibration of compressor is <63.5μm).

检查轴振动正常，汽轮机轴振动<60μm，压缩机轴振动<63.5μm。

9) Check whether the axial translation is normal (axial translation of steam turbine is <0.56mm; axial translation of compressor is <0.5mm).

检查轴位移正常，汽轮机轴位移<0.56mm，压缩机轴位移<0.5mm。

10) Check whether the differential pressure between first-level seal gas and balance pipe is normal (≥0.35MPa).

检查一级密封气与平衡管差压正常，≥0.35 MPa。

11) Check whether the differential pressure between the main seal gas of dry gas seal and the front buffer gas is normal (≥0.25MPa).

检查各干气密封主密封气与前置缓冲气差压正常，≥0.25 MPa。

12) Check whether the first-level intake flow of dry gas seal is normal.

检查各干气密封一级进气流量正常。

13) Check whether the second-level intake flow of dry gas seal is normal.

检查各干气密封二级进气流量正常。

14) Check whether the differential pressure of filter of dry gas seal is normal.

检查各干气密封各过滤器压差正常。

15) Check whether the spare lubrication pump is in "Automatic", whether the outlet overline (oil return tank) hand valve is fully opened and whether the vibration and temperature of operating pump are normal.

检查备用润滑油泵在“自动”位置，其出口跨线（回油箱）手阀为全关状态，运行泵振动、温度正常。

16) Check whether the temperature of lubricating oil is 35-55℃, the outlet pressure of pump is ≥1.2MPa, the pressure of lubricating oil is ≥0.25MPa and the pressure of control oil is ≥0.85MPa.

检查润滑油温度在 35～55℃、泵出口压力≥1.2MPa，润滑油压力≥0.25MPa，控制油压力≥0.85MPa。

17) Check whether the oil inlet pressure of lubricating point is normal, whether the oil return is smooth (oil flow accounts for about 1/3 of pipe diameter) and whether the temperature is normal.

检查各润滑点进油压力正常，回油顺畅（油流占管径 1 / 3 左右），温度正常。

18) Check whether the liquid level of lubricating oil tank is ≥66% and whether the overflow of top oil tank is normal.

检查润滑油箱液位≥66%，高位油箱溢流正常。

19) Check whether the manifold accumulator of lubricating oil is in normal adoption and the pressure is 0.30MPa; Whether the primary oil accumulator of oil motor of speed regulation system is normal, and the pressure is 0.8MPa.

检查润滑油主管蓄能器投用正常，压力 0.30MPa；调速系统油动机一次油蓄能器投用正常，压力 0.8MPa。

20) Check whether the differential pressure of lubricating oil filter is ＜0.15MPa.

检查润滑油过滤器差压＜0.15MPa。

21) Check the vibration of pipeline.

检查管线震动情况。

22) Check whether the gland steam cooler and the steam volume of steaming pipe are normal.

检查汽封冷却器系统正常，汽封冒汽管处汽量正常。

23) Check whether the speed regulation system of steam turbine, the valve position of quick-closing valve and the oil pressure are normal.

检查汽轮机调速系统正常，速关阀阀位正常，各油压正常。

24) Check whether all alarm interlock systems are normal.

检查所有报警联锁系统正常。

25) Check whether there is abnormal sound and whether the system has the phenomena such as bubbling, dropping and leaking.

检查无异常声响，系统无跑、冒、滴、漏。

(2) Regular maintenance and servicing 定期维护保养

1) Periodic analysis of oil quality: conduct sampling analysis on the lubricating oil in the oil tank every month.

油质定期分析：每月对油箱润滑油采样分析。

2) Switch the lubrication pump periodically: switch 2 lubrication pumps regular every half a year *Management Policy on Turning and Regular Switching of Spare Pump*.

润滑油泵定期切换：每半年对 2 台润滑油泵进行定期切换《备用机泵盘车和定期切换管理制度》。

3) Periodic detection of accumulator: the normal accumulator shall be tested every six months; during shutdown overhaul of unit, test according to the *Special Management System of Large Unit*.

蓄能器定期检测：正常运行的蓄能器每六个月检测一次；每次机组停机检修时，应检测一次《大机组特护管理制度》。

(3) Periodic maintenance 定期维修

Periodic maintenance period: the periodic maintenance period shall be synchronous with the startup and shutdown of device. The periodic maintenance items are as follows

定期维修周期：定期维修周期与装置开停工同步。定期维修项目如下

1) Check the abrasion and overheating of support and thrust bearing.
检查支撑和推力轴承磨损及过热。
2) Check the scale depositing, corrosion and axial displacement of rotor.
检查转子积垢、腐蚀、轴向位移。
3) Check the labyrinth seal of gas.
检查气体迷宫密封状况。
4) Check the scale depositing, corrosion and abrasion of casing and end cover.
检查机壳和端盖积垢、腐蚀、磨损情况。
5) Replace the skin of accumulator.
更换蓄能器皮囊。
6) Check and replace the dry gas seal, check and clean the filter and replace the filter element.
干气密封检查更换，过滤器检查清洗，滤芯更换。
7) Check and clean the oil filter.
油过滤器检查清洗。
8) Align after replacing the flexible film and bolt of compressor coupling.
压缩机联轴器挠性膜片、螺栓更换后找正。
9) Discharge oil in the oil tank, and clean and check the bottom.
油箱排油，底部清洗、检查。
10) Disassembly inspection of oil pump.
油泵解体检查。
11) Check the scaling and corrosion on the water side of oil cooler, and test pressure after reassembly.
油冷却器检查水侧结垢和腐蚀情况，回装后试压。
12) Check the abrasion of parts in the regulation valves and commission the electric valve.
检查各调节阀内部零件磨损情况，电动阀调试。
13) Inspection of pressure, temperature, liquid level transmitter and indicator.
压力、温度、液位变送器、指示器的检查。
14) Field commissioning of unit alarm and interlock.
机组报警、联锁现场调试。
15) Inspection of quick-closing control system and quick-closing valve of steam turbine, and replacement of seal ring.
汽轮机速关控制系统、速关阀检查，密封圈更换。

2.4.13.4 Flexicoking filter press PA-405 灵活焦化压滤机 PA-405

(1) Routine maintenance and servicing 日常维护保养

1) Check whether the pressure of air source is no less than 0.45MPa;
检查气源压力，不小于 0.45MPa；

2) During operation, check whether the vibration and temperature of bearing are normal, and whether the oil temperature and level of gearbox are normal;
运行状态检查各轴承振动温度是否正常，变速箱油温、油位是否正常；
3) Before startup, carefully check whether there is sundries on the filter belt of machine, and check whether the position of unbalanced limit detection plate is correct;
开机前仔细检查机器的滤带上是否有杂物，同时检查超偏极限探测板位置是否正确；
4) During operation, don't touch the operating parts;
机器运转时不得触及运行部件；
5) Don't adjust the position of filter belt limit travel switch. Otherwise, it may influence the normal operation of machine;
滤带极限形成开关的位置不得随意调整，否则影响机器正常运转；
6) When there is accident, shut down in emergency, turn on the power supply after removing the failure and reset the scram button;
发生意外情况时，紧急停机，待排除故障后才能接通电源并复位急停按钮；
7) During system operation, if the filter liquor is muddy, check the material flocculation and machine sealing, and find the reasons of material leakage;
系统运行时发现滤液浑浊，则需检查物料絮凝及机器的密封情况，查出漏料原因；
8) Before the machine stops working, clean the rack, transmission roller and filter belt, and prevent sundries adhesion;
机器工作结束前，将机架、各传动辊、滤带等部位冲洗干净，不允许有杂物粘附；
9) Cut off the power supply when stopping the machine;
机器停止使用时，切断电源；
10) After shutdown, flush back and exhaust the medium inside the pipeline to prevent pipeline blocking;
停机后，停留在管道中的介质需进行反冲洗并放空处理，以防管道堵塞；
11) Check whether there is abnormal sound and whether the system has the phenomena such as bubbling, dropping and leaking.
检查无异常声响，系统无跑、冒、滴、漏。

(2) Regular maintenance and servicing 定期维护保养
1) Add or change oil for the lubricating points such as speed control motor, pump, stirrer and motor;
调速电机、水泵、搅拌器及电机等各润滑点的定期加、换油；
2) Add 3# lithium base lubricating grease for the bearing seat once a month and clean the dirt;
轴承座每个月加注一次 3#锂基润滑脂，并清除污物；
(3) Periodic maintenance 定期维修
Periodic maintenance period: the periodic maintenance period shall be synchronous with the startup and shutdown of device. The periodic maintenance items are as follows

定期维修周期：定期维修周期与装置开停工同步。定期维修项目如下

1) Replace the filter belt.

更换滤带。

2) Fan overhaul.

风机检修。

3) Clean and check the bearing, replace it if there is any abrasion and add grease for the rest as required;

清扫、检查各轴承，有磨损情况的更换，其余按要求加脂；

4) Replace the intake filter element of cylinder.

更换气缸进气过滤器滤芯。

2.4.13.5 Flexicoking bag filter PA-402 灵活焦化袋式过滤器 PA-402

(1) Daily maintenance and servicing (The Operation Department shall fill in the following values by comparing with the final data)

日常维护保养（下述具体数值请运行部对照终版资料填写）

1) Check whether the pressure of air source is no less than 0.45MPa;

检查气源压力，不小于 0.45MPa；

2) During operation, check whether the vibration and temperature of bearing are normal;

运行状态检查各轴承振动温度是否正常；

3) Monitor the air outlet of dust remover. After working, the outlet air of dust removal will be included with little dust particles within 30h, this is normal, since the air after being filtered by the bag filter will not contain dust particles;

监视除尘器空气出口。在工作后，30 小时内除尘器出口空气会出现夹杂轻微的灰尘粉 粒，这属正常现场，在此之后的工作过程中经布袋除尘器过滤后的空气不会再含灰尘微粒；

4) When there is accident, shut down in emergency, turn on the power supply after removing the failure and reset the scram button;

发生意外情况时，紧急停机，待排除故障后才能接通电源并复位急停按钮；

5) Before stopping the machine, clean the filter bag, prevent it from being adhered with dust, seal the filter bag so as not to influence later use;

机器停止工作前，先清洁滤袋，避免滤袋上沾满灰尘，将滤袋密实，影响下一次使用；

6) When stopping the machine, place the master switch at "OFF";

机器停止使用时，将主开关置于“OFF”位置；

7) Check whether there is abnormal sound and whether the system has the phenomena such as bubbling, dropping and leaking.

检查无异常声响，系统无跑、冒、滴、漏。

(2) Regular maintenance and servicing 定期维护保养

1) Add or change oil regularly for the lubricating points such as speed control motor, fan and motor;

调速电机、风机及电机等各润滑点的定期加、换油；

2) Add 3# lithium base lubricating grease for the bearing seat once a month and clean the dirt;

轴承座每个月加注一次 3#锂基润滑脂，并清除污物；

3) Check and overhaul the air pressure reducing valve per week, confirm the condensate and sundries of filter are exhausted before overhaul during operation, but do remember to relieve the pressure of air distribution pipe when cleaning and filtering the cup;

每周检查检修空气减压阀，检修前确认排出过滤器冷凝水和杂质，本项工作可在设备运行时进行，但切记清洁过滤罩杯时已完成空气分配管的卸压；

4) Check the pressure gauge of pressure regulation valve per week, and check whether the pressure is normal (generally control the pressure as 3.5-5.5bar);

每周检查压力调节阀上的压力表，查看压力是否异常，一般压力控制在（3.5~5.5bar）；

5) Check the dust removal situation once a month, check the differential pressure filter during equipment operation, and confirm whether the control system is in faulty function, whether the pressure of air distribution pipe is normal and whether the solenoid valve works normally;

每月检查一次除尘情况，须在设备运行时进行，检查过滤器压差、控制系统有无误动作、空气分配管压力是否正常、电磁阀工作是否异常；

6) Check the working condition of diaphragm valve per month, and check whether the differential pressure between dust remover and ash silo is normal;

每月检查膜片阀的工作情况，查看除尘器与灰库压差是否正常；

7) Check the filter bag once a year, shut down the equipment during inspection, don't restart the equipment automatically or manually and open the upper access door on the bag dust remover. Check whether there are dust partcles on the nozzle pipeline and the installation plate of filter bag; remove some suspected failure bags for inspection; if you know the working condition of the filter bag of dust remover, rearrange the filter bag appropriately, and replace filter bag (severe abrasion) with filter bag (no abrasion or slight abrasion) for continuous use; install the filter bag; replace the abraded and defective filter bag.

每年进行一次滤袋的检查工作，检查时关掉设备确保设备不再自动、人为重新启动，打开布袋除尘器上部检修门。检查喷嘴管路和滤袋安装板上是否留有灰尘微粒；拆下个别认为出现故障的布袋进行检查；如熟悉除尘器滤袋的工作状况，可适当的重新安排滤袋，将未磨损、磨损较小的滤袋换到磨损较严重的地方，继续使用；装上滤袋；更换掉已磨损，有毛病的滤袋。

(3) Periodic maintenance 定期维修

Periodic maintenance period: the periodic maintenance period shall be synchronous with the startup and shutdown of device. The periodic maintenance items are as follows

定期维修周期：定期维修周期与装置开停工同步。定期维修项目如下

1) Clean the dust remover and replace the filter bag;

除尘器清扫，更换滤袋；

2) Replace the diaphragm of pulse solenoid valve;

更换脉冲电磁阀的隔膜；

3) Fan overhaul.

风机检修。

2.4.13.6 Flexicoking slurry thickener PA-407 灵活焦化浆液增稠器 PA-407

(1) Daily maintenance and servicing (The Operation Department shall fill in the following values by comparing with the final data) 日常维护保养（下述具体数值请运行部对照终版资料填写）

1) During operation, check whether the vibration and temperature of bearing are normal;

运行状态检查各轴承振动温度是否正常；

2) Check whether the lubricating oil temperature and level of reducer are normal;

检查减速机润滑油油温、油位是否正常；

3) Discharge the sludge at the bottom of tank regularly, so as to prevent sludge accumulation at the bottom;

罐底污泥经常排放，防止罐底污泥积累；

4) During shutdown, close the water inlet valve firstly, and enable the scraper to operate for a period of time before shutdown so as to prevent unsettled suspended matter from accumulation;

停机时先关进水阀门，耙料机刮泥运行一段时间后再关机，防止未沉降悬浮物堆积；

5) When there is accident, shut down in emergency;

发生意外情况时，紧急停机；

6) Check whether there is abnormal sound and whether the system has the phenomena such as bubbling, dropping and leaking.

检查无异常声响，系统无跑、冒、滴、漏。

(2) Regular maintenance and servicing 定期维护保养

1) Just change the machine oil of reducer once a year, but check it regularly so as to prevent poor lubrication due to contamination of lubricating oil;

减速机机油每年只需更换一次，但需经常检查，避免润滑油污染造成润滑不良；

2) Just change the machine oil of reducer once a year, but check it regularly so as to prevent poor lubrication due to contamination of lubricating oil;

减速机机油每年只需更换一次，但需经常检查，避免润滑油污染造成润滑不良；

(3) Periodic maintenance 定期维修

Periodic maintenance period: the periodic maintenance period shall be synchronous with the startup and shutdown of device. Periodic maintenance items

定期维修周期：定期维修周期与装置开停工同步。定期维修项目

1) Overhaul the scraper and replace the bearing;

耙料机检修，轴承更换；

2.4.13.7 Flexicoking dry coke loading device PA-404 灵活焦化干焦装车装置 PA-404

(1) Daily maintenance and servicing (The Operation Department shall fill in the following values by comparing with the final data) 日常维护保养（下述具体数值请运行部对照终版资料填写）

1) Check whether the pressure of air source is no less than 0.45MPa;
检查气源压力，不小于 0.45MPa；

2) During operation, check whether the vibration and temperature of bearing are normal, and whether the oil temperature and level of gearbox are normal;
运行状态检查各轴承振动温度是否正常，变速箱油温、油位是否正常；

3) Monitor the air outlet of dust remover. Observe the emission concentration of smoke at any time, check the damage of filter bag and the sealing of filter room in time if there is ash, block the leakage holes, and supplement or replace the bag;
监视除尘器空气出口。随时观察烟尘的排放浓度，如发现冒灰，应及时检查滤袋破损情况和过滤室密封情况，堵塞漏气孔隙，补袋或更换新袋；

4) Regularly check whether the electric ash removing device works normally, and adjust the ash removing time if necessary so as to ensure the ash removing efficiency;
经常检查电控清灰装置运转是否正常，必要时调整清灰时间，以保证清灰效率；

5) Before shutting down the dust remover, remove the ash of filter bag and clean the ash accumulated on the bag;
除尘器停机前，应对滤袋清灰一次，清除袋上积灰；

6) Start the screw conveyor without load (stop blanking before shutdown), increase the feeding speed gradually till it reaches the rated conveying capacity, and feed uniformly. Otherwise, blocking and accumulation of conveyed materials and motor overload may be caused easily;
螺旋输送机应无负载启动（停机前先停止下料），逐步增加给料速度至达到额定输送能力，给料应均匀，否则容易造成输送物料的积塞，电机过载；

7) The conveyed material shall not be mixed with hard and large materials, so as to prevent unit being damaged due to screw clamping;
输送物料不得混入坚硬的大型物料，避免螺旋卡死二造成机组损坏；

8) During working of screw conveyor, regularly check the working state of all parts, pay attention to whether the fastening machine parts are loose, and tighten the screws at once if they are loose;
螺旋输送机工作时，应经常检查其各部位的工作状态，注意各紧固机件是否松动，发现松动时，应立即拧紧螺钉；

9) Special attention shall be paid to whether the bolts between spiral pipe and the coupling are loose, and if any, the device shall be shut down immediately;
应特别注意螺旋管与联轴器见的螺栓是否松动，如发现，应立即停机；

10) If the loading device is out of use for a long time, the probe in the telescopic hose shall be cleaned;
装车装置若长期停用，应清理干净伸缩软管内的探头；
11) Keep the control cabinet door closed to prevent dust from contaminating electrical contacts and affecting the reliability of electrical elements;
保持控制柜柜门关严，以防粉尘沾染电气触点，影响电气元件工作的可靠性；
12) The fan shall be opened firstly before feeding the material when using the air chute. Stop the fan after stopping the feeding. The materials of the gas permeable layer shall be removed and cleared for long-time shutdown, so as to prevent the material from being attached to the gas permeable layer and affecting the air volume.
空气斜槽使用时先开风机后进料，先停进料后停风机，长时间停车应将透气层的物料清楚干净，以免物料受潮附着在透气层上而影响风量通过；
13) When accident happens to loading device, shut down in emergency, turn on the power supply after removing the failure and reset the scram button;
装车装置发生意外情况时，紧急停机，待排除故障后才能接通电源并复位急停按钮；
14) Check regularly whether there is abnormal sound and whether the system has the phenomena such as bubbling, dropping and leaking.
经常检查无异常声响，系统无跑、冒、滴、漏。

(2) Regular maintenance and servicing 定期维护保养
1) Add or change oil for the lubricating points such as speed control motor, pump, fan and motor;
调速电机、泵、风机及电机等各润滑点的定期加、换油；
2) Add 3# lithium base lubricating grease for the bearing seat once a month and clean the dirt;
轴承座每半个月加注一次 3#锂基润滑脂，并清除污物；
3) Clean the dirt retention on the equipment regularly;
定期清理设备表面积尘；
4) Open the inspection door cover for observation after using the air venting layer of the air chute for a period of time, and repair or replace it if damaged.
空气斜槽透气层使用一段时间后，打开检查门盖进行观察，如损坏可局部修补或更换；
5) Replace the air chute conveying air filter regularly;
定期更换空气斜槽输送风过滤器；
6) Inspect the slope of the air chute regularly, and correct it in time in case of any deviation;
定期检查空气斜槽的斜度，如果偏离及时校正；
7) Inspect the fastening and sealing of each part regularly;
定期检查各部位的紧固及密封情况；
8) Check the filter bag once a year, shut down the equipment during inspection, don't restart the equipment automatically or manually and open the upper access door on the bag dust

remover. Check whether there are dust partcles on the nozzle pipeline and the installation plate of filter bag; Remove some suspected failure bags for inspection; if you know the working condition of the filter bag of dust remover, rearrange the filter bag appropriately, and replace filter bag (severe abrasion) with filter bag (no abrasion or slight abrasion) for continuous use; install the filter bag; replace the abraded and defective filter bag.
每年进行一次滤袋的检查工作，检查时关掉设备确保设备不再自动、人为重新启动，打开布袋除尘器上部检修门。检查喷嘴管路和滤袋安装板上是否留有灰尘微粒；拆下个别认为出现故障的布袋进行检查；如熟悉除尘器滤袋的工作状况，可适当的重新安排滤袋，将未磨损、磨损较小的滤袋换到磨损较严重的地方，继续使用；装上滤袋；更换掉已磨损，有毛病的滤袋。

(3) Periodic maintenance 定期维修

Periodic maintenance period: the periodic maintenance period shall be synchronous with the startup and shutdown of device. The periodic maintenance items are as follows
定期维修周期：定期维修周期与装置开停工同步。定期维修项目如下

1) Open the cover of air chute, screw conveyor, slide slot and other equipment for cleaning;
空气斜槽、螺旋输送机、滑槽等设备开盖清扫；

2) Replace the dust filter bag;
更换除尘器滤袋；

3) Overhaul the fan;
风机检修；

4) Clean and check the bearing, replace it if there is any abrasion and add grease for the rest as required;
清扫、检查各轴承，有磨损情况的更换，其余按要求加油、脂；

5) Replace the filter element of conveying air filter;
输送风过滤器滤芯更换；

6) Overhaul or replace the coke powder discharge valve;
焦粉卸料阀检修，或更换；

7) Set safety valve pressure.
安全阀定压。

2.4.14 Description of the general part of the instrument system 仪表系统通用部分说明

2.4.14.1 The process parameters shall be detected and controlled using a process control system such as a distributed control system (DCS) and shall be operated and managed intensively in the central control room. The control, management and operation integration of the process unit and the public engineering unit will be finally realized after carrying out the project, and the overall automation level of the factory will reach the domestic advanced level.

工艺参数的检测及控制应采用分散控制系统（DCS）等过程控制系统，并在中心控制室集中操作和管理。项目实施后，最终实现工艺装置及公用工程单元的控制、管理、经营一体化，工厂整体自动化水平达到国内先进水平。

2.4.14.2 The Safety Instrumented System (SIS) shall be set separately, for which, the fail-safe type (non-excitation action of the solenoid valve) shall be adopted.
安全仪表系统（SIS）应独立设置，采用故障安全型（电磁阀非励磁动作）。

2.4.14.3 The flammable gas and toxic gas detection and alarm system (FGS) shall be designed with an independent control system.
可燃气体及有毒气体检测报警系统（FGS）采用独立的控制系统。

2.4.14.4 Centrifugal or axial-flow compressor units shall be separately designed with a separate compressor control system (CCS) for intensive operation and management; The Rotating Equipment Data Acquisition System (MMS) can be configured separately according to user requirements.
离心或轴流式压缩机组采用独立设置的压缩机控制系统（CCS）进行集中操作和管理；转动设备数据采集系统（MMS）可根据用户要求另行配置。

2.4.14.5 The equipment package control system (PLC) provided by the supplier in complete set can be adopted for the detection and control of special process equipment.
特殊工艺设备的检测及控制可采用由供应商成套供货的设备包控制系统（PLC）。
The communication connection and data exchange between process control system, such as the process control layer DCS, and the management network for plant-wide computer information and production scheduling system shall be conducted through the Process Data Interface Server (OPC). The whole plant computer information management and production scheduling system is considered by the user or by a third party entrusted by the user.
过程控制层 DCS 等过程控制系统与全厂计算机信息和生产调度系统管理网之间，应通过过程数据接口服务器（OPC）进行通信连接和交换数据。全厂计算机信息管理和生产调度系统由用户或另行委托第三方考虑。

2.4.15 Description of complex control loops 复杂控制回路说明

2.4.15.1 Feeding system 进料系统
(1) Liquid level of vacuum residue feeding tank (D-107) 减压渣油进料罐 (D-107) 液位
The liquid level of D-107 (LIC-10101) and the vacuum residue inlet flow (FIC-10101) shall be controlled in a cascade manner to maintain the stable liquid level of D-107 by adjusting the vacuum residue inlet flow. When the LT-10102 displays D-107 high liquid level, the cut-off

signal will be output and FV-10101 will be turned off to prevent the vacuum residue from continuing entering into D-107.
D-107 液位（LIC-10101）和减压渣油进装置流量（FIC-10101）串级控制，通过调节渣油进装置流量来维持 D-107 液位平稳。当 LT-10102 显示 D-107 高液位，输出切断信号，关闭 FV-10101 来阻止减压渣油继续进入 D-107。

(2) Liquid level of sludge feeding tank (D-102) 污泥进料罐（D-102）液位
Sludge refining is performed intermittently, D-102 liquid level (LIC-11701) and sludge inlet flow (FIC-11702) are controlled in a cascade manner to maintain the stable liquid level of D-102 by adjusting the vacuum residue inlet flow.
污泥回炼为间歇操作，D-102 液位（LIC-11701）和污泥进装置流量（FIC-11702）串级控制，通过调节污泥进装置流量来维持 D-102 液位平稳。

(3) VR Temperature control 渣油预热温度控制
The vacuum residue is heated by feeding preheaters E-231, E-230, E-209 and E-206, and it will enter into D-107, then to the reactor scrubber through the vacuum residue pump (P-107).
减压渣油通过进料预热器 E-231、E-230、E-209 和 E-206 进行升温，之后进入 D-107，通过减压渣油泵（P-107）送入反应器洗涤塔。

2.4.15.2 Reactor scrubber (C-101) 反应器洗涤塔 (C-101)
(1) Liquid level control 液位控制
1) C-101 liquid level C-101 液位
The vacuum residue will be withdrawn from D-107 and enter to C-101 through the vacuum residue pump (P-107). The vacuum residue feeding pump is equipped with a variable frequency regulator, which will provide protection to the feeding pump when the FIC-10105 detects low flow.
减压渣油从 D-107 抽出，通过减压渣油泵（P-107）进入 C-101。减压渣油进料泵安装有变频调节器，当 FIC-10105 检测到流量低时，可对进料泵提供保护。
The liquid level of C-101 level has two indications: LI-10401A and LI-10401B, which will be output to LIC-10401 through the option switch (HS-10401); then LIC-10401 and the inlet flow of FIC-10103 of slag residue C-101 shall be controlled in a cascade manner to maintain the stable liquid level of C-101 by adjusting the inlet flow of vacuum residue of C-101. The liquid level of C-101 shall be maintained below the top outlet of the reactor spin to prevent scrubber bottom oil from entering the reactor bed. The two liquid level transmitters on the C-101 are installed at 180°, both of which will be set with upper and lower alarms.
C-101 液位有两个指示：LI-10401A 和 LI-10401B，通过选择开关（HS-10401）输出到 LIC-10401，LIC-10401 和减渣渣油进 C-101 流量 FIC-10103 串级控制，通过调节减压渣油进 C-101 流量维

持 C-101 液面平稳。C-101 液位必须保持在反应器旋分顶部出口下方位置，防止洗涤塔底油进入反应器床层。C-101 上的两个液位变送器呈 180°安装，均设置上下限报警。

The liquid level of C-101 level can also be verified by TI-10407/10408/10409/10410/10411. These 5 temperature indications shall be arranged at a certain elevation interval, from the bottom of C-101 to the top outlet of the reactor. It means that the liquid level of C-101 is lower than the position of the thermocouple if the temperature is above 400℃ (gas phase exists if the temperature is above 400℃). It means that the scrubber liquid level is above the thermocouple if the temperature is below 390℃ (liquid phase exists if the temperature is below 390℃). These 3 temperature indications at the bottom, TI-10409/10410/10411, are typically in the liquid phase, the readings of which are at 378-381℃ approximately. The 2 temperature indications above, TI-10407/10408, are generally in the gas phase, the readings of which are at 451-525℃ approximately. If the liquid level of C-101 is high-high interlocked, the feeding to C-101 will be cut off by PS-105, and the slurry oil will be dumped outwards through E-105.

C-101 液位也可通过 TI-10407/10408/10409/10410/10411 进行验证。这 5 个温度指示按一定标高等间距布置，从 C-101 底部一直到反应器旋分顶部出口位置。如果温度高于 400℃，表明 C-101 液位低于该热电偶所处位置（如果温度高于 400℃，表明有气相存在）。如果温度低于 390℃，表明洗涤塔液位高于该热电偶（如果温度低于 390℃，表明有液相存在）。底部的 3 个温度指示，即 TI-10409/10410/10411，一般位于液相，读数大约保持在 378～381℃。上部的 2 个温度指示，即 TI-10407/10408，一般位于气相，读数大约保持在 451～525℃。如果 C-101 液位高高联锁，PS-105 切断向 C-101 的进料，并通过 E-105 外甩油浆出装置。

2) Flushing oil flow into the upper part of C-101 grille 进入 C-101 格栅上部的冲洗油流量

HHKGO from the fractionation tower (C-201) will be delivered into the upper portion of C-101 grille. The composition of HHKGO is heavier than that of HKGO, and the final boiling point and carbon residue of HKGO can be reduced by reducing the amount of recombination entering the bottom of C-201. Simultaneously, HHKGO is very important for reducing the droplets of circulating slurry oil and fine coke powder from the top of C-101 as a flushing oil. The flow rate of flushing oil entering the C-101 grille shall be kept above the minimum value, by which, the wetting rate into the grille is kept at a minimum of 0.68$dm^3/s/m^2$ to prevent coking of the grille. In case the flushing oil flow rate FT-21801B is low, the low pressure steam enters the flushing oil distributor through the RBV-10401 to prevent the flushing oil nozzle blocking.

来自分馏塔（C-201）的 HHKGO 被送入 C-101 的格栅上部。HHKGO 组成比 HKGO 更重，通过减少进入 C-201 底部的重组份含量，可以降低 HKGO 的终馏点和残炭。同时，HHKGO 作为冲洗油对于减少从 C-101 顶带出的循环油浆和焦粉细粉的液滴非常重要。进入 C-101 格栅的冲洗油流量必须保持在最低值以上，这样可使进入格栅的润湿速度保持在最小值 0.68dm3/s/m2，防止格栅结焦。当出现冲洗油流量 FT-21801B 显示低时，低压蒸汽通过 RBV-10401 进入冲洗油分配器，防止冲洗油喷嘴堵塞。

3) Slurry Flow into the C-101 baffle 油浆进入 C-101 挡板的流量

The slurry oil of C-101 baffle is circulated and the flow is controlled by FIC-10302. In order to prevent the C-101 baffle from coking, the slurry oil circulation is set with a minimum flow limit that is generally set at 117.5 sm³/hr.
C-101 挡板油浆循环，通过 FIC-10302 控制流量恒定。为防止 C-101 挡板出现结焦现象，油浆循环设定有最低流量限制，一般设定在 117.5 sm³/hr。

(2) Temperature control 温度控制
The C-101 is designed with 2 critical temperature control points: C-101 top temperature (TIC-10401) and C-101 bottom temperature (TIC-10413), which will be adopted to maintain the constant total amount of slurry oil circulation into C-101 grille.
C-101 有 2 个关键温度控制点：C-101 顶温（TIC-10401）和 C-101 底温（TIC-10413），同时保持进入 C-101 格栅的油浆循环总量不变。
The C-101 bottom temperature (TIC-10413) and the vacuum residue preheating temperature (TIC-20901) shall be controlled in a cascade manner to maintain the stable bottom temperature of C-101 by adjusting the vacuum residue preheating temperature. The bottom temperature of C-101 shall not exceed 383°C to minimize the occurrence of coking.
C-101 底温（TIC-10413）和减压渣油预热温度（TIC-20901）串级控制，通过调节减压渣油预热温度维持 C-101 底温平稳。C-101 底温不得超过 383°C，以尽可能减少结焦情况的发生。
The cutting point of device will be set based on C-101 top temperature; if the temperature setting is low, the liquid product yield decreases, and the C-101 top temperature is design temperature is 386℃. The actual control is 365℃.The slurry oil flow from E-101 to the scrubber grille will be controlled by FIC-10301, and C-101 top temperature (TIC-10401) and FIC-10301 shall be controlled in a cascade manner. The FIC-10302 is used to adjust the bypass slurry oil flow of the E-101 to control the total amount of slurry oil entering C-101 grille. If the unit feeding is low, the load on the E-101 will also drops. Under this condition, a low flow alarm will be installed on FIC-10301 by setting a limit on FV-10301, by which, the minimum flow rate passing E-101 tube bundle, as well as the inlet and outlet pipes will be controlled at 0.91 m/s.
C-101 顶温设定装置的循环切割点，如果该温度设置低，液体产品收率下降，C-101 顶温一般设计为 386℃，实际控制在 365℃。FIC-10301 控制从 E-101 到洗涤塔格栅的油浆流量，C-101 顶温（TIC-10401）和 FIC-10301 串级控制。通过 FIC-10302 来调节 E-101 的旁路油浆流量，控制进入 C-101 格栅的油浆总量。如果装置进料量低，E-101 的负荷也会下降。在该工况下，通过在 FV-10301 上设置限位，在 FIC-10301 上安装低流量报警使通过 E-101 管束和进出口管的最低流速控制在 0.91m/s。
If the unit is powered off, the slurry oil circulation pump (P-102) will stop, by which, heat removal of E-101 will be stopped. However, the C-101 top temperature will rise as the reactor stripping steam continues to supply, which may exceed the design temperature of C-201. To prevent this from happening, the reactor stripping steam will be discontinued by ES-101 when the C-101 top temperature high-high alarm happening.

如发生装置停电，油浆循环泵（P-102）停，会使 E-101 停止取热。但是，由于反应器汽提蒸汽仍在继续供应，C-101 顶温将上升，可能超过 C-201 的设计温度。为防止该情况出现，当 C-101 顶温高高报警时，ES-101 停止反应器汽提蒸汽。

2.4.15.3 Reactor (R-101) 反应器 (R-101)

(1) Feeding and Level control 进料和料位控制

1) R-101 feeding R-101 进料

The vacuum residue enters R-101 through a pressure control valve (PIC-10501), Pressure control 1.7MPa. And supplies oil to the feedstock nozzle through the 6 feeding rings arranged downwards. R-101 is designed with 29 feeding nozzles arranged at different elevations to ensure even distribution of feeding. 21 feeding nozzles will be used under design conditions.

减压渣油经压控阀（PIC-10501）进入 R-101，压力控制 1.7MPa，通过进料环向原料油喷嘴供油，进料环从上至下共 6 个。R-101 有 29 个进料喷嘴，分布在不同标高位置，确保进料均匀分布。设计工况下，有 21 个进料喷嘴投用。

Whether the feeding distribution of R-101 is good shall be subject to feeding nozzle pressure drop produced by the feedstock pressure and the atomizing vapor pressure. Thus, the PIC-10501 supplies oil to the reactor through pressure control. Similarly, PIC-10502 is used to control the atomization steam. Furthermore, the feeding nozzle shall be enabled or disabled subject to the feed quantity, so as to maintain feed ring pressure. If the atomizing vapor pressure is low or interrupted, the distribution of feeding effect will be poor, resulting in bed cooking of R-101. PS-102 has protection effect, and R-101 feeding shall be cut off after the atomizing vapor pressure lowers to the interlock value.

R-101 进料分布是否良好取决于进料喷嘴压降，压降是通过原料油压力和雾化蒸汽压力产生的。因此，PIC-10501 通过压力控制向反应器供油。同理，利用 PIC-10502 控制雾化蒸汽。另外，投用或停用进料喷嘴，取决于进料量，以保持进料环压力。如果雾化蒸汽压力低或中断，会造成进料分布效果差，进而导致 R-101 出现床层结焦。PS-102 能起到保护作用，在雾化蒸汽压力降低至联锁值后，切断 R-101 进料。

The vacuum residue must continuously circulate under normal working conditions to prevent coke powder deposition in the feeding ring, resulting in blocking of feeding nozzle. Therefore, FIC-10505 is used to maintain the minimum flow corresponding to the minimum flow rate (1m/s) of the bottom loop.

正常工况下，减压渣油必须连续循环，防止进料环内焦粉沉积造成进料喷嘴堵塞。因此，使用 FIC-10505 来保持底部环管最低流速（1m/s）相对应的最低流量。

Another feeding for R-101 is sludge, which is intermittently refined. R-101 shall be mounted with two specific nozzles (one open and one ready) for sludge refining. The feed quantity of sludge nozzle is approximately 3.3m³/h. The sludge is sent from the sludge tank (D-102) to R-101 through the pump P-103, and FIC-11704 is adopted for flow control. The other channel

of P-103 exit is used for sludge circulation, such sludge will return to D-102 for the flow (about 20m³/h) control using FIC-11703 to reduce the solid precipitation in D-102.

R-101 另一种进料是污泥，污泥是间歇回炼。R-101 上安装两个特定喷嘴（一开一备），用于污泥回炼。正常工况下，污泥喷嘴的进料量约为 3.3m³/h。污泥从污泥罐（D-102）通过泵 P-103 送入 R-101，用 FIC-11704 控制流量。P-103 出口另外一路是污泥循环，返回 D-102，用 FIC-11703 控制流量，约为 20m³/h，作用是减少 D-102 内固体沉淀。

2) R-101 Level R-101 料位

R-101 level is controlled by the cold coke slide valve LV-10502, and R-101 is designed with 2 level indicators: for LI-10502A and LI-10502B, the option switch HS-10502 is adopted for selecting the material level indicator. The material level of R-101 is controlled below the outlet of hot coke vertical pipe to ensure that the dilute phase is overheating.

R-101 料位受冷焦滑阀 LV-10502 控制，R-101 有 2 个料位指示：LI-10502A 和 LI-10502B，通过选择开关 HS-10502 来选择料位指示。R-101 料位控制在热焦立管出口下方，保证稀相过热。

The material level indicator LI-10502A and LI-10502B will be adopted to indirectly calculate the material level based on the differential pressure measurements. Differential pressure measuring points of PDI-10503 are distributed above three elevations of R-101: the same height as the bed material level measurement point, the top of stripper tower and the middle position of the two measurement points. The differential pressure of any two of the three points can be measured by setting the manifold. The measuring points can be used to determine the density and detect the material level during start-up or downtime. Given the distance between any two measuring points in the dense phase bed is known, the density of R-101 bed can be determined by measuring the pressure difference between the two dense phase measuring points. Then R-101 material level can be determined based on such density and the differential pressure between the top and bottom points.

料位指示 LI-10502A 和 LI-10502B 根据压差测量结果来间接计算料位。PDI-10503 压差测点分布在 R-101 三个标高上：与床层料位测点相同的高度、汽提塔塔顶以及两个测点的中间位置。通过设置歧管，可以测量三个测点中任意两个的压差。在开工或停工期间，测点可被用于确定密度及检测料位。密相床内任意两个测点之间的距离已知，通过测量两个密相测点之间的压差，可以确定 R-101 床层密度。然后和顶部测点与底部测点之间的压差一起确定 R-101 料位。

The high level of R-101 can be avoided by PS-104, and the coke powder will be delivered into C-101 and circulating slurry oil. When R-101 bed reaches the high level, the hot coke and flushing coke slide valves will be closed by PS-104 to activate PS-101A and PS-101B. As coke powder clogging and poor reliability may occur to the level transmitter, and regular maintenance is required, the logic of "two-out of three" will be adopted for PS-104. LT-10501 and the other two material level indicators namely, the LI-10502A and LI-10502B are evenly distributed in R-101, and the signals will be sent to the PS-104. The calibration range of differential pressure (dP) shall be set so that the three material level indicators can reach about 30% of the bed level.

PS-104 可防止 R-101 出现高料位，将焦粉带入 C-101 和循环油浆。在 R-101 床层达到高料位时，PS-104 关闭热焦和冲刷焦滑阀，激活 PS-101A 和 PS-101B。由于料位变送器会发生焦粉堵塞情况、可靠性差，需要定期维护，所以 PS-104 采用 3 取 2 逻辑。LT-10501 和另外两个料位指示 LI-10502A 及 LI-10502B 均匀分布在 R-101 内，信号均送至 PS-104。设置压差（dP）校准范围，以使三个料位指示读数达到床层料位的 30%左右。

(2) Temperature control 温度控制

The bed temperature of R-101 is controlled by the thermal coke slide valve TV-10510, and the range is 525-538℃. There are 2 indicator signals: TIC-10510A and TIC-10510B with the maximum acceptable deviation of 5℃. Beyond that, R-101 is designed with multiple dense phase temperature measuring points evenly distributed in a spiral shape, and at least one temperature measuring point shall be set between each feeding ring. R-101 is designed with 3 dilute phase temperature measuring points: TI-10501, TI-10502 and TI-10503 evenly distributed in R-101 dilute phase for monitoring if the dilute phase is overheating.

R-101 床层温度利用热焦滑阀 TV-10510 控制，范围为 525～538℃，指示信号有 2 个：TIC-10510A 和 TIC-10510B，可接受的最大偏差为 5℃。除此之外，R-101 还有多个密相温度测点，呈螺旋状均匀分布，各个进料环之间至少有一个温度测点。R-101 有 3 个稀相温度测点：TI-10501、TI-10502 和 TI-10503，均匀分布在 R-101 稀相，用于监控稀相过热情况。

The low bed temperature of R-101 will cause the bed argillization and PS-103 is activated, which cut off R-101 feeding. Meanwhile, R-101 bed temperature overriding control shall be set to prevent activation of the PS-103. When R-101 dense phase temperature is below 515℃, the sludge feeding FIC-11704 enters a given mode with a given value at 10% of the normal value.

R-101 床温低会导致床层结焦，此时 PS-103 激活，切断 R-101 进料。同时，设置 R-101 床温超驰控制，防止激活 PS-103。在 R-101 密相温度低于 515℃时，污泥进料 FIC-11704 进入给定模式，给定值为正常值的 10%。

(3) Pressure control 压力控制

R-101 pressure is controlled by the C-201 top PIC-20401 to maintain a stable pressure difference between the reactor and the heater and a smooth cycle of cold coke, hot coke and flushing coke.

R-101 压力通过 C-201 顶 PIC-20401 来控制，保持反应器和加热器的压差恒定，维持冷焦、热焦和冲刷焦平稳循环。

The pressure difference of R-101 stripping section is monitored by PDT-10502. The measuring point can be used to monitor the fouling of gas section and material level indicator in the periods of working and out of working.

R-101 汽提段压差用 PDT-10502 监控。开停工期间，该测点可用于监测气体段结垢情况和指示料位。

The differential pressure PDT-10402 of R-101 and C-101 is adopted to monitor the pressure drop of cyclone separator and indicate whether coking occurs to the cyclone separator.
R-101 和 C-101 压差 PDT-10402 监控的是旋风分离器压降，指示旋风分离器是否出现结焦。
The dipleg pressure differential PDT-10501A-C of R-101 cyclone separator is used to measure the density and material level of each dipleg.
R-101 旋风分离器料腿压差 PDT-10501A-C，用于测量每个料腿内的密度及料位。
The pressure drop of cold coke screen is measured using PDT-10601, and is used as an indicator for whether the screen is coking.
冷焦筛压降利用 PDT-10601 来测量，用作筛网上是否结焦的指示。

2.4.15.4 Heater (R-102) 加热器（R-102）

(1) Level control 料位控制

R-102 is used as a buffer tank for the reaction gasification system, and its material level is not directly controlled, but the material level indicators LI-10903 and LI-10904 shall be set with high and low alarms. R-102 material level shall be kept above the coke powder conveying line cone, based on which, the low level alarms and high level alarms are set.
R-102 作为反应气化系统的缓冲罐，料位不作直接控制，但料位指示 LI-10903 和 LI-10904 均设置高低报警。R-102 料位应保持在焦粉输送线锥体上方，低料位报警和高料位报警都基于这些条件设置。
The material level is calculated using the differential pressure by material level indicator, and R-102 bed density is determined by PDT-10905, PDT-10903A/B, and PDT-10904A/B to determine the material level of R-102. The measuring points installed are used to measure the differential pressure △P. Given the spacing between the two dense phase measuring points is known, the density of R-102 bed is determined by calculation, and then level R-102 is determined with the differential pressure measured by the material level.
料位指示利用压差计算得到料位，通过 PDT-10905、PDT-10903A/B 和 PDT-10904A/B 来确定 R-102 床层密度，进而确定 R-102 料位。所安装的测点用于测量压差△P，两个密相测点之间的间距已知，通过计算确定 R-102 床层的密度，然后和料位测量的压差一起确定 R-102 的料位。

(2) Temperature control 温度控制

1) Above R-102 grille R-102 格栅上方

R-102 is used as a heat exchanger between the reactor and the gasifier. TIC-10910 is adopted to maintain R-102 bed temperature at around 620℃ and the tempering air volume is controlled through the FV-11302. R-102 bed is designed four temperature indicators, namely TI-10904, TI-10905, TI-10907 and TI-10906. The four thermocouples are distributed in four quadrants to maintain a uniform spacing to monitor R-102 bed temperature.

R-102 用作反应器和气化器之间的换热器。TIC-10910 使 R-102 床温保持在 620℃左右，通过 FV-11302 控制调温风量。R-102 床层有 4 个温度指示，分别是 TI-10904、TI-10905、TI-10907 和 TI-10906，4 个热电偶分布在 4 个象限，保持均匀间距，以监测 R-102 床温。

2) Below R-102 grille R-102 格栅下方

TIC-11003 controls the temperature below R-102 grille at 650-680℃, and TV-11003 regulates the quenching coke flow into the top gasifier. The flexigas temperature at the top gasifier is higher than the design temperature of R-102 grille. The vaporizer spray on the top gasifier is controlled to prevent R-102 grille from overheating by setting PS-107.

TIC-11003 将 R-102 格栅下方温度控制在 650-680℃，TV-11003 调节进入气化器顶部管道内的急冷焦流量。气化器顶灵活气温度较高，超出 R-102 格栅的设计温度。通过设置 PS-107，控制气化器顶喷汽喷水防止 R-102 格栅超温。

3) Quench coke transferline 急冷焦管线

In order to prevent the high-temperature flexigas pouring into the quenching coke pipeline in reverse direction and causing damage, the quenching coke pipeline is designed with expansion joints and slide valves. If the temperature exceeds the set value, the PS-106 will be activated and TV-11003 will be closed. Another main purpose of quench coke transferline is to adjust the pressure difference between Heater and Gasifier to ensure the normal circulation of coke between "Two Main Vessels".

为防止高温灵活气倒窜入急冷焦管线造成损坏，急冷焦线安装有膨胀节和滑阀。当温度超出设定值时，激活 PS-106，关闭 TV-11003。 急冷焦管线的另一个主要目的是调节加热器与气化器之间的压差，保证“两器”焦粉循环正常。

4) Coke unloading line for shutdown 停工卸焦线

The temperature of R-102 quenching section is monitored using TE-11005A/B/C. If the coke powder is not sufficiently cooled in R-102 quench section, and it exceeds the design temperature of the slide valve PV-11001 and the bed coke bin D-401, and if the temperature of R-102 quenching section still exceeds the set value after the 30s delay at the maximum, ES-109 will turn off the XV-11001 and stop the unloading.

利用 TE-11005A/B/C 监控 R-102 急冷段温度。如果焦粉没有在 R-102 急冷段充分冷却，超出滑阀 PV-11001 和床层焦料仓 D-401 的设计温度。在最长 30s 的延时之后，如 R-102 急冷段的温度仍然超出设定值，ES-109 就会关闭 XV-11001，停止卸焦。

TIC-11006 turns on the atomizing steam valve FV-11002A firstly to control the coke powder temperature in the quenching section. As the temperature increases, the FV-11002A will be opened continuously. FV-11002B is opened when the FV-11002A is fully open and the temperature is still high and the coke powder will be cooled down with the water. The atomizing vapor shall be opened before the water enters to ensure that the quenching water can be effectively atomized to avoid mud.

TIC-11006 首先打开雾化蒸汽阀 FV-11002A 来控制急冷段焦粉温度。随温度升高，FV-11002A 持续打开，在 FV-11002A 全开而温度仍然高的情况下，再打开 FV-11002B，用水对焦粉进行冷却。雾化蒸汽应在水进入之前打开，确保急冷水有效雾化，避免和泥。

(3) Pressure control 压力控制

R-102 and flexigas treatment system pressure are regulated by a reactor-heater differential pressure controller at the top of the flexigas absorption tower. When the Heater pressure is too high, the flexigas Flare valve is used to adjust.

R-102 和灵活气处理系统压力通过灵活气吸收塔塔顶的反应器—加热器压差控制器调节。当加热器压力过高，则用灵活气放火炬阀调节。

(4) Tempering air volume control 调温风量控制

The tempering air ring is designed with a spiral opening and two modes of operation. One is used during the start-up period, the air volume of which is large; the other is used during normal operation, the air volume of which is small. The control modes of the two operations are different.

调温风环采用螺旋形开口设计，有两种操作模式。一种是在开工期间，风量较大；另一种是在正常操作期间，风量较小。两种操作的控制模式不同。

There is a main wind in the reactor side half ring during normal operation and steam enters the other half of the gasifier side. The minimum pressure drop of the wind ring is maintained at 0.002MPa by the medium of the wind ring.

正常操作期间，反应器侧半环内有主风，而蒸汽进入气化器侧的另一半环。通过风环的介质将风环的最低压降保持在 0.002MPa。

As stated above, the temperature control air flow can be controlled by R-102 bed temperature TIC-10910. TIC-10910 and FIC-11301 are in cascaded manner during normal operation; TIC-10910 and FIC-11302 are in cascaded manner during working. If the air volume passing through the half ring is insufficient under normal working conditions, the required pressure drop will not be maintained. Therefore, the additional steam flow can be added through RO-1275 and FV-11305C to maintain pressure drop. The other half-ring steam flow is controlled by RO-1270 and FV-11305B to maintain the pressure drop.

如上所述，通过 R-102 床温 TIC-10910 可以控制调温风流量。正常操作期间，TIC-10910 和 FIC-11301 串级；在开工期间，TIC-10910 和 FIC-11302 串级。正常工况下，通过半环的风量不足，不能维持所需压降。因此，通过 RO-1275 和 FV-11305C 增加额外蒸汽流量，保持压降。通过 RO-1270 和 FV-11305B 来控制另一半环蒸汽流量，进而保持压降。

According to FIC-11305 indicator during normal operation, if the air flow is reduced to 25m³/h, an open signal is sent to the FV-11305A/B/C through the HIC-11305A/B/C, and the steam is replenished to the two half rings to maintain the corresponding pressure drop.

正常操作期间，根据 FIC-11305 指示，如果空气流量降低，达到 25m³/h，通过 HIC-11305A/B/C 向 FV-11305A/B/C 发出打开信号，对两个半环补充蒸汽，保持相应的压降。

The main air volume is large and enters two half rings during working. Therefore, the FV-11305A, B, and C are closed. According to the measurement results of FIC-11302, if the main air volume during the start-up period drops below 6,700m^3/h, and the signal will be transmitted to HIC-11305A, B and C to open FV-11305A, B and C, and the steam shall be supplemented to the two half rings to maintain the corresponding pressure drop.

开工期间，主风量大，进入两个半环。因此，FV-11305A、B 和 C 关闭。如果根据 FIC-11302 的测量结果，开工期间的主风量下降到 6700m³/h 以下，信号会传给 HIC-11305A、B 和 C，以打开 FV-11305A、B 和 C，对两个半环补充蒸汽，保持相应的压降。

FIC-11305 shall send signals to the HIC-11305A, B, and C on the steam pipeline as a switch controller. The steam valve will remain opening so long as the main air flow remains below the set value. RO-1271, RO-1273 and RO-1276 are the subline of control valve, and they can preheat the pipeline and prevent vapor condensation.

FIC-11305 是一个开关控制器，将信号送至蒸汽管路上的 HIC-11305A、B 和 C。只要主风流量保持在设定值下方，蒸汽阀就会一直处于打开状态。RO-1271、RO-1273 和 RO-1276 是控制阀的副线，可对管线预热，防止蒸汽冷凝。

2.4.15.5 Quenching tank (D-101) 急冷罐 (D-101)

(1) Material level control 料位控制

In normal working condition, D-101 works in batches or continuous mode, depending on the unloading quantity of bed coke. LIC-11201 controls the slide valve on the feeding line of quenching tank so as to keep the material level of D-101 stable during bed coke unloading.

正常工况下，D-101 以分批或连续模式工作，取决于床层焦卸出量。LIC-11201 控制急冷罐进料管线上滑阀，从而在卸床层焦期间，使 D-101 料位维持平稳。

(2) Temperature control 温度控制

The hot coke taken from R-102 shall be cooled in D-101 through quenching mist and removed into the bed coke bin D-401. Therefore, TIC-11204 controls the bed temperature of D-101 as 200℃ and regulates the quenching water flow in D-101 sprayer through cascade with FIC-11203/11204.

从 R-102 内撤出的热焦首先利用急冷喷雾在 D-101 冷却，然后转移到床层焦料仓 D-401 内。因此，TIC-11204 将 D-101 床温控制在 200℃，通过和和 FIC-11203/11204 串级，调节进入 D-101 喷雾器内的急冷水流量。

TIC-11204 will start the lower spray steam/water FIC-11203 followed by upper spray steam/water FIC-11204. FIC-11203/11204 will open the steam FV-11203B/11204B followed by the water valve FV-11203A/11204A, and the valve opening sequence is as follows: FV-11203B, FV-11203A, FV-11204B and FV-11204A. In normal working condition, the lower spray

steam/water is put into use. When a large amount of bed coke is unloaded, the upper spray steam/water will be also put into use to cope with the minimum gasification rate. The proportion of atomization steam and quenching water is 0.068.
TIC-11204 先投用下部喷汽/水 FIC-11203，然后投用上部喷汽/水 FIC-11204。FIC-11203/11204 先打开 FV-11203B/11204B 蒸汽，后打开 FV-11203A/11204A 水阀，阀门开启顺序如下：FV-11203B、FV-11203A、FV-11204B、 FV-11204A。正常工况下，下部的喷汽/水投用。当有大量的床层焦卸出时，上部的喷汽/水也投用，应对的是最小气化率工况。雾化蒸汽和急冷水的比值为 0.068。
Monitor the bed temperature of D-101 by TE-11203A/B/C. If the coke powder is not fully cooled in D-101, the temperature of bed coke bin D-401 is higher than the design temperature and the bed temperature of D-101 is still extremely high after delaying for 30s, ES-108 will close XV-11201 and the coke-unloading slide valve to stop coke unloading.
通过 TE-11203A/B/C 监测 D-101 床层温度。如果焦粉在 D-101 未充分冷却，超出床层焦料仓 D-401 的设计温度。在最长 30s 的延时之后，如 D-101 床温仍然超高，ES-108 关闭 XV-11201 和卸焦滑阀，停止卸焦。
Monitor the temperature of coke powder in the bed coke pipeline with TE-40302A/B/C. If the coke powder is not fully cooled in D-101 and the temperature of bed coke bin D-401 is higher than the design temperature, ES-108 will close XV-11201 and the coke-unloading slide valve to stop coke unloading.
通过 TE-40302A/B/C 监测床层焦管线内的焦粉温度。如果焦粉在 D-101 未充分冷却，超出床焦粉仓 D-401 的设计温度，ES-108 关闭 XV-11201 和卸焦滑阀，停止卸焦。

2.4.15.6 Gasifier (R-103) 气化器 (R-103)

(1) Material level control 料位控制

1) R-103 Material level R-103 料位

Monitor the material level of R-103 with LI-11602 and LI-11201, and keep it stable through the gasification rate of coke powder. The main fan flow in R-103 will be increased with the increasing of R-103 reserve; The main fan flow in R-103 will be decreased with the decreasing of R-103 reserve; Control the material level of overflow hopper through the material level of R-103, and it is indicated through the pressure drop in the coke return line of gasifier. The feeding slide valve HV-11401 of R-103 is controlled manually. In normal working condition, the valve is fully opened so as to maximize the heat transfer between R-102 and R-103. However, when the gasification rate or feed quantity is lower, adjust the opening of valve, limit the quantity of coke powder flowing into R-103 from R-102 and control the material level of R-103 so as to reduce the quantity of coke powder returning from the overflow hopper to R-102.
利用 LI-11602 和 LI-11201 监测 R-103 料位，通过焦粉气化率来维持料位平稳。如果 R-103 藏量增加，通过 R-103 的主风流量相应增加；如果 R-103 藏量减少，通过 R-103 的主风流量相应减少。利用 R-103 料位控制溢流斗料位，并通过气化器返焦线内的压降来指示。R-103 进料滑阀

HV-11401 手动控制，正常工况下，阀门全开，实现 R-102 和 R-103 之间热量传输最大化。但是，在气化率或进料量较低的情况下，调整阀门开度限制从 R-102 流入 R-103 的焦粉量，辅助控制 R-103 料位，进而减少溢流斗返回 R-102 的焦粉量。

The material level indication LI-11602 and LI-11601 is designed to through differential pressure calculation. The actual gasification coke density is given to calculate the material level. Install PDI-11602A/B and PDI-11601A/B to confirm the bed density and material level of R-103. Given the distance between any two measuring points in the dense phase bed is known, the density of bed can be determined by measuring the pressure difference between the two dense phase measuring points. Confirm the material level of R-103 according to the differential pressure of material level.

料位指示 LI-11602 和 LI-11601 设计利用压差计算得到，实际气化焦粉密度给定值计算料位。安装 PDI-11602A/B 和 PDI-11601A/B 来确定 R-103 床层密度和料位。密相内两个测点之间的间距已知，通过测量两个密相测点之间的压差，可以确定床层的密度。再与料位压差结合起来确定 R-103 料位。

2) R-103 blast capacity R-103 风量

The blast capacity of R-103 is regulated by FIC-11607D and main fan. If the main fan of R-103 is suspended, the coke powder may flow back to the bottom of R-103 from the bottom grille. Since the carbon steel material is arranged at the bottom of R-103, it will be leaked if the bed temperature of R-103 is higher than the design temperature. To prevent this situation, start ES-111, activate PS-111, open the accident steam, keep the bed fluidization of R-103 and prevent backflow of coke powder.

R-103 风量通过 FIC-11607D 和主风机进行调节。如果 R-103 主风中断，会导致焦粉通过 R-103 底部格栅倒流至 R-103 底部。R-103 底部为碳钢材料，R-103 床温超出设计温度，会导致泄漏。为防止此种情况发生，启动 ES-111，激活 PS-111 打开事故蒸汽，保持 R-103 床层流化，防止焦粉倒流。

(2) Temperature control 温度控制

TIC-11604A controls the bed temperature of R-103, regulates the steam flow of R-103 with FIC-11605 and keeps the temperature as 899℃. Control the bed temperature of R-103 as low as possible, and prevent metal slag on the bed of R-103.

TIC-11604A 控制 R-103 床温，利用 FIC-11605 调节 R-103 蒸汽流量，使其保持在 899℃左右。R-103 床温应尽可能低，防止 R-103 床层形成金属熔渣。

There are 8 dense-phase bed temperature measuring points on the lower portion of R103, and TI-11603A-D and TI-11605A-D are distributed on two layers in the angle of 90°: 1.22mm above the grille and 1.83m below the grille, the layers are staggered by 45°. On the upper of R103, TI-11602A-D is evenly placed in the minimum distance below the top tangent to monitor the dilute-phase temperature of bed.

R103下部，总计8个密相床温测点TI-11603A-D和TI-11605A-D呈90°分布在两层：格栅上1.22m处和格栅下方1.83m处，层与层之间错位45°。R103上部， TI-11602A-D均匀放置在顶部切线下方的最小距离内，监控床层稀相温度。

16 grille metal measuring points of TI-11606A-P are arranged at the bottom of R-103 to measure the 4 evenly-distributed points through 4 temperature distribution area and form a cross in the center. High temperature alarm is arranged at the 16 temperature measuring points to remove failure and monitor grille conveniently.

R-103底部，设置16个格栅金属测点TI-11606A-P，通过4个温度分布区域来测量4个均匀分布的点，和中心点形成一个十字。16个温度测点均设置高温报警，便于排除故障和监控格栅。

Meanwhile, 4 temperature measuring points TI-11607Q-T are distributed at the bottom of main fan/steam room for monitoring and failure removal.

同时，4个温度测点TI-11607Q-T分布在主风/蒸汽室底内，用于监控和故障排除目的。

The 4 distribution manifold of main fan are provided with 2 temperature measuring points TI-11608A-H respectively. If the device has failure, the temperature measuring points can monitor the coke powder in the pipeline and remove failure.

4个主风分配总管均设置2个温度测点TI-11608A-H。装置发生故障后，这些温度测点可用于监控管线内的焦粉及进行故障排除。

(3) Pressure control 压力控制

PDI-11603 monitors the pressure drop of R-103 grille and indicates the blocking situation of grille cap.

PDI-11603监控R-103格栅压降，指示格栅帽堵塞情况。

The overflow hopper of R-103 is provided with PDI-11501 for monitoring the density of vertical pipe.

R-103溢流斗安装PDI-11501，用于监控立管密度。

2.4.15.7 Coke powder conveyor line 焦粉输送线

All slide valves have valve position indication. Meanwhile, the pressure drop of slide valve and the pressure accumulation of vertical pipe can be monitored through differential pressure, and the measuring points are located on the upper portion of vertical pipe and slide valve. In addition, the pressure drop of angle lifting pipe and vertical lifting pipe on the coke powder conveyor line can be also monitored through differential pressure, so as to realize monitoring and failure removal. Finally, a thermocouple is arranged in the vertical pipe above each slide valve to monitor the temperature.

所有滑阀均设置阀位指示。同时，通过压差监测滑阀压降和立管蓄压情况，测点位于立管及滑阀上方。压差还用于监测焦粉输送线上角提升管和垂直提升管的压降，实现监控和故障排除的目的。最后，每个滑阀上方立管内设置热电偶监测温度。

2.4.15.8 Auxiliary combustion chamber (F-101) 辅助燃烧室 (F-101)

(1) Temperature control 温度控制

The outlet temperature of F-101 is regulated by TIC-11304 and in cascade control with FIC-11303, and the hearth fuel gas flow of F-101 is regulated by FV-11303. The temperature control circuit is only put into use during working.

F-101 出口温度由 TIC-11304 调节，和 FIC-11303 串级控制，通过 FV-11303 调节 F-101 炉膛燃料气流量。该温度控制回路仅在开工期间投用。

(2) Main fan-fuel gas control 主风—燃料气控制

The main fan flow and fuel gas flow of F101 are controlled in ratio. FIC-11303 sends the fuel gas flow to FIC-11304A after ratio calculation, and the main fan flow is regulated by FV-11304A.

F-101 主风流量和燃料气流量采用比值控制。FIC-11303 将燃料气流量经比值计算发送至 FIC-11304A，通过 FV-11304A 调节主风流量。

2.4.15.9 Medium pressure steam drum (D-103) 中压蒸汽汽包 (D-103)

D-103 delivers boiler water to the medium-pressure steam generators through thermosiphon. The temperature of D-103 depends on the temperature of saturated steam under the pressure. The pressure of D-103 is regulated by PV-12502A/B at the outlet of medium-pressure steam superheater F-102.

D-103 通过热虹吸管将锅炉水输送至各个中压蒸汽发生器。D-103 温度取决于 D-103 压力下饱和蒸汽的温度。通过中压蒸汽过热炉 F-102 出口处的 PV-12502A/B 调节 D-103 压力。

The flow of boiler water entering D-103 is controlled by FY-12501, and it depends on the flow of boiler water, the liquid level of D-103 and the outlet medium-pressure steam flow of D-103. FV-12501 delivers boiler water to the feed water preheater E-103 through TIC-12202 after confirming the flow, controls the outlet flexigas temperature of E-103 and delivers the boiler water preheated by E-103 to D-103.

锅炉水进 D-103 的流量受 FY-12501 控制，以锅炉水流量、D-103 液位及 D-103 出口中压蒸汽流量为基础。FV-12501 确定锅炉水流量后，通过 TIC-12202 将其输送至给水预热器 E-103，控制 E-103 出口灵活气温度，E-103 预热后的锅炉水送至 D-103。

When the liquid level of D-103 is low-low, the outlet flexigas of E-103 may be overheated and result in the damage of downstream equipment. To avoid the situation, ES-112 sprays steam and water through R-102, cuts off the main fan of R-103 and stops producing flexigas.

D-103 液位低低时，E-103 出口灵活气会出现超温造成下游设备损坏。为避免此种情况发生，ES-112 通过 R-102 顶喷汽喷水、切断 R-103 主风，停止继续产生灵活气。

2.4.15.10 Main fan (K-101) 主风机 (K-101)

The control circuit of compressor includes: flow control and anti-surge control of main fan. The main control objective is as follows:
压缩机控制回路包括：主风流量控制和防喘振控制。主要控制目标如下：
(1) Adjust the angle of K-101 stationery blade and the opening of steam turbine valve so as to meet the requirements of main fan flow and pressure, and optimize the operating condition of K-101.
调整 K-101 静叶角度和汽轮机汽门开度满足工艺主风流量和压力要求，优化 K-101 运行工况。

(2) Set anti-surge valve FV-11802 and FV-11803 and realize anti-surge protection and startup of K-101. The anti-surge valve can also exhaust air when the outlet pressure is high and prevent jump of safety valve.
设置防喘振阀 FV-11802 和 FV-11803，实现 K-101 防喘振保护和开机启动。防喘振阀还可用于出口压力高时放空，避免安全阀起跳。

(3) Control the main fan flow of R-103 to be no less than the minimum flow specified on the meter of K-101, avoid great fluctuation of main fan flow of R-103, and ensure the continuous main fan (no less than the minimum flow of K-101) maintains the bed fluidization of R-103 and R-102. The sudden increasing of the main fan flow of R-103 may result in process incident. To further eliminate the risks of main fan flow surge of R-103, enable the main fan to exhaust with pressure reducing valve.
控制 R-103 主风流量不低于 K-101 数据表上指定的最小流量，避免 R-103 主风流量大幅波动，确保不低于 K-101 最小流量的连续主风维持 R-103 和 R-102 的床层流化。如果 R-103 主风流量突增，会导致工艺事故。为进一步消除 R-103 主风流量剧增的风险，采用先导操作减压阀供主风机放空。
If the device is powered off, the outlet flow of main fan will be reduced to the minimum flow specified on the main fan meter. During outage of device, all flexigas users will stop flexigas and send it to the flexigas torch system.
若出现装置全面停电，主风机出口流量应自动降低至主风机数据表上指定的最小流量。在装置全面停电期间，所有灵活气用户停用灵活气，装置内灵活气送至灵活气火炬系统。

2.4.15.11 Medium-pressure steam superheater (F-102) 中压蒸汽过热炉 (F-102)
(1) Steam side 蒸汽侧
F-102 can realize overheating of medium-pressure steam in the device, and the overheating steam will converge with the medium-pressure steam in the pipe network and be delivered to K-101 and K-201. When F-102 is shut down, prevent the steam in K-101 and K-201 containing water.
F-102 实现装置自产中压蒸汽的过热，与管网中压蒸汽汇合后送至 K-101 和 K-201。当 F-102 出现停炉时，必须防止 K-101 和 K-201 出现蒸汽带水的情况。

In normal working condition, the outlet manifold pressure of F-102 fluctuates slightly, the control valve PV-12502A is fully opened, and PIC-12502A is set under the normal manifold pressure. When the manifold pressure drops, PV-12502A will be closed to keep the pressure of self-produced steam and maintain stable operation.

正常工况下，F-102 出口总管压力上下小幅波动，控制阀 PV-12502A 全开， PIC-12502A 设定在正常总管压力以下。当总管压力下降时，PV-12502A 关闭，保持装置自产蒸汽的压力，维持平稳操作。

To prevent the medium-pressure steam in K-101 and K-201 containing water, set and control the temperature of TIC-12509 as 350℃ through low-selecting PY-12502A, and close PV-12502A. After closing PV-12502A, the pressure of self-produced steam system will be increased, the set value of the second pressure controller PIC-12502B is higher than the normal manifold pressure. Open PV-12502B to relieve pressure and keep the pressure of self-produced steam system. Use PIC-12502B during working till both the outlet steam temperature and pressure of F-102 meet the requirement, and send the steam to K-101 and K-201.

为防止 K-101 和 K-201 所用中压蒸汽出现带水的情况，TIC-12509 温度设置在 350℃，通过低选 PY-12502A 来控制，关闭 PV-12502A。随 PV-12502A 关闭，装置自产蒸汽系统压力将升高，第二个压力控制器 PIC-12502B 设定值高于正常总管压力，打开 PV-12502B 泄压，保持装置自产蒸汽系统压力。PIC-12502B 还在开工期间使用，直至 F-102 出口蒸汽温度和压力均满足条件，再送入 K-101 和 K-201。

(2) On the side of burner 燃烧器侧

DCS control application of burner ignition control (DCA)

燃烧器点火控制 DCS 控制应用（DCA）

Complicated control application of F-102. Regulate the flexigas and fuel gas with F-102. The control logic includes feedforward function which can realize stable control of the burning load and outlet steam temperature. The operator input the set value of outlet steam temperature and the proportion of flexigas heat load (maximum set value: 85%). The ignition limit (high/low voltage of fuel gas, flexigas pressure and oxygen content in flue gas) of F-102 is also used as the input of controller. The controller controls the outlet steam temperature and the proportion of flexigas heat load within the ignition limit range.

F-102 的复杂控制应用，指导 F-102 对灵活气和燃料气的调节。该控制逻辑包括前馈功能，实现燃烧负荷和出口蒸汽温度的平稳控制。操作人员输入出口蒸汽温度设定值和灵活气热负荷比例（最高设定值为 85%），F-102 点火限制（燃料气高低压、灵活气压力和烟气中氧含量等）也作为控制器的输入，控制器将出口蒸汽温度和灵活气热负荷比例控制在点火限制范围内。

Normal operation:

正常操作：

FY-12502 calculates the specified load according to the following cases:

FY-12502 中根据下列情况计算规定负荷：

1) Input FY-12502 for the set value of outlet steam controller (TIC-12508) set by the operator.
操作人员设定的出口蒸汽控制器（TIC-12508）设定值输入 FY-12502。
2) The inlet steam flow and pressure (FIC-12502 and PI-12501) of F-102 are also the input of FY-12502.
F-102 入口蒸汽流量和压力（FIC-12502 和 PI-12501）也作为 FY-12502 的输入。
3) FY-12502 calculates the required heat load based on the input.
FY-12502 使用这些输入计算所需要的热负荷。

Actual heat load, FY-12602B calculates the heat load sum of flexigas and fuel gas:
实际热负荷 FY-12602B 计算灵活气和燃料气热负荷之和：
1) FY-12602 calculates the actual heat load of flexigas according to the following values:
FY-12602 根据下列数值计算实际灵活气热负荷：
a. Pressure compensation from FY-12602, calculate the flexigas flow.
来自 FY-12602 的压力补偿计算灵活气流量。
b. Heat value analyzer AI-31202 measures the heat value of flexigas.
来自热值分析仪 AI-31202 测量灵活气热值。
2) FY-12604 calculates the actual heat load of flexigas according to the following values:
FY-12604 根据下列数值计算实际燃料气热负荷：
a. Pressure compensation from FY-12604, calculate the fuel gas flow.
来自 FY-12604 的压力补偿计算燃料气流量。
b. Heat value analyzer AI-12601 measures the heat value of fuel gas.
来自热值分析仪 AI-12601 测量燃料气热值。
FY-12502A calculates the specified total load variables (load difference) which is used as the difference between specified load and actual heat load.
FY-12502A 计算规定的总负荷变化量（负荷差值），以此作为规定负荷—实际热负荷的差值。
FY-12502B increases the total output load variables from FY-12502A and TIC-12508 (indicate the normal load), and provides the total heat demand.
FY-12502B 增大 FY-12502A 到 TIC-12508 输出的总负荷的变化量（表示正常负荷），提供总热量需求量。
FY-12502C regulates the total heat demand in FY-12502B as required, and keeps it within the oxygen content in the flow gas and the limit range of maximum heat load.
FY-12502C 按照要求调节 FY-12502B 中计算的总热量需求量，保持在烟气中氧含量要求和最高热负荷限定范围内。
The operator inputs the heat load proportion of flexigas through HIC-12602.
操作人员通过 HIC-12602 输入灵活气热负荷比例。
The set value of flexigas flow is confirmed in the following ways:
灵活气流量设定值按照下列方式进行确定：

FY-12602C calculates the set value of flexigas flow controller FIC-12602 according to the limited total heat demand (FY-12502C) and the set value of flexigas heat load proportion.
FY-12602C 根据受限的总热量需求量（FY-12502C）和灵活气热负荷比例设定值（HIC-12602）来计算灵活气流量控制器 FIC-12602 的设定值。

1) Fuel gas flow:
燃料气流量：

a. FY-12604A calculates the heat load proportion of fuel gas (100%-ignition proportion of flexigas)
FY-12604A 计算燃料气热负荷比例为（100%—灵活气点火比例）

b. During normal operation of HIC-12602, FY-12604B calculates according to specified total load variable (FY-12502C) and HIC-12602.
当 HIC-12602 设置为正常操作时，FY-12604B 根据规定的总负荷变化量（FY-12502C）和 HIC-12602 进行计算。

2) The set value of fuel gas PV-12614A pressure is confirmed according to the following values:
燃料气 PV-12614A 压力设定值根据下列数值来确定：

a. FY-12604A output adjusted in the following range:
在下列范围内调整的 FY-12604A 输出：

i. Low fuel gas pressure limit (high selection of PY-12614A between PIC-12614A and FIC-12604 input)
低燃料气压力限制（PIC-12614A 和 FIC-12604 输入之间的 PY-12614A 的高选）

ii. High fuel gas pressure limit (high selection of PY-12614B between PIC-12614B and FIC-12604 input)
高燃料气压力限制（PIC-12614B 和 FIC-12604 输入之间的 PY-12614B 的低选）

Set value of fuel gas flow (working)
燃料气流量设定值（开工操作）

During working, the flexigas is unavailable, all heat load of F-102 is supplied by the fuel gas.
开工期间，灵活气不可用，F-102 热负荷全部由燃料气提供。

1) HIC-12602 sets FIC-12602 as zero.
HIC-12602 将 FIC-12602 设置为零。

2) TIC-12508 outputs is the set value of fuel gas flow FIC-12604 (outlet steam temperature and fuel gas flow of F-102 are in cascade control).
TIC-12508 输出作为燃料气流量 FIC-12604 的设定值（F-102 出口蒸汽温度和燃料气流量串级控制）。

a. Set the valve position of PV-12614A/B through the FIC-12604 output limited by the following
通过从受下列限制的 FIC-12604 输出来设定 PV-12614A/B 的阀门位置

i. Low fuel gas pressure limit (high selection of PY-12614A between PIC-12614A and FIC-12604 input)
低燃料气压力限制（PIC-12614A 和 FIC-12604 输入之间的 PY-12614A 的高选）
ii. High fuel gas pressure limit (high selection of PY-12614B between PIC-12614B and FIC-12604 input)
高燃料气压力限制（PIC-12614B 和 FIC-12604 输入之间的 PY-12614B 的低选）

2.4.15.12 Medium-pressure steam superheater (F-104) 低压蒸汽过热炉 (F-104)
F-104 supplies overheating for the low-pressure steam, ensure the steam does not contain water and prevent coke powder from accumulating in the reaction gasification system. PV-13202 regulates the outlet steam pressure of F-104 and keeps stable control of pressure.
F-104 给低压蒸汽提供过热，确保蒸汽不带水，且不会使焦粉在反应气化系统出现聚集。F-104 出口蒸汽压力由 PV-13202 进行调节，保持压力平稳控制。
F-104 has two kinds of fuel gas: fuel gas of night light and hearth. During operation of F-104, the night light shall be on all the time. The fuel gas of hearth is controlled by FIC-12603, and the outlet steam temperature is regulated through cascade of TIC-13208 and FIC-12603. To reduce the pressure and flow fluctuation in the fuel gas burner, provide low and high selection with PY-12610A and PY-12610B.
F-104 有两种燃料气：长明灯燃料气和炉膛燃料气。F-104 运行期间，长明灯始终点燃。炉膛燃料气用 FIC-12603 进行控制，出口蒸汽温度 TIC-13208 和 FIC-12603 串级调节。为尽可能降低燃料气燃烧器内的压力及流量波动，使用 PY-12610A 和 PY-12610B 提供低选和高选。

2.4.15.13 Cooler of water tank (E-105) 水箱冷却器 (E-105)
E-105 is used for working or blowing the scrubber and feeding system in emergency. When the feeding of reactor is suddenly stopped, it can control the liquid level of scrubber. When the solid content of scrubber and feeding system, it can blow the scrubber.
E-105 用于开工操作，也可在紧急情况下对洗涤塔和进料系统进行吹扫。当反应器进料突然中断时，可用于控制洗涤塔液位。在洗涤塔和进料系统固体含量高时，还可用于吹扫洗涤塔。
E-105 is a simple and effective method to cool the hot oil rapidly, and it delivers oil to the Residue storage tank. E-105 is made of concrete or carbon steel, including the large-diameter pipeline immersed in warm temperature.
E-105 是快速实现对热油进行冷却的一种简单、有效的方法，之后将油送入渣油储罐。E-105 采用混凝土或碳钢材料制成，包括浸入温水中的大直径管道。
Lead the cooling medium from steam blowdown tank D-104, keep the water temperature of E-105 appropriate and be ready. If the water temperature is too low when hot slurry oil enters E-105, the heavy oil will approach the pour point and block the pipeline. The cooling water is delivered into E-105 through HV-11701. When the hot slurry oil is delivered into E-105, the water temperature will be increased gradually, and the valve will be opened slowly.

冷却介质从蒸汽排污罐 D-104 引入，保持 E-105 水温适当，随时做好准备。如果热油浆进入 E-105 时水温太低，重油就会接近其倾点，进而堵塞管道。冷却水通过 HV-11701 送入 E-105，当热油浆被送入 E-105，水温逐渐增加，该阀缓慢打开。

2.4.15.14 fractionation tower (C-201) 分馏塔 (C-201)

(1) HHKGO circulation HHKGO 循环量

Set HHKGO steam generator and keep the bottom temperature of C-201 as 330-360℃. If the temperature of tower bottom is higher than 360℃, coking will occur at the tower bottom and block the grille flushing oil nozzle of C-101. The HHKGO flow of steam generator is regulated by FIC-20101, and the temperature of tower bottom TIC-20116 and FIC-20101 is in cascade control.

设置 HHKGO 蒸汽发生器，使 C-201 底温保持在 330～360℃。如果塔底温度超出 360℃，塔底结焦，进而堵塞 C-101 格栅冲洗油喷嘴。通过蒸汽发生器的 HHKGO 流量由 FIC-20101 调节，塔底温度 TIC-20116 和 FIC-20101 串级控制。

(2) HKGO extraction HKGO 抽出

HKGO extraction port provides BPA circulation and HKGO product. The liquid level regulator LIC-20102 of HKGO extraction port regulates the HKGO flow of HKGO stripping tower (C-203), and HKGO is delivered to the downstream device or product tank through steam stripping, heat exchange and cooling. A temperature controller is arranged on the outlet pipeline to regulate the temperature of HKGO device (lower than 120℃). The HGKO flow is controlled through FIC-21001.

HKGO 抽出口提供 BPA 循环和 HKGO 产品。HKGO 抽出口液位 LIC-20102 调节送入 HKGO 汽提塔（C-203）的 HKGO 流量，通过蒸汽汽提、换热冷却，最后送至下游装置或产品罐。出口管道上设置有温度控制，调节 HKGO 出装置温度低于 120℃。通过 FIC-21001 控制出装置 HGKO 流量。

C-203 is provided with high-level override control. When the liquid level is high-high, stop steam injection and avoid the damage of internal component. C-203 is also provided with low liquid level cut-off device. When the liquid level of LT-20801 is low-low, shut down the tower bottom pump of C-203 (P-205 A/B) and avoid the pump damage due to exhaust.

C-203 安装有高液位超驰控制，出现液位高高时，停止蒸汽注入，避免对内构件造成损害。还设置有低液位切断，当 LT-20801 显示液位低低，停 C-203 塔底泵（P-205 A/B），避免泵抽空损坏。

(3) LKGO extraction LKGO 抽出

LKGO extraction port provides LKGO circulation and LKGO products. The LKGO circulation of C-201 is regulated by FIC-23201A, and the liquid level of LIC-20101 and FIC-23201A of LKGO

extraction port are in cascade control. If the circulation of LKGO is too low, FLC-23201B will lead the low pressure steam into distributor through RBV-20102 and prevent nozzle coking.
LKGO 抽出口提供 LKGO 循环和 LKGO 产品。进 C-201 的 LKGO 循环量通过 FIC-23201A 调节，LKGO 抽出口液位 LIC-20101 和 FIC-23201A 串级控制。如果 LKGO 循环量过低，低流量设置 FLC-23201B 通过 RBV-20102 将低压蒸汽引入到分配器，防止喷嘴结焦。
LKGO is delivered to downstream device, product tank and flushing oil system after steam stripping, heat exchange and cooling. A temperature controller is arranged on the outlet pipeline to regulate the temperature of LKGO (lower than 120℃), and the inlet temperature of flushing oil tank is lower than 150℃. Control the LKGO flow of downstream treatment device through FIC-21101.
LKGO 经过蒸汽汽提和换热冷却，最后送入下游装置、产品罐和冲洗油系统。出口管道上设置有温度控制，调节 LKGO 出装置温度低于 120℃，冲洗油罐入口温度低于 150℃。通过 FIC-21101 控制进入下游处理装置的 LKGO 的流量。
C-210 is provided with high-level override control. When the liquid level is high-high, stop steam injection and avoid the damage of internal component. C-210 is also provided with low liquid level cut-off device. When the liquid level of LT-23101 is low-low, shut down the tower bottom pump of C-210 (P-227 A/B) and avoid the pump damage due to exhaust.
C-210 安装有高液位超驰控制，出现液位高高时，停止蒸汽注入，避免对内构件造成损害。还安装有低液位切断，当 LT-23101 显示低低时，停止 C-210 塔底泵（P-227 A/B），避免泵抽空损坏。

(4) LKGO flushing oil LKGO 冲洗油
LKGO flushes the instrument and overhauls the equipment with flushing oil. The temperature of flushing oil is regulated through three-way valve TIC-21105. LIC-21201 regulates the flow from flushing oil to flushing oil tank (D-210) and keeps the liquid level of flushing oil tank stable. D-210 works at the liquid level of 90%, so as to ensure sufficient supply of flushing oil during accidental suspension. Flushing oil is divided into filter high pressure, filter low pressure and non-filter low pressure, depending on the final flushing requirement.
LKGO 用作冲洗油，冲洗仪表和检修设备。冲洗油温度通过三通阀 TIC-21105 进行调节。LIC-21201 调节冲洗油至冲洗油罐（D-210）流量，保持冲洗油罐液位平稳。D-210 在 90%液位操作，确保在冲洗油意外中断的情况下供应充足。冲洗油分为过滤高压、过滤低压和无过滤低压，取决于最终冲洗要求。
The parameters of flushing oil using point differs greatly, so three flushing oil manifolds will be provided. Firstly, the flushing oil for equipment maintenance is no need of filtering, the pressure is controlled as 1.05MPa and regulated by PIC-21302, and PSV-2140 provides overpressure protection. Since the flushing oil manifold is used all the time, install an angle valve (HV-2061) at the downstream of PV-21302 for returning D-210, and control the pressure of flushing oil manifold to be lower than the set value of safety valve through backflow of angle valve.

Secondly, after the flushing oil of low pressure instrument is filtered (25um), the pressure is controlled to be 1.05MPa and regulated by PIC-21303. PSV-2137 provides overpressure protection. Finally, after the flushing oil of high pressure instrument is filtered (25um), the pressure is controlled to be 1.860MPa and regulated by PIC-21304.

冲洗油使用点参数差异很大，所以提供三个冲洗油总管。首先，设备维修用冲洗油不需要过滤，压力控制在 1.05MPa，由 PIC-21302 进行调节， PSV-2140 提供超压保护。由于冲洗油总管一直投用，所以在 PV-21302 下游安装角阀（HV-2061）返回 D-210，通过角阀回流确保冲洗油总管压力低于安全阀设定值。其次，低压仪表冲洗油经过滤（25um），压力控制在 1.05MPa，由 PIC-21303 进行调节，PSV-2137 提供超压保护。最后，高压仪表冲洗油经过滤（25um），压力控制在 1.860MPa，由 PIC-21304 进行调节。

To prevent large consumption of flushing oil by FLOL manifold, pressure drop of FLOLI and FLOH manifold and operation fluctuation, set PIC-21303 and PIC-21304 to the override control of PIC-21302. The filtered flushing oil is used for flushing instrument, and the unfiltered flushing is used for equipment overhaul. Since the consumption of flushing oil may be intermittent, minimum flow setting is installed.

为避免 FLOL 总管消耗大量冲洗油，引起 FLOLI 和 FLOH 总管压力下降，导致操作波动，设置 PIC-21303 和 PIC-21304 至 PIC-21302 的超驰控制。过滤后的冲洗油用于仪表冲洗，未过滤的冲洗油用于设备检修。由于冲洗油消耗可能是断断续续的，所以安装最小流量设置。

(5) Middle circulation oil (MPA) 中部循环油 (MPA)

MPA supplies heat for dethanizer (C-204), reboiler (E-216) and vacuum residuum heat exchanger (E-230). MPA is delivered into E-216 and E-230 in parallel. The MPA flow of E-230 is regulated by FIC-21501 and in cascade control with the tower returning temperature TIC-20209 of MPA. The MPA flow entering E-216 is regulated by FIC-22801 and FIC-22802 and in cascade control with the gas-phase temperature TIC-22705.

MPA 给脱乙烷塔（C-204）重沸器（E-216）和减压渣油换热器（E-230）提供热量。MPA 被平行送入 E-216 和 E-230。进入 E-230 的 MPA 流量受 FIC-21501 调节，和 MPA 返塔温度 TIC-20209 串级控制。进入 E-216 的 MPA 流量分别由 FIC-22801 和 FIC-22802 调节，和气相温度 TIC-22705 串级控制。

The MPA flow entering the lower portion of C-201 is regulated by FIC-20701A, and FIC-20701A and the liquid level LIC-20202 of MPA exhaust port are in cascade control. If the reflux flow at the lower portion of MPA is too low, the low flow setting FLC-20701B will lead low pressure steam to spray distributor through RBV-20101 and prevent nozzle blocking.

进 C-201 下部的 MPA 流量受 FIC-20701A 调节，FIC-20701A 和 MPA 抽出口液位 LIC-20202 串级控制。如果 MPA 下部回流流量太低，低流量设置 FLC-20701B 通过 RBV-20101 将低压蒸汽引至喷雾分配器，防止喷嘴堵塞。

The MPA flow returning to the upper portion of C201 is regulated by FIC-20702 so as to keep the MPA circulation that enters C-201 stable.

MPA 返回 C201 上部流量由 FIC-20702 进行调节，确保进入 C-201 的 MPA 循环保持稳定。

(6) Extraction of diesel oil 柴油抽出

The extraction port of diesel oil is a half-extraction port, and residual liquid overflows to the lower tray. LIC-20501 regulates the inlet flow of diesel oil stripping tower (C-202), diesel oil is delivered to the downstream device, resorption tower (C-205) and product tank after steam stripping, heat exchange and cooling. A temperature control is installed on the outlet pipeline to prevent the temperature from exceeding the standard.

柴油抽出口为半抽出口，多余液体溢流至下部塔盘。LIC-20501 调节柴油汽提塔（C-202）入口流量，柴油经蒸汽汽提、换热冷却，最后送至下游装置、再吸收塔（C-205）和产品罐。出口管道上安装有温度控制，确保温度不超标。

Adjust the flow from diesel oil to downstream device through FIC-20601, adjust the flow from diesel oil to product tank through FIC-20602, and select both with manual switch (HS-20601).

通过 FIC-20601 调节柴油至下游装置流量，通过 FIC-20602 调节柴油至产品罐流量，手动开关（HS-20601）对二者进行选择。

C-202 is provided with high-level override control. When the liquid level is high-high, stop steam injection and avoid the damage of internal component.

C-202 安装有高液位超驰控制，出现液位高高时，停止蒸汽注入，避免对塔内件造成损坏。

(7) Pressure control of fractionation tower top 分馏塔顶压力控制

Under normal working condition, the pressure control of oil-gas separator (D-201) of fractionation tower top shall be as lower as possible, about 0.05MPa (G). If the pressure rises and exceeds the set value, PIC-20402 releases pressure to the torch system. Two control valves are installed on the tower top and have the split control function.

正常工况下，分馏塔塔顶油气分离器（D-201）压力控制尽可能低，约为 0.05MPa（G）。若压力升高超出设定值，PIC-20402 将泄压至火炬系统。塔顶安装有两个控制阀，带分程控制功能。

(8) Temperature control of fractionation tower top 分馏塔塔顶温度控制

Control the top temperature of C-201 to be 106℃ and keep it above the dew-point temperature of water. Adjust FIC-20201 and the tower top temperature TIC-20201 cascade control by adjusting the naphtha return flow.

C-201 顶温控制在 106℃，保持在水的露点温度以上。通过调节石脑油回流量 FIC-20201 来进行调节，FIC-20201 和塔顶温度 TIC-20201 串级控制。

(9) Water extraction port of C-201 C-201 水抽出口

The operation of C-201 top near the dew-point temperature of ammonia chloride may result in salt deposition and efficiency reduction of tray. Therefore, remove the deposit salt on the tray

from the system with intermittent washing. Extract water from water extraction port, and deliver it into acid water tank (D-209) with LIC-20201.
C-201 顶在接近氯化铵露点温度下操作，可能会导致结盐，造成塔盘效率下降。因此，利用间歇式水洗清除塔盘上的结盐，将其从系统中带走。通过水抽出口将水引出，用 LIC-20201 控制送入酸性水罐（D-209）。

(10) Flushing water of fractionation tower top 分馏塔顶冲洗水
Inject continuous flushing water into the air cooler (E-201) of C-201 top so as to reduce salt deposition on the tower top. The flow of flushing water is controlled by FIC-20301.
向 C-201 顶空冷（E-201）注入连续冲洗水，减少塔顶结盐。冲洗水流量由 FIC-20301 进行控制。

2.4.15.15 Absorption and stabilization system 吸收稳定系统
(1) Aerostatic press (K-201) 气压机（K-201）
K-201 has the process parameter control and anti-surge control function, and the pressure is regulated by corresponding facilities. The inlet pressure of K-101 is controlled by adjusting the speed of steam turbine. Realize startup and anti-surge protection through the anti-flying setting, and return the compressed rich gas to the inlet from each outlet.
K-201 有工艺参数控制和防喘振控制功能，通过相应设施进行调节。通过调节汽轮机转速控制 K-101 入口压力。通过反飞动设置实现开机启动和防喘振保护，将压缩富气从每级出口返回至入口。

(2) Outlet liquid-separating tank of K-101 K-101 出口分液罐
The outlet rich gas of K-101 is condensed and separated in the interstage equipment. Naphtha extracted from the first-stage, second-stage and third-stage outlet liquid-separating tank is delivered to different positions of C-204 through P-209 A/B, P-211 A/B and P-213 A/B. The flow of extracted naphtha and the liquid level of liquid-separating tank are in cascade control.
K-101 各级出口富气在级间设备中冷凝、分离。从一级、二级和三级出口分液罐抽出的石脑油分别通过 P-209 A/B、P-211 A/B 和 P-213 A/B 送至 C-204 不同位置。抽出石脑油流量和分液罐液位串级控制。
The acid water in the liquid-separating tank is used as the flushing water of the next-stage condenser outlet. The acid water of third-stage liquid-separating tank (D-204) is delivered into acid water tank (D-209), and the acid water flow and D-204 boundary are in cascade control.
分液罐内酸性水用作下一级冷凝器入口的冲洗水。来自三级分液罐（D-204）的酸性水送入酸性水罐（D-209），酸性水流量和 D-204 界位串级控制。
The first-stage naphtha pump (P-209A/B) and second-stage naphtha pump (P-211 A/B) are multi-stage pump. When the liquid level of liquid-separating tank is low-low, shut down the pump and avoid damage due to evacuation.

一级石脑油泵（P-209A/B）和二级石脑油泵（P-211 A/B）是多级泵，当分液罐液位低低时，停泵，避免抽空造成损坏。

(3) Absorption and desorption tower (C-204) 吸收解吸塔 (C-204)

The pressure of C-204 is controlled by the PIC-22901 on the top of downstream reabsorber (C-205). To keep the lower temperature of absorption section, reduce the temperature through middle circulation cooler (E-214A/B), deliver material flow into separator (D-205) after cooling, remove the water included in naphtha, regulate the circulation by FIC-22601, and reduce the water condensation in C-204 and flowing risk into C-205.

C-204 压力受下游再吸收塔（C-205）塔顶的 PIC-22901 控制。为保持吸收段较低温度，通过中段循环冷却器（E-214A/B）降低温度，冷却后物流送入分离器（D-205），去除石脑油夹带水，循环量由 FIC-22601 进行调节，降低水在 C-204 冷凝以及流入 C-205 的风险。

The heat at the bottom is supplied by the bottom reboiler (E-216 A/B) and middle reboiler (E-215). E-215 keeps the stable control of heat load of reboiler through load controller and avoids operation fluctuation. The heat input of E-215 is confirmed according to the inlet and outlet temperature and pipe flow.

塔底所需热量通过塔底重沸器（E-216 A/B）和中间重沸器（E-215）提供。E-215 利用负荷控制器保持重沸器的热负荷平稳控制，避免操作波动。E-215 的热量输入根据入口、出口温度和管程流量来确定。

MPA supplies heat to bottom reboiler (E-216A/B), and the MPA flow FIC-22801 and FIC-22802 and the C204 bottom return temperature TIC-22705 are in cascade control.

MPA 向底部重沸器（E-216A/B）供应热量，MPA 流量 FIC-22801、FIC-22802 和 C204 底返回温度 TIC-22705 串级控制。

(4) Reabsorber (C-205) 再吸收塔 (C-205)

The pressure of C-205 is controlled through tower top PIC-22901. The poor absorption oil is delivered into C-205 to absorb C5+component included with dry gas, and the flow of poor absorption oil is controlled by FIC-22901. The rich absorption oil containing light hydrocarbon leaves C-205, exchanges heat with diesel oil and returns to the fractionation tower, and the liquid level of C205 is controlled by LIC-22901.

C-205 压力通过塔顶 PIC-22901 控制。贫吸收油送入 C-205，吸收干气夹带的 C5+组分，贫吸收油流量受 FIC-22901 控制。含有轻烃的富吸收油离开 C-205，和柴油换热后，返回到分馏塔，C205 液位受 LIC-22901 控制。

(5) Stabilizer (C-207) 稳定塔 (C-207)

The top pressure of C-207 is controlled by PIC-23501 which regulates PV-23501 at the downstream of cooler (E-219 A/B) according to the control scheme of immersion cooler. The

manual controller HIC-23501 is used intermittently so as to avoid coagulation and accumulation.

C-207 塔顶压力通过 PIC-23501 控制，PIC-23501 采用浸没式冷却器控制方案对位于冷却器（E-219 A/B）下游的 PV-23501 进行调节。手动控制器 HIC-23501 间歇使用，避免不凝气累积。

The top temperature is monitored by TI-23301. The feed quantity FIC-22702 of stabilizer sends flow signal to the ratio controller (FY-22702). The top reflux of stabilizer is regulated by FIC-23301.

TI-23301 对塔顶温度进行监控。稳定塔进料量 FIC-22702）向比值控制器（FY-22702）发出流量信号，通过 FIC-23301 调节稳定塔顶回流量。

Some of liquefied gas in the liquefied gas liquid-separating tank (D-208) of stabilizer top flows back, some is discharged. Wherein, the discharging flow of liquefied gas and the liquid level of D-208 are in cascade control.

稳定塔顶液化气分液罐（D-208）内液化气一部分打回流，一部分出装置。其中，液化气出装置流量和 D-208 液位串级控制。

Steam supplies heat for the reboiler E-220A and E-220B of stabilizer bottom, and the steam flow FIC-23401 and FIC-23402 and the return temperature of stabilizer TIC-23306 are in cascade control.

稳定塔底重沸器 E-220A 和 E-220B 由蒸汽提供热量，蒸汽流量 FIC-23401、FIC-23402 和稳定塔底返回温度 TIC-23306 串级控制。

If the liquid level of stabilizer is low-low, the liquefied gas will enter the naphtha storage tank and be damaged due to overpressure. Therefore, low liquid level protection is provided. When the liquid level indication is low-low, shut down the bottom pump P-217A/B of stabilizer and close XV-23802 and XV-23801.

如果稳定塔底液位出现低低，导致液化气进入石脑油储罐，进而出现超压造成损坏。因此，设置低液位保护，当液位指示低低，停稳定塔底泵 P-217A/B，关闭 XV-23802 和 XV-23801。

(6) Naphtha 石脑油

Regulate the supplemented absorbent flow from naphtha to C-204 through FIC-22501.

通过 FIC-22501 调节石脑油至 C-204 作补充吸收剂流量。

2.4.15.16 Torch liquid-separating tank (D-211) 火炬分液罐 (D-211)

D-211 collects heavy dirty oil and the safety valves discharge hydrocarbon so as to realize gas-liquid separation. The sump oil pump (P-220) and acid pump (P-221) extract oil and water from the tank respectively. The sump oil is delivered to the tank area or sludge recycling tank (D-102). D-211 is provided with high liquid level protection. When the liquid level is high-high, close the isolating valve XV-24002 of enclosed discharge manifold.

D-211 收集重污油和各安全阀泄放烃类，实现气液分离。污油泵（P-220）和酸性水泵（P-221）分别从罐内抽出油和水。其中，污油送至罐区或污泥回炼罐（D-102）。D-211 设置高液位保护，当液位显示高高，关闭密闭排放总管隔断阀 XV-24002。

2.4.15.17 Third-stage cyclone separator (CY-301) 三级旋风分离器 (CY-301)

(1) Material level control 料位控制

LIC-30101 monitors the bed height of third-stage cyclone separator (D-301) and control the coke powder unloading. The amount of coke powder is relatively small, and the bed height of D-301 increases slowly. When the material level of D-301 reaches the highest set value, LIC-30101 will send signals to PIC-30102. Open PV-30102A or PV-30102B (one of them is in the manual fully-open state) through the option switch HS-30102. The opening of PV-30102A or PV-30102B is controlled by PIC-30102. The flow of coke powder entering the conveyor line is increased, and the back pressure of conveying air pipeline rises. Close the slide valve slightly to prevent coke powder from blocking the mixing point. If the flow of coke powder is reduced, the opposite situation has occurred. When the material level of D-301 reaches the lowest set value, PV-30102 will be closed. The material level is controlled circularly.

LIC-30101 监测三旋分离罐（D-301）床层高度，并控制卸焦粉。焦粉量相对较少，D-301 床层高度缓慢增加。当 D-301 料位达到最高设定值时，LIC-30101 向 PIC-30102 发送信号，通过选择开关 HS-30102 打开 PV-30102A 或 PV-30102B（其中一个是手动全开状态）。PV-30102A 或 PV-30102B 开度由 PIC-30102 控制，焦粉进入输送线的流量增加，输送风管线背压升高，此时滑阀将关小，防止混合点被焦粉堵塞。如果焦粉流量下降，则情况正好相反。当 D-301 料位达到最低设定值时，PV-30102 关闭。料位控制过程循环进行。

Coke powder enters the pneumatic conveyor line through PV-30102, and the delivered air keeps continuous flow and controlled by FIC-30103. Coke powder and delivered air are delivered to the fine coke powder bin (T-401).

焦粉通过 PV-30102 进入气动输送线，输送风保持连续流量，由 FIC-30103 进行控制。焦粉和输送风输送至细焦粉料仓（T-401）。

The material level of D-301 separates the flexigas from the coke powder conveyor line (containing the air). If the pressure drop of slide valve is low, the delivered air will flow back to D-301, mixed with flexigas and result in major accidents such as burning overtemperature or explosion. At the moment, ES-302 will close the emergency shut-off valve XV-30101 to prevent major accidents.

D-301 料位将灵活气与焦粉输送管线（含空气）隔离。若滑阀压降低，输送风倒窜进入 D-301，与灵活气混合，引起燃烧超温或爆炸等重大事故。此时，ES-302 关闭紧急切断阀 XV-30101，防止这种情况发生。

If PV-30102A and B are not closed and D-301 has no material level, the flexigas may enter the coke powder conveyor line and T-401 and form explosive gas or burning overtemperature. To prevent the above situation, when the material level measurement points LT-30102 A, B and C

detect that the material level of D-301 is low-low, ES-301 will be activated to close the emergency shut-off valve XV-30101.
若 PV-30102A、B 未关闭且 D-301 没有料位，则灵活气可能进入焦粉输送管线和 T-401，形成爆炸气或燃烧超温。为防止这种情况发生，当料位测点 LT-30102 A、B、C 检测到 D-301 料位低低， ES-301 激活，关闭紧急切断阀 XV-30101。

(2) Others 其它
During startup and shutdown, CY-301 may receive wet coke and result in material leg blocking. To avoid the above situation, CY-301 shortens the material leg above the material level of bed.
开停工期间，CY-301 可能接收到湿焦，导致料腿堵塞。为避免出现这种情况，CY-301 缩短了床层料位上方的料腿长度。
Under normal working condition, 1%～3% gas flow enters D-301. To avoid pressure buildup, provide the gas outlet and set the balance tube. PDI-30102 is used for measuring the differential pressure between the balance tube and the top outlet pipeline of three-stage cyclone separator. Since the differential pressure is lower during startup, set the startup line to lead the gas of D-301 to the Venturi separator.
正常工况下，1%～3%气体流量进入 D-301，为避免憋压，需要提供气体出口，因此设置平衡管。PDI-30102 用于测量平衡管与三旋顶部出口管线之间的压差。由于开工过程中压差较低，设置开工线将 D-301 气体直接引至文丘里分离器。
If the three-stage cyclone separation tank (D-301) is loose, the nitrogen temperature will be high so as to ensure the drying of coke powder and prevent the conveyor pipeline from being blocked by condensate. The high-temperature nitrogen is regulated by pore plate and led into the bottom cone of three-stage cyclone separation tank and the vertical pipe. The electrical heater F-301 is used for heating nitrogen.
三旋分离罐（D-301）松动氮气温度高，可确保焦粉干燥，防止输送管线出现凝液导致堵塞。高温氮气由孔板调节，并引入三旋罐底部锥体，再进入立管。电加热器 F-301 用来给氮气升温。

2.4.15.18 Venturi washer (DY-302) and Venturi separation tank (D-302)
文丘里洗涤器 (DY-302) 和文丘里分离罐 (D-302)
(1) DY-302 circulation DY-302 循环量
DY-302 washes the flexigas with water and clear away the included coke powder. When the proportion between washing water and flexigas is controlled to be 0.00175～0.00270 (volume ratio), DY-302 will have the best elimination efficiency of coke powder. Since it cannot calculate the flow of flexigas accurately, FIC -30202 sets the initial flow of washing water as the fixed value, and it can only be adjusted when the flow speed of flexigas changes remarkably. If there is no washing water, scaling will occur on the top of DY-302. Therefore, FIC-30202 has DCS limit to ensure the minimum valve opening of 40% during failure.

DY-302 用水洗涤灵活气，清除夹带的焦粉。当洗涤水与灵活气的比例控制在 0.00175～0.00270（体积比），DY-302 具有最佳的焦粉去除效率。由于此处不能准确计量灵活气流量，FIC -30202 将洗涤水初始流量设定成固定值，只有当灵活气流速显著变化时才进行调整。如果洗涤水出现中断，DY-302 顶部将出现结垢。因此，FIC-30202 设有 DCS 限位，确保故障时 40%的最小阀门开度。

The washing water is delivered to the Venturi tube throat through nozzle to wet the coke powder in flexigas. PDI-30201 measures the differential pressure of throat, monitors and optimizes the washing water flow of throat tube and facilitates adjustment.

洗涤水通过喷嘴送入文丘里管喉部，润湿灵活气夹带的焦粉。PDI-30201 测量喉部差压，监测和优化进入喉管的洗涤水流量，便于进行调整。

(2) Liquid level of D-302 D-302 液位

The liquid level LIC-30201 of D-302 is kept by delivering slurry to the slurry stripping tower (C-301). D-302 receives the supplement water from the first-stage contact cooling tower (C-302) to supplement the evaporation loss of water of DY-302. The delivery slurry flow FIC-30203 and the liquid level LIC-30201 of D-302 are in cascade control.

D-302 液位 LIC-30201，通过将浆液外送至浆液汽提塔（C-301）来保持。D-302 接收来自一级接触冷却塔(C-302)的补充水,弥补 DY-302 蒸发损失的水分。外送浆液流量 FIC-30203 和 D-302 液位 LIC-30201 串级控制。

(3) Alkali injection 注碱

Inject alkaline into the inlet of P-301A/B can neutralize sulfur dioxide in flexigas in the early period of working.

在 P-301A/B 入口注碱可以中和开工前期灵活气中的二氧化硫。

2.4.15.19 Slurry stripping tower (C-301) 浆液汽提塔 (C-301)

(1) Control of liquid level and stripping steam flow 液位和汽提蒸汽流量控制

The feed quantity FIC-30203 of C-301 and the liquid level LIC-30201 of D-302 are in cascade control. Slurry is preheated in E-302 before entering C-302. The stripping steam flow FIC-30802 and slurry feed quantity FIC-30203 are controlled in proportion. With the increasing of slurry feed amount, more steam will be needed for stripping slurry and reaching the discharge index of slurry (<15ppmw NH_3 and <5ppmw H_2S). After stripping, slurry will be delivered to the dilute slurry storage tank (T403/404) through pump, and the delivery slurry flow FIC-30803 and the liquid level LIC-30802 of C-301 are in cascade control.

C-301 的进料量 FIC-30203 和 D-302 液位 LIC-30201 串级控制。进入 C-302 前，浆液在 E-302 中预热。汽提蒸汽流量 FIC-30802 和浆液进料量 FIC-30203 按比例控制，随着浆液进料量的增加，需要更多蒸汽来汽提浆液，以达到浆液排放指标（<15ppmw NH_3 和<5ppmw H_2S）。汽提

后浆液通过泵送入稀浆液储罐（T403/404），外送浆液流量 FIC-30803 和 C-301 液位 LIC-30802 串级控制。

(2) Alkali injection 注碱

Flexigas contains certain amount of chloride, and the specific content depends on the raw material of the device. Chloride in the gas is dissolved in the slurry of Venturi washer and generates strong acid (HCL). The dissociated proton and ammonia are combined to form ammonium ion (NH4+) which is a kind of substance that cannot be stripped but can keep the charge balance with chloride ion (Cl-). The stripping steam of C-301 cannot eliminate ammonium ion separately.

灵活气包含一定量氯化物，具体含量取决于装置原料。气体中的氯化物溶解在文丘里洗涤器浆液中，生成强酸（HCL），离解的质子与氨结合形成铵离子（NH4+），这是一种不可汽提的物质，保持与氯离子（Cl-）电荷平衡。C-301 汽提蒸汽不能单独清除铵离子。

To inject alkali into slurry is helpful for stripping ammonia through Na+ neutralized Cl-ion, and OH- of NaOH and the proton of NH4+ are combined to form strippable NH_3 again. If the concentration of NH_3 at the bottom of C-301 is more than 30ppmw, inject alkali to promote NH_3 stripping.

向浆液中注碱有助于通过用 Na+中和 Cl-离子来汽提氨，NaOH 的 OH-与 NH4+上的质子结合，重新形成可汽提 NH_3。如果 C-301 塔底 NH_3 浓度超过 30ppmw，就需要注碱促进 NH_3 汽提。

Under normal working condition, control alkali injection through pH. The acid water stripping device of ExxonMobil is favorable for controlling alkali injection through PH. After sampling from the bottom of stripping tower for analysis, it is found that if the slurry discharge requirement cannot be met, alkali shall be injected to control the PH of slurry at the stripping tower bottom even if excessive stripping steam is injected. When the PH value is changed, confirm the target PH value by measuring the content of NH_3 in the discharge slurry. According to the experience of ExxonMobil, it will be the best if the PH value is 9. It will be bad if the PH value is too high, since the effect will not be so good when the pH value of scale inhibitor in the stripping tower is 11 or more.

正常工况下，通过 pH 控制注碱。ExxonMobil 公司的酸性水汽提装置，利用 PH 值控制注碱。从汽提塔塔底采样分析，发现如果不能满足浆液排放要求，即使注入过量汽提蒸汽，也需要注碱控制汽提塔底部浆液的 PH 值。当 PH 值变化时，应通过测量外排浆液的 NH_3 含量来确定目标 PH 值。根据 ExxonMobil 公司的经验，PH 值为 9 左右最佳。PH 值过高不好，因为添加到汽提塔中的防垢剂在 pH 为 11 或以上时，效果不佳。

(3)Anti-scale injection 注入防垢剂

According to the previous operation experience, the scaling of stripping tower is serious, so it is necessary to inject scale inhibitor to prevent tray blocking. Detect the pressure drop of stripping tower with PDI-30801 and confirm whether there is scaling on the tray. The measuring pump

injects scale inhibitor into C-301 to slow down the generation of calcium carbonate and magnesium carbonate.
根据以往操作经验，汽提塔结垢严重，需加注防垢剂防止塔盘堵塞。利用 PDI-30801 检测汽提塔的压降，确认是否出现塔盘结垢。计量泵将防垢剂注入 C-301，减缓碳酸钙和碳酸镁生成。
The current experience in f flexicoking unit is that when the PH value of slurry at the bottom of C-301 tower is 11 or more, the scale inhibitor will be invalid. Therefore, it is necessary to carefully monitor the PH value of the slurry at the bottom of slurry stripping tower so as to adjust the alkali injection according to the situation and improve the ammonia stripping effect.
目前对灵活焦化装置的经验是，当浆液汽提塔 C-301 塔底浆液的 PH 值在 11 或以上时，防垢剂会失效。因此，需要小心监测浆液汽提塔塔底浆液的 PH 值，以便根据情况注碱进行调节，改善氨汽提效果。

2.4.15.20 Grade 1 contact cooling tower (C-302) 一级接触冷却塔 (C-302)

(1) Pump circulation 泵循环

The function of C-302 is to cool the flexigas, reduce the temperature below the inlet temperature of COS converter and dehydrate. Under normal working condition, the flexigas can be cooled below 55℃, and lower temperature will be favorable for the operation. The lower the temperature, the more water to be dehydrated. If the volume and flow entering COS converter are reduced, the cooling load and acid water flow of second-stage contact cooling tower C-303 will also be reduced.
C-302 的作用是冷却灵活气，将其温度降至 COS 转化器进口温度以下，并脱除水分。正常工况下，灵活气可以冷却到 55℃以下，较低温度对操作有利。温度越低，脱除的水越多，进入 COS 转化器的体积流量下降，二级接触冷却塔 C-303 的冷却负荷和酸性水流量也下降。
Lower top temperature has less influence on the load of COS preheater E-306A/B, since the lower feeding flow and the lower inlet temperature will offset each other. The slurry stripping tower C-301 can also strip the condensate water of C-302, and the design load is 125% under normal working condition.
较低塔顶温度对 COS 预热器 E-306A/B 的负荷影响很小，因为较低进料流量和较低进口温度的影响相互抵消。浆料汽提塔 C-301 也可以汽提在 C-302 冷凝的水份，其设计负荷是正常工况的 125%。
The slurry air cooler E-301 is used for controlling the top temperature TIC-30302 of control tower, which is realized by adjusting the frequency converter of fan. FIC -30402 keeps the constant flow and ensure the cooling effect. The liquid level LIC-30301 of C-302 and the discharge slurry flow FIC -30401 are in cascade control.
浆液空冷 E-301 用于控制塔顶温度 TIC-30302，通过调节风机变频器来实现。FIC -30402 保持恒定流量，确保冷却效果。C-302 液位 LIC-30301 和外甩浆液流量 FIC -30401 串级控制。

During working, if the water content of flexigas is high, increase the top temperature of C-302 tower, and reduce the condensate water and the working load of C-301. If the temperature of tower top is 57℃ during working, the feed quantity of C-301 will be about 63,366 kg/h.
开工期间，灵活气含水量较高，可以提高 C-302 塔顶温度，减少凝结水，同时可以降低 C-301 的开工负荷。对于开工期间 57℃的塔顶温度，C-301 的进料量约为 63366 kg/h 。

(2) Demister 除雾器
The demister on the top of C-302 tower prolongs the operation period of COS reactor by reducing the coke powder and water in flexigas. When the pressure drop of grille rises, flush the coke powder through intermittent spraying.
C-302 塔顶除雾器通过减少灵活气中的焦粉和水携带延长 COS 反应器的运行周期。当格栅上的压降开始上升时，通过间歇喷淋水冲洗焦粉。

(3) Anti-scale injection 注入防垢剂
C-302 injects the scale inhibitor into circulation slurry so as to reduce the scaling of heat exchanger. The operation experience of ExxonMobil refinery shows that the flexicoking heat exchanger may be blocked easily due to deposition of coke powder or scaling. Therefore, the size of heat exchange shall be large enough, and all parts shall be cut off separately for cleaning except under the maximum temperature. Scale inhibitor is generally not needed but will be used only when there is obvious scaling.
C-302 将防垢剂注入循环浆液，减少换热器结垢。ExxonMobil 炼油厂的运行经验表明，灵活焦化换热器容易因焦粉沉积或结垢导致堵塞。因此，换热器的尺寸设计足够大，除了最高气温条件外，都可单独切除清洗。一般不需要注入防垢剂，通常只有明显结垢时才使用。

2.4.15.21 COS preheater (E-306) and COS reactor (R-301)
COS 预热器 (E-306) 和 COS 反应器 (R-301)
(1) Pressure control 压力控制
The flexigas treatment system is provided with two parallel-connected COS reactors R-301A/B so as to convert the COS in flexigas into H_2S, and H_2S can be removed from the downstream flexigas scrubber (C-304). Under normal working condition, one COS reactor is startup and the other is for standby. When the online reactor meets the operation stopping condition (such as pressure drop rising or conversion efficiency reducing), do the following operations:
灵活气处理系统设置两台并联的 COS 反应器 R-301A/B，将灵活气中的 COS 转化成 H_2S，H_2S 在下游灵活气洗涤塔（C-304）脱除。正常工况下，COS 反应器一开一备。当在线反应器达到终止运行条件时（如压降上升或转化效率下降），需采取如下操作：
1) The standby reactor is put into use and operate in parallel with the online reactor;
备用反应器投用，与在线反应器并联运行；
2) Cut off the online reactor to facilitate catalyst;

在线反应器切除，以便更换催化剂；

3) After replacing catalyst, the reactor will be in the standby state.

催化剂更换完毕后，该反应器进入备用状态。

The type selection of reactor can ensure the operation period (3-6 months) of catalyst.

反应器的选型确保催化剂的运行周期为 3-6 个月。

When the reactor is switched between standby and online, the two reactors may be closed and result in pressure buildup of heater. Therefore, take corresponding measures to avoid the above situation:

当反应器在备用和在线之间切换时，两台反应器可能同时关闭，导致加热器憋压。因此需要设定相应措施，避免发生以上情况：

1) Set bypass line for COS reactor, and install PV-30501 on the bypass line. If the two reactors are closed, open PV-30501, and the flexigas will enter the downstream process through bypass line. PV-30501 is used for treating the design flow of 100% flexigas.

设置 COS 反应器旁通线，旁通线安装 PV-30501。如果两台反应器均关闭，则 PV-30501 打开，灵活气走旁通线进入下游流程。PV-30501 设计用于处理 100%灵活气设计流量。

2) Set the software interlock system, describe on the PLC of inlet/outlet electric valve of reactor and prevent the closing of the two reactors.

设置软件联锁系统，在反应器进出口电动阀上的 PLC 上进行描述，防止两个反应器同时关闭。

3) Set safety valve on the bypass line, and when the above two measures fail, ensure the upstream equipment is protected without overpressure.

旁通线上设置安全阀，当以上两种措施都失效时，确保上游设备仍然受到保护，不会出现超压。

(2) Temperature control 温度控制

E-306 heats the flexigas to 120～135℃, avoid catalyst damage due to water condensation, and provide the reaction temperature that can convert COS into H_2S. The heating medium is the low-pressure steam. The low-pressure steam flow FIC-30501 and the outlet temperature TIC-30502/30505 of COS preheater are in cascade control. The temperature indication for the outlet pipeline of the COS reactor is provided by TI-30507.

E-306 将灵活气加热至 120～135℃，避免水冷凝损坏催化剂，并提供将 COS 转化为 H_2S 的反应温度。加热介质采用低压蒸汽。低压蒸汽流量 FIC-30501 和 COS 预热器出口温度 TIC-30502/30505 串级控制。COS 反应器的出口管线上由 TI-30507 提供温度指示。

2.4.15.22 Grade 2 contact cooling tower (C-303) 二级接触冷却塔 (C-303)

(1) Pump circulation 泵循环

The function of C-303 is to cool down the flexigas and further remove the water entrained by the flexigas. The plate heat exchanger E-307A/B is used for cooling, and the FIC-30601 controls the circulation flow. The design flow of 709m^3/h is maintained for the circulation volume to ensure a good water distribution on the C-303 packed bed. The cascade control of the flow

rate FIC-30701 of the out-throw device and the C-303 liquid level LIC-30603 for the condensed water collected by C-303.
C-303 的作用是冷却灵活气，进一步清除灵活气夹带水，板式换热器 E-307A/B 用于冷却，FIC-30601 控制循环流量。将循环量保持在 709m³/h 的设计流量，确保 C-303 填料床保持良好的水分布。C-303 收集的冷凝水，外甩出装置流量 FIC-30701 和 C-303 液位 LIC-30603 串级控制。

(2) Demister 除雾器
The demister at the top of C-303 can reduce the moisture entrainment and the amine liquid loss in the flexigas scrubber. The cleaning ejector equipped with the demister can intermittently flush off the coke powder on the grille as the pressure drop of the grille increases.
C-303 顶部除雾器能够减少水分夹带，降低灵活气洗涤塔胺液损失。除雾器配备有清洗喷射器，当格栅上压降增加时，这些清洗喷射器将间歇性地冲洗掉格栅上的焦粉。

(3) C-303 upper circulation C-303 上部循环
The upper circulation of C-303 can significantly reduce the concentration of NH_3 in the flexigas from 270ppmv to less than 15ppmv. If the upper circulation of C-303 is interrupted, a large amount of NH_3 contained in the flexigas entering the flexigas scrubber C-304 will result in the loss of amine fluid.
C-303 上部循环可显著降低灵活气中 NH_3 浓度，从 270ppmv 降至 15ppmv 以下。若 C-303 上部循环中断，进入灵活气洗涤塔 C-304 的灵活气含有的大量 NH_3 将导致胺液损失。

2.4.15.23 Flexigas scrubber (C-304) 灵活气洗涤塔 (C-304)
(1) Flexigas main pipe pressure control 灵活气总管压力控制
When the process is adjusted for the reaction gasification system, the amount of flexigas generated will also fluctuate. The control requirements are as follows:
当反应气化系统出现工艺调整时，产生的灵活气量也会发生波动，控制要求如下：
1) Maintain the pressure differential between the reactor and the heater in stable.
保持稳定的反应器—加热器差压。
2) Prevent fluctuations in the flexigas burner.
防止灵活气燃烧炉发生波动。
Function descriptions:
功能描述：
Normal operations:
正常运行：
The pressure of the reactor R-101 is controlled by PIC-20401 top of C-201. In order to control the cooling, heating and flushing circulation of the coke between the reactor and the heater, the

pressure differential between the reactor and the heater should be kept constant mainly by the control valve PDV-10902A at the top of the flexigas scrubber.
反应器 R-101 压力由 C-201 顶 PIC-20401 控制。为了控制反应器与加热器之间冷焦、热焦和冲刷焦循环，必须保持反应器与加热器之间差压恒定，主要通过灵活气洗涤塔顶控制阀 PDV-10902A 进行调节。

The heater and the flexigas treatment system pressures are controlled by the reactor-heater pressure differential PDIC-10902A. During normal operation:
加热器和灵活气处理系统压力由反应器—加热器差压 PDIC-10902A 控制。正常运行期间：
1) Operate PDV-10902A to maintain the reactor-heater pressure differential.
为了保持反应器—加热器差压，操作 PDV-10902A。
2) PV-31202A/B 100% normally-close.
PV-31202A/B 100%常闭。
Flexigas low pressure protection:
灵活气低压保护：
The flexigas main pipe pressure can be declined in many ways, such as:
灵活气总管压力下降的原因很多，例如：
1) The decrease of the feed quantity in the device, the change in the feeding composition or the decrease in the gasification rate of the unit result in the production drawdown of the flexigas.
装置进料量下降、进料组成变化或装置气化率降低导致灵活气产量下降。
2) The consumption of the flexigas increases due to the unexpected increase in demand.
由于需求突然增加，灵活气的耗量增加。
As the flexigas main pipe pressure drops and PDIC-10902A decreases, the low pressure differential protection is provided by adjusting PDV-10902A.
随灵活气总管压力下降，PDIC-10902A 降低，通过调节 PDV-10902A 提供低差压保护。
Flexigas high pressure protection:
灵活气高压保护：
If the flexigas production volume exceeds the consumption of the downstream unit, the remaining flexigas is transported to the flexigas torch through the PV-31202A/B split-ranging control, and controlled by PDIC-10902A, PIC-31202A or PIC-31202B through the high-selection signal. If the flexigas production volume exceeds the consumption of the downstream unit slightly, it is discharged to the flexigas torch through PV-31202A and controlled by PDIC-10902A. The set value of PIC-31202A will be approximately 49.0KPa higher than the maximum pressure set for PDIC-10902A. PIC-31202B checks the increase rate of the flexigas main pipe pressure. The set value is slightly higher than the operating value of the flexigas main pipe (+10KPa), and only responds when the main pipe pressure rises rapidly.
若灵活气产量超过下游装置消耗量，剩余灵活气通过 PV-31202A/B 分程控制输送至灵活气火炬，由 PDIC-10902A、PIC-31202A 或 PIC-31202B 通过高选信号控制。若灵活气产量略超消耗量，

通过 PV-31202A 排放至灵活气火炬，由 PDIC-10902A 控制。PIC-31202A 的设定值将比 PDIC-10902A 设定最高压力高约 49.0KPa。PIC-31202B 检查灵活气总管压力上升速率，设定值略高于灵活气总管操作值（+10KPa），仅在总管压力快速上升时才作出响应。

Startup and operation:

开工运行：

At the startup phase, the PDIC-10902B is provided to the high-selection switch as a backup input to adjust the flexigas flare valve PV-31202A/B.

开工阶段，PDIC-10902B 作为备用输入，提供给高选开关，调节灵活气放火炬阀 PV-31202A/B。

Restrictions on the flexigas by flexigas users:

灵活气用户对灵活气的限制：

The flexigas consumption varies with the calorific value of the flexigas, and the load should be maintained by controlling the fuel gas. Due to the above constraints, the actual flexigas consumption is lower than the production volume.

灵活气耗量随灵活气的热值变化而变化，需要通过控制燃料气来维持负荷。由于存在以上约束，实际灵活气消耗量低于产量。

(2) C-304 upper level control C-304 上部液位控制

The water washing system is installed on the upper part of C-304 to recycle the amine liquid entrained by the flexigas. The water is supplemented by setting the boiler water for the water washing circulation and controlled by FIC-31202 to keep the constant concentration of the amine liquid system. The excess water discharged from the water washing circulation is transported into the lower part of C-304 after being adjusted by LIC-31203.

C-304 上部设置水洗系统，回收灵活气夹带胺液。水洗循环设置锅炉水补水，由 FIC-31202 控制，使胺液系统浓度保持恒定。从水洗循环排出的过量水受 LIC-31203 调节进入 C-304 下部。

(3) C-304 lower level control C-304 下部液位控制

The cascade control of the flow rate FIC-31401 of the rich liquid discharge device at the bottom of the C-304 tower and the liquid level LIC-31203 of C-304.

C-304 塔底富液出装置流量 FIC-31401 和 C-304 液位 LIC-31203 串级控制。

(4) Amine liquid circulation amount 胺液循环量

The circulation amount of C-304 amine liquid is controlled by FIC-31201.

C-304 胺液循环量由 FIC-31201 控制。

(5) Defoamer injection 消泡剂注入

The defoamer injection is implemented manually to avoid foaming in the flexigas scrubber.

消泡剂注入是手动添加，避免灵活气洗涤塔出现发泡。

2.4.15.24 Amine liquid regeneration tower (C-305), reboiler (E-311) and regenerator (E-312)
胺液再生塔 (C-305)、重沸器 (E-311) 和再生器 (E-312)

(1) Temperature control 温度控制

E-311 heating medium is the low-low saturated steam from DS-102. The controlled temperature should not exceed 185℃. Otherwise, the amine liquid will be degraded. The parallel operation set for 2 sets, the rated load of each set is 50% of the design value. The steam flow of heat exchanger and the rich amine liquid feeding flow of C-305 are proportionally controlled.

E-311 加热介质是来自 DS-102 的低低压饱和蒸汽，温度控制不超过 185℃，否则会使胺液降解。设置 2 台并联运行，每台额定负荷为设计值的 50%。换热器蒸汽流量和 C-305 富胺液进料流量按比例控制。

The heating medium of E-312 is the medium-pressure steam cooled down by the boiler water, and the steam flow entering into the regenerator is controlled by FIC-32003.

E-312 的加热介质是用锅炉水降温后的中压蒸汽，通过 FIC-32003 对进入再生器的蒸汽流量进行控制。

Before flowing into C-305, the rich amine liquid is preheated by E-310. Two sets of E-310 should be set up, one for operation and another for backup under the normal operation condition. The model with 100% design load should be selected. The other one can be put into operation when a heat exchanger is heavily fouled and should be deactivated for cleaning.

进入 C-305 前，富胺液经 E-310 预热，E-310 设置两台，每台选型为 100%设计负荷，正常工况下一开一备。当一台换热器结垢严重时，可以停用进行清洗，另外一台投入运行。

The feeding temperature of C-305 is controlled by TIC-31301 for smooth operation of the C-305. During the initial start-up process, the heat transfer efficiency of the newly-used heat exchanger is high, resulting in the excessive vaporization or flashing, which may cause vibration of C-305. SR-308 is installed at the inlet of E-310 to remove the coke powder entrained by the amine liquid to prevent fouling and blockage, and avoid foaming in C-305 due to the existence of the coke powder.

C-305 进料温度由 TIC-31301 控制，用于 C-305 的平稳操作。在初期开工过程中，新投用换热器传热效率高，导致过量汽化或闪蒸，可能引起 C-305 振动。E-310 入口安装 SR-308，除去胺液携带的焦粉粉末，防止结垢堵塞，还可避免 C-305 中存在焦粉而发泡。

The proportional control mode for C-305 is adopted to change the saturated low-low pressure steam flow of the reboiler with the feed quantity of the rich amine liquid, and the override control of the temperature at the top C-305 should be set at the same time.

C-305 采用比例控制，使重沸器的饱和低低压蒸汽流量随富胺液进料量发生变化，同时设置 C-305 顶温超驰控制。

E-312 operates intermittently, and controls the temperature and the liquid level throughout the circulation.

E-312 间歇运行，并在整个循环过程中执行温度和液位控制功能。

Use the medium-pressure steam after the temperature and the pressure are decreased to provide heat to E-312 so as to reduce the degradation of the amine liquid. During the E-312 operation, it is necessary to reduce the thermal load of E-311 to ensure smooth operation of C-305. There are four steps for the amine liquid regenerating, each of which has different control objectives:

使用减温减压后的中压蒸汽向 E-312 提供热量，减少胺液降解。E-312 运行期间，需要降低 E-311 的热负荷，保证 C-305 平稳运行。胺液再生过程有四个步骤，每个步骤都有不同的控制目标：

1) Initial loading: the flow rate FIC-32001 of the amine liquid feeding into E-312 and the liquid level LIC-32001 of E-312 should be cascaded. The alkali injection amount and the amine liquid feedstock flow are proportionally controlled, and the solution is heated to the boiling temperature by steam.

初始加载：胺液进 E-312 流量 FIC-32001 和 E-312 液位 LIC-32001 串级控制，注碱量和胺液进料流量按比例控制，用蒸汽将溶液加热至其沸腾温度。

2) Amine liquid concentration: the steam produced by the boiling solution is returned to C-305. Most of the steam is water at the beginning. As the water vapor evaporates, the concentration of the amine liquid in the vapor gradually rises until the amine liquid in the gas phase reaches the equilibrium state. During the step, E-312 is operated based on the liquid level/flow control which is the same as that of step 1.

胺液浓缩：沸腾溶液产生的蒸汽返回 C-305。最初大部分蒸汽是水，随着水汽蒸发，蒸汽中胺液浓度逐渐上升，直到气液相中胺液达到平衡状态。在此步骤中，E-312 按与步骤 1 相同的液位/流量控制运行。

3) Steady-state boiling: the solution is boiled continuously after reaching the equilibrium state. The amine liquid flows into E-312, and only impurities with high boiling points are deposited. Under the steady state, the E-312 liquid phase temperature is maintained at 185℃ by adjusting the water injection flow rate. During the step, E-312 is operated based on the liquid level/flow control which is the same as that of step 1.

稳态沸腾：达到平衡后，将溶液连续煮沸，使胺液进入 E-312，只有高沸点杂质沉积。在稳定状态下，E-312 液相温度通过调节注水流量维持在 185℃。在此步骤中，E-312 同样按与步骤 1 相同的液位/流量控制运行。

4) Amine liquid recycle: at the end of the steady-state boiling, E-312 is filled with the contaminated solution. Close the amine liquid inlet valve and allow the solution to boil continuously, and ensure that the remaining amine is returned to C-305. During the step, the boiler water regulator valve opens and the boiler water flows through FV-32001. After the recycle of the amine liquid is completed, the remaining dirty slag is flushed and discharged to the alkali residue pool (T-303).

胺液回收：在稳态沸腾结束时，E-312 充满污染溶液。将胺液进口阀关闭并让溶液继续沸腾，确保剩余的胺液返回 C-305。在此步骤中，锅炉水调节阀打开，流过 FV-32001。待胺液回收结束，剩余污渣冲洗并排至碱渣池（T-303）。

The lean amine liquid at the bottom of C-305 is cooled down by the lean-rich liquid heat exchanger E-310 firstly, and transported to the lean amine tank (T-302) after being further cooled down by the air cooler E-317 and the water cooler E-314. The lean amine liquid temperature is controlled by adjusting the E-317 frequency converter via TIC-31303.
C-305 塔底贫胺液首先经贫富液换热器 E-310 冷却，然后通过空冷 E-317 和水冷 E-314 进一步冷却后送至贫胺液罐（T-302），贫胺液温度通过 TIC-31303 调节 E-317 变频器来实现。

(2) Liquid level control 液位控制

1) Return tank at the top of the regeneration tower (D-304) 再生塔顶回流罐（D-304）

The liquid level of D-304 is regulated by LIC-31501, and cascade-controlled with the acidic water return flow FIC-31503. At the same time, the NH_3 and the cyanide content deposited in the amine liquid system is reduced by using FIC-31504 to adjust the acid water flow rate of the device. The water flow of the inlet boiler of the air-cooler A-303 is adjusted by FIC-31501 to avoid the blockage due to the salt deposition.
D-304 液位由 LIC-31501 调节，和酸性水回流量 FIC-31503 串级控制。同时，用 FIC-31504 调节出装置酸性水流量，降低胺液系统中沉积的 NH_3 和氰化物含量。通过 FIC-31501 调节空冷 A-303 入口锅炉水流量，避免结盐堵塞。

The emergency shut-off valve XV-31501 should be closed to prevent the acid gas from carrying the liquid and affecting the downstream device if the acid water pump fails, and the indicating value of the return tank liquid level LT-31503 is high-high.
如果酸性水泵出现故障，回流罐液位 LT-31503 指示高高，关闭紧急切断阀 XV-31501，防止酸性气带液，影响下游装置。

The light hydrocarbons collected in D-304 flows into the collection tank via the overflow baffle. The height of the baffle is between the normal and the high-high liquid levels. The overflow is operated manually, and the light hydrocarbons is pumped out by the pump P-312 and transported to D-102 after the liquid level is raised and maintained above the height of the baffle.
收集在 D-304 的轻烃，通过溢流挡板进入集油箱。挡板高度位于正常液位与高高液位之间。溢流采用手动操作，待液位升高并保持在挡板之上，通过泵 P-312 将轻烃抽出，送至 D-102。

2) C-305 liquid level control C-305 液位控制

The liquid level LIC-31401 of C-305 and the lean amine liquid flow FIC-31301 are in cascade control. When the indicating value of the liquid level LT-31401A/B/C is low-low, close the emergency shut-off valve XV-31701 and stop pump P-315A/B at the bottom of the regeneration tower to prevent the acid gas from entering the lean amine liquid storage tank (T-302).
C-305 液位 LIC-31401 和贫胺液流量 FIC-31301 串级控制。当液位 LT-31401A/B/C 显示低低，关闭紧急切断阀 XV-31701，停止再生塔底泵 P-315A/B，避免酸性气体窜入贫胺液储罐（T-302）。

3) Defoamer injection 注入消泡剂

The defoamer is added manually to reduce the foam in the amine liquid regeneration tower.

消泡剂手动添加，以减少胺液再生塔内的泡沫。

2.4.15.25 Dry coke loading system 干焦装车系统

There are several loading modes for the coke powder. 焦粉装车有多种运行模式。

(1) Normal operation 正常运行

1) Bed coke stock bin (D-401) and quench tank (D-101)

床层焦料仓（D-401）和急冷罐（D-101）

The bed coke is discharged from D-101 and transported to D-401 through the DN150 finless coke powder conveying line. The temperature and the conveying rate of the coke powder are controlled by TIC-11204 and PIC-11201 at D-101 respectively. The temperature is controlled below 200℃. If the coke powder temperature exceeds 300℃, the interlock protection system is activated, the emergency shut-off valve XV-11201 is closed, and the coke discharging via D-101 is stopped.

床层焦从 D-101 卸出通过 DN150 无翅片焦粉输送线送至 D-401。焦粉温度和输送速率分别由 TIC-11204 和 PIC-11201 在 D-101 处控制。温度控制在 200℃以下，如果焦粉温度超过 300℃，则激活联锁保护系统，关闭紧急切断阀 XV-11201，停止 D-101 卸焦。

2) Bed coke stock bin (D-401) and coke powder conveying hopper (BN-401)

床层焦料仓（D-401）和焦粉输送料斗（BN-401）

The bed coke is transported from D-401 to the coke powder conveying hopper BN-401 for loading. During normal operation, the pressure of D-401 is controlled at 0.054MPa (G) by PIC-40301A at the top. The pressure is higher than that of the coke powder-air mixing point in the coke powder conveying line at the bottom to prevent the conveying air from flowing back into D-401.

床层焦从 D-401 输送到焦粉输送漏斗 BN-401，以便装车。正常运行期间, D-401 压力通过顶部 PIC-40301A 控制在 0.054MPa（G）。该压力高于底部焦粉输送线中焦粉—空气混合点的压力，避免输送风倒窜进 D-401。

Under normal conditions, the loading of the bed coke from D-401 to BN-401 is implemented intermittently for 12 hours per day through the cold conveying air controlled by FIC-40401 or FIC-40402 with constant flow. The bed coke enters into the lower finned tube by controlling the slide valve PV-40401 or PV-40402 in the coke powder standpipe. The slide valve is adjusted by the pressure PIC-40401 or PIC-40402 in the coke powder conveying line. Turn down the slide valve to avoid clogging of the coke powder if the back pressure of the conveying air pipeline is increased due to the excessive conveying amount of the coke powder. The situation is just the opposite if a small amount of coke powder is conveyed. Under normal conditions, only one of the two DN100 conveying lines should be used.

正常工况下，从 D-401 到 BN-401 的床层焦装车是间歇性的，每天运行 12 小时，通过 FIC-40401 或 FIC-40402 以恒定流量控制的冷输送风实现。通过控制焦粉立管中的滑阀 PV-40401 或 PV-40402，床层焦进入下部翅片管。滑阀由焦粉输送线中的压力 PIC-40401 或 PIC-40402 进行

调节。如果焦粉输送量大，导致输送风管线背压升高，滑阀关小，避免焦粉堵塞。如果焦粉输送量小，情况刚好相反。正常工况下，只需要投用 2 条 DN100 管线中的 1 条。

The temperature drops to 60℃ (the temperature of the bed coke in D-401 is within the range of 130-205℃) when the coke powder is transported from D-401 to BN-401.

焦粉从 D-401 输送至 BN-401 时，温度下降至 60℃（D-401 中的床层焦温度在 130～205℃范围内）。

3) Looseness nitrogen for the bed coke stock bin (D-401)

床层焦料仓（D-401）松动氮气

The looseness nitrogen for D-401 cone and conveying standpipes is used continuously. The coke powder temperature of D-401 is relatively high and is transported through the main air/coke powder conveyor line, with continuous flow of air. The looseness nitrogen is applied continuously at D-401 to prevent local overheating. At the same time, it also creates an inert atmosphere within D-401.

D-401 锥体和输送立管松动氮气连续投用。D-401 焦粉温度相对较高，且通过主风/焦粉输送线输送，有一股连续气流进入。在 D-401 处使用连续的松动氮气，防止局部超温。同时，它还在 D-401 内建立惰性气氛。

(2) Condition with low gasification rate 低气化率工况

The coke discharging operation with low gasification rate is the same as that under the normal condition. The main difference is that the amount of coke discharged from D-101 and D-401 is significantly larger, and the conveying air volume should be increased correspondingly.

低气化率的卸焦操作与正常工况下一样，主要区别在于从 D-101 和 D-401 卸出的床层焦量明显较大，输送风量相应增加。

In order to increase the discharge amount of the bed coke, the two coke powder conveying lines from D-401 to BN-401 should be applied with the looseness nitrogen for 18 hours per day. As the pressure of the coke powder-conveying air mixing point rises, the pressure of D-401 should be raised to 0.108MPa.

为提高床层焦卸出量，从 D-401 到 BN-401 的两条焦粉输送线均要投用松动氮气，且每天运行 18 小时。由于焦粉—输送风混合点的压力上升，D-401 相应提升压力至 0.108 MPa。

(3) Startup phase 开工阶段

At the startup phase, all of the coke powder is stored in D-401. The bed coke is transported from D-401 to the heater R-102 for the subsequent operation. The bed coke conveying of D-401 is implemented with the warm air at the outlet of K-101 at a constant flow rate controlled by FIC-40403. The coke powder enters into the DN250 conveying line through the slide valve PV-40403, the opening of which is controlled by PIC-40403 in the conveying air pipeline. Turn down the slide valve to avoid clogging if the back pressure of the conveying air pipeline is

increased due to the excessive conveying amount of the coke powder. The situation is just the opposite if a decreased amount of coke powder is conveyed.

开工阶段，全部焦粉储存在 D-401。床层焦从 D-401 输送至加热器 R-102，以便后续开车使用。D-401 的床层焦输送利用 K-101 出口暖风实现，由 FIC-40403 控制在恒定流量。焦粉通过滑阀 PV-40403 进入 DN250 输送线，滑阀开度由输送风管线中的 PIC-40403 控制。若焦粉输送量增加，输送风管线背压升高，为避免堵塞，滑阀关小。若焦粉输送量下降，情况刚好相反。

There are significant differences in the operation of the coke powder loading system between the startup stage and the normal condition, mainly reflected by:

开工阶段和正常工况下，焦粉装车系统操作存在明显差异，主要体现在：

1) Under normal conditions, the operating pressure of D-401 is 0.054MPa(G), which prevents the conveying air from flowing back into D-401 and transports the coke powder to the coke hopper BN-401. At the startup stage, the coke powder is delivered to the heater R-102, and the pressure of D-401 is controlled at 0.158-0.34MPa (G).

正常工况下，D-401 的运行压力为 0.054MPa（G），防止输送风倒流进入 D-401，并将焦粉输送至焦粉料斗 BN-401。开工阶段，焦粉被输送到加热器 R-102， D-401 压力控制在 0.158～0.34MPa（G）。

2) At the startup stage, the hot nitrogen from the electrical heater F-401 for the nitrogen is used for loosening and fluidizing at the bottom of D-401. The hot nitrogen helps keep the coke powder dry and the bed fluidized.

开工阶段，来自氮气电加热器 F-401 的热氮用于 D-401 底部松动和流化。热氮有助于保持焦粉干燥和床层流化。

3) At the startup stage, the lower conveying air of D-401 is the warm air from the K-101 outlet, instead of the cold air from D-106 under normal conditions, in order to keep as much heat as possible for the system during the startup stage.

开工阶段，D-401 下部输送风是 K-101 出口暖风，而不是正常工况下 D-106 冷风，这是为了在开工阶段让系统保留尽可能多的热量。

The coke loading process during the startup phase can be divided into two stages depending on whether the heater R-102 has reached the coke powder ignition temperature. The first stage of operation often lasts for 18 hours, and temperature of heater is higher than that of fire point of the coke powder in such period. The second stage of operation often lasts for 6 hours, and temperature of heater is higher than that of fire point of the coke powder in such period. At the first stage, the coke powder is loaded in a high speed and delivered to the heater by the air. In the second stage, the coke powder flows from BN-402 to R-102 by the action of gravity.

开工装焦分为两个阶段，具体取决于加热器 R-102 是否已达到焦粉点火温度。开工第一阶段通常持续 18 小时，此时加热器温度低于焦粉燃点。开工第二阶段通常持续 6 小时，此时加热器温度高于焦粉燃点。第一阶段，焦粉装载速度较快，用风将焦粉输送至加热器。第二阶段，焦粉通过重力作用从 BN-402 流向 R-102。

(1) The first stage of operation 开工第一阶段

At the first stage of the operation, the coke powder and the air flow directly to the heater R-102. The settings of BN-402/CY-401 are as follows:

开工第一阶段，焦粉和输送风直接流向加热器 R-102。BN-402/CY-401 的设置如下：

a. The CY-401 and BN-402 are bypassed, and the coke powder and the air flow directly to the heater R-102.

CY-401 和 BN-402 旁通，焦粉和输送风直接流向加热器 R-102。

b. The differential pressure controller PDIC-40801 is in the manual state and the gas bleed valve PDV-40801 is closed.

差压控制器 PDIC-40801 处于手动状态，并且泄气阀 PDV-40801 关闭。

c. The material controller ULK-A LIC-40801 is in the manual state and the slide valve LV-40801 is closed.

料位控制器 LIC-40801 处于手动状态，滑阀 LV-40801 关闭。

d. The XV-10905 is on, and the ES-401 and PS-401 are bypassed.

XV-10905 打开，ES-401 和 PS-401 旁通。

At this stage, the heater operating pressure is about 0.069 MPa (G), and the mixing point's pressure of D-401 coke powder-conveyed air is 0.130 MPa (G). The D-401 pressure is at 0.158 MPa (G) controlled by PV-40301A. Since no air enters the D-401, the D-401 is boosted by the main air from the FV-40302. After the first boost, the main air continues to keep a lower flow to maintain the D-401 pressure.

此阶段，加热器运行压力约为 0.069MPa（G），D-401 焦粉—输送风混合点的压力为 0.130MPa（G）。D-401 压力在 0.158MPa（G），由 PV-40301A 控制。由于没有输送风进入 D-401，D-401 由来自 FV-40302 的主风升压。初次升压后，主风继续保持较低流量，以维持 D-401 压力。

As mentioned above, the coke powder-conveyed air enters the heater in the first stage. Therefore, the amount of gas in the Venturi scrubber DY-402 is obviously lower than the minimum flow rate of the design. To meet the minimum flow requirements of the DY-402, the gas flow is increased by using the additional boosting air at the D-401 to deliver the conveyed air to the fine coke powder bin T-401 and the coke powder feeder BN-401. For the BN-401, the flow of conveyed air FIC-40401 and FIC-40402 are set to the set value, and the slide valve controllers PIC-40401 and PIC-40402 are placed at 0% in manual mode. Similarly, the FIC-30103 is set to automatic mode and the PIC-30102 is in manual mode when the T-401 is placed at 0%. If additional gas is required, the discharge valve PV-40501 in the Venturi scrubber can also be used.

如上所述，焦粉输送风在第一阶段进入加热器。因此，文丘里洗涤塔 DY-402 的气体量明显较小，低于设计最小流量。为满足 DY-402 最小流量要求，通过在 D-401 处使用附加升压风，通过将输送风送至细焦粉料仓 T-401 和焦粉料斗 BN-401，增加气体流量。对于 BN-401，输送风流量 FIC-40401 和 FIC-40402 给至设定值，滑阀控制器 PIC-40401 和 PIC-40402 放在 0%置于手动模式。同样，FIC-30103 置于自动模式，PIC-30102 在 T-401 放在 0%时置于手动模式。如果需要附加气体，也可使用文丘里洗涤塔的放泄阀 PV-40501。

(2) The second stage of operation 开工第二阶段

At the second stage of operation, the coke powder in the heater begins to burn. At this moment, the coke powder needs to be loaded into the R-102 through the CY-401 to remove the air. The air is vented from the top, and the coke powder flows into the BN-402 through the dipleg of CY-401 under the force of gravity. The BN-402 prepares for use - the differential pressure controller PDIC-40801 is set to automatic mode to ensure that the BN-402 is at a higher pressure than R-102. The material level control LIC-40801 is also set to automatic mode to ensure that the BN-402's material level remains stable. When setting up the parameters, we should prevent air from flowing into the heater and prevent gas from flowing back from the heater to the coke powder addition system.

开工第二阶段，加热器焦粉开始燃烧。此时，焦粉需通过 CY-401 装载到 R-102 中，去除空气。空气从顶部泄放，焦粉在重力作用下通过 CY-401 料腿流入 BN-402。BN-402 做好投用准备—压差控制器 PDIC-40801 置于自动模式，以确保 BN-402 的压力高于 R-102。料位控制 LIC-40801 也置于自动模式，以确保 BN-402 的料位维持平稳。设置这些参数时，要防止空气流入加热器，还要防止气体从加热器倒流到焦粉添加系统。

Similar to the second stage, it is transported to R-102 through CY-401 and BN-402, if it is necessary to add coke powder online during operation. When the heater temperature is higher than the fire point of the coke powder, the powder addition cyclone separator cannot be through the bypass line, in order to prevent air from entering the heater. At this moment, the pressure of the heater was 0.241 MPa (G), the mixing point's pressure of the coke powder-convoyed air was 0.313 MPa (G), and the pressure of the D-401 was 0.34 MPa (G), which was controlled by PV-40301A. Similar to the first stage, the D-401 boosts by the pressurized air from the FV-40302, and the main air maintains a low flow to ensure the pressure of D-401 after boosting.

与开工第二阶段类似，如果在运行期间需要在线添加焦粉，需通过 CY-401 和 BN-402 将其输送到 R-102。当加热器温度高于焦粉燃点时，为了防止空气进入加热器，焦粉添加旋风分离器不能走旁通线。此时，加热器的压力为 0.241MPa（G），焦粉—输送风混合点的压力为 0.313MPa（G），D-401 压力在 0.34MPa（G），由 PV-40301A 控制。与开工第一阶段类似，D-401 使用来自 FV-40302 的加压空气升压，并且在升压后主风维持低流量保证 D-401 压力。

Before starting the R-102, the coke powder should return the line by seal gasifier, usually through CY-401 and BN-402.

R-102 开工装焦前，首先要用焦粉密封气化器返焦线，通常通过 CY-401 和 BN-402 进行操作。

(3) Nitrogen heater in the bed coke powder bin (F-401) 床层焦料仓氮气加热器(F-401)

F-401 is used at the start-up stage to preheat D-401 loosening and fluidizing nitrogen. At the stage of start-up, hot nitrogen from F-401 is also used in the line of the gasifier.

F-401 用于开工阶段，预热 D-401 松动和流化氮气。开工阶段，来自 F-401 的热氮也用于气化器返焦线。

During the shutdown period, the coke powder is discharged from the quench zone of the heater and stored in the D-401. At the subsequent stage, the coke powder stored in D-401 may become damp, so D-401 needs to dry the coke powder by hot nitrogen, preventing the particles from agglomerating, and improving the fluidity of the coke powder, in order to transport it to the heater.

停工阶段，焦粉从加热器急冷段卸出，储存在 D-401 中。在随后的开工阶段，储存在 D-401 中的焦粉可能会变潮，因此 D-401 需用热氮干燥焦粉，防止颗粒物结团，改善焦粉的流动性，以将其输送至加热器。

During normal operation, it is not necessary to use hot nitrogen to loosen and fluidize it. The coke powder discharged from the R-102 has sufficient heat to remain dry throughout the operating process of quenching the D-101.

正常运行期间，不需要用热氮进行松动和流化。从 R-102 中卸出的焦粉在急冷罐 D-101 的整个操作过程中有足够的热量保持干燥。

In the process of adding coke powder online, it is necessary to loosen and fluidize it with hot nitrogen.

在线添加焦粉的过程中，需要用热氮进行松动和流化。

(4) The depressurization after the start 开工后的降压

At the end, the D-401 pressure needs to fall from approximately 0.34 MPa (G) to a normal operating pressure of 0.054 MPa (G) within 2 hours. The pressure set value of the PIC-40301 can be lower in two hours. Since PV-40301A and PV-40301B are in split-ranging control, PV-40301A reaches 100% before turning on PV-40301B.

开工结束时，D-401 压力需要在 2 小时内从大约 0.34MPa（G）降至 0.054MPa（G）的正常运行压力。PIC-40301 的压力设定值可在两个小时内降低。由于 PV-40301A 和 PV-40301B 处于分程控制，PV-40301A 在 PV-40301B 打开前，先达到 100%。

(5) Stop-working stage 停工阶段

Bed coke bin (D-401) and heater (R-102) quench zone

床层焦料仓（D-401）和加热器（R-102）急冷段

During the stop-working stage, the coke powder is discharged from the reactor, heater and gasifier. The (uncooled) conveyed air was used to deliver it from the R-102 quench zone to the D-401 through the DN300 line within 24 hours. In the R-102 quench zone, we should control the coke powder temperature and delivery rate, the temperature is controlled below 200℃. If the coke powder temperature is over 300℃, we should start interlock protection and close the emergency shut-off valve.

停工阶段，焦粉从反应器、加热器和气化器中卸出。使用（未冷却的）输送风，将其从 R-102 急冷段在 24 小时内通过 DN300 管线输送至 D-401。在 R-102 急冷段控制焦粉温度和输送速率，温度控制在 200℃以下，如果焦粉温度超过 300℃，启动联锁保护，关闭紧急切断阀。

For faster discharging, the minimum pressure of the D-401 is maintained at 10KPa. The set value of PIC-40301 can be set to 0. Low set value and high conveyed air flow will cause the full opening of the PV-40301A and PV-40301B. The FIC-40301 can be the top gas flow controller of the D-401, and its set value should be based on the design values of the bag filters (SR-401A and SR-401B).

为更快卸焦，D-401 的最低压力保持在 10KPa。PIC-40301 设定值可设置为 0。低设定值和高输送风流量将导致 PV-40301A 和 PV-40301B 全开。FIC-40301 可以是 D-401 的顶部泄气控制器，其设定值应当根据袋式过滤器（SR-401A 和 SR-401B）的设计值来进行限定。

(6) D-401 pressure control (PV-40301A/B and FIC-40301)

D-401 压力控制（PV-40301A/B 和 FIC-40301）

The pressure of the D-401 is controlled by the PIC-40301 via two parallel pressure control valves, PV-40301A/B. Due to the various operational modes of the D-401, the upstream pressure and the gas bleed volume of the PV-40301A/B change greatly:

D-401 的压力由 PIC-40301 通过两个并联压控阀 PV-40301A/B 控制。由于 D-401 有多种运行模式，所以 PV-40301A/B 的上游压力和泄气量变化很大：

The gas bleed volume and operating pressure of the D-401

D-401 泄气量和操作压力

Two parallel pressure control valves are adopted to accommodate the fluctuations in inlet pressure and flow. The selection of PV-40301A should meet the four working conditions of normal operation, low gasification rate, start-up stage and depressurization at the end. During the stop-working stage, PV-40301A and PV-40301B need to be used at the same time.

采用两个并联压控阀，以适应进口压力和流量的波动。PV-40301A 的选型要满足正常运行、低气化率、开工阶段和开工结束后降压四种工况。停工阶段，需要同时投用 PV-40301A 和 PV-40301B。

The PV-40301A/B is set to meet the requirements of split control. PV-40301A will move first and open 100% before opening PV-40301B. When the PV-40301A is fully open, the PV-40301B will be turned back on, if the pressure of D-401 is still high. The sudden opening of the PV-40301B may exceed the design volume flow of the bag filter. Therefore, the FIC-40301/PY-40301 provides a low-selection signal to prevent gas flow from exceeding the design value of the bag filler. The set value of FIC-40301 is limited according to the design flow rate of the bag filter.

PV-40301A/B 的设置要满足分程控制要求。在 PV-40301B 打开之前，PV-40301A 将先动作并 100%打开。当 PV-40301A 全开时，如果 D-401 压力仍然很高，PV-40301B 再打开。突然打开

PV-40301B 可能会超过袋式过滤器的设计体积流量。因此，FIC-40301/PY-40301 提供低选信号，防止气体流量超出袋式除尘器设计值。FIC-40301 的设定值根据袋式过滤器设计流量进行限定。

(7) Dry coke loading 干焦装车

The dry coke loading is provided by dry coke loading logic LG-401 and LG-402. There are three modes: Bed coke mode, Dry coke mode and Mixed coke mode.

干焦装车由干焦装载逻辑 LG-401 和 LG-402 提供，分为三种模式：床层焦模式、干焦粉模式以及混合模式。

The bed coke is sent from D401 to BN401 and then to the loading system through the bottom chute.

床层焦自 D401 送至 BN401，再经底部滑槽送至装车系统。

The coke powder was intermittently transferred from D-301 to T-401 and the delivery rate was controlled at D-301. During the operation, T-401 adopts loose and fluidized nitrogen to prevent agglomeration of coke powder. At the same time, loose nitrogen is sent to the bottom annular conveyor trough, and it is used intermittently as needed, replacing the oxygen in the D-301 or dredging the draw nozzle.

细焦粉从 D-301 间歇输送至 T-401，输送速率在 D-301 处控制。操作期间，T-401 投用松动和流化氮气，防止焦粉结块。同时，松动氮气被送到底部环形输送槽，松动氮气根据需要间歇使用，置换 D-301 中的氧气或疏通卸焦管线抽出口。

During loading, the time of duration of nitrogen flowing to the bottom ring is controlled by the coke powder loading logic function LG-401.

装车期间，氮气流向底环的持续时间由焦粉装载逻辑功能 LG-401 控制。

The amount of nitrogen flowing to each trough is controlled by a restriction orifice. The safety valve protects the trough from the overpressure and the damage. The safety valve position is located in the downstream of the orifice that controls the flow of the trough.

通过限流孔板控制流向每个输送槽的氮气量。安全阀保护输送槽不会出现超压而损坏。安全阀位于控制输送槽流量的孔板的下游。

(8) High temperature cut-off of D-401 CY-401 D-401 和 CY-401 顶部高温切断

The top gas of D-401 is sent to a bag filter to remove entrained coke powder before being discharged into the atmosphere. If the coke powder reaches up to D-401 when being overtemperature (> 260℃), the top gas temperature may exceed the designed temperature of the filter bag, causing the filter bag to burn and be damaged. According to the temperature of main fan discharged from the main blower K-101, high temperature may occur during the start-stop process. At this moment, the TE-40502 has a high-temperature shutoff signal, and the top gas is directly connected to the bag filter and introduced into the venturi scrubber. In this case, the coke powder particles are removed in the venturi scrubber DY-402 before discharging into the atmosphere.

D-401 顶部气体被送至袋式过滤器，以便在排入大气前除去夹带的焦粉。如果焦粉在温度过高（> 260℃）时达到 D-401，顶部气体温度可能会超出滤袋的设计温度，导致滤袋燃烧而损坏。根据从主风机 K-101 排出的主风温度，在开停工过程中，也可能出现高温，此时 TE-40502 出现高温切断信号，将顶部气体直接旁通袋式过滤器，引入文丘里洗涤器。在这种情况下，在排入大气前，焦粉颗粒在文丘里洗涤塔 DY-402 内脱除。

(9) Material level instrument in T-401, D-401 and BN-401

T-401、D-401 和 BN-401 中的料位仪表

For the T-401, D-401 and BN-401, a radar level gauge is provided for continuous measurement. There is also a capacitance-type level gauge. The radar level gauge continuously blows with nitrogen to avoid the scaling of the coke powder, as the scaling can affect the accuracy of the readings. The capacitance-type level gauge serves as an alternative to measuring the level of the bin to verify that the reading of the radar level gauge is correct or not. These level gauges are installed with highly high alarm, high alarm and low alarm. In addition, the T-401 and D-401 have low-low alarm.

对于 T-401、D-401 和 BN-401，设有一只雷达料位计，用于连续测量。还设有电容式料位计。雷达料位表用氮气连续吹扫，避免焦粉结垢，因为结垢会影响读数的准确性。电容式料位计作为测量料仓料位的备用方式，验证雷达料位计的读数是否正确。这些料位计均设置高高报警、高报警和低报警。此外，T-401 和 D-401 还有低低报警。

2.4.15.26 Wet coke loading 湿焦装车

The thin slurry tank (T-403/T-404) and slurry thickening tank (T-405)

稀浆液罐（T-403/T-404）和浆液增稠罐（T-405）

The T-403/T-404 is equipped with a liquid level indicator and a liquid level alarm. FIC-41001 is installed on the outlet pipeline of the P-402A/B to control the flow of T-403/T-404 to T-405. The thin slurry from T-403/T-404 usually flows into the T-405. When the T-405 is out of use, the T-403/T-404 switches the operating mode: The slurry is thickened in a slurry tank, and the P-402A/B delivers the thickened slurry directly to a gravity belt filter press. The slurry flow rate was manually adjusted by a control valve (FI-41003 and HV-41201) which is close to the gravity belt filter press.

T-403/T-404 装有液位指示和液位报警，在 P-402A/B 的出口管路上装有 FIC-41001，以控制 T-403/T-404 至 T-405 的流量。来自 T-403/T-404 的稀浆液通常流入 T-405，当 T-405 停用时，T-403/T-404 切换操作模式：浆液在稀浆液罐中增稠，P-402A/B 将增稠浆液直接送至重力带式压滤机。浆液流量由靠近重力带式压滤机的控制阀（FI-41003 和 HV-41201）手动调节。

(2) Turbidity analysis meter AI-41101 浊度分析仪 AI-41101

Under the normal conditions, the water drained from T-406 is very clean, and it is sent directly to the wastewater treatment equipment. The turbidity analyzer AI-41101 has a high alarm

function to monitor the excessive concentration of coke powder in the water drained from the T-406. In this case, a manual valve will be installed to connect the overflow water to the T-403/T-404. Alternatively, it can be transported to a coke powder separator or the sewer system.

正常工况下，T-406 排出的水很干净，直接送至废水处理装置。浊度分析仪 AI-41101 具有高报警功能，监控从 T-406 排出的水中焦粉浓度过高的情况。在这种情况下，安装手动阀门，将溢流水接入 T-403/T-404。另外一种方法是，将其输送到焦粉分离器或下水道系统。

(3) Belt filter press 重力带式压滤机

AI-41001, FI-41003, and FI-41004 were used to determine the solid matter content (weight percentage) of SR-402. The slurry feed of SR-402 is designed to have a solids content (weight percentage) of 5% to 15.4%.

AI-41001、FI-41003 和 FI-41004 用于确定 SR-402 的固体物质含量（重量百分比）。SR-402 的浆液进料设计为 5%～15.4%固体物质含量（重量百分比）。

2.4.16 Logic control procedure of self-preservation of the Unit 装置自保的逻辑控制规程

2.4.16.1 Overtemperature interlock of ES-101 scrubber overhead

ES-101 洗涤塔顶温度超温联锁

Misoperation or scrubber overtemperature will cause fractionator system overtemperature, and damage the fractionator. When scrubber overhead is overtemperature, ES-101 shuts off reaction feed and stripping steam, and actuates PS-101B so that the Unit is in hot bypass status.

操作失误或洗涤塔超温会引起分馏塔系统超温，对分馏塔造成损害。当洗涤塔顶超温时，ES-101 切断反应进料和汽提蒸汽。同时，激活 PS-101B 使装置处于热旁路状态。

Causes 引发因素	Valve action 阀门动作		Remarks 备注
1. Scrubber overhead is overtemperature TE-10403A/B/C (2oo3): Alarm at 435°C, starting self-preservation at 460°C; 洗涤塔顶超温 TE-10403A/B/C（3 取 2）：435℃报警，460℃启动	PS-101B	Open main air blower outlet vent valve FV-11802 打开主风机出口放空阀 FV-11802	1. Action after time delay 15 minutes if connecting with PS-101B; 与 PS-101B 有联系的延时 15 分钟动作； 2. No time delay if overhead temperature exceeds 460°C in case of power failure. 停电时顶温超过 460℃，不再延时。
		Open main air blower outlet vent valve FV-11803 打开主风机出口放空阀 FV-11803	
		Open steam valve FV-11605 to gasifier 打开蒸汽至气化器阀 FV-11605	
		Close D-101 coke discharge slide valve PV-11201 关闭 D-101 卸焦滑阀 PV-11201	

<table>
<tr>
<td rowspan="8">自保；
2. Vapor temperature of intermediate section circulation of fractionator TE-20101A-D (2oo4): Alarm at 345°C, starting self-preservation at 390°C;
分馏塔中段循环气相温度 TE-20101A-D（4取2）：345℃报警，390℃启动自保；
3. HS-101 manually starting self-preservation.
HS-101 手动启动自保。</td>
<td rowspan="4"></td>
<td>Close D-401 bed coke slide valve PV-40401 to BN-401
关闭 D-401 床层焦至 BN-401 滑阀 PV-40401</td>
<td rowspan="8"></td>
</tr>
<tr>
<td>Close D-401 bed coke slide valve PV-40402 to BN-401
关闭 D-401 床层焦至 BN-401 滑阀 PV-40402</td>
</tr>
<tr>
<td>Close scouring coke slide valve HV-10801
关闭冲刷焦滑阀 HV-10801</td>
</tr>
<tr>
<td>Close quenched coke slide valve TV-11003
关闭急冷焦滑阀 TV-11003</td>
</tr>
<tr>
<td colspan="2">XV-10401 closes feedstock return line valve
XV-10401 关闭原料返回线阀</td>
</tr>
<tr>
<td colspan="2">XV-11701 closes slurry recycling valve
XV-11701 关闭污泥回炼阀</td>
</tr>
<tr>
<td colspan="2">Stop P-101AB
停 P-101AB</td>
</tr>
<tr>
<td colspan="2">XV-10501 closes feedstock to reactor valve
XV-10501 关闭原料进反应器阀</td>
</tr>
<tr>
<td colspan="2">XV-10502 closes reactor stripping steam valve (time delay 5 minutes)
XV-10502 关闭反应器汽提蒸汽阀（延时 5 分钟）</td>
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2.4.16.2 PS-101A (shutting off feed to reactor, and in hot standby status)

PS-101A 保护反应器联锁（反应器切断进料、处于热备用状态）

PS-101A protects reaction system, and enables it to rapidly start up. PS-101A may avoid high liquid level in the scrubber and maintain feedstock oil system circulation by shutting off reaction feed, and by opening the scrubber emergency rejection to E-105 to leave the Unit. In most cases, PS-101B will also be interlocked to be activated (heater and gasifier part) when PS-101A starts so that the Unit is in the conditions in which coke fines circulation, bed fluidization and temperature & pressure hold may rapidly start.

PS-101A 保护反应系统，使其能快速开工。PS-101A 通过切断反应进料，打开洗涤塔紧急外甩至 E-105 出装置，避免洗涤塔液位高，维持原料油系统循环。大多数情况下，PS-101A 启动时，也会引起 PS-101B 启动（加热器和气化器部分），使装置处于焦粉循环、床层流化和保温保压能快速启动的状态。

Causes 引发因素	Valve action 阀门动作	Remarks 备注
1. PS-102 (low pressure of feed atomization steam); PS-102（进料雾化蒸汽压力低）； 2. PS-103 (low temperature of reactor bed); PS-103（反应器床温低）； 3. PS-104 (high level in reactor); PS-104（反应器料位高）； 4. PS-105 (high liquid level in scrubber); PS-105（洗涤塔液位高）； 5. PS-111 (low main air flow of gasifier); PS-111（气化器主风流量低）； 6. HS-P101A manually starting self-preservation. HS-P101A 手动启动自保。	Close feed valve PV-10501 关闭进料阀 PV-10501 Close feedstock return valve FV-10505 关闭原料返回阀 FV-10505 Close slurry feed valve FV-11704 关闭污泥进料阀 FV-11704 Open scrubber feedstock valve HV-10301 to E-105 打开洗涤塔原料至 E-105 阀 HV-10301	N/A 无

2.4.16.3 PS-101B (shutting off main air to gasifier, and in hot standby status)

PS-101B 保护加热器联锁（气化器切断主风，处于热备用状态）

PS-101B protects heater and gasifier, and enables it to rapidly start up. PS-101B closes several slide valves (including scouring coke, bed coke to coke fines hopper, quenched coke), prevent coke fines inventory from change, and prevent coke fines conveying line from clogging. Supply process steam to gasifier, and shut off main air so that fluidization and coke fines circulation in the gasifier and heater shall be maintained.

PS-101B 保护加热器和气化器，使其能快速开工。PS-101B 关闭多个滑阀（包括冲刷焦、床层焦到焦粉加注料斗、急冷焦），避免焦粉藏量变化和堵塞焦粉输送管线。

气化器通入工艺蒸汽，切断主风，使得气化器和加热器保持流化和焦粉循环。

Causes 引发因素	Valve action 阀门动作	Remarks 备注
1. ES-101 (scrubber overhead is overtemperature); ES-101（洗涤塔顶超温）；	Open main air blower outlet vent valve FV-11802 打开主风机出口放空阀 FV-11802	Provide 15-minute time delay

2. PS-102 PT-10503 (low pressure of feed atomization steam); PS-102 PT-10503（进料雾化蒸汽压力低）； 3. PS-103 TE-10525 (low temperature of reactor bed); PS-103 TE-10525（反应器床温低）； 4. PS-104 LI-10501/10502AB (high level in reactor); PS-104 LI-10501/10502AB（反应器料位高）； 5. PS-105 LY-10401AB (high liquid level in scrubber bottom); PS-105 LY-10401AB（洗涤塔底液位高）； 6. PS-111 (low main air flow of gasifier); PS-111（气化器主风低流量）； 7. HS-P101B (manually starting self-preservation) HS-P101B（手动启动自保）	Open main air blower outlet vent valve FV-11803 打开主风机出口放空阀 FV-11803 Open steam valve FV-11605 to gasifier 打开蒸汽至气化器阀 FV-11605 Close D-101 coke discharge slide valve PV-11201 关闭 D-101 卸焦滑阀 PV-11201 Close D-401 bed coke slide valve PV-40401 to BN-401 关闭 D-401 床层焦至 BN-401 滑阀 PV-40401 Close D-401 bed coke slide valve PV-40402 to BN-401 关闭 D-401 床层焦至 BN-401 滑阀 PV-40402 Close scouring coke slide valve HV-10801 关闭冲刷焦滑阀 HV-10801 Close quenched coke slide valve TV-11003 关闭急冷焦滑阀 TV-11003	protection 提供 15 分钟延时保护

2.4.16.4 LP interlock of atomization steam 雾化蒸汽压力低联锁

Low pressure of atomization steam results in shutting off reaction feed, preventing reactor from being muddy or preventing loss of coke fines circulation.

因雾化蒸汽压力低，切断反应进料，避免反应器泥化或焦粉循环中断。

Causes 引发因素	Valve action 阀门动作		Remarks 备注
1. PT-10503 low pressure of MP steam (1oo1), alarm at 2.854MPa, starting self-preservation at 2.511MPa; PT-10503 中压蒸汽压力低(1 取 1)，2.854MPa 报警，2.511MPa 启动自保； 2. HS-P102 manually starting. HS-P102 手动启动。	PS-101A	Close feed valve PV-10501 关闭进料阀 PV-10501	1. PS-101A: No time delay; PS-101A：不延时； 2. PS-101B: 15-minute time delay. PS-101B：延时 15 分钟。
		Close feedstock return valve FV-10505 关闭原料返回阀 FV-10505	
		Close slurry feed valve FV-11704 关闭污泥进料阀 FV-11704	
		Open scrubber feedstock valve HV-10301 to E-105 打开洗涤塔原料至 E-105 阀 HV-10301	
	PS-101B	Open main air blower outlet vent valve FV-11802 打开主风机出口放空阀 FV-11802	
		Open main air blower outlet vent valve FV-11803 打开主风机出口放空阀 FV-11803	
		Open steam valve FV-11605 to gasifier 打开蒸汽至气化器阀 FV-11605	
		Close D-101 coke discharge slide valve PV-11201 关闭 D-101 卸焦滑阀 PV-11201	
		Close D-401 bed coke slide valve PV-40401 to BN-401 关闭 D-401 床层焦至 BN-401 滑阀 PV-40401	
		Close D-401 bed coke slide valve PV-40402 to BN-401 关闭 D-401 床层焦至 BN-401 滑阀 PV-40402	

		Close scouring coke slide valve HV-10801 关闭冲刷焦滑阀 HV-10801	
		Close quenched coke slide valve TV-11003 关闭急冷焦滑阀 TV-11003	

2.4.16.5 Low reaction temperature interlock of PS-103 PS-103 反应温度低联锁

Low temperature reactor dense phase results in shutting off reaction feed, preventing reactor from being muddy or preventing loss of coke fines circulation.

因反应器密相温度低切断反应进料，避免反应器泥化或导致焦粉循环中断。

Causes 引发因素	Valve action 阀门动作		Remarks 备注
1. Low temperature of dense phase TE-10525ABC (2oo3) Alarm at 510°C, starting self-preservation at 505°C; 密相温度低 TE-10525ABC（3 选 2）510℃报警，505℃启动自保； 2. HS-P103 manually starting. HS-P103 手动启动。	PS-101A	Close feed valve PV-10501 关闭进料阀 PV-10501	1. PS-101A: No time delay; PS-101A：不延时； 2. PS-101B: 15-minute time delay. PS-101B：延时 15 分钟。
		Close feedstock return valve FV-10505 关闭原料返回阀 FV-10505	
		Close slurry feed valve FV-11704 关闭污泥进料阀 FV-11704	
		Open scrubber feedstock valve HV-10301 to E-105 打开洗涤塔原料至 E-105 阀 HV-10301	
	PS-101B	Open main air blower outlet vent valve FV-11802 打开主风机出口放空阀 FV-11802	
		Open main air blower outlet vent valve FV-11803 打开主风机出口放空阀 FV-11803	
		Open steam valve FV-11605 to gasifier 打开蒸汽至气化器阀 FV-11605	
		Close D-101 coke discharge slide valve PV-11201 关闭 D-101 卸焦滑阀 PV-11201	
		Close D-401 bed coke slide valve PV-40401 to BN-401	

Causes 引发因素	Valve action 阀门动作		Remarks 备注
		关闭 D-401 床层焦至 BN-401 滑阀 PV-40401	
		Close D-401 bed coke slide valve PV-40402 to BN-401 关闭 D-401 床层焦至 BN-401 滑阀 PV-40402	
		Close scouring coke slide valve HV-10801 关闭冲刷焦滑阀 HV-10801	
		Close quenched coke slide valve TV-11003 关闭急冷焦滑阀 TV-11003	

2.4.16.6 High level interlock of PS-104 reactor PS-104 反应器料位高联锁

High level reactor shuts off reaction feed, closing hot coke and scouring coke slide valves, and preventing a lot of coke fines from entering scrubber.

反应器料位高，切断反应进料、关闭热焦和冲刷焦滑阀，避免焦粉大量带入洗涤塔。

Causes 引发因素	Valve action 阀门动作		Remarks 备注
1. High level in reactor LI-10501/10502AB (2oo3), (implementing after 15 seconds). High alarm settingpoint of LI-10501 is normal level plus 1000mm, and interlocking settingpoint is normal level plus 2000mm. 反应器料位高 LI-10501/10502AB（3 选 2），(在 15 秒后实施)。LI-10501 高报警设置值为正常料位高度加 1000mm，联锁值设置	PS-101A	Close feed valve PV-10501 关闭进料阀 PV-10501	1. PS-101A: No time delay; PS-101A：不延时； 2. PS-101B: 15-minute time delay. PS-101B：延时 15 分钟。
		Close feedstock return valve FV-10505 关闭原料返回阀 FV-10505	
		Close slurry feed valve FV-11704 关闭污泥进料阀 FV-11704	
		Open scrubber feedstock valve HV-10301 to E-105 打开洗涤塔原料至 E-105 阀 HV-10301	
	PS-101B	Open main air blower outlet vent valve FV-11802 打开主风机出口放空阀 FV-11802	
		Open main air blower outlet vent valve FV-11803 打开主风机出口放空阀 FV-11803	

Causes 引发因素	Valve action 阀门动作		Remarks 备注
为正常料位高度加2000mm。 2. HS-P104		Open steam valve FV-11605 to gasifier 打开蒸汽至气化器阀 FV-11605	
		Close D-101 coke discharge slide valve PV-11201 关闭 D-101 卸焦滑阀 PV-11201	
		Close D-401 bed coke slide valve PV-40401 to BN-401 关闭 D-401 床层焦至 BN-401 滑阀 PV-40401	
		Close D-401 bed coke slide valve PV-40402 to BN-401 关闭 D-401 床层焦至 BN-401 滑阀 PV-40402	
		Close scouring coke slide valve HV-10801 关闭冲刷焦滑阀 HV-10801	
		Close quenched coke slide valve TV-11003 关闭急冷焦滑阀 TV-11003	
	Close hot coke slide valve TV-10509 关闭热焦滑阀 TV-10509		
	Close scouring coke slide valve HV-10801 关闭冲刷焦滑阀 HV-10801		

2.4.16.7 High level in scrubber PS-105 C101 PS-105 C101 洗涤塔液位高联锁

High level in the scrubber shuts off feed to scrubber, opens scrubber valve to cooling tower, prevents backflow to reactor cyclone outlet, damages cyclone, and results in shutdown of the Unit.

洗涤塔液位高，切断洗涤塔进料，打开洗涤塔去冷却塔阀门，避免倒流至反应器旋分出口，损害旋分器，引起装置停工。

Causes 引发因素	Valve action 阀门动作		Remarks 备注
1. PS-105 high liquid level in scrubber bottom (implementing after 15	PS-101 A	Close feed valve PV-10501 关闭进料阀 PV-10501	1. PS-101A: No time
		Close feedstock return valve FV-10505	

seconds) (3oo4) LI10401AB (specific value is hold), TI10407-TY10409 (low temperature difference, 40°C alarm, self-preservation starting at 28°C), TI10408-TY10409 (low temperature difference, alarm at 40°C, starting self-preservation at 28°C) PS-105 洗涤塔底液位高 (在 15 秒后实施)（4 选 3） LI10401AB（具体值待定）、TI10407-TY10409（温差低，40℃报警，28℃自保启动）、TI10408-TY10409（温差低，40℃报警，28℃自保启动） 2. HS-P105 manually starting HS-P105 手动启动		关闭原料返回阀 FV-10505	delay; PS-101A：不延时； 2. PS-101B: 15-minute time delay. PS-101B：延时 15 分钟。
		Close slurry feed valve FV-11704 关闭污泥进料阀 FV-11704	
		Open scrubber feedstock valve HV-10301 to E-105 打开洗涤塔原料至 E-105 阀 HV-10301	
	PS-101 B	Open main air blower outlet vent valve FV-11802 打开主风机出口放空阀 FV-11802	
		Open main air blower outlet vent valve FV-11803 打开主风机出口放空阀 FV-11803	
		Open steam valve FV-11605 to gasifier 打开蒸汽至气化器阀 FV-11605	
		Close D-101 coke discharge slide valve PV-11201 关闭 D-101 卸焦滑阀 PV-11201	
		Close D-401 bed coke slide valve PV-40401 to BN-401 关闭 D-401 床层焦至 BN-401 滑阀 PV-40401	
		Close D-401 bed coke slide valve PV-40402 to BN-401 关闭 D-401 床层焦至 BN-401 滑阀 PV-40402	
		Close scouring coke slide valve HV-10801 关闭冲刷焦滑阀 HV-10801	
		Close quenched coke slide valve TV-11003 关闭急冷焦滑阀 TV-11003	

Causes 引发因素	Valve action 阀门动作	Remarks 备注
1. PS-105 high liquid level in scrubber bottom (implementing after 15 seconds) (3oo4) LI10401AB	Halve HKGO REFLUX flow FV-21401A to fractionator 减半 HKGO 至分馏塔的 REFLUX 量 FV-21401A	1. PS-101A: No time delay; PS-101A：不

(specific value is hold), TI10407-TY10409 (low temperature difference, 40°C alarm, self-preservation starting at 28°C), TI10408-TY10409 (low temperature difference, alarm at 40°C, starting self-preservation at 28°C) PS-105 洗涤塔底液位高 (在 15 秒后实施)（4 选 3） LI10401AB（具体值待定）、TI10407-TY10409（温差低，40℃报警，28℃自保启动）、TI10408-TY10409（温差低，40℃报警，28℃自保启动） 2. HS-P105 manually starting HS-P105 手动启动	Halve flow HHKGO FV-21801A to scrubber 减半 HHKGO 至洗涤塔的量 FV-21801A Close feedstock pump-107 FV-10103 to scrubber bottom 关闭原料泵-107 至洗涤塔底 FV-10103 Close feedstock pump-107 shut-off valve RBV-10101 to scrubber bottom 关闭原料泵-107 至洗涤塔底切断阀 RBV-10101 Open HV-10301 from pump -102 to E-105 打开泵-102 至 E-105 的 HV-10301 Stop pump -101AB 停泵-101AB	延时； 2. PS-101B: 15-minute time delay. PS-101B：延时 15 分钟。

2.4.16.8 Overtemperature interlock of PS-106 quenched coke standpipe

PS-106 急冷焦立管超温联锁

Overtemperature of quenched coke standpipe shuts off quenched coke slide valve, prevents gas in gasifier overhead from entering the heater through short circuit, and damages heater internals.

急冷焦立管超温，切断急冷焦滑阀，避免气化器顶气走短路直接进入加热器，损坏加热器内构件。

Causes 引发因素	Valve action 阀门动作	Remarks 备注
1. PS-106 TE-10911ABC (2oo3), high temperature after TV-11003 expansion joint, high alarm at 627°C, starting self-preservation at 649°C. PS-106 TE-10911ABC（3 取 2），TV-11003 膨胀节后温度高，627℃高报警，649℃启动自保。 2. HS-P106 manually starting self-preservation HS-P106 手动启动自保	Close TV-11003 slide valve 关闭 TV-11003 滑阀	N/A 无

2.4.16.9 Overtemperature of R102 grating of PS-107 heater

PS-107 加热器 R102 格栅超温超温

Overtemperature of heater grating opens gasifier overhead nozzle.

加热器格栅超温，打开气化器顶喷嘴。

Causes 引发因素	Valve action 阀门动作	Remarks 备注
1. PS-107 TE-11004ABC, 2oo3 high temperature of heater quenching section, alarm at 695°C, opening FV11602 at 700°C, and opening FV11603 and RBV11601 at 913°C. PS-107 TE-11004ABC，3 取 2 加热器急冷段温度高，695℃报警。700℃打开 FV11602，913℃打开 FV11603 和 RBV11601。 2. HS-P107 manually starting self-preservation HS-P107 手动启动自保	Open level I spraying water FV-11602 打开一级喷水 FV-11602 Open level II spraying water FV-11603. Open RBV-11601 打开二级喷水 FV-11603，打开 RBV-11601	Permanently Bypass 永久摘除

2.4.16.10 Overtemperature interlock of ES-108 D-101 to D-401

ES-108 D-101 至 D-401 卸焦超温联锁

Overtemperature of bed coke to bed coke bin closes cooling coke extraction slide valve.

床层焦至床层焦料仓超温，关闭冷却焦抽出滑阀。

Causes 引发因素	Valve action 阀门动作	Remarks 备注
1. TXE-40302ABC, 2oo3. Alarm at 250°C, starting self-preservation at 300°C; TXE-40302ABC，3 取 2，250℃报警，300℃启动自保； 2. TI-11203ABC, high temperature of D-101 bottom, 2oo3. Alarm at 250°C, starting self-preservation at 300°C; TI-11203ABC，D-101 底温度高，3 取 2，250℃报警，300℃启动自	Close XV-11201 shut-off valve (cooling coke extraction slide valve) 关闭 XV-11201 切断阀（冷却焦抽出滑阀） Trigger PS-116 to close PV-11201AB slide valve (Close cooling coke extraction slide valve) 触发 PS-116 关闭 PV-11201AB 滑阀（关闭冷却焦抽出滑阀）	N/A 无

保； 3. HS-108 manually starting self-preservation HS-108 手动启动自保		

2.4.16.11 Overtemperature interlock of ES-109 R-102 to D-401 coke unloading

ES-109 R-102 至 D-401 卸焦超温联锁

High temperature of heater coke fines extraction closes heater coke fines extraction valve.

加热器焦粉抽出温度高，关闭加热器焦粉抽出阀。

Causes 引发因素	Valve action 阀门动作	Remarks 备注
1. High temperature of heater coke fines extraction TXE-40303ABC, 2oo3. High alarm at 250°C, starting self-preservation at 300°C; 加热器焦粉抽出温度高 TXE-40303ABC，3 选 2，250℃高报警，300℃启动自保； 2. High temperature of heater TE-11005ABC, 2oo3. High alarm at 250°C, starting self-preservation at 300°C; 加热器温度高 TE-11005ABC，3 选 2，250℃高报警，300℃启动自保； 3. HS-109 manually starting self-preservation HS-109 手动启动自保	Close XV-11001 shut-off valve 关闭 XV-11001 切断阀 Trigger PS-117 to close slide valve PV-11001 触发 PS-117 关闭滑阀 PV-11001	N/A 无

2.4.16.12 ES-111 (low flow rate of main air to gasifier) ES-111（气化器主风流量低）

Low flow of main air to gasifier opens emergency steam to prevent from backflow.

气化器主风流量低，打开事故蒸汽防止倒流。

Causes 引发因素	Valve action 阀门动作	Remarks 备注
1. Low flow of main air to ES-111 FT-11607ABC, 2oo3. alarm at	Open gasifier emergency steam valve XV-11601 打开气化器事故蒸汽阀 XV-11601	1. PS-101A: No time delay; PS-101A：不延

137kNm3/h, starting interlocking at 128.8kNm3/h. ES-111 主风低流量 FT-11607ABC，3 选 2，137kNm^3/h 报警，128.8kNm^3/h 启动联锁。 2. HS-111 manually starting self-preservation HS-111 手动启动自保	Trigger PS-111 low flow of main air, PS-111 actuates PS-101A, PS-101B, closes coke discharge slide valve PV-40403 of D-401 to BN-402, closes heater emergency shutdown coke discharge slide valve PV-11001, and closes main air duct damping check valve HV-11902 触发 PS-111 主风低流量，PS-111 激活 PS-101A、PS-101B、关闭 D-401 至 BN-402 的卸焦滑阀 PV-40403、关闭加热器紧急停工卸焦滑阀 PV-11001、关闭主风管道阻尼单向阀 HV-11902		时； 2. PS-101B: 15-minute time delay. PS-101B：延时 15 分钟。
	PS-101A	Close feed valve PV-10501. 关闭进料阀 PV-10501，	

Causes 引发因素	Valve action 阀门动作	Remarks 备注	
1. Low flow of main air to ES-111 FT-11607ABC, 2oo3. alarm at 137kNm3/h, starting interlocking at 128.8kNm3/h. ES-111 主风低流量 FT-11607ABC，3 选 2，137kNm^3/h 报警，128.8kNm^3/h 启动联锁。 2. HS-111 manually starting self-preservation HS-111 手动启动自保	PS-101A	Close feedstock return valve FV-10505. 关闭原料返回阀 FV-10505，	1. PS-101A: No time delay; PS-101A：不延时； 2. PS-101B: 15-minute time delay. PS-101B：延时 15 分钟。
		Close slurry feed valve FV-11704. 关闭污泥进料阀 FV-11704，	
		Open scrubber feedstock valve HV-10301 to E-105. 打开洗涤塔原料至 E-105 阀 HV-10301.	
	PS-101B	Open main air blower outlet vent valve FV-11802. 打开主风机出口放空阀 FV-11802，	
		Open main air blower outlet vent valve FV-11803. 打开主风机出口放空阀 FV-11803，	
		Open steam valve FV-11605 to gasifier. 打开蒸汽至气化器阀 FV-11605，	
		Close D-101 coke discharge slide valve PV-11201. 关闭 D-101 卸焦滑阀 PV-11201，	

		Close D-401 bed coke slide valve PV-40401 to BN-401. 关闭 D-401 床层焦至 BN-401 滑阀 PV-40401，	
		Close D-401 bed coke slide valve PV-40402 to BN-401. 关闭 D-401 床层焦至 BN-401 滑阀 PV-40402，	
		Close scouring coke slide valve HV-10801. 关闭冲刷焦滑阀 HV-10801，	
		Close quenched coke slide valve TV-11003. 关闭急冷焦滑阀 TV-11003.	

2.4.16.13 Low flow interlock of PS-111 gasifier main air PS-111 气化器主风流量低联锁

Low flow of main air to gasifier closes quenching tank slide valve, main air check valve, feed and slide valve, and prevents heater from coke fines deposit and clogging.

气化器主风流量低，关闭急冷罐滑阀、关闭主风止回阀、关闭进料、关闭滑阀避免加热器焦粉积炭和堵塞。

Causes 引发因素	Valve action 阀门动作		Remarks 备注
ES-111	PS-111 low flow of main air, PS-111 actuates PS-101A, PS-101B, closes coke discharge slide valve PV-40403 of D-401 to BN-402, closes heater emergency shutdown coke discharge slide valve PV-11001, and closes main air duct damping check valve HV-11902 PS-111 主风低流量，PS-111 激活 PS-101A、PS-101B、关闭 D-401 至 BN-402 的卸焦滑阀 PV-40403、关闭加热器紧急停工卸焦滑阀 PV-11001、关闭主风管道阻尼单向阀 HV-11902		1. PS-101A: No time delay; PS-101A：不延时； 2. PS-101B: 15-minute time delay. PS-101B：延时 15 分钟。
	PS-101A	Close feed valve PV-10501. 关闭进料阀 PV-10501，	
		Close feedstock return valve FV-10505. 关闭原料返回阀 FV-10505，	
		Close slurry feed valve FV-11704.	

		关闭污泥进料阀 FV-11704，	
		Open scrubber feedstock to E-105 valve HV-10301. 打开洗涤塔原料至 E-105 阀 HV-10301.	
	PS-101B	Open main air blower outlet vent valve FV-11802. 打开主风机出口放空阀 FV-11802，	
		Open main air blower outlet vent valve FV-11803. 打开主风机出口放空阀 FV-11803，	
		Open steam valve FV-11605 to gasifier. 打开蒸汽至气化器阀 FV-11605，	
		Close D-101 coke discharge slide valve PV-11201. 关闭 D-101 卸焦滑阀 PV-11201，	
		Close D-401 bed coke slide valve PV-40401 to BN-401. 关闭 D-401 床层焦至 BN-401 滑阀 PV-40401，	
		Close D-401 bed coke slide valve PV-40402 to BN-401. 关闭 D-401 床层焦至 BN-401 滑阀 PV-40402，	
ES-111	PS-101B	Close scouring coke slide valve HV-10801. 关闭冲刷焦滑阀 HV-10801，	1. PS-101A: No time delay; PS-101A：不延时； 2. PS-101B: 15-minute time delay. PS-101B：延时 15 分钟
		Close quenched coke slide valve TV-11003. 关闭急冷焦滑阀 TV-11003.	

2.4.16.14 Low level interlock of steam drum D103 of ES-112 ES-112 汽包 D103 液位低联锁

Causes 引发因素	Valve action 阀门动作	Remarks 备注
1. Steam drum D-103. LI-12301ABC, 2oo3. 汽包 D-103，LI-12301ABC，3 选 2， 2. HS-112 manually starting self-preservation HS-112 手动启动自保	Open main air vent valve XV-11801, open heater dilute phase SSW water spraying XV-10902A, open heater dilute phase SSW water spraying atomization steam XV-10901A, actuate ES-111, and actuate ES-114 (after 10seconds) 打开主风放空阀 XV-11801，打开加热器稀相喷 SSW 水 XV-10902A，打开加热器稀相喷 SSW 水雾化蒸汽 XV-10901A，激活 ES-111，激活 ES-114（十秒钟后）	1. PS-101A: No time delay; PS-101A：不延时； 2. PS-101B: 15-minute time delay. PS-101B：延时 15 分钟。
	ES-111 opens gasifier emergency steam valve XV-11601, and actuates PS-111 ES-111 打开气化器事故蒸汽阀 XV-11601，激活 PS-111	
	ES-114 closes main steam XV-12001 to ST-101 ES-114 关闭 ST-101 主蒸汽 XV-12001	

2.4.16.15 Overtemperature interlock of PS-116 bed coke to bed coke bin (Overtemperature of D101 to D401) PS-116 床层焦到床层焦料仓超温联锁 (D101 至 D401 超温)

Causes 引发因素	Valve action 阀门动作	Remarks 备注
1. ES-108 2. HS-P116	Close quenching tank extraction slide valve PV-11201AB 关闭急冷罐抽出滑阀 PV-11201AB	N/A 无

2.4.6.16 PS-117 interlock closing heater shutdown coke unloading slide valve

PS-117 关闭加热器停工焦卸焦滑阀联锁

Causes 引发因素	Valve action 阀门动作	Remarks 备注
1. ES-109 2. HS-P117	Close shutdown coke extraction slide valve PV-11001 关闭停工焦抽出滑阀 PV-11001	N/A 无

2.4.6.17 ES-118(pump shutdown system of reaction feed pump) ES-118 反应进料泵停泵联锁

Causes 引发因素	Valve action 阀门动作	Remarks 备注
1. Low PT-10201 after filter STR-101AB, 1oo1. Alarm at 0.3MPa, starting self-preservation at 0.2MPa 过滤器 STR-101AB 后 PT-10201 低，1 选 1，0.3MPa 报警，0.2MPa 启动自保 2. Low flow of pump-101 outlet FT-10201, 1oo1. 泵-101 出口流量 FT-10201 流量低，1 选 1， 3. HS-118A 4. HS-118B	Shut down pump -101AB 停泵-101AB	N/A 无

2.4.6.18 Low level interlock of ES-301 tertiary cyclone ES-301 三旋料位低联锁

Causes 引发因素	Valve action 阀门动作	Remarks 备注
1. Low level in D-301 cone section LT-30102ABC, 2oo3. D-301 锥段料位低 LT-30102ABC，3 选 2， 2. HS-301	Close shut off valve XV-30102 of coke fines discharge from tertiary cyclone tank 关闭三旋罐卸焦粉的截断阀 XV-30102	N/A 无
	Trigger PS-308 (implementing after 10 seconds) to close slide valve PV-30102AB 触发 PS-308（十秒后实施）关闭滑阀 PV-30102AB	

2.4.16.19 Low pressure drop interlock across ES-302 tertiary cyclone

ES-302 三旋滑阀压降低联锁

Causes 引发因素	Valve action 阀门动作	Remarks 备注
1. Low pressure drop across slide valve PV-30102 PDT-30103ABC, 2oo3. Alarm at 0.02MPa, starting self-preservation at 0.005MPa 滑阀 PV-30102 压降低 PDT-30103ABC，3 选 2，0.02MPa 报警，0.005MPa 启动自保 2. HS-302	Close shut off valve XV-30102 of coke fines discharge from tertiary cyclone tank 关闭三旋罐卸焦粉的节断阀 XV-30102	N/A 无
	Trigger PS-308 (implementing after 10 seconds) to close slide valve PV-30102AB 触发 PS-308（十秒后实施）关闭滑阀 PV-30102AB	

2.4.16.20 High level interlock of Flexigas absorber C304 of PS-303

PS-303 灵活气吸收塔 C304 液位高联锁

Causes 引发因素	Valve action 阀门动作	Remarks 备注
1. High level in amine absorber LIC-31203. 1oo1; 胺液吸收塔液高 LIC-31203，1 取 1；T-302 液位低 LI31701/LI31702，2 取 2 2. HS-P303	Shut down pump -308AB 停泵-308AB	N/A 无

2.4.16.21 High level interlock of amine tank T302 of ES-307

ES-307 胺液储罐 T302 液位高联锁

Causes 引发因素	Valve action 阀门动作	Remarks 备注
1. High liquid level in amine tank T-302 LT-31701. 1oo1 2. HS-307 胺液储存罐 T-302 液位高 LT-31701，1 取 1	Close shut off valve XV-31601 of fresh amine 关闭新鲜胺液截断阀 XV-31601	N/A 无

2.4.16.22 Closing interlock of PS-308 cyclone slide valve PS-308 旋滑阀关闭联锁

Causes	Valve action	Remarks

引发因素	阀门动作	备注
1. ES-301 2. ES-302 3. HS-P308	Close tertiary cyclone extraction slide valve PV-30102AB 关闭三旋抽出滑阀 PV-30102AB	N/A 无

2.4.16.23 Low pressure drop interlock from ES-401 coke fines hopper to heater

ES-401 焦粉加注料斗至加热器压降低联锁

Causes 引发因素	Valve action 阀门动作	Remarks 备注
1. Differential Pressure between heater and BN-402 PDIC-40801ABC, 2oo3. Alarm at 0.007MPa, starting self-preservation at differential Pressure less than 0 加热器与 BN-402 的差压 PDIC-40801ABC，3 选 2，0.007MPa 报警，差压小于 0 启动自保 2. HS-401	Close coke loading valve XV-1920 to heater, actuate PS-401 关闭向加热器装焦阀 XV-1920，激活 PS-401	
	PS-401 closes slide valve LV-40801 of BN-402, and closes coke discharge slide valve PV-40403 of D-401 PS-401 关闭 BN-402 下的滑阀 LV-40801，关闭 D-401 的卸焦滑阀 PV-40403	N/A 无

2.4.16.24 Low pressure drop interlock from PS-401 coke fines hopper to heater

PS-401 焦粉加注料斗至加热器压降低联锁

Causes 引发因素	Valve action 阀门动作	Remarks 备注
1. ES-401 2. HS-P401	Close slide valve LV-40801 of BN-402. 关闭 BN-402 下的滑阀 LV-40801， Close coke discharge slide valve PV-40403 of D-401 关闭 D-401 的卸焦滑阀 PV-40403	N/A 无

2.4.17 Interlocking logic control diagram of self-preservation of the Unit 装置自保的联锁逻辑控制图

See the figure. 见附图。

2.4.18 Logic control diagram of self-preservation of the Unit 机组自保的逻辑控制图

See the figure. 见附图。

2.5 Shutdown scheme 停工方案

Prior to normal shutdown of the Unit, notify other departments at site which can be affected by shutdown, and prepare necessary documents for shutdown. Jointly review the shutdown procedures together with operation and technical departments' personnel, and ensure all personnel shall understand purpose, sequence and key nodes of the shutdown.

装置正常停车前，需通知现场可能受到停车影响的其他部门，应当准备好停车必要的文件。与运行和技术部门的人员共同审查停车程序，保证所有人员熟悉停车的意图、顺序和关键节点。

Before starting actual shutdown procedures of the Unit, check that the following pre-shutdown activities shall be completed:

开始实际的装置停车步骤前，应当检查下列预停车活动的完成情况：

Ensure that there shall be adequate vacuum residue tank capacity;

确保有充足的减压渣油罐容；

Ensure that flushing oil supply shall be adequate;

确保冲洗油供应充足；

Ensure that storage capacity of circuit cleaning for fractionation and stabilization systems shall be adequate;

确保用于分馏稳定系统管线置换的库容充足；

Test coke discharge system of heater. The line shall get through to bed coke bin;

测试加热器卸焦系统，管线贯通至床层焦料仓；

Perform explosion purging of heater bed coke discharge line to heater bed and heater quenching section;

爆破吹扫加热器床层卸焦管线至加热器床层和加热器急冷工段；

Check shutdown and coke discharge line slide valves, and ensure operationability;

检查停车和卸焦管线滑阀的情况，确保可操作性；

Review inventory of bed coke bin (D401), and ensure that coke fines supply for re-startup shall be adequate;

审查床层焦料仓（D-401）的藏量，确保重新开车用焦粉供应充足；

Perform tests on test bench, and then install heater quenching section nozzles. Nozzles installed during operation shall be substituted nozzle;

进行试验台测试，然后安装加热器急冷工段喷嘴。运行过程中安装的是替代喷嘴；

When workload in early stage of shutdown sequence is small, convert purging and conveying head to nitrogen from fuel gas to avoid potential safety hazards resulting in procedural neglect in the follow-up process;

在停车顺序早期工作负荷较轻时，将吹扫输送总管从燃料气切换至氮气，避免在后续过程中造成步骤疏忽的安全隐患；

Notify the coke fines user the shutdown of units and predicted effect on coke fines product;

通知焦粉用户装置停车以及对焦粉产品的预期影响；

Ensure that fine coke fines bin (T401) shall have adequate storage capacity of tertiary cyclone coke fines;
确保细焦粉料仓（T-401）有充足的三旋焦粉贮存能力；
Connect underflow balance line to Venturi separator from tertiary cyclone vessel outlet. Since Flexigas flow decreases, pressure from tertiary cyclone vessel to normal tertiary cyclone vessel outlet cannot ensure that aeration gas into tertiary cyclone vessel will flow out without affecting efficiency of cyclone;
将 D301 平衡线从三旋容器出口切换至文丘里分离器。因为灵活气流量下降，三旋容器到正常三旋容器出口的压力无法保证进入三旋容器的松动气体在不影响旋分效率的条件下流出；
Because main air blower outlet pressure will decrease when its load decreases, convert coke fines conveying medium to plant air and ensure stable conveying;
因为主风机出口压力在其负荷降低时会下降，将焦粉输送介质从空气切换至工厂风，确保稳定输送；
Ensure that wet coke treatment system (T403/T404) shall have adequate storage capacity to store Venturi coke slurry and water for flushing the equipment in late stage of shutdown;
确保湿焦处理系统（T-403/T-404）有充足库容贮存文丘里焦浆和停车后期冲洗设备的水；
Ensure that caustic injection unit shall be ready;
确保碱液注入单元准备就绪；
Ensure that there shall be adequate tank capacity to store the amine;
确保有充足罐容（T302）贮存胺液；
Check that all online pH, specific gravity and Flexigas analyers shall be operational and calibrated properly because these instruments shall be used to judge the change of operations of Flexigas treatment system.
检查所有在线 PH、比重和灵活气分析仪工作正常并进行了标定，因为这些仪表要用于判断灵活气处理系统操作的变化。

2.5.1 Inventory decrease of heater, reactor and gasifier 三器降藏量

Inventory decrease of heater, reactor and gasifier helps to shorten shutdown coke discharge duration. Coke discharge speed is about 50t/h during the shutdown. Main operations used are normal coke discharge from heater, increasing gasifier rate of gasification so that gasifier inventory decreases gradually. The specific operating procedures are as follows:
三器降藏量有利于缩短停工卸焦时间，停工时卸焦速度约为 50t/h。主要采取的操作是加热器正常卸焦、提高气化器气化率，使得气化器藏量逐渐下降。具体操作步骤如下：

2.5.1.1 Empty storage capacity of bed coke bin (D401) in advance to facilitate coke fines discharge during the shutdown;
提前将床层焦料仓（D-401）库容腾出来，便于停工期间卸焦粉；

2.5.1.2 Increase rate of gasification to 100% and decrease system inventory 24 hours in advance before shutdown;
在停工前 24 小时，将气化率提至 100%，降低系统藏量；

2.5.1.3 Mainly decrease gasifier inventory, properly monitor heater inventory and grating temperature, avoid misdirected flow due to emptying gasifier overflow downcomer, and use gasifier overhead nozzle to control the heater grating temperature.
主要是降低气化器藏量，监控好加热器藏量和格栅温度，避免气化器溢流斗空出现气体倒窜，用气化器顶喷嘴控制加热器格栅温度。

2.5.2 Shutting off feed 切断进料
After shutting off feed, the specific operating procedures are as follows:
切断进料后，具体操作步骤如下：

2.5.2.1 Reactor — scrubber 反应器—洗涤塔
(1) Close feed nozzle, and decrease reactor feed;
逐个关进料喷嘴，降低反应器进料；
(2) Reject scrubber bottom oil to tank farm through E105;
将洗涤塔底油通过 E-105 外甩至罐区；
(3) With decrease of feed flow, decrease reactor pressure;
随着进料量的降低，降低反应器压力；
(4) Close scouring coke slide valve, and remain coke fines in the steam cleaning pipe of riser;
关冲刷焦滑阀，保留提升管上的蒸汽清理管内焦粉；
(5) When all nozzles are closed, continue to replace material in scrubber with fresh feed, and avoid clogging resulting from increase of solid content during discharge of coke fines;
当喷嘴全部关完，继续保持新鲜进料对洗涤塔进行置换，避免卸焦粉时固含上升造成堵塞；
(6) Continue maintaining flushing oil circulation of scrubber overhead grating, and avoid increase of solid content in fractionator;
继续维持洗涤塔顶格栅的冲洗油循环，避免分馏塔固含上升；
(7) When starting coke discharge from reactor, inject a little of flushing oil to the system for replacement;
反应器开始卸焦时，向分馏系统注入少量冲洗油进行置换；
(8) Scrubber bottom oil circulation and feedstock oil circulation shall be maintained until coke fines in reactor have been discharged completely;
直到反应器焦粉卸尽，洗涤塔底油循环和原料油循环都要维持；
(9) When coke fines in reactor have been discharged completely, shut off fresh feed to the Unit, replace scrubber bottom oil, feedstock oil and system oil with flushing oil;

当反应器焦粉卸尽，切断新鲜进料进装置，将洗涤塔底油和原料油系统油置换为冲洗油；

(10) Continue performing circulation to ensure that all of them are replaced;

继续进行循环，确保置换干净；

2.5.2.2 Fractionation and absorption-stabilization systems 分馏和吸收稳定系统

(1) With decrease of reaction feed flow, product flow from the Unit decreases;

随着反应进料量的下降，产品出装置量也随之下降；

(2) Properly control temperature of individual sections of fractionator, and ensure that oil quality is acceptable;

控制好分馏塔各段温度，确保油品质量合格；

(3) supply wax oil to make up level in fractionator bottom through P-204 inlet startup line, and ensure that scrubber overhead grating flushing oil circulation;

通过 P-204 入口开工线引外来蜡油补分馏塔底液面，保证洗涤塔顶格栅冲洗油循环；

(4) Change rejected product line to tank farm;

改不合格线至罐区；

(5) Stop diesel oil, light wax oil, heavy wax oil stripping steam;

停柴油、轻蜡油、重蜡油汽提蒸汽；

(6) Pressurize fractionator overhead with fuel gas, and control auxiliary differential pressure of reactor and heater;

分馏塔顶用燃料气充压，控制反应器和加热器副压差；

(7) Stop steam to stabilizer bottom reboiler;

停稳定塔底重沸器蒸汽；

(8) When coke fines in reactor have been discharged completely, start to replace fractionator BPA and LKGO with flushing oil;

当反应器焦粉卸完，分馏塔 BPA 和 LKGO 开始用冲洗油进行置换；

(9) Stop gas compressor, and stop pump after material is withdrawn from absorption-stabilization system;

停气压机，吸收稳定系统退料后停泵；

(10) Stop adding additives, and maintain slight positive pressure in fractionator and absorption-stabilization systems with nitrogen;

停加助剂，用氮气维持分馏塔和吸收稳定系统微正压；

(11) Prepare for oil flush of fractionator;

准备分馏塔油冲洗；

2.5.2.3 Gasifier — heater — heater overheads 气化器—加热器—加热器顶

(1) Increase unloading of from bed coke, properly control temperature of heater and D101;

提高床层焦的卸载量，控制好加热器和 D-101 温度；

(2) Change aeration fluid of coke-for-gasification return line to nitrogen from steam;

将气化焦返回线松动介质由蒸汽改为氮气；

(3) When gasifier inventory decreases, decrease the opening of coke-for-gasification feedstock line, and properly level in control heater;

当气化器藏量下降，关小气化器进料焦线，控制好加热器料位；

(4) With decrease of reactor pressure, heater pressure decreases;

随着反应器压力下降，加热器压力随之下降；

(5) Change aeration fluid of heater coke discharge, coke-for-gasification feedstock, scouring coke and quenched coke lines and D101 to nitrogen from steam;

将加热器卸焦线、气化器进料焦线、冲刷焦线、急冷焦线、D-101 上松动介质从蒸汽改为氮气；

(6) With decrease of gasifier overhead gas flow, monitor linear speed at the quenched coke line inlet. When linear speed is less than 15m/s, close quenched coke slide valve;

随着气化器顶气量的下降，监控急冷焦线入口处线速。当线速低于 15m/s 时，关闭急冷焦滑阀；

(7) After shutting off the feed, decrease main air flow to control temperature of gasifier and heater;

当进料切除后，降低主风量控制气化器和加热器温度缓慢下降；

2.5.2.4 Other Important notes 其它注意事项

(1) Piping, heat exchangers, filters and pumps of all feedstock oil and scrubber systems shall be circulated with flushing oil. Prior to detergent/hot water circulation, fluids in all heavy oil lines must be replaced with flushing oil;

所有原料油系统和洗涤塔系统的管线、换热器、过滤器和泵必须用冲洗油进行循环，所有的重油管线在清洁剂/热水循环前必须用冲洗油置换；

(2) With change of scrubber bottom and fractionator bottom fluids, deviation of level indication takes place. Closely observe the level gauge at site.

随着洗涤塔底和分馏塔底介质的变化，液位指示会出现偏差，要密切关注现场液面计。

2.5.3 Monitoring coke loading and Flexigas composition 监控焦炭装车和灵活气组成

With shutting off the feed, loss of heater coke fines will increase due to fluidization upset, closely observe level in tertiary cyclone tank and coke fines content in water of Flexigas treatment system. The specific operating procedures are as follows:

随着进料切断，加热器焦粉跑损量因流化波动会出现上升，必须密切关注三旋罐料位和灵活气处理系统水中焦粉含量。具体操作步骤如下：

2.5.3.1 Tertiary and tertiary cyclone tanks 三旋和三旋罐

(1) Observe level in the tertiary cyclone tank, monitor coke fines carryover in heater overhead, and avoid overloading of Venturi scrubber, resulting in clogging in the piping, and affecting shutdown progress;

关注三旋罐料位，监控加热器顶焦粉夹带量，避免文丘里洗涤器超负荷造成管线堵塞，影响停工进程；

(2) If necessary, increase tertiary cyclone pressure to ensure conveying of bottom coke fines. Increasing Flexigas system pressure (adjusting Flexigas valve from the Unit or vent valve to flare) may be used, but fluidization of heater and gasifier will be affect;
如有必要，可以提高三旋压力保证下部焦粉输送。可以通过提高灵活气系统压力（调节灵活气出装置阀或至火炬阀），但是会影响加热器和气化器的流化；
(3) If the above actions cannot reduce coke fines carryover, reduce the level in the heater, reduce Flexigas flow to heater, and re-establish bed fluidization of heater, etc.;
如以上措施都不能减少焦粉夹带量，则考虑降低加热器料位、降低灵活气进加热器流量，重新建立加热器的床层流化等；

2.5.3.2 Venturi scrubber and diluted slurry stripper 文丘里洗涤塔和稀浆液汽提塔
(1) Use the online hydrometer AI-30202 (one sampling per 2h) to monitor coke fines content in the Venturi scrubber and diluted slurry stripper;
通过在线比重计 AI-30202（每 2h 采样）监控文丘里洗涤塔和稀浆液汽提塔中焦粉含量；
(2) Ensure slurry circulation flow, and avoid sedimentation of coke fines;
保证浆液循环量，避免焦粉沉积；
(3) If coke fines content in water exceed 15w%, make up process water to replace them;
如果水中焦粉含量超过 15w%，补充生产水进行置换；
(4) Use online analyer AI-30201 to monitor pH value of slurry. If temperature of gasifier bed decreases to 800°C, coke fines gasification stops, and SO_2 content in the Flexigas increases. When pH value is less than 6.5, inject the caustic to control pH value between 7.0 and 7.5.
用在线分析仪 AI-30201 监控浆液 PH 值。如果气化器床温下降至 800℃，焦粉气化停止，灵活气中 SO_2 含量上升，当 PH 值低于 6.5 时需要注碱，控制 PH 值在 7.0～7.5。

2.5.3.3 Direct contact condensing tower C-302 直接接触冷凝塔 C-302
(1) Monitor coke fines content in water (one sampling per 2h);
监控水中焦粉含量（每 2h 采样）；
(2) Maintain slurry circulation flow, avoid sedimentation of coke fines, piping clogging;
维持浆液循环量，避免焦粉沉积，管线堵塞；
(3) If necessary, make up process water when coke fines content exceed 1w%;
如有必要，当焦粉含量超过 1w%，补充生产水；
(4) When pH value is less than 6.5, inject the caustic to control pH value between 7.0 and 7.5.
当 PH 值低于 6.5 时需要注碱，控制 PH 值在 7.0～7.5。

2.5.3.4 Preheater and COS reactor 预热器和 COS 反应器
(1) In normal case, maintain operating time of system, reduce sulfur emission;
正常情况下，维持系统运行时间，减少硫排放；

(2) To avoid combustion after sedimentation of coke fines or foreign matters on COS reactor bed, shut off COS reactor, and pass through the bypass when starting coke discharge from heater;
为避免 COS 反应器床层上焦粉或杂质沉积后燃烧，在加热器开始卸焦时，将 COS 反应器切除走旁路；
(3) Slowly open bypass control valve PV-30501. Decrease the opening of COS reactor inlet valve MOV-30501/MOV-30502. Then close outlet valve MOV-30503/MOV-30504;
缓慢打开旁路控制阀 PV-30501，关小 COS 反应器入口阀 MOV-30501/MOV-30502，之后关闭出口阀 MOV-30503/MOV-30504；
(4) Stop steam to COS preheater;
停 COS 预热器蒸汽；
(5) Use nitrogen to purge COS preheater and reactor. After purging, fill nitrogen to maintain slight positive pressure;
用氮气对 COS 预热器和反应器进行吹扫，吹扫完成后充氮气维持微正压；

2.5.3.5 Direct contact cooling tower C303 直接接触冷却塔 C-303
(1) Monitor coke fines content in water (one sampling per 2h);
监控水中焦粉含量（每 2h 采样）；
(2) Maintain slurry circulation flow, avoid sedimentation of coke fines, piping clogging;
维持浆液循环量，避免焦粉沉积，管线堵塞；
(3) If necessary, make up process water when coke fines content exceed 1w%;
如有必要，当焦粉含量超过 1w%，补充生产水；
(4) When pH value is less than 6.5, inject the caustic to control pH value between 7.0 and 7.5.
当 PH 值低于 6.5 时需要注碱，控制 PH 值在 7.0～7.5。

2.5.4 Coke discharge 卸焦
When coke fines temperature is more than 400°C, fluidization of coke fines may be cooled more easily.
当焦粉温度在 400℃以上时，焦粉流化更好控制。

2.5.4.1 Discharge of heater bed coke 加热器床层焦的卸载
Discharge of coke fines from heater is performed mainly based on the cooler D101. Coke discharge from reactor is performed by transferring to the heater through the cold coke line. Coke discharge from of gasifier is performed by directly discharging to quenching section of heater through the gasifier coke discharge line. Use atomization of quenching section to control coke discharge temperature. The specific operating procedures are as follows:

加热器焦粉卸载主要依靠冷却器 D-101 来完成，反应器是通过冷焦线转移至加热器完成卸焦，气化器是通过气化器卸焦线直接卸至加热器急冷段。通过急冷段喷雾来控制卸焦温度。具体操作步骤如下：

(1) Verify that all of bag-type dust collectors of coke fines treatment system is put into service, that conveying air flow shall be increased;

确认焦粉处理系统的布袋除尘器全部投用，提高输送风量；

(2) Open PV-11201 to get through the flow process from coke discharge to coke fines bin;

打开 PV-11201 贯通卸焦至焦粉料仓流程；

(3) Monitor temperature of coke discharge line, and prevent self-preservation system from starting (≧300°C);

监控卸焦线上温度，避免自保系统启动（≧300℃）；

(4) If starting coke discharge, PDI-11202 will increase, and D-101 inventory will decrease. Use PDI-11202 as inventory indication of D-101 to adjust PV-11201 and to ensure material sealing of D-101;

如果开始卸焦，PDI-11202 会上升，D-101 藏量下降。用 PDI-11202 作为 D-101 的藏量指示调整 PV-11201 保证 D-101 料封；

(5) Coke fines shall be discharged from heater according to the normal coke discharge process;

按正常卸焦流程卸出加热器焦粉；

(6) After coke fines of heater and gasifier is discharged completely, increase main air flow to perform cooling. If rapid increase of temperature takes place, this means that coke fines are combusting. Withdraw main air, and increase steam to gasifier to control the temperature;

当加热器和气化器焦粉卸尽后，提主风量进行降温。如果出现温度快速上升，则指示焦粉燃烧，将主风退出，提气化器蒸汽量控制温度；

(7) Then, withdraw main air from the system, close all steam to gasifier and heater;

之后，将主风退出系统，关闭气化器和加热器所有蒸汽；

2.5.4.2 Transferring coke to heater from reactor 反应器向加热器转焦

After shutting off the feed, and getting through coke discharge process from heater, start the coke discharge from reactor. Coke discharge from reactor shall be rapid as possible. Then, purging of scrubber and fractionator may be performed. When shutting off all feeds, close hot coke and scouring coke slide valves, use cold coke slide valve to transfer coke to heater. The specific operating procedures are as follows:

当进料切除、加热器卸焦流程打通后，开始反应器卸焦。反应器卸焦要越快越好，之后才能进行洗涤塔和分馏塔的吹扫。当进料全部切除后，关闭热焦和冲刷焦滑阀，用冷焦滑阀开始向加热器转焦。具体操作步骤如下：

(1) After shutting off the feed, coke discharge from reactor starts;

切断进料后，反应器卸焦开始；

(2) Close hot coke and scouring coke slide valves, and remain steam in the riser;
关闭热焦和冲刷焦滑阀，保留提升管上蒸汽；
(3) Use cold coke slide valve to control speed of coke transfer, use PDI-10503 (bed density) and PDI-10502 (stripping section density) to monitor reactor inventory. If necessary, increase reactor pressure and cold coke steam flow to ensure coke discharge speed;
用冷焦滑阀控制转焦速度，用 PDI-10503（床层密度）和 PDI-10502（汽提段密度）监控反应器藏量。如果有必要，可以提高反应器压力和冷焦蒸汽量保证卸焦速度；
(4) Discharge the rest of coke fines from reactor stripping section (bed level is lower than cold coke extraction outlet) through large chunk coke discharge line;
用大焦块卸焦线卸出反应器汽提段（床层料位低于冷焦抽出口）剩余的焦粉；

2.5.4.3 Discharging coke from gasifier 气化器卸焦

Coke discharge from gasifier may be used only when gasifier coke discharge line is shutdown. Prior to coke discharge from gasifier, temperature of gasifier shall first reach 400°C to meet the requirements of coke discharge temperature. The specific operating procedures are as follows:
气化器卸焦线只有在停工时气化器卸焦采用。在气化器卸焦之前，气化器的温度先降至 400℃满足卸焦温度需要。具体操作步骤如下：
(1) Decrease main air flow to gasifier, and use steam to decrease temperature of gasifier;
降低气化器主风量，用蒸汽降低气化器温度；
(2) PV-11610 is shut off. Use nitrogen to purge coke discharge line. When TI-11610 increases, convert nitrogen to steam;
PV-11610 关，用氮气对卸焦线进行吹扫。当 TI-11610 上升，将氮气换为蒸汽；
(3) Slowly open PV-11610. Start coke discharge from gasifier, and monitor temperature of gasifier (ensure that it shall be less than THA alarm value 427°C);
缓慢打开 PV11610 缓慢打开 PV-11610，开始气化器卸焦，监控气化器温度（确保在 THA 报警值 427℃以下）；

2.5.5 FXG desulfurizer C-304 withdrawing FXG 脱硫塔 C-304 退出

2.5.5.1 When temperature of gasifier is less than 800°C, SO_2 content in the FXG increases, CO and H_2 content decrease, Flexigas shall be routed to Flexigas flare, and C304 continue operating;
当气化器温度低于 800℃时，FXG 中的 SO_2 含量上升，CO 和 H_2 含量下降，灵活气要送至灵活气火炬，C-304 继续运行；

2.5.5.2 When temperature of gasifier decreases to 650°C, shut off desulfurizer and regenerator circulation. Send amine to tank, replace it with water.
当气化器温度降至 650℃时，切断脱硫塔和再生塔循环。胺液送至储罐，用水代替。

2.5.6 Initial washing with detergent 清洁剂初洗

Prior to initial washing with detergent, stop caustic and antiscalant injections. Stop stripping steam to slurry stripper.

清洁剂初洗之前，停碱液加注、阻垢剂加注，停浆液汽提塔汽提蒸汽。

2.5.6.1 Reactor - scrubber 反应器-洗涤塔

(1) After residue is withdrawn, with decrease of temperature, use light oil to perform piping flushing of feedstock oil and scrubber bottom oil systems until heavy oil and solid are removed completely. Include rotating machinery, filter and heat exchanger.

当渣油退出之后，随着温度的下降用轻油对原料油和洗涤塔底油系统进行管线冲洗，直到重油和固体全部冲洗干净。包括机泵、过滤器和换热器

(2) Reactor shall continue supplying steam and heat, and play stirring action;

反应器继续给蒸汽，提供热量，起搅拌作用；

(3) Stop flushing oil, and open drain at low point to withdraw oil to slop oil tank;

停冲洗油，开低点排空撤油至污油罐；

(4) Starting washing with detergent: Decreasing reactor steam consumption to control temperature ——Establishing water solvent circulation of feedstock oil and scrubber bottom oil systems ——Detergent passing through feed nozzle, and withdrawing from reactor bottom——Sampling analysis of cleaning progress——Sending detergent to tank farm for oil/water separation, and then recycling it for flushing, 2 to 3 circulations may achieve complete cleaning——Monitoring liquid level in scrubber bottom, the level shall not be higher than reactor cyclone outlet;

开始清洗剂洗涤：降低反应器蒸汽用量控制温度——建立原料油和洗涤塔底油系统水溶剂循环——清洗剂通过进料喷嘴，从反应器底部退出——采样分析清洗进展——将清洗液送至罐区进行油水分离，然后再次回用进行冲洗，2 到 3 次循环就能清洗干净——监控洗涤塔底液面，不能没过反应器旋分出口；

(5) After flushing is completed, stop all steam to reactor, stop instrument air, start separating reactor and scrubber, and prepare for opening the manhole;

冲洗干净后，停反应器所有蒸汽、停仪表风，开始隔离反应器和洗涤塔，准备开人孔；

2.5.6.2 Fractionator 分馏塔

(1) After residue is withdrawn, with decrease of temperature, use light oil to perform piping flushing of fractionator until heavy oil and solid are removed completely. Include rotating machinery, filter and heat exchanger.

当渣油退出之后，随着温度的下降用轻油对分馏塔进行管线冲洗，直到重油和固体全部冲洗干净。包括机泵、过滤器和换热器；

(2) Reactor shall continue supplying steam and heat, and play stirring action;

反应器继续给蒸汽，提供热量，起搅拌作用；

(3) Stop flushing oil, and open drain at low point to withdraw oil to slop oil tank;

停冲洗油，开低点排空撤油至污油罐；

(4) Starting washing with detergent: Decreasing reactor steam consumption to control temperature——Supplying steam, circulation washing of light wax oil, heavy wax oil and fractionator bottom systems with detergent——Sampling analysis of cleaning progress

开始清洗剂洗涤：降低反应器蒸汽用量控制温度——给蒸汽，用清洗剂对轻蜡油、重蜡油和分馏塔底系统进行循环清洗——采样分析清洗进展

(5) After flushing is completed, stop all steam to reactor and fractionator, stop instrument air, start separating fractionator, and prepare for opening the manhole;

冲洗干净后，停反应器和分馏塔所有蒸汽、停仪表风，开始隔离分馏塔，准备开人孔；

2.5.6.3 Absorption-stabilization system 吸收稳定系统

Absorption-stabilization system and fractionator may be washed at the same time, and the detergent used shall be vapour.

吸收稳定系统可以和分馏塔同时进行清洗，用到的清洗剂是气相。

(1) Residue shall be drained at low point to slop oil tank;

残余油低点排凝至污油罐；

(2) Supply steam to the columns, inject the detergent after the appropriate temperature is reached;

塔器给蒸汽，达到合适温度后加注清洗剂；

(3) Ensure that all nodes shall be washed, including rotating machinery, heat exchanger, control valve, sub-line, etc.;

确保所有节点全部清洗，包括机泵、换热器、控制阀、副线等；

(4) Monitor the washing progress by sampling analysis;

采样分析监控清洗进展；

(5) After washing is completed, stop steam and instrument air, and separate the system to prepare for opening the manhole;

清洗干净后，停蒸汽、停仪表风，隔离系统准备开人孔；

2.5.6.4 Gasifier - heater - gasifier overhead systems 气化器-加热器-气化器顶系统

(1) When coke fines is discharged completely, withdraw steam from gasifier and heater, and perform natural ventilation and cooling;

当焦粉卸完，蒸汽退出气化器和加热器，自然通风冷却；

(2) When main air is withdrawn and steam is shut off, water circulation in heater overhead system may be stopped;

当主风退出，蒸汽切除，加热器顶系统水循环可以停止；

(3) Prior to stop of water circulation, verify that solid content in water of heater overhead system shall be acceptable;
水循环停止前，确认加热器顶系统水中固含合格；
(4) Washing heater overhead system will not require detergent;
加热器顶系统不需要用到清洗剂；
(5) Separate the system to prepare for opening the manhole
隔离系统准备开人孔；

2.5.6.5 Tertiary and tertiary cyclone tanks 三旋和三旋罐
(1) Through material conveying bypass, completely withdraw coke fines in the tank, and purge the conveying piping with conveying air or nitrogen;
通过下料旁路退净罐内焦粉，用输送风或氮气对输送管线进行吹扫；
(2) Stop nitrogen heater;
停氮气加热器；
(3) After releasing pressure in heater overhead system, open tertiary cyclone tank bottom to empty residue, or handle residue by suction-type vacuum car;
当加热器顶系统撤压后，打开三旋罐底部排空清除残渣，或用抽真空车处理残渣；

2.5.6.6 Venturi scrubber, knockout drum and slurry stripper
文丘里洗涤塔、分离罐和浆液汽提塔
Make up water to Venturi scrubber through C-302, perform circulation flushing, and send diluted slurry to wet coke treatment system. Monitor solid concentration in the circulated liquid, and ensure that flushing shall be completed.
通过 C-302 向文丘里洗涤塔补水进行循环冲洗，稀浆液送至湿焦处理系统。监控循环液中固体浓度，确保冲洗干净。

2.5.6.7 Direct contact cooling tower C-302 直接接触冷却塔 C-302
Perform circulation with water, monitor solid concentration in the circulated liquid, and ensure that flushing shall be completed.
用水进行循环，监控环液中固体浓度，确保冲洗干净。

2.5.6.8 COS preheater and reactor COS 预热器和反应器
(1) After shutting off, use nitrogen for pressurization protection;
切除后用氮气充压保护；
(2) Slowly open, and avoid spontaneous combustion;
缓慢打开，避免自燃；
(3) Replace catalyst bed;
更换催化剂床层；

2.5.6.9 Direct contact cooling tower C303 直接接触冷却塔 C-303

Perform circulation with water, monitor solid concentration in the circulated liquid, and ensure that flushing shall be completed.

用水进行循环，监控环液中固体浓度，确保冲洗干净。

2.5.6.10 Flexigas desulfurizer C304 灵活气脱硫塔 C-304

After circulating water is clean, stop circulation, and drain water.

当循环水干净后，停止循环，排水。

2.5.7 Installing blind, opening manhole 加盲板，开人孔

The manhole shall be opened upward to avoid stack effect (spontaneous combustion resulting from air entering). Monitor CO and CO2 contents in vessel, and avoid spontaneous combustion.

人孔要从上往下开，避免烟囱效应（风进入引起自燃）。监控容器中的 CO 和 CO_2 含量，避免自燃。

2.5.8 Dry coke treatment 干焦炭处理

During shutdown, coke fines stored in coke fines bin is prepared for startup.

停工时焦粉料仓内储存的焦粉是为开工准备的。

2.5.9 Wet coke treatment system 湿焦处理系统

After liquid level in diluted slurry storage tank is empty, stop wet coke treatment system (concentrate tank, dehydrator, etc.).

当稀浆液储罐液面拉空后，停湿焦处理系统（浓缩罐、脱水机等）。

2.6 Troubleshooting of abnormal phenomena and accidents 异常现象及事故的判断、原因分析和处理方法

2.6.1 Treatment principles 处理原则

2.6.1.1 If it is overtemperature problem, shut off main air to system.

如果是超温问题，把主风切出系统。

2.6.1.2 If it is low temperature of reactor, shut off feed.

如果是反应器温度低，切除进料。

2.6.1.3 Properly control reactor pressure, and prevent main air from entering oil system.

控制好反应器压力 ，防止主风进入油系统。

2.6.2 Main accidents requiring emergency shutdown 需紧急停工的主要事故

Emergency shutdown mainly means starting self-preservation to shut off all feeds to reactor, and maintaining gasifier fluidization as possible; properly controlling temperature, liquid level and slurry oil discharge outlet temperature at individual fractionation points, and maintaining heavy oil circulation; maintaining double-column circulation and system pressure of absorption-stabilization system; maintaining water circulation of Flexigas treatment system. After emergency shutdown, re-organize feeding and startup of the Unit based on the specific conditions, or perform follow-up procedures based on normal shutdown scheme.
紧急停工主要指启用自保切断反应器所有进料，尽可能维持气化器流化；控制好分馏各点温度、液面和油浆外排温度、维持重油循环；维持吸收稳定系统的双塔循环和系统压力；维持灵活气处理系统水循环。紧急停工后，应视情况重新组织装置进料开工或按正常停工方案进行后续步骤。
Shut off the feed, and perform emergency shutdown in case of:
发生下列事故，须切断进料，紧急停工:
2.6.2.1 Main air blower unit failed and stopped, loss of main air.
主风机组故障停运，主风中断。
2.6.2.2 Malfunction of coke fines circulation and fluidization, or there is risk of misdirected flow between oil and gas.
焦粉循环流化失常（例如：热焦中断，冷焦中断，进料焦中断），或有油气互串危险。
2.6.2.3 Bed becomes muddy.
床层和泥。
2.6.2.4 Loss of water, electricity, steam, air to full Unit, and rapid restoration is impossible.
全装置水、电、汽、风中断，且不能迅速恢复。
2.6.2.5 Material supply failure or product path clogging take place in the system.
系统发生物料供应故障或产品后路阻塞。
2.6.2.6 Loss of coke fines is too much, failure to maintain normal production.
焦粉跑损太多，无法维持正常生产。
2.6.2.7 DCS failure, failure to restoration in short time, failure to perform operations.
DCS 故障，短时无法恢复，操作无法进行。
2.6.2.8 Key equipment failed or severely leaked, endangers safety production or takes place severe fire or explosion accident.
重要设备发生故障或严重泄漏，危及安全生产或发生严重火灾或爆炸事故。
2.6.2.9 Severe overtemperature, overpressure conditions.
严重超温、超压状态。
2.6.2.10 Other force majeure.
其他不可抗拒之情况。

2.6.3 Treatment method of emergency shutdown 紧急停工处理方法

2.6.3.1 Steps to be taken immediately 应立即采取的步骤

(1) Shut off all main air to gasifier, maximize steam flow to maintain bed fluidization, to prevent coke fines from backflow to plenum chamber.

切断气化器所有主风，蒸汽开到最大以维持床层流化，以避免焦粉倒流回至集气室。

(2) Transfer feed of reactor, and stop fresh feed to the Unit. Monitor liquid level in the scrubber (level gauge and thermometer), to avoid backflow to reactor cyclone resulting from too high level.

转移反应器的进料，同时停止装置的新鲜进料。监控洗涤塔液位（液位计和温度计），以防液位过高倒流回至反应器旋分。

(3) Shut off air that can enter the heater.

切断所有可能进入加热器的空气。

(4) Close hot coke, cold coke, scouring coke and quenched coke slide valves.

关闭热焦、冷焦、冲刷焦和急冷焦滑阀。

(5) Close aeration gas to gasifier coke return line to stop this circulation.

关闭气化器返焦线的松动气，停止该循环。

(6) Ensure that emergency spraying water for both gasifier and heater shall be ready to avoid overtemperature.

确保备好气化器应急喷水和加热器应急喷水，以便用来防止超温。

2.6.3.2 Follow-up procedures 后续步骤

(1) Unless this is unsafe, maintain continuous circulation of circulation oil system for scrubber to reduce possibility of clogging. Control the temperature of scrubber overhead and bottom.

除非这样做不安全，否则请保持洗涤塔循环油系统继续循环以减少堵塞几率。控制洗涤塔塔顶和塔底温度。

(2) Reduce steam flow to reactor, and minimize coke fines carryover to scrubber.

减少去反应器的蒸汽用量，把携带至洗涤塔的焦粉量降至最低。

1) Reduce stripping steam flow.

减少汽提蒸汽量。

2) As needed, manually shut off breaking steam to reactor, ensure that no breaking steam enters.

根据需要手动切断反应器破碎蒸汽，确保无破碎蒸汽进入。

3) Close all explosion purging steam (if any) to reactor, cold coke standpipe, hot coke riser or scouring coke riser.

关闭所有去反应器、冷焦立管、热焦提升管或冲刷焦提升管的爆破吹扫蒸汽（如果还在投用）。

(4) Close feed slide valve to gasifier.

关闭气化器进料滑阀。

(5) Verify at site that quenched coke slide valve has been closed (no quenched coke flow), to prevent coke fines from accumulation in downstream area, because this may cause gasifier top piping clogging when restart up, resulting in pressure increase of gasifier.
现场确认急冷焦滑阀已完全关闭（没有急冷焦流量），以防焦粉在下游区域累积，因为这样在重新开工时可能导致气化器顶部管线堵塞，进而导致气化器压力上升。
(6) If it is safe to do so, please open the flushing oil and pour it into the cooling water tank E-105 to the special tank.
如果这样做安全，请打开冲洗油注入到冷却水箱 E-105 至专用罐。
When the Unit is temporarily in safe condition, assess the conditions of the Unit, and determine whether or not emergency can be remedied. Once remedy is completed, operation of the Unit shall be restored according to normal startup procedures (which may be modified properly as needed). If it cannot be remedied, start coke discharge, then perform the shutdown according to normal shutdown procedure as possible.
当装置临时处于安全状态下时，对装置情况进行评估并确定突发事件能否补救。一旦完成补救，按照正常开工程序（根据需要可以适当修改）恢复装置运行。如果不能补救，开始卸焦，然后尽可能按正常停车程序停车。

2.6.4 Treatment method of accidents 事故处理方法

During routine production, both process of the Unit and self-preservation system of the Train must be put into operation and reliably operate. This is strong support of emergency treatment in accident conditions. After enabling individual self-preservations, timely go to site to perform site check, verify that action of self-preservation shall be correct and in place. If any action is incorrect or doesn’t operate, rapidly open or close the related valves. After self-preservation of feed is activated, immediately close all feed nozzle hand valves. When treating common accidents of Flexicoker, the following principles must be followed:
日常生产中，装置的工艺及机组自保系统必须投入且运行可靠，这是事故状态下紧急处理的有力保证。启用各自保后，要及时到现场检查，核实自保动作是否正确到位，若动作有误或没有动作，要迅速打开或关闭有关阀门。进料自保动作后，要立即关闭所有进料喷嘴手阀。灵活焦化装置处理常见事故时，必须掌握下列原则：

2.6.4.1 In any case, inventories of reactor and heater shall not be emptied each other to prevent air and oil vapor from mixing resulting in explosion. When it is difficult to stop it, close cold coke, hot coke and scouring coke single-action slide valves, shut off reaction feed, fill stripping steam to reaction, maintain fluidization. For heater, bed sealing treatment may be taken depending on the specific conditions.
在任何情况下，两器（反应器和加热器）藏量不得互相压空，以防空气和油气混合产生爆炸。难以制止时应关闭冷焦、热焦、冲刷焦三个单动滑阀，切断反应进料，反应通入汽提蒸汽，保持流化，加热器可视具体情况采取闷床处理。

2.6.4.2 When the main air flow is low and interrupted, the main air must be quickly used for self-protection, the one-way damping valve of the main air outlet should be closed, and steam should be introduced to prevent the coke powder from flowing back. When the main air is interrupted, pay close attention to the temperature drop of the bed. The temperature should not be lower than 350℃. Keep the temperature of the system. When the temperature is lower than 350℃, the unloading will stop if there is no possibility of starting work to prevent the bed from muddy.

主风低流量、中断时，必须迅速投用主风自保，关闭主风出口单向阻尼阀，并通入蒸汽以防止焦粉倒流。主风中断时，并密切注意床层的温度下降情况，其温度不得低于 350℃，保持系统温度，当温度低于 350℃，如无开工的可能则卸焦停工，防止床层泥化。

2.6.4.3 When there is feed to reaction, maintain reaction temperature shall not be less than 505℃ as possible; otherwise decrease the processed quantity until shutting off feed, to prevent reactor bed from being muddy.

在反应有进料时，要尽量维持反应温度不低于 505℃，否则降低处理量直到切断进料，以防反应器床层泥化。

2.6.4.4 When shutting off the feed, increase stripping steam flow, and ensure fluidization.

当切断进料时，应增大汽提蒸汽量，保证流化。

2.6.4.5 When there are coke fines in heater, reactor and gasifier, ensure scrubber circulation and Flexigas treatment system circulation, and prevent coke fines from increase resulting in tray clogging. When there are coke fines in heater, reactor and gasifier, individual purging points must be provided with nitrogen (or fuel gas) to prevent from clogging.

三器有焦粉时，必须保证洗涤塔循环和灵活气处理系统循环，防止焦粉上升堵塞塔盘。三器有焦粉时，各吹扫点必须要有氮气（或燃料气）防止堵塞。

2.6.4.6 After shutting off feed, if there is oil vapor in the fractionator, cold backflow must be injected to control overhead temperature less than 110°C in order to prevent reactor overpressure and fractionator impingement tower. Properly control liquid level in fractionator bottom, feedstock oil tank and naphtha tank to prevent from high high level resulting in building up the pressure of reaction; reject slurry oil to outside to prevent from high solid content in slurry oil resulting in sedimentation of catalyst, piping clogging.

切断进料后，在分馏塔内有油气的情况下，必须打冷回流控制塔顶温度小于 110℃，以防反应器超压和分馏塔冲塔；要控制好分馏塔底、原料油罐、石脑油罐液面，防止超高造成反应憋压；油浆外甩，防止油浆固体含量高造成催化剂沉积，堵塞管线。

2.6.4.7 If major accident of absorption-stabilization takes place, immediately shut off individual circuit feeds and heat source, rapidly vent to flare for pressure relief, withdraw oil, and strictly prevent extension of accident.

吸收稳定发生重大事故，必须立即切断各路进料和热源，并迅速放火炬撤压、退油，严防事故扩大。

2.6.4.8 Keep in touch with the Dispatch and the related departments. Any non-conforming product shall be timely sent to non-conforming product tank, preventing from quality accident of finished product. In any case, control that temperature of oil product from the Unit shall not be high high, preventing from extension of accident.
要与调度及有关单位保持联系，不合格产品要及时联系改送不合格罐，防止造成成品质量事故。任何情况下，控制油品出装置温度不超高，防止事故扩大。
2.6.4.9 Prevent steam drums from being dry. If dry steam drum take places, fill it with water is prohibited strictly. Shut off the heating source. Water may be filled after it has been cooled down. Report and dispatch, and observe the MP steam pipe network case.
防止各汽包干锅，若发生干锅，严禁进水，必须切出热源，待冷却后方可上水。汇报调度，注意中压蒸汽管网工况。
2.6.4.10 Timely understand contents in the alarm column displayed in DCS screen, make correct accident judgment, and confirm the alarm items.
及时了解 DCS 屏显示报警栏警报内容，作出正确事故判断，确认报警项。

2.6.5 Loss of feed 原料中断

2.6.5.1 Accident description 事故说明

(1) There are many causes resulting in loss of Flexicoker feedstock. These causes are mainly divided into four types: 1. equipment failure; 2. Interlock shutting off feed; 3. Loss of supply of utility auxiliary systems cause loss of feed; 4. Misoperation of operator. 5.There are some water in flushing oil or flushing oil is so light, P101 is Isolated.
灵活焦化装置原料中断的原因较多，主要分四大类：1.设备（进料泵 P101 振动大停泵、重要设备发生泄露等）故障；2.联锁切断进料；3.公用工程辅助系统供应中断，导致进料中断；4.操作工误操作；5. 机泵冲洗油太轻或带水，P101 抽空。
(2) Loss of Flexicoker feedstock will cause emergency shutdown of the Unit. This accident plan mainly addresses emergency treatment after loss of feedstock so that damage resulting from shutdown is minimized and production may be restored as easily as possible.
灵活焦化装置原料中断，将导致装置紧急停车，本事故预案主要针对原料中断后进行的应急处理，以便降低停车损失和尽早恢复生产。

2.6.5.2 Accident symptoms 事故现象

(1) The liquid level of D107 drops rapidly, the middle section of the fractionation tower, the extraction temperature of light wax and heavy wax rises, the feed flowmeter FT10101/FT10110 displays zero, and the feed pressure PI10101/PI10110 displays zero (upstream device feed interruption, FV10101/10110 adjustmeoont Valve failure)
D107 液位快速下降，分馏塔中段、轻蜡、重蜡抽出温度上涨，进料流量计 FT10101/FT10110 显示归零，进料压力 PI10101/PI10110 显示归零（上游装置供料中断, FV10101/10110 调节阀故障）

(2) The liquid level of C101 drops, the temperature of C101 rises, and the liquid level of D107 rises (P107 failure, FV10103 regulating valve failure closed, self-protection valve RBV10101 malfunction)
(2) C101 液位下降，C101 温度上升，D107 液位上涨（P107 故障，FV10103 调节阀故障关闭，自保阀 RBV10101 误动作）
(3) The reaction temperature rises, the reaction pressure drops, the reactor material level drops, the C101 temperature drops, and the C101 liquid level rises. (P101 fault, PV10501/XV10501 fault closed)
(3)反应温度上升，反应压力下降，反应器料位下降，C101 温度下降，C101 液位上涨。（P101 故障，PV10501/XV10501 故障关闭）
(4) Reaction feed is shut off. With increase of bed density, level in reactor will decrease. With transferring coke fines inventory to reactor, level in heater will also decrease.
(4)反应进料切除，随着床层密度增加反应器料位将会下降，随着焦粉藏量转移至反应器，加热器料位也会下降。
(5) The reactor will no longer requires heat load, thus heater temperature will increase rapidly.
(5)反应器不再需要热负荷，所以加热器温度会迅速上升。

2.6.5.3 Remedies 处理步骤
(1) Reaction gasification system 反应气化系统
[N] Informed the dispatch that the feed interruption of the flexible coking unit may result in the sewage discharge of ammonia nitrogen and sulfide significantly exceeding the standard; the production and heating value of flexible gas will be reduced; the delivery of wax oil, gasoline, wax oil, and dry gas will be interrupted. F102 deactivates the flexible gas burner, and the output of medium-pressure steam may drop significantly.
通知调度，灵活焦化装置进料中断，可能会导致污水排放氨氮、硫化物将大幅超标；灵活气产量及热值将会降低；外送产品蜡油、汽油、蜡油、干气将中断。F102 停用灵活气火嘴，中压蒸汽产量将可能大幅下降。
[B] Immediately confirm the specific reason for the material interruption. If the feed interruption is caused by the interruption of upstream feed, appropriately reduce the processing capacity of the device, immediately contact the relevant upstream unit to restore the feed quantity as soon as possible, and change the external rejection to the D107 inlet pipeline or stop the external rejection for a short time. If the liquid is low in D107/C101 The supply can be resumed in time when it is in place, and the device will gradually resume production
立即确认原料中断的具体原因。若进料中断原因是上游供料中断，适当降低装置处理量，立即联系相关上游单位，尽快恢复进料量，外甩改至 D107 入口管线或短时间停止外甩，若在 D107/C101 低液位时能及时恢复供料，装置逐步恢复生产
[N] If the upstream feed is not restored in a short time and the device processing capacity is reduced, the external spin is changed to the D107 inlet pipeline or the external spin is stopped

for a short time, and the liquid level of the raw material tank and washing tower cannot be maintained, then the feed is cut off. Set the reactor feed control valve PV-10501 to manual, then close PV-10501 to cut off the slag-reducing feed to the reactor. Close the feed loop circulation valve FV-10505 to prevent the scrubber oil from flowing back to the reaction feed nozzle. Manually shut down FV-11704 to cut off the reactor feed, and arrange for external operation to stop the sewage oil refining pump. After cutting off the feed nozzle at the reaction site, start P101 to establish the raw material circulation.

若上游短时间未恢复供料，且降低装置处理量，外甩改至 D107 入口管线或短时间停止外甩，仍无法维持原料罐和洗涤塔液位，则切断进料。将反应器进料控制阀 PV-10501 置于手动，然后关闭 PV-10501，切断去反应器的减渣进料。关闭进料环管循环阀 FV-10505，避免洗涤塔油倒流至反应进料喷嘴。手动关闭 FV-11704 切断反应器进料，并安排外操停污油回炼泵。反应外操现场切除进料喷嘴后，启动 P101 建立原料循环。

[N] Bypass PS111 (gasifier air volume low interlock), and the three instrument back-blowing fuel gas is changed to 0.6Mpa nitrogen.

旁路 PS111（气化器风量低联锁），三器仪表反吹燃料气改为 0.6Mpa 氮气。

[N] Maintain the circulation in the scrubber, reduce the main air of the gasifier, and close the heater quenching coke slide valve TV11003.

维持洗涤塔内循环，降低气化器主风，关闭加热器急冷焦滑阀 TV11003。

[N] Back focus line of sealed vaporizer

密封气化器返焦线

[N]Shut down the gasifier inlet coke slide valve HV11401, pass in appropriate steam to maintain fluidization, maintain a low circulation rate between the heater and the reactor, close the scour coke slide valve, and maintain the heater and reactor temperature above 450°C through temperature-regulating air.关小气化器进焦滑阀 HV11401，通入适当蒸汽维持流化，加热器与反应器维持低循环量，关闭冲刷焦滑阀，通过调温风维持加热器、反应器温度在 450℃以上。

[N]The steam output of E102/103 is very small. The raw material is heated by inverting steam from DS101 at F102. The top of D103 is vented slightly, PV12502A is closed, PV12502B is opened, and F102 steam hand valve is closed.

[N]E102/103 产汽量很小，通过 F102 处 DS101 倒引蒸汽进行加热原料，D103 顶部放空稍开，PV12502A 关闭，打开 PV12502B，关小进入 F102 蒸汽手阀

(2) Fractionation-stabilization system 分馏稳定系统

[N] If shutdown of gas compressor doesn’t shut off the feed, based on decrease of processing flow by the Reaction Post, adjust heat loads of individual fractionator sections, adjust extraction flows of individual products, maintain reflux of individual fractionator sections, maintain that P207, P206, P102 shall operate properly, ensure that scrubbing oil flow through fractionator and scrubber gratings shall be proper, and prevent the grating from clogging by coke fines.

维持 C101 塔内循环，降低或关闭 C101 顶冲洗油量，打开 HHKGO 事故蒸汽，防止喷嘴堵塞。（根据 C201 液位调整）通过外甩阀 HIC10301 控制 C101 液位，C101 控制 30%

[N] Pressure hold operation of absorption-stabilization. Maintain single column circulation of individual absorption-stabilization columns, stably control liquid level in the individual columns and reflux tanks. If liquid level cannot be controlled, the pump may be stopped.

分馏系统降低各路循环量，建立塔内循环，D210 改收罐区蜡油

[N] Determine causes resulting in shutdown of rich gas compressor, maintain that compressor shall be in hot backup conditions, and restart the compressor after normal nitrogen is restored.

分馏塔收蜡油，启用 HHKGO 冲洗油，维持 C101 外甩量 10-15 吨/小时，控制稳 C101 液位。吸收稳定系统保压保液位。停 C205 再吸收油。停 P225。停用 E220AB

[N] If shutting off feed or nitrogen to the Unit cannot be restored in short time, perform treatment according to emergency plan shutting off reaction feed.

视 C101 和 C201 温度情况，可将 E101/E210/E235 改倒加热模式，维持温度

(3) Flexigas treatment system 灵活气处理系统

[N] Gas compressor shutdown or shutting off feed the Unit will cause upset in Flexigas system. To prevent equipment from clogging by coke fines, immediately open COS reactor subline valve (PV30501), close COS reactor inlet and outlet valves, and shut off COS reactor. Meanwhile, close heating steam valve (FV30501) of COS preheater, and prevent sealing heating from overpressure.

C304 停止脱硫，停 P310/P309，改 C305 单塔循环流程，控制 C305 各项指标在正常范围内

[W] Maintain that rotating machinery of Flexigas treatment system, and water wash cooling units, amine desulphurization and regeneration units shall operate properly.

保持 C305 与 T302 循环，并通知硫磺酸性气会减少慢慢中断

[N] Control the pressure of reaction gasification system by sending Flexigas to outside. If impact of Flexigas on downstream is large, open Flexigas vent valve to flare, and Flexigas is directly vented to flare for incineration.

切除 R301，灵活气改走 R301 旁路

[W] Normal filling of individual chemicals to Flexigas system. If shutdown for a long time, filling amount of flocculant may be reduced appropriately.

D302/C302/C303/C301 维持循环，多余水量走原流程外送

E102/E103 底部开始注氨

(4) Main air blower, gas compressor systems 主风机、气压机系统

[N] Minimize air flow to gasifier, open main air blower outlet vent valve, and maintain normal operation conditions of main air blower.

气化器用风量降至最低，打开主风机出口放空阀，维持主风机正常运行状态。

[N] Minimize air consumption of gasifier, open vent valve at main air blower outlet, and maintain that main air blower shall be in normal operating conditions.
分馏系统视情况打开 FIC20401 补氮气/燃料气瓦斯充压，气压机全反飞动低转速运行
(5) Coke fines treatment system 焦粉处理系统
[W] If nitrogen pressure decreases (isn't interrupted), minimize nitrogen consumption.
通知反应外操改好通过 D401/BN402 向 R102 装焦流程，D401 充压 0.34Mpa，根据 R102/R103 料位情况，适当进行补焦操作。
[W] Wet coke fines treatment system may maintain normal operation. If shutting off the feed since nitrogen cannot be restored in long time, wet coke treatment load may be reduced appropriately; if production cannot be restored in long time, shut down dry coke discharge.
维持湿焦系统水循环
2.6.5.4 Attention 注意事项
(1) When the interlock is triggered, it is necessary to process normally during the delay period as much as possible to prevent the PS101B from continuing to trigger after the PS101A action cuts off the feed, which will cause difficulties in the later recovery of production
(1)在联锁触发时，需尽可能的在延时期间处理正常，防止在 PS101A 动作切断进料后，继续触发 PS101B，给后期恢复生产造成困难
(2) When the raw material system is changed to the heating process, the low-temperature steam should be prevented from entering the main fan-steam turbine, causing equipment failure
(2)原料系统改倒加热流程时，应防止低温蒸汽进入主风机-汽轮机，造成设备故障
(3) The desulfurization system should be removed in time to avoid non-hydrogen sulfide media polluting the solvent
(3)脱硫系统要及时切除，避免非硫化氢介质污染溶剂
(4) R301 should be removed in time to prevent coke powder from clogging the bed
(4)R301 应及时切除，防止焦粉堵塞床层
(5) The oil sealing system should be changed to collect the wax oil in the tank area to prevent the pump of the heavy oil machine from emptying
(5)封油系统应改收罐区蜡油，防止重油机泵抽空
(6) Control the pressure difference between the heater and the reactor to maintain fluidization of the two vessels
(6)控制好加热器与反应器压差，维持两器流化
(7) When the feed is interrupted, it is necessary to prevent the top of the scrubber from overheating and make adjustments in advance
(7)在进料中断时，要防止洗涤塔顶超温，提前做好调整
(8) If the feed is interrupted and cannot be recovered for a long time, change the back-blowing fuel gas of the three instruments to 0.6MPa nitrogen as soon as possible
(8)进料中断若长时间无法恢复，尽快将三器仪表反吹燃料气改成 0.6MPa 氮气

2.6.6 DCS blank screen or crash DCS 黑屏或死机

2.6.6.1 Accident description 事故说明

(1) DISTRIBUTED CONTROL SYSTEM (DCS) from Yokogawa (China 中国) Co., Ltd. shall be used for Flexicoker.

灵活焦化装置采用横河电机（中国）有限公司的 DISTRIBUTED CONTROL SYSTEM（DCS）集散控制系统。

(2) Crash or blank screen that takes place in the DCS system is generally resulted from two causes: One cause is control station (engieer station) failure, another one is signal transmission system failure. Signal transmission system is generally provided with two circuits of transmission systems, which are connected to different terminals respectively. In case of one circuit failed, another one may perform monitoring. If control station failed, system monitoring cannot be performed.

DCS 系统出现死机或黑屏一般有两个原因，一是控制站（工程师站）故障，另一个是信号传输系统故障。信号传输系统一般有两路传输系统，分别接入不同的终端，一路出现故障了另一路还可以进行监控；如果控制站出现故障，则无法进行系统监控。

(3) Unit control system of Flexicoker differs from DCS. When the DCS system failed, the Unit control system may also operate properly.

灵活焦化装置的机组的控制系统与 DCS 不同，当 DCS 系统出现故障时，机组的控制系统还可以正常运行。

(4) Interlocking self-preservation system of Flexicoker may still operate independently after blank screen or crash of the DCS.

灵活焦化装置的联锁自保系统在 DCS 出现死机和黑屏后仍然可以进行独立运行。

2.6.6.2 Accident symptoms 事故现象

(1) All control valves cannot be adjusted.

所有调节阀不能调节。

(2) DCS parameters cannot be updated, displayed.

所有 DCS 参数无法更新、显示。

(3) DCS operation is disabled, doesn’t accept input signal; or blank screen.

DCS 操作不动、不接受输入信号；或黑屏。

2.6.6.3 Remedies 处理步骤

[N] Finder shall immediately report to shift leader.

发现者立即向班长报告

[B] Immediately report to the Dispatch, manager on duty, and start the emergency plan.

立即向调度、值班干部汇报，同时启动应急预案

[B] Contact Electrical & Instrumentation section discipline personnel to perform emergency treatment.
联系仪电分部专业人员紧急处理
[B] Notify the members in section emergency team to perform related treatment.
通知分部应急小组成员，做相关处理
[B] Immediately arrange to check the monitor terminals of field operator room, engineer station, if available, and maintain normal production of the Unit.
立即安排查看外操室、工程师站的监控终端、如果能够正常使用，则维持装置的正常生产。
[B] If the monitor terminals of field operator room and engineer station are also in crash or blank screen condition, conditions of the Unit shall be judged based on the operating systems of upstream and downstream units and the Unit. In case of, upstream feed flow upset too much, main air blower outlet pressure, flow upset exceeding normal range; inlet and outlet temperature, pressure upsets of gas compressor exceeding normal range, pumping out or building up the pressure in rotating machinery at site, field operation cannot be performed by the field operator based on primary instruments, (the above symptoms mean the Unit is out of control), the Unit shall be immediately shut down.
如果外操室、工程师站的监控终端同样处于死机、黑屏状态，则通过上下游装置和机组操作系统对装置的状态进行判断，如果出现上游物料波动过大、主风机出口压力、流量波动超过正常范围；气压机进、出口温度、压力波动超过正常范围，现场出现机泵抽空或憋压现象，外操通过现场一次表无法进行现场操作等情况，（以上现象说明装置已经处于失控状态），装置立即停工

(1) Reaction gasification system 反应气化系统
[N] Immediately start self-preservation PS101A protecting reaction, self-preservation PS101B protecting gasifier and heater, self-preservation PS105 of liquid level in C101, self-preservation ES112 of low level in steam drum, self-preservation ES113 of low pressure steam overheater, self-preservation ES117 of MP steam overheater. The whole Unit shall be shut down.
立即启动保护反应自保 PS101A、保护气化器加热器自保 PS101B、C101 液位自保 PS105、汽包低液位自保 ES112、低压蒸汽过热炉自保 ES113、中压蒸汽过热炉自保 ES117。装置全线停工
[W] Immediately go to site to implement actions of individual self-preservations,
立即到现场落实各自保的动作情况，
[W] Immediately seal the coke return line
立即对返焦线进行密封
[W] Stop rotating machinery P101, P102, P103, P104, P107, P108 of reaction gasification system
停反应气化系统各机泵 P101、P102、P103、P104、P107、P108
[W] Field coke discharge work stops, and close coke discharge slide valve.
现场卸焦工作停止，关闭卸焦滑阀

[W] Designated personnel go to site to monitor liquid level in D103. If the level is too low, start P108 to makeup water, and then stop the pump.
专人现场监控 D103 液位，过低则启动 P108 补水后停泵
[N] Open at site the flare valve of Flexigas, and prevent heater, gasifier from overpressure.
现场打开灵活气之火炬阀门，防止加热器、气化器超压
[N] Open at site the gas compressor inlet valve to flare, and vent the pressure in reactor.
现场打开气压机入口放火炬阀门，反应器泄压。
[W] Monitor the levels in reactor, gasifier, heater with field primary instruments, and prevent from level emptying.
通过现场一次仪表监控反应器、气化器、加热器料位，防止料位压空
[W] Monitor the levels in scrubber with field primary instruments. If the level is too high, start P102 to send slurry oil to tank farm.
通过现场一次仪表洗涤塔料位，出现料如果料位过高则启动 P102 将油浆送至罐区

(2) Main air blower, gas compressor systems 主风机、气压机系统
[N] Gas compressor enters the power safety operation conditions after reaction starts self-preservation. Closely monitor steam temperature and pressure of steam turbine. If safe operation of main air blower cannot be ensured, immediately start the shutdown self-preservation of main air blower. Main air blower shall be shut down.
反应启动自保后气压机进入动力安全运行状态，密切监控汽轮机的蒸汽温度和压力，如果不能保证主风机的安全运行，则立即启动主风机停机自保，主风机停机处理
[N] Verify that gas compressor inlet vent valve to flare shall be opened, start the shutdown self-preservation of gas compressor. Gas compressor shall be shut down.
确认气压机入口放火炬阀门打开，则启动气压机停机自保，气压机停机处理
[W] Maintain that lube oil system of main air blower shall operate properly.
保持主风机润滑油系统运行正常
[W] Open ST101, ST201 inlet and outlet steam vent valves, vent and warm steam and standby system.
打开 ST101、ST201 进出口蒸汽放空阀，对蒸汽和备压系统进行排放暖管。

(3) Fractionation-stabilization system 分馏稳定系统
[N] Verify that self-preservation of feed is activated, that the whole fractionating system is shut down, and that individual circulations shall be shut down.
确认已经启动进料自保，分馏系统全线停工，停各路循环停。
[W] Shut down rotating machinery P201, P202, P203, P204, P205, P207, P218, P225, P227, P228 of fractionating system.
停分馏系统各机泵 P201、P202、P203、P204、P205、P207、P218、P225、P227、P228。

[W] Monitor level in E207. If the level is too high, decrease the level in E207 through blowdown line, and prevent water from entering steam system.
监控 E207 液位，液位超高通过排污线将 E207 液位降低，防止水进入蒸汽系统
[W] The whole stabilization system is shut down. Open at site gas hand valve to the Unit, absorption-stabilization is connected with system and in pressure hold conditions.
稳定系统全线停工，现场打开瓦斯至装置手阀，吸收稳定与系统联通保压状态
[W] Shut down the rotating machinery of stabilization system P209, P210, P211, P212, P213, P214, P215, P217, P226, P223.
停稳定系统各机泵 P209、P210、P211、P212、P213、P214、P215、 P217、P226、P223、
[W] Close at site rich absorption oil hand valve below C205, and prevent gas from entering fractionator.
现场关闭 C205 下富吸收油手阀，防止瓦斯窜入分馏塔
[W] Field liquefied gas hand valve from the Unit, prevent liquefied gas from entering the downstream units.
现场液化气出装置手阀，防止液化气窜入在下游装置
[W] Close at site steam hand valve of stabilizer bottom reboiler. Do not heat the stabilizer.
现场关闭稳定塔底重沸器蒸汽手阀，不在对稳定塔进行加热

(4) Flexigas treatment system 灵活气处理系统
[W] Immediately open at site Flexigas hand vent valve to flare, and depressurize Flexigas system.
立即现场打开灵活气至火炬手阀，灵活气系统降压
[W] Immediately shut off COS reactor, and pass through subline.
立即将羰基硫放应器切除走浮线
[W] Shut down water, slurry and solvent circulations of Flexigas system. The whole Unit shall be shut down. Shut down the following rotating machinery P301, P302, P303, P305, P306, P307, P308, P309, P310, P311, P312, P315, P322.
灵活气系统水循环、浆液循环、溶剂循环停运，装置全线停工，停以下机泵 P301、P302、P303、P305、P306、P307、P308、P309、P310、P311、P312、P315、P322
[W] Close steam hand valve of solvent regenerator bottom reboiler. Do not regenerate the solvent.
现场关闭溶剂再生塔底重沸器蒸汽手阀，不在对溶剂进行再生
[W] Close at site sour gas hand valve to complex, and open sour gas hand vent valve to flare,
现场关闭酸性气至联合会装置手阀，打开酸性气至火炬手阀，
[W] Close sour gas hand valve from the Unit, and prevent material from misdirected flow.
关闭酸性气出装置手阀，防止物料互窜

(5) Coke fines treatment system 焦粉处理系统

[W] Shut down dry and wet coke loading facilities. Shut down dry and wet coke coke discharge.
干湿焦装车设施停运，停止干湿焦卸焦。
[W] The whole Unit shall be shut down. Shut down the following rotating machinery P401, P402, P403, P404, P406, P407.
装置全线停工，停以下机泵 P401、P402、P403、P404、P406、P407。

2.6.7 Shutdwon of main air blower, loss of main air 主风机停机、主风中断

2.6.7.1 Accident description 事故说明

(1) Main air blower of Flexicoker shall be axial type, and driven by 3.9MPa steam turbine. Failure of main air blower or steam turbine will cause shutdown of main air blower.
灵活焦化装置主风机采用轴流式风机，使用 3.9MPa 蒸汽透平带动，主风机或蒸汽透平出现故障都会造成主风机停机。
(2) Setting of partial interlocking of the Unit will also bring main air to safe operation conditions, and shut off main air.
由于装置部分连锁的设置也会是主风进入安全运行的状态，是主风中断

2.6.7.2 Accident symptoms 事故现象

(1) Flow alarm, audible and visual alarm of main air occur at the same time
主风低流量报警，声光报警同时出现
(2) Flow indication of main air of heater, gasifier returns back to zero rapidly.
加热器、气化器主风流量显示迅即回零
(3) Pressure of heater, gasifier decreases greatly and suddenly.
加热器、气化器压力突然大幅下降
(4) Level in heater, gasifier decreases suddenly, and density indication increases.
加热器、气化器料位突然下降，密度显示增大
(5) Shutdown alarm or safe operation alarm of main air blower
主风机停机报警或安全运行报警

2.6.7.3 Remedies 处理步骤

Reaction gasification system 反应气化系统
[N] According to the accident plan of the main wind interruption, the accident handling, notification and scheduling, the safe operation of the flexible coke main fan, cut off the feed, and the sewage discharge will greatly exceed the ammonia nitrogen and sulfide; the flexible gas will be interrupted, and the delivery of liquid gas and dry gas will be interrupted; F102 deactivates the flexible gas burner and uses fuel gas instead.

[N]根据主风中断的事故预案进行事故处理，通知调度，灵活焦主风机安全运行，切断进料，污水排}放氨氮、硫化物将大幅超标；灵活气中断，液化气、干气外送中断；F102 停用灵活气火嘴，改用燃料气。

[B] Immediately verify the specific causes of loss of main air, the causes of shutdown of main air blower.

立即确认主风中断的具体原因，主风机的停机原因。

[N] Immediately check that the interlocking shall be enabled. If it isn't automatically started, immediately manually start self-preservation PS101A protecting reaction system, and manually start PS101B protecting gasifier and heater system self-preservation. To confirm the reaction, close the cold and hot coke slide valves, cut off the reactor and heater coke circulation, and close the quench coke slide valves.

[N]立即查看连锁是否启用，如果没有自动启动立即手动启动保护反应系统自保 PS101A，和手动启动保护气化器和加热器系统自保 PS101B,确认反应关闭冷、热焦滑阀，切断反应器、加热器焦炭循环，关闭急冷焦滑阀。

[W] Close tempering air field valve of heater, prevent heater from overtemperature; meanwhile, panel operator shall increase opening of heater steam valve (FV11301ABC), prevent heater from overtemperature, and maintain that level in heater shall be 30%-50%.

关闭加热器调温风现场阀门，防止加热器超温；同时主操开大加热器蒸汽阀门（FV11301ABC），防止加热器超温，同时保持加热器料位 30%-50%。

[N] Close main air valve to gasifier (FV11606, HV11603), increase opening of gasifier steam, and maintain that gasifier bed shall in fluidization conditions.

关闭主风进气化器阀门（FV11606、HV11603），同时开大气化器蒸汽，保持气化器床层处于流化状态。

[W] Immediately close at site P101 outlet valve, and close sealing oil valve of rotating machinery, (if there is leakage at rotating machinery, and close inlet valve of rotating machinery)

现场立即关闭 P101 出口阀门，关闭机泵封油阀门，（如果机泵有泄漏现象，同时关闭机泵入口阀）

[N] Immediately close reaction feed pressure control valve (PV10501), feed emergency shut-off valve (XV10501), feed return valve (FV10505), feed return shut-off valve (XV10401).

立即关闭反应进料压控阀（PV10501）、进料紧急切断阀（XV10501）、进料返回阀（FV10505）、进料返回切断阀（XV10401）

[W] Stop P103AB. Panel operator shall close slop oil recycling control valve (FV11704) and slop oil recycling emergency shut-off valve (XV11701) to stop slurry oil recycling.

停 P103AB，主操关闭污油回炼控制阀（FV11704）和污油回炼紧急切断阀（XV11701）停止油浆回炼

[W] Maintain that P102 circulation flow to C101 shall be normal. Open slurry oil for emergency sending to outside. Slurry oil temperature to outside shall be controlled between 70°C and 100°C, and level in C101 shall be controlled between 30% and 70%.
维持 P102 循环返 C101 流量正常，开启油浆紧急外送，外送油浆温度控制 70℃-100℃之间、控制 C101 液位在 30%-70%之间。
[N] Maintain that feedstock atomization steam flow shall be normal, and that reaction stripping steam flow shall be normal.
保持原料雾化蒸汽流量正常、反应汽提蒸汽流量正常。
[N] Stopping reactor feed will cause level in reactor decreases. Control the level in reactor between 30% and 50% with cold coke and hot coke valves.
由于反应器进料停止反应器料位会下降，通过冷焦阀和热焦阀控制反应器料位 30%-50%。
[N] Close scouring coke valve (HV10801), prevent coke fines from entering scrubber.
关闭冲刷焦阀门（HV10801），防止焦粉带入到洗涤塔。
[N] After notifying the external operator to seal back to the coke line, close all the feed nozzles.
通知外操密封返回焦管线后，再关闭所有进料喷嘴。
[N] Panel operator shall closely monitor heater dilute phase temperature TI10903 and TI10902, which shall not exceed 640°C. Dilute phase spray water valve (XV10902A) and dilute phase spraying water atomization steam valve (XV10901A) of heater may be opened to decrease dilute phase temperature of heater.
[N]主操密切监控加热器稀相温度 TI10903 和 TI10902 不得超过 640℃，可打开加热器稀相喷水阀（XV10902A）和加热器稀相喷水雾化蒸汽阀（XV10901A）来降低加热器稀相温度
[N] Close external circulation tank slide valve HV1101 of heater, and prevent coke fines from accumulating below distributor.
关闭加热器外循环罐滑阀 HV1101，防止焦粉在分布器下堆积
[N] Open stage I emergency cooling valve (FV11602) of gasifier overhead. If necessary, open stage II emergency cooling valve RBV11601 and FV11603 of gasifier overhead , control that gasifier overhead temperature TI11601 shall not exceed 690°C.
打开气化器顶部一级紧急降温阀（FV11602），必要时打开气化器顶部二级紧急降温阀 RBV11601 和 FV11603，控制气化器顶温度 TI11601 不超过 690℃
[N] Notify the outside operator to change the meter back blow to nitrogen, close the control valve PV12601 into the D110 tank
通知外操改仪表反吹改成氮气后，关闭进 D110 罐控制阀 PV12601
[N] Because heat decrease will cause decrease of steam generation, panel operator shall open blowdown valve (HV12303) of D103, and decrease opening of water control valve (FV12501) on the steam drum, control the level in D103 to 40-60%; control the level in DH101 to 40-60%.
由于热量降低发汽量减少，主操打开 D103 的排污阀（HV12303），同时关小汽包上水控制阀（FV12501），控制 D103 液位 40-60%；控制 DH101 液位 40-60%。

[N] Due to decrease of steam generation and direct exhaust of main air blower turbine, pressure of MP steam system decreases, MP steam consumption of refinery increases. Ensure the proper operation of steam turbine of gas compressor, and decrease the opening of direct steam exhaust of main air blower steam turbine so that steam of main air blower turbine is in piping warming condition.

由于产汽量减少和主风机透平的的直排，中压蒸汽系统压力降低，增大使用炼厂中压蒸汽用量，保障气压机的汽轮机正常运行，同小主风机蒸汽透平的蒸汽直排，是主风机透平蒸汽处于暖管状态。

[N] Due to decrease of Flexigas, F102 steam temperature decreases. By adjusting fuel gas consumption, control MP overheating steam temperature between 400°C and 440°C.

由于灵活气量减少，F102 蒸汽温度下降，通过调节燃料汽使用量，控制中压过热蒸汽温度 400℃-440℃

[B] Open accident emergency air piping of non-purified air and main air piping, fill a little of non-purified air to heater and gasifier to maintain temperature of gasifier and heater, and maintain fluidization conditions.

打开非净化风与主风管线的事故应急风管线，加热器和汽化器少量通入非净化风保持气化器、加热器温度并保持流化状态。

(2) Fractionation-stabilization system 分馏稳定系统

[N] Verify that the Reaction post has shut off the feed, immediately open slurry oil to outside, and control temperature of slurry oil to outside to 70°C-100°C.

确认反应岗位已经切断进料、立即开启油浆外送，并控制油浆外送温度 70℃-100℃之间

[N] Decrease residue flow to the Unit and residue flow to scrubber, and maintain the levels in fractionator and scrubber between 30% and 70%.

降低渣油进装置流量和进洗涤塔流量，维持分馏塔、洗涤塔液位 30-70%之间

[N] Maintain that P207, P206, P102 shall operate properly. Ensure that scrubbing oil flow through fractionator and scrubber grating shall be normal, and prevent grating from clogging by coke fines.

保持 P207、P206、P102 运行正常，保证分馏塔、洗涤塔格栅的洗涤油量正常，防止焦粉堵塞格栅。

[W] Decrease individual side flows of fractionation. In case of pumping out of rotating machinery at side, immediately stop the pump.

降低分馏各侧线流量，侧线机泵抽空立即停泵

[W] Maintain normal operation of P218. Ensure use of flushing oil of individual systems. Contact the Dispatch to collect wax oil to D210 from tank farm, and ensure that level in D210 shall be 30%-70%.

维持 P218 的正常运行，保障各系统冲洗油的使用，联系调度从罐区收蜡油进 D210，保证 D210 液位 30%-70%。

[W] After shutdown of lean absorption oil pump P225, immediately close rich absorption oil control valve (LV22901) below C205, and arrange the field operator to close field hand valve, and prevent gas from entering fractionator after level in C205 is empy.
贫吸收油泵 P225 停运后，要立即关闭 C205 下的富吸收油控制阀（LV22901），同时安排外操关闭现场手阀，防止 C205 液位压空后，瓦斯窜入分馏塔。
[N] Decrease naphtha flow to absorption-stabilization. If necessary, sending to outside may be stopped. Ensure that level in D201 shall be 30%-60%. Ensure normal operation of P201. Ensure that reflux of fractionator overhead shall be normal. Control the temperature of fractionator overhead to 105°C-115°C.
降低石脑油至吸收稳定流量，必要时可以停止外送，保证 D201 液位 30%-60%之间，保证 P201 运行正常，保证分馏塔顶回流正常，控制分馏塔顶温度 105℃-115℃。
[N] Emergency shutdown. Normal operation of gas compressor must be maintained in short time. By increasing opening of Stage I, II, III anti-surge valves of gas compressor, If necessary, by opening the fuel gas makeup valve (FV21401) at gas compressor inlet to make up gas compressor inlet flow, by increasing opening of stabilization gas valve to outside, decrease the pressure of stabilization system to ensure that gas compressor shall operate outside the surge zone.
紧急停工，短时间必须维持气压机正常运行，通过开大气压机一、二、三级返飞动阀门，必要时打开气压机入口补充燃料气阀（FV21401）补充气压机入口流量，开大稳定瓦斯外送阀、降低稳定系统压力来保障气压机在喘震区外运行。
[N] Decrease stabilization naphtha flow from the Unit. If necessary, the flow from the Unit may be stopped. Increasing opening of makeup absorption control valve (FV22501) to increase makeup absorbent flow. For stabilization system, maintain two-column circulation of naphtha, and the level shall maintain 30%-70%.
降低稳定石脑油出装置量，必要时可停止出装置，开大补充吸收控制阀（FV22501）提高补充吸收剂流量，稳定系统保持石脑油两塔循环，液位维持 30%-70%之间。
[N] Due to loss of intermediate section circulation of fractionation, decrease of C204 bottom and inadequate analysis, pressure C205 is too high. Open non-condensable gas control valve (HV23501) to decrease the pressure. If pressure cannot be decreased, open non-condensable gas vent valve to flare (HV23502) to decrease the pressure. Maintain that C205 pressure shall be 1.1MPa-1.3Mpa.
由于分馏中段循环中断，C204 底部降低，解析不足，会造成 C205 压力超高，打开不凝气控制阀（HV23501）降压，如果压力无法下降可打开不凝气去火炬阀门（HV23502）降压，维持 C205 压力 1.1MPa-1.3MPa
[N] Decrease liquefied gas flow to outside. Maintain that level in D208 shall be 30%-70%.
降低液化气外送量，保持 D208 液位 30%-70%
[N] Ensure that level and interface in D202, D203, D204 shall be normally 30%-70%. Level in D204 cannot ensure that pump P213 may be stopped.

保证 D202、D203、D204 液位、界位正常 30%-70%，D204 液位入无法保证可以停泵 P213。

(3) Flexigas treatment system 灵活气处理系统

[W] Emergency shutdown of main air stopping unit will cause upset in Flexigas system. To prevent equipment from clogging by coke fines, immediately open COS reactor subline valve (PV30501), close COS reactor inlet and outlet valves, and shut off COS reactor. Meanwhile, close heating steam valve (FV30501) of COS preheater, and prevent sealing heating from overpressure.

主风停运装置紧急停工造成灵活气系统波动，为防止焦粉堵塞设备，立即打将羰基硫反应器副线阀（PV30501）打开，将羰基硫反应器进出口阀关闭、切除羰基硫反应器；同时关闭羰基硫预热器的加热蒸汽阀（FV30501），防止密闭加热。

[N] Maintain that rotating machinery of Flexigas treatment system, and water wash cooling units, amine desulphurization and regeneration units shall operate properly.

保持灵活气处理系统各机泵正常运行，水洗冷却单元、胺液脱硫再生单元正常运行。

[N] Control the pressure of reaction gasification system by sending Flexigas to outside. If impact of Flexigas on downstream is large, open Flexigas vent valve to flare, and Flexigas is directly vented to flare for incineration.

通过灵活气外送控制反应气化系统压力，若灵活气对下游单元冲击过大，则打开灵活气至火炬阀门，灵活气直接放火炬焚烧。

[W] Normal filling of individual chemicals to Flexigas system. If shutdown for a long time, filling amount of flocculant may be reduced appropriately.

灵活气系统各化材正常加注，若长时间停车，则可适当减少絮凝剂加注量

(4) Main air blower, gas compressor systems 主风机、气压机系统

[N] Immediately check and determine causes of shutdown of main air blower.

立即检查确定主风机停运原因

[W] Verify the action of self-preservation of main air blower, and verify that valve action of related self-preservation shall in correct position.

确认主风机自保动作，相关自保阀门动作到位。

[W] Check that steam valves of steam turbine shall be fully closed. Open backpressure steam system to vent to atmosphere. Maintain that backpressure system shall be in piping warming conditions.

检查汽轮机蒸汽阀全关，打开背压蒸汽系统放空，保持背压系统暖管状态

[W] Decrease the opening of direct steam exhaust of main air blower steam turbine so that 3.9MPa steam of main air blower turbine is in piping warming condition.

关小主风机蒸汽透平的蒸汽直排，使主风机透平 3.9MPa 蒸汽处于暖管状态

[W] Maintain that lube oil system of main air blower shall operate properly.

保持主风机润滑油系统运行正常

[N] Gas compressor shall open Stage I, II, III anti-surge valves, and maintain normal operation of gas compressor. If necessary, open the fuel gas makeup valve (FV21401) at gas compressor inlet to make up gas compressor inlet flow, increase opening of stabilization gas valve to outside.
气压机打开一二三级反飞动阀，保持气压机正常运行，必要时打开气压机入口补充燃料气阀（FV21401）补充气压机入口流量，开大稳定瓦斯外送阀、
[B] Main air blower has been shut down for a long time. Feed cannot be restored. Gas compressor is shut down. The whole Unit is shut down.
主风机长时间停机，无法恢复进料，气压机停机，装置全线停工。

(5) Coke fines treatment system 焦粉处理系统
[W] Wet coke fines treatment system may maintain normal operation. If feeding, production cannot be restored in long time, wet coke treatment load may be reduced appropriately; if production cannot be restored in long time, shut down dry coke discharge.
湿焦粉处理系通过可维持正常运行，若长时间无法恢复进料、恢复生产，则可以适当减湿焦处理负荷；若长时间无法恢复生产，则停车干焦卸焦。

2.6.8 Shutdown of gas compressor 气压机停机

2.6.8.1 Accident description 事故说明
(1) Main air blower of Flexicoker shall be driven by 3.9MPa steam turbine. Failure of gas compressor or steam turbine will cause shutdown of gas compressor.
灵活焦化装置气压机使用 3.9MPa 蒸汽透平带动，气压机或蒸汽透平出现故障都会造成气压机停机。
(2) Emergency shutdown of gas compressor takes place. The Unit may maintain production by venting rich gas to flare.
气压机出现紧急停机，装置可通过富气放火炬维持生产。
(3) This accident plan mainly addresses emergency treatment after shutdown of gas compressor resulting from failure.
本事故预案主要针对气压机故障停机后进行的应急处理。

2.6.8.2 Accident symptoms 事故现象
(1) Audible and visual alarm of gas compressor shutdown occurs at the Unit.
装置出现气压机停的声光报警
(2) Pressure PI20201 of fractionator and pressure indication PIC10501 of reactor feed increase greatly.
分馏塔压力 PI20201 和反应器进料压力指示 PIC10501 大幅上升
2.6.8.3 Remedies 处理步骤

(1) Reaction gasification system 反应气化系统

[N] Immediately open gas compressor inlet vent valve PV20402 to flare. Control reaction pressure to normal pressure.

立即打开气压机入口放火炬阀门 PV20402，控制反应压力至正常压力。

[B] By adjusting Flexigas control valve to outside, adjust pressure of heater and gasifier, and maintain that coke fines fluidization of heater, reactor and gasifier shall be normal.

通过调节灵活气外送控制阀，调节加热器、气化器压力，保持三器焦粉流化正常。

[W] Since gas compressor turbine is shut down, 3.9MPa steam upsets. Control pressure balance for 3.9MPa steam by F102 fuel gas and 3.9MPa steam flow to the Unit.

由于气压机透平停机，3.9MPa 蒸汽出现波动，通过 F102 燃料气和进装置 3.9MPa 蒸汽流量控制 3.9MPa 蒸汽用压力平衡

[B] Since gas compressor turbine is shut down, 0.5MPa steam system is inadequate. Increase 0.5MPa steam flow to the Unit after contacting the Dispatch.

由于气压机透平停机，0.5MPa 蒸汽系统不足，联系调度后增大 0.5MPa 蒸汽进装置量。

[B] Based on startup time of gas compressor, adjust processing flow of the Unit, appropriately decrease processing flow of the Unit, and avoid too large damage.

根据气压机的开机时间对装置处理量进行调节，适当降低装置处理量，防止损失过大。

[W]In the external operation of the reaction, open the hand valve of the nitrogen into the D110 tank as the instrument backflushing medium

[W]反应外操打开氮气进 D110 罐手阀作仪表反吹介质

(2) Fractionation-stabilization system 分馏稳定系统

[N] Maintain stable operation of individual systems of fractionation. Maintain normal operation of individual rotating machinery. Based on adjustment of processing flow of reaction, adjust reflux of individual sections of fractionator.

保持分馏各系统运行平稳，保持各机泵运行正常，根据反应处理量的调整情况调节分馏塔各段回流

[W] Directly send sour water in D201 to D209. Naphtha in D201 is changed to be directly sent to tank farm through nonconforming product line.

D201 含硫污水直接送至 D209 内，D201 内石脑油改走不合格线直接去罐区

[W] Close the third-stage outlet hand valve of the air pressure machine by external operation of fractionation, and check whether the EBV valve at the entrance and exit of each section of the air pressure machine is completely closed

[W]分馏外操关闭气压机三级出口手阀，并检查气压机各段出入口 EBV 阀是否完全关闭

[N] Close dry gas valve from the Unit, and hold the pressure of stabilization system.

关闭干气出装置阀门，稳定系统保压

[W] Open the medium-pressure nitrogen hand valve to add pressure to the absorption tower. If the C205 tower cannot maintain the low pressure and the liquid level due to insufficient pressure compensation, close FIC22901 and LV22901

[W]开中压氮气手阀给吸解塔补压，若 C205 塔因补压不及时压力低液位无法维持时，关闭 FIC22901 和 LV22901

稳定塔底蒸汽通过关闭 PV23401 缓慢将蒸汽撤掉，关闭液化气外送阀 FV23601，D208 液位无法维持时，停液化气泵 P215

[N] Open the fuel gas valve to D202 to confirm that P209 can maintain the oil delivery to C204

分馏外操开 D202 瓦斯补压线，确认 P209 可以维持往 C204 送油

[W]Stop P210, P211, P212 and P213 when the liquid level of the tank D203 and D204 cannot be maintained

[W]气压机级间罐 D203 和 D204 液位无法维持时，停 P210、P211、P212 和 P213

(3) Flexigas treatment system 灵活气处理系统

[W]If the air compressor cannot be repaired for a long time and the gasifier does not produce flexible gas, then C304 will stop desulfurization, change the C305 single-tower cycle process, and stop P310/P309

[W]若长时间气压机无法修复，气化器不产灵活气，则 C304 停止脱硫，改 C305 单塔循环流程，停 P310/P309

[W]Removal of R301, flexible gas to bypass R301; close the carbonyl sulfide reactor inlet valve to 5-10% to ensure that the carbonyl sulfide reactor is in hot standby; the temperature is 130-140℃, and the heating of the small base sulfur preheater is turned off Steam valve (FV30501) to prevent airtight heating from overpressure

[W]切除 R301，灵活气改走 R301 旁路；将羰基硫反应器进入口阀关至 5-10%、保证羰基硫反应器处于热备状态；温度 130-140℃，同时关小基硫预热器的加热蒸汽阀（FV30501），防止密闭加热超压

(4) Main air blower, gas compressor systems 主风机、气压机系统

[W] Maintain normal operation of main air blower. Based on air consumption of anti-gasification system, adjust discharge air outlet flow.

保持主风机运行正常，根据反气化系统的使用风量来调节出风出口流量。

[W] Immediately check and verify causes resulting in shutdown of gas compressor, and check actions of emergency shut-off valve of gas compressor. If it isn't closed, immediately close front hand valve, check outlet and inlet valves of individual stages of gas pressure. If it isn't closed, immediately manually close it,

立即检查确认气压机停机原因，并检查气压机紧急切断阀的动作情况，如果未关闭则立即关前手阀，检查气压各级出入口阀门，如未关闭，则立即手动关闭，

[W] Check and close backpressure valve. 3.9MPa steam system shall be vented and subject to piping warming. Backpressure piping shall be vented and subject to piping warming piping warming.
检查并关毕背压阀，3.9MPa 蒸汽系统排空暖管、背压管线打排空暖管
[W] Check lube oil system of gas compressor, and maintain normal operation of lube oil system of gas compressor.
检查气压机润滑油系统，保持气压机润滑油系统运行正常
[W] Open drain valves and other steam drains of steam turbine, gas compressor body.
打开汽轮机、气压机机体排凝阀及其他蒸汽排凝
[W] Check at site causes resulting in shutdown
[W]现场查找停机原因

(5) Coke fines treatment system 焦粉处理系统
[W] Coke loading is stopped temporarily.
装焦工作暂停

2.6.9 Hot coke transfer line break off 热焦线中断

2.6.9.1 Accident description 事故说明
The hot coke slide valve is faulty, stuck, or closed
热焦滑阀故障、卡涩、关小
Hot coke lifting steam or aeration steam clogging, hot coke cutting is not smooth
热焦提升蒸汽或松动蒸汽堵塞，热焦下料不畅
2.6.9.2 Accident symptoms 事故现象
The reaction temperature of TIC-10510 drops rapidly.
反应温度 TIC-10510 快速下降
The heater level LI-10903/LI10904 increases, and the reactor level LIC-10502 decreases.
加热器料位 LI-10903/LI10904 上涨，反应器料位 LIC-10502 下降
Reduced pressure drop of hot coke line and hot coke slide valve.
热焦线及热焦滑阀压降降低
2.6.9.3 Remedies 处理步骤
(1) Reaction gasification system 反应气化系统
[B] Notification dispatch, the flexible coking cold coke line is interrupted, and the feed needs to be reduced or cut; the sewage discharge ammonia nitrogen and sulfide will greatly exceed the standard; the flexible gas drop fluctuates, the user can be notified to remove the flexible gas in advance; the delivery of liquefied gas and dry gas will be reduced or Interrupted; F102 deactivates the flexible gas burner and uses fuel gas instead

[B]通知调度，灵活焦化冷焦线中断，需降低或切进料；污水排放氨氮、硫化物将大幅超标；灵活气降波动，可通知用户提前切除灵活气；液化气、干气外送将降低或中断；F102 停用灵活气火嘴，改用燃料气

[N] Instruct the outside operator to cut off the feed nozzles. When the reaction temperature drops to 520℃, cut off 3 nozzles. If the reactor drops to 515℃, continue to cut off 3 nozzles; when the reaction temperature drops to 512℃, close the P101 outlet control valve and trigger the pump Low outlet flow and low interlock to stop the pump, cut off all feed

[N]通知外操切除进料喷嘴，反应温度降低至 520℃时，切除 3 个喷嘴，若反应器降低至 515℃继续切除 3 个喷嘴；当反应温度降低至 512℃，关闭 P101 出口控制阀，触发泵出口流量低低联锁停泵，切除所有进料

[N]Close the cold coke slide valve

[N]关闭冷焦滑阀

[N]If the nozzle is not cut in time, the reaction temperature will decrease and the interlock will be triggered: PS103 interlock, and then PS101A will be triggered: the feed valve PV10501 closes, the raw material circulation valve FV10505 closes, the sludge refining valve FV11704 closes, and the washing tower emergency external HV10301 opens .

[N]若切喷嘴不及时，反应温度降低将触联锁：PS103 联锁，紧接着触发 PS101A：进料阀 PV10501 关闭，原料循环阀 FV10505 关闭，污泥回炼阀 FV11704 关闭，洗涤塔紧急外甩 HV10301 打开。

[W]Examine the cause of the thermal focus interruption,and resume its operation within 15 minutes as possible.

[W]外操检查热焦中断原因，尽可能在 15 分钟内恢复其运行。

[W]After closing all the hand valves of the feed nozzle at the reactor station, start P101 to establish the raw material circulation

[W]反应器岗位关闭进料喷嘴所有手阀后，启动 P101 建立原料循环

[N]Reduce the amount of residual oil entering the device, maintain the raw material circulation, and balance the D107 and C101 liquid levels through the external flap valve HIC10301. D107 controls 60%-70%, and C101 controls 45%-50%.

[N]降低渣油进装置量，维持原料循环，通过外甩阀 HIC10301 平衡 D107、C101 液位。D107 控制 60%-70%，C101 控制 45%-50%。

[N]Simultaneously reduce the steam volume and main air volume of the gasifier to reduce coke consumption

[N]同时降低气化器蒸汽量和主风量，减少焦炭消耗

[N]Try to maintain the line speed of the quench section not less than 15 m/s

[N]尽可能维持急冷段线速不低于 15 米/s

[N]Adjust the opening of the quench coke slide valve to maintain the pressure difference between the heater and vaporizer 35-40KPa

[N]调整急冷焦滑阀开度，维持加热器、气化器两器压差 35-40KPa

[N]If the line speed is lower than 14m/S due to the decrease in air volume, close the quench coke slide valve and the heater grille temperature is controlled by the vaporizer top spray water
[N]若因风量降低，线速低于 14 米/S，则关闭急冷焦滑阀，加热器格栅温度由气化器顶喷水控制
[N]If the hot coke returns to normal operation within 15 minutes
[N]若热焦在 15 分钟内恢复正常运行
[N]Open the hot coke slide valve to raise the reaction temperature to 530℃, and open the cold coke slide valve to maintain the reactor and heater material level
[N]打开热焦滑阀，将反应温度提至 530℃，同时打开冷焦滑阀，维持反应器、加热器料位
[N]According to the reaction temperature, the feed nozzle is gradually used (starting from the 8th layer), the feed is gradually restored, and the fractionation and stabilization system gradually restores the product delivery of each section
[N]根据反应温度逐步投用进料喷嘴（从 8 层开始投用），逐渐恢复进料，分馏、稳定系统逐渐恢复各段产品外送
[N]If the hot coke fails to resume normal operation within 15 minutes, PS101B will be triggered after 15 minutes
[N]若热焦在 15 分钟内无法恢复正常运行，15 分钟后触发 PS101B
[N]PS101B trigger action: the main fan outlet anti-surge valve FV11802/FV11803 is opened; the vaporizer process steam FV11605 is opened; the quench coke tank unloading slide valve PV11201A/B is closed; the scour coke slide valve HV10801 is closed; the quench coke slide valve TV11003 is closed ; Close D401 to BN401 unloading slide valve PV40401/PV40402. The device enters the hot standby state.
[N]PS101B 触发动作：主风机出口防喘振阀 FV11802/FV11803 打开；气化器工艺蒸汽 FV11605 开大；关闭急冷焦罐卸焦滑阀 PV11201A/B；关闭冲刷焦滑阀 HV10801；关闭急冷焦滑阀 TV11003；关闭 D401 至 BN401 卸焦滑阀 PV40401/PV40402。装置进入热备状态。
[N]The main air of the gasifier is interrupted, the gasification is stopped, and the process steam is used to maintain the minimum fluidization of the gasifier, and the steam volume is 20t/h.
[N]气化器主风中断，停止气化，用工艺蒸汽维持气化器最低流化，蒸汽量 20t/h。
[N]Seal the gasifier return line, close the gasifier feed coke slide valve HV11401
[N]密封气化器返焦线，关闭气化器进料焦滑阀 HV11401
[W]Use back-focus sealed nitrogen on both sides
[W]投用返焦两侧密封氮气
[N]Heater temperature adjustment air volume adjustment, maintain the heater temperature about 600 ℃, at this time the heater temperature adjustment air volume is about 60000-80000Nm3/h
[N]加热器调温风量调整，维持加热器温度 600℃左右，此时加热器调温风量约 60000-80000Nm3/h
[W]D301 balance line changed to start-up process
[W]D301 平衡线改走开工流程

[W]Inject liquid ammonia into E102/103 elbow
[W]E102/103 弯头处注入液氨
[N]Control the F102 temperature to control 400℃ by fuel gas. If the temperature fluctuates greatly and it is difficult to control, it can be vented to avoid affecting the operation of the main fan.
[N]F102 用瓦斯控制温度控制 400℃,若温度波动大，不好控制，可改放空，避免影响主风机运行
[N]Flexible gas use flare to control the differential pressure of the two devices 100-110KPa
[N]灵活气用放火炬控制两器差压 100-110KPa
[N]The reactor uses stripping steam to maintain the lowest fluidization state, and the reactor material level is observed to be about 160-170Kpa of PDI10503
[N]反应器用汽提蒸汽维持最低流化状态，反应器料位观察 PDI10503 160-170Kpa 左右
[N]Use HHKGO flushing oil 15t/h, with a ratio of 1/3 to residual oil, maintain C101 external dumping volume, and control and stabilize D107 and C101 liquid levels;
[N]启用 HHKGO 冲洗油 15t/h，与渣油配比 1/3，维持 C101 外甩量，控制稳 D107、C101 液位；
[N]Depending on the temperature of C101 and C201, E101/E210/E235 can be changed to heating mode to maintain the temperature
[N]视 C101 和 C201 温度情况，可将 E101/E210/E235 改倒加热模式，维持温度

(2) Fractionation-stabilization system 分馏稳定系统
[N]The fractionation system stops the delivery of light and heavy wax oil, diesel oil, naphtha, liquefied petroleum gas, and dry gas, and absorbs and stabilizes the pressure maintenance operation of the system
[N]分馏系统停轻重蜡油、柴油、石脑油、液化气、干气外送，吸收稳定系统保压操作
[B]Depending on the liquid level of the fractionation tower, contact the dispatcher to collect wax oil; D210 is changed to collect wax oil in the tank area
[B]视分馏塔液位情况，联系调度收蜡油；D210 改收罐区蜡油
[N]HHKGO accident steam used in the top of the scrubber
[N]洗涤塔顶投用 HHKGO 事故蒸汽
[W]If it cannot be recovered, the fractionation tower will collect wax oil and D210 will collect wax oil.
[W]若无法恢复，分馏塔收蜡油，D210 收蜡油
[N]Before there is enough liquid level at the bottom of the fractionation tower, the flushing oil at the top of the washing tower can be replaced by steam
[N]在分馏塔底有足够液位之前，洗涤塔顶冲洗油可用蒸汽代替
[N]Absorption stabilization system maintains pressure and liquid level, stops C205 and then absorbs oil, stops P225
[N]吸收稳定系统保压保液位，停 C205 再吸收油，停 P225

[N]Open FIC20401 to make up the fuel gas, K201 anti-flying slowly and fully open to ensure the normal operation of the compressor, if necessary, you can open the fuel gas to make up the K201 inlet regulating valve to control the pressure; and maintain the tank level between all levels, and stop the pump if necessary

[N]打开 FIC20401 补燃料气，K201 反飞动缓慢全开保证压缩机运行正常，必要时可以打开燃料气补 K201 入口调节阀控制压力；并且维持好各级间罐液位，必要时停泵

[N]Adjust the heat load of each section of the fractionation tower, adjust the output of each product, maintain the reflux of each section of the fractionation tower, and keep each pump running normally

[N]调整分馏塔各段取热负荷，调整各产品抽出量，维持分馏塔各段回流，保持各个机泵运行正常

[W]Introduce light wax oil to D210 and C203 as needed to ensure normal fractionation cycle

[W]根据需要引进轻蜡油至 D210,C203 保证分馏循环正常

[N]Absorb stable heat preservation, maintain pressure, and maintain liquid level operations. If necessary, carry out large-scale naphtha circulation. C205 controls the liquid level to prevent the liquid level from empty and back to the fractionation

[N]吸收稳定保温，保压，保液位操作，必要时进行石脑油大循环，C205 控制好液位，防止液位空，倒窜至分馏

[W]After cutting the feed, if there is no liquefied gas, stop the P215 pump as needed

[W]切进料后，没有液化气根据需要停 P215 泵

(3) Flexigas treatment system 灵活气处理系统

[N]C304 stops desulfurization, changes the C305 single tower cycle process, stops P310/P309

[N]C304 停止脱硫，改 C305 单塔循环流程，停 P310/P309

[W]Removal of R301, flexible gas to bypass R301; close the carbonyl sulfide reactor inlet valve to 5-10% to ensure that the carbonyl sulfide reactor

[W]切除 R301，灵活气改走 R301 旁路；将羰基硫反应器进入口阀关至 5-10%、保证羰基硫反应器处

[N]In the hot standby state; the temperature is 130-140℃, and the heating steam valve (FV30501) of the basic sulfur preheater is closed at the same time to prevent the closed heating from overpressure

[N]于热备状态；温度 130-140℃，同时关小基硫预热器的加热蒸汽阀（FV30501），防止密闭加热超压

[N]Keep the cycle of C305 and T302, and notify that sulfuric acid gas will reduce and slowly interrupt

[N]保持 C305 与 T302 循环，并通知硫磺酸性气会减少慢慢中断

[N]D302/C302/C303/C301 maintain the circulation, and the excess water will be sent outside through the original process

[N]D302/C302/C303/C301 维持循环，多余水量走原流程外送

[W]Flexible gas system D302, P301, C301 increase injection reduction everywhere to ensure around PH8
[W]灵活气系统 D302,P301,C301 各处加大注减保证 PH8 左右

(4) Coke fines treatment system 焦粉处理系统
[N]Notify the reaction external operation to improve the process of loading coke to R102 through D401/BN402; according to the material level of R102/R103, properly carry out the coke supplement operation
[N]通知反应外操改好通过 D401/BN402 向 R102 装焦流程；根据 R102/R103 料位情况，适当进行补焦操作
At this time, the entire device is processing the hot standby state. If the hot coke cannot be recovered due to extreme reasons, and the D401 reserve is excessively consumed due to the maintenance system temperature (the remaining 700t), reduce the temperature adjustment air and prepare the auxiliary combustion chamber to heat up The temperature of the device is controlled at 230℃, the burning of coke is stopped, the device is restored to the minimum fluidization of steam, the temperature is maintained, and the other systems are maintained in circulation, waiting for the recovery of the hot coke line treatment, and resume production according to the start plan again
此时，整个装置处理热备状态，若热焦因极端原因始终无法恢复，而 D401 藏量由于维持系统温度消耗过度（剩余 700t 左右），则降低调温风，准备点辅助燃烧室，使加热器温度控制在 230℃，停止燃烧消耗焦炭，使装置恢复到蒸汽最低流化，维持温度状态，其他系统维持循环，等待热焦线处理恢复，再次按开工方案恢复生产

2.6.9.4 Attention 注意事项
It is strictly forbidden to remove the device interlock. Interlock is a protective measure to make the device retreat to the hot standby state. If the device fluctuates, it may cause other more serious and irreversible secondary accidents. The device cannot be "saved" by cutting the interlock
严禁切除装置联锁，联锁是使装置退守至热备状态的保护措施，在装置波动情况下随意切除联锁，可能导致其他更严重的、不可逆次生事故。不能通过切联锁来“救”装置
When it is found that the hot coke line circulation is interrupted, the feed should be cut off in time to prevent the coke powder and mud caused by the reaction temperature is too low. After using the interlock to cut off the feed, it is also necessary to arrange an external operator to close the hand valve of the feed nozzle (close the double valve) at the site, and also need to bypass PS101B to prevent the main air from venting and the main air of the vaporizer and heater is interrupted

在发现热焦线循环中断时，应及时切除进料，防止反应温度过低造成焦粉和泥。在使用联锁切断进料后，也需安排外操到现场关闭进料喷嘴手阀（关双阀），同时需旁路 PS101B，防止主风放空，气化器、加热器主风中断

When the raw material system is changed to the heating process, it is necessary to prevent low-temperature steam from entering the main fan-steam turbine, causing equipment failure

原料系统改倒加热流程时，应防止低温蒸汽进入主风机-汽轮机，造成设备故障

The desulfurization system should be removed in time to avoid non-hydrogen sulfide media polluting the solvent

脱硫系统要及时切除，避免非硫化氢介质污染溶剂

R301 should be removed in time to prevent coke powder from clogging the bed

R301 应及时切除，防止焦粉堵塞床层

The oil sealing system should be changed to collect wax oil in the tank area to prevent the heavy oil machine pump from being emptied

封油系统应改收罐区蜡油，防止重油机泵抽空

Maintain the fluidization and temperature of coke powder in the reactor through reactor stripping steam, atomizing steam, anti-coking steam, etc.

通过反应器汽提蒸汽、雾化蒸汽、防焦蒸汽等维持反应器内焦粉流化及温度

When closing the cold coke slide valve, prevent the heater and vaporizer from over-temperature on site, and make adjustments in advance

在关闭冷焦滑阀时，应防止加热器、气化器出现超温现场，提前做好调整

2.6.10 Cold coke transfer line break off 冷焦线中断

2.6.10.1 Accident description 事故说明

The cold coke spool valve has a small failure, jams, and can’t move

冷焦滑阀故障关小，卡涩，无法动作

The cold coke filter is clogged and the feeding is not smooth

冷焦滤网堵塞，下料不畅

Loose cold coke or blockage by lifting steam

冷焦松动或提升蒸汽堵塞

2.6.10.2 Accident symptoms 事故现象

The reactor material level rises rapidly and the heater material level drops

反应器料位快速上升，加热器料位下降

The reactor dilute phase temperature drops rapidly

反应器稀相温度快速下降

Reduced pressure difference in cold coke pipeline

冷焦管线压差降低

2.6.10.3 Remedies 处理步骤

(1) Reaction gasification system 反应气化系统

[B]Notification scheduling, the flexible coking cold coke line is interrupted, and the feed needs to be reduced or cut; the sewage discharge ammonia nitrogen and sulfide will greatly exceed the standard; the flexible gas drop fluctuates, the user can be notified to remove the flexible gas in advance; the delivery of liquefied gas and dry gas will be reduced or Interrupt

[B]通知调度，灵活焦化冷焦线中断，需降低或切进料；污水排放氨氮、硫化物将大幅超标；灵活气降波动，可通知用户提前切除灵活气；液化气、干气外送将降低或中断

[N]Close the hot coke slide valve to prevent the reaction material level from being too high and a large amount of coke powder running into the washing tower and even the fractionating tower

[N]关闭热焦滑阀，避免反应料位过高，焦粉大量跑损进入洗涤塔乃至分馏塔

[N]Instruct the outside operator to cut off the feed nozzles. When the reaction temperature drops to 520℃, cut off 3 nozzles. If the reactor drops to 515℃, continue to cut off 3 nozzles; when the reaction temperature drops to 512℃, close the P101 outlet control valve and trigger the pump Low outlet flow and low interlock to stop the pump, cut off all feed

[N]通知外操切除进料喷嘴，反应温度降低至 520℃时，切除 3 个喷嘴，若反应器降低至 515℃继续切除 3 个喷嘴；当反应温度降低至 512℃，关闭 P101 出口控制阀，触发泵出口流量低低联锁停泵，切除所有进料

[W]Examine the cause of the cold coke interruption during the external operation, and restore it as soon as possible

[W]外操检查冷焦中断原因，尽快恢复

[N]Turn on the HHKGO accident steam in the scrubber to prevent nozzle clogging

[N]打开洗涤塔 HHKGO 事故蒸汽，防止喷嘴堵塞

[N]Reduce the feed volume of the raw material tank to reduce slag, increase the oil slurry rejection, and control the washing liquid level to not exceed 60%

[N]降低原料罐减渣进料量，增大油浆外甩，控制好洗涤液位不超过 60%

[N]If the cold coke line can be recovered in a short time, gradually open the hot coke slide valve to increase the reaction temperature, and gradually use the nozzle (starting from the 8th floor)

[N]冷焦线若短时间可以恢复，逐步打开热焦滑阀，反应升温，同时逐步投用喷嘴（由 8 层开始投用）

[N]If the cold coke line cannot be recovered in a short time, the main air of the vaporizer will be gradually transferred to the heater

[N]若冷焦线短时间无法恢复，气化器主风逐步转移至加热器

[N]Close the gasifier feed coke slide valve, stop the return line from loosening, stop lifting steam, seal, and put the nitrogen on both sides

[N]关闭气化器进料焦滑阀，返焦线停松动、停提升蒸汽，密封，投用其两侧密封氮气

[N]The process steam for the gasifier can be maintained at the lowest fluidization state

[N]气化器用工艺蒸汽维持最低流化状态即可

[N]Stop quenching coke, close the quenching coke slide valve

[N]停急冷焦，关闭急冷焦滑阀

[N]If the cold coke line still fails to return to normal, turn on the auxiliary combustion chamber, gradually cut off the heater main air, and use F101 to maintain the heater temperature
[N]若冷焦线仍无法恢复正常，点辅助燃烧室，逐渐切除加热器主风，用 F101 维持加热器温度
[W]The top of the steam drum D103 is vented slightly, F102 reversely draws steam, puts in desuperheater and desuperheating water, F102 steam is vented to prevent low temperature steam from entering the main fan
[W]汽包 D103 顶部放空稍开，F102 倒引蒸汽，投用减温器及减温水，F102 蒸汽放空，防止低温蒸汽进入主风机
[N]While cutting the main air of the heater, turn on the temperature-regulating air steam and turn on the fluidized steam at the bottom of the quench section of the heater to maintain the heater fluidization
[N]切加热器主风的同时，开大调温风蒸汽，开大加热器急冷段底部流化蒸汽，维持加热器流化
[W]Prepare the liquid ammonia cylinder, ready to start work again
[W]准备好液氨钢瓶，为再次开工作准备
[N]The three vessels use steam to maintain the lowest fluidization state, and charge the heater according to the situation to maintain the material level
[N]三器用蒸汽维持最低流化状态，可视情况向加热器装焦，维持料位
At this time state: three fluidization; fractionation system collects wax oil, and each section maintains self-circulation; raw material system maintains liquid level to maintain the oil rejection; flexible gas system water circulation, desulfurization tower stops, C305 self-circulation; dry coke to R102 Load coke; wet coke water circulation or delivery; torch light is lit.
此时状态：三器流化；分馏系统收蜡油，各段维持自循环；原料系统维持液位，维持收油外甩；灵活气系统水循环，脱硫塔停止，C305 自循环；干焦向 R102 装焦；湿焦水循环或外送；火炬长明灯点燃。

(2) Fractionation-stabilization system 分馏稳定系统
[N]The fractionation system reduces the extraction of products in each section, and when necessary, notify the dispatcher to collect wax oil
[N]分馏系统降低各段产品抽出，必要时通知调度收蜡油
[W]The fractionation tower collects the wax oil, starts HHKGO flushing, and the ratio is 1/3 with the residual oil, and maintains the oil slurry outside to maintain the liquid level of the scrubber
[W]分馏塔收蜡油，启用 HHKGO 冲洗，与渣油配比 1/3，并维持油浆外甩，维持洗涤塔液位
[W]Depending on the temperature of the fractionation tower and scrubber, use E101/E210 to heat backwards, use E235 to maintain the temperature
[W]视分馏塔及洗涤塔温度情况，投用 E101/E210 倒加热，投用 E235，维持温度

(3) Flexigas treatment system 灵活气处理系统
[W]Distillation post cuts C305, its self-circulation, R301 cuts off in time to take the auxiliary line

[W]分馏岗切除 C305，其自循环，R301 及时切除走副线
[W]C304 desulfurization stops to prevent the solvent from polluting non-hydrogen sulfide media
[W]C304 脱硫停止，防止溶剂收非硫化氢介质污染
[N]Flexible air-water system to maintain water circulation
[N]灵活气水系统维持水循环

(4) Coke fines treatment system 焦粉处理系统
[W]D401 charge pressure, change the process of starting the coke loading process, and properly charge the heater to control the heater level
[W]D401 充压，改通开工装焦流程，适当向加热器装焦控制加热器料位

2.6.10.4 Attention 注意事项
The cold coke line cannot be restored in a short time. The vaporizer is cut off in time, the heater air volume is also reduced, and the auxiliary combustion chamber is used to maintain the temperature of the two reactors (reactor/heater)
冷焦线短时间不能恢复，及时切除气化器，加热器风量也降低，投用辅助燃烧室维持两器温度（反应器/加热器）
F102 steam is cut and vented in time to avoid low-temperature steam entering the main fan and causing main fan failure
F102 蒸汽及时切除放空，避免低温蒸汽进入主风机，引起主风机故障
When cold coke is interrupted, cut off the feed nozzle in time to prevent reaction coking
冷焦中断时，及时切除进料喷嘴，防止反应结焦
The desulfurization system should be removed in time to avoid non-hydrogen sulfide media polluting the solvent
脱硫系统要及时切除，避免非硫化氢介质污染溶剂
Cut off the carbonyl sulfide reactor in time to prevent the coke powder from clogging the bed
羰基硫反应器及时切除，防止焦粉堵塞器床层

2.6.11 TW break off 除盐水中断
2.6.11.1 Accident description 事故说明
The control valve of the desalinated water inlet to the deaerator is closed due to failure, and the desalinated water is interrupted
除盐水进除氧器控制阀故障关闭，除盐水中断
Desalinate partial failure or full shutdown, desalination interruption
海淡局部故障停车或全部停车，除盐水中断

2.6.11.2 Accident symptoms 事故现象
The liquid level of deaerator and steam drum drops rapidly

除氧器、汽包液位快速下降

E102/103 Flexible gas temperature gradually increases with the decrease of the drum level, and the slurry temperature of the flexible gas treatment system increases

E102/103 灵活气温度随汽包液位降低而逐渐升高，灵活气处理系统浆液温度升高

2.6.11.3 Remedies 处理步骤

(1) Reaction gasification system 反应气化系统

[B]Dispatch notification, demineralized water interruption, flexible coking plant is about to shut down, sewage discharge ammonia nitrogen and sulfide will significantly exceed the standard; flexible gas interruption, liquefied gas and dry gas delivery interruption; F102 deactivate flexible gas burner and switch to fuel gas; The back blow was changed to nitrogen, and the amount of nitrogen increased.

[B]通知调度，除盐水中断，灵活焦化装置准备停工，污水排放氨氮、硫化物将大幅超标；灵活气中断，液化气、干气外送中断；F102 停用灵活气火嘴，改用燃料气；仪表反吹改为氮气，氮气用量增加。

[N]If it is found that the control valve of the desalinated water entering the deaerator is closed down, contact the external operator to open the auxiliary line valve as soon as possible to supplement the level of the deaerator and steam drum. The timely operation will not cause the device to stop

[N]若发现除盐水进除氧器控制阀故障关闭，联系外操尽快打开副线阀，补充除氧器、汽包液位，操作及时将不会导致装置停车

[W]Contact the external operation and change the meter back to nitrogen, and close the control valve PV12601 into the D110 tank for the internal operation

[W]联系外操三器仪表反吹改成氮气，内操关闭进 D110 罐控制阀 PV12601

[W]Contact an external operation to remove part of the nozzle and reduce the processing capacity to 60%

[W]联系外操切除部分喷嘴，降低处理量至 60%

[N]Gradually turn off the main air volume of the vaporizer and reduce the vaporizer rate

[N]逐渐关小气化器主风量，降低气化器率

[W]Contact the outside operator to close the steam drum, E102/103/E207/E101/E210, etc.

[W]联系外操关闭汽包、E102/103/E207/E101/E210 等定、连排

[N]When the level of the steam drum is as low as 25% and the desalinated water still cannot be recovered, the ES111 interlock is activated, and the device stops working

[N]在汽包液位低至 25%，除盐水仍无法恢复时，启动 ES111 联锁，装置紧急停工

[N]The interlocking actions of ES111 are as follows: the vaporizer accident steam XV11601 is on, the main fan outlet damping check valve HV11902 is off, the sludge refining control valve FV11704 is off, the oil slurry rejection HV10301 is off, the raw material pressure control PV10501 is off, and the raw material circulation FV10505 is off. , Vaporizer process steam

FV11605 is fully open, quench coke slide valve TIC11003 is closed, scour coke slide valve HIC10801 is closed, D101 coke unloading slide valve PIC11201 is closed

[N]ES111 联锁动作如下：气化器事故蒸汽 XV11601 开，主风机出口阻尼单向阀 HV11902 关，污泥回炼控制阀 FV11704 关，油浆外甩 HV10301 关，原料压控 PV10501 关，原料循环 FV10505 关，气化器工艺蒸汽 FV11605 全开，急冷焦滑阀 TIC11003 关，冲刷焦滑阀 HIC10801 关，D101 卸焦滑阀 PIC11201 关

The status of the device is as follows: the main air is interrupted, and the gasifier process steam is fully opened to maintain fluidization and cut off the feed; the reactor and the gasifier coke cycle are cut off; the heater and the gasifier coke cycle are interrupted, and the coke return line is sealed;

装置状态如下：主风中断，气化器工艺蒸汽全开维持流化切断进料；切断反应器、气化器焦炭循环；加热器与气化器焦炭循环中断，返焦线密封；

[N]Pannel operator make sure the heater is fully opened and the bed fluidized steam HIC11305ABC maintains the heater fluidization

[N]反应内操全开加热器床层流化蒸汽 HIC11305ABC 维持加热器流化

[N]Close the coke inlet slide valve of the vaporizer

[N]关闭气化器进焦滑阀

[W]Contact the outside operator to close all loose and lift steamer wall valves

[W]联系外操关闭返焦线所有松动、提升蒸汽器壁阀

[W]Contact the outside operator to close all the inlet nozzle wall valves

[W]联系外操关闭所有进料喷嘴器壁阀

[N]By pass the F102 steam flow low-low interlock, close the flexible gas to the F102 control valve FIC12602, adjust the main gas control valve, and stabilize the F102 furnace medium pressure steam temperature

[N]切除 F102 蒸汽流量低低联锁，关闭灵活气至 F102 控制阀 FIC12602，调整主瓦斯控制阀，稳定 F102 炉中压蒸汽温度

[N]Contact the tank area to collect the residual oil into the raw material tank, open the slurry control to open, restore the raw material system to the open circuit of the tank area, restore the operation of the raw material system, and control 40-50 t/h

[N]联系罐区收渣油进原料罐，油浆外甩控制打开，恢复原料系统至罐区开路循环，恢复原料系统运行，外甩控制 40-50 t/h

[W]Open the bottom elbow of E102/E103 and pat it down

[W]打开 E102/E103 底部弯头低点拍凝

[W]Turn on the low point at the bottom of the three spin

[W]打开三旋底部低点拍凝

[W]Close the flexible gas to the F102 wall hand valve

[W]关闭灵活气至 F102 器壁手阀

[N]The three vessels maintain the lowest fluidization state, waiting for the recovery of desalinated water

[N]三器维持最低流化状态，等待除盐水恢复

[N]Internal operation control F104 temperature stability

[N]内操控制 F104 温度稳定

[N]Before the desalinated water returns to normal, if the heater temperature is lower than 280℃, press the F101 point furnace operation card, ignite F101, and after the desalinated water returns to normal, drive according to the start operation procedure

[N]除盐水恢复正常之前，若加热器温度低于 280℃，则按 F101 点炉操作卡，点燃 F101，待除盐水恢复后按开工操作程序开车

[N]If the temperature of the heater is not lower than 280℃ before the demineralized water returns to normal, and after the demineralized water returns to normal, the following steps will be started gradually

[N]若除盐水恢复正常之前，若加热器温度不低于 280℃，除盐水恢复正常后，则按以下步骤逐渐开工

[N]Bypass ES111, PS111, PS101AB interlock and reset

[N]旁路 ES111、PS111、PS101AB 联锁，并复位

[N]Vaporizer steam reduced to 23t/h

[N]气化器蒸汽降低至 23t/h

[N]Open the damping check valve at the outlet of the main fan, slowly and the main air enters the heater

[N]打开主风机出口阻尼单向阀，缓慢并主风进入加热器

[N]Slowly merge the main air to the heater heating up, the air volume is 40,000Nm3/h, and at the same time reduce the temperature-regulating air accident steam to 9t/h

[N]缓慢并入主风至加热器升温，风量 40000Nm3/h，同时降低调温风事故蒸汽至 9t/h

[N]When the heater temperature reaches 630-640℃, open the cold and hot coke slide valve to establish a cold and hot coke cycle, and the reactor will heat up

[N]当加热器温度达到 630-640℃，打开冷、热焦滑阀，建立冷热焦循环，反应器升温

[N]Start P101, establish raw material circulation, open FV10505 auxiliary line, position P101 outlet flow 190t/h, pressure in front of raw material nozzle 1.7MPa

[N]启动 P101，建立原料循环，打开 FV10505 副线，位置 P101 出口流量 190t/h，原料喷嘴前压力 1.7MPa

[N]Gradually open the large cold and hot coke cycle, when the reaction temperature reaches 530-535 ℃, notify the outside operation to use the feed nozzle, and notify the dispatcher at the same time

[N]逐渐开大冷热焦循环，当反应温度达到 530-535℃，通知外操投用进料喷嘴，同时通知调度

[N]Continue to open the main air static blade or close the surge valve to increase the main air volume. While maintaining the heater temperature adjustment air volume, wind the gas into the carburettor and slowly increase the vaporizer temperature

[N]继续打开主风静叶或关小喘振阀，提高主风量，在维持加热器调温风量的同时，并风进气化器，缓慢提高气化器温度

[N]According to the reaction temperature, the feed nozzle is used every 10-15 minutes, and the air pressure machine manually adjusts the speed to control the reactor pressure

[N]根据反应温度情况以每 10-15 分钟的速度投用进料喷嘴，气压机手动调节转速控制反应器压力

[N]When the temperature of the gasifier reaches about 650℃, notify the external operator to unblock and return to the coke line, and establish a heater and gasifier coke cycle

[N]当气化器温度达到 650℃左右，通知外操解封返回焦线，建立加热器与气化器焦炭循环

[N]Put 8-10 nozzles into use, gradually increase the air volume of the vaporizer, the vaporizer heats up, and gradually enter the vaporization mode

[N]喷嘴投用 8-10 个，逐步提高气化器风量，气化器升温，逐渐进入气化模式

[N]Under the condition of maintaining the reaction temperature, the temperature adjustment air is transferred to the gasifier, and at the same time, the feed nozzle is gradually used according to the reaction temperature.

[N]在维持反应温度的情况下，将调温风转入气化器，同时根据反应温度情况，逐步投用进料喷嘴

[N]When 12 nozzles are used, the gasifier enters the full gasification mode, and the temperature is adjusted to within 10000 Nm3/h

[N]当喷嘴投用 12 个后，气化器进入全气化模式，调温降至 10000 Nm3/h 以内

[W]Stop the ammonia injection, gradually reduce the alkali injection according to the PH value, and control the PH8-9

[W]停立换注氨，根据 PH 值逐步减少注碱，控制 PH8-9

[W]Sampling and analysis of flexible gas, after qualified hydrogen sulfide, gradually put into use F102 flexible gas burner

[W]采样分析灵活气，硫化氢合格后，逐步投用 F102 灵活气火嘴

[B]Notify the dispatching power station, the aromatics can gradually restore the flexible gas burner

[B]通知调度电站、芳烃可逐步恢复灵活气火嘴

[B]Contact the dispatcher, change the meter to blow back to dry gas

[B]联系调度、一部改仪表反吹为干气

[N]After the device runs stably, put into use PS101AB, P101 low flow interlock

[N]装置运行稳定后，投用 PS101AB，P101 低流量联锁

[N]Reset the safe operation of the main fan on the main fan screen

[N]在主风机画面复位主风机安全运行

[B]Inform the dispatch, the main fan of flexible coking is ready to resume operation, and the consumption of medium pressure steam will increase

[B]通知调度，灵活焦化主风机准备恢复运行，中压蒸汽用量将增加

[N]Slowly open the angle of the static blades of the main fan, increase the main air pressure at the outlet of the main fan to 0.15-0.2MPa, close the flexible gas torch valve, and control the "two devices" differential pressure around 70Kpa

[N]缓慢开大主风机静叶角度，提高主风机出口主风压力至 0.15-0.2MPa，关小灵活气大小火炬阀，控制“两器”差压 70Kpa 左右

(2) Fractionation-stabilization system 分馏稳定系统

[N]Fractional distillation stable stop LPG, naphtha, diesel, wax oil delivery device

[N]分馏稳定停止 LPG、石脑油、柴油、蜡油外送装置

[N]According to the reaction feed situation, the fractionation and stabilization system maintains the liquid level of each stage and the product is delivered

[N]根据反应进料情况，分馏、稳定系统维持各段液位及产品外送

(3) Flexigas treatment system 灵活气处理系统

[W]The slurry and wet coke system lacked salt water and the pump could not be started. Venturi and stripper sewage was discharged into the oily sewage tank on the spot and sent by the sewage pump. The wet coke system was shut down.

[W]浆液及湿焦系统因缺除盐水，机泵无法启动，文丘里及汽提塔污水就地排入含油污水池，由污水泵外送，湿焦系统停运

[W]Start the large alkali injection pump, inject alkali into the venturi, and control PH8-9

[W]启动注碱大泵，向文丘里注入碱液，控制 PH8-9

[W]Put into use for ammonia injection

[W]投用立换注氨

2.6.11.4 Attention 注意事项

During the recovery process of the device, only the triggered interlocks are allowed to be removed, and other untriggered interlocks are not allowed to be removed

装置恢复过程中，只允许切除触发过的联锁，其他未触发联锁不允许切除

When the drum level is lower than 25% and it is confirmed that the demineralized water cannot be recovered for a period of time, manually start the main air interlock ES111Change the back blow of the meter to nitrogen in time to prevent the meter from being blocked

及时将仪表反吹改成氮气，防止仪表堵塞

In the process of resuming production, adjust the alkali injection in time, and the PH control is 8-9R301 should be removed in time to prevent coke powder from clogging the bed

R301 应及时切除，防止焦粉堵塞床层

If the feed cannot be recovered for a long time, the oil sealing system should be changed to collect the wax oil in the tank area to prevent the pumping of the heavy oil pump

若较长时间无法恢复进料，封油系统应改收罐区蜡油，防止重油机泵抽空

After the main air is cut off, it is sealed and returned to the focal line in time to prevent the heater's coke powder from running out and blocking the flexible air system
主风切除后及时密封返回焦线，防止加热器焦粉跑损，堵塞灵活气系统
If desalination water is interrupted, stop the slurry system pump in time (demineralize water is the pump washing medium) to avoid damage to the pump
除盐水中断，及时停运浆液系统水泵（除盐水为机泵冲洗介质），避免机泵损坏

2.6.12 MP Steam break off 中压蒸汽中断

2.6.12.1 Accident description 事故说明

Possible reason 1: Interruption of medium-pressure steam is generally caused by power station boiler failure.
可能原因 1：中压蒸汽中断一般是由于电站锅炉故障跳停。
Possible cause 2: Flange damage occurs in the medium-pressure steam pipe network, resulting in a large amount of leakage, or the safety valve cannot be seated after it has taken off for a short time.
可能原因 2：中压蒸汽管网管线出现法兰损伤，导致大量泄漏，或者安全阀起跳短时间无法回座。

2.6.12.2 Accident symptoms 事故现象

D503 inlet temperature and pressure drop rapidly
D503 入口温度压力快速下降
The inlet temperature and pressure of ST101 and ST201 decrease, and the flow rate increases. Corresponding back pressure pipe network low pressure and low pressure steam pipe network pressure rises, flow rate rises.
ST101 和 ST201 入口温度压力下降，流量上升。对应的背压管网低压和低低压蒸汽管网压力上升，流量上升。
All the medium pressure steam in use includes reactive atomization steam, E220, E312 and other temperature and pressure drop rapidly.
所有在用的中压蒸汽包括反应雾化蒸汽，E220，E312 等温度压力快速下降。
The condensate system fluctuates and the liquid level of the deaerator fluctuates.
凝结水系统波动，除氧器液位出现波动。

2.6.11.3 Remedies 处理步骤

(1) Reaction gasification system 反应气化系统

[N]Respond to the early detection of abnormalities in internal operations, and contact the power station and duty dispatcher to understand the reasons for the interruption of the medium pressure steam, so as to respond in a targeted manner.
[N]反应内操及早发现异常，并联系电站和值班调度了解中压蒸汽中断的原因，以便针对性的作出应对。
[N]When the medium pressure steam pressure drops to about 3.0 MPa:
[N]当中压蒸汽压力下降到 3.0 兆帕左右时：

[N]The main fan unit maintains normal operation, and the reaction can appropriately increase the amount of process steam, thereby increasing the production of flexible gas, increasing the steam production of E102. The increase in steam production may cause the temperature of F102 outlet steam to drop. The increase of steam will increase the load of P104. If the water supply of the drum D103 is insufficient, one more P104 can be opened in a short time.
[N]主风机组维持正常运行，反应可适当提高工艺蒸汽用量，从而增加灵活气产量，使 E102 产汽增加，产汽增加可能导致 F102 出口蒸汽温度下降，需及时提高炉用燃料气用量，同时产汽增加会增加 P104 的负荷，如果汽包 D103 上水不足，短时间内 P104 可以多开一台。
[N]The reaction produces as much heat and steam as possible, shuts off the sludge refining, reduces the discharge of coke powder, and reduces the oil slurry outside the scrubber.反应尽量[N]多产热多产汽，关闭污泥回炼，减少焦粉卸出，减少洗涤塔外甩油浆。
[B]Contact the dispatcher to prepare to stop the air compressor, and change the inlet to set a torch to control the reaction pressure. The shutdown of the air pressure machine will cause the pressure and temperature of the low-pressure steam network to drop.
[B]联系调度准备停气压机，改入口放火炬控制反应压力。气压机停机将导致低压蒸汽管网压力和温度下降。
[N]If the pressure of low-pressure steam drops too fast, it may cause problems in the fluidization of coke powder transportation, which requires close attention. At the same time, if the temperature drops, the reaction heat will be lost further. In addition, a rapid pressure drop may cause a chain shutdown of the aromatics combined unit's steam turbine with low back pressure.
[N]低压蒸汽压力下降过快可能导致焦粉输送流化出现问题，需要密切关注，同时如果温度下降将进一步使反应热量损失。并且压力下降过快可能引起芳烃联合装置的汽轮机背压低连锁停机。
(2) Fractionation-stabilization system 分馏稳定系统
[W]Cut off the third-stage gas-rich outlet of the air compressor to the stable system, contact the downstream device to cut off the dry gas output to ensure the stable system pressure, and at the same time change the three-device back-blowing fuel gas to nitrogen at D110 to avoid large-scale failure of the three-device instrument. Try to establish a two-tower circulation, if it cannot be established, maintain the liquid level. The heat source of each reboiler of the stabilization system is cut off, and the cooler is gradually cut out.
[W]切断气压机三级出口富气至稳定系统，联系下游装置干气出装切断，保稳定系统压力，同时在 D110 处将三器反吹燃料气改为氮气，以免三器仪表大面积失灵。尝试建立双塔循环，如果不能建立，保持液位。稳定系统各重沸器热源切断，冷却器逐步切出。
[N]Fractionation If the pumping of diesel oil is stopped, C205 will stop the rich absorption oil and return to the fractionation tower to maintain the C205 liquid level to prevent the pressure of the liquid level from causing a large increase in the pressure of the reaction system. The delivery of liquefied petroleum gas naphtha stopped.

[N]分馏如果停柴油抽出，C205 停止富吸收油返回分馏塔，保持 C205 液位防止液位压空导致反应系统压力大幅度上升。液化气石脑油停止外送。

(3) Flexigas treatment system 灵活气处理系统

[N]The flexible gas treatment system maintains normal operation.

[N]灵活气处理系统维持正常运行。

When the medium pressure steam drops to 2.854MPA: the reaction atomization steam low pressure alarm, the reaction is ready to cut feed. And notify the dispatch and other related departments: the flexible coking unit may do the reaction cutting feed processing in the next.

中压蒸汽下降到 2.854MPA 时：反应雾化蒸汽低压报警，反应做好切进料准备。并通知调度和其它相关部门：灵活焦化装置可能在接下来做反应切进料处理。

When the pressure is as low as 2.511Mpa:

压力低至 2.511Mpa 时：

PS102 acts, the reaction cuts the feed, the slide valve between the three vessels is cut off, the seal returns to the coke, and the stuffed bed maintains the material level. Stop D101 and D401 coke unloading and prepare to store coke powder.

PS102 动作，反应切进料，三器间滑阀切断，密封返回焦，闷床维持料位。停止 D101 和 D401 卸焦，做好储备焦粉的准备。

Decide whether to stop the main fan according to the dispatching instructions. The main fan should be shut down to consider the impact on the 0.5Mpa low and low pressure steam pipe network and the condensate pipe network. It is necessary to contact sulfur in time to prevent the influence of low and low pressure pipe network fluctuations: heater temperature adjustment wind accident steam, deaerator liquid level, E311 amine liquid regeneration reboiler. Excessive fluctuation of 0.5Mpa steam may also cause the hydrocracking cycle hydrogen steam turbine and reforming cycle hydrogen steam turbine to have low back pressure and chain shutdown.

根据调度指令决定是否停主风机，主风机停运需考虑对 0.5Mpa 低低压蒸汽管网以及凝结水管网的影响。需及时联系硫磺防止低低压管网波动影响：加热器调温风事故蒸汽，除氧器液位，E311 胺液再生重沸器。0.5Mpa 蒸汽波动过大还可能引起加氢裂化循环氢汽轮机、重整循环氢汽轮机背压低连锁停机。

The raw material system maintains circulation to prevent pipeline condensation, and the fractionation stabilization system stops sending materials to maintain the liquid level. Pay attention to the level control of the oil sealing system, and collect wax oil if necessary.

原料系统维持循环防止管线凝线，分馏稳定系统停止外送物料维持液位。封油系统注意液位控制，必要时收蜡油。

Ensure that the oil is flushed at the top of the washing tower, the light wax is fractionated, and the internal reflux of the heavy wax cannot be interrupted. If necessary, steam is introduced to prevent nozzle blockage. P102/206/228/207/218 can not stop the pump. In order to ensure the liquid level of the scrubber, the delivery of oil slurry can not be interrupted, so it is necessary to contact the tank area to collect wax oil from the bottom of the fractionation tower through

FV10102.

保证洗涤塔顶冲洗油，分馏轻蜡，重蜡的内回流不能中断，必要时通入蒸汽防止喷嘴堵塞。P102/206/228/207/218 不能停泵。洗涤塔为了保证液位，外送油浆也不能中断，需联系罐区通过 FV10102 向分馏塔底收蜡油。

2.6.12.4 Attention 注意事项

It is strictly forbidden to remove the device interlock. Interlock is a protective measure to make the device retreat to the hot standby state. If the device fluctuates, it may cause other more serious and irreversible secondary accidents. The device cannot be "saved" by cutting the interlock

严禁切除装置联锁，联锁是使装置退守至热备状态的保护措施，在装置波动情况下随意切除联锁，可能导致其他更严重的、不可逆次生事故。不能通过切联锁来“救”装置

If the medium-pressure steam is interrupted due to the failure of the whole plant's desalination system, the water vapor system in this device may also be greatly restricted, and it can be handled according to the desalination interruption accident plan.

如果是全厂除盐水系统故障导致的中压蒸汽中断，本装置内水汽系统也有可能受到较大限制，可根据除盐水中断事故预案进行处理。

When the medium pressure steam is interrupted, the low and low pressure steam and the condensate system will also fluctuate synchronously or the interruption depends on the situation.

中压蒸汽中断的同时低压和低低压蒸汽以及凝结水系统也往往会同步出现波动或者中断需视情况而定。

Since the steam consumption of the main fan of this device is always greater than the steam produced by the device, it is not necessary to cut off the medium pressure steam into the device from the perspective of maintaining the pipe network in the device. When the medium pressure steam is insufficient, the first consideration should be to reduce the consumption in preparation for the resumption of production or emergency shutdown.

本装置由于主风机消耗的蒸汽量总是大于装置自产的蒸汽量，从维持装置内管网的角度来讲不用切断中压蒸汽进装置。当中压蒸汽不足时应首先考虑降低消耗量，为恢复生产或紧急停工做准备。

2.6.13 urgent shut down 紧急停工

2.6.13.1 Accident description 事故说明

Possible reason 1: Interruption of medium-pressure steam is generally caused by power station boiler failure and tripping, insufficient steam load of the whole plant and insufficient electric load.

可能原因 1：中压蒸汽中断一般是由于电站锅炉故障跳停，全厂蒸汽负荷不足，电负荷不足。

Possible cause 2: Flange damage occurs in the medium-pressure steam pipe network, resulting in a large amount of leakage, or the safety valve cannot be seated after it has taken off for a short time.

Power plant coal conveying system failure

可能原因 2：中压蒸汽管网管线出现法兰损伤，导致大量泄漏，或者安全阀起跳短时间无法回座。电站输煤系统故障

2.6.13.2 Accident symptoms 事故现象

D503 inlet temperature and pressure drop rapidly

D503 入口温度压力快速下降

The inlet temperature and pressure of ST101 and ST201 decrease, and the flow rate increases. The pressure of the low-pressure and low-pressure steam pipe network drops.

ST101 和 ST201 入口温度压力下降，流量上升。低压和低低压蒸汽管网压力均下降。

All the medium pressure steam in use includes reactive atomization steam, E220, E312 and other temperature and pressure drop rapidly.

所有在用的中压蒸汽包括反应雾化蒸汽，E220，E312 等温度压力快速下降。

The condensate system fluctuates and the liquid level of the deaerator fluctuates.

凝结水系统波动，除氧器液位出现波动。

2.6.13.3 Remedies 处理步骤

(1) Reaction gasification system 反应气化系统

[B]In view of the insufficient steam load and electricity load of the whole plant (steam and electricity are not completely interrupted, water, electricity, wind and nitrogen are still stable) Respond to the early detection of abnormalities in internal operations, and contact the power station and the on-duty dispatcher to understand the reason for the insufficient medium pressure steam load, according to the coordination and interlocking of the machine network, as well as the planning and adjustment arrangements, and remove the air pressure machine as appropriate.

[B]针对全厂蒸汽负荷不足，电负荷不足的情况（蒸汽、电未完全中断，水、电、风、氮仍稳定）反应内操及早发现异常，并联系电站和值班调度了解中压蒸汽负荷不足原因，根据机网协调联锁，以及计调安排，视情切除气压机。

[B]Contanct with Dispatch, the main fan of Flexi coke operates safely, the feed is cut off, and the sewage discharge ammonia nitrogen and sulfide will greatly exceed the standard; the flexible gas is interrupted, and the delivery of liquefied gas and dry gas is interrupted; F102 disables the flexible gas burner and uses fuel gas

[B]通知调度，灵活焦主风机安全运行，切断进料，污水排放氨氮、硫化物将大幅超标；灵活气中断，液化气、干气外送中断；F102 停用灵活气火嘴，改用燃料气

[W]Close the P101 outlet control valve, trigger the pump outlet low flow interlock to stop the pump, cut off all the feed, and notify the external operator to close all the feed nozzles wall hand valves

[W]关闭 P101 出口控制阀，触发泵出口流量低低联锁停泵，切除所有进料，通知外操关闭所有进料喷嘴器壁手阀

[W]Contact the external operation and change the meter back to nitrogen, and close the control valve PV12601 into the D110 tank for the internal operation

[W]联系外操三器仪表反吹改成氮气，内操关闭进 D110 罐控制阀 PV12601

[N]The reaction closes the flushing coke slide valve to maintain the "three vessels" coke circulation

[N]反应关闭冲刷焦滑阀，维持“三器”焦炭循环

[N]Stop the air press, adjust the "two devices" differential pressure to reverse differential pressure, -10kpa, use the flare valve to control the reaction pressure

[N]停气压机，调整“两器”差压为倒差压，-10kpa，用放火炬阀控制反应压力

[N]Calculate the coke powder storage capacity of D401 and three vessels, gasify part of the coke powder according to the situation, and control the storage capacity of D401+three coke powders=1650t

[N]计算 D401 及三器焦粉藏量，视情况气化部分焦粉，控制 D401+三器焦粉藏量=1650t

[N]Gradually turn off the main air volume of the vaporizer, reduce the vaporizer rate, and reduce the main air to trigger PS111

[N]逐渐关小气化器主风量，降低气化器率，降低主风至触发 PS111

[N]Fully open heater bed fluidized steam HIC11305ABC

[N]全开加热器床层流化蒸汽 HIC11305ABC

[N]Close the flexible gas to the F102 control valve FIC12602, adjust the main gas control valve, and stabilize the medium pressure steam temperature of the F102 furnace

[N]关闭灵活气至 F102 控制阀 FIC12602，调整主瓦斯控制阀，稳定 F102 炉中压蒸汽温度

[W]Check the operation of the related valves of the interlocking ES111, PS111, PS101AB: the vaporizer accident steam XV11601 is on, the main fan outlet damping check valve HV11902 is off, the sludge refining control valve FV11704 is off, the oil slurry is thrown out HV10301 is off, and the raw material pressure is controlled. PV10501 is off, raw material circulation FV10505 is off, gasifier process steam FV11605 is fully opened, quench coke slide valve TIC11003 is off, flush coke slide valve HIC10801 is off, D101 coke unloading slide valve PIC11201 is off

[W]检查联锁 ES111、PS111、PS101AB 相关阀门动作情况：气化器事故蒸汽 XV11601 开，主风机出口阻尼单向阀 HV11902 关，污泥回炼控制阀 FV11704 关，油浆外甩 HV10301 关，原料压控 PV10501 关,原料循环 FV10505 关,气化器工艺蒸汽 FV11605 全开,急冷焦滑阀 TIC11003 关，冲刷焦滑阀 HIC10801 关，D101 卸焦滑阀 PIC11201 关

[N]Close the cold and hot coke slide valves, cut off the reactor and heater coke circulation, and maintain the minimum fluidization of the "three vessels" steam.

[N]关闭冷、热焦滑阀，切断反应器、加热器焦炭循环，维持“三器”蒸汽最低流化。

[N]Maintain the internal circulation of the C101 tower, maintain the amount of flushing oil at the top of the C101, throw the oil slurry outside to the tank area, and throw the oil slurry and residual oil (raw material tank D107) outside to the tank area as much as possible

[N]维持 C101 塔内循环，维持 C101 顶冲洗油量，外甩油浆至罐区，尽可能将油浆、渣油（原料罐 D107）通过外甩甩至罐区

(2) Fractionation-stabilization system 分馏稳定系统

[N]The fractionation system reduces the circulation volume of each circuit, establishes the internal circulation of the tower, and D210 is changed to collect the wax oil in the tank area

[N]分馏系统降低各路循环量，建立塔内循环，D210 改收罐区蜡油

[N]Send the wax oil in the fractionation tower to C101, change to the large-scale cycle process, replace the residual oil pipeline with wax oil, and then throw it from the scrubber to the tank

[N]将分馏塔内蜡油送至 C101，改通开工大循环流程，用蜡油置换渣油管线，再由洗涤塔外甩至罐区

[W]After the air compressor is shut down, close the hand valve of the third-stage outlet of the air compressor by the external operation of fractionation, and check whether the EBV valve at the inlet and outlet of the air compressor is completely closed

[W]气压机停机后，分馏外操关闭气压机三级出口手阀，并检查气压机各段出入口 EBV 阀是否完全关闭

[N]The internal fractionation operation closes the regulating valve PV22901 of the dry gas outlet device at the top of the reabsorption tower to maintain the stable absorption system pressure

[N]分馏内操关闭再吸收塔顶干气出装置调节阀 PV22901 维持吸收稳定系统压力

[N]To stabilize the bottom steam, slowly remove the steam by closing PV23401, and close the liquefied gas delivery valve FV23601. When the liquid level of D208 cannot be maintained, stop the liquefied gas pump P215

[N]稳定塔底蒸汽通过关闭 PV23401 缓慢将蒸汽撤掉，关闭液化气外送阀 FV23601，D208 液位无法维持时，停液化气泵 P215

[N]Fractional distillation stops the delivery of wax oil, diesel, naphtha

[N]分馏停止蜡油、柴油、石脑油外送

(3) Flexigas treatment system 灵活气处理系统

[W]D301 balance line changed to start-up process

[W]D301 平衡线改走开工流程

[W]C304 stop desulfurization, stop P310/P309, change the C305 single-tower cycle process, control C305 various indicators within the normal range

[W]C304 停止脱硫，停 P310/P309，改 C305 单塔循环流程，控制 C305 各项指标在正常范围内

[N]Keep the cycle of C305 and T302, and notify that sulfuric acid gas will reduce and slowly interrupt

[N]保持 C305 与 T302 循环，并通知硫磺酸性气会减少慢慢中断

[N]C304/C305 stop cycle, stop P310/P309/P308/P315

[N]C304/C305 停止循环，停 P310/P309/P308/P315
[N]Stop C304 and top water washing, stop C305 and control water injection
[N]停 C304 顶水洗水，停 C305 顶控制注水
[W]Removal of R301, flexible Qi change to R301 bypass
[W]切除 R301，灵活气改走 R301 旁路
[N]D302/C302/C303/C301 stop water circulation, stop C303 top water supply
[N]D302/C302/C303/C301 停止水循环，停止 C303 顶部补水

(4) Coke fines treatment system 焦粉处理系统
[N]Sewage sent from the wet coke system will be suspended depending on the situation.
[N]湿焦系统外送污水视情况停运，停止外送

Status: "Three devices" coke powder is discharged to D401 (it is estimated that it will take 2 days to unload the coke), the main fan is shut down, the air pressure machine is shut down; the heavy oil in the scrubber and fractionation tower is exhausted; the absorption is stable and separated from the fractionation tower system. Stable pressure holding; outage of flexible gas desulfurization system; outage of dry and wet coke system; "three vessels", fractionation, stable absorption, flexible gas desulfurization system, depending on the situation, nitrogen protection (if nitrogen).
状态：“三器”焦粉卸至 D401（预计卸焦需 2 天时间），主风机停机、气压机停机；洗涤塔、分馏塔中重油甩完；吸收稳定与分馏塔系统切隔开，吸收稳定保压；灵活气脱硫系统停运；干、湿焦系统停运；“三器”、分馏、吸收稳定、灵活气脱硫系统视情况充氮保护（若有氮气）。

If the steam of the whole plant will be completely interrupted in a short period of time, such as coal transportation interruption, water, electricity, steam, wind, and nitrogen all public utilities interruption)
若全厂蒸汽短时间内将完全中断，例如输煤中断，水、电、汽、风、氮所有公用工程中断）情况
If notified by the dispatch, confirm that the steam of the whole plant will be completely interrupted in a short time
若得到调度通知，确认全厂蒸汽将短时间完全中断
[N]The internal operation of the reaction closes the P101 outlet control valve, triggers the low and low flow rate of the pump outlet to stop the pump, cuts all the feed, and informs the external operation to close all the hand valves on the wall of the feed nozzle
[N]反应内操关闭 P101 出口控制阀，触发泵出口流量低低联锁停泵，切除所有进料，通知外操关闭所有进料喷嘴器壁手阀
[W]Contact the external operation and change the meter back to nitrogen, and close the control valve PV12601 into the D110 tank for the internal operation
[W]联系外操三器仪表反吹改成氮气，内操关闭进 D110 罐控制阀 PV12601

[N]Cut off the feed of residual oil, open the large scrubber and throw the slurry outside
[N]切断渣油进料，开大洗涤塔油浆外甩
[N]Stop the air pressure machine, set the flare valve to control the reaction pressure, the "two devices" differential pressure control the reverse differential pressure -10kpa
[N]停气压机，放火炬阀控制反应压力，“两器”差压控制倒差压-10kpa
[N]Control the C101 liquid level of the scrubber, and increase the HHKGO flushing oil in the scrubber to speed up the rejection of heavy oil such as residual oil and heavy wax oil.
[N]控制好洗涤塔 C101 液位，洗涤塔 HHKGO 冲洗油开大，加快渣油、重蜡油等重油外甩
[N]Gradually turn off the main air volume of the vaporizer, trigger the PS111 interlock, and cut off the main air
[N]逐步关小气化器主风量，触发 PS111 联锁，切断主风
[N]Check the operation of the related valves of the interlocking ES111, PS111, PS101AB: the vaporizer accident steam XV11601 is on, the main fan outlet damping check valve HV11902 is off, the sludge refining control valve FV11704 is off, the oil slurry is thrown out HV10301 is off, and the raw material pressure is controlled. PV10501 is off, raw material circulation FV10505 is off, gasifier process steam FV11605 is fully opened, quench coke slide valve TIC11003 is off, flush coke slide valve HIC10801 is off, D101 coke unloading slide valve PIC11201 is off
[N]检查联锁 ES111、PS111、PS101AB 相关阀门动作情况：气化器事故蒸汽 XV11601 开，主风机出口阻尼单向阀 HV11902 关，污泥回炼控制阀 FV11704 关，油浆外甩 HV10301 关，原料压控 PV10501 关，原料循环 FV10505 关，气化器工艺蒸汽 FV11605 全开，急冷焦滑阀 TIC11003 关，冲刷焦滑阀 HIC10801 关，D101 卸焦滑阀 PIC11201 关
[N]D101 cut, close the coke inlet valve, close the gas return line
[N]D101 切除，关闭进焦阀，关闭气相返回线
[N]Close the main air to the heater and vaporizer valve, and stop the main fan
[N]关闭主风至加热器、气化器阀门，停主风机
[W]Reaction field operator close the "three vessels" and all the steamer wall valves of the transmission pipeline, and open the condensation discharge slightly
[W]反应外操关闭“三器”以及输送管道所有蒸汽器壁阀门，排凝稍开
[W]Close the "three devices" and the valve on the blower wall of the pipeline instrumentation
[W]关闭“三器”以及输送管道仪表反吹器壁阀门
[N]After the heavy oil such as residual oil is thrown out, stop throwing out, and stop all cycles of fractionation
[N]渣油等重油甩完后，停外甩，停分馏所有循环
[W]Stop all running pumps of the device
[W]停装置所有运行机泵
[W]Close all boundary valves
[W]关闭所有界区阀门

2.6.13.4 Attention 注意事项

It is strictly forbidden to remove the device interlock. Interlock is a protective measure to make the device retreat to the hot standby state. If the device fluctuates, it may cause other more serious and irreversible secondary accidents.

严禁切除装置联锁，联锁是使装置退守至热备状态的保护措施，在装置波动情况下随意切除联锁，可能导致其他更严重的、不可逆次生事故。

After the device is shut down, check the possible mutual channeling process in the device to avoid the mutual channeling of the medium during the re-starting period

装置停车后，检查装置内可能互窜流程，避免再次开工期间造成介质互窜

Starting time requirements after emergency stop

急停后开工时间需求

After the emergency stop of the flexible coking unit, the re-starting time should be analyzed according to different situations:

灵活焦化装置紧急停车后，再次开工时间应根据不同情况分析：

1. If the "three vessels" have not unloaded the coke powder and the steam is in the lowest fluidized state, it is estimated that it will take 3-5 days to restart the work.

若“三器”未卸焦粉，处于蒸汽维持最低流化状态，则再次开工预计需要 3-5 天。

2. If the coke powder of the "three devices" is discharged, it will take 8 days to start work again

若“三器”焦粉卸出，再次开工需要 8 天

3. If the coke powder of the "three devices" is not unloaded, and the "three devices" are in a stuffy bed state, the re-start time cannot be determined, or the coke powder may be piled up and cannot be started normally.

若“三器”焦粉未卸出，“三器”处于闷床状态，再次开工时间无法确定，也可能因为焦粉堆死，无法正常开工。

The main influencing factors for the second start of the flexible coking unit are the status of the "three vessels" coke powder and the status of the steam pipe network.

灵活焦化装置二次开工主要影响因素就是“三器”焦粉的状态，以及蒸汽管网的状态。

3 Technical renovation measures 技改技措规程

3.1 Reduces slurry outside technology 减少油浆外甩技改

3.1.1 Project description and reasons 项目说明及理由

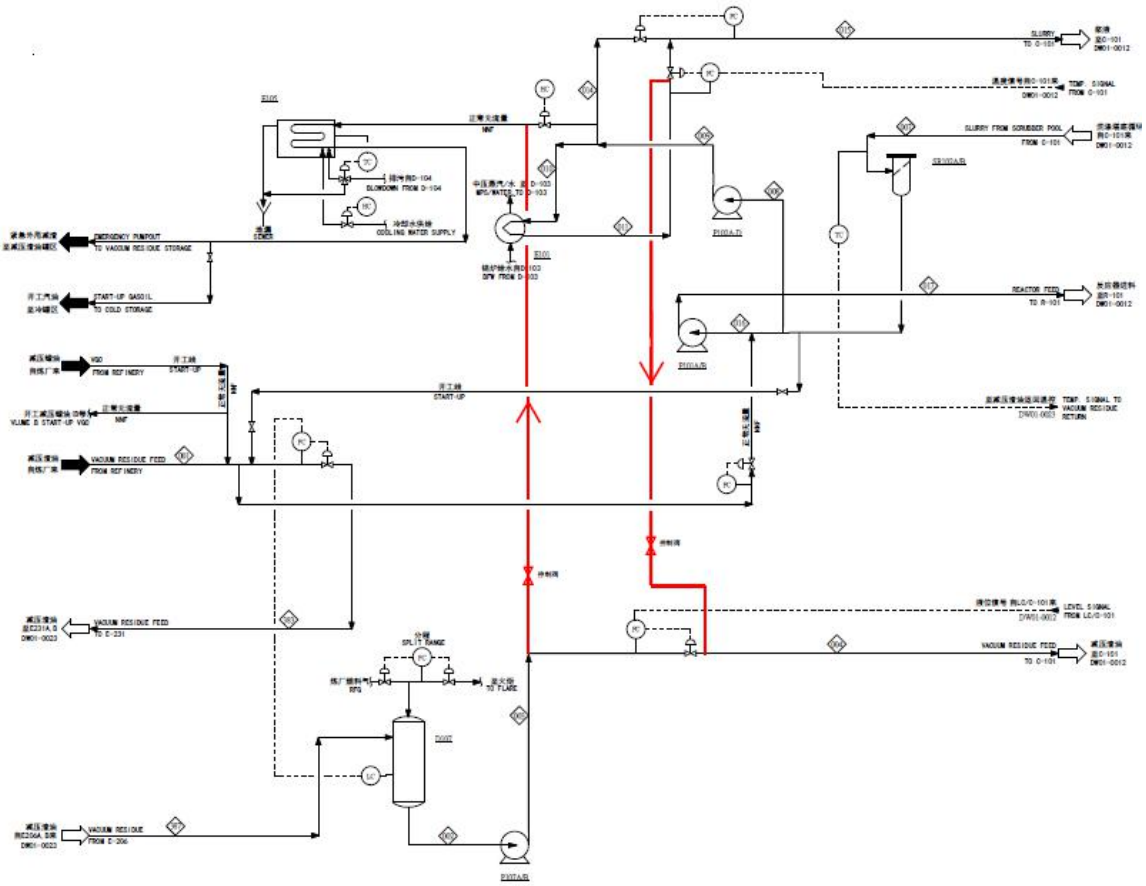
Since the Flexicoking unit start-up, the Feed CCR has been below 20 for a long time.Lower than the design value of 23.6. The oil and gas output of the reactor is larger than the design, and the heat carried from the Reactor to the bottom of the scrubber is more than the design. So the temperature of the scrubber is higher than the design. In order to control the bottom temperature of the scrubber, the long-term slurry is thrown out 30t/h.This resulting in a large amount of heat waste and loss.In the design of the process package, there is no slurry throwing

during normal operation. In order to reduce or even close the slurry throwing, control the temperature of the scrubber and recover the heat of slurry. It is suggested to add two processes: 1.Increase the pipeline flow of E101 cold slurry to the scrubber residue feed to control the temperature at the bottom of the scrubber and recover heat at the same time;2. Increase the flow from the export of the VR pump P107 to the inlet of the slurry cooler E105, and throw out a small amount of fresh VR. The purpose is to ensure that the E105 is smooth.
灵活焦化装置开工至今，原料残炭长期在 20 以下，低于设计值 23.6，反应器油气产量较设计大，自反应器携带入洗涤塔底热量较设计多，洗涤塔温度较设计偏高，为了控制洗涤塔底温度，长期油浆外甩 30t/h，造成大量热量浪费损失。工艺包设计中，正常运行情况下是没有油浆外甩，为了降低甚至关闭油浆外甩，同时又控制洗涤塔温度，回收油浆外甩的热量，建议增加两条工艺流程：1.增加 E101 冷后油浆至洗涤塔渣油进料管线流程，目的是控制洗涤塔底温度，同时回收热量；2.增加渣油泵 P107 出口至油浆冷却器 E105 入口流程，少量新鲜渣油外甩，目的是保证外甩线畅通。

3.1.2 Design content and technical conditions 设计内容和技术条件

Since the Flexicoking unit start-up, the Feed CCR has been below 20 for a long time. Lower than the design value of 23.6. The oil and gas output of the Reactor is larger than the design, and the heat carried from the reactor to the bottom of the scrubber is more than the design, and the temperature of the scrubber is higher than the design. In order to control the bottom temperature of the scrubber, the long-term slurry is thrown out 30t/h.It resulting in a large amount of heat waste and loss.In the design of the process package, there is no slurry throwing during normal operation. In order to reduce or even close the slurry throwing, control the temperature of the scrubber and recover the heat of slurry throwing. It is suggested to add two processes: 1.From the FIC10301 control valve and the upstream hand valve before wiring to the residual control valve FIC10103 and the downstream hand valve, increase the flow control valve. The maximum flow demand 50t/h;2. Increase the flow from the outlet of the VRI pump P107 to the inlet of the slurry cooler E105, connect the connection between FIC10103 and the upstream hand valve to HIC10301 and the downstream hand valve, increase the flow control valve, and the maximum flow demand is 40t/h.
灵活焦化装置开工至今，原料残炭长期在 20 以下，低于设计值 23.6，反应器油气产量较设计大，自反应器携带入洗涤塔底热量较设计多，洗涤塔温度较设计偏高，为了控制洗涤塔底温度，长期油浆外甩 30t/h，造成大量热量浪费损失。工艺包设计中，正常运行情况下是没有油浆外甩，为了降低甚至关闭油浆外甩，同时又控制洗涤塔温度，回收油浆外甩的热量，建议增加两条工艺流程：1.自 FIC10301 控制阀与上游手阀之前接线至渣油控制阀 FIC10103 与下游手阀之间，增加流量控制阀，流量需求最大 50t/h；2.增加渣油泵 P107 出口至油浆冷却器 E105 入口流程，自 FIC10103 与上游手阀之间接线至 HIC10301 与下游手阀之间，增加流量控制阀，流量需求最大 40t/h。

3.1.3 Flow diagram 流程示意图



3.2 Added Reaction feed pump P101C technical modification 增加反应进料泵 P101C 技改

3.2.1 Project description and reasons 项目说明及理由

Flexicoking unit reaction feed pump 1070-P101AB temperature is high, the solid content in the feed is high, the operation conditions are harsh.The normal operation flow and head deviate greatly from the design.The above reasons make the pump run far away from the rated point under bad working conditions, especially the 1070-P101B with high failure rate, frequent maintenance and long-term unsound condition, which seriously affects the stable operation of the Unit.In order to ensure the stable operation of the Unit, it is planned to add a P101C to improve the operating point of the reaction feed pump and increase the reserve rate of the reaction feed pump to improve the stability of the Unit operation.

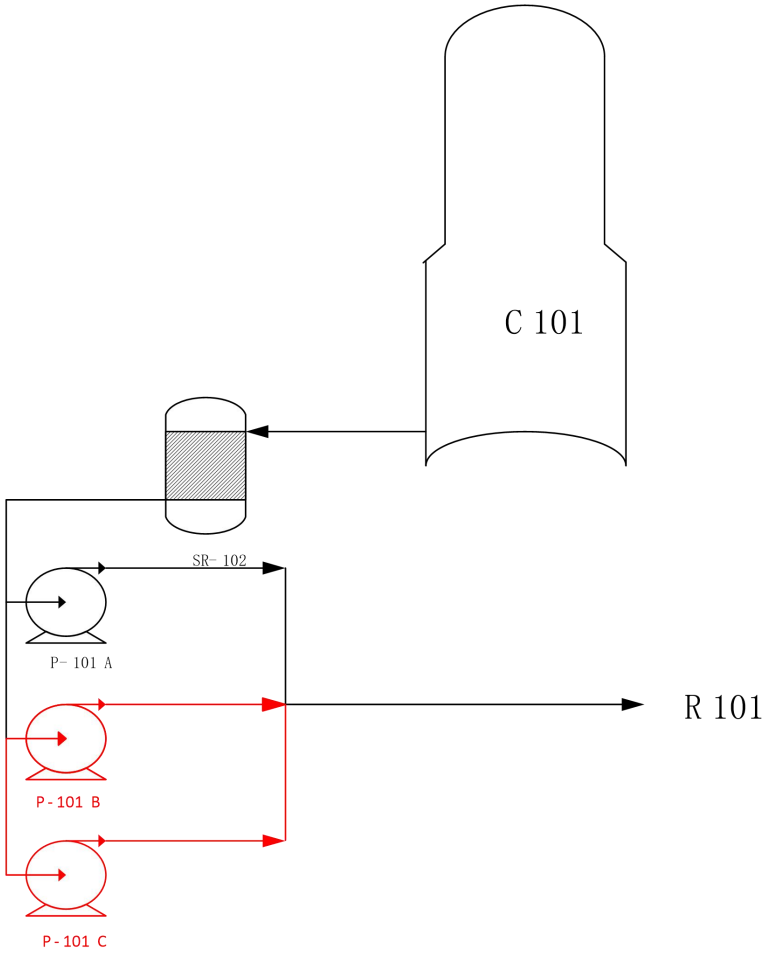
灵活焦化装置反应进料泵 1070-P101AB 介质温度高、介质中固体含量高，运行条件苛刻；正常运行流量、扬程与设计偏差较大。上述原因使该泵运行在远离额定点的恶劣工况下，特别是 1070-P101B 故障率高，检修频繁，长期处于不完好状态，严重影响装置的稳定运行。 为保证装置的稳定运行，拟保增加一台 P101C，改善反应进料泵的运行工况点并增加反应进料泵的备用率，提高装置运行的稳定性。

3.2.2 Design content and technical conditions 设计内容和技术条件

The original reaction feed pump P101AB of the Flexicoking unit should be retained. A P101C should be added according to the data sheet and selection of P101AB, and the import and export pipelines of 1070-P101CD should be added and merged with the original system pipelines respectively.

保留灵活焦化装置原反应进料泵 P101AB，按 P101AB 的数据表及选型增加一台 P101C，新增 1070-P101CD 进出口管线并分别与原系统管线汇合即可。

3.2.3 Flow diagram 流程示意图



3.3 Optimization of diesel and heavy aromatics to Hydrocracking 柴油、重芳烃至加氢裂化工艺流程优化技改

3.3.1 Project description and reasons 项目说明及理由

In order to optimize the system process of the whole plant, reduce the diesel Hydrocracking raw material load (coke diesel), reduce the severity of diesel Hydrocracking operation, increase the output of heavy naphtha and optimize the product structure of the company. The following technical reform measures are put forward (the following technical reform is implemented in the coking battery limit) :Add coke diesel to Hydrocracking Unit.Add heavy aromatics to Hydrocracking Unit.

为了优化全厂系统流程，减轻柴油加氢裂化原料负荷（焦柴），降低柴油加氢操作苛刻度，同时多产增产重石脑油产量，优化公司产品结构，特提出以下技改措施（以下技改均在焦化界区实施）：增设焦柴至加氢裂化流程。增设重芳烃至加氢裂化流程。

3.3.2 Design content and technical conditions 设计内容和技术条件

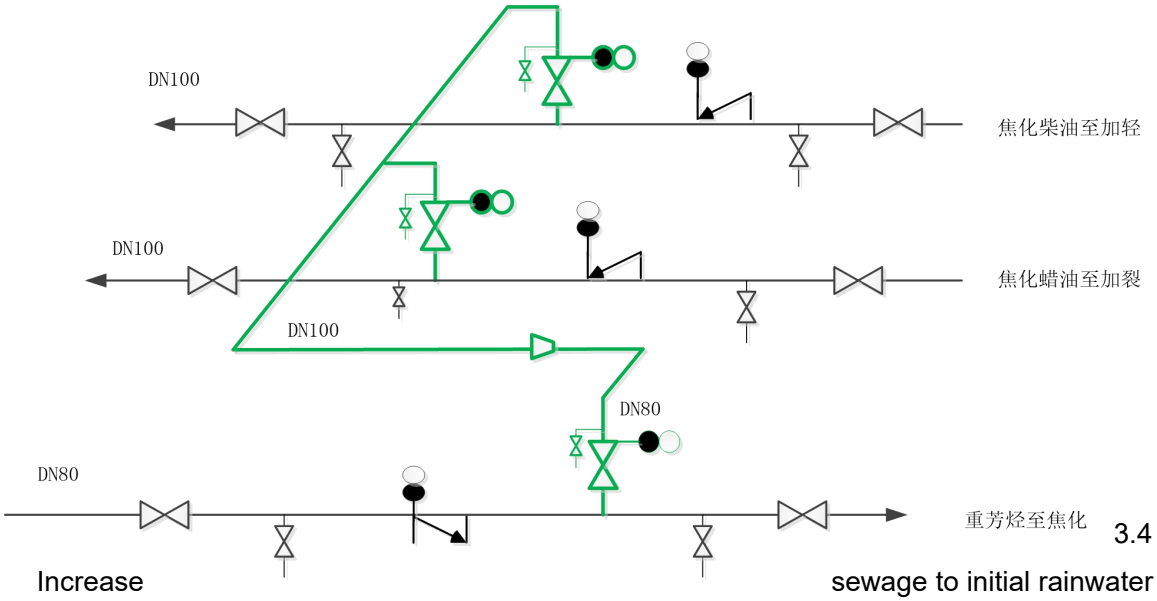
In the coking battery limit from coking diesel to Hydrotreating direct supply pipeline to coking gasoil to Hydrotreating direct supply pipeline process;The pipe diameter is DN100, the pressure is 0.8MPa, and the temperature is 100℃.

In the coking battery limit from heavy aromatic hydrocarbon resmelting pipeline to coking gasoil to hydrogenation direct feed pipeline process;The pipe diameter is DN100, the pressure is 1.5MPa, and the temperature is 40℃.

在焦化界区从焦化柴油至加氢直供管线增设至焦化蜡油至加氢直供料管线流程；管径 DN100，压力 0.8MPa，温度 100℃。

在焦化界区从重芳烃回炼管线增设至焦化蜡油至加氢直供料管线流程；管径 DN100，压力 1.5MPa，温度 40℃。

3.3.3 Flow diagram 流程示意图



3.4 Increase sewage to initial rainwater 增加污水至初期雨水跨线技改

3.4.1 Project description and reasons 项目说明及理由

Flexicoking wastewater 60-70t per hour sent to system sewage pipe with other Units via the same pipeline sent to the sewage treatment Unit.When coking wastewater ammonia nitrogen, volatile sulfide cutting accident cans, can't separate accident tank.The water can only be sent to the accident tank with other sewage from other Units.Or stop other sewager from other Units. It affect the flexibility of sewage treatment.In order to increase the flexibility of sewage treatment, increased a bypass line from sewage to initial rainwater at the coking battery limit. When the ammonia nitrogen and sulfide of the coking wastewater fluctuate.It is directly sent to the accident water through the initial rainwater line to accident tank without affecting the sewage sent out from other Units.

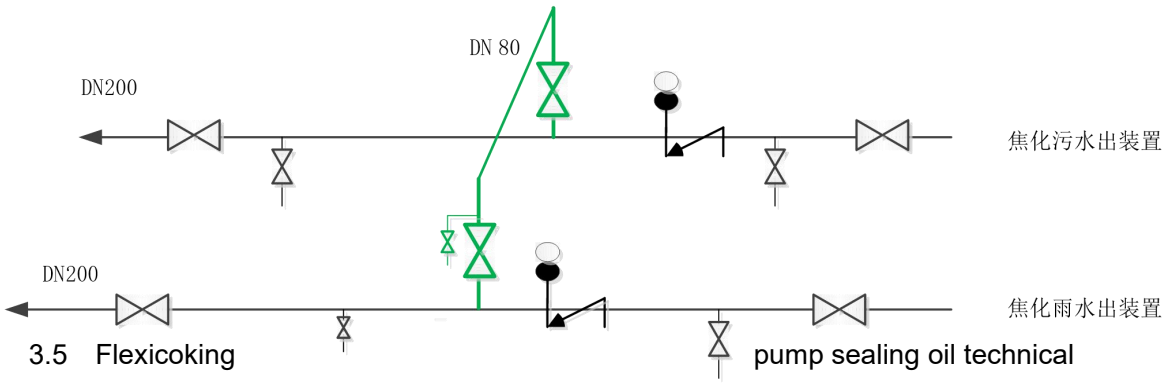
灵活焦化污水每小时 60-70t 送至系统管廊与其他装置污水经同一管线送至污水处理厂，当焦化污水氨氮、硫化物波动切事故罐时，无法单独送事故罐，只能与其他装置污水一同送至事故罐，或停止其他装置外送污水，影响污水处理的灵活性。为了增加污水处理的灵活性，在焦化界区污水线增加至焦化初期雨水跨线，当焦化污水氨氮、硫化物波动切事故罐时，通过初期雨水线直接送至事故罐，不影响其他装置外送污水。

3.4.2 Design content and technical conditions 设计内容和技术条件

Design a bypass line from coking sewage pipeline to rainwater at the Flexicoking battery limit.The pipe diameter is DN80, the pressure is 0.8MPa, and the temperature is 45℃

在焦化界区从焦化污水管线增设至焦化初期雨水跨线流程；管径 DN80，压力 0.8MPa，温度 45℃。

3.4.3 Flow diagram 流程示意图



3.5 Flexicoking pump sealing oil technical improvement 灵活焦化机泵封油技改

3.5.1 Project description and reasons 项目说明及理由

The sealing oil for the pump of the Flexicoking unit is provided by the LKGO whick produced by the Flexicoking unit during normal operation.And by the gas oil from the Storage during start-up.Because there is some coke powder in LKGO.The coke powder entering the machine seal is easy to cause seal damage and leakage. In order to extend the life of the machine seal and stabilize the operation of pumps.It is now applied to increase the atmospheric and vacuum gas oil (Storage supply) to the Flexicoking unit as sealing oil.

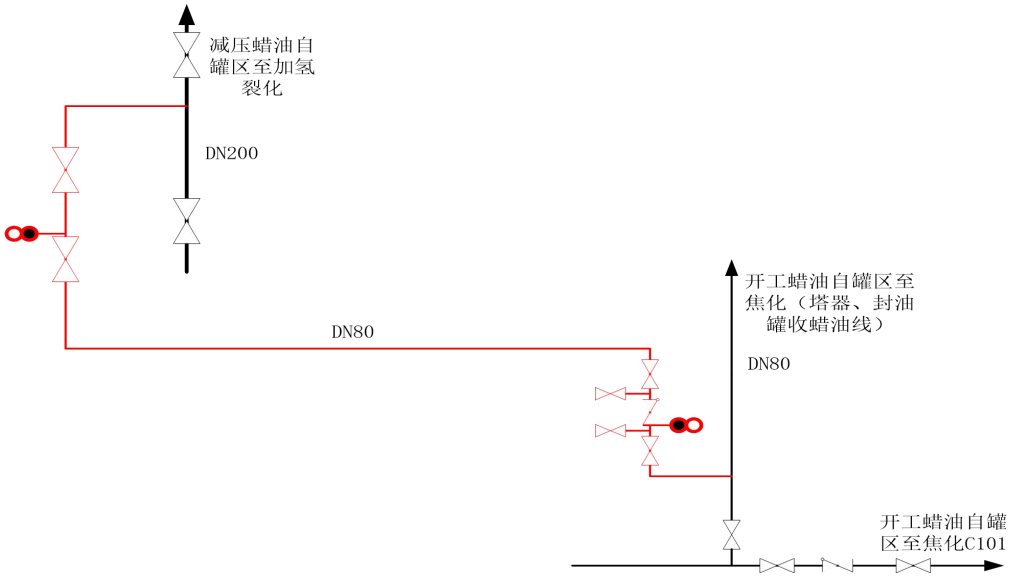
灵活焦化装置机泵封油正常运行时由焦化自产轻蜡油提供，开工期间由罐区收蜡油提供。由于焦化自产轻蜡油含有焦粉，焦粉进入机封容易造成密封损坏、泄露，为了延长机封寿命，稳定装置机泵运行，现申请增加常减压蜡油（罐区供）至焦化做封油流程。

3.5.2 Design content and technical conditions 设计内容和技术条件

Increase a gas oil pipline from the the Hydrocracking battery limit to Flexicoking unit battery limit.The pipe diameter is DN80, the pressure is 1.1MPa, and the temperature is 120℃.

在加氢裂化界区从减压蜡油自罐区管线双阀间增设至灵活焦化界区收蜡油管线；管径 DN80，压力 1.1MPa，温度 120℃

3.5.3 Flow diagram 流程示意图



3.6 Thick slurry to Power station Boiler technical improvement 灵活焦化稠浆液至电站锅炉技改

3.6.1 Project description and reasons 项目说明及理由

The wet coke system of the flexicoking unit produces about 15 tons of wet coke every day. Which is delivered to the coal bunker of the Power station by truck every day. At present, the problem of wet coke combustion and feeding is not smooth in the power station, and the operation cost of the wet coke system is high (large amount of polymer filling) and workload is large (wet coke transportation).Now we apply to add a pipeline to send the thick slurry of the wet coke system directly to the power station, and then enter to the bottom of the incinerator through the existing oil nozzle of the power station. The combustion is full, and the impact on the incinerator is minimal. The polymer can significantly reduce.The filter press can be discontinued (for standby), the wet coke can achieve zero output, and the wet coke transportation work can be reduced at the same time.

灵活焦化装置湿焦系统每天产生湿焦 15 吨左右，由槽车每天送至电站煤仓，目前出现湿焦在电站燃烧下料不畅问题，且湿焦系统的运行成本高（絮凝剂加注量大）、工作量大（湿焦运送）。现申请增加管线，将湿焦系统稠浆液直接送至电站，经电站现有油火嘴进入焚烧炉底部，燃烧充分，对焚烧炉影响最小，絮凝剂可以大幅的减少加注，压滤机可以停用（备用），湿焦可以实现零产出，同时降低湿焦运送工作量。

3.6.2 Design content and technical conditions 设计内容和技术条件

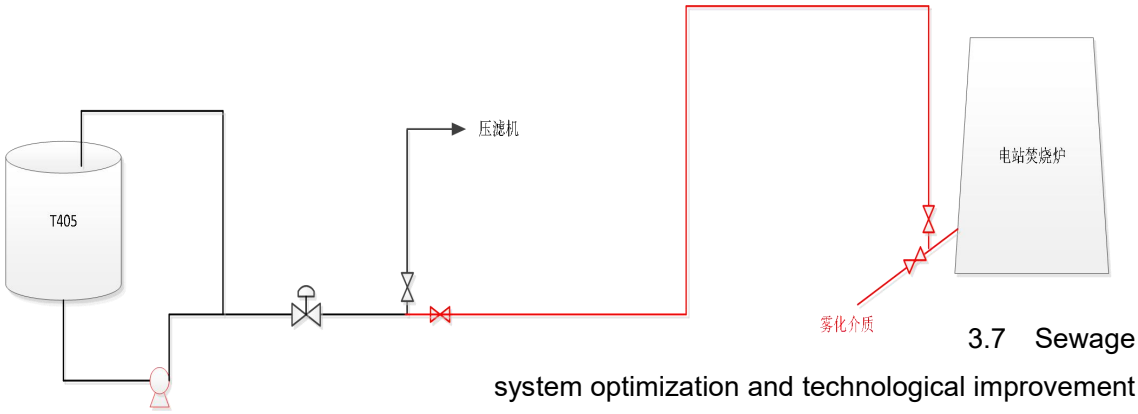
A pipeline is added at the outlet of the slurry pump P403 of the wet coke system to the boiler of the Power station. The power station uses the existing oil nozzle (without atomizing medium), and the thick slurry directly enters the furnace through the oil nozzle for mixed combustion with coal.

Properties of thick slurry: water content ≥95% (design), coke content: 24200.0 mg/L (measured), pH value 7-7.5, ammonia nitrogen: ≤50mg/L, sulfide: fluctuate greatly, about 120 mg/L at present.Temperature 40℃, pressure: 0.3-0.58MPa, flow: 3-7t/h.

在湿焦系统浆液泵 P403 出口增设管线至电站锅炉，电站利旧现有油火嘴（无需雾化介质），稠浆液经油火嘴直接进入炉膛与煤混合燃烧。

稠浆液性质：含水量≥95%（设计），焦粉含量：24200.0 mg/L（实测），PH 值 7-7.5，氨氮：≤50mg/L，硫化物：波动较大，目前 120 mg/L 左右。温度 40℃，压力：0.3-0.58MPa，流量：3-7t/h。

3.6.3 Flow diagram 流程示意图



3.7 Sewage system optimization and technological improvement 灵活焦化污水系统优化技改

3.7.1 Project description and reasons 项目说明及理由

Flexicoking Unit has been started so far, the CCR of VR has been on the low side for a long time and fluctuates greatly, while the Flexicoking sewage system is large and complex, the pH value of sewage fluctuates greatly, it is difficult to control, and the ammonia nitrogen and sulfide of the exported sewage fluctuates frequently. The large pH fluctuation will also affect the amount of polymer, and may even lead to the black of the exported sewage.In addition, because of the special environment of Flexicoking unit, the coking wastewater pool will deposit coke powder, which will accumulate in the bottom of the pool for a long time, and it is difficult to

deal with.In order to optimize the whole sewage system, the following technical improvement measures are put forward:

1. Add an online pH meter to the outlet sewage pipeline of stripper C301 to facilitate the operator to adjust the pH value of the system from the source in time, so as to ensure that the ammonia nitrogen and sulfide of the outlet sewage are qualified (to avoid fluctuations).Objective: At present, manual pH test paper is used to measure pH value on site. The measurement error is large, the workload is large, and it is easy to cause the fluctuation of sewage index. Therefore, we apply to increase the online pH meter.

2. Add pumps and pipelines at the side of the overflow tank of the coke sewage pool to send the coke sewage and the deposited coke powder to T403/404.Objective: A large amount of coke powder is deposited at the bottom of the wastewater tank containing coke, which is difficult to clean up. Therefore, it is applied to pump the coke mud from the bottom of the tank into the wet coke system to remove the coke powder.

3. Add the process of Venturi D402 sewage to T403/404 to avoid the discharge of sewage containing coke powder to the sewage tank containing coke powder.Objective: At present, small Venturi D402 sewage water (containing coke powder) is directly discharged to the coke containing sewage pool, which will accelerate the deposition of coke powder in the coke containing sewage pool. Therefore, it is applied to add a pipeline to send D402 sewage water to the wet coke system to remove the coke powder.

灵活焦化装置开工至今，原料残炭长期偏低且波动大，而灵活焦化污水系统大且复杂，污水 PH 值波动大、控制困难，外送污水氨氮、硫化物频繁波动，PH 波动大还会影响絮凝剂使用量，甚至可能导致外送污水发黑。另外，由于灵活焦化装置特殊环境，焦化的含焦污水池会沉积焦粉，长期积累在池子底部，处理困难。为了优化整个污水系统，特提出以下技改措施：

1.在汽提塔 C301 外送污水管线上增加在线 PH 计，便于操作工及时从源头调整系统 PH 值，以保证外送污水氨氮、硫化物合格（避免波动）。目的：目前人工用 PH 试纸现场测量 PH 值，测量误差大、工作量大，容易造成污水指标波动，故申请增加在线 PH 计。

2.在含焦污水池溢流槽侧增加泵及管道，将焦池污水及沉积的焦粉送至 T403/404。目的：含焦污水池底部沉积大量焦粉，清理困难，故申请增加机泵抽出池底焦泥进湿焦系统脱除焦粉。

3.增加小文丘里 D402 污水至 T403/404 流程，避免含焦粉污水排至含焦污水池。目的：目前小文丘里 D402 污水（含焦粉）直排至含焦污水池，这将加快焦粉在含焦污水池沉积，故申请增加管线将 D402 污水送至湿焦系统，脱除焦粉。

3.7.2 Design content and technical conditions 设计内容和技术条件

1.An online pH meter is added on the C301 outward sewage pipeline of stripper to facilitate the operator to adjust the pH value of the system from the source in time, so as to ensure that the ammonia nitrogen and sulfur compounds of the outward sewage are qualified (to avoid fluctuations).PH meter range requirements: 6-9, sewage volume: 60t/h, water temperature ≤50℃, design pressure 1.0MPa

2. Add pumps and pipelines at the side of the overflow tank of the coke sewage pool to send the coke sewage and the deposited coke powder to T403/404.P-04 pump required outlet pressure 0.6MPa, flow 20t/h, sewage coke content 30%(W);The design pressure of all pipelines is 1.0MPa, and the material of pipelines is carbon steel.

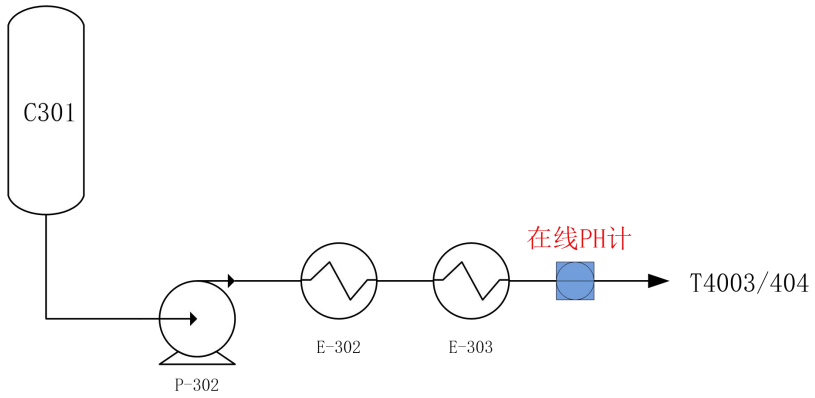
Add the process of Little Venturi D402 sewage to T403/404 to avoid the discharge of sewage containing coke powder to the sewage tank containing coke powder.The design pressure of the pipeline is 1.0MPa, the material of the pipeline is carbon steel, the diameter of the pipeline is DN50.

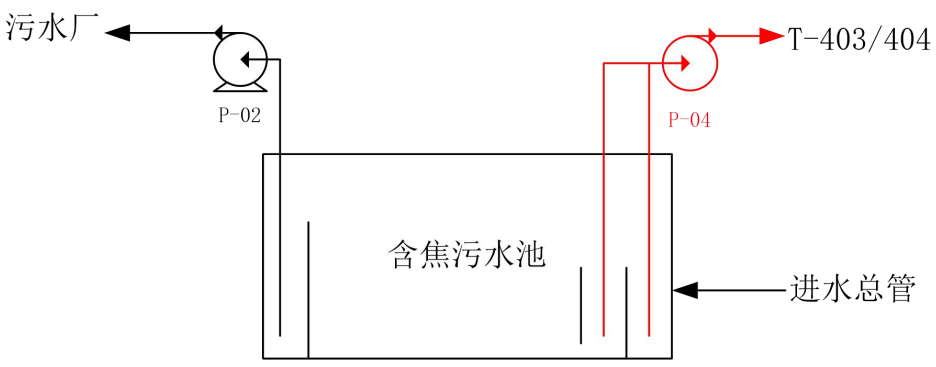
1.在汽提塔 C301 外送污水管线上增加在线 PH 计，便于操作工及时从源头调整系统 PH 值，以保证外送污水氨氮、硫化物合格（避免波动）。PH 计量程要求：6-9,污水量：60t/h，水温≤50℃，设计压力 1.0MPa

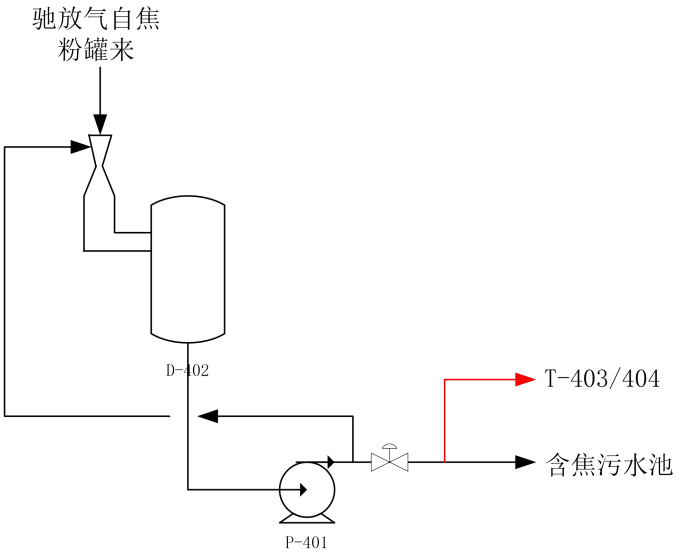
2.在含焦污水池溢流槽侧增加泵及管道，将焦池污水及沉积的焦粉送至 T403/404。P-04 泵要求出口压力 0.6MPa，流量 20t/h，污水含焦量 30%(w)；所有管线设计压力 1.0MPa，管道材质：碳钢。

增加小文丘里 D402 污水至 T403/404 流程，避免含焦粉污水排至含焦污水池。管线设计压力 1.0MPa，管道材质：碳钢，管径 DN50。

3.7.3 Flow diagram 流程示意图







3.8 Process optimization for acidic water system 灵活焦化装置含焦酸性水流程优化技改

3.8.1 Project description and reasons 项目说明及理由

Flexicoking Unit DCCT II tower C303 acidic water contains a small amount of coke powder, and the acid water into the acidic water stripping unit easily deposited downstream blocking pipeline, equipment, tray, influence of acidic water stripping device runs for a long period of time, the acid gas stripping device has appeared the problem above, hereby apply for the acidic water to the flexible coking in the slurry stripping tower (C301) for processing, ease of acidic water stripping device operation load.

灵活焦化装置二级接触冷却塔 C303 酸性水含有少量焦粉，此酸性水进入下游酸性水汽提装置容易沉积堵塞管线、设备、塔盘，影响酸性水汽提装置长周期运行，目前酸性气汽提装置已经出现以上问题，现申请将此酸性水送至灵活焦化的浆液汽提塔（C301）进行处理，减轻酸性水汽提装置的运行负荷。

3.8.2 Design content and technical conditions 设计内容和技术条件

Starting from the downstream of the C303 acid water control valve FIC31701, the front of the hand valve throws the acidic water to the flexible gas first-stage water washing tower (low C302). After mixing with the first-stage acid water, the acidic water is finally sent to the grout stripper for treatment through the first-stage water washing water process.

Acid water property (C303) : flow 15-30t/h, pH 8, ammonia nitrogen 200mg/L, sulfide 1500mg/L, coke content: 5%;

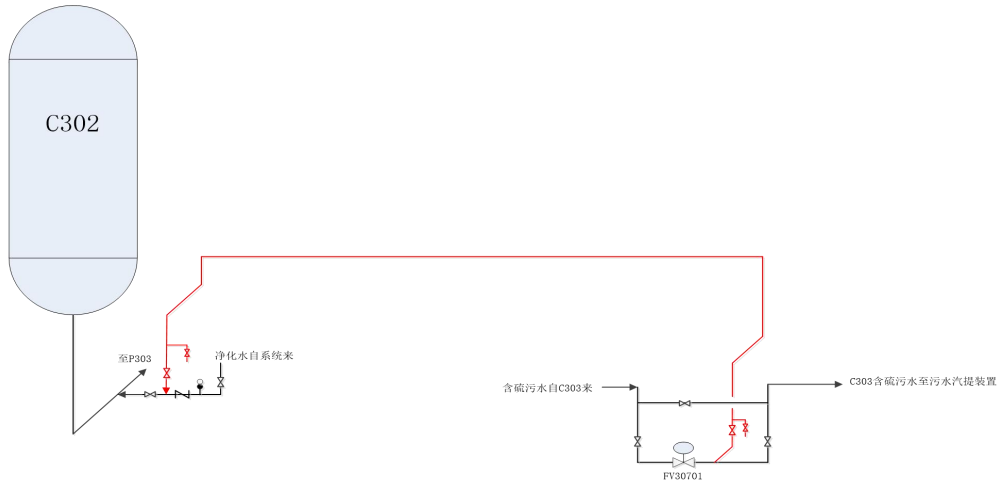
Coke particle size: 0~50μm.

自 C303 酸性水控制阀 FIC31701 下游手阀前甩头，引酸性水至灵活气一级水洗塔内（C302 低），与一级酸性水混合后利用一级水洗水流程最终将酸性水送至浆液汽提塔内进行处理。

酸性水性质（C303）：流量 15-30t/h，PH 8，氨氮 200mg/L，硫化物 1500mg/L，焦粉含量：5%；

焦粉粒径：0~50μm。

3.8.3 Flow diagram 流程示意图



4 Technical regulations for safety, environmental protection and health 安全、环保、健康技术规定

4.1 Safety requirements for plant entry 进装置的安全要求

4.1.1 Safety requirements 安全要求

4.1.1.1 The personnel entering production plant shall wear proper PPEs, and working after drinking shall be prohibited. All workers must frequently inspect, analyze and communicate the work, and must not sleep, read books and papers not related to the work and shout aloud during work.

进入生产装置人员须穿戴好劳动保护用品，不得酒后上岗。在岗期间做到三勤（勤检查、勤分析、勤联系）和三不（不打瞌睡、不看与生产无关的书报、不随便大声叫喊）。

4.1.1.2 The persons not related to the production shall not be allowed to enter the production plant. Relevant permit shall be obtained for all vehicles (except the vehicles for fire control, gas defense and ambulance) before entering the plant, and no vehicle is allowed to enter the plant without permit.

与生产装置无关人员一律不准进入。一切机动车辆（消防、气防及急救护车辆除外）需办理经批准的许可证进入装置区内，未经批准不得进入装置。

4.1.1.3 The visiting apprentices and new employees must pass Level III safety education. The equipment and facilities shall not be operated without permission. New employees shall not begin their work before obtaining the relevant certificates.
外来实习人员和新入职员工，须通过三级安全培训教育，并考试合格。未经允许不得动用装置区域内所有设备设施。新员工未取得上岗操作证，不得上岗操作和单独操作高风险作业。

4.1.1.4 Placing clothes, wiping cloth and other flammable material on high temperature equipment and pipeline shall be strictly prohibited.
高温设备和管线上严禁放衣服、抹布及其它易燃物。

4.1.1.5 The workers on duty shall properly maintain and manage the safety and fire control facilities; the fire control facilities (boxes) shall not be used for other purpose.
当班员工应做好安全消防设施、器材的维护管理工作，消防器材（箱）不得挪作它用。

4.1.1.6 The operators shall stick to their posts in case of any accident, and perform the work according to instructions of foreman.
装置发生事故时，操作人员应坚守岗位及时汇报，听从班长统一指挥，按事故应急预案进行处理。

4.1.1.7 Protection measures and remarkable safety label shall be provided for H_2S sampling points; the sampler shall be inspected and suitable PPEs shall be used before sampling.
含硫化氢的介质采样点要注意防止 H_2S 中毒，采样点应挂有明显的安全标志牌，采样前要认真检查采样器具是否完好，并佩戴适宜的防毒器具。

4.1.1.8 The workers shall participate in the team safety activities of at least twice each month, and the 1 hour per time; the management personnel shall participate in the team safety activities at least once per month.
班组岗位人员每月至少进行 2 次班组安全活动(1、安全知识、工艺设备知识等学习课程。2、事故应急预案演练)每次至少 1 小时，管理人员每月参加 1 次班组安全活动。

4.1.2 Regulations on toxicosis and asphyxiation prevention 防止中毒窒息规定

4.1.2.1 When entering the confined space with toxic and harmful gas or anoxygenous atmosphere, the manhole shall be opened for natural ventilation, purged and isolated with blind, the sample data shall be analyzed and accepted, the work permit for confined space entry shall be obtained, and qualified supervisor shall be designated.
进入含有毒有害气体或缺氧环境的有限空间内作业时，应对设备内部进行蒸汽吹扫、蒸煮置换后加盲板隔离，打开人孔自然通风，采样分析数据合格，办理进入受限作业许可证，指派经过培训合格的监护人。

4.1.2.2 Reliable PPEs must be used when working in toxic and asphyxiant atmosphere.
在有中毒和窒息环境等高风险作业时，作业人员必须佩带空气呼吸器等可靠的劳动防护用品进行作业。

4.1.2.3 Risks assessment shall be performed, and emergency response plan and necessary PPEs shall be prepared for positions with toxic and asphyxiant atmosphere.

对有毒或有窒息危险的岗位，要进行风险评价，制订应急计划和配备必要的劳动防护用品。

4.1.2.4 The places with toxic and harmful material shall be periodically inspected and relevant measures shall be adopted to assure that such places conform to the standard of Brunei.
要定期对装置区域内有毒有害场所进行检测，采取防范措施，使之符合文莱国家标准。

4.1.2.5 The toxic material and relevant PPEs must be managed by dedicated persons and periodically inspected.
对各类有毒物品和防毒器具必须有专人管理，并定期检查。

4.1.2.6 The gas detection equipment and instrument shall be periodically inspected and calibrated to assure they are in good conditions.
气体检测设备、仪器要定期检查、校验，保持完好。

4.1.2.7 The persons suffering from toxicosis and asphyxia shall be timely treated with correct method.
发生人员中毒、窒息时，要及时报警，及时救护、及时启用应急处置预案。

4.1.3 Regulations on H_2S toxicosis prevention 防止硫化氢中毒规定

4.1.3.1 The persons handling H_2S must participate in the education training for H_2S toxicosis and emergency rescue and pass the test before begin the work.
从事接触硫化氢人员上岗前须接受有关硫化氢中毒及救护知识的教育培训，经考试合格后，方准上岗作业。

4.1.3.2 Each department shall establish the layout plan for area with H2S, and place warning board at hazardous place.
装置要建立硫化氢存在区域平面分布图，并在危险作业点设置警示牌。

4.1.3.3 Proper PPE shall be provided and managed according to the H_2S exposure hazards to working post and environment.
按照岗位和工作环境接触硫化氢的危害，配备符合标准要求的劳动防护用品，加强管理。

4.1.3.4 The production shall be performed in enclosed system, and the sealing leakage points shall be periodically inspected, so as to assure the H_2S concentration in plant area conforming to the standards of Brunei.
密闭化生产，定期检测密封泄漏点，确保生产装置区域作业环境硫化氢浓度符合文莱国家标准。

4.1.3.5 The plant or area with risks of H_2S leakage shall be provided with harmful and toxic gas detector and alarm, and such detectors and alarms shall be 100% in good conditions. 在有硫化氢泄漏危险的装置或区域，安装有毒有害检测报警器，确保 100%完好投用。

4.1.3.6 If the workers are required to enter the equipment and vessel for maintenance, the work can be performed after purging, blind installation, sampling and analysis, obtaining work permit for confined space. Feasible construction procedure and safety measures must be prepared before work under special cases.
需要进入设备、容器检修，一般要经过吹扫、置换、加盲板、采样分析合格后、办理受限空间作业许可证才能作业。但特殊情况，必须要制订切实可行的施工方案和安全措施，方可作业。

4.1.3.7 H_2S protection mask shall be used for activities of sampling, inspection, dewatering, leakage repair, maintenance and etc., and at least two persons shall be present at site, one works in confined space and one supervise the work.
从事对存有硫化氢介质的采样、检尺、脱水、堵漏、检修等作业时，要佩戴防硫化氢防护面具，应有两人同时到现场，站在上风口，一人作业，一人监护。
4.1.3.8 When working in H_2S contaminated area with special PPE, the PPE shall not be removed before leaving the hazardous area to avoid toxicosis.
在硫化氢污染区佩戴特种防护用品作业时，在未脱离危险区域前严禁摘下防护用具，以防中毒。

4.1.4 Regulations on electrostatic hazards prevention 防止静电危害规定

4.1.4.1 The flammable and explosive material flow shall be strictly controlled according to process requirements, and blending and agitating with compressed air shall be prohibited.
严格按照工艺要求控制输送易燃易爆介质流速，禁止使用压缩空气调合、搅拌。
4.1.4.2 The flammable and explosive fluid shall be hold for a period of time after transfer, and then it shall be inspected, tested and sampled.
易燃易爆流体停止输送后，须静止一定时间，方可进行检尺、测温、采样等作业。
4.1.4.3 Explosion proof tools shall be used when filling the flammable and explosive fluid into tanks.
对易燃易爆流体贮罐进油操作，应使用防爆工具。
4.1.4.4 Fill oil from top of road tanker shall be prohibited, and the tanker shall be filled under level with loading arm. Oil products shall not be loaded in plant or tank farm.
禁止从油槽车罐上部输油，应采用槽车罐下部装车。并设有接地保护线。严禁在装置或罐区灌装油品。
4.1.4.5 Entering flammable and explosive area with clothes may generate electrostatics, and putting on/taking off clothes or wiping equipment with chemical fiber fabrics shall be prohibited.
严禁穿易产生静电的服装进入易燃易爆区，不得在该区穿、脱衣或用化纤织物擦拭设备。
4.1.4.6 The humidity of the area that may generate chemical fiber and powder statics shall be controlled within the specified range.
容易产生化纤和粉体静电的环境，其湿度必须控制在规定范围以内。
4.1.4.7 The equipment within flammable and explosive area that may generate chemical fiber and powder electrostatics must be properly grounded.
易燃易爆区易产生化纤和粉体静电的装置，必须做好设备防静电接地设施。
4.1.4.8 The measures for electrostatics removal shall be adopted for material and packages that may generate electrostatics; the plant and tank farm shall be provided with human body electrostatic eliminator.
易产生静电的介质输送和包装，须采取消除静电或泄出静电措施，装置、储罐区设置人体静电消除器。

41.4.9 The measures and devices against electrostatics shall be inspected and filed periodically by dedicated person.
防静电措施和设备要指定专人定期进行检查并建立登记存档。

4.1.5 Regulations on LPG safety 液化石油气安全规定

4.1.5.1 Operating LPG equipment and pipeline above the specified temperature, pressure, speed and load shall be strictly prohibited.
对液化石油气的设备及管线严禁超温、超压、超流速、超负荷运行。
4.1.5.2 The LPG equipment and pipeline shall be inspected at random intervals for leakage; proper measures shall be immediately adopted in case of any leakage. The relevant detection and alarm facilities shall be periodically inspected to assure the flexibility and reliability.
不定期检测液化气设备与管线，及时检测泄漏点，一旦发现泄漏，立即采取措施，以防事态扩大。相关检测报警设施必须定期检查试验，确保灵敏可靠。
4.1.5.3 LPG shall not be vented without permission; LPG shall be vented via HP/LP flare pipeline network for combustion.
液化石油气不准随意放空，要通过高低压火炬管网排放处理。
4.1.5.4 Safety education shall be performed for personnel handling LPG; emergency response procedure rehearsal shall be properly organized, recorded and filed.
对从事液化石油气作业人员定期进行安全教育，组织事故预案演练，建立记录、档案。
4.1.5.5 The plant and area handling LGP must be provided with flammable gas detector, alarm, and necessary protection devices.
有液化石油气的装置和区域，必须配备可燃气体监测报警器和必要的保护装置。
4.1.5.6 The LPG equipment and pipeline shall be periodically inspected, tested and recorded according to the post responsibility system.
认真执行岗位责任制，对在用的液化石油气设备与管线要认真进行巡回和定期专业检查、检测，作好记录。
4.1.5.7 The equipment for LPG storage and transfer shall be provided with complete safety attachments, periodically inspected to assure the flexibility and reliability.
储存、输送液化石油气的设备要配齐各种安全附件，定期检修检验，保证灵敏可靠。
3.1.5.8 The problems and potential hazards shall be timely treated to avoid accident.
发现问题及隐患要及时处理，采取可靠措施，防止事故发生。

4.1.6 Regulations on work safety 操作安全技术规定

4.1.6.1 Workers of relevant positions must be strictly performed according to the process card, operation regulations and technical specification.
岗位人员要严格执行工艺卡片和岗位操作法、技术规程的规定，禁止违章操作。

4.1.6.2 The startup and shutdown procedure shall be strictly observed, and the equipment temperature and pressure shall be increased and decreased according to the specified speed.
严格执行开停工方案，按照操作步骤控制设备升温升压、降温降压速度。

4.1.6.3 The plant interlock operation management regulations must be observed, the interlocks shall not be overridden without permission, and the control methods or control parameters shall not be changed without permission. When instrument operator operates the automation instrument, confirmation of technical personnel of operation department shall be required and the relevant formalities shall be handled.
严格执行装置联锁操作管理规定，不得任意切除联锁，不得任意更改控制方案或修改控制参数；仪表操作工处理自保系统仪表时，须经运行部门技术人员确认，并办理相关手续。

4.1.6.4 The technical regulations for large machinery unit startup, furnace startup, gas tightness test, purging, steam introduction, gas introduction, heat exchanger switch, blowdown and etc. shall be strictly observed.
严格执行开启大机组、点炉、气密、置换、引蒸汽、引瓦斯、换热器投用、排污等有关技术规定。

4.1.6.5 The audio-visual alarm, flammable gas detector, portable flammable gas detector and alarm, portable H_2S gas detection and alarm shall be periodically inspected according to the regulations of Company.
装置内声光报警、可燃气体检测仪、便携式可燃气体检测报警仪、便携式 H_2S 气体检测报警仪等按公司规定进行按期提交检验。

4.1.6.6 Work permit must be obtained for confined space entry; the work can be begun only after the toxic gas, oxygen and flammable gas analysis is performed, and dedicated supervision person is designated.
进入受限空间要办理作业许可证，事先应进行有毒、氧含量及可燃气体介质分析合格后方可作业，并有专人在现场监护。

4.1.6.7 The H_2S sampling point shall be marked with eye-catching warning board, and the sampler shall be checked for completeness before work; the samples shall be taken by two persons, one takes samples and the other provides protection; the work must be performed at upwind direction; and the positive pressure breather shall be used during working. The manual valve shall be opened slowly during sampling; if the valve is difficult to open, knocking the valve with spanner shall be prohibited.
含 H_2S 的采样点应挂有明显的警示牌，采样前要认真检查采样器是否完好，采样时须两人进行操作，一人采样，一人监护，且须站在上风向，佩带好正压式空气呼吸器等防护用品。采样过程中，手阀应慢慢打开，如阀难以打开，切忌用扳手敲打阀门。

4.2 Regulations on Equipment safety 设备安全技术规定

4.2.1 The HSE equipment shall be inspected strictly according to the requirements, and confirmed via signature item by item, managed by a closed-loop manner;
严格执行 HSE 设备设施检查要求，逐项确认签字跟踪整改，闭环管理；

4.2.2 Before closing the column and vessel manholes, make thorough check to assure no impurities in the equipment. For equipment not inspected against the checklist, open the manhole already closed for inspection;
封闭塔、容器的人孔时，要认真检查，保证设备内不留任何杂物；未经检查表确认的设备，已封人孔必须打开进行检查；

4.2.3 The startup purging and pressure test of column and pipeline shall be performed strictly according to the commissioning, purging and pressure test procedure;
塔、管线开工吹扫、试压要严格执行贯通、吹扫、试压方案；

4.2.4 The safety valve, pressure gauge, level gauge and other primary detection and measurement instrument must be timely commissioned before startup purging.
开工吹扫前要及时、正确投用安全阀、压力表、液面计等一次检测、测量仪表；

4.2.5 Pipeline shall be inspected before the steam and water is introduced; the steam shall be introduced slowly to avoid water hammer;
引汽、引水要先检查管路，引汽要缓慢进行，防止水击；

4.2.6 The equipment temperature and pressure shall be increased strictly according to the operation specification to avoid damaging the equipment;
设备升温、升压要严格按操作规程进行，防止损坏设备；

4.2.7 The rotary equipment shall operate the equipment according to the operation specification; so that the problem can be timely identified and solved during startup;
转动设备运行要按照设备操作规程进行，在启动过程中做到及时检查、发现问题及时解决；

4.2.8 The heat exchanger must be put into service according to the specification; the shell side shall not be closed when the media passes through the tube side to avoid overpressure;
冷换设备投用必须按规程操作，当换热器管程走介质时，则壳程不得封闭，防止憋压；

4.2.9 The equipment shall be protected to avoid vacuum conditions during startup; over temperature and overpressure shall be avoided to prevent equipment and pipeline from being damaged;
在开工过程中，严防各设备抽负压，严禁设备超温、超压，防止损坏设备管线；

4.2.10 The flow meter and control valve shall be changed to sub-line during introducing the steam to system.

在蒸汽贯通时应将流量计、调节阀改付线。

4.3 Fire fighting 消防

4.3.1 Introduction fire control knowledge 消防知识概述

4.3.1.1 Combustion 燃烧

(1) Combustion: the combustion is exothermic reaction between material and oxidizer, flame and visible light will be released at same time.
燃烧：是物质与氧化剂之间的放热反应，它通常会同时释放出火焰或可见光。

(2) Flammability: the flammability of oil products shall be determined according to their flash point, ignition point, and self-ignition points; when the oil products and oxidizer (oxygen or air) are exposed to fire source or certain temperature conditions, the products may be ignited.
燃烧性：石油产品的燃烧性是根据其闪点、燃点和自燃点的高低而决定的，当它们与助燃物（氧或空气）遇到火源或在一定的温度条件下即发生燃烧。

(3) The three conditions for combustion include flammable material, oxidizer, and ignition source.
燃烧的三个必要条件：可燃物、助燃物、引火源。

(4) The common ignition sources include open fire, electric arc (sparking), lightning, high temperature, pyrophoric material.
常见的引火源：明火、电弧（电火花）、雷击、高温、自然引燃物。

(5) Type of combustion:

1. Fire: including ignition (forced fire) and self-combustion;
2. Explosion.

燃烧的类型：（1）着火。包括点燃（强迫着火）和自然。（2）爆炸。

(6) Combustion includes gas combustion, liquid combustion and solid combustion.
燃烧包括气体燃烧、液体燃烧和固体燃烧。

(7) Gas combustion includes diffusion combustion (gas oven, oxygen-acetylene and etc.) and premix combustion (explosive combustion).
气体燃烧包括扩散燃烧（煤气灶、氧气乙炔等）和预混燃烧（爆炸式燃烧）。

(8) Liquid combustion may cause flash burning (flammable liquid), boiling over (heavy oil, such as crude oil), and splashing (heavy oil, such as crude oil).

液体燃烧可产生闪燃（易燃液体）、沸溢（重质油品如原油）和喷溅（重质油品如原油）。

(9) Solid combustion can be classified as

1. evaporation combustion (S, K, candle);
2. Surface combustion (charcoal);
3. decomposition combustion (wood, coal, synthetic plastics and etc.);
4. smoking combustion (ignition);
5. power combustion (explosion) (explosive material)

固体燃烧可分为（1）蒸发燃烧（S、K、蜡烛）；（2）表面燃烧（木炭）；（3）分解燃烧（木材、煤、合成塑料等）；（4）熏烟燃烧（引燃）；（5）动力燃烧（爆炸）（炸药等）

(10) Main combustion products: CO, CO_2, CH_4, C_2H_4, H_2 and etc. Hazards of combustion products:

1) Toxicosis: stimulus to respiratory system;
2) Short breath, increased inhaling quantity of smoke, headache, obnubilation and etc.;
3) Light attenuation: the fire may irritate eyes and reduce the visibility.

主要的燃烧产物：CO、CO_2、CH_4、C_2H_4、H_2等。燃烧产物的危害性：①毒性。刺激人的呼吸系统；②呼吸急促、烟气吸入量增加，引起头痛、神志不清等症状；③减光性。火场中还刺激眼睛，降低能见度。

(11) Ignition point and self-ignition point 燃点与自燃点

1) Ignition point: the minimum temperature required to ignite the surface of material with external heat source under specified test conditions, and maintain the required combustion duration.

燃点：在规定的试验条件下，应用外部热源使物质表面起火并持续燃烧一定时间所需的最低温度为燃点。

2) Self-ignition point: the minimum temperature causing self-ignition of flammable material under specified conditions. The material is exposed to air (oxygen) at such temperature, combustion can be caused without open fire. The self-ignition point is the basis to evaluate the self-ignition hazards caused by heating the flammable material.

自燃点：在规定的条件下，可燃物产生自燃的最低温度称为自燃点。在这一温度时，物质与空气（氧）接触，不需要明火的作用就能发生燃烧。自燃点是衡量可燃物质受热升温导致自燃危险的依据。

(12) Flash burning and flash point 闪燃与闪点

1) Flash burning: the combustion phenomenon that sufficient flammable vapor will be generated on the surface of liquid (solid), and flame is be caused and then extinguished when exposed to fire.

闪燃：在液体（固体）表面上能产生足够的可燃蒸气，遇火能产生一闪即灭的火焰的燃烧现象称为闪燃。

2) Flash point: The minimum temperature required for flash burning at surface of liquid (solid) under specified test conditions. The flash point is the one of the main indexes to evaluate the property of flammable liquid. The lower flash point may cause higher fire hazards.

闪点：在规定的试验条件下，液体（固体）表面能产生闪燃的最低温度称为闪点。闪点是衡量可燃液体性质的主要标志之一。闪点越低，火灾危险性越大。

4.3.1.2 Basic knowledge of fire accident 火灾的基本知识

(1) Classification of fire accident 火灾的分类

1) Fire accident: the disasters that is caused by combustion out of control during specified time and space. The fire accident may be classified into six categories according to the combustion characteristics of material.

火灾：是在时间和空间上失去控制的燃烧所造成的灾害。按物质的燃烧特性将火灾分为如下 6 类:

Class A fire: referring to the fire of solid material containing organics, and may generating hot ash during combustion, such as wood, cotton, wool, hemp, paper and etc.;

A 类火灾，是指固体物质火灾，这种物质往往具有有机物质，一般在燃烧时能产生灼热的灰烬，如木材、棉、毛、麻、纸张等；

Class B fire: referring to fire of liquid of meltable solid, such as gasoline, kerosene, diesel oil, crude oil, methanol, ethanol, asphalt, paraffin;

B 类火灾，是指液体火灾和可熔化的固体物质火灾，如汽油、煤油、柴油、原油、甲醇、乙醇、沥青、石蜡火灾；

Class C fire: referring to fire of gases, such as coal gas, natural gas, methane, ethane, propane, hydrogen and etc.;

C 类火灾，是指气体火灾，如煤气、天然气、甲烷、乙烷、丙烷、氢气火灾等；

Class D fire: referring to fire of metal, such a potassium, sodium, magnesium, titanium, lithium, aluminum magnesium alloy and etc.

D 类火灾，是指金属火灾，如钾、钠、镁、钛、锂、铝镁合金火灾等。

Class E fire: fire on electrical equipment. The fire of material with electricity, such as electrical fire of transformer and etc.;

E 类火灾，带电火灾。物体带电燃烧的火灾。例如变压器等设备的电气火灾等。

Class F fire: referring to the fire of food within cooker (such as fats or grease);

F 类火灾，烹饪器具内烹饪物（如动物油脂和植物油脂）的火灾。

2) Fire development stage: initial stage, development stage, violent stage, decrement stage, extinguishing stage.

火灾发展阶段：初期阶段、发展阶段、猛烈阶段、下降阶段、熄灭。

(2) Basic principles and methods for fire extinguishing: 灭火的基本原理及方法：

1) Cooling: one of the conditions to maintain continuous combustion for common flammable material is that the flammable material reaches the initiation temperature at flame or hot conditions. Therefore, when the temperature of common flammable material is cooled to a temperature lower than ignition temperature or flash point, the combustion reaction will be stopped. The fire extinguishing mechanism of water is cooling.

冷却灭火：对一般可燃物来说，能够持续燃烧的条件之一就是它们在火焰或热的作用下达到了各自的着火温度。因此，对一般可燃物火灾，将可燃物冷却到其燃点或闪点以下，燃烧反应就会中止。水的灭火机理主要是冷却作用。

2) Smothering: the flammable material must be burned above the required minimum oxygen concentration, or the burning cannot be continued. Therefore, the fire can be extinguished via reducing the oxygen concentration around the flammable material. The fire extinguishing mechanism of CO_2, N_2, steam and etc. is smothering.

窒息灭火：各种可燃物的燃烧都必须在其最低氧气浓度以上进行，否则燃烧不能持续进行。因此，通过降低燃烧物周围的氧气浓度可以起到灭火的作用。通常使用的二氧化碳、氮气、水蒸气等的灭火机理主要是窒息作用。

3) Isolation: the combustion will be automatically stopped if the flammable material is isolated from ignition source or oxygen. The relevant valves shall be closed during fire accident to block the flammable gas and liquid to fire accident area; open the relevant valves to transfer the flammable liquid in vessels affected by fire accident to safe area via pipeline.

隔离灭火：把可燃物与引火源或氧气隔离开来，燃烧反应就会自动中止。火灾中，关闭有关阀门，切断流向着火区的可燃气体和液体的通道；打开有关阀门，使已经发生燃烧的容器或受到火势威胁的容器中的液体可燃物通过管道导至安全区域，都是隔离灭火的措施。

4) Chemical inhibition: breaking the combustion chain reaction via reaction between fire extinguishing agent and the intermediate free radical of chain reaction. The main fire extinguishing mechanism of conventional dry powder fire extinguishing agent is chemical inhibition.

化学抑制灭火：就是使用灭火剂与链式反应的中间体自由基反应，从而使燃烧的链式反应中断使燃烧不能持续进行。常用的干粉灭火剂。主要灭火机理就是化学抑制作用。

(3) Types of conventional fire extinguisher 常用灭火器的种类

The fire extinguishers can be classified as water based fire extinguisher, foam fire extinguishers, dry powder fire extinguishers, gas fire extinguishers and etc. according to the fire extinguishing agents used; it can also be classified as portable and wheeled fire extinguisher according to the operation type; and the fire extinguishers can be classified as 1kg, 2kg, 3kg, 4kg, 5kg, 6kg, 7kg, 8kg, 20kg, 35kg, 50kg, 100kg and etc. according to the weight of fire extinguishing agent.

按灭火介质分为水基型灭火器、泡沫灭火器、干粉灭火器、气体灭火器等；按操作类型分手提式和推车式；按重量分 1kg、2kg、3kg、4kg、5kg、6kg、7kg、8kg、20kg、35k、50kg、100kg 等

(4) Explosion 爆炸

1) Definition 爆炸的含义

Explosion: referring to the violent oxidization or decomposition of material causing sudden increment of temperature and/or pressure.

爆炸：是指由于物质急剧氧化或分解反应，使温度、压力急剧增加或使两者同时急剧增加的现象。

2) Classification of explosion 爆炸的分类

The explosion can be classified as physical explosion, chemical explosion and nuclear explosion.

爆炸可分为：物理爆炸、化学爆炸和核爆炸。

3) Explosion limit 爆炸极限

Explosion limit: referring to the maximum or minimum concentration of flammable gas, steam or dust in air that may cause explosion when exposed to fire. In general, it is expressed in volume percentage.

爆炸极限：是指可燃气体、蒸汽或粉尘与空气混合后，遇火产生爆炸的最高或最低浓度。通常以体积百分数表示。

4) Direct cause of explosion: material, activity, production equipment and production process.

引起爆炸的直接原因：物料原因、作业行为原因、生产设备原因、生产工艺原因。

5) Common ignition source for explosion: mechanical ignition source, hot ignition source (surface subject high temperature and direct sunshine), electric ignition source (electric sparks, electrostatic sparks, lightning), open fire.

常见爆炸引火源：机械火源、热火源（高温表面、日照表面）、电火源（电火花、静电火花、雷电）、明火。

6) Precautions for explosion accident: 预防爆炸事故措施：

a. Monitoring measures shall be adopted for flammable gas, steam, dust concentration in air; safety and protection measures shall be adopted immediately when the concentration reaches the hazardous level.

采取监测措施，当发现空气中的可燃气体、蒸汽或粉尘浓度达到危险值时，应立即采取适当的安全防护措施。

b. Welding work must be avoided in fire and explosive area, and safe distance must be kept between the welding work site and flammable and explosive equipment.

在有火灾、爆炸危险的区域内，应尽量避免焊接作业，进行焊接作业的地点必须要和易燃易爆的生产设备保持安全距离。

c. Hot work on equipment and pipeline for flammable and explosive material shall be performed strictly according to the management regulations for hazardous activities; work permit must be obtained and the equipment and pipeline must be isolated, purged, cleaned and analyzed to assure the safety of hot work.

对生产、盛装易燃易爆物料的设备和管道进行动火作业时，应严格执行风险作业管理规定，办理作业许可证，采取隔绝、置换、清洗、动火分析等措施，确保动火作业的安全。

d. D Spark arrester shall be installed on the exhaust pipe of vehicles in area with fire and explosion hazards.

在有火灾、爆炸危险的场所，机械车辆的排气管上应安装火星熄灭器。

e. The vessels and cylinders for flammable gas and liquid shall be handled with care; throwing and bumping shall be strictly avoided.

搬运盛有可燃气体或易燃液体的容器、气瓶时要轻拿轻放，严禁抛掷、防止相互撞击。

f. The workers entering workshop with flammable and explosive material shall wear antistatic working clothes and shows without nails.

进入易燃易爆车间的人员应穿防静电的工作服，不穿带钉子的鞋。

g. Different material that may cause explosion when exposed to each other shall not be placed together; the material that may decomposed and exploded with exposed to acid or alkali shall not be placed away from the acid or alkali; the material is sensitive to mechanical effect shall be handled with care.

互相接触会引起爆炸的两类物质不能混合存放；遇酸、碱有可能发生分解爆炸的物质应避免与酸碱接触；对机械作用较为敏感的物质要轻拿轻放。

h. Stabilizer shall be added to the unstable material during storage.

对于不稳定物质，在贮存中应添加稳定剂。

i. Operators for special activities must be trained and pass the test, obtain the work permit before operation.

特种作业操作人员必须经过培训并考试合格，取得操作证以后方可进行操作。

j. The boiler, pressure vessel can be used only when the safety valve, pressure vessel, level gauge and other safety devices are in good conditions; over-temperature and overpressure shall be avoided.

锅炉、压力容器须在安全阀、压力表、液体计等安全装置保持完好的情况下才能使用；严禁超温超压运行。

(5) Fire extinguishing principles 安全灭火的原则

1) The system shall be alarmed immediately after fire accident, and the rescue work shall be timely organized.

发生火灾应迅速报警，并组织救人与自救。

2) The power supply, gas supply, oil supply and various flammable, combustible and toxic materials shall be stopped first.

灭火首先应切断电源、气源、油源及各种可燃、易燃和有毒物质。

3) The fire of electrical equipment shall be extinguished via CO_2 fire extinguisher instead of water and foam fire extinguisher to avoid hurting personnel.

电气设备火灾应使用 CO_2 灭火器灭火，不得使用水和使用泡沫灭火器，防止导电伤人。

4) The fire of oil product or gas products shall be extinguished by foam fire extinguisher or spraying water at side of tank instead of direct water flow to avoid splashing or boiling, extending the fire area; the fire of gas cannot be directly extinguished to avoid explosion of explosive mixture.
油品或气体类火灾时，不能直接用直流水冲击，易发生喷溅或沸溢，扩大火灾面积，可使用大量泡沫灭火器喷射泡沫灭火，或在罐边喷水降温灭火；气体类火灾不可直接扑灭，防止形成爆炸性混合物发生爆炸。
5) CO_2 or dry power fire extinguishers, or carpet shall be used to extinguish the fire on precise instrument or documents.
精密仪器或文档资料着火，应使用二氧化碳或干粉灭火器扑救，或使用灭火毯覆盖灭火

4.3.2 Operation method of fire extinguisher 灭火器的使用方法

4.3.2.1 Operation method of portable dry powder fire extinguisher
手提式干粉灭火器的使用方法
The dry powder fire extinguisher shall be placed at 3-5m away upwind direction of the fire accident spot. The fire shall be extinguished in the following sequences: shake the fire extinguishers first to loosen the dry power, then pull out the pin, hold the nozzle with left hand and push the handle with right hand, spray to the bottom of flame.
将干粉灭火器提到燃烧区域，在距离着火点 3-5 米处，放下灭火器，在室外使用时应占据上风方向。使用时先将灭火器上下颠倒几次，使筒类干粉松动，然后拔下插销，左手握住喷嘴，右手用力压下压把，对准火焰的根部左右喷射，进行灭火。
4.3.2.2 Operation method of CO_2 fire extinguisher 二氧化碳灭火器的使用方法
The CO_2 fire extinguisher shall be placed at 3-5m away from the combustion material, and then the fire shall be extinguished in the following sequence: pull out safety pin, hold the nozzle with left hand and push the handle with right hand, spray toward flame. Never directly hold the nozzle or metal tube with hand to avoid frostbite.
将二氧化碳灭火器提到燃烧区域，在距离燃烧物 3-5 米处，放下灭火器，拔出保险销，左手将喇叭嘴对准火源，右手用力压下压把，对准火焰扫射灭火。注意使用时不能直接用手抓握喇叭口外壁或金属管道，防止冻伤。
4.3.2.3 Operation method of wheeled dry powder fire extinguisher
手推车干粉灭火器使用方法
The fire extinguisher shall be placed at 8-10m away to the fire accident spot, one open the safety pin and open the switch, and the other bring the nozzle and extend the hose, then open the hose switch and extinguish the fire.
将灭火器推到起火地点，在距离起火点 8-10 米处，将灭火器放稳，一人打开保险销，打开开关，另一人取下喷枪，展开喷射软管，对准火源，打开喷射软管开关，进行灭火。
4.3.2.4 Operation method of fire control facilities 消防器材的使用方法

(1) The above ground hydrants shall be used together with fire water hose, hydrant spanner, fire water gun in firefighting box by two or more persons. One takes out the fire water hose and gun, open the hose with one connector, take the other end to the fire accident spot and connect the water gun; the other takes out the hydrant spanner, and put it on the hydrant switch; connects the hose and hydrants, open the hydrants switch to extinguish the fire after receiving the signal.

室外地上消防栓，室外地上消防栓与消防器材箱中配备的消防水带、消防栓扳手、消防水枪相匹配 2 人及以上人员配合使用，操作时打开消防箱器材们，一人取出消防水带及水枪，打开水带留下一个水带接口，携带水带另一端接口跑步至需要使用的区域，连接好水枪，发出出水的指令；另一人取出消防栓扳手，将消防栓扳手放置在消防栓开关上，连接水带接口与消防栓，听到前方人员发出出水的指令后匀速打开消防栓开关，出水灭火。

(2) The indoor aboveground hydrants shall be used together with firewater hose, fire water gun, hose reel by two persons; one opens the hydrant box door, takes out hose with one connector, takes the other end with fire water gun to fire accident spot, connects the water gun and gives the signals; the other connects the hose and hydrant, opens the switch and extinguishes the fire after receiving signal.

室内消防栓，室内消防栓箱中配备消防水带、消防水枪、软管卷盘，2 人配合使用，操作时一人打开消防栓箱门，取出挂架上水带，打开水带留下水带一端接口，携带水带另一端接口及消防水枪跑步至使用区域，连接好水枪，发出出水指令；另一人迅速连接水带接口与消防栓出水口，听到前方发出出水指令后匀速打开出水开关，出水灭火。

(3) The firewater monitor can be operated by one person in horizontal and vertical direction; the monitor shall be rotated in horizontal direction toward the fire accident area, and in vertical direction toward the accident spot; the water can be adjusted via opening the switch and turning the monitor, checking the pressure gauge, and adjusting the water supply switch according to requirements.

消防炮，消防水炮具备水平旋转、垂直旋转功能，1 人可操作使用，操作时水平旋转调整炮头对准需要使用区域，操作垂直旋转调整炮头高度对准事故点，打开出水开关出水，调整炮头调节至需要的水流形态，查看压力表，调节出水开关根据需求进行使用。

(4) Firewater riser shall be used together with fire control box or fire engine by two or more persons. One takes out the hose with connector at one end, brings the other end to and connects the firewater riser, and gives the signal; the other person takes out the hydrants spanner and placed it on the hydrants switches, connects the hose to hydrant outlet, and opens the switch after receiving the signal.

消防竖管，消防竖管需要与消防器材箱或消防车辆配套使用，2 名及以上人员配合使用，操作时一人取出消防器材箱消防水带，打开水带留下一端水带接口，携带另一端水带接口至消防竖管并

进行连接，打开消防竖管开关，发出出水指令；另一人取出消防栓扳手放置在消防栓开关上，迅速连接水带接口与消防栓出水口，听到出水指令后匀速打开消防栓出水开关出水。

(5) Fire control system is divided into foam system, water system, gas fire extinguishing system; the system can be operated in automatic and manual status; the system can be started automatically if the system is in automatic mode, or it can be manually started if the system is in manual mode; the site operator shall be trained by system expert before operating the system.
消防系统，消防系统分泡沫系统、水系统、气体灭火系统；系统主要分为自动与手动，当发生事故时自动状态可自动启动，如不能自动启动时需操作人员前往现场手动启动，现场操作人员需经系统厂家专项培训合格后方可操作使用。

4.3.3 Basic methods for fire extinguishing 灭火的基本方法

4.3.3.1 Cooling: one of the conditions to maintain continuous combustion for common flammable material is that the flammable material reaches the initiation temperature at flame or hot conditions. Therefore, when the temperature of common flammable material is cooled to a temperature lower than ignition temperature or flash point, the combustion reaction will be stopped. The fire extinguishing mechanism of water is cooling.
冷却灭火：对一般可燃物来说，能够持续燃烧的条件之一就是它们在火焰或热的作用下达到了各自的着火温度。因此，对一般可燃物火灾，将可燃物冷却到其燃点或闪点以下，燃烧反应就会中止。水的灭火机理主要是冷却作用。
4.3.3.2 Smothering: the flammable material must be burned above the required minimum oxygen concentration, or the burning cannot be continued. Therefore, the fire can be extinguished via reducing the oxygen concentration around the flammable material. The fire extinguishing mechanism of CO_2, N_2, steam and etc. is smothering.
窒息灭火：各种可燃物的燃烧都必须在其最低氧气浓度以上进行，否则燃烧不能持续进行。因此，通过降低燃烧物周围的氧气浓度可以起到灭火的作用。通常使用的二氧化碳、氮气、水蒸气等的灭火机理主要是窒息作用。
4.3.3.3 Isolation: the combustion will be automatically stopped if the flammable material is isolated from ignition source or oxygen. The relevant valves shall be closed during fire accident to block the flammable gas and liquid to fire accident area; open the relevant valves to transfer the flammable liquid in vessels affected by fire accident to safe area via pipeline.
隔离灭火：把可燃物与引火源或氧气隔离开来，燃烧反应就会自动中止。火灾中，关闭有关阀门，切断流向着火区的可燃气体和液体的通道；打开有关阀门，使已经发生燃烧的容器或受到火势威胁的容器中的液体可燃物通过管道导至安全区域，都是隔离灭火的措施。
4.3.3.4 Chemical inhibition: breaking the combustion chain reaction via reaction between fire extinguishing agent and the intermediate free radical of chain reaction. The main fire

extinguishing mechanism of conventional dry powder fire extinguishing agent is chemical inhibition.
化学抑制灭火：就是使用灭火剂与链式反应的中间体自由基反应，从而使燃烧的链式反应中断使燃烧不能持续进行。常用的干粉灭火剂、卤代烷灭火剂的主要灭火机理就是化学抑制作用。

4.3.4 Extinguishing initial fire 初起火灾的扑救

4.3.4.1 Methods and principles to extinguish initial fire: the fire shall be extinguished with adjacent firefighting facilities, equipment in case of fire accident. The automatic firefighting system, if any, shall be started immediately.
初起火灾扑救的方法和原则：发生火灾后，要及时使用就近的灭火器材、设备进行扑救。有自动灭火系统的应立即启动。
(1) Isolating the flammable material. 切断可燃物

(2) Removing the flammable material near the fire accident spot that may cause fire spreading;
将燃烧点附近可能成为火势蔓延的可燃物移走。

(3) Closing the relevant valves to cut off the flammable gas and liquid flowing to fire accident spot; 关闭有关阀门，切断流向燃烧点的可燃气体和液体。
(4) Open the relevant valve to send the flammable material in vessels on fire or affected by the fire accident to safe area via pipeline.
打开有关阀门，将已经燃烧的容器或受到火势威胁容器中可燃物料通过管道导至安全地带。

(5) Mud, sand dikes shall be used to block the flammable liquid flowing to fire accident spot.
采用泥土、黄沙筑堤等方法，阻止流淌的可燃液体流向燃烧点。

4.3.4.2 Cooling 降温
(1) Cooling the facilities via adjacent hydrants, hose reel, fire water monitor supply system.
使用附近消防栓、软管卷盘、消防炮给水系统对设施灭火降温。
(2) Effective fire control facilities or simple tools can be selected for the specified material on fire, such as fire water bucket, firefight sand and etc.
针对着火的介质，选用有效的消防器材，也可选用简单工具灭火，如消防水桶、消防沙等。

4.3.4.3 Smothering 窒息
(1) Covering the surface of burning material with sand and firefighting blanket;
使用沙土、灭火毯覆盖燃烧物表面。
(2) Covering the burning area with cover of vessels and equipment;
利用容器、设备的顶盖盖没燃烧区。

(3) Covering the pot immediately in case of oil pot fire;
油锅着火时，立即盖上锅盖。
(4) Cover the surface of burning material with wet blanket, quilt, burlap and etc.;
将毯子、棉被、麻袋等浸湿后覆盖在燃烧物表面。
(5) Covering the burning material with sand, soil; the fire on material not compatible with water shall be extinguished with gas fire extinguisher, dry sand, soil.
用沙、土覆盖燃烧物。对忌水物质，必须采用气体灭火器、干燥沙、土扑救。

4.3.4.4 Power failure 断电
(1) The power supply must be cut off in case of fire on electrical equipment, or the fire may affect the safety of electrical circuits, electrical equipment, or the firefighting personnel.
如发生电气火灾，或者火势威胁到电气线路、电气设备，或电气影响灭火人员安全时，首先要切断电源。
(2) Dry power fire extinguisher shall be used for fire extinguishing. 使用干粉灭火器灭火。

4.4 Hazardous chemicals 危险化学品

4.4.1 MSDS of main hazardous chemicals (descripting them in the list) 主要危险化学品MSDS（列表描述内容）

4.4.1.1 Hydrogen sulfide (H_2S) 硫化氢

Table 39：Hazards and countermeasures of hydrogen sulfide (H_2S)

表 39：硫化氢的危害和应对措施

Chemical Name: 化学品中文名：	Hydrogen sulfide (H_2S) 硫化氢	OEL: 职业接触限值：	10mg/m^3
Hazard Description: 危险性概述：	Hazard classification: Class 2.1 flammable gas. 危险性类别：2.1 类易燃气体。 Route of entry: Inhalation. 侵入途径：吸入。 Health hazard: This product is strong neurotoxic substance, and has strong irritation effect. 健康危害：本品是强烈的神经毒物，对粘膜有强烈刺激作用。 Environmental hazard: It has environmental hazard, and may cause water and atmospheric contamination. 环境危害：对环境有危害，对水体和大气可造成污染。 Combustion risk: This product is flammable, and has strong irritation. 燃爆危险：本品易燃，具强刺激性。		
First aid measures:	Immediately escape from the site, and remove to fresh air. Keep		

急救措施：	respiratory tract clear. Adequately flush it with plenty of running clear water or normal saline for at least 15 minutes. Get medical attention immediately. 迅速脱离现场至空气新鲜处。保持呼吸道通畅。用大量流动清水或生理盐水彻底冲洗至少 15 分钟。就医。
Fire fighting measures: 消防措施：	Fire fighter must wear the whole body fireproof and antitoxic clothing, and extinguish fire at the windward side. Cut off the gas supply. If gas supply cannot be cut off, the flame at leak shall not be extinguished. Cool the vessel by spraying water. If possible, remove to open location from the site. Fire extinguishing agents: Spray water, alcohol resistant foam, dry chemicals. 消防人员必须穿全身防火防毒服，在上风向灭火。切断气源。若不能切断气源，则不允许熄灭泄漏处的火焰。喷水冷却容器，可能的话将容器从火场移至空旷处。灭火剂：雾状水、抗溶性泡沫、干粉。
Accidental release measures: 泄漏应急处理:	Rapidly remove people away from the leakage contamination area to upwind location, and immediately separate them. Separation distance shall be 150m for small spill and 300m for large spill. Strictly restrict access. Cut off fire source. Suggest that emergency processing personnel wear self-contained positive-pressure breathing apparatus and anti-static work clothing. Enter the site from the windward side. Cut off source of spills as possible. 迅速撤离泄漏污染区人员至上风处，并立即进行隔离，小泄漏时隔离 150m，大泄漏时隔离 300m，严格限制出入。切断火源。建议应急处理人员戴自给正压式呼吸器，穿防静电工作服。从上风处进入现场。尽可能切断泄漏源。

4.4.1.2 Crude oil and main petroleum products 原油及主要石油产品

(1) Flash point and spontaneous combustion point of crude oil and main petroleum products
原油及主要石油产品的闪点、自燃点

Table 40: Flash point and spontaneous combustion point of crude oil and main petroleum products products

表 40：原油及主要石油产品的闪点、自燃点

Petroleum product name 油品名称	Flash point 闪点（℃）	Spontaneous combustion point 自燃点（℃）
Crude oil 原油	-6.67—32.3	300
Slurry oil 油浆		250
Wax oil 蜡油		330
Diesel oil 柴油	45—120	350—380

Naphtha 石脑油	-50—10	225—530
Liquefied gas 液化气	-73.5	425—540

(2) Explosion limit of petroleum gas in air 石油气体在空气中的爆炸极限

Table 41: Explosion limit of petroleum gas in air

表 41：石油气体在空气中的爆炸极限

Gas name 气体名称	Explosion limit 爆炸极限（v%）	Gas name 气体名称	Explosion limit 爆炸极限（v%）	Gas name 气体名称	Explosion limit 爆炸极限（v%）
Methane 甲烷	5—15	Hexane 己烷	1.6—9.4	Carbon monoxide 一氧化碳	12.5—74
Ethane 乙烷	3—12.5	Ethylene 乙烯	2.7—28.5	Naphtha 石脑油	0.76—6.9
Propane 丙烷	2.1—9.5	Propylene 丙烯	2—10.7	Diesel oil 柴油	1.4—6
Butane 丁烷	1.5—8.5	Butene 丁烯	1.7—9		
Pentane 戊烷	1.4—7.8	H_2S 硫化氢	4.3—45.5		

4.4.2 Main control and protection measures for hazardous chemicals 危险化学品重点控制和防护措施

Table 42: Main control and protective measures for hazardous chemicals

表 42：危险化学品重点控制和防护措施

Item 序号	Location or equipment 场所或设备	Hazardous material 危险有害物质	Hazards 危险、危害	Control measures 控制措施

1	Fractionation stabilization pump area 分馏稳定泵区	Residual, wax oil, diesel oil, naphtha, liquefied gas, dry gas, H_2S 渣油、蜡油、柴油、石脑油、液化气、干气、硫化氢	High temperature, toxic; flammable & explosion, toxic when leakage takes place 高温、有毒；泄漏时易燃易爆、中毒	1 Provide fire steam extinguishing ring, 设置消防蒸汽灭火环， 2 Provide flammable and toxic gas detector 可燃、有毒气体检测仪 3 Provide fire water syste, fire-fighting apparatus and materials, etc. 配备消防谁系统、消防器材等
2	Flexigas processing system area 灵活气处理系统泵区	Flexigas, sour water 灵活气、酸性水	High temperature, toxic; flammable & explosion, toxic when leakage takes place 高温、有毒；泄漏时易燃易爆、中毒	Omitted 略
3	Coke powder loading area 焦粉装车区	H_2S, coke powder, sour water 硫化氢、焦粉、酸性水	High temperature, toxic; flammable & explosion, toxic when leakage takes place 高温、有毒；泄漏时易燃易爆、中毒	Omitted 略

4.4.3 Application method of conventional gas mask 常用防毒面具的使用方法

4.4.3.1 How to use air breathing apparatus 空气呼吸器使用方法

(1) Inspection before application 使用前检查

1) Open the cylinder switch, short alarm sound can be heard with the increasing pressure in depressurization system.

打开气瓶开关，随着减压器系统中压力的上升，会听到警报发出短暂的音响。

2) Close the cylinder switch, and observe the reading of pressure gauge; if the pressure drop in several seconds is not greater than 2MPa, the tightness of air supply pipe (HP) system is acceptable.

关闭气瓶开关，观察压力表的读数，在数秒钟时间压力下降不大于 2MPa，表明供气管（高压）系统气密完好。

3) Slightly press the valve membrane after the tightness inspection of HP system, when pressure in cylinder is decreased to 4MPa – 6MPa, the alarm sound indicates that the pipeline is not blocked, and the alarm is in good condition.

高压系统气密完好后，轻轻按供给阀膜片，当气瓶压力降至 4MPa－6MPa，警报器气笛发出音响，证明通气管路畅通，报警器完好。

(2) Application method 佩戴方法

1) Lift the breathing apparatus with the cylinder valve facing downward.

提起呼吸器，使其垂直，气瓶阀朝下。

2) Place the breathing apparatus on back and fix according to the body situation.

背上呼吸器，根据身材调节好肩带、腰带，以合身牢靠、舒适为宜。

3) Connect the mask to supply valve. Place the long belt of full mask around neck and full mask in front to facilitate the application.

将面罩与供给阀相连。并将全面罩的一条长脖带套在脖子上，使用前全面罩跨有胸前，以便佩戴使用。

4) Open the cylinder switch before application, full open the cylinder valve and then turn 1/4 circle backward.

使用时首先打开气瓶开关，将气瓶阀开到底，然后再往回关 1/4 圈。

5) Place the chin in mask, fasten the belt and cover the mask with hand to check the tightness, breathe 2-3 times, connect the valve and then breath once to open the valve.

佩戴面罩时，先将下巴收进面罩，由下向上将面罩系带收紧，用手捂住面罩需求阀接口检查其气密性，进行 2－3 次深呼吸，感觉舒畅，接好需求阀，深吸一口气使其打开。

6) When pressure in cylinder is decreased to 6MPa－4MPa, the alarm will give sharp sound, the user shall immediately evacuate from site.

当气瓶压力下降到 6MPa－4MPa 时，警报器会发出尖锐音响，应立即撤离现场。

7) Loosen the belt clip of full mask and remove the full mask after use, close the supply valve switch. Remove the breathing apparatus form body and close the cylinder switch.

使用后将全面罩系带卡子松开，从面部摘下全面罩，同时将供给阀转换开关置于关闭状态。此时从身体上拆下呼吸器，关闭气瓶开关。

4.4.3.2 Application method of filter type gas mask 过滤式防毒面具使用方法

(1) Performance of canister 滤毒罐防护性能

The filter type gas mask with tube is used for the atmosphere with oxygen concentration not less than 18%, toxic material concentration not greater than 1% (ammonia 2%).

带导管过滤式防毒面具是用于空气中氧含量不低于 18%，有毒有害介质不高于 1%（氨 2%）的环境。

Table 43: Performance of canister

表 43：滤毒罐防护性能

Model No. 型号	Color 标色	Type 防毒类型	Protected objects 防护对象举例	Test agent 试验毒剂
1L	Green + white 绿＋白道	Comprehensive protection 综合防毒	Hydrocyanic acid, cyanogen chloride, hydrogen arsenide, phosgene, diphosgene, chloropicrin, benzene, bromomethane, dichloromethane, lewisite, mustard gas and etc. 氢氰酸、氯化氰、砷化氢、光气、双光气、氯化苦、苯、溴甲烷、二氯甲烷、路易氏气、芥子气等	Hydrocyanic acid 氢氰酸 （HCN）
1	Green 绿			
2L	Orange +white 桔红＋白道	Comprehensive protection (for CO) 综合防毒 （防 CO）	CO, organic vapor, hydrocyanic acid and its derivant and etc. 一氧化碳、各种有机蒸气、氢氰酸及其衍生物等	Hydrocyanic acid 氢氰酸
				CO 一氧化碳
3L	Brown + white 褐＋白道	For organic gas 防有机气体	Organic gases and vapors such as benzene, chlorine, acetone, alcohols, anilines, carbon disulfide 有机气体与蒸气如：苯、氯气、丙酮、醇类、苯胺类、二硫化碳等	Benzene 苯（C_6H_6） Chlorine 氯（Cl_2）
3	Brown 褐			
4L	Grey + white 灰＋白道	For ammonia, H_2S 防氨、硫化氢	Ammonia, H_2S, etc. 氨、硫化氢等	Ammonia 氨（NH_3）
4	Grey 灰			Hydrogen sulfide 硫化氢 （H_2S）
5	White 白	For CO 防一氧化碳	Carbon monoxide 一氧化碳	CO 一氧化碳

Table 43: Performance of canister

表 43（续）：滤毒罐防护性能

Model No.	Color 标色	Type 防毒类型	Protected objects 防护对象举例	Test agent 试验毒剂

型号				
6	Black 黑	For mercury vapor 防汞蒸气	Mercury vapor 汞蒸气	Mercury 汞（Hg）
7L	Yellow +white 黄＋白道	For sour gas 防酸性气体	Acidic gas and vapor: SO_2, Cl_2, H_2S, NOx, phosgene, phosphorus and etc. 酸性气体和蒸气如：二氧化硫、氯气、硫化氢、氮的氧化物、光气、磷等	SO_2 二氧化硫
7	Yellow 黄			

(2) Maintenance 维护保养

1) The spare filter type gas mask shall be placed in dedicated apparatus cabinet in site operation room; the cabinet shall be sealed; the gas mask shall be placed in dry and cool place to avoid exposure to acid, alkaline, or toxic material and etc.

备用的过滤式防毒面具应放在外操间专用器材柜内，柜上应贴封条，应防潮、防高温，禁止与酸、碱、油类或有毒等物品接触。

2) The talcum powder shall be placed on the rubber parts of bow cap in case of long term storage to assure the completeness; the gas mask shall be periodically inspected and cleaned.

长期存放的头罩应在橡胶部位均匀撒上滑石粉，以保持完好，定期进行检查及清理。

3) The top cover and bottom plug of used canister shall be covered and plugged respectively to avoid humidity and toxic gas entering canister and affect the performance.

使用后的滤毒罐应将顶盖、底塞分别盖上、堵紧，防止罐内滤毒药剂受潮或吸附有毒气体，以致影响防毒效能。

4) The canister for normal use shall be inspected once per month, and once per quarter for stored canister; the canister that cannot be reused shall be timely discarded or replace with new filtration agent.

常用的滤毒罐每月检查一次；长期存放的滤毒罐每季检查一次；对于失效的滤毒罐，则应及时报废，更换新的滤毒药剂。

(3) Application method 使用方法

1) The bow cap, air tube shall be checked for damage, blockage, connection tightness, breath valve fitness; and the canister shall be checked for top cover and bottom plug availability, proper packaging; the canister shall not be used if any defect is found.

检查头罩、导气管有无缺件、损坏、漏气、堵塞，连接是否紧密牢固，呼吸阀是否好用；滤毒罐有无顶盖、底塞，有无装填不实现象，如不合格严禁佩戴。

2) Removing the rubber plug at bottom of canister.

拔去滤毒罐底部胶塞。

3) Putting on the bow cap on head from bottom to top; the eye window shall be placed at 1cm below the eye location.
把头罩从下至上套在头上，眼窗中心位置在眼睛正前方下一厘米左右。
4) Taking deep breath several times, and entering site after confirming the canister is at normal conditions.
深呼吸数次，确认正常后方可进入现场。
5) Working within the specified protection and shall not work overtime.
要在药品规定的标准防毒时间范围内作业，不得超时间作业。

4.4.4 Emergency rescue and evacuation knowledge 应急救护与逃生知识

4.3.4.1 Emergency response principles: all personnel participating in the emergency response plan must perform the work according to instruction and following principles to prevent accident from occurring and dispersing, minimize the personal injury and assets loss.
应急原则：应急指挥人员为了尽快扼制事故发生和蔓延，尽可能减少人员伤亡和财产损失，所有参与应急计划实施的人员必须做到一切行动听指挥，必须遵守以下应急原则：
(1) The person shall be rescued first then the goods in case of emergency situation; alarm must be first given before fire extinguishing in case of serious fire accident.
一般要先救人后救物，重大火灾先报警后灭火。
(2) The feedstock shall be first isolated, depressurized, and blocked to avoid explosion in case of fire on flammable gas.
可燃气体泄漏着火，不应立即扑灭火灾，应先进行隔离、泄压、切断进料，以防爆炸。
(3) The site fire sources shall be controlled first in case of leakage of large quantity of liquid hydrocarbon, gas.
大量液态烃、瓦斯泄漏应先控制现场各种火源。
(4) The emergency response personnel shall first protect themselves before rescue the site poisoned persons; the victims shall be sent to first aid center. First aid shall be provided first to poisoned victims and those suffered from cardiac arrest (artificial respiration and cardio-pulmonary resuscitation).
现场中毒窒息人员抢救，首先应做好自身防护，抢救出来的伤员送急救中心。中毒和心跳停止的伤员立即现场急救（做人工呼吸和胸外心肺复舒）。
(5) Large quantity of clean water shall be used to flush the affected position for at least 15min in case of chemical burn and corrosion (such as ammonia water); the wounded area of fracture or electric arc burn shall be protected to avoid water or impurities.
化学品的灼伤腐蚀（如氨水）首先要对患处用大量清洁水冲洗至少 15min，骨折或电弧烧伤者应先保护创面，禁止沾水或杂物。

4.4.5 Protection regulations and first aid principles for toxicosis and asphyxia 中毒窒息的防护规定和急救原则

4.4.5.1 Basic requirements 基本要求

(1) The operation, maintenance and other personnel must receive the safety education before work to be familiar with the basic property of hazardous material of each production plant and position; safety specification; application, maintenance, first aid and rescue principles.
操作、检修及其他有关人员上岗前接受安全教育，了解生产装置、岗位有毒有害物质的基本性质，熟练掌握安全规程，熟悉防护用品的使用、维护，掌握自救、互救的基本要领。

(2) The employees must periodically participate in physical examination before work and after working for certain years; the personnel with occupational contraindication shall not perform the relevant work.
员工上岗前须经过健康检查，在岗位工作一定年限后应定期接受身体检查，有职业忌症者不得从事岗位操作。

(3) The relevant department shall timely report the type and distribution, monitoring data and etc. of toxic and hazardous material to the authority according the material and production situation.
部门应根据生产的物料及产品变化情况，及时向主管部门汇报有毒有害物质的种类和分布，监测数据等情况。

4.4.5.2 PPE provision and application regulations 防护装备的配置与使用规定

(1) The site operation room shall be provided with first aid apparatus box, the following first aid apparatus in box (respirator, filter type gas mask, stretcher, fire clothes, organic glass mask, protective gloves, oil-resistant boots, safety rope, safety belt) shall be periodically inspected.
外操间配备急救器材箱，箱内下列急救用品（空气呼吸器、过滤式防毒面具、担架、防火服、有机玻璃面罩、耐酸碱手套、耐油靴、安全绳、安全带）要定期检查保证齐全完好。

(2) Filter type gas mask and positive pressure respiratory apparatus, H2S alarm shall be provided for positions exposure to H2S for normal operation and accident treatment.
有硫化氢岗位配备过滤式防毒面具和正压式空气呼吸器、硫化氢报警仪，供正常操作和处理故障时使用。

(3) Automatic detector and alarm shall be installed at the places with presence of H2S, to monitor the concentration of H_2S.
在硫化氢存在的场所，安装自动监测报警器，随时监测硫化氢的浓度状况。

4.4.5.3 Site first aid principles 现场急救原则

(1) If anyone is found poisoned or injured, the victim shall be immediately removed to safe place for rescue, and dial 911 for help, and report to HSE management department and planning dispatching department provided that the safety of rescue personnel can be assured.

发现有人中毒或其他伤害，在确保自身安全的情况下，应立即将受害者移出毒区进行抢救，并拨打 991 急救电话电话，向 HSE 管理部和计划调度部汇报。

(2) When more than one person are found poisoned, the foreman on duty shall immediately began the emergency response plan and organize the duty personnel to perform rescue work, cut off the poison source and take the victims out of the dangerous area.

在发生多人中毒的情况下，当班班长应迅速启动应急预案，组织岗位人员在自身安全情况下进行救护工作，切断毒源，把患者抢救出毒区。

(3) Two workers with respirator must form one group when entering the area with hazardous poison area. Rubber clothes, rubber boots and rubber gloves must be used with entering the poisonous area of ammonia, chlorine, H2F, NOx or acid, alkali, liquid ammonia, methanol spraying.

进入危险性较大的毒区时，必须两人一组，佩戴空气呼吸器。进入高浓度的氨气、氯气、氟化氢、氮氧化物或有酸碱、液氨、甲醇喷溅的毒区，必须穿戴胶皮防护服、胶皮靴、胶皮手套。

(4) If the accident involves fracture and burn, special attention shall be paid to avoid harmful consequences. If the victims cannot be removed from the area, relevant gas masks must be used.

事故区伴有骨折、烫伤的患者。应仔细加以防护，以免造成不良后果。若不能将患者迅速移出毒区，须给其戴上相应的防毒面具。

(5) The victims shall be placed at locations with proper ventilation and temperature conditions after removing from hazardous area; the clothes and belt shall be immediately loosened to assure the smooth breath. The contaminated clothes must be removed and proper measures shall be adopted to keep warm.

患者移出毒区后，应放在空气流通和温度适宜的地方，立即解开衣领、腰带等，以保持患者的呼吸畅通。如患者的衣服被毒物污染，须脱去衣服，在冬天应注意给患者保暖。

(6) If the victims suffer from breathing cease or dyspnea, artificial respiration shall be given. The victims suffering from H2S, CO toxicosis, nitrogen, CO2 asphyxia shall be treated via resuscitator or artificial respiration; cardio-pulmonary resuscitation shall be used in case of cardiac arrest.

如患者呼吸已停止或呼吸困难时，应立即进行人工呼吸。硫化氢、一氧化碳中毒，氮气、二氧化碳窒息的患者，可使用苏生器或人工呼吸的方法来急救；如患者心跳停止时，应立即施行心肺复苏急救。

(7) Cardiac massage type artificial respiration shall be prohibited for victims suffered from chlorine, ammonia, NOx toxicosis, and only mouth-to-mouth resuscitation or oxygen therapy is allowed. Common artificial respiration is only used for breath cease due to electric shock.

对于氯气、氨气、氧化氮中毒的患者，禁止使用压迫式人工呼吸的方法，只允许施行口对口人工呼吸或给予输氧抢救。只有在“电击式”呼吸停止时才允许使用一般的人工呼吸方法。

(8) Resuscitator or artificial respiration method shall be prohibited for secondary dyspnea, and only oxygen therapy is allowed. The victims shall be timely sent to hospital for treatment.

对于继发性呼吸困难者，严禁使用苏生器或人工呼吸的方法来急救，只能给予输氧，并应尽快将患者转交医院处理。

(9) Oxygen therapy treatment must be used immediately for victims suffered from dyspnea and cyanosed face; victims suffered from H2S and CO toxicosis shall be treated via hyperbaric oxygen chamber.

对于呼吸困难者面色青紫的患者，应迅速给予输氧，硫化氢和一氧化碳中毒的患者，最好给予高压氧仓治疗。

4.4.6 Emergency supplies 应急物资

4.4.6.1 Composition of emergency supplies 应急物资组成

The emergency supplies of the flexi-oking unit consist of two parts. One of them is the daily emergency supplies, such as: air respirator, half-face respirator, full-face respirator, safety belt, anti-scalding clothing, warning belt, four-in-one detector , Medicine cabinet, etc. The second is emergency supplies for accidents, such as: linoleum, fire-resistant surfaces, mobile emergency lighting, explosion-proof tools, and radiation source clothing.

灵活焦化装置应急物资有两部分组成，一是日常应急物资，如：空气呼吸器、半面罩防毒口罩、全面罩防毒口罩、安全带、防烫服、警戒带、四合一检测仪、医药箱等。二是事故应急物资，如：吸油毡，防火面、移动应急照明灯、防爆工具、防放射源服等。

4.4.6.2 List of Emergency materials storage location and quantity 应急物资存放点、数量-览表

No. 序号	Equipment Descripon 物资名称	Specifications & Models 规格型号	Amount 数量	Unit 单位	Emergency Supplies level 应急物资级别	Place of Storage 存放地点
1	Thermal insulation clothing (fire protection clothing) 隔热服（防火服）	The moon RGF – F 登月 RGF-F	4	Set 套	department 部门	2 sets of emergency cabinets for coking and sulfur outside operation room 焦化、硫磺外操间应急柜各 2 套
2	Light chemical protection suit (acid and alkali proof)	Lakeland acid and alkali resistant headsuit	2	Set 套	department 部门	2 sets of emergency cabinet for sulfur outside operation

	轻防化服（防酸碱）	雷克兰耐强酸强碱带帽连体服				room 硫磺外操间应急柜 2 套
3	Level 1 chemical protection suit 一级防化服	The moon RHF – I 登月 RHF-I	2	Set 套	department 部门	1 set of emergency cabinet for coking and sulfur outside operation room 焦化、硫磺外操间应急柜各 1 套
4	Full cover long tube respirator 全面罩长管呼吸器	HG-GZ	6	Set 套	department 部门	3 set of emergency cabinet for coking and sulfur outside operation room 焦化、硫磺外操间应急柜各 3 套
5	Isolated air breathing apparatus 隔离式空气呼吸器	Honeywell SCBA123L C900 霍尼韦尔 SCBA123L C900	16	Set 套	department 部门	18set of emergency cabinet for coking and sulfur outside operation room 焦化、硫磺外操间应急柜各 8 套
6	Cordon 警戒带	The moon JS – 2 登月 JS-2	10	Box 盒	department 部门	5 set of emergency cabinet for coking and sulfur outside operation room 焦化、硫磺外操间应急柜各 5 盒
7	Emergency medicine cabinet 应急药箱	Standard emergency medicine kit 标准应急药箱	2	A 个	department 部门	1 set of emergency cabinet for coking and sulfur outside operation room 焦化、硫磺外操间应急柜各 1 个

8	Four in one detecto 四合一检测仪	Mesian Eagle 4X 梅思安天鹰 4X	13	A 台	department 部门	Coking (9 sets), sulfur (4 sets) outside operation shift 焦化（9 台）、硫磺（4 台）外操间交班
9	H2S alarming device H2S 报警仪	Skyhawk 2 x 天鹰 2X	2	A 台	department 部门	Transition of sulphur outside operation 硫磺外操间交班
10	Radiation meter 辐射计量仪	R - or EGD R-EGD 型	1	A 台	department 部门	Transition of coking operation 焦化外操间交班
11	Handheld explosion-proof flashlight 手持式防爆手电	Sea king JW7210 海洋王 JW7210	12	A 把	department 部门	焦化（8 把）、硫磺（3 把）外操间交班
12	Portable explosion-proof searchlight 手提式防爆探照灯	Sea kingFW6102GF 海洋王 FW6102GF	4	A 盏	department 部门	Coking, sulfur tools room each 2 焦化、硫磺工具间各 2 盏
13	Safety line (life line) 安全绳（救生绳）	NTR Vertical Safety Line, 16mm diameter, High Strength Polyester 耐特尔:NTR 垂直安全绳，直径 16mm，高强涤纶	4 (one bar each for 5m, 10m and 30m) 4（5m、10m、30m 各 1 条）	A 条	department 部门	Coking, sulfur tools room each 2 焦化、硫磺工具间各 2 条
14	Suction linoleum PP – 2 吸油毡 PP-2	Suzhou Jiahe, 120*60*1cm white felt, 20KG per pack 苏州佳	5	Bag 包	department 部门	Coking (4 packs), sulfur (1 pack) tool room 焦化（4 包）、硫磺

		和，吸油毡 120*60*1cm 白色 每包 20KG				（1 包）工具间
15	Copper shovel 铜锹	Cangzhou Bohai Sea. 340 x 175 square spade with handle 沧州渤海。340*175 方锹带柄	4	A 把	department 部门	Coking tool room 焦化工具间
16	Explosion-proof wrench 防爆扳手	安天防爆。8*10-10*12	2	Set 套	department 部门	Coking and sulfur tool room (1 set each)焦化、硫磺工具间（各 1 套）
17	Explosion-proof crowbar 防爆撬棍	安天防爆。22*800	2	A 根	department 部门	Coking and sulfur tool room (1 each) 焦化、硫磺工具间（各 1 根）
18	Asbeston 防火布	20M	8	rollreel 卷	department 部门	Coking and Sulfur Tool Room (4 rolls each) 焦化、硫磺工具间（各 4 卷）
19	Put on a full gas mask 全面罩防毒面具	HG-800，全面罩的视屏采用全面式	8	Set 套	department 部门	Emergency cabinet for external operation room of coking and sulfur (4 sets each) 焦化、硫磺外操间应急柜（各 4 套）
20	Antifreeze gloves 防冻手套	代尔塔 VV735 201753	4	Pair 双	department 部门	Emergency cabinet for external operation room of coking and sulfur (2 pairs each)

						焦化、硫磺外操间应急柜（各 2 双）

4.5 Environmental protection 环保技术规定

4.5.1 Wastewater discharge 废水排放

Table 44: Summary of wastewater discharge

表 44：废水排放一览表

No. 序号	Pollution source 污染源	Discharge parameter 排放参数		Discharge quantity 排放量(t/h)	Main pollutants 主要污染物	Discharge frequency 排放频率	Destination 排放去向
1	D-209	40℃	0.7MPa	20.2	Oil, sulfur content, COD 油、硫含量、COD	Cont. 连续	To wastewater stripping unit 至污水汽提装置
3	C-303			26.9			
4	D-304			3.0			
5	Wastewater tank 废水池	40℃	0.7MPa	40	Coke powder, oil, COD 焦粉、油、COD	Cont. 连续	To wastewater treatment system 至污水处理系统

4.5.2 Waste gas emission 废气排放

Table 45: Summary of waste gas emission

表 45：废气排放一览表

No. 序号	Pollution source 污染源	Discharge parameter 排放参数		Discharge quantity 排放量 (Nm^3/h)	Main discharge 主要排放物（%WT）	Discharge frequency 排放频率	Destination 排放去向
		Temperature 温度	Pressure 压力				
1	Exhaust of furnace F-102, Furnace -104 炉 F-102、炉 -104 排气	Ambient temperature 常温	Normal pressure 常压	40000	Smoke 烟气	Cont. 连续	Atmosphere 大气
2	Discharge	Ambient	Normal	1650	Air	Cont.	Atmosphere

	of K-401, K-402, K-403 K-401、K-402、K-403 出口	temperature 常温	pressure 常压		空气	连续	大气

4.5.3 Solid wastes discharge 固废排放

Table 46 List of solid wastes

表 46：固废排放一览表

No. 序号	Pollution source 污染源名称	Discharge quantity 排放量 t/a	Main pollutants 主要污染物	Discharge frequency 排放频率	Destination 排放去向
1	COS spent catalyst COS 废催化剂	186.2m^3	Al_2O_3	Semiannually 半年一次	Outsourcing, landfilling 外委、填埋
2	COS porcelain ball COS 瓷球	53.2m^3	Al_2O_3	Semiannually 半年—次	Outsourcing, landfilling 外委、填埋
3	Activated carbon 活性炭	100m^3	Activated carbon 活性炭	Semiannually 半年—次	Boiler blending combustion 锅炉掺烧
4	Dry coke powder 干焦粉	5500	Coke 焦炭	Weekly 1 次/周	Boiler blending combustion 锅炉掺烧
5	Wet coke powder 湿焦粉	3400	Coke 焦炭	Weekly 1 次/周	Boiler blending combustion 锅炉掺烧
6	Bed coke 床层焦	7800	Coke 焦炭	Weekly 1 次/周	Boiler blending combustion 锅炉掺烧

4.5.4 Noise emission 噪声排放

Table 47: List of noise emission

表 47：噪声排放一览表

No. 序号	Noise source 噪声源	Frequency 工作情况	Noise level before treatment 消声前声压级 dB(A)	Measures 消声措施	Noise level after treatment 消声后声压级 dB(A)
1	Main blower area 主风机区	Cont.连续	95～100	Providing noise enclosure 加隔音罩	85
2	Gas compressor area 气压机区	Cont.连续	85	Selecting low noise equipment 选用低噪声设备	85
3	Pump area 泵区	Cont.连续	85	Selecting low noise equipment 选用低噪声设备	85

4.5.5 Add diverting wastewater from clean water (including operating specification, operating requirements, oily sewage pipe network, initial rainwater and rainwater pipe networks, etc.)
增加清污分流（包括：操作规定、操作要求、含油污水管网、初期雨水及雨水管网等）

4.5.6 Radioactive source management 放射源管理

There are 3 radioactive liquid level meters and 1 radioactive hydrometer. Radioactive source is γ-ray source.
本装置中有 3 个放射性液位计和 1 个放射性比重计，放射源为（γ射线）。

Table 48: Radioactive source schedule

表 48：放射源一览表

No. 序号	Nuclide name 核素名称	Factory activity 出厂活度（Bq）	Installation or use position 安放或使用位置
1	Cs-137	7.40E+8	LT-20103ABC/C201
2	Cs-137	7.40E+8	AT-41001/T405

4.6 Safety and environmental protection precautions during shutdown and maintenance period 停工检修期间安全、环保注意事项

4.6.1 Safety precautions during shutdown period 停工期间安全注意事项

4.6.1.1 The workers of each position shall be organized to inspect the safety of all pumps, tower, heat exchangers, vessels, pipelines and accessories as well as instrument, so as to

perform the JHA analysis and prepare risks control measures according to the maintenance scheme.
组织各岗人员将所有的机泵、塔、换热器、容器、管线及其附件和仪表等进行全面的检查，按照检修方案开展工作危害 JHA 分析，制定风险控制措施。

3.6.1.2 The surplus material during plant shutdown shall be properly arranged, the purging process, treatment procedures for equipment/pipeline to be checked shall be properly arranged and specific person shall be arranged to perform the work.
装置停工时的残料，应妥善安排，停工后的吹扫流程、需检修的设备、管线的处理方案都要事先安排好，并将责任落实到个人。

4.6.1.3 The hot work within and around the plant shall be prohibited during shutdown, the abnormal situation and treatment methods shall be timely recorded. 停车过程中，装置内及周围禁止热工作业，对发生的异常情况和处理方法，要随时作好记录。

4.6.1.4 The plant shutdown must be performed according to the instruction. The internal/external liaison shall be strengthened, and the equipment shall be cooled, decommissioned and shut down strictly according to the operation specification; the equipment shall be cooled according to the specified rate. The temperature of high temperature equipment shall not be cooled rapidly to avoid equipment damage, leakage, fire, leakage and toxicosis.
停工过程必须统一指挥。加强内外联系，设备降温、降量和停工时的操作，要严格按操作规程进行，降温应按规定的降温速率进行降温，需保证达到规定要求。高温设备不能急骤降温，以免设备损坏和泄漏着火、漏气中毒。

4.6.1.5 The system shall be depressurized slowly, but the pressure shall never be decreased to zero or negative pressure. The system shall be maintained at slightly positive pressure. The equipment shall not be dismantled before depressurization.
系统卸压要缓慢由高压降至低压，但压力不得降至零，更不能造成负压，一般要求系统内保持微正压。在未作好卸压前，不得拆动设备。

4.6.1.6 All equipment, pumps, raw material pipeline shall be properly treated according to the shutdown procedure: purging the system, closing the valve. Communication between positions and plants shall be strengthened; special attention shall be paid to the fire control, explosion proof, overpressure prevention, leakage prevention.
所有的设备、机泵、原料线均应根据停工措施的规定，妥善处理，该吹扫的必须吹扫干净，该关的阀门必须关严，不得有任何遗漏。岗位之间及有关联的装置要加强联系，注意防火、防爆、防超压、防跑串。

4.6.1.7 The vent valve shall be timely opened after steam blowing of tower, vessel and tank; the opening at top of tank shall be checked when venting from bottom or transferring material via pump, so as to avoid vacuum conditions tank damage.
塔、容器、罐用蒸汽吹扫后，应及时打开放空阀，塔、容器、罐在底部放空或用泵倒料时，应先检查罐顶的开孔是否打开，打开后才能进行作业，以免产生真空引起憋罐事故。

4.6.1.8 All inspected and repaired equipment and pipeline must be properly purged, and properly recorded if purged with steam; the steam supply and stop time, procedure, responsible persons shall be clearly specified. The condensate shall be completely drained before steam purge to avoid equipment damage.
所有检修的设备、管线必须吹扫干净，对蒸汽吹扫进行登记，明确开、停汽时间、流程和责任人，防止漏扫。蒸汽扫线前放尽冷凝水以防水击打坏设备。

4.6.1.9 The gas, liquid and solid material in production system (equipment, pipeline) shall be completely discharged. If the material cannot be completely drained, further safety measures shall be adopted; such material shall not be vent or discharged to gutter to avoid environmental pollution or accident.
排净生产系统(设备、管道)内储存的气、液、固体物料。如物料确实不能完全排净，应进一步采取安全措施，不得随意放空或排入下水道，以免污染环境或发生事故。

4.6.1.10 Plant purge procedure shall be prepared for plant shutdown. The tower, vessel shall be purged with steam for 72 hours to assure the acceptable flammable gas analysis results. Special personnel shall be arranged for custody after open fire test before entering the equipment. Entering equipment by single person shall be strictly prohibited. The material line, gas line and shall be blinded after shutdown and purging.
装置停工吹扫时，先制定吹扫流程。塔、容器用蒸汽吹扫要达 72 小时，达到无味，可燃气体分析合格，明火试验后外面有专人看护，方可进入工作，严禁单人进入设备。停工扫线后与系统有关的物料线、瓦斯线、物料线应打盲板。

4.6.1.11 The system shall be properly isolated to prevent the toxic, flammable, explosive, corrosive, asphyxiant or high temperature material from entering equipment and causing major accident; therefore, the inspected and repaired equipment must be properly isolated. The most reliable isolation method is to remove part of pipeline or install blind. All blinds must be registered by dedicated person, and removing/installing blind without permission shall be strictly prohibited.
做好隔绝工作，由于隔绝不可靠，致使有毒、易燃、易爆、腐蚀、窒息或高温介质进入检修设备而造成的重大事故时有发生，因此，检修设备必须进行可靠隔绝。视具体情况最安全可靠的隔绝办法是拆除部分管线或插入盲板。所有盲板必须专人负责登记，严禁私自拆加盲板。

4.6.1.12 The equipment manholes shall be opened from top to bottom after equipment shutdown, the internal temperature and pressure shall be decreased to safe level; the bottom material discharge valve shall be first opened to confirm that the equipment is not plugged or there is no material inside before opening the bottom manhole. Do not loosen all bolts before the manhole cover is loosened, so as to avoid scalding personnel. The heat exchanger shall be vented to depressurize before removing the head of exchanger, all sewer cover and ground drains must be sealed with asbestos cloth.
停工吹扫后，打开设备人孔时，其内部温度、压力应降到安全条件以下，并从上而下依次打开，在打开底部人孔时，应先打开最底部放料排空阀门，待确认内部没有堵塞或残存物料时，方可进行拆卸。人孔盖在松动之前，切记不要把螺丝全部拆开，严防烫伤人员。拆卸换热器封头时，应先放空，消除压力，所有的下水井盖、地漏应用石棉布封死。

4.6.1.13 Purging: the flammable, explosive and hazardous gas in equipment and pipeline within the inspection and repair scope shall be properly purged to assure the work safety.
做好置换工作。为保证检修动火和进设备内作业安全，在检修范围内的所有设备和管线中的易燃、易爆、有毒有害气体应进行置换。

4.6.1.14 Cleaning: the sediment and scale of flammable and toxic material at internal wall of equipment that cannot be removed via purging and blowing shall be cleaned and scraped via boiling and chemical cleaning. Special attention shall be paid to that the waste liquid from chemical cleaning shall be properly treated before discharging, and the sediment scraped shall also be properly treated.
做好清洗和铲除工作。对置换和吹扫都无法清除的黏结在设备内壁的易燃、有毒物质的沉积物及结垢，采用清洗和铲除的办法进行处理。清洗一般有蒸煮和化学清洗。注意采用化学清洗后的废液应予以处理后方可排放，对铲刮下来的沉积物妥善处理。

4.6.1.15 Gas mask, air respirator and special PPE must be provided for activities performed in toxic and harmful position (including activities inside equipment, wastewater lifting tank, and water well) to avoid poisoning; work permit must be obtained for activities performed in confined space.
凡进入有毒、有害部位（包括进入设备内、污水提升池、下水井内）作业，必须配备防毒面具、空气呼吸器等特殊防护用品以防中毒，进入有限空间作业必须办理作业票。

4.6.1.16 The tools must be inspected before maintenance, especially the welding tools, lifting tools, mechanical tools; any tool that does not conform to the requirements shall not be used.
检修前必须对工具进行检查，特别是焊接工具、起重工具、机具，凡不符合要求的，一律禁止使用。

4.6.1.17 The following four principles must be observed during maintenance: Don't begin any construction and hot work without safety measures, don't enter construction site without helmet, don't perform any aloft work without safety belt, and don't throw objects during construction at high place.
检修工作要严格执行"四不准"的规定，即：没有安全措施或措施不落实不准施工和用火、不带安全帽不准进入施工作业现场、不系安全带不准进行高空作业，高处施工不准高空落物。

4.6.1.18 The hot work permit system shall be strictly observed; the hot work during maintenance period belongs to level II hot work, and work permit shall be issued by plant engineer and engineer assistant.
严格执行用火制度，检修期间装置动火属于二级动火，火票由装置工程师和工程师助理签发才可生效。

4.6.1.19 Maintenance activities performed within flammable and explosive area shall not use sparking tools to dismantle or knock equipment. The temporary electrical facilities and illumination facilities shall conform to the safety and technical requirements of explosion proof electrical equipment.
在易燃易爆区域内检修，不得使用产生火花的工具拆卸、敲打设备。临时用电设施或照明应符合电气防爆安全技术要求。

4.6.1.20 The scaffolding, ropes and etc. for aloft work must be carefully checked before maintenance activities, the rolling objects on the platform must be removed timely; the aloft work area must be enclosed with rope and dedicated persons shall be arranged for guarding. If activities are to be performed in layers, reliable protection and isolation measures must be provided; the tools for aloft work must be secured with safety rope and throwing any object shall be strictly prohibited.
在检修中，高空作业的脚手架、绳索等，工作前必须进行详细检查，平台上的滚动物件必须随时清除，高空作业的区域，要用绳索围起来作为禁区，并指派专人监护禁止行人通过。如因工作确实需要分层作业，必须有可靠的防护隔离措施，高空作业的工具必须系上保险绳，严禁往下抛扔任何物件。

4.6.1.21 Work permit must be obtained and site custody must be performed by dedicated person during working in sewer.
进入下水道作业时，必须办理作业票并指派专人在现场监护。

4.6.1.22 Work permit must be obtained and all manholes on equipment shall be opened before maintenance activities in equipment to maintain ventilation in equipment; forced ventilation shall be used if necessary; but pure oxygen shall not be allowed to avoid toxicosis.

在设备内检修作业前应办理作业证，应打开设备上的所有人孔，保持设备内空气流通，必要时可向设备内通风，但不得通入纯氧，以防中毒。

4.6.1.23 Work permit must be obtained when removing the slags of flammable material in vessel, and non-sparking tools must be used; knocking with iron tools shall be strictly prohibited.

在清除容器内少量可燃物料残渣必须办理作业票，必须使用不产生火花的工具，严禁用铁器敲击碰撞。

4.6.2 Environmental precautions during shutdown period 停工期间环保注意事项

Technical requirements for environmental management of the department shall be prepared according to the environmental management contents of startup & shutdown and repair & maintenance of environmental management system of HSE management department.

参照 HSE 管理部环保管理制度开停工及检维修环保管理内容编制部门环保管理技术要求。

5 Attachment 附件

Attachment 1: Equipment schedule
附件 1：设备一览表

Attachment 2: Interlocking logic diagram of processes
附件 2：工艺联锁逻辑图

Attachment 3: Interlocking logic diagram of the Units
附件 3：机组联锁逻辑图

5.1 Equipment schedule 设备一览表

Table 49: Reaction equipment
表 49：反应设备类

No. 序号	Item No. 设备位号	Equipment name 设备名称	Qty., set(s) 数量（台）	Type 型式	Volume, m^3 容积 m^3	Fluid 介质	Design conditions 设计条件		Reactor size 反应器规格
							Design pressure 设计压力 (MPa)	Design temperature 设计温度（℃）	Diameter (Φ) mm× length (height)mm× wall thickness 直径（Φ）mm×长度 (高度)mm×壁厚
1	R-101	Reactor 反应器	1	Vertical 立式	1190	Coke fines, Residue, oil vapor 焦粉、渣油、油气	0.4	538	Φ5050*Φ5450*Φ3650*52750*40/20/34/34/36/20/30/30/16/24
2	R-102	Heater 加热器	1	Vertical 立式	1423	Coke fines, Flexigas 焦粉、灵活气	0.56	343	Φ9365*Φ4330*34893*28/20
3	R-103	Gasifier 气化器	1	Vertical 立式	2996	Coke fines, Flexigas 焦粉、灵活气	0.56	343	Φ13360*24110*36
4	R-301A/B	COS converter 羰基硫转换器	2	Horizontal 卧式	458.3	Flexigas 灵活气	0.66	300	Φ6300*15794*24

Table 50: Vessels
表 50：容器类

No. 序号	Item No. 设备位号	Equipment name 设备名称	Qty., set(s) 数量（台）	Type 型式	Dimensions 外型尺寸	Volume, 容积（m^3）	Fluid 介质	Pressure 压力(MPaG)		Temperature 温度℃	
					Diameter (Φ) mm×length) mm×wall thickness mm 直径（Φ）mm×长度)mm×壁厚 mm			Operating 工作	Design 设计	Operating 工作	Design 设计
1	D-101	Coke quenching tank 焦炭急冷罐	1	Vertical 立式	Φ1724*8720*12	17.5	Coke fines, water steam 焦粉、水汽	0.232	0.66	615	649
2	D-102	Slurry recycling tank 污泥回炼罐	1	Vertical 立式	Φ2300*8700*16	32.1	Slop oil 污油	0.23	1.22	50	245
3	D-103	MP steam separator 中压蒸汽汽水分离器	1	Horizontal 卧式	Φ3400*14624*62	127.2	Steam, water 蒸汽、水	4.2	4.55	252	420

Table 50: Vessels (Continued)
表 50：容器类（续）

No. 序号	Item No. 设备位号	Equipment name 设备名称	Qty., set(s) 数量（台）	Type 型式	Dimensions 外型尺寸 Diameter (Φ) mm×length) mm×wall thickness mm 直径（Φ）mm×长度)mm×壁厚 mm	Volume, m^3 容积（m^3）	Fluid 介质	Pressure 压力(MPaG)		Temperature 温度℃	
								Operating 工作	Design 设计	Operating 工作	Design 设计
4	D-104	Steam condensate water blowdown drum 蒸汽冷凝水排污罐	1	Vertical 立式	Φ900*3191*8	1.94	MP steam 中压蒸汽	0.52	0.8	160	270
5	D-105	Fuel gas KO drum 燃料气分液罐	1	Vertical 立式	Φ800*4085*10	1.3	Fuel gas 燃料气	0.45	1/-0.1	40	150
6	D-106	Main air blower outlet KO drum 主风机出口分液罐	1	Vertical 立式	Φ800*2816*8	1.36	Air 空气	0.355	0.66	65	285
7	D-107	Vacuum Residue feed tank 减压渣油进料罐	1	Vertical 立式	Φ3400*11483* (30+3)	102.7	Residue 渣油	0.23	1.91	270	300
8	D-110	Purging fuel gas KO drum 吹扫燃料气分液罐	1	Vertical 立式	Φ800*4085*10	1.3	Fuel gas 燃料气	1	1.2/-0.1	40	250
9	D-201	Fractionator overhead reflux tank 分馏塔顶回流罐	1	Horizontal 卧式	Φ3600*13436*18	130	Fractionator overhead reflux 分馏塔顶回流	0.1	0.48/-0.1	44	270
10	D-202	Stage I compression KO drum 一级压缩气液分离罐	1	Horizontal 卧式	Φ3000*10636*26	71	Oil vapor, naphtha, sour water 油气、石脑油、酸性水	0.26	1.6	40	150
11	D-203	Stage II compression KO drum 二级压缩气液分离罐	1	Horizontal 卧式	Φ2600*9232*24	47	Oil vapor, naphtha, sour water 油气、石脑油、酸性水	0.74	1.6	40	60

Table 50: Vessels (Continued)
表 50：容器类（续）

No. 序号	Item No. 设备位号	Equipment name 设备名称	Qty., set(s) 数量（台）	Type 型式	Dimensions 外型尺寸 Diameter (Φ) mm×length) mm×wall thickness mm 直径（Φ）mm×长度)mm×壁厚 mm	Volume, 容积（m^3）	Fluid 介质	Pressure 压力(MPaG)		Temperature 温度℃	
								Operating 工作	Design 设计	Operating 工作	Design 设计
12	D-204	Stage III compression KO drum 三级压缩气液分离罐	1	Horizontal 卧式	Φ2400*8448*24	36.55	Oil vapor, naphtha, sour water 油气、石脑油、酸性水	2.16	2.57	40	150
13	D-205	Cooler separator of intermediate section of absorption-desorption tower 吸收解吸塔中段冷却器分离器	1	Horizontal 卧式	Φ1700*6705*22	14	Unstable naphtha, sour water 不稳定石脑油、酸性水	2.09	2.67、-0.1	40	255
14	D-206	Settling tank of absorption-desorption tower water 吸收解吸塔水沉降罐	1	Horizontal 卧式	Φ2100*8016*26	25	Naphtha, sour water 石脑油、酸性水	2.1	2.67/-0.1	73	255
15	D-208	Stabilizer overhead reflux tank 稳定塔顶回流罐	1	Horizontal 卧式	Φ1900*7890*20	21.5	Liquefied gas 液化气	1.266	1.825	40	255/-34
16	D-209	Sour water collection tank 酸性水收集罐	1	Horizontal 卧式	Φ2500*10247*16	46	Sour water 酸性水	0.1	0.48/-0.1	40	150
17	D-210	Flushing oil tank 冲洗油罐	1	Vertical 立式	Φ2500*10024*12	47	Light wax oil 轻蜡油	0.18	0.46/-0.1	150	245
18	D-211	Flare KO drum 火炬分液罐	1	Horizontal 卧式	Φ3900*13586*18	155	Flare gas 火炬气体	0.02	0.375	150	390
19	D-212	Clean and slop oil tank 清污油罐	1	Horizontal 卧式	Φ2200*5924*12		Light slop oil 轻污油	0.08	0.78	40	200

Table 50: Vessels (Continued)
表 50：容器类（续）

No. 序号	Item No. 设备位号	Equipment name 设备名称	Qty., set(s) 数量（台）	Type 型式	Dimensions 外型尺寸 Diameter (Φ) mm×length) mm×wall thickness mm 直径（Φ）mm×长度)mm×壁厚 mm	Volume, 容积（m^3）	Fluid 介质	Pressure 压力(MPaG)		Temperature 温度℃	
								Operating 工作	Design 设计	Operating 工作	Design 设计
20	D-214	Reboiler condensate water tank 重沸器冷凝水罐	1	Vertical 立式	Φ578*3501*16	0.61	Condensate water, steam 凝结水、蒸汽	2.31	2.75/-0.1	222	425
21	D-301	Tertiary cyclone tank 三级旋风分离器罐	1	Vertical 立式		120	Flexigas, coke fines, nitrogen 灵活气、焦粉、氮气	0.208	0.66	215	345
22	D-302	Flexigas Venturi separator 灵活气文丘里分离器	1	Vertical 立式	Φ5000*12600	281.7	Flexigas, slurry 灵活气、浆液	0.177	0.66	93	245
23	D-303	Condensate water tank 冷凝水罐	1	Vertical 立式	Φ610*2326*10		Condensate water, steam 凝结水、蒸汽	0.58	1.5	164	320
24	D-304	Regenerator reflux tank 再生塔回流罐	1	Horizontal 卧式	Φ2500*9897* (10+3)	44	Sour gas, sour liquid 酸性气、酸性液	0.107	1.06/-0.1	48	185
25	D-305	Regenerator bottom reboiler condensate water tank 再生塔底重沸器冷凝水罐	1	Vertical 立式	Φ500*3270*10	0.53	Condensate water, steam 凝结水、蒸汽	0.4	0.84/-0.1	152	250
26	D-306	Activated carbon tank 活性炭罐	1	Vertical 立式	Φ3000*6700		Solvent, activated carbon 溶剂、活性炭	0.539	0.87	45	150
27	D-307	Condensate water tank of solvent recovery unit 溶剂回收器冷凝水罐	1	Vertical 立式	Φ610*2533.5*18		Condensate water, steam 凝结水、蒸汽	1.69	4.2	207	285

Table 50: Vessels (Continued)
表 50：容器类（续）

No. 序号	Item No. 设备位号	Equipment name 设备名称	Qty., set(s) 数量（台）	Type 型式	Dimensions 外型尺寸 Diameter (Φ) mm×length) mm×wall thickness mm 直径（Φ）mm×长度)mm×壁厚 mm	Volume, m^3 容积（m^3）	Fluid 介质	Pressure 压力(MPaG)		Temperature 温度℃	
								Operating 工作	Design 设计	Operating 工作	Design 设计
28	D-308	Condensate water flash tank 凝结水扩容器	1	Vertical 立式	Φ1200*4745*10	4.8	Condensate water, steam 凝结水、蒸汽	0.54	0.8	162	250
29	D-309	Flexsorb underground solvent tank Flexsorb 地下溶剂罐	1	Horizontal 卧式	Φ4200*16940*26	224	Solvent 溶剂	0.1	0.35/-0.1	50	150
30	D-311	Vent gas water sealed drum 放空气体水封罐	1	Horizontal 卧式	Φ3638*20918*	200	Flare vent gas 火炬放空气	0.128	0.7	215	245
31	D-312	Purified water tank 净化水罐	1	Horizontal 卧式	Φ1900*2599*12	17.8	Purified water 净化水	0.22	0.78	40	150
32	D-401	Bed coke bin 床层焦料仓	1	Vertical 立式	Φ8800*39375*40 /34/30	2044.4	Bed coke 床层焦	0-0.34	0.66	130-247	310
33	D-402	Coke fines Venturi separator 焦粉文丘里分离器	1	Vertical 立式	Φ1500*6483	12.21	Coke fines, water 焦粉、水	-2.45KPa	-30.6/4.9KPa	93	310
34	D-503	1.0MPa steam separator 1.0MPa 蒸汽分水罐	1	Vertical 立式	Φ2000*4976*18	12.6	1.0 MPa steam 1.0 MPa 蒸汽	1	1.5	252	320
35	D-504	3.5MPa steam separator 3.5MPa 蒸汽分水罐	1	Vertical 立式	Φ1900*5180*38	7.07	3.5 MPa steam 3.5 MPa 蒸汽	3.5	4.2	390	450
36	D-505	Instrument air tank 仪表风罐	1	Vertical 立式	Φ2600*7004*12	45.65	Instrument air 仪表风	0.7	1	40	150
37	D-506	Plant air tank 工厂风罐	1	Vertical 立式	Φ2600*7004*12	45.65	Plant air 工厂风	0.7	1	40	150
38	D-508	LP nitrogen tank 低压氮气罐	1	Vertical 立式	Φ2600*9404*12		LP nitrogen 低压氮气	0.6	1	40	150

Table 50: Vessels (Continued)
表 50：容器类（续）

No. 序号	Item No. 设备位号	Equipment name 设备名称	Qty., set(s) 数量（台）	Type 型式	Dimensions 外型尺寸 Diameter (Φ) mm×length) mm×wall thickness mm 直径（Φ）mm×长度)mm×壁厚 mm	Volume, m^3 容积（m^3）	Fluid 介质	Pressure 压力(MPaG)		Temperature 温度℃	
								Operating 工作	Design 设计	Operating 工作	Design 设计
39	T-301	FLEXSORB fresh solvent tank FLEXSORB 新鲜溶剂储罐	1								
40	T-302	Lean solvent tank 贫溶剂储罐	1								
41	T-303	Soda residue tank 碱渣池	1								
42	T-401	Coke fines bin 焦粉料仓	1								
43	T-402	Water sealed tank 水封罐	1	Vertical 立式	Φ1500*2275.6*6	4.01	Water 水	0	±0.0049	40	310
44	T-403	Diluted slurry tank 稀浆液储罐	1								
45	T-404	Diluted slurry tank 稀浆液储罐	1								
46	T-405	Slurry thickener tank 浆液增稠器储罐	1		Φ10000*5000						
47	T-409	Coke fines separator/wastewatertank 焦粉分离器/污水池	1								
48	BN401	Coke conveying hopper 焦炭输送料斗	1	Vertical 立式	Φ5000*21109*14	353.3	Coke 焦炭	1.96KPa	±0.0049	60	220
49	BN402	Coke filling hopper 焦炭装填料斗	1	Vertical 立式	Φ1300*7965*14		Coke 焦炭				
50	FI301	Flare shell 火炬筒体	1	Vertical 立式	Φ1200*75000		Flare vent gas 火炬放空气	Atmospheric 常压	0.7	215	245
51	DH101	Deaerator 除氧器	1	Horizontal 卧式	C*C-95/35	35	deoxygenated water 除氧水	0.1	1.2	120	250

Table 51: Heater
表 51：加热炉

No. 序号	Item No. 设备位号	Equipment name 设备名称	Qty., set(s) 数量（台）	Model and specification 型号规格	Combustion medium 燃烧介质	Pressure 压力（MPa）		Temperature 温度(℃)		Tube material 炉管材质	Tube size 炉管规格
						Operating 操作	Design 设计	Operating 操作	Design 设计		
1	F-101	Auxiliary combustion chamber 辅助燃烧室	1	Φ2000*9920*20；25.6t	Fue gas 燃料气	0.395	0.66	1200	1650	/	
2	F-102	MP steam superheater 中压蒸汽过热炉	1	Radiation chamber: Φ6684*12100; convection chamber: Φ1998*8418 chimney: Φ1712*22282; total weight: 172t 辐射室：Φ6684*12100 对流室：Φ1998*8418 烟囱：Φ1712*22282； 总重：172t	Fuel gas, Flexigas 燃料气、灵活气	3.979		440/801	521/950	WP22	Φ127*12*13000
3	F-104	LP steam superheater 低压蒸汽过热炉	1	Radiation chamber: Φ4539*7010; convection chamber: Φ1560*4720; total weight: 61t 辐射室：Φ4539*7010 对流室：Φ1560*4720 总重：61t	Fuel gas 燃料气	0.846		485/742	588/906	WP22	Φ102*10*10000

Table 52: Towers
表 52：塔类

No. 序号	Item No. 设备位号	Equipment name 设备名称	Qty., set(s) 数量（台）	Dimensions 外型尺寸	Fluid 介质	Pressure 压力 MPaG		Temperature 温度℃			Internal structure 内部结构	
				Diameter (Φ) mm×height mm×wall thickness mm 直径（Φ）mm×高度 mm×壁厚 mm		Operating 操作	Design 设计	Overhead 顶部	Bottom 底部	Design 设计	Type 型式	Number of trays or number of packing layers 塔板数或填料层数
1	C-101	Reactor scrubber 反应器洗涤塔	1	Φ4000*Φ5038*20209*(20+3)/(20+3)/(46+6)/(46+6)/(28+6)/(40+6)	Oil slurry, oil vapor 油浆、油气	0.1	0.4	386	386	538	Herringbone baffle/grid packing 人字挡板/格栅填料	6/1
2	C-201	Fractionator 分馏塔	1	Φ4000*52688*(3+18)/16/(3+14)	Heavy wax oil, Light wax oil, diesel oil, naphtha, water (H_2S) 重蜡油、轻蜡油、柴油、石脑油、水（硫化氢）	0.06	0.345 for upper 0.385 for lower 0.345 上 0.385 下	106	343	390 for upper 460 for lower 390 上 460 下	Packing, tray 填料、塔盘	Packing section 1: 3120mm Packing section 2: 3900mm Packing section 3: 1560mm Tray 1: 16 Tray 2: 16 填料段 1：3120mm 填料段 2：3900mm 填料段 3：1560mm 塔盘 1：16 塔盘 2：16

Table 52: Towers (Continued)
表 52：塔类（续）

No. 序号	Item No. 设备位号	Equipment name 设备名称	Qty., set(s) 数量（台）	Dimensions 外型尺寸	Fluid 介质	Pressure 压力 MPaG		Temperature 温度℃			Internal structure 内部结构	
				Diameter (Φ) mm×height mm×wall thickness mm 直径（Φ）mm×高度 mm×壁厚 mm		Operating 操作	Design 设计	Overhead 顶部	Bottom 底部	Design 设计	Type 型式	Number of trays or number of packing layers 塔板数或填料层数
3	C-202	Diesel oil stripper 柴油汽提塔	1	Φ1800/Φ1100/Φ1100*33085*(3+10)/(3+10)/10 (the same as total dimension of C210) Φ1800/Φ1100/Φ1100*33085*(3+10)/(3+10)/10（同 C210 总尺寸）	Diesel oil, steam 柴油、蒸汽	0.08	0.455	176	174	320	Sieve tray 筛板塔盘	6
4	C-203	Coking heavy wax oil stripper 焦化重蜡油汽提塔	1	Φ1100/Φ1800*19286*(3+8)	Heavy wax oil, steam 重蜡油、蒸汽	0.1	0.375	346	335	420	Baffle tray 挡板塔盘	12
5	C-204	Absorption-desorption tower 吸收解吸塔	1	Φ1700/Φ2300/Φ3300*59047*22/26/34	Oil vapor, naphtha, sour water 油气、石脑油、酸性水	2.07	2.35	53	176	255	Sieve tray 筛板塔盘	50
6	C-205	Reabsorber 再吸收塔	1	Φ1100*25689*14	Oil vapor, absorbed oil 油气、吸收油	1.999	2.35	48	62	185	Sieve tray 筛板塔盘	24
7	C-207	Stabilizer 稳定塔	1	Φ3800/Φ2100*38941*26/16	Naphtha (H_2S), liquefied gas 石脑油（硫化氢）、液化气	1.331	1.505	61	192	255	Sieve tray 筛板塔盘	36
8	C-210*	Coking light wax oil stripper 焦化轻蜡油汽提塔	1	Φ1800/Φ1100/Φ1100*33085*(3+10)/(3+10)/10 (the same as total dimension of C203) Φ1800/Φ1100/Φ1100*33085*(3+10)/(3+10)/10（同 C203 总尺寸）	Light wax oil, steam 轻蜡油、蒸汽	0.084	0.5	299	296	390	Baffle tray 挡板塔盘	12
9	C-301	Slurry stripper 浆液汽提塔	1	Φ1500*48088*22/(3+10)	Slurry, steam 浆液、蒸汽	0.208	0.66	134	137	315	Baffle tray 挡板塔盘	59
10	C-302	Stage I contact cooling tower 一级接触冷却塔	1	Φ5300*28551*26	Flexigas, water 灵活气、水	0.17	0.66	55	76	245	Packing 填料	2638mm

Table 52: Towers (Continued)
表 52：塔类（续）

No. 序号	Item No. 设备位号	Equipment name 设备名称	Qty., set(s) 数量（台）	Dimensions 外型尺寸	Fluid 介质	Pressure 压力 MPaG		Temperature 温度℃			Internal structure 内部结构	
				Diameter (Φ) mm×height mm×wall thickness mm 直径（Φ）mm×高度 mm×壁厚 mm		Operating 操作	Design 设计	Overhead 顶部	Bottom 底部	Design 设计	Type 型式	Number of trays or number of packing layers 塔板数或填料层数
11	C-303	Stage II contact cooling tower 二级接触冷却塔	1	Φ4900*31449*24	Flexigas, water 灵活气、水	0.132	0.66	42	51	245	Packing 填料	Packing section 1: 2625mm Packing section 2: 1583mm 填料段 1：2625mm 填料段 2：1583mm
12	C-304	Flexigas desulfurizer 灵活气脱硫塔	1	Φ5400*35569*18/(3+16)	Solvent, Flexigas 溶剂、灵活气	0.128	0.66	46	50	245	Packing 填料	Packing section 1: 2440mm Packing section 2: 7925mm 填料段 1：2440mm 填料段 2：7925mm
13	C-305	Flexsorb solvent regenerator Flexsorb 溶剂再生塔	1	Φ4000*41317*16/(3+14)	Solvent 溶剂	0.127	0.725	120	131	215	Sieve tray 筛板塔盘	29

Table 53: Heat exchanger
表 53：换热器

No. 序号	Item No. 设备位号	Equipment name 设备名称	Type 型式	Qty., set(s) 数量（台）	Dimensions(inner diameter×length ×wall thickness) (mm) 外型尺寸（内径×长度×壁厚）（mm）	Heat exchange area, m^2 换热面积 m^2	Number of passes 程数		Fluid 介质		Design and operating conditions 设计及操作条件						Structure of tubeside 管程结构	
											Pressure 压力（MPaG）		Temperature 温度（℃）					
											Shellside 壳程	Tubeside 管程	Shellside design 壳程设计		Tubeside design 管程设计			
							Shellside 壳程	Tubeside 管程	Shellside 壳程	Tubeside 管程	Design/ operating 设计/操作	Design/ operating 设计/操作	Design 设计	Operating inlet/outlet 操作入/出口	Design 设计	Operating Inlet/outlet 操作入口/出口	Outer diameter of tube×wall thickness ×length 管子外径×壁厚×长度	Number of tubes (pc(s)) 管子数量（根）
1	E-101	Scrubber bottom circulation oil steam generator 洗涤塔底循环油蒸汽发生器	BHS900-4.8-317-9/25-8I(B=480)	1	Φ900*10510	317	1	8	Water steam 水汽	Scrubber bottom oil 洗涤塔底油	4.8/ 4.234	3.84/1.05	420	252/255	405	373/ 286	25*2.5*9000	448
2	E-102	Flexigas steam generator 灵活气蒸汽发生器	NES3200-4.8/0.66-1664-8/50-1I(B=600)	1	Φ3200*18990	1545.2	1	1	Boiler water and steam 锅炉水和蒸汽	Flexigas 灵活气	4.801/4. 15	0.66/0.22	290/150	252/255	343	613/ 315	51*5.6*8000	1218
3	E-103	Boiler feedwater preheater 锅炉给水预热器	NES2700-4.8/0.66-985-6/50-1I(B=600)	1	Φ2700*14637	956	1	1	Boiler water and steam 锅炉水和蒸汽	Flexigas 灵活气	4.785-/4. 45	0.66/0.23	290/150	122/215	343	315/ 215	51*5.6*6000	1003

Table 53: Heat exchanger (Continued)
表 53：换热器（续）

No. 序号	Item No.	Equipment name	Type 型式	Qty., set(s)	Dimensions(inner	Heat exchange	Number of passes	Fluid 介质	Design and operating conditions 设计及操作条件	Structure of tubeside 管程结构

	设备位号	设备名称		数量（台）	diameter×length ×wall thickness) (mm) 外型尺寸（内径×长度×壁厚）（mm）	area, m^2 换热面积 m^2	程数				Pressure 压力（MPaG）		Temperature 温度（℃）					
							Shellside 壳程	Tubeside 管程	Shellside 壳程	Tubeside 管程	Shellside 壳程	Tubeside 管程	Shellside design 壳程设计		Tubeside design 管程设计		Outer diameter of tube×wall thickness ×length 管子外径×壁厚×长度	Number of tubes (pc(s)) 管子数量（根）
											Design/ operating 设计/操作	Design/ operating 设计/操作	Design 设计	Operating inlet/outlet 操作入/出口	Design 设计	Operating Inlet/outlet 操作入口/出口		
4	E-104	Steam condensate water breakdown cooler 蒸汽冷凝水排污冷却器	AES400-1.6-15-3/25-2I(B=150)	1	Φ400*3875	15	1	2	Condensate water 凝结水			1.0/ 0.4	205	160/55	160	33/ 43	25*2.5*3000	74
5	E-105	Water tank cooler 水箱冷却器		1	(7060*9660)*10500*14	450			Cooling water 冷却水			3.7/ 1.3	100	95/ 65	410	373/ 155	89*8，L=579	
6	E-106	Conveying air cooler 输送风冷却器	AES400-1.6-15-3/25-4I(B=150)	1	Φ400*3875	15	1	4	Air 空气	Cooling water 冷却水	0.8/ 0.394	1.0/ 0.4	310	247/65	285	33/ 38	25*2.5*3000	68
7	E-202 A/B	Fractionator overhead water-cooled exchanger 分馏塔顶水冷器	BJ21S1300-1.6-460-6/25-4I(B=600)	2 in parallel 2 并	Φ1300*7650	456.2	1	4	Fractionator overhead oil vapor 分馏塔顶油气	Cooling water 冷却水	0.45/0.038	1.0/0.51	290	55/44	90	33/ 43	25*2.5*6000	998
8	E-203	Diesel oil /absorbed oil heat exchanger 柴油/吸收油换热器	BES800-2.5-163-6/25-4I(B=200)	1	Φ800*7378.5	163	1	4	Rich absorbed oil 富吸收油	Diesel oil 柴油	2.35/0.363	2.43/1.5	180	58/130	290	175/ 136	25*2.5*6000	352
9	E-205 A/B	Diesel oil water-cooled exchanger 柴油水冷器	BES600-2.5-96-6/25-2I(B=200)	2 in series 2 串	Φ600*7055	96 单	1	2	Diesel oil 柴油	Cooling water 冷却水	2.43/1.5	1.87/0.65	200	55/ 40	90	33/ 43	25*2.5*6000	198
10	E-206 A/B	HKGO/vacuum Residue heat exchanger HKGO/减压渣油换热器	LBES600-2.5-87-6/25-4I(B=200)	2 in series 2 串	Φ600*7086	87 单	1	4	Residue 渣油	Heavy wax oil 重蜡油	1.91/ 0.262	2.47/1.67	340	266/272	420	335/ 279	25*2.5*6000	176

Table 53: Heat exchanger (Continued)
表 53：换热器（续）

No.	Item	Equipment	Type	Qty.,	Dimensions(inn	Heat	Number of	Fluid	Design and operating conditions	Structure of tubeside

序号	No. 设备位号	name 设备名称	型式	set(s) 数量（台）	er diameter×length ×wall thickness) (mm) 外型尺寸（内径×长度×壁厚） （mm)	exchange area, m^2 换热面积 m^2	passes 程数		介质		设计及操作条件						管程结构	
											Pressure 压力（MPaG）		Temperature 温度（℃）					
							Shellside 壳程	Tubeside 管程	Shellside 壳程	Tubeside 管程	Shellside 壳程	Tubeside 管程	Shellside design 壳程设计		Tubeside design 管程设计		Outer diameter of tube×wall thickness ×length 管子外径×壁厚×长度	Number of tubes (pc(s)) 管子数量（根）
											Design/ operating 设计/操作	Design/ operating 设计/操作	Design 设计	Operating inlet/outlet 操作 入/出口	Design 设计	Operating Inlet/outlet 操作 入口/出口		
11	E-207	HKGO steam generator HKGO 蒸汽发生器	BKS1100-2.5-390-6/19-6I	1	Φ1100*7615	384	1	6	Boiler water and steam 锅炉水和蒸汽	Heavy wax oil 重蜡油	1.9/ 1.0	2.47/1.6	320	122/185	420	301/ 195		
12	E-209 A/B/C/D	Bottom reflux /vacuum Residue heat exchanger 底部回流/减压渣油换热器	LBES1000-4.0-269-6/25-4I(B=200)	4 in series and parallel 4 串并	Φ1000*7669	269 单	1	4	Residue 渣油	Fractionator bottom circulation oil 分馏塔底循环油	1.91/ 0.262	1.25/0.74	375	193/266	420	347/ 284	25*2.5*6000	580
13	E-210	HHKGO/MP steam generator HHKGO/中压蒸汽发生器	BJS500-4.0-60-6/25-4I(B=600	1	Φ500*7152	60	1	4	Boiler water and steam 锅炉水和蒸汽	Fractionator bottom oil 分馏塔底油	4.87/ 4.234	3.75/1.7	425	252/255	375	344/ 287	25*2.5*6000	116
14	E-211 A/B	Stage I compression water-cooled exchanger 一级压缩水冷器		2 in series 2 串	Φ1400*7835*20	360*2	1	6	Rich gas 富气	Cooling water 冷却水	1.6/ 0.25	1.0/ 0.4	150	110	60	33/ 43	32*2*6000	626
15	E-212 A/B	Stage II compression water-cooled exchanger 二级压缩水冷器		2 in series 2 串	Φ1200*6622*18	227*2	1	6	Rich gas 富气	Cooling water 冷却水	1.6/ 0.74	1.0/ 0.4	150	110	60	33/ 43	32*2*5000	476
16	E-213 A/B	Stage III compression water-cooled exchanger 三级压缩水冷器	BJ21S1200-4.0-400-6/25-2I	2 in series 2 串	Φ1200*7862	396.72*2	1	2	Rich gas 富气	Cooling water 冷却水	2.57/ 2.159	1.98/0.4	150	73/ 40	90	33/ 43	25*2.5*6000	880

Table 53: Heat exchanger (Continued)

表 53：换热器（续）

No.	Item No.	Equipment name	Type	Qty., set(s)	Dimensions(inner	Heat exchange	Number of passes	Fluid	Design and operating conditions	Structure of tubeside

序号	设备位号	设备名称	型式	数量（台）	diameter×length ×wall thickness) (mm) 外型尺寸（内径×长度×壁厚）（mm）	area, m² 换热面积 m²	程数		介质		设计及操作条件						管程结构	
							Shellside 壳程	Tubeside 管程	Shellside 壳程	Tubeside 管程	Pressure 压力（MPaG）		Temperature 温度（℃）				Outer diameter of tube×wall thickness ×length 管子外径×壁厚×长度	Number of tubes (pc(s)) 管子数量（根）
											Shellside 壳程	Tubeside 管程	Shellside design 壳程设计		Tubeside design 管程设计			
											Design/ operating 设计/操作	Design/ operating 设计/操作	Design 设计	Operating inlet/outlet 操作 入/出口	Design 设计	Operating Inlet/outlet 操作 入口/出口		
17	E-214	Absorption dethanizer water-cooled intercooler 吸收脱乙烷塔中间水冷器	BES900-4.0-282-6/19-2I(B=200)	1	Φ900*7405	282	1	2	Unstable naphtha 不稳定石脑油	Cooling water 冷却水	2.62/ 2.086	2.02/0.4	255	55/ 40	90	33/ 43	19*2.0*6000	800
18	E-215	Absorption dethanizer inter-reboiler 吸收脱乙烷塔中间再沸器	BJS800-4.0-213-6/19-2I(B=600)	1	Φ800*7362	213	1	2	Naphtha 石脑油	Stable naphtha 稳定石脑油	2.69/ 1.3	3.75/2.8	255	98/ 115	245	184/ 132	19*2.0*6000	610
19	E-216 A/B	Absorption dethanizer reboiler 吸收脱乙烷塔再沸器	BJS1300-4.0-447-6/25-6I(B=600)	2 in parallel 2 并	Φ1300*7963	447	1	6	Desorption tower bottom oil 解析塔底油	Light circulation oil 轻循环油	2.69/ 2.17	2.07/0.74	255	154/176	375	251/ 203	25*2.5*6000	972
20	E-218 A/B	Coking naphtha water-cooled exchanger 焦化石脑油水冷器	BES600-4.0-114-6/19-2I(B=300)	2 in series 2 串	Φ600*6000	114 单	1	2	Naphtha product 石脑油产品	Cooling water 冷却水	3.75/ 2.61	2.89/0.5	140	55/40	90	33/ 43	19*2.0*6000	324
21	E-219 A/B	Debutanizer overhead condensator 脱丁烷塔顶冷凝器	BJS1100-2.5-454-6/19-2I(B=480)	2 in series 2 串	Φ1100*7679	454 单	1	2	LPG	Cooling water 冷却水	1.83/ 1.331	1.41/0.4	255	61/ 40	90	33/ 43	19*2.0*6000	1254
22	E-220 A/B	Debutanizer bottom reboiler 脱丁烷塔底再沸器	BJS700-4.0-153-6/19-2I(B=600)	2 in parallel 2 并	Φ700*7155	153	1	2	Naphtha 石脑油	MP steam 中压蒸汽	1.74/ 1.43	2.75/2.34	255	188/192	425	223/ 222	19*2.0*6000	436

Table 53: Heat exchanger (Continued)
表 53：换热器（续）

No. 序号	Item No. 设备	Equipment name 设备名称	Type 型式	Qty., set(s) 数量	Dimensions(inner diameter×lengt	Heat exchange area, m²	Number of passes 程数	Fluid 介质	Design and operating conditions 设计及操作条件	Structure of tubeside 管程结构

	位号			（台）	h ×wall thickness) (mm) 外型尺寸（内径×长度×壁厚）（mm)	换热面积 m^2	Shellside 壳程	Tubeside 管程	Shellside 壳程	Tubeside 管程	Pressure 压力（MPaG）		Temperature 温度（℃）					
											Shellside 壳程	Tubeside 管程	Shellside design 壳程设计		Tubeside design 管程设计		Outer diameter of tube×wall thickness ×length 管子外径×壁厚×长度	Number of tubes (pc(s)) 管子数量（根）
											Design/ operating 设计/操作	Design/ operating 设计/操作	Design 设计	Operating inlet/outlet 操作 入/出口	Design 设计	Operating Inlet/outlet 操作 入口/出口		
23	E-230	Circulation oil heat exchanger of vacuum Residue intermeidate section 减压渣油中段循环油换热器	LBES1200-4.0-400-6/25-6I(B=350)	1	Φ1200*7870.5	400	1	6	Residue 渣油	Light circulation oil 轻循环油	1.91/ 0.9	1.47/1.04	300	171/193	375	251/ 210	25*2.5*6000	864
24	E-231 A/B	LKGO/vacuum Residue heat exchanger LKGO/减压渣油换热器	LBES1200-4.0-471-6/19-6I(B=350)	2 in parallel 2 并	Φ1200*7862	471	1	6	Residue 渣油	Light wax oil 轻蜡油	1.91/ 0.9	2.24/2.1	300	155/171	390	297/ 174	19*2.0*6000	1348
25	E-232	Debutanizer feed preheater 脱丁烷塔进料预热器	BES500-4.0-60-6/25-2I(B=300)	1	Φ500*7040	60	1	2	Desorption tower bottom oil 解析塔底油	Stabilizer bottom oil 稳定塔底油	2.35/ 1.35	3.75/2.9	255	165/169	255	194/ 184	25*2.5*6000	124
26	E-234 A/B	Coking gas water-cooled exchanger 焦化气水冷器	BES600-4.0-43-3/25-4I(B=300)	2 in series 2 串	Φ600*4075	43	1	4	Coking dry gas 焦化干气	Cooling water 冷却水	2.54/ 1.2	1.96/0.4	185	48/ 40	90	33/ 43	25*2.5*3000	188
27	E-235	Fractionator bottom circulation oil/ steamheater 分馏塔底循环油/蒸汽加热器	BES700-4.0-164-6/19-2I(B=300)	1	Φ700*7195	164	1	2	Bottom circulation oil 塔底循环油	MP steam 中压蒸汽	3.24/ 0.8	4.2/ 3.46	375	80/ 156	425	244/ 242	19*2.0*6000	468

Table 53: Heat exchanger (Continued)
表 53：换热器（续）

No. 序号	Item No.	Equipment name 设备名称	Type 型式	Qty., set(s)	Dimensions(inner diameter×lengt	Heat exchange area, m^2	Number of passes 程数	Fluid 介质	Design and operating conditions 设计及操作条件	Structure of tubeside 管程结构

	设备位号			数量（台）	h ×wall thickness) (mm) 外型尺寸（内径×长度×壁厚）（mm）	换热面积 m^{2s}	Shellside 壳程	Tubeside 管程	Shellside 壳程	Tubeside 管程	Pressure 压力（MPaG）		Temperature 温度（℃）					
											Shellside 壳程	Tubeside 管程	Shellside design 壳程设计		Tubeside design 管程设计		Outer diameter of tube×wall thickness ×length 管子外径×壁厚×长度	Number of tubes (pc(s)) 管子数量（根）
											Design/ operating 设计/操作	Design/ operating 设计/操作	Design 设计	Operating inlet/outlet 操作 入/出口	Design 设计	Operating Inlet/outlet 操作 入口/出口		
28	E-302	Slurry stripper feed heat exchanger 浆液汽提塔进料换热器	1H-L-1T	1	Φ29"*48"				Stripper bottom slurry 汽提塔底浆液	Stripper slurry 汽提塔浆液	1.92/ 0.719	1.92/0.83	170	134/111	170	90/ 115		
29	E-303 A/B	Diluted slurry cooler 稀浆液冷却器	1H-L-1T	2	Φ55"*48"				Stripper bottom slurry 汽提塔底浆液	Cooling water 冷却水	1.655/0.52 2	1.65/ 0.4	170	111/40	170	33/ 43		
30	E-305 A/B	Stage I contact cooling tower aftercooler 一级接触冷却塔后冷器	TS35-PFG	2	1174*3000*237 5				Diluted slurry 稀释浆液	Cooling water 冷却水	1.505/0.63 5	1.50/0.33	170	55/ 40	170	33/ 43		
31	E-306 A/B	COS preheater 羰基硫预热器	BXU1600*6650	2	Φ1600*7000				Flexigas 灵活气	LP steam 低压蒸汽	0.66/ 0.17	1.5/ 0.60	300	55/ 135	320	243/ 164	25*2*7000	677
32	E-307 A/B	Stage II contact cooling tower circulating cooler 二级接触冷却塔循环冷却器	T35-PFG	2	1174*2400*287 5				DCCT II	Cooling water 冷却水	1.625/0.80 6	1.62/0.33	170	55/ 38	170	33/ 43		
33	E-310 A/B	Rich/Lean solvent heat exchanger 富/贫溶剂换热器	CPX75-V-500	2	1326*1326*322 7				Lean solvent 贫溶剂	Rich solvent 富溶剂	1.615/0.50 7	1.61/ 0.73	185	131/77	185	50/ 107		

Table 53: Heat exchanger (Continued)
表 53：换热器（续）

No. 序号	Item No. 设备位	Equipment name 设备名称	Type 型式	Qty., set(s) 数量	Dimensions(inner diameter×lengt	Heat exchange area, m^2	Number of passes 程数	Fluid 介质	Design and operating conditions 设计及操作条件	Structure of tubeside 管程结构

	号			（台）	h ×wall thickness) (mm) 外型尺寸（内径×长度×壁厚）（mm）	换热面积 m^{2s}	Shellside 壳程	Tubeside 管程	Shellside 壳程	Tubeside 管程	Pressure 压力（MPaG）		Temperature 温度（℃）					
											Shellside 壳程	Tubeside 管程	Shellside design 壳程设计		Tubeside design 管程设计		Outer diameter of tube×wall thickness ×length 管子外径×壁厚×长度	Number of tubes (pc(s)) 管子数量（根）
											Design/ operating 设计/操作	Design/ operating 设计/操作	Design 设计	Operating inlet/outlet 操作入/出口	Design 设计	Operating Inlet/outlet 操作入口/出口		
34	E-311A /B	Regenerator bottom reboiler 再生塔底重沸器	AHU1800-1.6-1387-6/19-2(B=600)	2 in parallel 2 并	Φ1800*8819	1387	1	2	Solvent 溶剂	LLP steam 低低压蒸汽	1.08/ 0.156	0.84/0.42	215	131/131	250	156/ 152	U19*2.0*6000	1964
35	E-312	Solvent recovery unit 溶剂回收器	BKU(φ2000/φ3575-4.2/1.08-1966-10.3905/25-2	1	Φ2000*13510	1966	1	2	Solvent 溶剂	MP steam 中压蒸汽	1.08/ 0.5	4.2/ 1.83	283	131/185	425	212/ 207	U25*2.5*7315	1373
36	E-314	Lean solvent aftercooler 贫溶剂后冷器	BES1500-2.5-645-6/25-4(B=300)	1	Φ1500*7996	645	1	4	Lean solvent 贫溶剂	Cooling water 冷却水	1.62/ 0.33	1.25/0.4	165	75/ 45	90	33/ 43	25*2.5*6000	1400
37	E-315	Regenerator overhead aftercooler 再生塔塔顶后冷器	BJ21S600-1.6-90-6/25-2（B=180）	1	Φ600*7231	91.9	1	2	Regenerator overheads olvent 再生塔顶溶剂	Cooling water 冷却水	1.06/ 0.5	1.0/ 0.4	185	55/ 48	90	33/ 43	25*2.5*6000	198
38	E-236	Seal oil cooler 封油冷却器	BIU600-4.0-90-6/25-2Ⅰ	1	Φ600*7584	90	1	2	Seal oil 封油	Cooling water 冷却水	3.14/ 2.24	2.42/0.45	245	150/90	90	33/ 43	U25*2.5*6000	190
39		Air preheater 空气预热器	Plate type—cast iron combined type 板式—铸铁组合式	1	About Φ2450*8600 约Φ2450*8600													
40		Main air blower oil-cooled exchanger 主风机油冷器		2		90					0.8/	1.6/						
41		Compressor oil-cooled exchanger 气压机油冷器		2		115						/0.4						

Table 53: Heat exchanger (Continued)
表 53：换热器（续）

No. 序号	Item No. 设备位	Equipment name 设备名称	Type 型式	Qty., set(s) 数量	Dimensions(inner diameter×lengt	Heat exchange area, m^2	Number of passes 程数	Fluid 介质	Design and operating conditions 设计及操作条件	Structure of tubeside 管程结构

	号			（台）	h ×wall thickness) (mm) 外型尺寸（内径×长度×壁厚）（mm)	换热面积 m^{2s}	Shellside 壳程	Tubeside 管程	Shellside 壳程	Tubeside 管程	Pressure 压力（MPaG）		Temperature 温度（℃）					
											Shellside 壳程	Tubeside 管程	Shellside design 壳程设计		Tubeside design 管程设计		Outer diameter of tube×wall thickness ×length 管子外径×壁厚×长度	Number of tubes (pc(s)) 管子数量（根）
											Design/ operating 设计/操作	Design/ operating 设计/操作	Design 设计	Operating inlet/outlet 操作入/出口	Design 设计	Operating Inlet/outlet 操作入口/出口		
42		Main air blower steam seal cooler 主风机汽封冷却器		1	Φ480*1849													
43		Compressor steam seal cooler 气压机汽封冷却器	JQ3822	1	Φ620*2710	38												

Table 54: Air cooler

表 54：空冷器

No. 序号	Item No. 设备位号	Equipment name 设备名称	Qty., set(s) 数量（台）	Operating conditions (tubeside) 操作条件(管程)				Tube bundle 管束			Motor 电动机	
				Fluid 介质	Temperature 温度(℃)		Pressure 压力（MPaG）	Model 型号	Qty., set(s) 数量（台）	Weight 重量	Power, 功率 kW	Qty., set(s) 数量（台）
					Inlet 入口	Outlet 出口	（MPaG）					
1	A-201A~F	Fractionator overhead air cooler 分馏塔顶空冷器	6	Fractionator overhead oil vapor 分馏塔顶油气	91	44	0.385/0.052	SYL-12*3			11	24
2	A-204A/B	Diesel oil air cooler 柴油空冷器	2	Diesel oil 柴油	138	55	2.425/1.296	GP9×3-6-193-1.6K1-23.4/DR-Ⅵa	2	11.6	30	2
3	A-208	Cooking heavy wax oil product air cooler 焦化重蜡油产品空冷器	1	Cooking heavy wax oil 焦化重蜡油	195	120	2.465/1.403	GP9×3-4-129-2.5K1-23.4/DR-Ⅱa	1	7.5	30	1
4	A-217A/B	Cooking naphtha air cooler 焦化石脑油空冷器	2	Cooking naphtha 焦化石脑油	137	55	3.745	GP9×3-6-193-4.0K1-23.4/DR-Ⅲa	2	11.7	30	2
5	A-221A~F	Slop oil air cooler 污油空冷器	6	Slop oil 污油	150	50	1.22/0.594	GP9×3-6-193-1.6K1-23.4/DR-Ⅵa	6	11.6	30	6
6	A-233	Cooking Light wax oil air cooler 焦化轻蜡油空冷器	1	Cooking light wax oil 焦化轻蜡油	174	120	2.24/1.83	GP9×3-4-130-2.5K1-23.4/DR-Ⅳa	1	7.5	30	1
7	A-301A-P	Stage I contact cooling tower reflux air cooler 一级接触冷却塔回流空冷	16	Slurry 浆液	76	40	1.505/0.812	SYL-6*3			18.5	32
8	A-302A-F	Lean solvent air cooler 贫溶剂空冷器	6	Lean solvent 贫溶剂	77	46	1.615/0.399	SYL-9*3			11	24
9	A-303A-F	Regenerator overhead air cooler 再生塔顶空冷器	6	Regenerator overhead vapor 再生塔顶气	120	55	1.06/0.127	GP9×3-6-193-1.6S-23.4/DR-Ⅱa	6	12	30	6
10	A-304	Condensate water air cooler 凝结水空冷器	1	Condensate water 凝结水	136	100	3.745/0.23	GP9×3-6-193-1.6S-23.4/DR-Ⅱa	1	11.6	11	3

Table 55: Filter
表 55：过滤器

No. 序号	Item No. 设备位号	Equipment name 设备名称	Type 型式	Qty., set(s) 数量（台）	Size 规格 Diameter φ×length mm×mm of filter element 滤芯直径φ×长度 mm×mm	Filtration area 过滤面积 m^2	Filtration medium 过滤介质	Filtration precision 过滤精度 μm	Operation and design 操作设计 Temperature 温度(℃) Operating 操作	Design 设计	Pressure 压力(MPaG) Operating 操作	Design 设计
1	SR0204	Automatic backwash filter 自动反冲洗过滤器	Johnson screen 约翰逊网	1	φ37.5*1100	6sets*2.08 6 组*2.08	Wax oil 蜡油	25	120	315	1.93	2.47
2	SR101	Main air blower inlet filter 主风机入口过滤器	Self-cleaning air filter 自洁式空气过滤器	1	FC23D13-16242-3		Air 空气					
3	STR101A/B	Scrubber bottom circulation oil filter 洗涤塔底循环油过滤器	Basket/vertical 滤篮/立式	2	TYXX200φ220*1200	4*(≮2)	Scrubber bottom oil 洗涤塔底油	6000	373	405	0.505	1.22
4	SR201A/B	Intermediate section circulation oil filter 中段循环油过滤器	Basket/vertical 滤篮/立式	2	TYL100φ140*280	0.055	Intermediate section circulation oil 中段循环油	3970	251	375	0.594	1.175
5	SR202A/B	Fractionator bottom circulation oil filter 分馏塔底循环油过滤器	Basket/vertical 滤篮/立式	2	TYL200φ280*500	0.2	Bottom circulation oil 塔底循环油	6000	290	420	0.424	3.235
6	SR203A/B	Fractionator bottom circulation oil internal reflux filter 分馏塔底循环油内回流过滤器	Basket/vertical 滤篮/立式	2	TYL100φ140*280	0.055	Bottom circulation oil 塔底循环油	3500	347	420	0.401	3.235
7	SR204A/B	HHKGO filter HHKGO 过滤器	Basket/vertical 滤篮/立式	2	TYL100φ140*280	0.034	Heavy heavy wax oil 重重蜡油	1585	341	460	0.896	3.745
8	SR205A/B	Cooking light wax oil filter 焦化轻蜡油过滤器	Basket/vertical 滤篮/立式	2	TYL100φ140*280	0.055	Light wax oil 轻蜡油	2780	300	390	0.501	1.025
9	SR206A/B	Flushing oil filter 冲洗油过滤器	Filter element /vertical 滤芯/立式	2	TYXX40φ40*1500	44*8.3	Flushing oil 冲洗油	25	151	245	2.259	3.14
10	SR301A/B	Stage I contact cooling tower reflux filter 一级接触冷却塔回流过滤器	Basket/vertical 滤篮/立式	2	TYL400φ560*1000	0.45	Sour water 酸性水	1000	55	170	0.704	1.505
11	SR302A/B	Stage II contact cooling tower bottom filter 二级接触冷却塔塔底过滤器	Basket/vertical 滤篮/立式	2	TYL350φ490*700	0.5	Sour water 酸性水	3187	51	170	0.875	1.625
12	SR303A/B	Cooling water filter 冷却水过滤器	Basket/vertical 滤篮/立式	2	TYL400φ560*950	0.76	Cooling water 冷却水	2500	33	90	0.4	1
13	SR304A/B	Stage I contact cooling tower wash water filter 二级接触冷却塔洗涤水过滤器	Basket/vertical 滤篮/立式	2	TYL150φ210*430	0.127	Wash water 洗涤水	9525	42	170	0.584	1.83
14	SR305A/B	Lean solvent feed filter 贫溶剂进料过滤器	Basket/vertical 滤篮/立式	2	TYL300φ420*700	0.24	Lean solvent 贫溶剂	1000	45	170	0.48	1.375
15	SR306A/B	Wash water filter 洗涤水过滤器	Basket/vertical 滤篮/立式	2	TYL150φ210*430	0.127	Wash water 洗涤水	3970	47	170	0.539	1.395
16	SR307A/B	Lean solvent filter 贫溶剂过滤器	Basket/vertical 滤篮/立式	2	TYL300φ420*700	0.42	Lean solvent 贫溶剂	2500	131	185	0.63	1.615

Table 55: Filter (Continued)
表 55：过滤器（续）

No. 序号	Item No. 设备位号	Equipment name 设备名称	Type 型式	Qty., set(s) 数量（台）	Size 规格 Diameter φ×length mm×mm of filter element 滤芯直径φ×长度 mm×mm	Filtration area 过滤面积 m^2	Filtration medium 过滤介质	Filtration precision 过滤精度 μm	Operation and design 操作设计 Temperature 温度(℃) Operating 操作	Design 设计	Pressure 压力(MPaG) Operating 操作	Design 设计
17	SR308A/B	Cooling water filter 冷却水过滤器	Basket/vertical 滤篮/立式	2	TYL500φ280*860	1.3	Cooling water 冷却水	2500	33	90	0.4	1
18	SR309	Underground solvent filter 地下溶剂过滤器	Basket/vertical 滤篮/立式	1	TYL100φ140*280	0.031	Solvent 溶剂	1000	50	150	0.281	0.715
19	SR310	Lean solvent stage I filter 贫溶剂一级过滤器		1	FC11G15-1664-10	361*≮72.2	Lean solvent 贫溶剂	10	45	150	0.608	0.87
20	SR311	Lean solvent stage II filter 贫溶剂二级过滤器		1	FC11G15-1664-5	145*≮28.9	Lean solvent 贫溶剂	5	45	150	0.47	0.87
21	SR312A/B	Rich solvent filter 富溶剂过滤器	Filter element/vertical 滤芯/立式	2	TYBX150φ150*1000	29*217.5	Rich solvent 富溶剂	10	50	170	0.803	1.375

Table 56: Compressor
表 56：压缩机

Model 型号	Size 规格			Main parameters 主要参数									Driver 驱动机	
	Number of cylinder(s) 缸数	Number of section(s) 段数	Number of stage(s) 级数	Fluid 介质	Molecular weight 分子量	Pressure 压力 MPa		Temperature 温度℃		Flow 流量 kg/h	Speed 转速 rpm	Shaft power 轴功率 kW	Type 类型	Power 功率 kW
						Inlet/rated 入口/额定	Outlet /rated 出口/额定	Inlet 入口	Outlet 出口					
AV56-18	1	1	18	Air 空气	28.959	0.098	0.581	28	254	2263.3	5500	11381	Steam turbine 汽轮机	14134
MCL453+2MCL457	2	3	10	Rich gas 富气	34.92/31.77/30.19	0.1	2.3	40	116.5	21583	10658	3198	Steam turbine 汽轮机	3518

Table 57: Steam turbine
表 57：汽轮机

No. 序号	Unit name 装置名称	Equipment name 设备名称	Item No. 设备位号	Size and model 规格型号	Qty., set(s) 数量（台）	Suction pressure 进汽压力 MPa	Discharge pressure 排汽压力 MPa(a)	Suction temperature 进汽温度℃	exhaust temperature 排汽温度℃	Suction capacity 进汽量 t/h	rated speed 额定转速 rpm	Power 功率 kW	Extraction capacity 抽汽量 t/h	Extraction pressure 抽汽压力 MPa	Extraction temperature 抽汽温度℃
1	Flexicoking 灵活焦化	Main air blower turbine 主风机透平	ST-101	B50/01	1	1900/1/3	0.65	390							
2	Flexicoking 灵活焦化	Compressor turbine 气压机透平	ST-201	NG40/32	1	1900/1/3	1.15	390	263.2	56.8	10658	3518	0.1	1.1	250

Table 58: Reciprocating pump
表 58：往复泵

Model 型号	Qty., set(s) 数量（台）	Main parameters 主要参数					Stroke 冲程(mm)	Number of cylinder(s) 缸数	Type and size of seal 密封型式及规格	Motor 电机	
		Fluid 介质	Flow 流量(L/h)	Temperature 温度(℃)	Outlet pressure 出口压力(MPaG)	Head 扬程(mm)				Power 功率(kW)	Speed 转速(rpm)
SNH940R46	2	Lube oil 润滑油	54000		1.5					37	
	2	Lube oil 润滑油								55	
DPMSZAB1800/0.3-Ⅲ	1	Sour water 酸性水	1800	40	0.3	7.8	32	1	Packing ring 填料环	1.5	1400
DPMSXAABB820/0.4-Ⅲ	1	Polycyclic aromatic hydrocarbon 稠环芳烃	800	48	0.4	16.6	20	1	Packing ring 填料环	0.55	1390

Table 59: Centrifugal pump
表 59：离心泵

No. 序号	Item No. 设备位号	Equipment name 设备名称	Model 型号	Qty., set(s) 数量（台）	Main parameters 主要参数					Head 扬程(m)	Flow 流量 m³/h	Speed 转速 rpm	Shaft power 轴功率 kW
					Fluid 介质			Pressure 压力 MPa					
					Description 名称	Specific weight 比重	Temperature 温度 ℃	Suction 吸入	Discharge 排出				
1	P-101A/B	Reaction feed pump 反应进料泵	4X17J	2	Reactor feed 反应器进料	794.5	373	0.363~0.882	2.154	229.8	285.9	2975	274
2	P-102A/B/C/D	Scrubber bottom circulating pump 洗涤塔底循环泵	SCE 4X2X15	4	Scrubber bottom circulation oil 洗涤塔底循环油	794.5	373	0.36~0.882	1.103	141.5	80.6	2960	68.8
3	P-103A/B	Slurry recycling pump 污泥回炼泵	HAY80-120X2	2	Slurry 污泥	974.8	50	0.227~1.348	2.255	212.1	24.5	2950	37.2
4	P-104A/B/C	HP deoxygenated water pump 高压除氧水泵	80X50SS12M	3	HP deoxygenated water 高压除氧水	943.2	40~121	0.15~1.283	4.609	482	44.5	2980	91.9
5	P-107A/B	Vacuum residue pump 减渣泵	150X100UCWM32	2	Vacuum Residue 减压渣油	848.7	155~270	0.133~2.048	0.847	119	162.7	2980	87.3

Table 59: Centrifugal pump (Continued)
表 59：离心泵（续）

No. 序号	Item No. 设备位号	Equipment name 设备名称	Model 型号	Qty., set(s) 数量（台）	Main parameters 主要参数							
					Fluid 介质			Pressure 压力 MPa		Head 扬程(m)	Flow 流量 m³/h	Speed 转速 rpm	Shaft power 轴功率 kW
					Description 名称	Specific weight 比重	Temperature 温度 ℃	Suction 吸入	Discharge 排出				
6	P-108A/B	LP deoxygenated water pump 低压除氧水泵	LG211-11.5/122.9-15-60IIDT	2	LP deoxygenated water 低压除氧水	943.2	40~121	0.149~1.283	1.285	122.9	11.5	6000	10.6
7	P-201A/B	Fractionator overhead reflux pump 分馏塔顶回流泵	HZE100-80-250	2	Fractionator overhead reflux 分馏塔顶回流	732.7	44	0.074~0.558	0.635	78.1	87.8	2950	20.1
8	P-202A/B	Fractionator overhead sour water pump 分馏塔顶酸性水泵	HZE80-40-250	2	Sour water 酸性水	983.9	44	0.093~0.587	0.764	69.6	32.2	2950	11.3
9	P-203A/B	Diesel oil stripper bottom pump 柴油汽提塔底泵	HZE100-50-400	2	Diesel oil 柴油	769.7	25~174	0.213~0.739	1.587	182.1	63.2	2950	58.8
10	P-204A/B	Intermediate section circulating pump 中段循环泵	200X150UCWM25	2	Intermediate section circulation oil 中段循环油	767.7	25~251	0.356~0.698	0.769	54.9	368	2970	62.2
11	P-205A/B	Heavy wax stripper bottom pump 重蜡汽提塔底泵	50X40DCS7M	2	Heavy wax oil 重蜡油	767.2	80~335	0.14~0.554	1.686	205.4	21.1	2970	28
12	P-206A/B	Fractionator bottom circulating pump 分馏塔底循环泵	SCE 6X6X12	2	Fractionator bottom circulation oil 分馏塔底循环油	757.3	346	0.2~0.503	0.787	79	282.6	2960	80.5
13	P-207A/B	Fractionator bottom pump 分馏塔底泵	SCE 4X2X12.25	2	Fractionator bottom oil 分馏塔底油	774.9	343	0.13~0.451	1.021	117.3	54.8	2960	33.2
14	P-209A/B	Compressor stage I naphtha pump 压缩机一级石脑油泵	GSB-L1-23/344	2	Compressor stage I condensed oil 压缩机一级凝缩油	712.9	40	0.249	2.658	344.6	23.6	10238	34.7

Table 59: Centrifugal pump (Continued)
表 59：离心泵（续）

No. 序号	Item No. 设备位号	Equipment name 设备名称	Model 型号	Qty., set(s) 数量（台）	Main parameters 主要参数								
					Fluid 介质			Pressure 压力 MPa		Head 扬程(m)	Flow 流量 m³/h	Speed 转速 rpm	Shaft power 轴功率 kW
					Description 名称	Specific weight 比重	Temperature 温度 ℃	Suction 吸入	Discharge 排出				
15	P-210A/B	Compressor stage I sour water pump 压缩机一级酸性水泵	HZE80-40-250	2	Compressor stage I sour water 压缩机一级酸性水	984	40	0.273~0.68	1.083	84	20.1	2950	10.1
16	P-211A/B	Compressor stage II naphtha pump 压缩机二级石脑油泵	GSB-L2-4/267	2	Compressor stage II condensed oil 压缩机二级凝缩油	657	40	1.127	2.446	266.9	3.8	12221	7.1
17	P-212A/B	Compressor stage II sour water pump 压缩机二级酸性水泵	HZAQ25-100X2	2	Compressor stage II sour water 压缩机二级酸性水	983	40	0.753~1.16	2.591	190.5	20.4	2950	24.2
18	P-213A/B	Compressor stage III naphtha pump 压缩机三级石脑油泵	HZE40-25-200	2	Compressor stage III condensed oil 压缩机三级凝缩油	588.5	40	2.203~2.647	2.423	38.1	7.1	2950	1.5
19	P-214A/B	Absorption-desorption tower intermediate cooling pump 吸收解析塔中间冷却泵	HZE100-80-200	2	Absorption-desorption tower intermediate section oil 吸收解吸塔中段油	679.5	40	2.171~2.737	2.486	47.3	108.3	2950	13.6
20	P-215A/B	Stabilizer reflux pump 稳定塔回流泵	HZE100-50-450	2	Stabilizer reflux 稳定塔回流	515.8	40	1.303~1.883	2.139	165.1	97.5	2950	46.5
21	P-217A/B	Stabilizer bottom pump 稳定塔底泵	HAY150-150X2	2	Stabilizer bottom oil 稳定塔塔底油	540.4	25~192	1.4~2.78	3.011	303.9	129.4	2950	135
22	P-218A/B	Flushing oil pump 冲洗油泵	GSB-L1-25/240	2	Flushing oil 冲洗油	870.6	80~150	0.183	2.235	240.3	25	9118	29.8
23	P-220	Flare condensed oil pump 火炬凝缩油泵	HVS25-30X3	1	Slop oil 污油	924.5	25~120	0.035	0.695	72.8	25	2950	8.3

Table 59: Centrifugal pump (Continued)
表 59：离心泵（续）

No. 序号	Item No. 设备位号	Equipment name 设备名称	Model 型号	Qty., set(s) 数量（台）	Main parameters 主要参数								
					Fluid 介质			Pressure 压力 MPa		Head 扬程(m)	Flow 流量 m³/h	Speed 转速 rpm	Shaft power 轴功率 kW
					Description 名称	Specific weight 比重	Temperature 温度 ℃	Suction 吸入	Discharge 排出				
24	P-221	Flare sour water pump 火炬酸性水泵	HZE40-25-200	1	Sour water 酸性水	983.5	25~100	0.021~0.439	0.456	45.1	6	2950	2.4
25	P-223A/B	Sour water pump 酸性水泵	MDCE80-40-250	2	Sour water 酸性水	983.6	40	0.089	0.889	83	20.6	2950	11.6
26	P-225A/B	Lean absorbed oil booster pump 贫吸收油升压泵	HAY80-100X2	1	Diesel oil absorbent 柴油吸收剂	870.8	40	0.828~2.417	2.372	180.7	25.4	2950	27.6
27	P-227A/B	Light wax oil stripper bottom pump 轻蜡油汽提塔底泵	50X40DCS6M	2	Cooking light wax oil 焦化轻蜡油	762.9	80~296	0.122~0.692	1.412	172.3	20.9	2970	23.3
28	P-228A/B	Light wax oil pump to tower 轻蜡油返塔泵	50X40UCWM20	2	Cooking light wax oil reflux 焦化轻蜡油回流	758.1	80~300	0.312~0.692	0.635	43.5	27.7	2930	6
29	P-301A/B	Venturi scrubber bottom pump 文丘里洗涤塔底泵	HZE200-200-560	2	Slurry 浆液	965.4	90	0.222~0.736	1.06	88.6	349.6	1475	122
30	P-302A/B	Diluted slurry pump 稀释浆液泵	HZE100-50-400	2	Diluted slurry 稀浆液	928.7	25~137	0.266~0.76	0.719	49.8	43.9	1475	12.4
31	P-303A/B	Direct contact cooling tower bottom pump 直接接触冷凝塔底泵	HYS400-80	2	Stage I contact cooling tower bottom liquid 一级接触冷凝塔塔底液	975.2	76	0.214~0.764	0.953	77.2	1015	1475	280
32	P-305A/B	Direct contact cooling tower bottom pump 直接接触冷却塔底泵	HYS350-80	2	Stage II contact cooling tower bottom liquid 二级接触冷凝塔塔底液	990.3	51	0.173~0.739	0.875	72.2	736.9	1475	180

Table 59: Centrifugal pump (Continued)
表 59：离心泵（续）

No. 序号	Item No. 设备位号	Equipment name 设备名称	Model 型号	Qty., set(s) 数量（台）	Main parameters 主要参数							
					Fluid 介质			Pressure 压力 MPa		Head 扬程(m)	Flow 流量 m³/h	Speed 转速 rpm	Shaft power 轴功率 kW
					Description 名称	Specific weight 比重	Temperature 温度 ℃	Suction 吸入	Discharge 排出				
33	P-306A/B	Circulating wash water pump 循环洗涤水泵	HZE100-80-200	2	Wash water 洗涤水	992.2	42	0.276~0.83	0.712	44.8	96	2950	15.8
34	P-307	Fresh solvent pump 新鲜溶剂泵	HZE50-25-160	2	Fresh solvent 新鲜溶剂	951.4	25	0~0.068	0.224	24	10	2950	1.5
35	P-308A/B	Lean amine pump 贫胺液泵	HZE250-250-500	2	Lean solvent feed 贫溶剂进料	995.4	45	0.002~0.104	0.608	62.1	707	1475	152
36	P-309A/B	Wash water pump 洗涤水泵	HZE100-80-200	2	Wash water 洗涤水	989.7	47	0.316~0.871	0.667	36.1	109.7	2950	15.4
37	P-310A/B	Rich amine pump 富胺液泵	HZE250-250-500	2	Rich solvent 富溶剂	1010	50	0.159~0.729	0.803	65	530.9	1475	127
38	P-311A/B	Solvent regeneration reflux pump 溶剂再生回流泵	HZE80-40-250	2	Regenerator reflux 再生塔回流	987.7	48	0.142~0.782	0.873	75.4	37	2950	14.3
39	P-314	Underground amine pump 地下胺液泵	80CYL35-26	1	Underground solvent 地下溶剂	1010	50~131	0~0.385	0.281	26.1	35	1450	5.47
40	P-315A/B	Amine regenerator bottom pump 胺液再生塔底泵	HZE250-250-400	2	Regenerator bottom liquid 再生塔底液	934.6	25~131	0.209~0.863	0.63	45.9	564.7	1475	88.5
41	P-322A/B	Purified water pump 净化水泵	HZE100-80-250	2	Purified water 净化水	992.3	40	0.23~0.839	1	79.1	109.6	2950	33.2
42	P-401A/B	Circulating water pump 循环水泵	HGB50-200	2							34		
43	P-402A/B	Diluted slurry pump 稀释浆液泵	HZE100-80-315	2	Diluted slurry 稀浆液	997.7	40	0~0.147	0.26	26.5	55.4	1475	6.4

Table 59: Centrifugal pump (Continued)
表 59：离心泵（续）

No. 序号	Item No. 设备位号	Equipment name 设备名称	Model 型号	Qty., set(s) 数量（台）	Main parameters 主要参数								
					Fluid 介质			Pressure 压力 MPa		Head 扬程(m)	Flow 流量 m³/h	Speed 转速 rpm	Shaft power 轴功率 kW
					Description 名称	Specific weight 比重	Temperature 温度 ℃	Suction 吸入	Discharge 排出				
44	P-403A/B	Clarifier bottom slurry pump 澄清器底浆液泵	HZE100-50-400	2	Slurry 浆液	1056	40	0.001~0.07	0.324	31.2	42.1	1475	8.3
45	P-404A/B	Wastewater pump to outside 外排污水泵	HZE100-50-315	2	Slurry 浆液	992.6	40	0~0.025	1.089	111.9	78.3	2950	43.3
46	P-222	Light slop oil pump 轻污油泵	50CWZ32-250A	1	Light slop oil 轻污油	820	100			70	20	2900	12.7
47	P-01A/B	Initial rainwater lift pump 初期雨水提升泵	80CLZ60-55	2	Initial rainwater 初期雨水	998.5	38			55	60	2900	24.9
48	P-02A/B	Wastewater lift pump 污水提升泵	80CLZ60-55	2	Wastewater 污水	998.5	38			55	60	2900	24.9
49	P-01A/B	Oily water lift pump 含油污水提升泵	80CLZ30-55	2	Oily water 含油污水	998.5	38			55	30	2900	16
50	A-201A~F	Water system piping pump of fractionator overhead air-cooled exchanger 分馏塔顶空冷器水系统管道泵	KQL200/185-15/4Z	12							50		
51	A-301A-P	Water system piping pump of Stage I contact cooling tower reflux air-cooled exchanger 一级接触冷却塔回流空冷水系统管道泵	KQL125/90-7.5/2	32							48		
52	A-302A-F	Water system piping pump of lean solvent air-cooled exchanger 贫溶剂空冷器水系统管道泵	KQL200/185-15/4Z	12							55		

Table 60: Air blower

表 60：风机

No. 序号	Item No. 设备位号	Equipment name 设备名称	Model 型号	Qty.(sets) 数量(台)	Main parameters 主要参数						Driver 驱动机	
					Fluid 介质		Air pressure 风压		Air capacity 风量（m³/h)	Speed 转速 (rpm)	Type 类型	Power 功率 kW
					Description 名称	Temperature 温度	Suction 吸入 MPa	Discharge 排出				
1		Air blower 鼓风机	VR73V-0800 D/F01	2	air 空气	30	0.1		21050	1450	Motor 电机	30
2		induced draft fan 引风机	VR65-1060 D/S1	1	air 空气	162	0.1		45876	1450	Motor 电机	55
3	K-401	Coke fines induced draft fan 焦粉引风机（PA-403）	风机	1		310	0.036	Atmospheric 常压	9812		Motor 电机	
4	K-402	Loading induced draft fan 装车引风机（PA-404）	4-68N0.4A	1					5083		Motor 电机	4
5	K-403	Exhaust fan of ventilation hood 通风柜排气扇(PA-405)	风机	1					17000		Motor 电机	
6	A-201A~F	Fractionator overhead air-cooled exchanger 分馏塔顶空冷器	DLZF18	24	air 空气	Normal temperature 常温	Atmospheric 常压				Motor 电机	11
7	A-204A/B	Diesel oil air-cooled exchanger 柴油空冷器	G-TF36B6-Vs30	2	air 空气	Normal temperature 常温	Atmospheric 常压	190pa	300000	318	Motor 电机	30
8	A-208	Cooking heavy wax oil product air-cooled exchanger 焦化重蜡油产品空冷器	G-TF36B6-Vs30	1	air 空气	Normal temperature 常温	Atmospheric 常压	190pa	300000	318	Motor 电机	30
9	A-217A/B	Cooking naphtha air-cooled exchanger 焦化石脑油空冷器	G-TF36B6-Vs30	2	air 空气	Normal temperature 常温	Atmospheric 常压	190pa	300000	318	Motor 电机	30
10	A-221A~F	Slop oil air-cooled exchanger 污油空冷器	G-TF36B6-Vs30	6	air 空气	Normal temperature 常温	Atmospheric 常压	190pa	300000	318	Motor 电机	30
11	A-233	Cooking Light wax oil air-cooled exchanger 焦化轻蜡油空冷器	G-TF36B6-Vs30	1	air 空气	Normal temperature 常温	Atmospheric 常压	190pa	300000	318	Motor 电机	30
12	A-301A-P	Stage I contact cooling tower reflux air-cooled exchanger 一级接触冷却塔回流空冷	DLZF22	32	air 空气	Normal temperature 常温	Atmospheric 常压				Motor 电机	18.5
13	A-302A-F	Flexsorb lean solvent air-cooled exchanger Flexsorb 贫溶剂空冷器	DLZF18	24	air 空气	Normal temperature 常温	Atmospheric 常压				Motor 电机	11
14	A-303A-F	Regenerator overhead air-cooled exchanger 再生塔顶空冷器	G-TF36B6-Vs30&G-ZFS36B6-Vs30	6	air 空气	Normal temperature 常温	Atmospheric 常压	190pa	300000	318	Motor 电机	30
15	A-304	Condensate water air-cooled exchanger 凝结水空冷器	G-TF24B4-Vs11	3	air 空气	Normal temperature 常温	Atmospheric 常压	190pa	100000	477	Motor 电机	11

Table 61: Relief valve

表 61：安全阀

No. 序号	Item No. 位号	Nominal pressure 公称压力 MPa	Nominal Diameter 公称直径 mm	Fluid 介质	Operating Temperature 工作温度 ℃	Operating pressure 工作压力 MPa	Reseating pressure 回座压力 MPa	Design pressure 设计压力 MPa	Pressure setting 整定压力 MPa	Outlet diameter 出口直径 mm	Inlet diameter 进口直径 mm
1	PSV-1004	20;20	25D50	Circulating return water 循环回水	43	0.25	0.85	2	1	50	25
2	PSV-1006	20;20	25D50	Circulating return water 循环回水	43	0.25	0.85	2	1	50	25
3	PSV-1008A	50;20	25D50	Vacuum residue 减渣	270	0.23	1.7763	5	1.91	50	25
4	PSV-1008B	50;20	25D50	Vacuum residue 减渣	270	0.23	1.7763	5	1.91	50	25
5	PSV-1026A	50;20	25D50	Oil slurry 油浆	373	0.51	1.037	5	1.22	50	25
6	PSV-1026B	50;20	25D50	Oil slurry 油浆	373	0.51	1.037	5	1.22	50	25
7	PSV-1274	50;20	100L150	Steam 蒸汽	177	0.25	0.6138	2	0.66	150	100
8	PSV-1529A	20;20	150R200	Steam 蒸汽	238	0.34	0.6138	2	0.66	200	150
9	PSV-1529B	20;20	150R200	Steam 蒸汽	238	0.34	0.6138	2	0.66	200	150
10	PSV-1540A	20;20	40H80	Slurry 污泥	30	0.23	1.1346	2	1.22	80	40
11	PSV-1540B	20;20	40H80	Slurry 污泥	30	0.23	1.1346	2	1.22	80	40
12	PSV-1561A	20;20	150R200	Air 空气	280	0.48	0.6138	2	0.66	200	150
13	PSV-1561B	20;20	150R200	Air 空气	280	0.48	0.6445	2	0.693	200	150
14	PSV-1561C	20;20	150R200	Air 空气	280	0.48	0.6445	2	0.693	200	150
15	PSV-1561D	20;20	150R200	Air 空气	280	0.48	0.6445	2	0.693	200	150
16	PSV-1561E	20;20	150R200	Air 空气	280	0.48	0.6138	2	0.66	200	150
17	PSV-1579A	20;20	40G80	Air, water 空气、水	65	0.358	0.6138	2	0.66	80	40
18	PSV-1579B	20;20	40G80	Air, water 空气、水	65	0.358	0.6138	2	0.66	80	40
19	PSV-1643A	110;20	100P150	Steam 蒸汽	252	4	4.2315	11	4.55	150	100
20	PSV-1643B	110;20	100P150	Steam 蒸汽	252	4	4.2315	11	4.55	150	100
21	PSV-1713A	20;20	25E50	Fuel gas 燃料气	40	0.45	0.93	2	1	50	25
22	PSV-1713B	20;20	25E50	Fuel gas 燃料气	40	0.45	0.93	2	1	50	25

Table 61: Relief valve (Continued)

表 61：安全阀（续）

No. 序号	Item No. 位号	Nominal pressure 公称压力 MPa	Nominal Diameter 公称直径 mm	Fluid 介质	Operating Temperature 工作温度 ℃	Operating pressure 工作压力 MPa	Reseating pressure 回座压力 MPa	Design pressure 设计压力 MPa	Pressure setting 整定压力 MPa	Outlet diameter 出口直径 mm	Inlet diameter 进口直径 mm
23	PSV-1787A	20;20	40F50	Deoxygenated water 除氧水	159	0.5	0.68	2	0.8	50	40
24	PSV-1787B	20;20	40F50	Deoxygenated water 除氧水	159	0.5	0.68	2	0.8	50	40
25	PSV-1875A	20;20	40G80	Water 水	120	0.1	1.116	2	1.2	80	40
26	PSV-1875B	20;20	40G80	Water 水	120	0.1	1.116	2	1.2	80	40
27	PSV-1876A	110;20	80J100	Steam 蒸汽	255	4.234	4.45	11	4.785	100	80
28	PSV-1876B	110;20	80J100	Steam 蒸汽	255	4.234	4.45	11	4.785	100	80
29	PSV-1878	110;20	25D50	Deoxygenated water 除氧水	121	3.5	3.57	11	4.2	50	25
30	PSV-1879A	20;20	40F50	Steam 蒸汽	160	0.52	0.68	2	0.8	50	40
31	PSV-1879B	20;20	40F50	Steam 蒸汽	160	0.52	0.68	2	0.8	50	40
32	PSV-1881A	20;20	40G80	Fuel gas 燃料气	40	1	1.116	2	1.2	80	40
33	PSV-1881B	20;20	40G80	Fuel gas 燃料气	40	0.8	1.116	2	1.2	80	40
34	PSV-2074A	20;20	200T250	Light hydrocarbon, naphtha 轻烃、石脑油	343	0.097	0.321	2	0.345	250	200
35	PSV-2074B	20;20	200T250	Light hydrocarbon, naphtha 轻烃、石脑油	343	0.097	0.3367	2	0.362	250	200
36	PSV-2074C	20;20	200T250	Light hydrocarbon, naphtha 轻烃、石脑油	343	0.097	0.3367	2	0.362	250	200
37	PSV-2074D	20;20	200T250	Light hydrocarbon, naphtha 轻烃、石脑油	343	0.097	0.321	2	0.345	250	200
38	PSV-2113A	20;20	100N150	Light wax oil 轻蜡油	150	0.177	0.423	2	0.455	150	100
39	PSV-2113B	20;20	100N150	Light wax oil 轻蜡油	150	0.177	0.423	2	0.455	150	100
40	PSV-2136A	50;20	40F50	Steam 蒸汽	185	1.09	1.767	5	1.9	50	40
41	PSV-2136B	50;20	40F50	Steam 蒸汽	185	1.09	1.767	5	1.9	50	40
42	PSV-2137A	20;20	25E50	Light wax oil 轻蜡油	151	1.05	1.037	2	1.22	50	25

Table 61: Relief valve (Continued)
表 61：安全阀（续）

No. 序号	Item No. 位号	Nominal pressure 公称压力 MPa	Nominal Diameter 公称直径 mm	Fluid 介质	Operating Temperature 工作温度 ℃	Operating pressure 工作压力 MPa	Reseating pressure 回座压力 MPa	Design pressure 设计压力 MPa	Pressure setting 整定压力 MPa	Outlet diameter 出口直径 mm	Inlet diameter 进口直径 mm
43	PSV-2137B	20;20	25E50	Light wax oil 轻蜡油	151	1.05	1.037	2	1.22	50	25
44	PSV-2140A	50;20	25E50	Light wax oil 轻蜡油	151	1.05	1.037	5	1.22	50	25
45	PSV-2140B	50;20	25E50	Light wax oil 轻蜡油	151	1.05	1.037	5	1.22	50	25
46	PSV-2150A	20;20	40G80	Diesel oil 柴油	100	0.8	1.012	2	1.19	80	40
47	PSV-2150B	20;20	40G80	Diesel oil 柴油	100	0.8	1.012	2	1.19	80	40
48	PSV-2193A	110;20	25D50	Steam 蒸汽	255	4.234	4.524	11	4.865	50	25
49	PSV-2193B	110;20	25D50	Steam 蒸汽	255	4.234	4.524	11	4.865	50	25
50	PSV-2244A	50;20	80K100	Light hydrocarbon 轻烃	111	2.207	2.697	5	2.9	100	80
51	PSV-2244B	50;20	80K100	Light hydrocarbon 轻烃	111	2.207	2.697	5	2.9	100	80
52	PSV-2287A	50;20	100P150	Light hydrocarbon 轻烃	176	2.068	2.186	5	2.35	150	100
53	PSV-2287B	50;20	100P150	Light hydrocarbon 轻烃	176	2.068	2.186	5	2.35	150	100
54	PSV-2365A	50;20	150Q200	Light hydrocarbon 轻烃	192	1.331	1.4	5	1.505	200	150
55	PSV-2365B	50;20	150Q200	Light hydrocarbon 轻烃	192	1.331	1.4	5	1.505	200	150
56	PSV-2370	50;20	40G80	Light wax oil 轻蜡油	120	0.695	1.037	5	1.22	80	40
57	PSV-2423A	20;20	100M150	H_2S,NH_3	40	0.06	0.446	2	0.48	150	100
58	PSV-2423B	20;20	100M150	H_2S,NH_3	40	0.06	0.446	2	0.48	150	100
59	PSV-2438A	50;20	50H80	Naphtha 石脑油	40	0.85	1.42	5	1.67	80	50
60	PSV-2438B	50;20	50H80	Naphtha 石脑油	40	0.85	1.42	5	1.67	80	50
61	PSV-2439A	50;20	100L150	Naphtha 石脑油	100	0.85	1.373	5	1.615	150	100
62	PSV-2439B	50;20	100L150	Naphtha 石脑油	100	0.85	1.373	5	1.615	150	100
63	PSV-2460A	20;20	40G80	Diesel oil 柴油	40	0.8	1.233	2	1.45	80	40
64	PSV-2460B	20;20	40G80	Diesel oil 柴油	40	0.8	1.233	2	1.45	80	40

Table 61: Relief valve (Continued)
表 61：安全阀（续）

No. 序号	Item No. 位号	Nominal pressure 公称压力 MPa	Nominal Diameter 公称直径 mm	Fluid 介质	Operating Temperature 工作温度 ℃	Operating pressure 工作压力 MPa	Reseating pressure 回座压力 MPa	Design pressure 设计压力 MPa	Pressure setting 整定压力 MPa	Outlet diameter 出口直径 mm	Inlet diameter 进口直径 mm
65	PSV-2614A	110;20	80J100	Steam 蒸汽	381	2.41	2.558	11	2.75	100	80
66	PSV-2614B	110;20	80J100	Steam 蒸汽	381	2.41	2.558	11	2.75	100	80
67	PSV-2103A	20;20	80L100	Oil vapor 油气	44	0.03	0.408	2	0.48	100	80
68	PSV-2103B	20;20	80L100	Oil vapor 油气	44	0.03	0.408	2	0.48	100	80
69	PSV-2271A	50;20	80K100	Oil vapor 油气	40	2.16	2.39	5	2.57	100	80
70	PSV-2271B	50;20	80K100	Oil vapor 油气	40	2.16	2.39	5	2.57	100	80
71	PSV-2100A	20;20	40F50	Cooking wax oil 焦化蜡油	120	1	1.075	2	1.265	50	40
72	PSV-2100B	20;20	40F50	Cooking wax oil 焦化蜡油	120	1	1.075	2	1.265	50	40
73	PSV-2642A	50;20	40F50	Cooking wax oil 焦化蜡油	120	1	1.075	5	1.265	50	40
74	PSV-2642B	50;20	40F50	Cooking wax oil 焦化蜡油	120	1	1.075	5	1.265	50	40
75	PSV-2108A	20;20	25D50	Circulating return water 循环回水	43	0.25	0.85	2	1	50	25
76	PSV-2108B	20;20	25D50	Circulating return water 循环回水	43	0.25	0.85	2	1	50	25
77	PSV-2110	20;20	25D50	Circulating return water 循环回水	43	0.25	0.85	2	1	50	25
78	PSV-2111	20;20	25D50	Circulating return water 循环回水	43	0.25	0.85	2	1	50	25
79	PSV-2126	20;20	25D50	Circulating return water 循环回水	43	0.25	0.85	2	1	50	25
80	PSV-2128	20;20	25D50	Circulating return water 循环回水	43	0.25	0.85	2	1	50	25
81	PSV-2133	20;20	25D50	Circulating return water 循环回水	43	0.25	0.85	2	1	50	25
82	PSV-2139	20;20	25D50	Circulating return water 循环回水	43	0.25	0.85	2	1	50	25
83	PSV-2141	20;20	25D50	Circulating return water 循环回水	43	0.25	0.85	2	1	50	25
84	PSV-2154	20;20	25D50	Circulating return water 循环回水	43	0.25	0.85	2	1	50	25
85	PSV-2160	20;20	25D50	Circulating return water 循环回水	43	0.25	0.85	2	1	50	25
86	PSV-3104A	20;20	150R200	COS,N_2	55	0.170	0.614	2	0.66	200	150

Table 61: Relief valve (Continued)

表 61：安全阀（续）

No.	Item No.	Nominal pressure	Nominal Diameter	Fluid	Operating	Operating	Reseating pressure	Design pressure	Pressure setting	Outlet diameter	Inlet diameter

序号	位号	公称压力 MPa	公称直径 mm	介质	Temperature 工作温度 ℃	pressure 工作压力 MPa	回座压力 MPa	设计压力 MPa	整定压力 MPa	出口直径 mm	进口直径 mm
87	PSV-3104B	20;20	150R200	COS,N_2	55	0.170	0.614	2	0.66	200	150
88	PSV-3105	20;20	40H80	Flexigas 灵活气	135	0.160	0.614	2	0.66	80	40
89	PSV-3130	20;20	40H80	Flexigas 灵活气	135	0.160	0.614	2	0.66	80	40
90	PSV-3306A	20;20	150R200	Flexigas 灵活气	46	0.128	0.614	2	0.66	200	150
91	PSV-3306B	20;20	150R200	Flexigas 灵活气	46	0.128	0.614	2	0.66	200	150
92	PSV-3353A	20;20	100P150	Amine 胺液	120	0.127	0.674	2	0.725	150	100
93	PSV-3353B	20;20	100P150	Amine 胺液	120	0.127	0.674	2	0.725	150	100
94	PSV-3360A	20;20	40H80	Purified water 净化水	40	0.220	0.725	2	0.78	80	40
95	PSV-3360B	20;20	40H80	Purified water 净化水	40	0.220	0.725	2	0.78	80	40
96	PSV-3393	20;20	25D50	Polycyclic aromatic hydrocarbons 多环芳烃	48	0.334	1.037	2	1.22	50	25
97	PSV-3439A	50;20	80J100	Amine 胺液	45	0.539	0.809	5	0.87	100	80
98	PSV-3439B	50;20	80J100	Steam 蒸汽	45	0.539	0.809	5	0.87	100	80
99	PSV-3468	110;20	25D50	Deoxygenated water 除氧水	121	4.610	3.57	11	4.2	50	25
100	PSV-3470	50;20	80L100	Amine 胺液	185	0.156	1.004	5	1.08	100	80
101	PSV-3475A	20;20	100P150	Steam 蒸汽	162	0.540	0.744	2	0.8	150	100
102	PSV-3475B	20;20	100P150	Steam 蒸汽	162	0.540	0.744	2	0.8	150	100
103	PSV-3495	20;20	25E50	Amine 胺液	50	0.02	0.321	2	0.345	50	25
104	PSV-4013	20;20	25D50	Nitrogen 氮气	20	-0.98	0.02	2	0.196	50	25
105	PSV-4015	20;20	25D50	Nitrogen 氮气	20	-0.98	0.02	2	0.196	50	25
106	PSV-4017	20;20	25D50	Nitrogen 氮气	20	-0.98	0.02	2	0.196	50	25
107	PSV-4019	20;20	25D50	Nitrogen 氮气	20	-0.98	0.02	2	0.196	50	25
108	PSV-4021	20;20	25D50	Nitrogen 氮气	20	-0.98	0.02	2	0.196	50	25

Table 61: Relief valve (Continued)
表 61：安全阀（续）

No. 序号	Item No. 位号	Nominal pressure 公称压力 MPa	Nominal Diameter 公称直径 mm	Fluid 介质	Operating Temperature 工作温度 ℃	Operating pressure 工作压力 MPa	Reseating pressure 回座压力 MPa	Design pressure 设计压力 MPa	Pressure setting 整定压力 MPa	Outlet diameter 出口直径 mm	Inlet diameter 进口直径 mm
109	PSV-4023	20;20	25D50	Nitrogen 氮气	20	-0.98	0.02	2	0.196	50	25
110	PSV-4025	20;20	25D50	Nitrogen 氮气	20	-0.98	0.02	2	0.196	50	25
111	PSV-4027	20;20	25D50	Nitrogen 氮气	20	-0.98	0.02	2	0.196	50	25
112	PSV-4029	20;20	25D50	Nitrogen 氮气	20	-0.98	0.02	2	0.196	50	25
113	PSV-4031	20;20	25D50	Nitrogen 氮气	20	-0.98	0.02	2	0.196	50	25
114	PSV-4033	20;20	25D50	Nitrogen 氮气	20	-0.98	0.02	2	0.196	50	25
115	PSV-4035	20;20	25D50	Nitrogen 氮气	20	-0.98	0.02	2	0.196	50	25
116	PSV-4037	20;20	25D50	Nitrogen 氮气	20	-0.98	0.02	2	0.196	50	25
117	PSV-4039	20;20	25D50	Nitrogen 氮气	20	-0.98	0.02	2	0.196	50	25
118	PSV-4041	20;20	25D50	Nitrogen 氮气	20	-0.98	0.02	2	0.196	50	25
119	PSV-4043	20;20	25D50	Nitrogen 氮气	20	-0.98	0.02	2	0.196	50	25
120	PSV-4045	20;20	25D50	Nitrogen 氮气	20	-0.98	0.02	2	0.196	50	25
121	PSV-4047	20;20	25D50	Nitrogen 氮气	20	-0.98	0.02	2	0.196	50	25
122	PSV-3001	20;20	25D50	Circulating return water 循环回水	43	0.250	0.85	2	1	50	25
123	PSV-3002	20;20	25D50	Circulating return water 循环回水	43	0.250	0.85	2	1	50	25
124	PSV-3003	20;20	25D50	Circulating return water 循环回水	43	0.250	0.85	2	1	50	25
125	PSV-3004	20;20	25D50	Circulating return water 循环回水	43	0.250	0.85	2	1	50	25
126	PSV-3005	20;20	25D50	Circulating return water 循环回水	43	0.250	0.85	2	1	50	25
127	PSV-3006	20;20	25D50	Circulating return water 循环回水	43	0.250	0.85	2	1	50	25
128	PSV-3007	20;20	25D50	Circulating return water 循环回水	43	0.250	0.85	2	1	50	25
129	PSV-3008	20;20	25D50	Circulating return water 循环回水	43	0.250	0.85	2	1	50	25
130	PSV-4097A	20;20	50J80	Air 空气	130	0.063	0.614	2	0.66	80	50

Table 61: Relief valve (Continued)
表 61：安全阀（续）

No. 序号	Item No. 位号	Nominal pressure 公称压力 MPa	Nominal Diameter 公称直径 mm	Fluid 介质	Operating Temperature 工作温度 ℃	Operating pressure 工作压力 MPa	Reseating pressure 回座压力 MPa	Design pressure 设计压力 MPa	Pressure setting 整定压力 MPa	Outlet diameter 出口直径 mm	Inlet diameter 进口直径 mm
131	PSV-4097B	20;20	50J80	Air 空气	130	0	0.614	2	0.66	80	50
132	PSV-4225	20;20	25D50	Air 空气	211	0.07	0.614	2	0.66	50	25
133	PSV-0001A	20;20	40H80	Air 空气	40	0.7	0.93	2	1	80	40
134	PSV-0001B	20;20	40H80	Air 空气	40	0.7	0.93	2	1	80	40
135	PSV-0002A	20;20	40H80	Air 空气	40	0.7	0.93	2	1	80	40
136	PSV-0002B	20;20	40H80	Air 空气	40	0.7	0.93	2	1	80	40
137	PSV-0003A	20;20	40H80	LP nitrogen 低压氮气	40	0.6	0.93	2	1	80	40
138	PSV-0003B	20;20	40H80	LP nitrogen 低压氮气	40	0.6	0.93	2	1	80	40
139	PSV-0004A	50;20	150R250	LP nitrogen 低压氮气	250	1	1.395	5	1.5	250	150
140	PSV-0004B	50;20	150R250	LP nitrogen 低压氮气	250	1.00	1.395	5	1.5	250	150
141	PSV-0005A	110;50	150Q200	MP steam 中压蒸汽	390	3.50	4.032	11	4.2	200	150
142	PSV-0005B	110;50	150Q200	MP steam 中压蒸汽	390	3.50	4.032	11	4.2	200	150
143	PSV-2210A	20;20	150R200	Oil vapor 油气	100	0.251	0.401	2	0.431	200	150
144	PSV-2210B	20;20	150R200	Oil vapor 油气	100	0.251	0.401	2	0.431	200	150
145	PSV-2227A	20;20	100P150	Oil vapor 油气	101	0.746	0.861	2	0.926	150	100
146	PSV-2227B	20;20	100P150	Oil vapor 油气	101	0.746	0.861	2	0.926	150	100
147	PSV-2252A	20;20	150R200	Oil vapor 油气	40	0.26	0.401	2	0.431	200	150
148	PSV-2252B	20;20	150R200	Oil vapor 油气	40	0.26	0.401	2	0.431	200	150
149	PSV-2262A	20;20	100P150	Oil vapor 油气	40	0.74	0.861	2	0.926	150	100
150	PSV-2262B	20;20	100P150	Oil vapor 油气	40	0.74	0.861	2	0.926	150	100
151	PSV-1596A								0.8		
152	PSV-1596B								0.85		

Table 61: Relief valve (Continued)
表 61：安全阀（续）

No. 序号	Item No. 位号	Nominal pressure 公称压力 MPa	Nominal Diameter 公称直径 mm	Fluid 介质	Operating Temperature 工作温度 ℃	Operating pressure 工作压力 MPa	Reseating pressure 回座压力 MPa	Design pressure 设计压力 MPa	Pressure setting 整定压力 MPa	Outlet diameter 出口直径 mm	Inlet diameter 进口直径 mm
153	PSV-2619A								1.35		
154	PSV-2619B								1.35		

Table 62: Other equipment
表 62：其它设备

No. 序号	Item No. 设备位号	Equipment name 设备名称	Model and size 型号规格	Qty. 数量	Main performance and operating parameters 主要性能及工作参数
1	EH-301	Electric heater of nitrogen 氮气电加热器	Tubular Heater	1	Shell:18.4/215 ℃,0.025 m^3
2	EH-401	Electric heater of nitrogen 氮气电加热器	Tubular Heater	1	Shell:18.4/200 ℃,0.106 m^3
3	PA-101	Scale inhibitor filling system 阻垢剂加注系统	1 m^3	1	30 L/h, 1 for operation, 1 for standby 30 L/h，1 开 1 备
4	PA-102	Packaged chemical filling system 成套加药系统	1 m^3	1	20 L/h, 2 for operation, 2 for standby 20 L/h，2 开 2 备
5	PA-201	Amine filling facilities 注胺设施	4.5 m^3	1	20 L/h, 1 for operation, 1 for standby 20 L/h，1 开 1 备
6	PA-301	Antiscalant filling facilities 防垢剂加注设施	2 m^3	1	1.7/0.2/5 L/h, 3 for operation, 2 for standby 1.7/0.2/5 L/h,3 开 2 备
7	PA-302	Caustic filling facilities 注碱加注设施	40 m^3	1	22 L/h, 1 for operation, 1 for standby; 3500 L/h for startup 22 L/h，1 开 1 备；3500 L/h 开工用
8	PA-303	Defoamer filling facilities 阻泡剂设施	2 m^3	1	5.4 L/h, 1 for operation, 1 for standby 5.4 L/h，1 开 1 备
9	PA-401	Filter press oligomer package 压滤机低聚物成套装置	4.5 m^3	1	20 L/h, 1 for operation, 1 for standby 20 L/h，1 开 1 备
10	PA-402	Bag filter package 袋式过滤器成套装置	Other equipment 其他设备	1	Bag filter body, 1 for operation, 1 for standby; dust removal efficiency 99.5% 袋式过滤器本体 1 开 1 备；除尘效率 99.5%
11	PA-403	Venturi scrubber package 文丘里洗涤器成套装置	Other equipment 其他设备	1	Washing efficiency≮95w% 洗涤效率≮95w%

Table 62: Other equipment (Continued)
表 62：其它设备（续）

No. 序号	Item No. 设备位号	Equipment name 设备名称	Model and size 型号规格	Qty. 数量	Main performance and operating parameters 主要性能及工作参数
12	PA-404	Dry coke fines loading package 干焦粉装车成套装置	Other equipment 其他设备	1	Maximum loading capacity 212 T/d 最大装载量 212 T/d
13	PA-405	Gravity-type belt filter press package 重力带式压滤机成套装置	STDNY-2000	1	Capacity≥15-25 m^3/h; sludge moisture content at outlet ≥45% 处理能力≥15-25 m^3/h；出泥含水率≥45%
14	PA-407	Slurry thickener tank package 浆液增稠器罐成套装置	Scraper GNSZG-10 耙料机 GNSZG-10	1	Minimum output shaft torque 45000Nm, center drive, screw lift 输出轴最小扭矩 45000Nm，中心传动，螺旋提升
15	PA-408	Thickener oligomer package 增稠器低聚物成套装置	4.5 m^3	1	20 L/h, 1 for operation, 1 for standby 20 L/h，1 开 1 备
16	WS-401	Weighbridge 地秤	QS-80	1	80 T
17	CY-401	BN-402 overhead cyclone BN-402 顶旋风	Other equipment 其他设备	1	
18	CY-101A-C	Reactor cyclone 反应器旋风分离器	Other equipment 其他设备	3	SA-387.Gr 12Cr12
19	CY-102A-H	Heater primary cyclone 加热器一级旋风分离器	Other equipment 其他设备	8	S30409
20	CY-103A-H	Heater secondary cyclone 加热器二级旋风分离器	Other equipment 其他设备	8	S30409
21	CY-301A-H	Tertiary cyclone 三级旋风分离器	Other equipment 其他设备	8	
22	DC-401	Dust collector 粉尘收集器	HMC-64	1	Capacity 5000 m^3/h; filtration area 48 m^2 处理风量 5000 m^3/h；过滤面积 48 m^2
23	DS-101	MP steam desuperheater 中压蒸汽减温器	JW-25.2-01	1	Temperature, pressure and flow of desuperheated water: 122℃, 4.608 MPa, 3.25 t/h 减温水温度、压力、流量：122℃、4.608 MPa、3.25 t/h
24	DS-102	LLP steam desuperheater 低低压蒸汽减温器	JW-56.8-01	1	Temperature, pressure and flow of desuperheated water: 121℃, 1.285 MPa, 4.68 t/h 减温水温度、压力、流量：121℃、1.285 MPa、4.68 t/h
25	DS-201	MP steam desuperheater 中压蒸汽减温器	JW-7.4-01	1	Temperature, pressure and flow of desuperheated water: 122℃, 3.5 MPa, 1.28 t/h 减温水温度、压力、流量：122℃、3.5 MPa、1.28 t/h

Table 62: Other equipment (Continued)
表 62：其它设备（续）

No. 序号	Item No. 设备位号	Equipment name 设备名称	Model and size 型号规格	Qty. 数量	Main performance and operating parameters 主要性能及工作参数
26	DS-301	MP steam desuperheater 中压蒸汽减温器	JW-7.4-01	1	Temperature, pressure and flow of desuperheated water: 122℃, 4.608 MPa, 1.61 t/h 减温水温度、压力、流量：122℃、4.608 MPa、1.61 t/h
27	DY-302	Flexigas Venturi scrubber 灵活气文丘里洗涤器	Other equipment 其他设备	1	Washing efficiency≮99w% 洗涤效率≮99w%
28	DY-402	Flexigas Venturi scrubber 灵活气文丘里洗涤器	Other equipment 其他设备	1	Washing efficiency≮95w% 洗涤效率≮95w%
29	TV-1099	Hot coke slide valve 热焦滑阀	Hot Wall	1	38"CL300
30	LV-1091	Cold coke slide valve 冷焦滑阀	Hot Wall	1	36"CL300
31	HV-1421	Gasification feed valve 气化进料阀	Hot Wall	1	24"CL300
32	HV-1220	Scouring coke slide valve 冲刷焦滑阀	Hot Wall	1	22"CL300
33	TV-1279	Quenched coke slide valve 急冷焦滑阀	Hot Wall	1	36"CL300
34	LV-1351	Quenched coke feed valve 急冷焦进料阀	Cold Wall	1	14"CL300
35	PV-1359A/B	Quenched coke product coke 急冷焦产品焦	Cold Wall	2	4"CL300
36	HV-1289	Upper coke unloading valve of heater 加热器上部卸焦阀	Cold Wall	1	8"CL600
37	PV-1499	Coke unloading valve of gasifier 气化器卸焦阀	Cold Wall	1	8"CL600
38	PV-1300	Shutdown oke unloading of heater 加热器停工卸焦	Cold Wall	1	8"CL300
39	PV-3016A/B	Coke fines unloading of tertiary cyclone 三旋卸焦粉	Cold Wall	2	4"CL150
40	PV-4122	Coke loading valve (to BN-401) of coke tank 焦罐卸焦阀（至 BN-401）	Cold Wall	1	8"CL150

Table 62: Other equipment (Continued)
表 62：其它设备（续）

No. 序号	Item No. 设备位号	Equipment name 设备名称	Model and size 型号规格	Qty. 数量	Main performance and operating parameters 主要性能及工作参数
41	PV-4125	Coke loading valve (to BN-401) of coke tank 焦罐卸焦阀（至 BN-401）	Cold Wall	1	8"CL150
42	PV-4128	Startup coke loading valve (to BN-402) of coke tank 焦罐开工装焦阀(至 BN-402)	Cold Wall	1	12"CL150
43	LV-4226	BN-402 startup coke loading valve (to system) BN-402 开工装焦阀（至系统）	Cold Wall	1	12"CL300
44	MA-401AB	T-403 agitator T-403 搅拌器	CMR7500-130A	2	
45	MA-402AB	T-404 agitator T-404 搅拌器	CMR7500-130A	2	
46		Travelling crane 行车	20/5 electric two-girder 20/5 电动双梁	1	Weight of lifted maximum piece 16000kg 最大起吊件重量 16000kg
47		Travelling crane 行车	10/3.2 electric two-girder 10/3.2 电动双梁	1	Weight of lifted maximum piece 5000kg 最大起吊件重量 5000kg
48		Elevator 电梯	TTJac1000/1.0-JXW(VVVF)	1	Rated capacity 1000KG; rated speed 1.0m/s; lifting height 75000mm 额定载重 1000KG；额定速度 1.0m/s；提升高度 75000mm

5.2 Interlocking logic diagram of processes 工艺联锁逻辑图

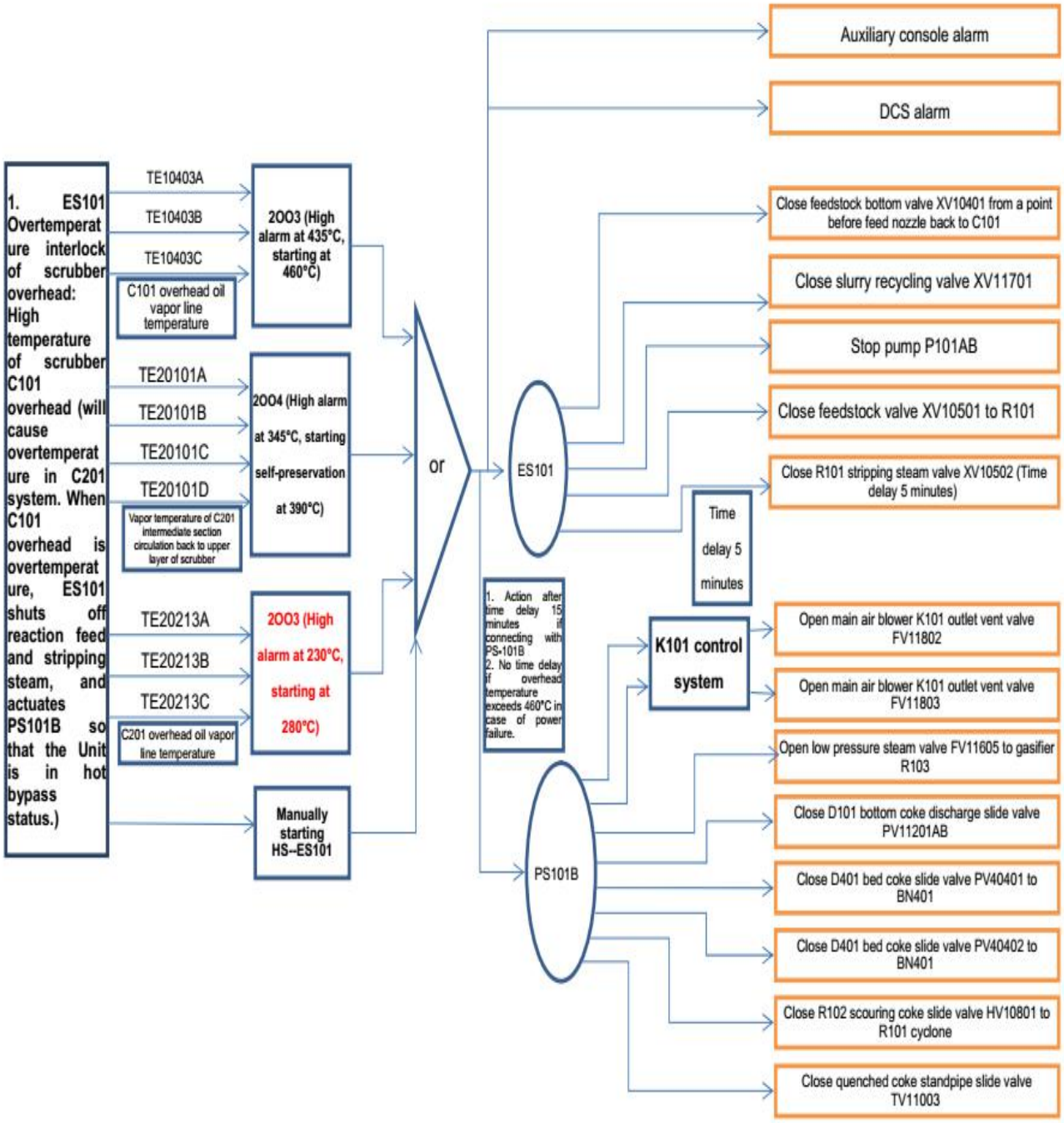


Figure 30: Process Interlocking Logic Diagram (ES System Interlock)
图 30：工艺联锁逻辑图（ES 系统联锁）

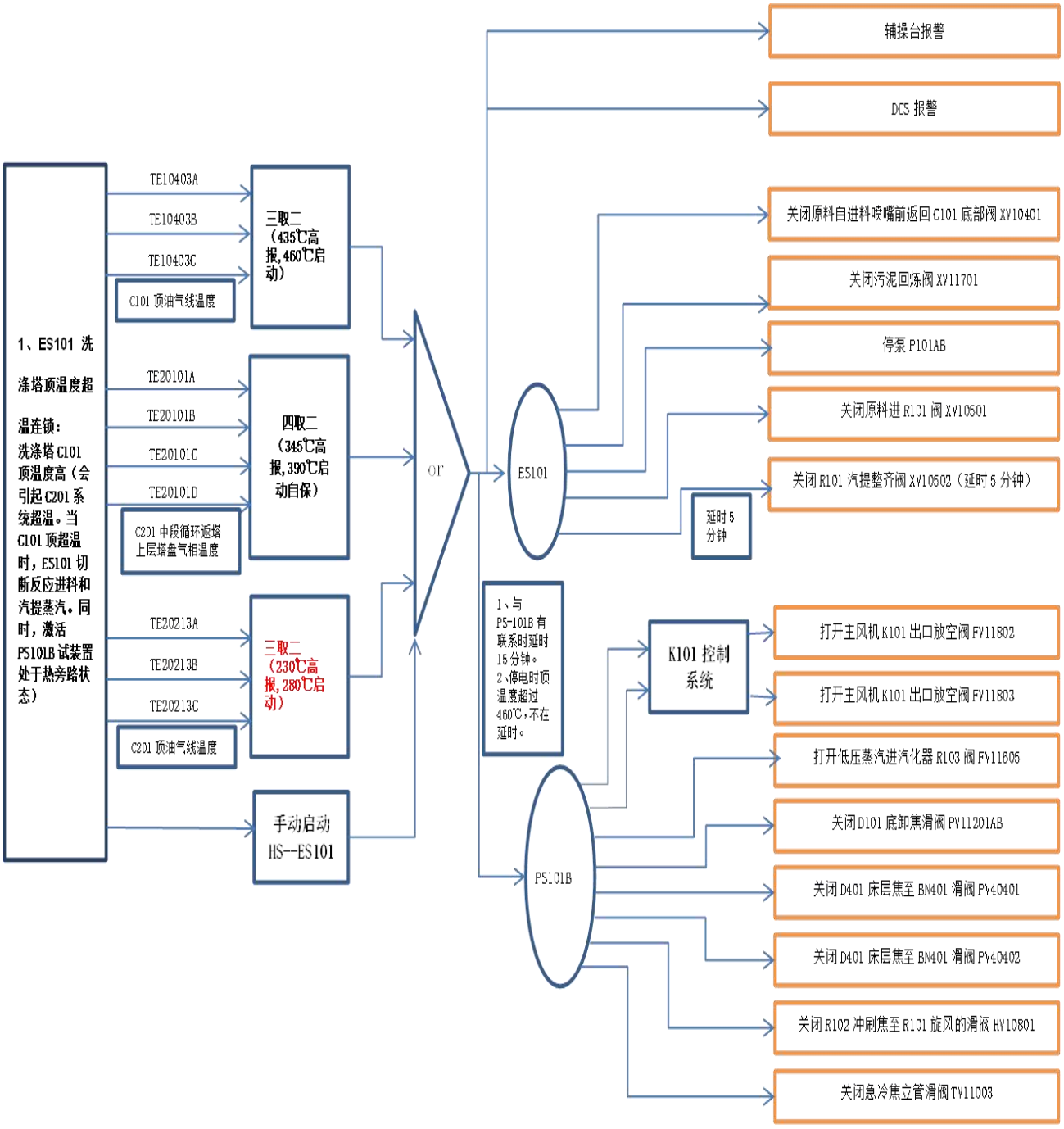
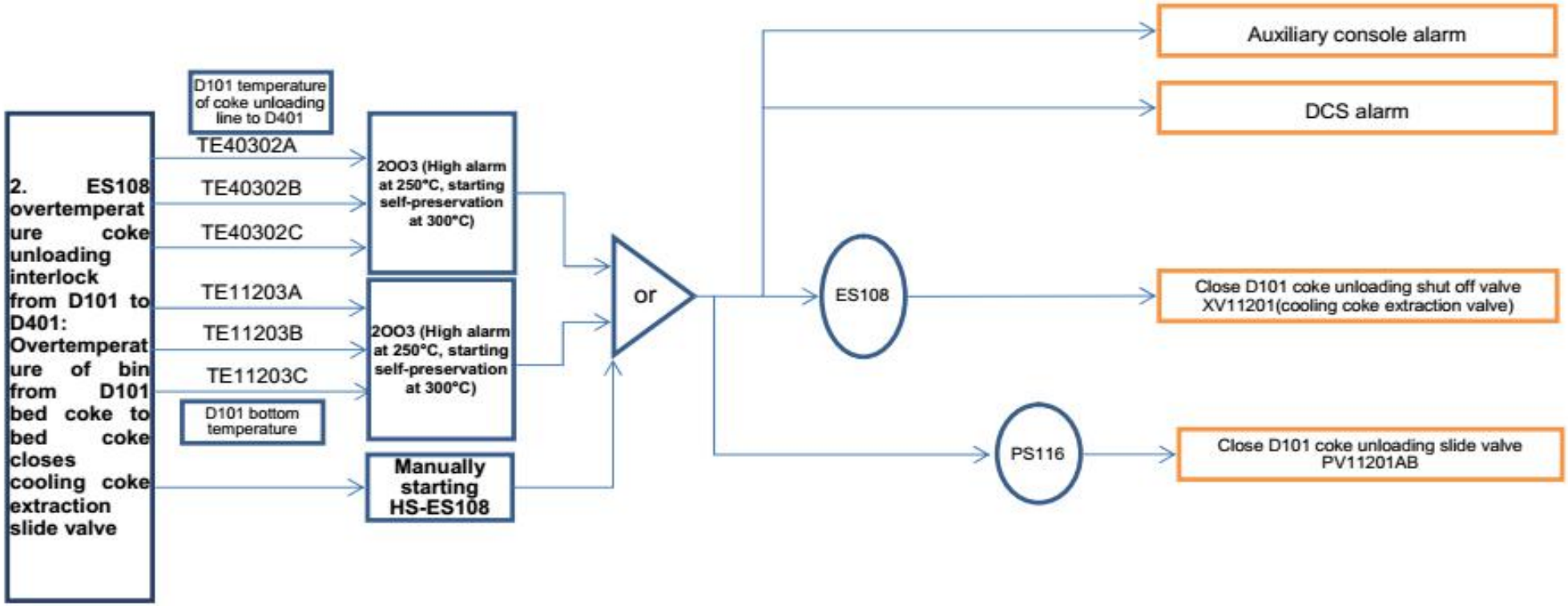
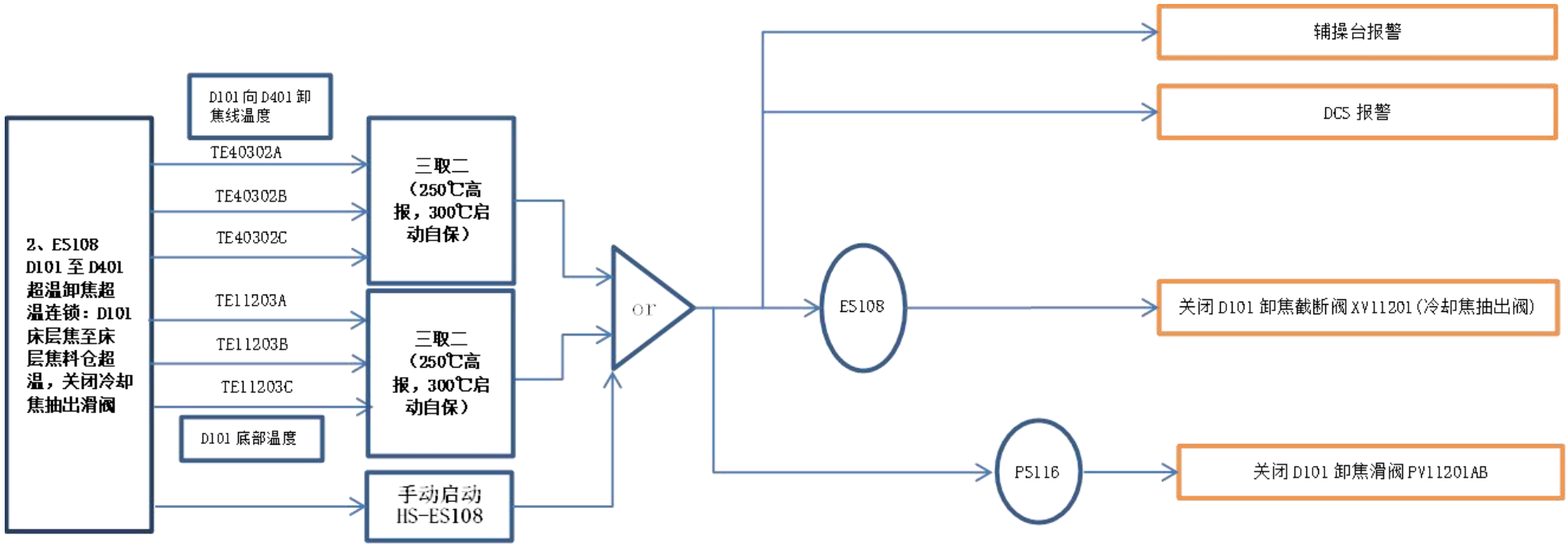
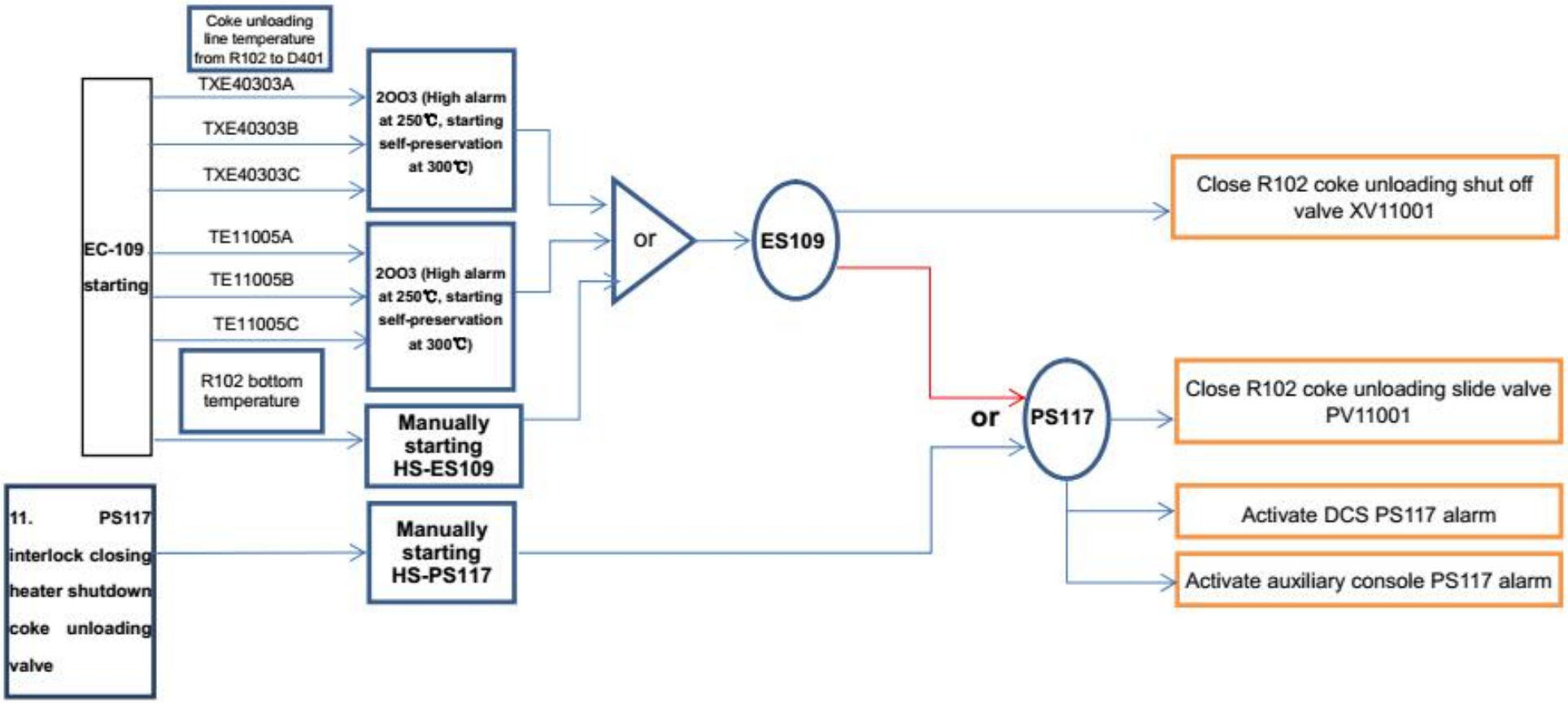
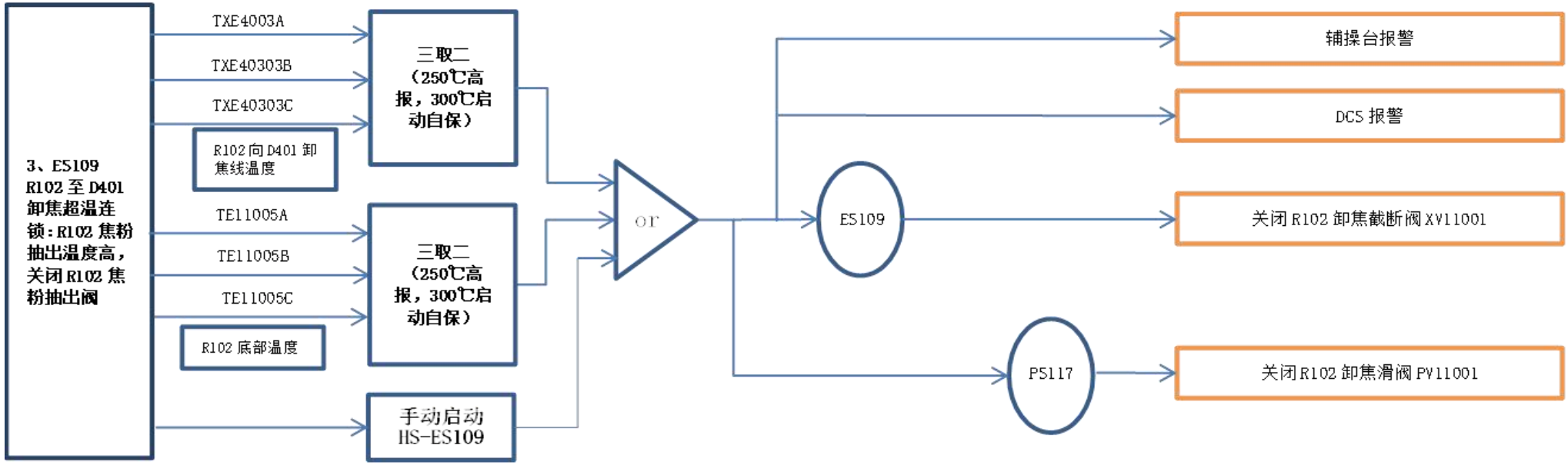


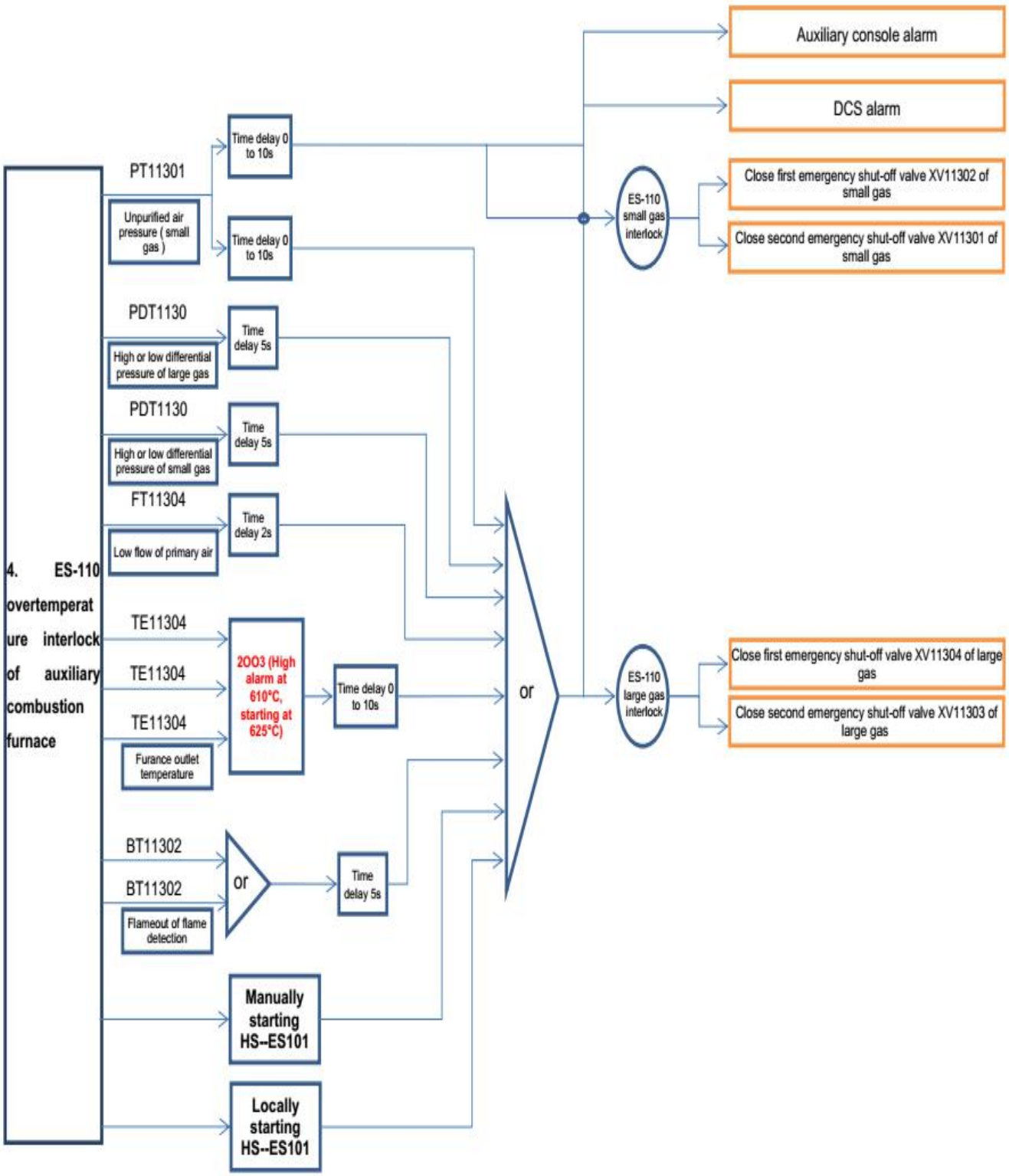
Figure 30: Process Interlocking Logic Diagram (ES System Interlock) (Continued)
图 31：工艺联锁逻辑图（ES 系统联锁)（续)

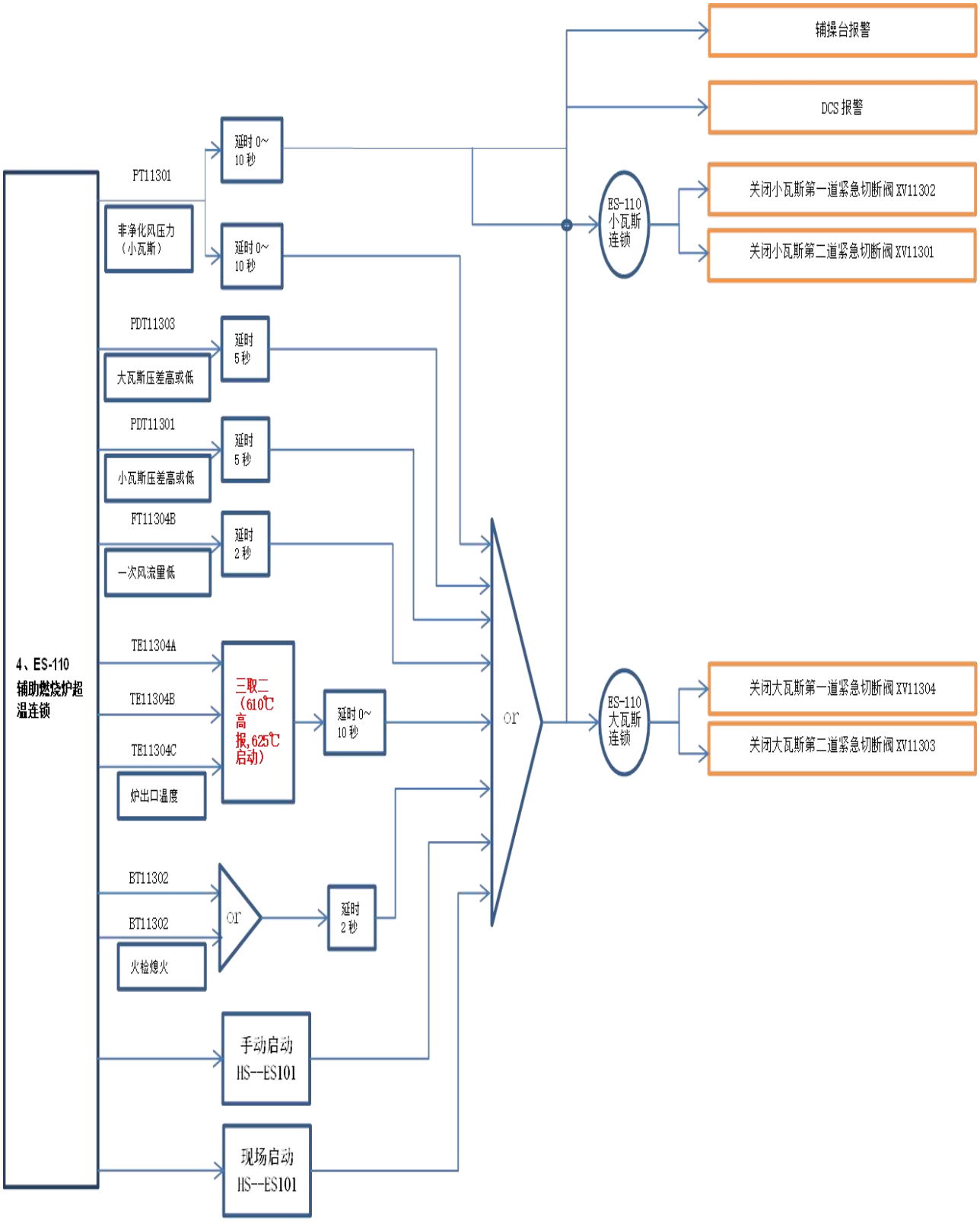

2. ES108 overtemperature coke unloading interlock from D101 to D401: Overtemperature of bin from D101 bed coke to bed coke closes cooling coke extraction slide valve
D101 temperature of coke unloading line to D401
TE40302A
TE40302B
TE40302C
TE11203A
TE11203B
TE11203C
D101 bottom temperature
2OO3 (High alarm at 250°C, starting self-preservation at 300°C)
2OO3 (High alarm at 250°C, starting self-preservation at 300°C)
Manually starting HS-ES108
or
ES108
PS116
Auxiliary console alarm
DCS alarm
Close D101 coke unloading shut off valve XV11201(cooling coke extraction valve)
Close D101 coke unloading slide valve PV11201AB

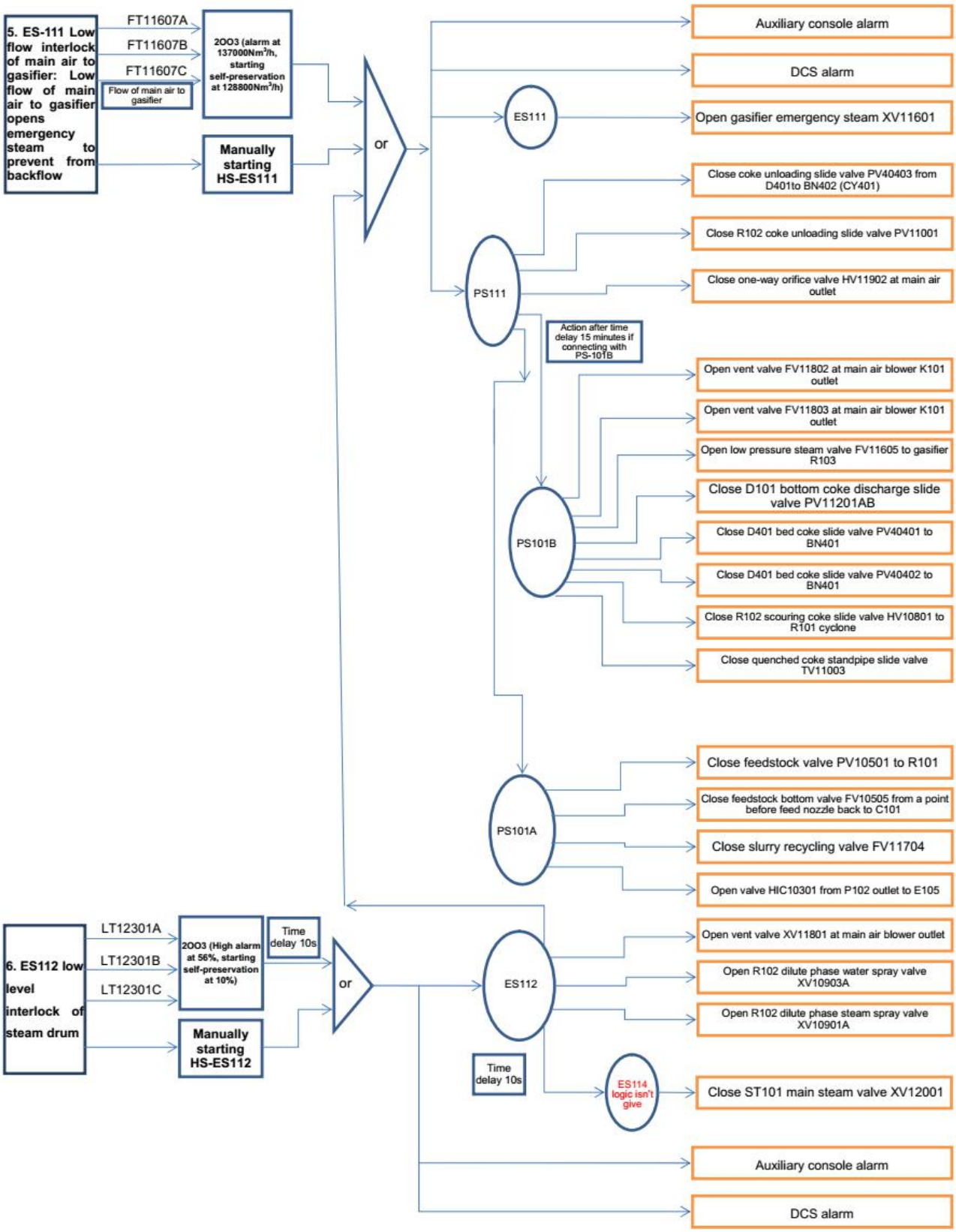

2、ES108 D101 至 D401 超温卸焦超温连锁：D101 床层焦至床层焦料仓超温，关闭冷却焦抽出滑阀
D101 向 D401 卸焦线温度
TE40302A
TE40302B
TE40302C
三取二（250℃高报，300℃启动自保）
TE11203A
TE11203B
TE11203C
D101 底部温度
三取二（250℃高报，300℃启动自保）
手动启动 HS-ES108
OT
ES108
PS116
辅操台报警
DCS 报警
关闭 D101 卸焦截断阀 XV11201（冷却焦抽出阀）
关闭 D101 卸焦滑阀 PV11201AB

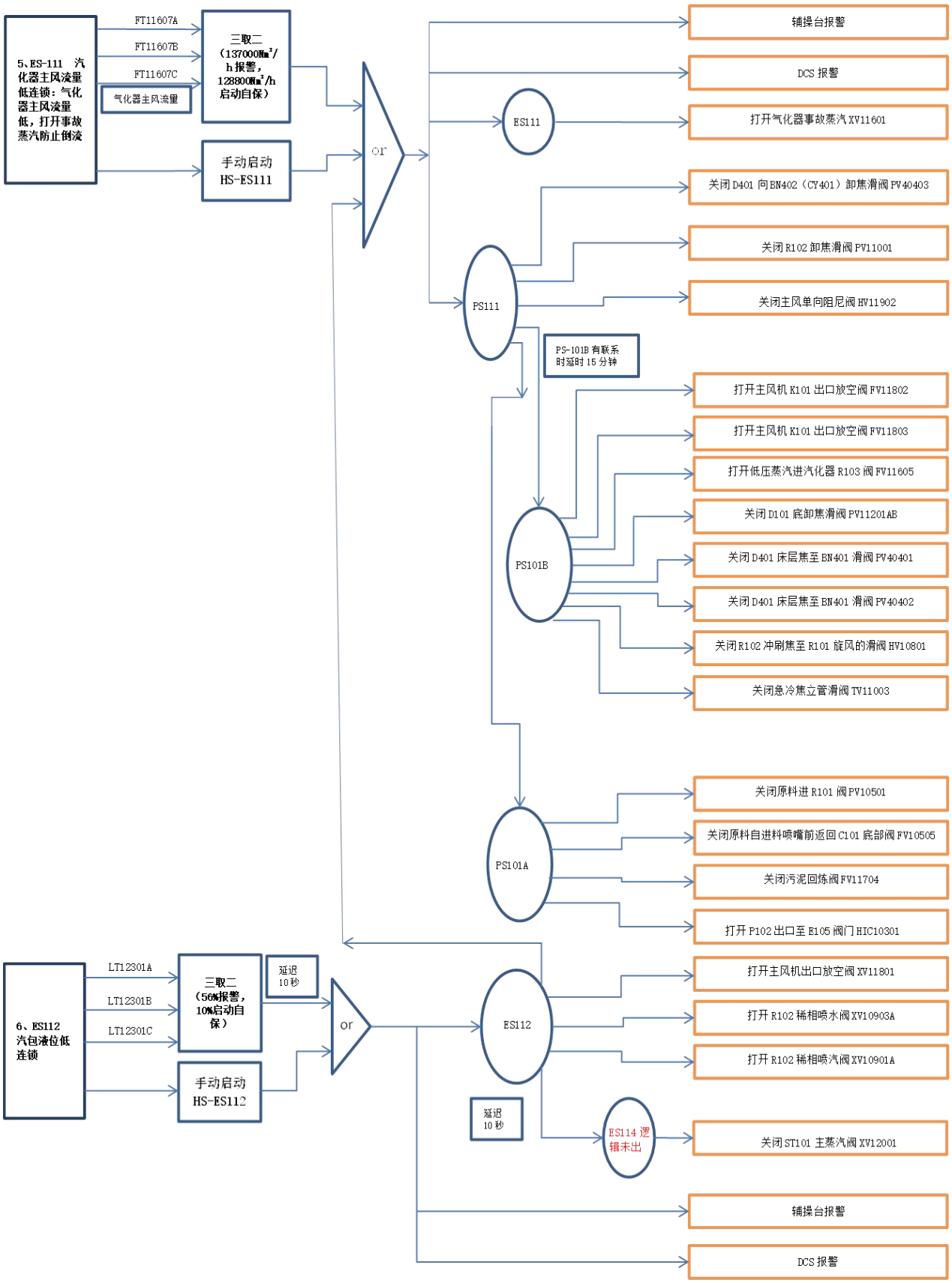

Coke unloading line temperature from R102 to D401
TXE40303A
TXE40303B
TXE40303C
2OO3 (High alarm at 250℃, starting self-preservation at 300℃)
EC-109 starting
TE11005A
TE11005B
TE11005C
2OO3 (High alarm at 250℃, starting self-preservation at 300℃)
R102 bottom temperature
Manually starting HS-ES109
or
ES109
Close R102 coke unloading shut off valve XV11001
or
PS117
Close R102 coke unloading slide valve PV11001
Activate DCS PS117 alarm
Activate auxiliary console PS117 alarm
11. PS117 interlock closing heater shutdown coke unloading valve
Manually starting HS-PS117

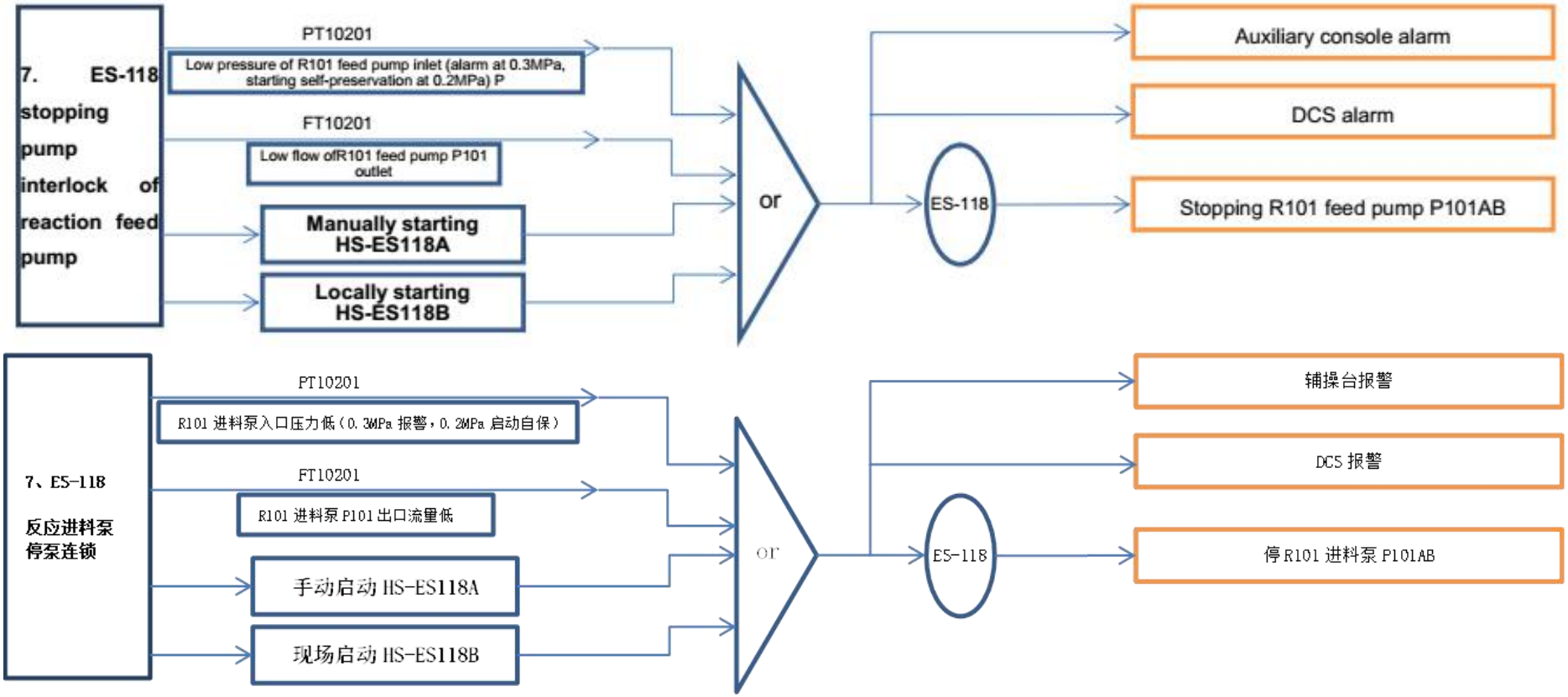

3、ES109 R102 至 D401 卸焦超温连锁：R102 焦粉抽出温度高，关闭 R102 焦粉抽出阀
TXE40303A
TXE40303B
TXE40303C
R102 向 D401 卸焦线温度
三取二（250℃高报，300℃启动自保）
TE11005A
TE11005B
TE11005C
R102 底部温度
三取二（250℃高报，300℃启动自保）
手动启动 HS-ES109
or
ES109
PS117
辅操台报警
DCS 报警
关闭 R102 卸焦截断阀 XV11001
关闭 R102 卸焦滑阀 PV11001

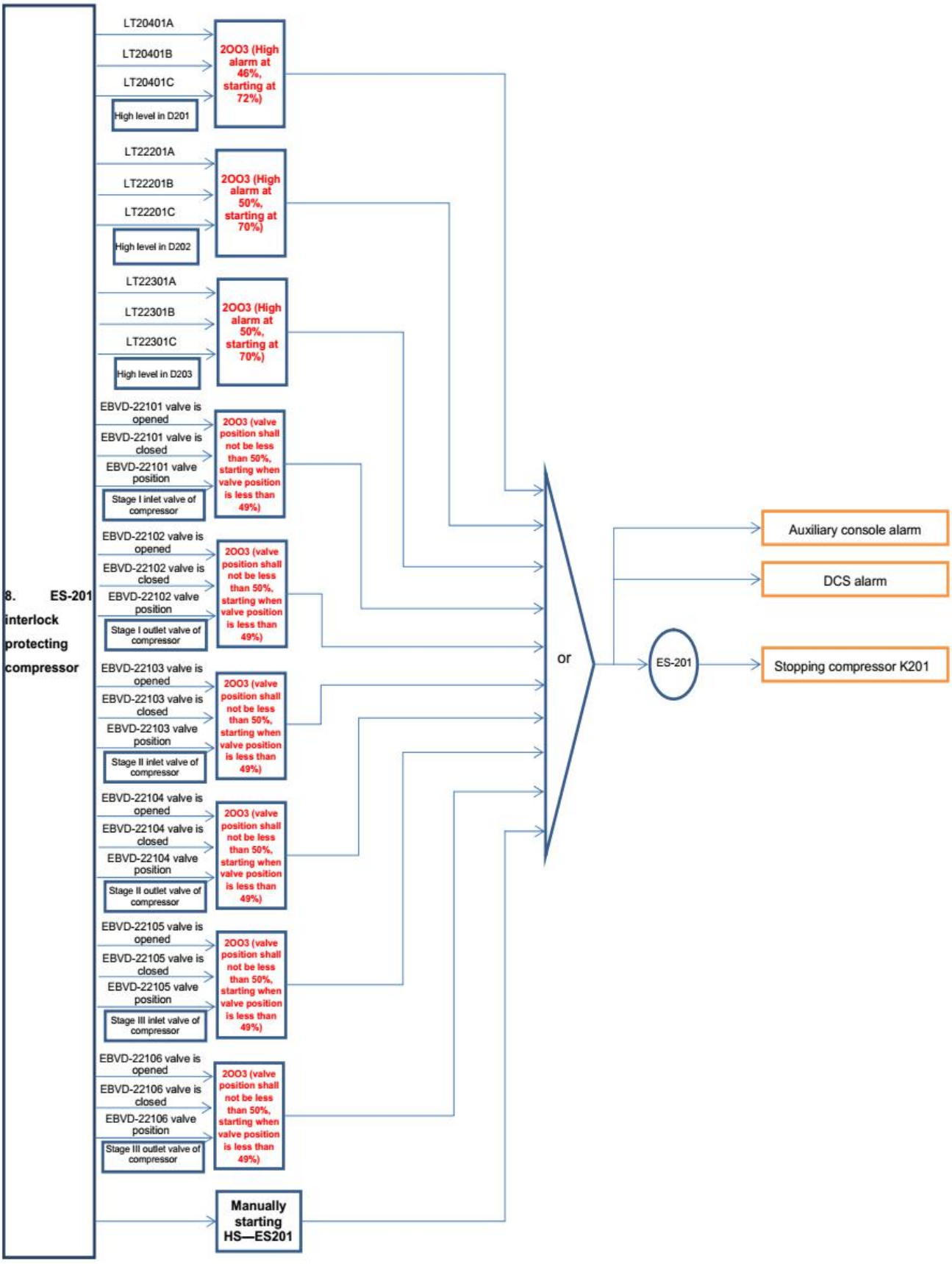

4. ES-110 overtemperature interlock of auxiliary combustion furnace
PT11301
Unpurified air pressure (small gas)
Time delay 0 to 10s
Time delay 0 to 10s
PDT1130
High or low differential pressure of large gas
Time delay 5s
PDT1130
High or low differential pressure of small gas
Time delay 5s
FT11304
Low flow of primary air
Time delay 2s
TE11304
TE11304
TE11304
Furance outlet temperature
2OO3 (High alarm at 610°C, starting at 625°C)
Time delay 0 to 10s
BT11302
BT11302
Flameout of flame detection
or
Time delay 5s
Manually starting HS--ES101
Locally starting HS--ES101
or
Auxiliary console alarm
DCS alarm
ES-110 small gas interlock
Close first emergency shut-off valve XV11302 of small gas
Close second emergency shut-off valve XV11301 of small gas
ES-110 large gas interlock
Close first emergency shut-off valve XV11304 of large gas
Close second emergency shut-off valve XV11303 of large gas

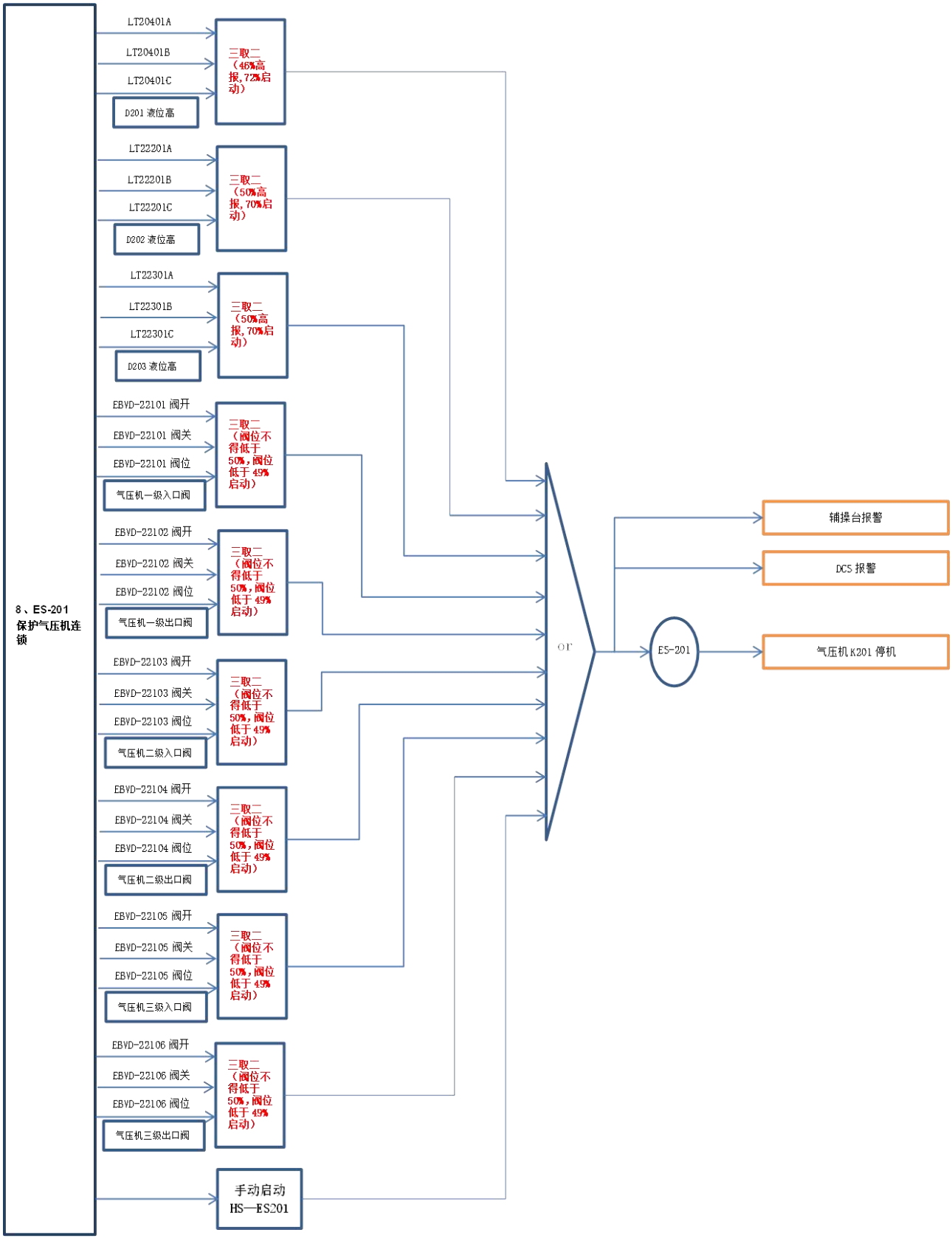

辅操台报警
DCS 报警
关闭小瓦斯第一道紧急切断阀 XV11302
关闭小瓦斯第二道紧急切断阀 XV11301
关闭大瓦斯第一道紧急切断阀 XV11304
关闭大瓦斯第二道紧急切断阀 XV11303
ES-110 小瓦斯连锁
ES-110 大瓦斯连锁
4、ES-110 辅助燃烧炉超温连锁
PT11301
非净化风压力（小瓦斯）
延时 0~10 秒
延时 0~10 秒
FDT11303
大瓦斯压差高或低
延时 5 秒
PDT11301
小瓦斯压差高或低
延时 5 秒
FT11304B
一次风流量低
延时 2 秒
TE11304A
TE11304B
TE11304C
三取二（610℃高报,625℃启动）
延时 0~10 秒
炉出口温度
BT11302
BT11302
火检熄火
or
延时 2 秒
or
手动启动 HS--ES101
现场启动 HS--ES101

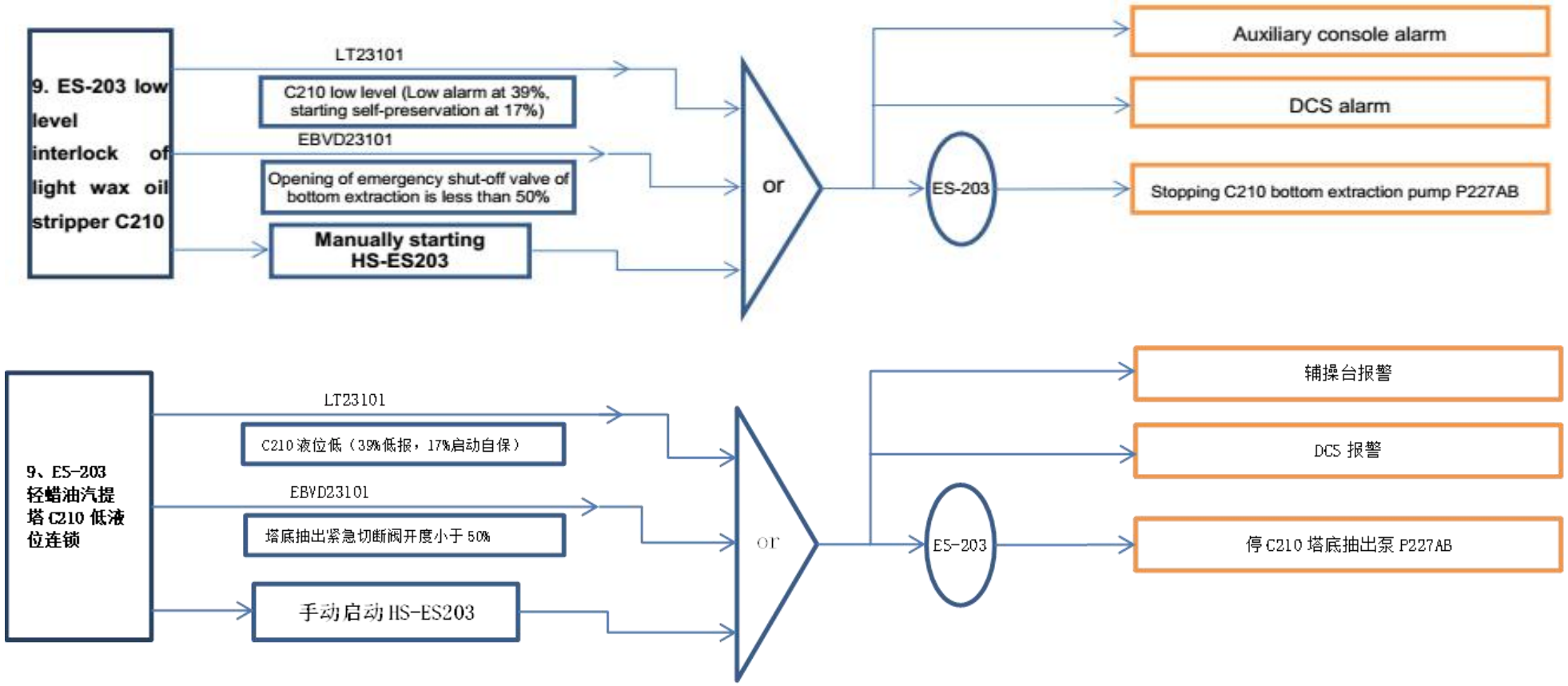

5. ES-111 Low flow interlock of main air to gasifier: Low flow of main air to gasifier opens emergency steam to prevent from backflow
FT11607A
FT11607B
FT11607C
Flow of main air to gasifier
2OO3 (alarm at 137000Nm³/h, starting self-preservation at 128800Nm³/h)
Manually starting HS-ES111
or
Auxiliary console alarm
DCS alarm
ES111
Open gasifier emergency steam XV11601
Close coke unloading slide valve PV40403 from D401to BN402 (CY401)
Close R102 coke unloading slide valve PV11001
PS111
Close one-way orifice valve HV11902 at main air outlet
Action after time delay 15 minutes if connecting with PS-101B
Open vent valve FV11802 at main air blower K101 outlet
Open vent valve FV11803 at main air blower K101 outlet
Open low pressure steam valve FV11605 to gasifier R103
Close D101 bottom coke discharge slide valve PV11201AB
PS101B
Close D401 bed coke slide valve PV40401 to BN401
Close D401 bed coke slide valve PV40402 to BN401
Close R102 scouring coke slide valve HV10801 to R101 cyclone
Close quenched coke standpipe slide valve TV11003
Close feedstock valve PV10501 to R101
Close feedstock bottom valve FV10505 from a point before feed nozzle back to C101
PS101A
Close slurry recycling valve FV11704
Open valve HIC10301 from P102 outlet to E105
6. ES112 low level interlock of steam drum
LT12301A
LT12301B
LT12301C
2OO3 (High alarm at 56%, starting self-preservation at 10%)
Time delay 10s
Manually starting HS-ES112
or
ES112
Open vent valve XV11801 at main air blower outlet
Open R102 dilute phase water spray valve XV10903A
Open R102 dilute phase steam spray valve XV10901A
Time delay 10s
ES114 logic isn't give
Close ST101 main steam valve XV12001
Auxiliary console alarm
DCS alarm

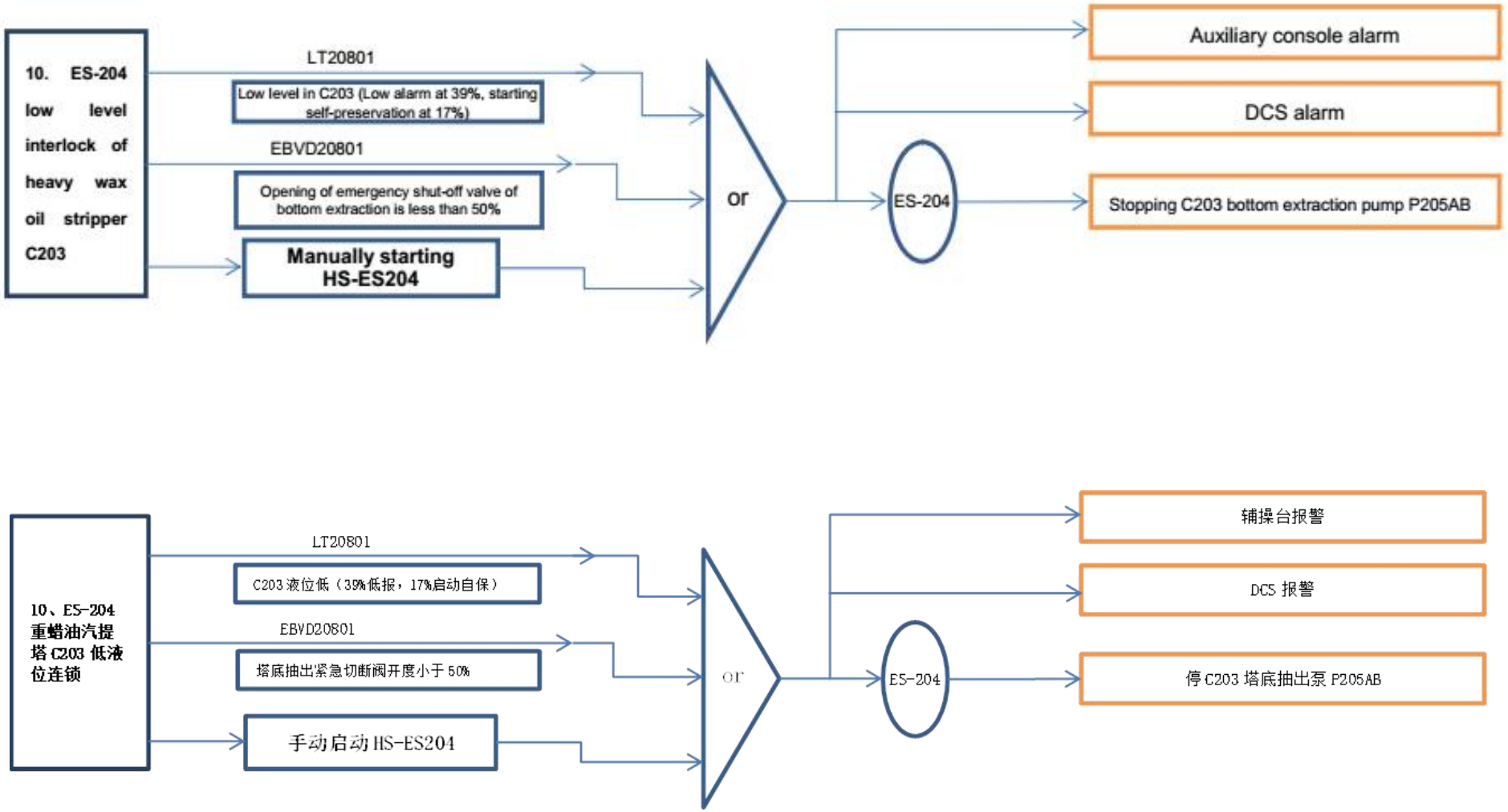

5、ES-111 汽化器主风流量低连锁：气化器主风流量低，打开事故蒸汽防止倒流
FT11607A
FT11607B
FT11607C
气化器主风流量
三取二（137000Nm³/h报警，128800Nm³/h启动自保）
手动启动 HS-ES111
or
辅操台报警
DCS 报警
ES111
打开气化器事故蒸汽 XV11601
关闭 D401 向 BN402（CY401）卸焦滑阀 PV40403
关闭 R102 卸焦滑阀 PV11001
关闭主风单向阻尼阀 HV11902
PS111
PS-101B 有联系时延时 15 分钟
打开主风机 K101 出口放空阀 FV11802
打开主风机 K101 出口放空阀 FV11803
打开低压蒸汽进汽化器 R103 阀 FV11605
关闭 D101 底卸焦滑阀 PV11201AB
关闭 D401 床层焦至 BN401 滑阀 PV40401
关闭 D401 床层焦至 BN401 滑阀 PV40402
关闭 R102 冲刷焦至 R101 旋风的滑阀 HV10801
关闭急冷焦立管滑阀 TV11003
PS101B
关闭原料进 R101 阀 PV10501
关闭原料自进料喷嘴前返回 C101 底部阀 FV10505
关闭污泥回炼阀 FV11704
打开 P102 出口至 E105 阀门 HIC10301
PS101A
6、ES112 汽包液位低连锁
LT12301A
LT12301B
LT12301C
三取二（56%报警，10%启动自保）
延迟 10 秒
手动启动 HS-ES112
or
ES112
打开主风机出口放空阀 XV11801
打开 R102 稀相喷水阀 XV10903A
打开 R102 稀相喷汽阀 XV10901A
延迟 10 秒
ES114 逻辑未出
关闭 ST101 主蒸汽阀 XV12001
辅操台报警
DCS 报警

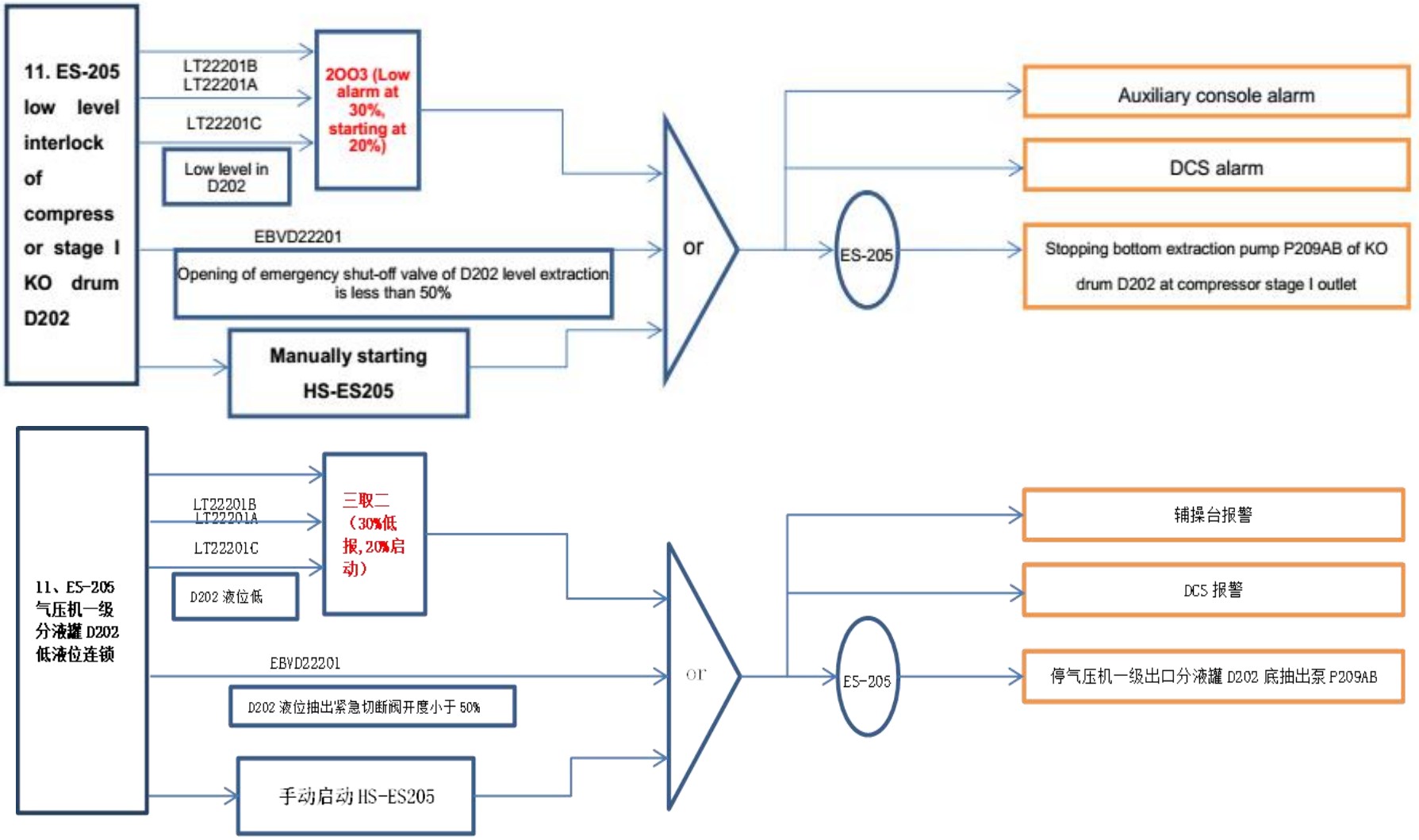

7. ES-118 stopping pump interlock of reaction feed pump
PT10201
Low pressure of R101 feed pump inlet (alarm at 0.3MPa, starting self-preservation at 0.2MPa) P
FT10201
Low flow ofR101 feed pump P101 outlet
Manually starting HS-ES118A
Locally starting HS-ES118B
or
ES-118
Auxiliary console alarm
DCS alarm
Stopping R101 feed pump P101AB
7、ES-118 反应进料泵停泵连锁
PT10201
R101 进料泵入口压力低（0.3MPa 报警，0.2MPa 启动自保）
FT10201
R101 进料泵 P101 出口流量低
手动启动 HS-ES118A
现场启动 HS-ES118B
or
ES-118
辅操台报警
DCS 报警
停 R101 进料泵 P101AB

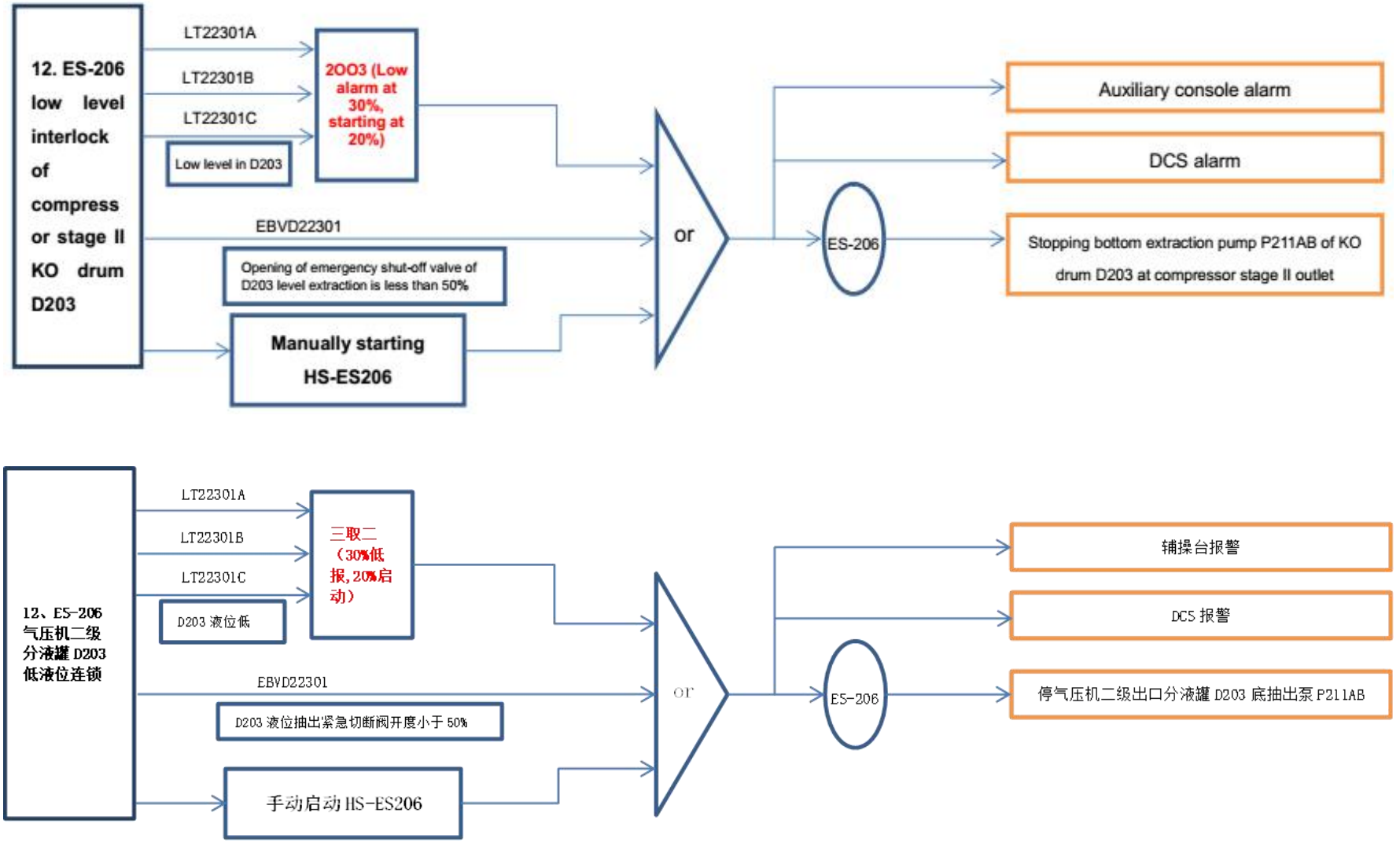

8. ES-201 interlock protecting compressor
LT20401A
LT20401B
LT20401C
High level in D201
2OO3 (High alarm at 46%, starting at 72%)
LT22201A
LT22201B
LT22201C
High level in D202
2OO3 (High alarm at 50%, starting at 70%)
LT22301A
LT22301B
LT22301C
High level in D203
2OO3 (High alarm at 50%, starting at 70%)
EBVD-22101 valve is opened
EBVD-22101 valve is closed
EBVD-22101 valve position
Stage I inlet valve of compressor
2OO3 (valve position shall not be less than 50%, starting when valve position is less than 49%)
EBVD-22102 valve is opened
EBVD-22102 valve is closed
EBVD-22102 valve position
Stage I outlet valve of compressor
2OO3 (valve position shall not be less than 50%, starting when valve position is less than 49%)
EBVD-22103 valve is opened
EBVD-22103 valve is closed
EBVD-22103 valve position
Stage II inlet valve of compressor
2OO3 (valve position shall not be less than 50%, starting when valve position is less than 49%)
EBVD-22104 valve is opened
EBVD-22104 valve is closed
EBVD-22104 valve position
Stage II outlet valve of compressor
2OO3 (valve position shall not be less than 50%, starting when valve position is less than 49%)
EBVD-22105 valve is opened
EBVD-22105 valve is closed
EBVD-22105 valve position
Stage III inlet valve of compressor
2OO3 (valve position shall not be less than 50%, starting when valve position is less than 49%)
EBVD-22106 valve is opened
EBVD-22106 valve is closed
EBVD-22106 valve position
Stage III outlet valve of compressor
2OO3 (valve position shall not be less than 50%, starting when valve position is less than 49%)
Manually starting HS—ES201
or
ES-201
Auxiliary console alarm
DCS alarm
Stopping compressor K201

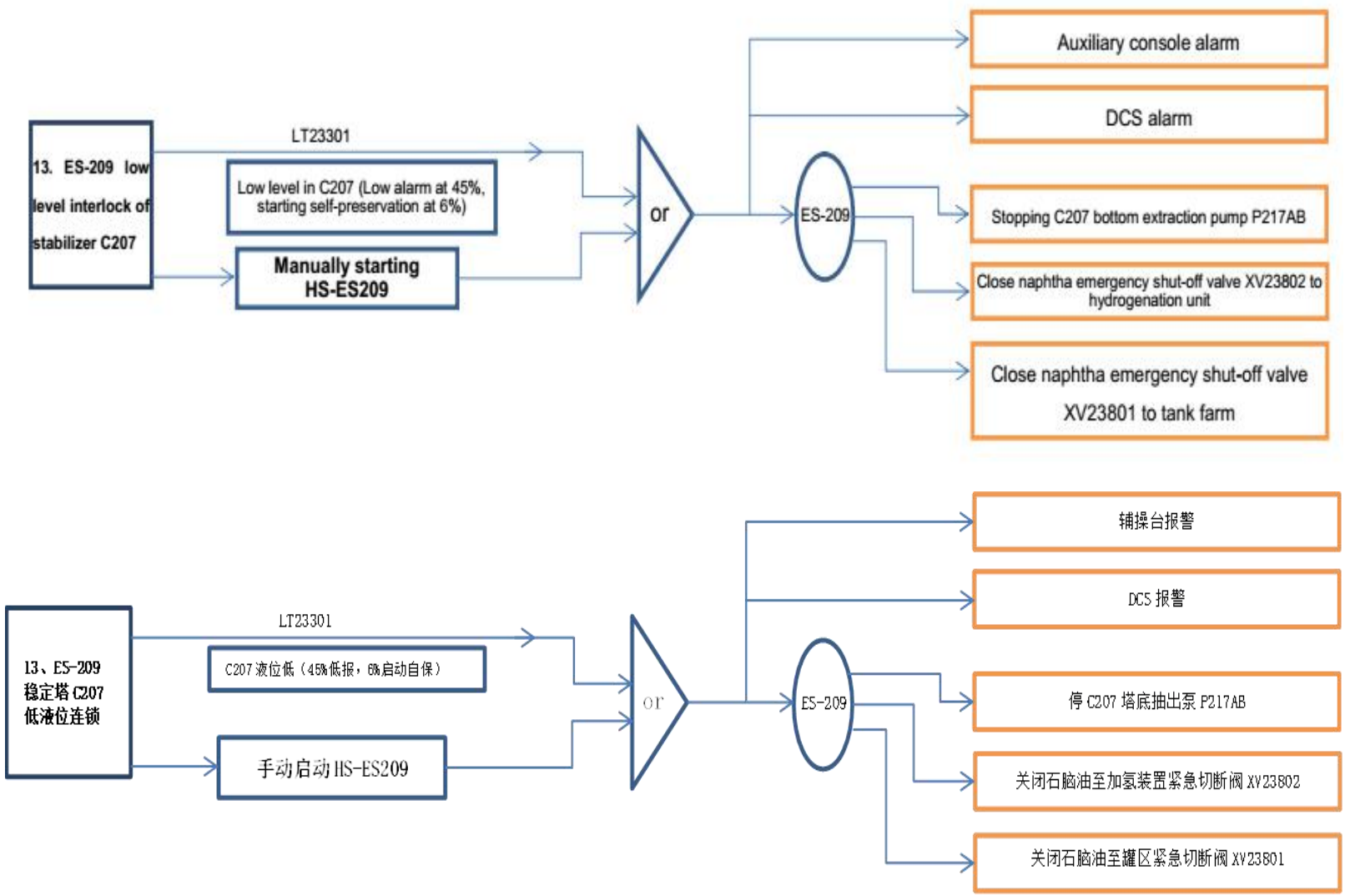

8、ES-201 保护气压机连锁
LT20401A
LT20401B
LT20401C
D201 液位高
三取二（46%高报，72%启动）
LT22201A
LT22201B
LT22201C
D202 液位高
三取二（50%高报，70%启动）
LT22301A
LT22301B
LT22301C
D203 液位高
三取二（50%高报，70%启动）
EBVD-22101 阀开
EBVD-22101 阀关
EBVD-22101 阀位
气压机一级入口阀
三取二（阀位不得低于50%，阀位低于49%启动）
EBVD-22102 阀开
EBVD-22102 阀关
EBVD-22102 阀位
气压机一级出口阀
三取二（阀位不得低于50%，阀位低于49%启动）
EBVD-22103 阀开
EBVD-22103 阀关
EBVD-22103 阀位
气压机二级入口阀
三取二（阀位不得低于50%，阀位低于49%启动）
EBVD-22104 阀开
EBVD-22104 阀关
EBVD-22104 阀位
气压机二级出口阀
三取二（阀位不得低于50%，阀位低于49%启动）
EBVD-22105 阀开
EBVD-22105 阀关
EBVD-22105 阀位
气压机三级入口阀
三取二（阀位不得低于50%，阀位低于49%启动）
EBVD-22106 阀开
EBVD-22106 阀关
EBVD-22106 阀位
气压机三级出口阀
三取二（阀位不得低于50%，阀位低于49%启动）
手动启动
HS—ES201
OR
ES-201
辅操台报警
DCS 报警
气压机 K201 停机

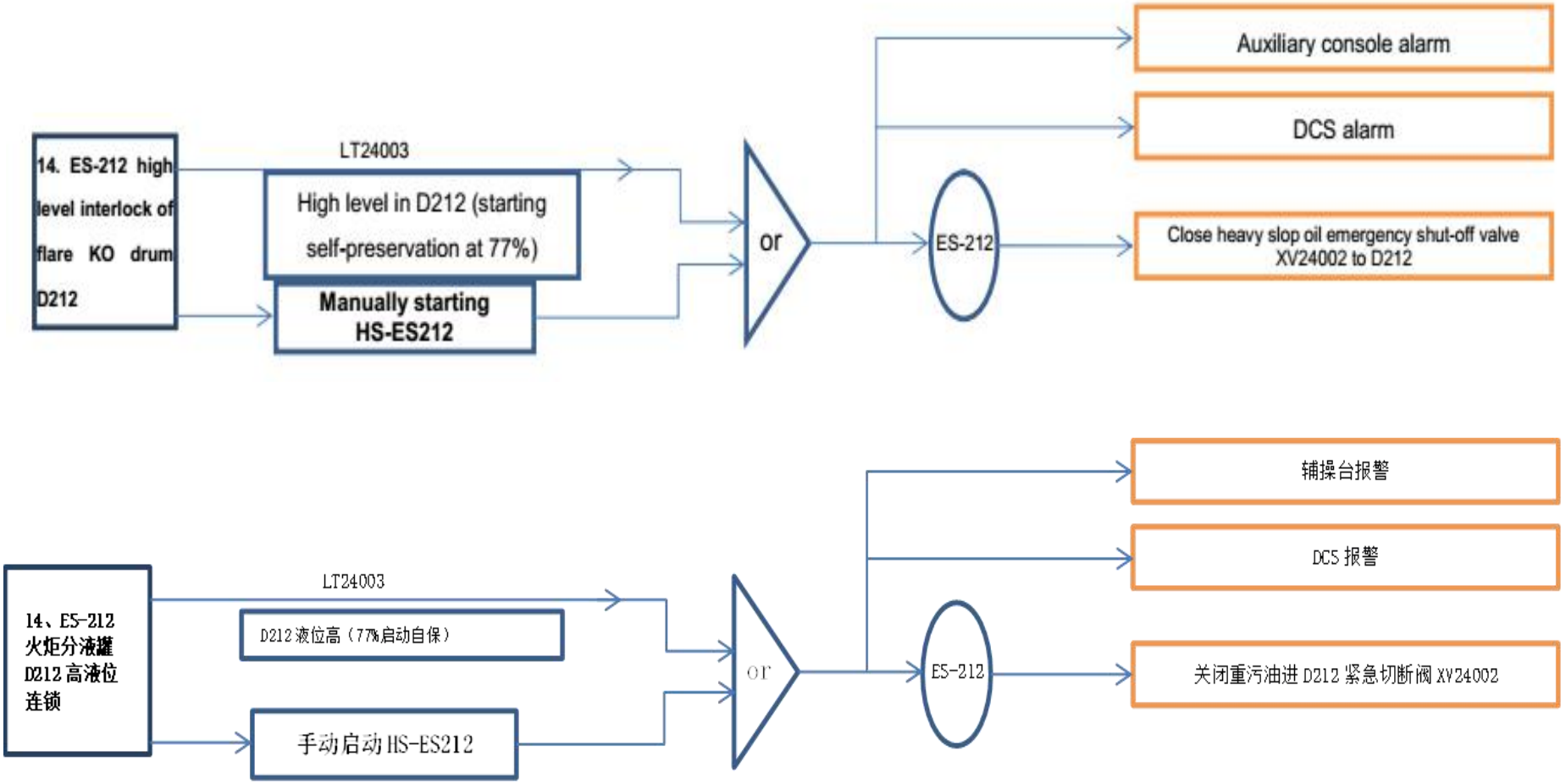

9. ES-203 low level interlock of light wax oil stripper C210
LT23101
C210 low level (Low alarm at 39%, starting self-preservation at 17%)
EBVD23101
Opening of emergency shut-off valve of bottom extraction is less than 50%
Manually starting HS-ES203
or
ES-203
Auxiliary console alarm
DCS alarm
Stopping C210 bottom extraction pump P227AB
9、E5-203 轻蜡油汽提塔 C210 低液位连锁
LT23101
C210 液位低（39%低报，17%启动自保）
EBVD23101
塔底抽出紧急切断阀开度小于 50%
手动启动 HS-ES203
OR
E5-203
辅操台报警
DCS 报警
停 C210 塔底抽出泵 P227AB

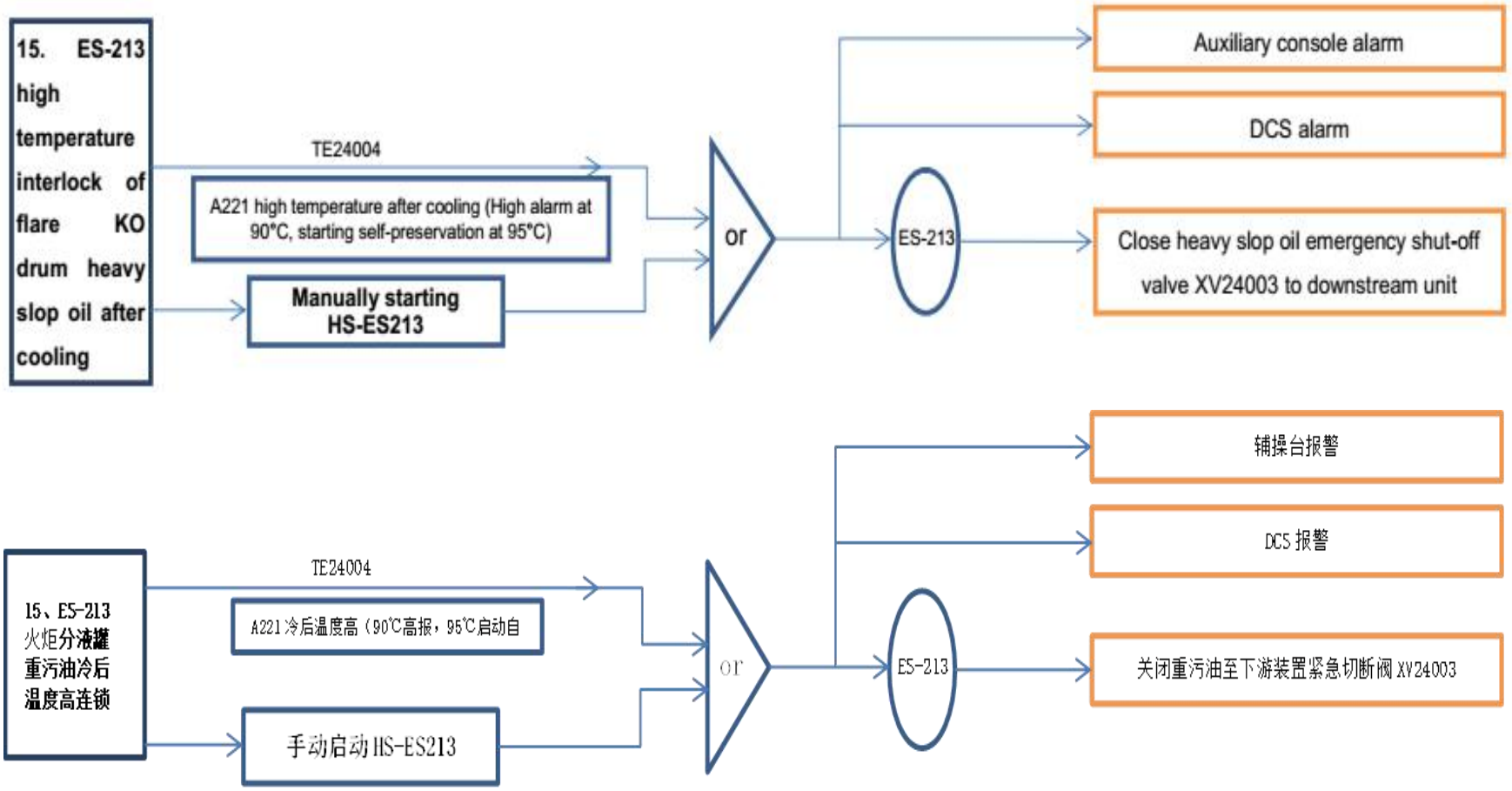

10. ES-204 low level interlock of heavy wax oil stripper C203
LT20801
Low level in C203 (Low alarm at 39%, starting self-preservation at 17%)
EBVD20801
Opening of emergency shut-off valve of bottom extraction is less than 50%
Manually starting HS-ES204
or
ES-204
Auxiliary console alarm
DCS alarm
Stopping C203 bottom extraction pump P205AB
10、ES-204 重蜡油汽提塔 C203 低液位连锁
LT20801
C203 液位低（39%低报，17%启动自保）
EBVD20801
塔底抽出紧急切断阀开度小于 50%
手动启动 HS-ES204
or
ES-204
辅操台报警
DCS 报警
停 C203 塔底抽出泵 P205AB

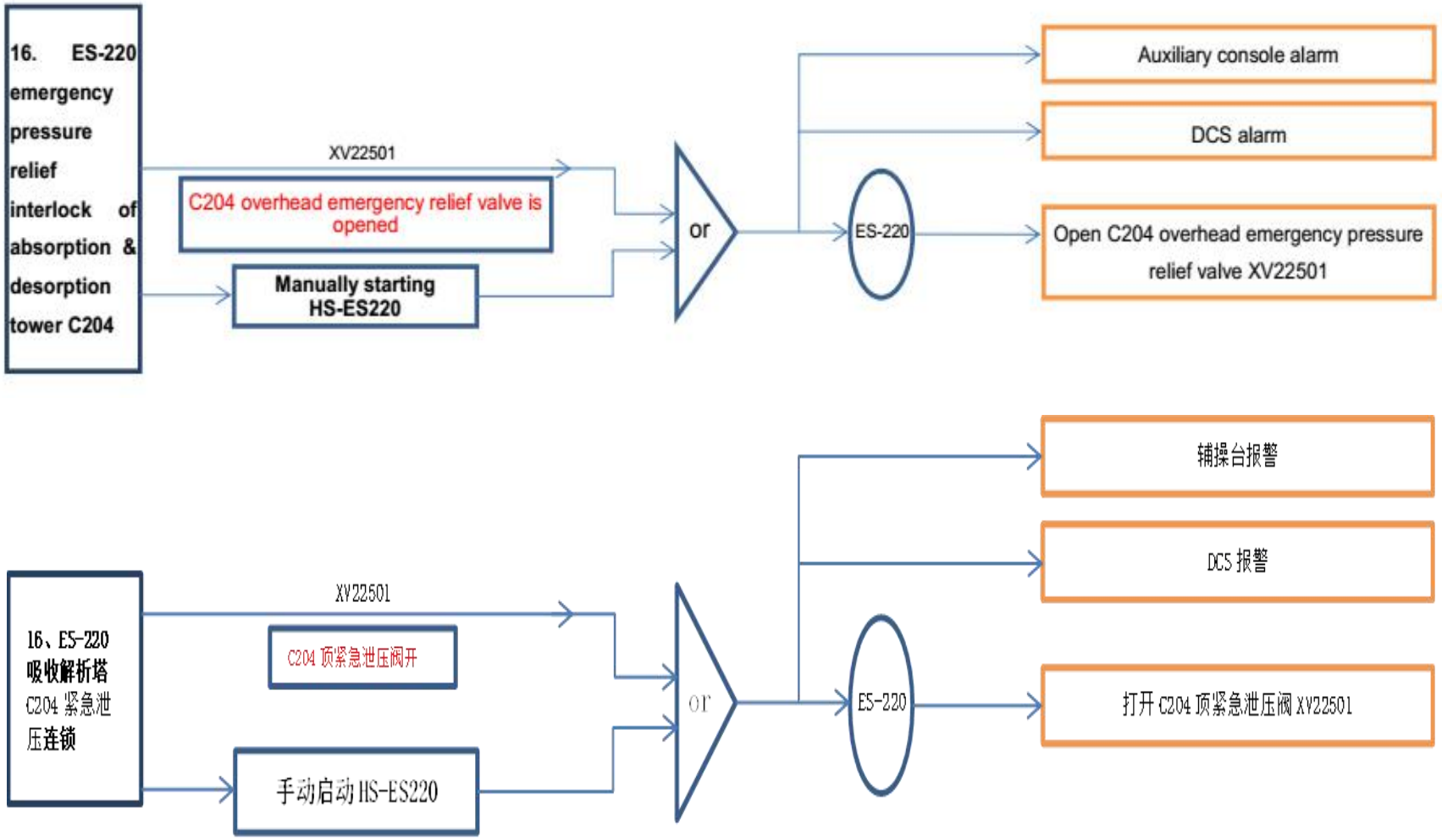

11. ES-205 low level interlock of compress or stage I KO drum D202
LT22201B
LT22201A
LT22201C
2OO3 (Low alarm at 30%, starting at 20%)
Low level in D202
EBVD22201
Opening of emergency shut-off valve of D202 level extraction is less than 50%
Manually starting HS-ES205
or
ES-205
Auxiliary console alarm
DCS alarm
Stopping bottom extraction pump P209AB of KO drum D202 at compressor stage I outlet
11、ES-205 气压机一级分液罐 D202 低液位连锁
LT22201B
LT22201A
LT22201C
三取二（30%低报,20%启动）
D202 液位低
EBVD22201
D202 液位抽出紧急切断阀开度小于 50%
手动启动 HS-ES205
or
ES-205
辅操台报警
DCS 报警
停气压机一级出口分液罐 D202 底抽出泵 P209AB

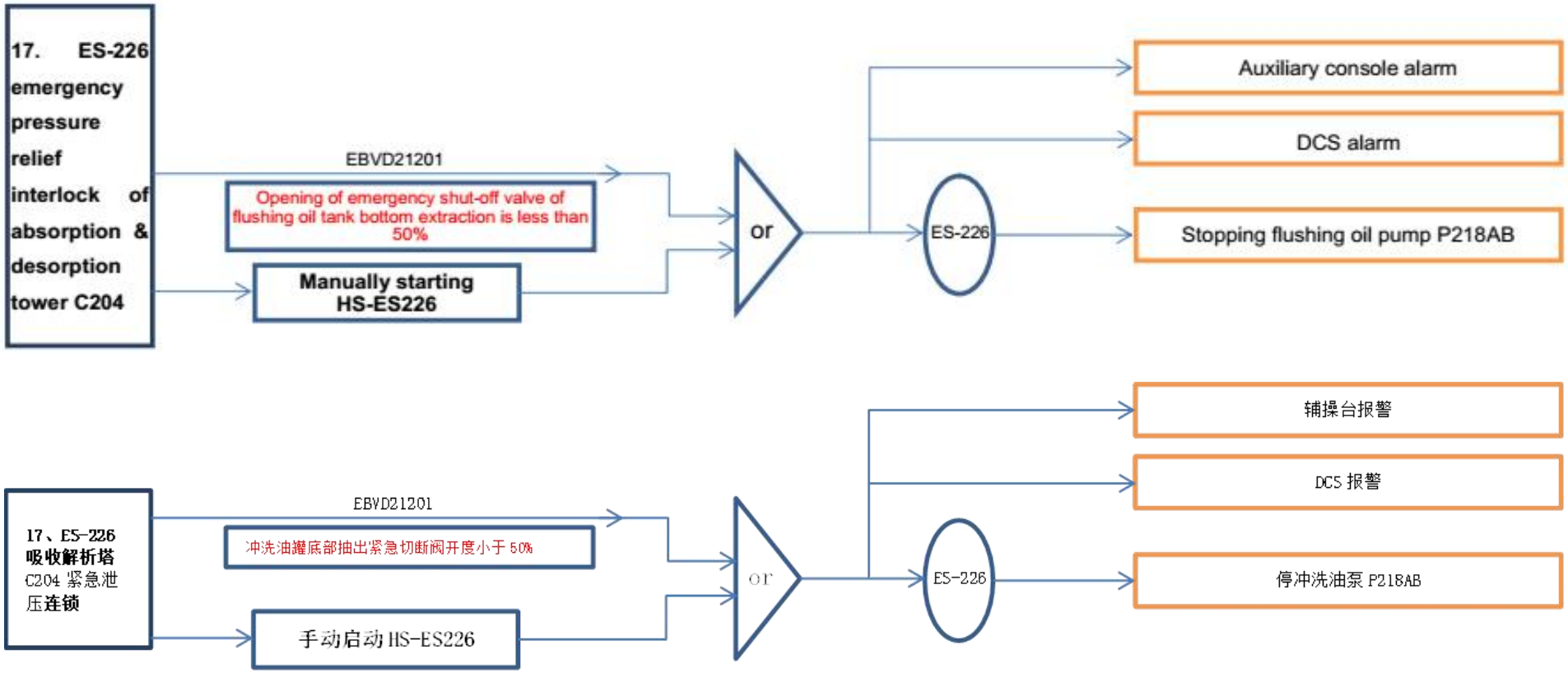

12. ES-206 low level interlock of compressor stage II KO drum D203
LT22301A
LT22301B
LT22301C
Low level in D203
2OO3 (Low alarm at 30%, starting at 20%)
EBVD22301
Opening of emergency shut-off valve of D203 level extraction is less than 50%
Manually starting HS-ES206
or
ES-206
Auxiliary console alarm
DCS alarm
Stopping bottom extraction pump P211AB of KO drum D203 at compressor stage II outlet
12、ES-206 气压机二级分液罐 D203 低液位连锁
LT22301A
LT22301B
LT22301C
D203 液位低
三取二（30%低报，20%启动）
EBVD22301
D203 液位抽出紧急切断阀开度小于 50%
手动启动 HS-ES206
or
ES-206
辅操台报警
DCS 报警
停气压机二级出口分液罐 D203 底抽出泵 P211AB

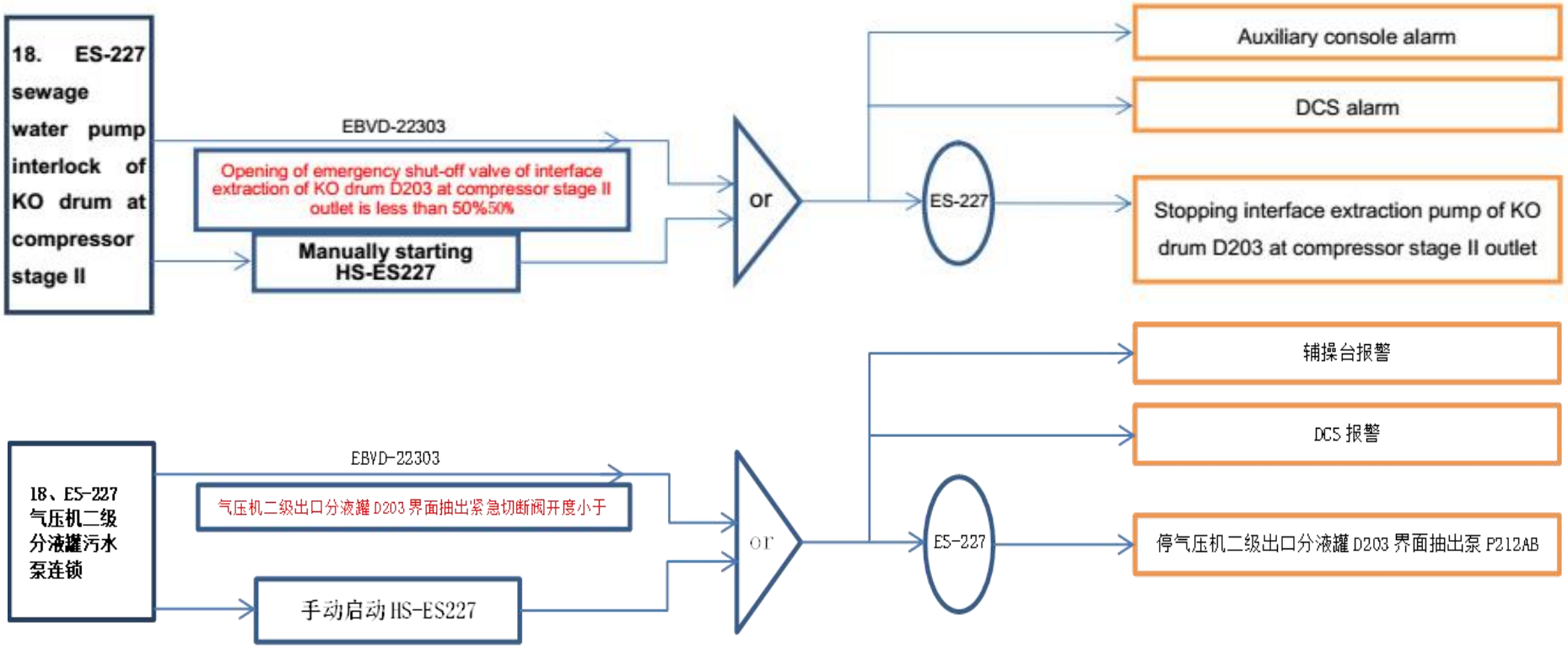

13. ES-209 low level interlock of stabilizer C207
LT23301
Low level in C207 (Low alarm at 45%, starting self-preservation at 6%)
Manually starting HS-ES209
or
ES-209
Auxiliary console alarm
DCS alarm
Stopping C207 bottom extraction pump P217AB
Close naphtha emergency shut-off valve XV23802 to hydrogenation unit
Close naphtha emergency shut-off valve XV23801 to tank farm
13、ES-209 稳定塔C207 低液位连锁
LT23301
C207液位低（45%低报，6%启动自保）
手动启动HS-ES209
or
ES-209
辅操台报警
DCS报警
停C207塔底抽出泵P217AB
关闭石脑油至加氢装置紧急切断阀XV23802
关闭石脑油至罐区紧急切断阀XV23801

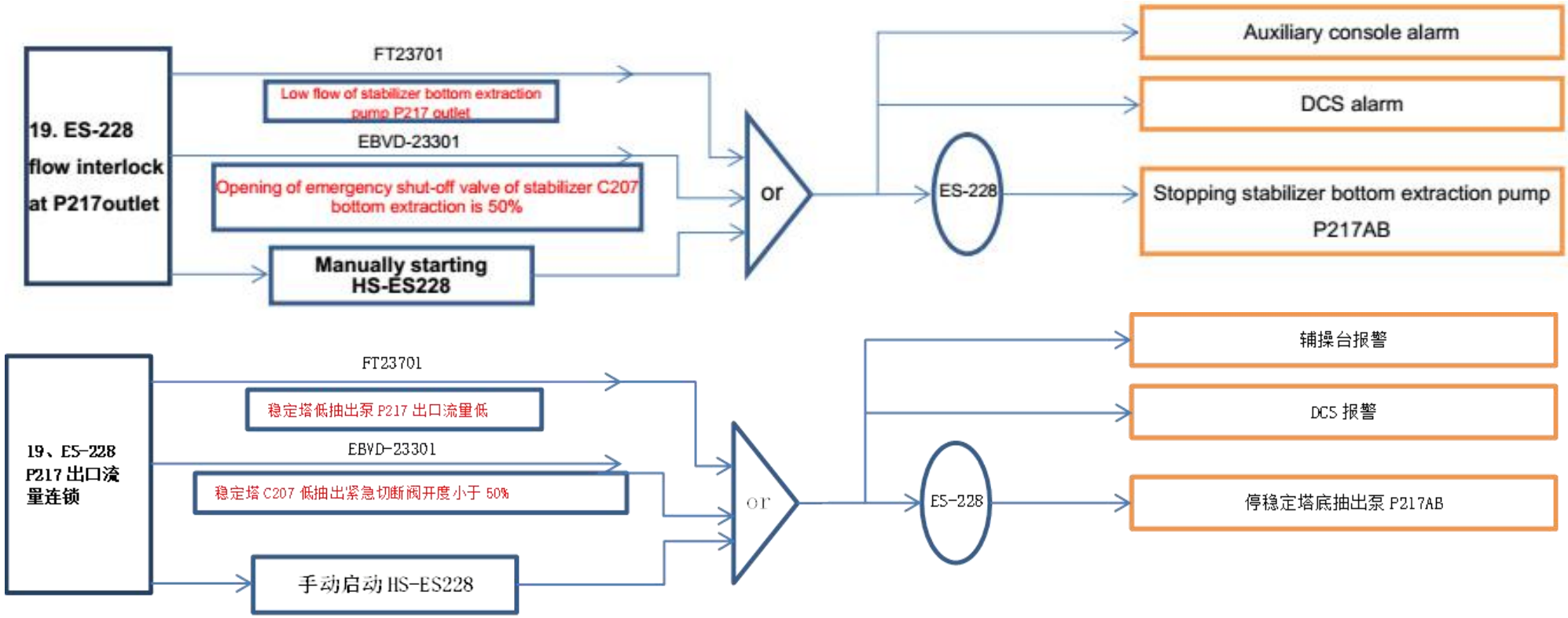

14. ES-212 high level interlock of flare KO drum D212
LT24003
High level in D212 (starting self-preservation at 77%)
Manually starting HS-ES212
or
ES-212
Auxiliary console alarm
DCS alarm
Close heavy slop oil emergency shut-off valve XV24002 to D212
14、ES-212 火炬分液罐 D212 高液位 连锁
LT24003
D212 液位高（77%启动自保）
手动启动 HS-ES212
OR
ES-212
辅操台报警
DCS 报警
关闭重污油进 D212 紧急切断阀 XV24002

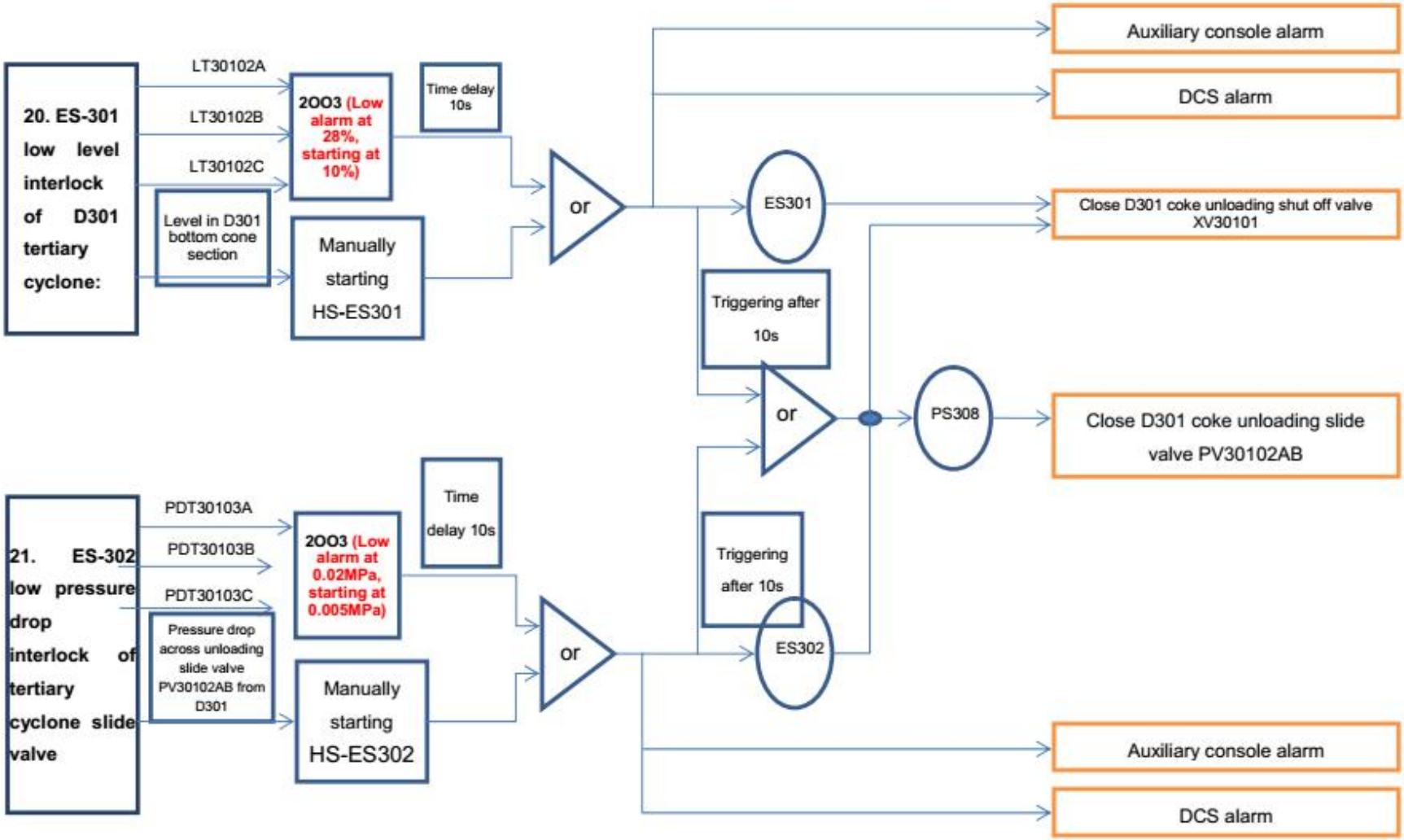

15. ES-213 high temperature interlock of flare KO drum heavy slop oil after cooling
TE24004
A221 high temperature after cooling (High alarm at 90°C, starting self-preservation at 95°C)
Manually starting HS-ES213
or
ES-213
Auxiliary console alarm
DCS alarm
Close heavy slop oil emergency shut-off valve XV24003 to downstream unit
15、ES-213 火炬分液罐重污油冷后温度高连锁
TE24004
A221冷后温度高（90℃高报，95℃启动自
手动启动HS-ES213
or
ES-213
辅操台报警
DCS报警
关闭重污油至下游装置紧急切断阀XV24003

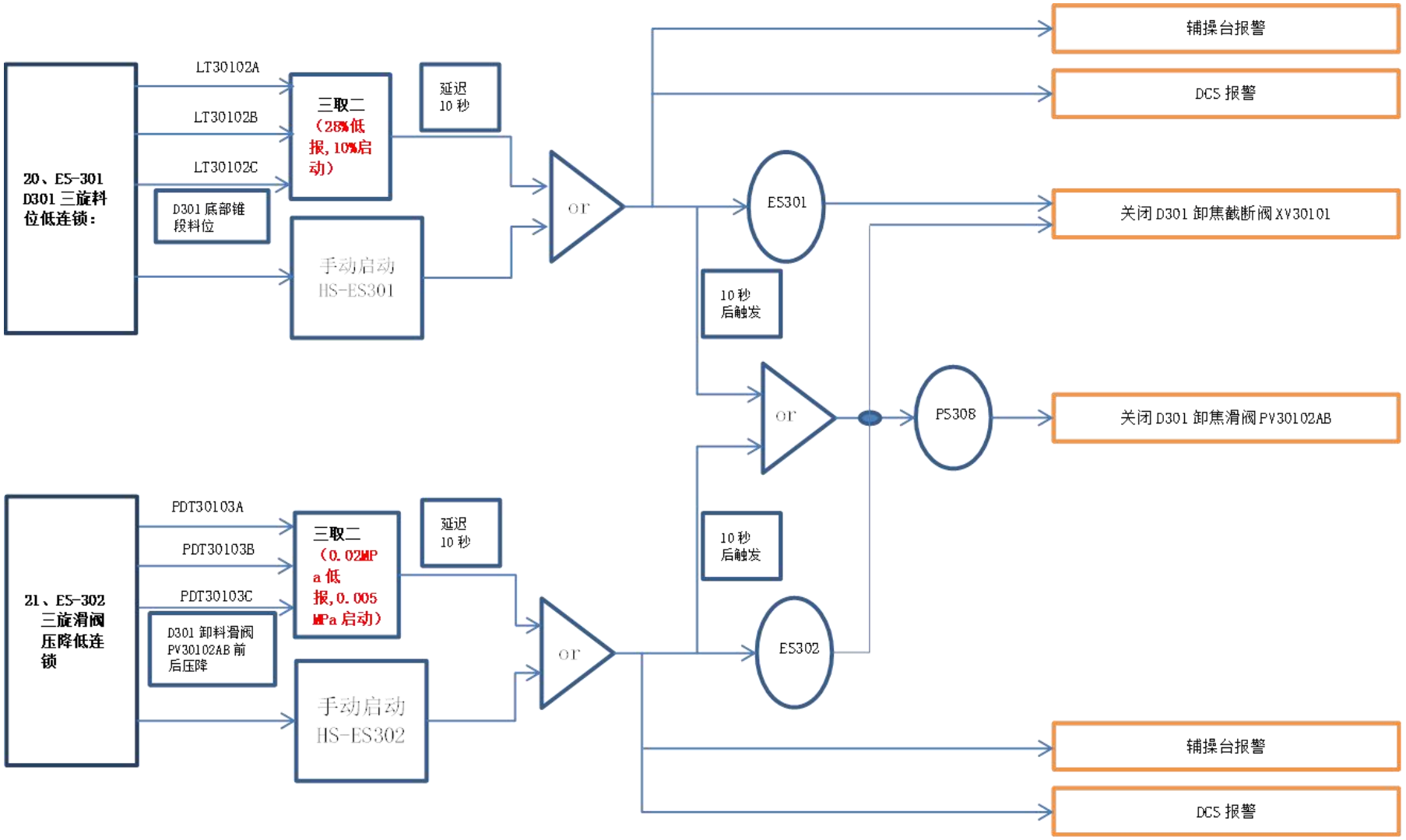

16. ES-220 emergency pressure relief interlock of absorption & desorption tower C204
XV22501
C204 overhead emergency relief valve is opened
Manually starting HS-ES220
or
ES-220
Auxiliary console alarm
DCS alarm
Open C204 overhead emergency pressure relief valve XV22501
16、ES-220 吸收解析塔 C204 紧急泄压连锁
XV22501
C204 顶紧急泄压阀开
手动启动 HS-ES220
or
ES-220
辅操台报警
DCS 报警
打开 C204 顶紧急泄压阀 XV22501

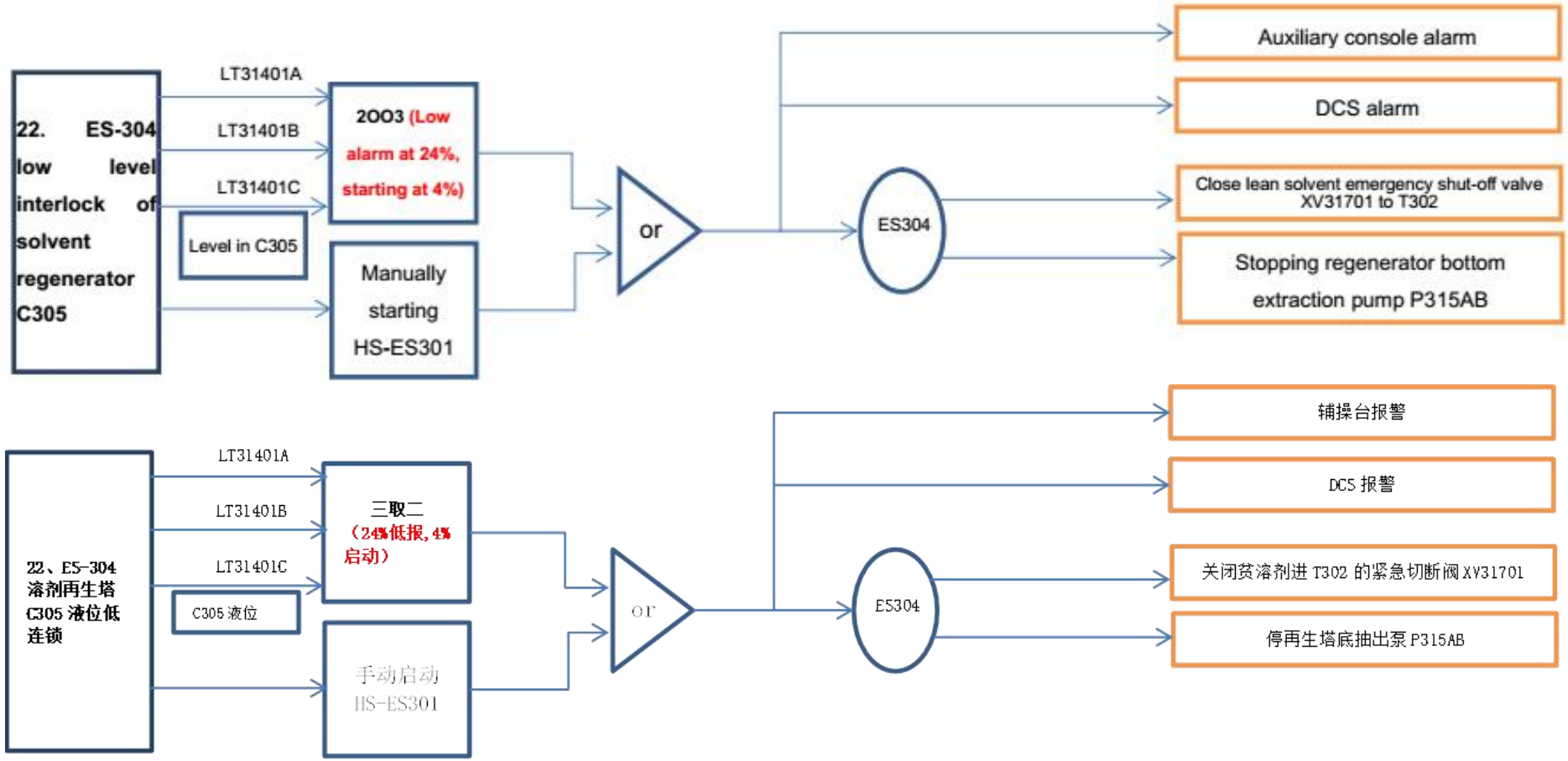

17. ES-226 emergency pressure relief interlock of absorption & desorption tower C204
EBVD21201
Opening of emergency shut-off valve of flushing oil tank bottom extraction is less than 50%
Manually starting HS-ES226
or
ES-226
Auxiliary console alarm
DCS alarm
Stopping flushing oil pump P218AB
17、ES-226 吸收解析塔 C204 紧急泄压连锁
EBVD21201
冲洗油罐底部抽出紧急切断阀开度小于 50%
手动启动 HS-ES226
or
ES-226
辅操台报警
DCS 报警
停冲洗油泵 P218AB

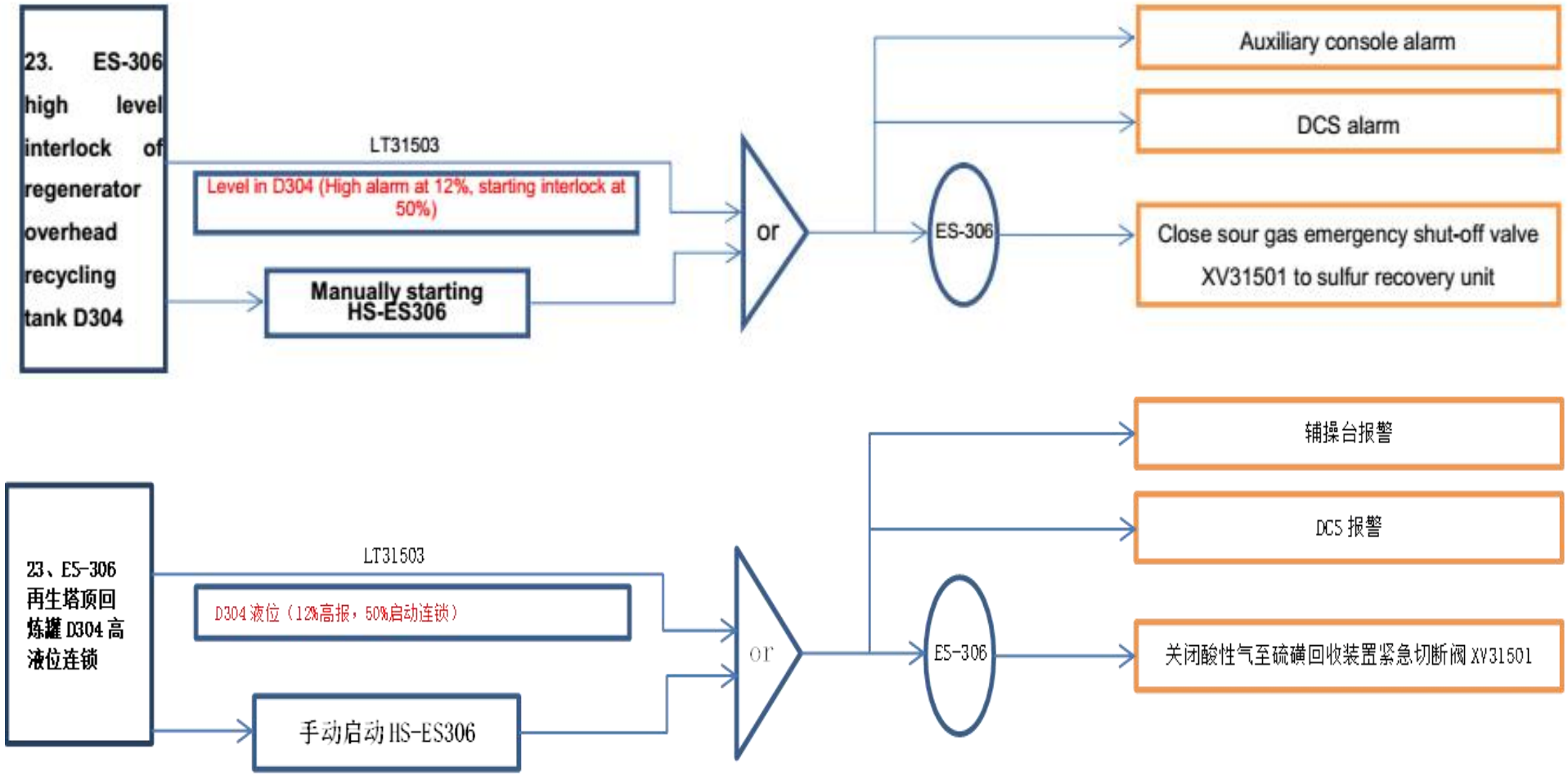

18. ES-227 sewage water pump interlock of KO drum at compressor stage II
EBVD-22303
Opening of emergency shut-off valve of interface extraction of KO drum D203 at compressor stage II outlet is less than 50%50%
Manually starting HS-ES227
or
ES-227
Auxiliary console alarm
DCS alarm
Stopping interface extraction pump of KO drum D203 at compressor stage II outlet
18、ES-227 气压机二级分液罐污水泵连锁
EBVD-22303
气压机二级出口分液罐 D203 界面抽出紧急切断阀开度小于
手动启动 HS-ES227
or
ES-227
辅操台报警
DCS 报警
停气压机二级出口分液罐 D203 界面抽出泵 P212AB

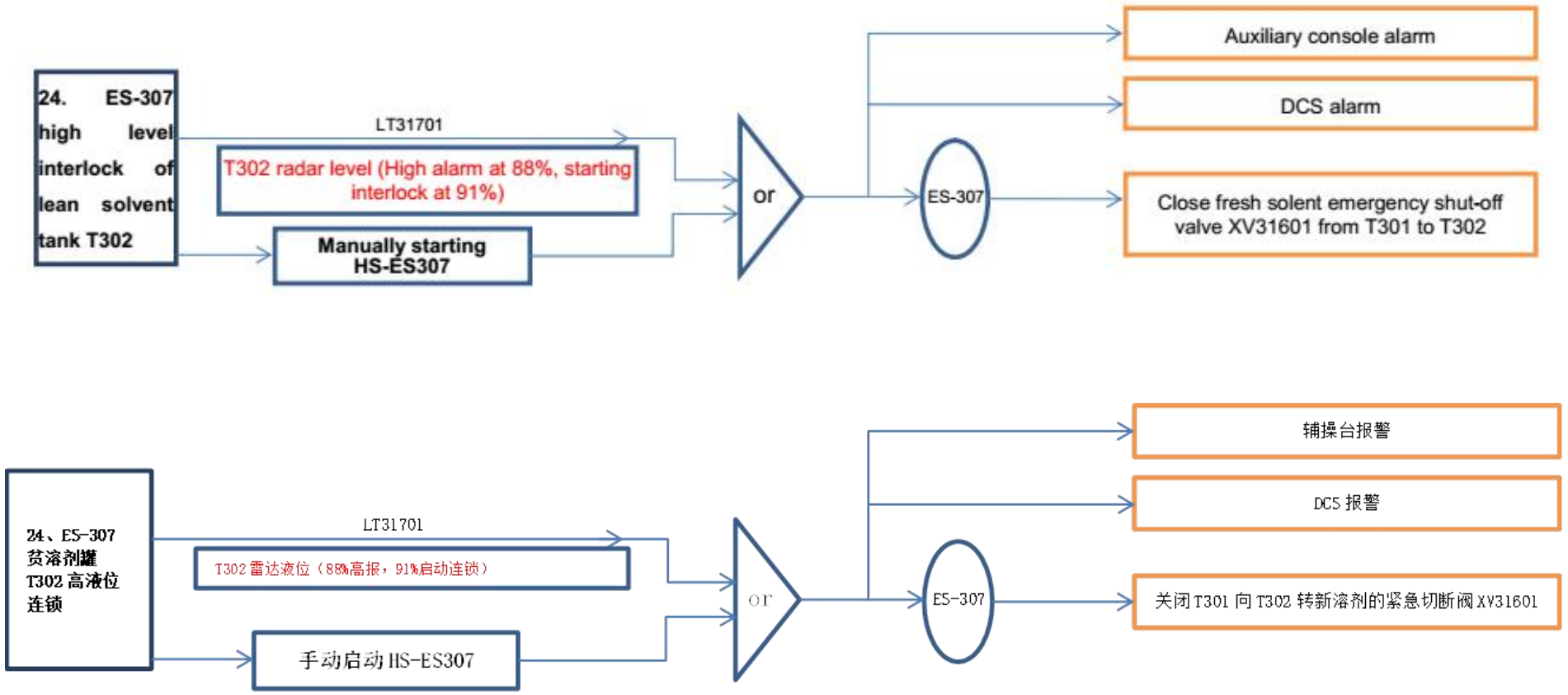

19. ES-228 flow interlock at P217outlet
FT23701
Low flow of stabilizer bottom extraction pump P217 outlet
EBVD-23301
Opening of emergency shut-off valve of stabilizer C207 bottom extraction is 50%
Manually starting HS-ES228
or
ES-228
Auxiliary console alarm
DCS alarm
Stopping stabilizer bottom extraction pump P217AB
19、ES-228 P217 出口流量连锁
FT23701
稳定塔低抽出泵 P217 出口流量低
EBVD-23301
稳定塔 C207 低抽出紧急切断阀开度小于 50%
手动启动 HS-ES228
OR
ES-228
辅操台报警
DCS 报警
停稳定塔底抽出泵 P217AB

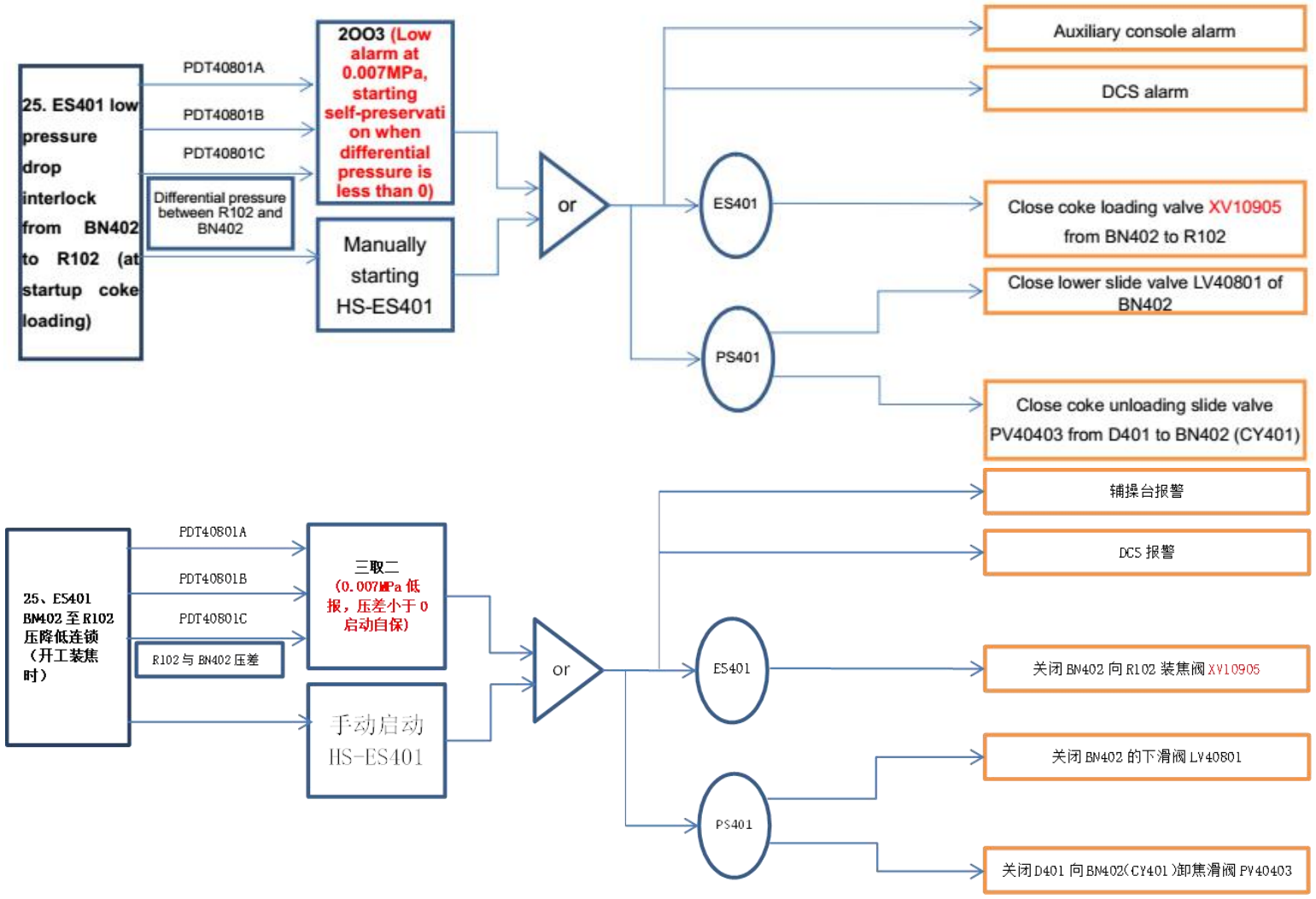

20. ES-301 low level interlock of D301 tertiary cyclone:
LT30102A
LT30102B
LT30102C
Level in D301 bottom cone section
2OO3 (Low alarm at 28%, starting at 10%)
Time delay 10s
Manually starting HS-ES301
or
ES301
Auxiliary console alarm
DCS alarm
Close D301 coke unloading shut off valve XV30101
Triggering after 10s
or
PS308
Close D301 coke unloading slide valve PV30102AB
21. ES-302 low pressure drop interlock of tertiary cyclone slide valve
PDT30103A
PDT30103B
PDT30103C
Pressure drop across unloading slide valve PV30102AB from D301
2OO3 (Low alarm at 0.02MPa, starting at 0.005MPa)
Time delay 10s
Manually starting HS-ES302
or
Triggering after 10s
ES302
Auxiliary console alarm
DCS alarm

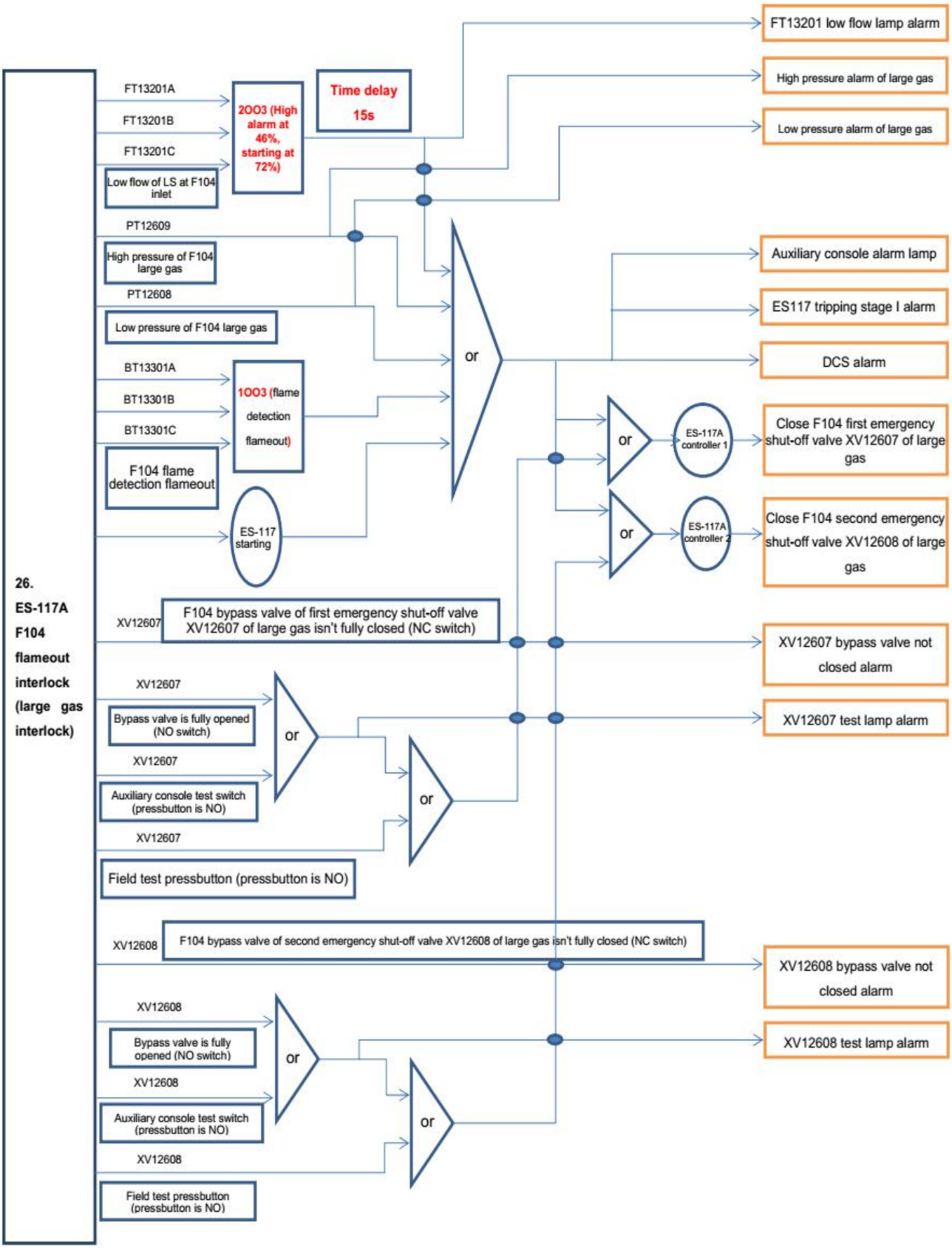

20、ES-301 D301 三旋料位低连锁：
LT30102A
LT30102B
LT30102C
D301 底部锥段料位
三取二（28%低报，10%启动）
延迟 10 秒
手动启动 HS-ES301
or
辅操台报警
DCS 报警
ES301
关闭 D301 卸焦截断阀 XV30101
10 秒后触发
or
PS308
关闭 D301 卸焦滑阀 PV30102AB
21、ES-302 三旋滑阀压降低连锁
PDT30103A
PDT30103B
PDT30103C
D301 卸料滑阀 PV30102AB 前后压降
三取二（0.02MPa 低报，0.005 MPa 启动）
延迟 10 秒
手动启动 HS-ES302
or
10 秒后触发
ES302
辅操台报警
DCS 报警

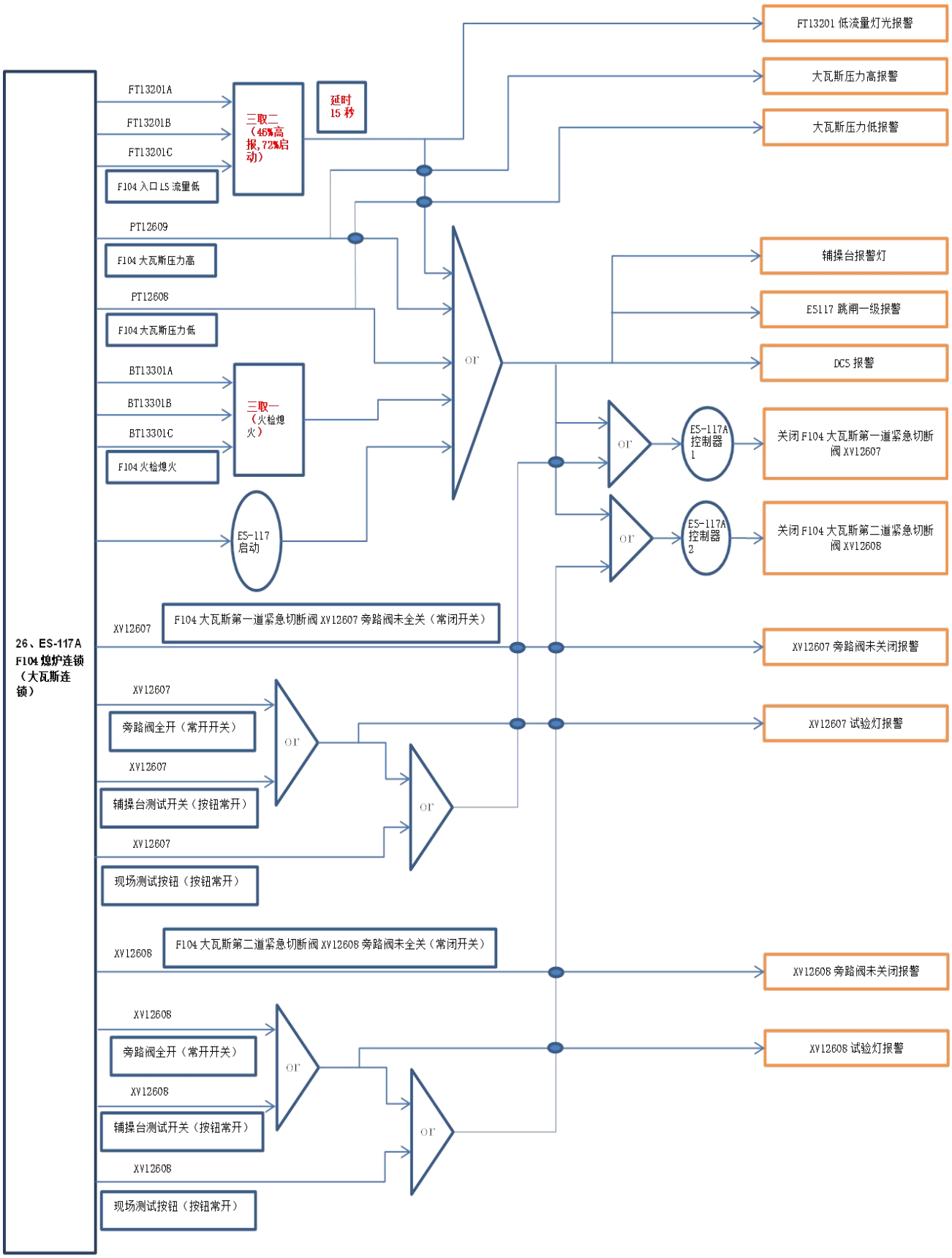

22. ES-304 low level interlock of solvent regenerator C305
LT31401A
LT31401B
LT31401C
Level in C305
2OO3 (Low alarm at 24%, starting at 4%)
Manually starting HS-ES301
or
ES304
Auxiliary console alarm
DCS alarm
Close lean solvent emergency shut-off valve XV31701 to T302
Stopping regenerator bottom extraction pump P315AB
22、ES-304 溶剂再生塔 C305 液位低连锁
LT31401A
LT31401B
LT31401C
C305 液位
三取二（24%低报，4%启动）
手动启动 HS-ES301
or
ES304
辅操台报警
DCS 报警
关闭贫溶剂进 T302 的紧急切断阀 XV31701
停再生塔底抽出泵 P315AB

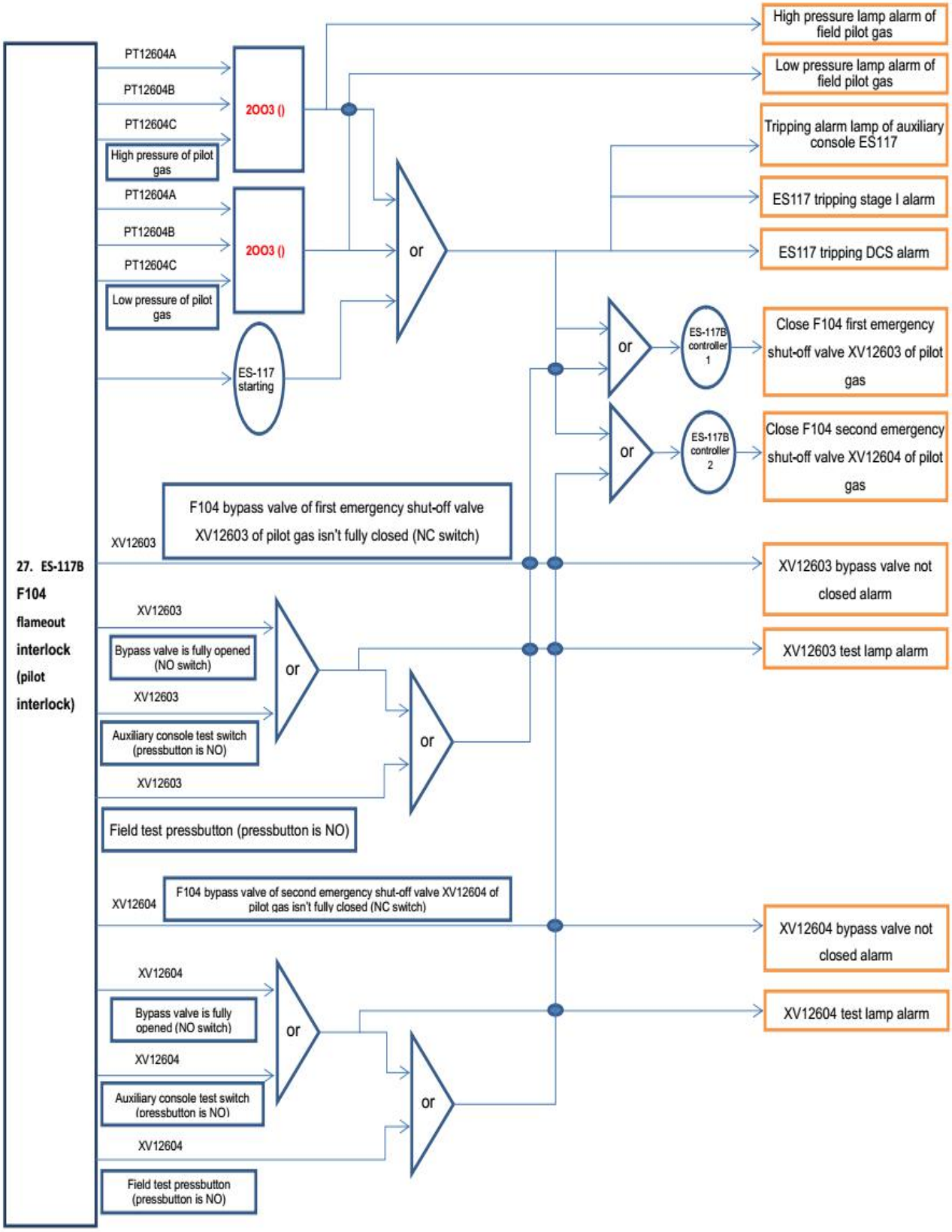

23. ES-306 high level interlock of regenerator overhead recycling tank D304
LT31503
Level in D304 (High alarm at 12%, starting interlock at 50%)
Manually starting HS-ES306
or
ES-306
Auxiliary console alarm
DCS alarm
Close sour gas emergency shut-off valve XV31501 to sulfur recovery unit
23、ES-306 再生塔顶回炼罐 D304 高液位连锁
LT31503
D304 液位（12%高报，50%启动连锁）
手动启动 HS-ES306
OR
ES-306
辅操台报警
DCS 报警
关闭酸性气至硫磺回收装置紧急切断阀 XV31501

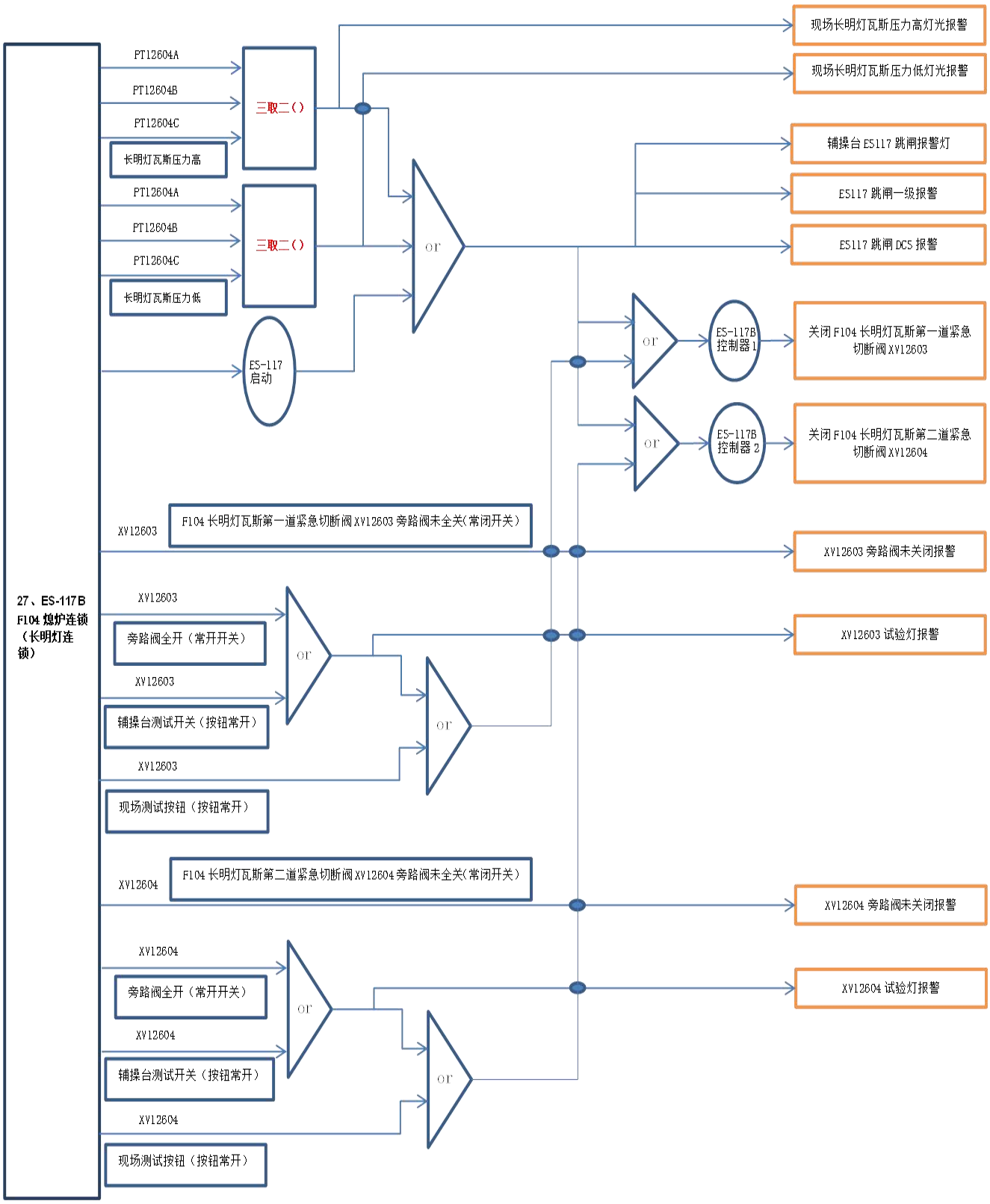

24. ES-307 high level interlock of lean solvent tank T302
LT31701
T302 radar level (High alarm at 88%, starting interlock at 91%)
Manually starting HS-ES307
or
ES-307
Auxiliary console alarm
DCS alarm
Close fresh solent emergency shut-off valve XV31601 from T301 to T302
24、ES-307 贫溶剂罐 T302 高液位 连锁
LT31701
T302 雷达液位（88%高报，91%启动连锁）
手动启动 HS-ES307
OR
ES-307
辅操台报警
DCS 报警
关闭 T301 向 T302 转新溶剂的紧急切断阀 XV31601

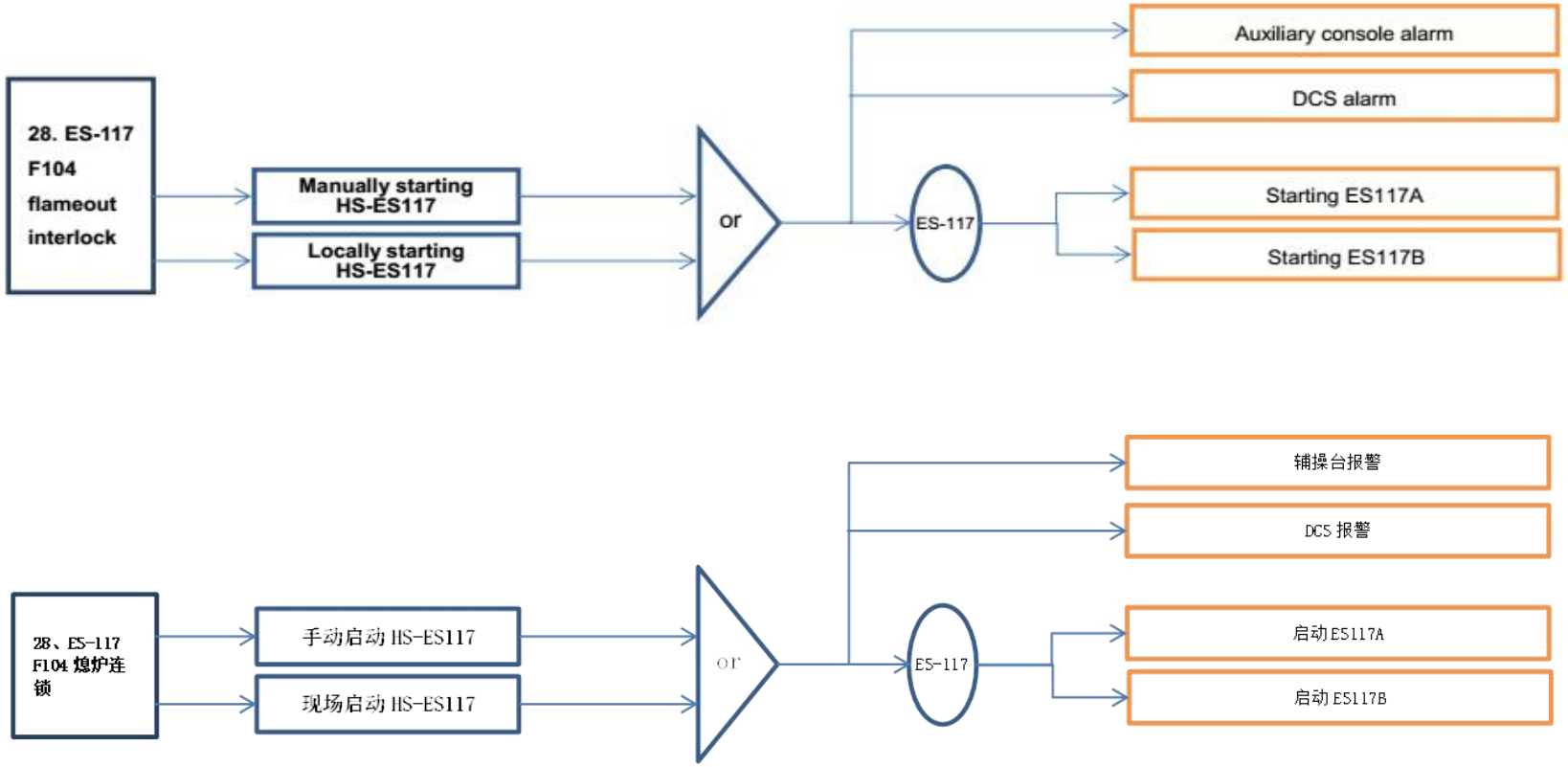

25. ES401 low pressure drop interlock from BN402 to R102 (at startup coke loading)
PDT40801A
PDT40801B
PDT40801C
Differential pressure between R102 and BN402
2OO3 (Low alarm at 0.007MPa, starting self-preservation when differential pressure is less than 0)
Manually starting HS-ES401
or
ES401
PS401
Auxiliary console alarm
DCS alarm
Close coke loading valve XV10905 from BN402 to R102
Close lower slide valve LV40801 of BN402
Close coke unloading slide valve PV40403 from D401 to BN402 (CY401)
25、ES401 BN402 至 R102 压降低连锁（开工装焦时）
PDT40801A
PDT40801B
PDT40801C
R102 与 BN402 压差
三取二 (0.007MPa 低报，压差小于 0 启动自保)
手动启动 HS-ES401
or
ES401
PS401
辅操台报警
DCS 报警
关闭 BN402 向 R102 装焦阀 XV10905
关闭 BN402 的下滑阀 LV40801
关闭 D401 向 BN402(CY401)卸焦滑阀 PV40403

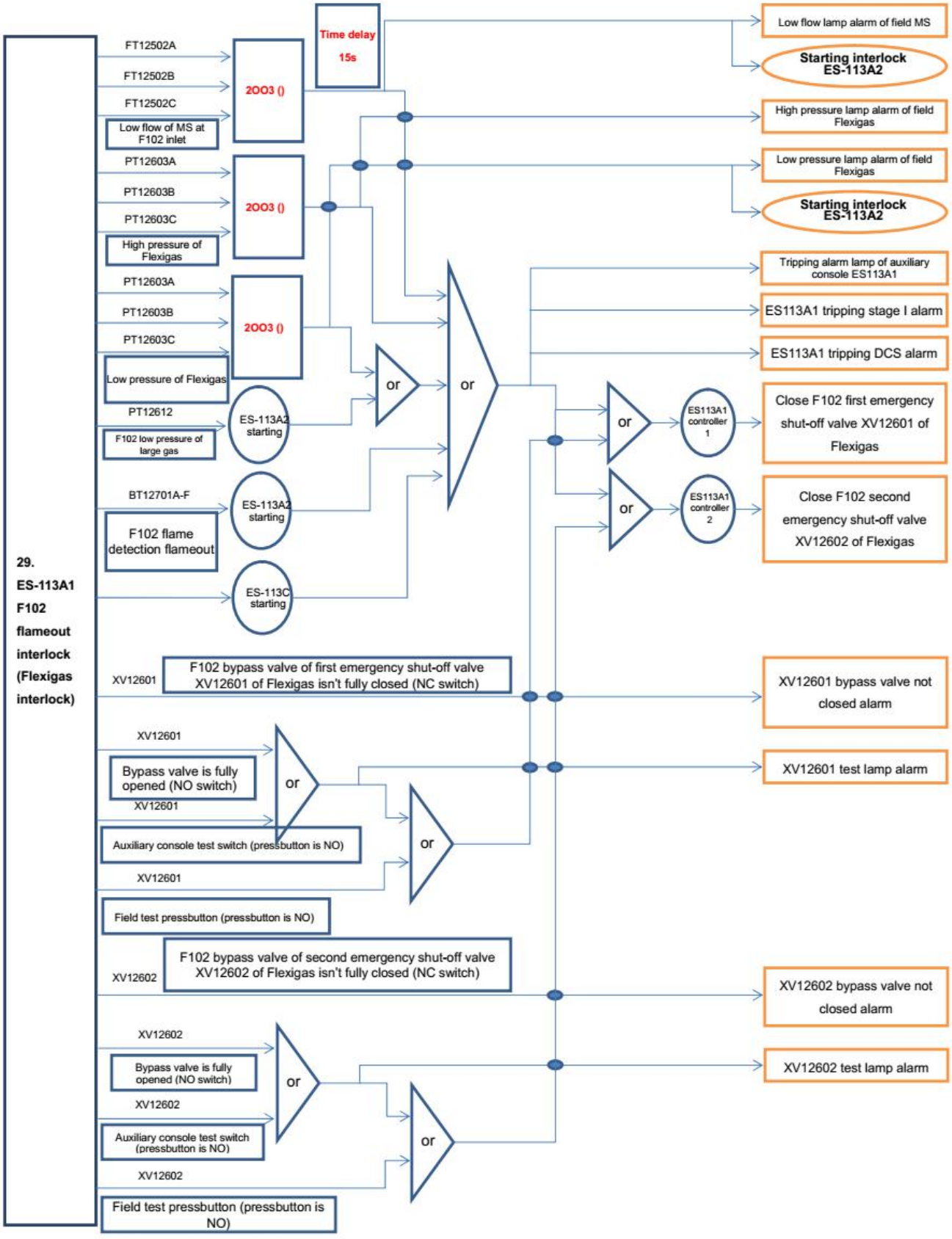

26. ES-117A F104 flameout interlock (large gas interlock)
FT13201A
FT13201B
FT13201C
2OO3 (High alarm at 46%, starting at 72%)
Time delay 15s
Low flow of LS at F104 inlet
PT12609
High pressure of F104 large gas
PT12608
Low pressure of F104 large gas
BT13301A
BT13301B
BT13301C
1OO3 (flame detection flameout)
F104 flame detection flameout
ES-117 starting
or
FT13201 low flow lamp alarm
High pressure alarm of large gas
Low pressure alarm of large gas
Auxiliary console alarm lamp
ES117 tripping stage I alarm
DCS alarm
ES-117A controller 1
Close F104 first emergency shut-off valve XV12607 of large gas
ES-117A controller 2
Close F104 second emergency shut-off valve XV12608 of large gas
XV12607
F104 bypass valve of first emergency shut-off valve XV12607 of large gas isn't fully closed (NC switch)
XV12607 bypass valve not closed alarm
Bypass valve is fully opened (NO switch)
Auxiliary console test switch (pressbutton is NO)
Field test pressbutton (pressbutton is NO)
XV12607 test lamp alarm
XV12608
F104 bypass valve of second emergency shut-off valve XV12608 of large gas isn't fully closed (NC switch)
XV12608 bypass valve not closed alarm
XV12608 test lamp alarm

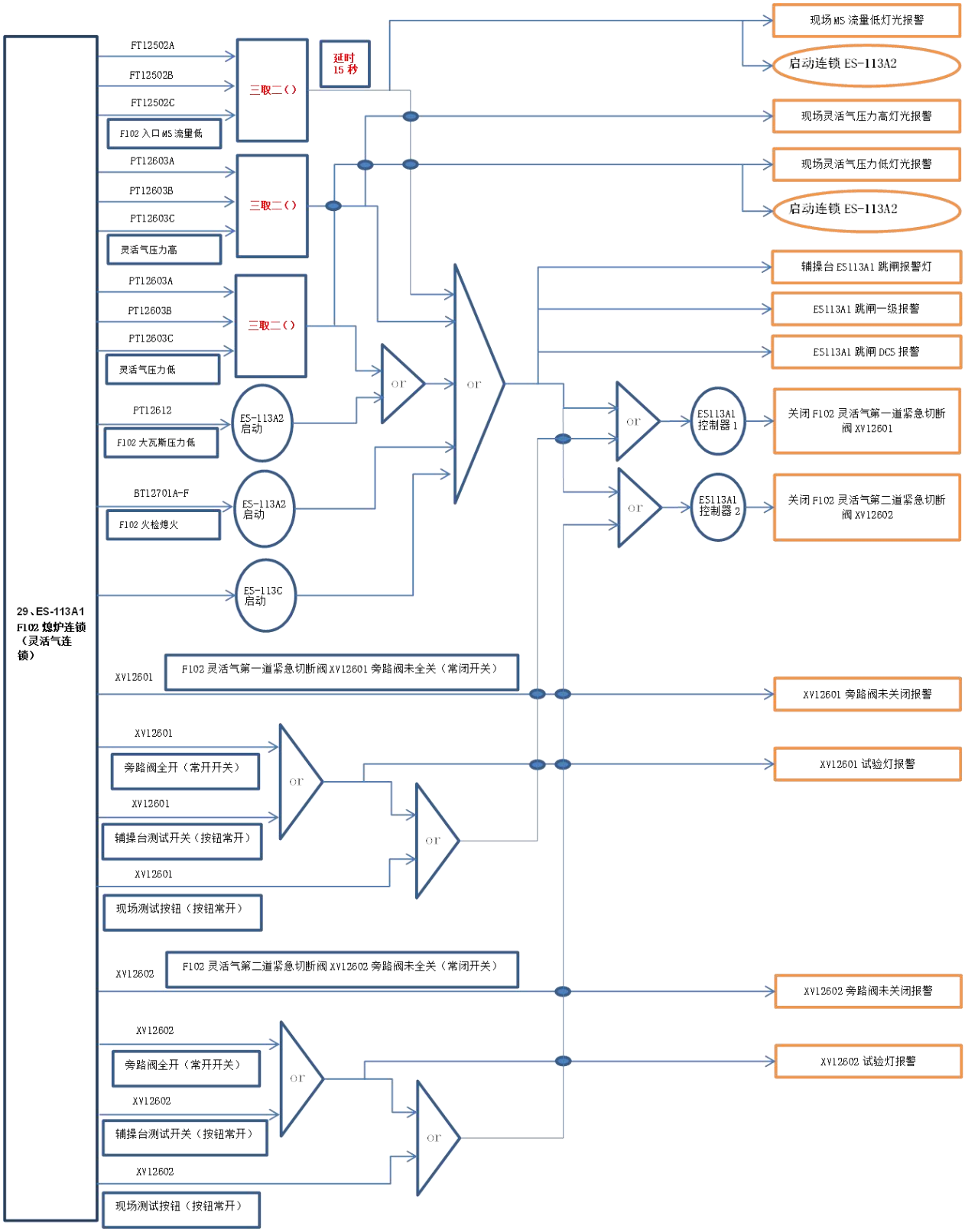

26、ES-117A F104 熄炉连锁（大瓦斯连锁）
FT13201A
FT13201B
FT13201C
三取二（46%高报，72%启动）
延时15秒
F104 入口 LS 流量低
FT13201 低流量灯光报警
大瓦斯压力高报警
大瓦斯压力低报警
PT12609
F104 大瓦斯压力高
PT12608
F104 大瓦斯压力低
BT13301A
BT13301B
BT13301C
三取一（火检熄火）
F104 火检熄火
or
辅操台报警灯
ES117 跳闸一级报警
DCS 报警
ES-117 启动
ES-117A 控制器 1
关闭 F104 大瓦斯第一道紧急切断阀 XV12607
ES-117A 控制器 2
关闭 F104 大瓦斯第二道紧急切断阀 XV12608
XV12607
F104 大瓦斯第一道紧急切断阀 XV12607 旁路阀未全关（常闭开关）
XV12607 旁路阀未关闭报警
XV12607
旁路阀全开（常开开关）
XV12607
辅操台测试开关（按钮常开）
XV12607
现场测试按钮（按钮常开）
XV12607 试验灯报警
XV12608
F104 大瓦斯第二道紧急切断阀 XV12608 旁路阀未全关（常闭开关）
XV12608 旁路阀未关闭报警
XV12608
旁路阀全开（常开开关）
XV12608
辅操台测试开关（按钮常开）
XV12608
现场测试按钮（按钮常开）
XV12608 试验灯报警

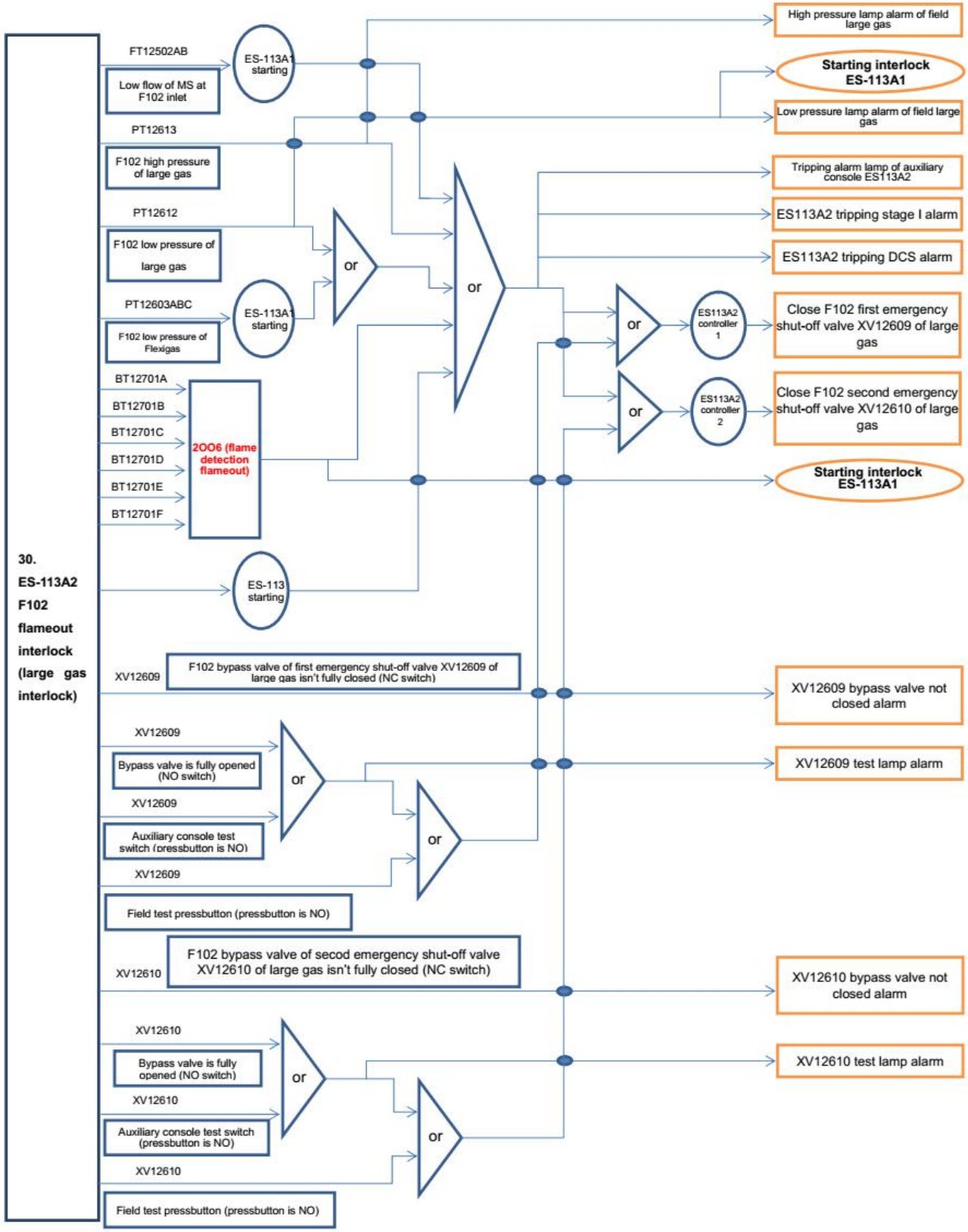

27. ES-117B F104 flameout interlock (pilot interlock)
PT12604A
PT12604B
PT12604C
High pressure of pilot gas
2003 ()
PT12604A
PT12604B
PT12604C
Low pressure of pilot gas
2003 ()
ES-117 starting
or
High pressure lamp alarm of field pilot gas
Low pressure lamp alarm of field pilot gas
Tripping alarm lamp of auxiliary console ES117
ES117 tripping stage I alarm
ES117 tripping DCS alarm
or
ES-117B controller 1
Close F104 first emergency shut-off valve XV12603 of pilot gas
or
ES-117B controller 2
Close F104 second emergency shut-off valve XV12604 of pilot gas
XV12603
F104 bypass valve of first emergency shut-off valve XV12603 of pilot gas isn't fully closed (NC switch)
XV12603 bypass valve not closed alarm
XV12603
Bypass valve is fully opened (NO switch)
XV12603
Auxiliary console test switch (pressbutton is NO)
XV12603
Field test pressbutton (pressbutton is NO)
or
or
XV12603 test lamp alarm
XV12604
F104 bypass valve of second emergency shut-off valve XV12604 of pilot gas isn't fully closed (NC switch)
XV12604 bypass valve not closed alarm
XV12604
Bypass valve is fully opened (NO switch)
XV12604
Auxiliary console test switch (pressbutton is NO)
XV12604
Field test pressbutton (pressbutton is NO)
or
or
XV12604 test lamp alarm

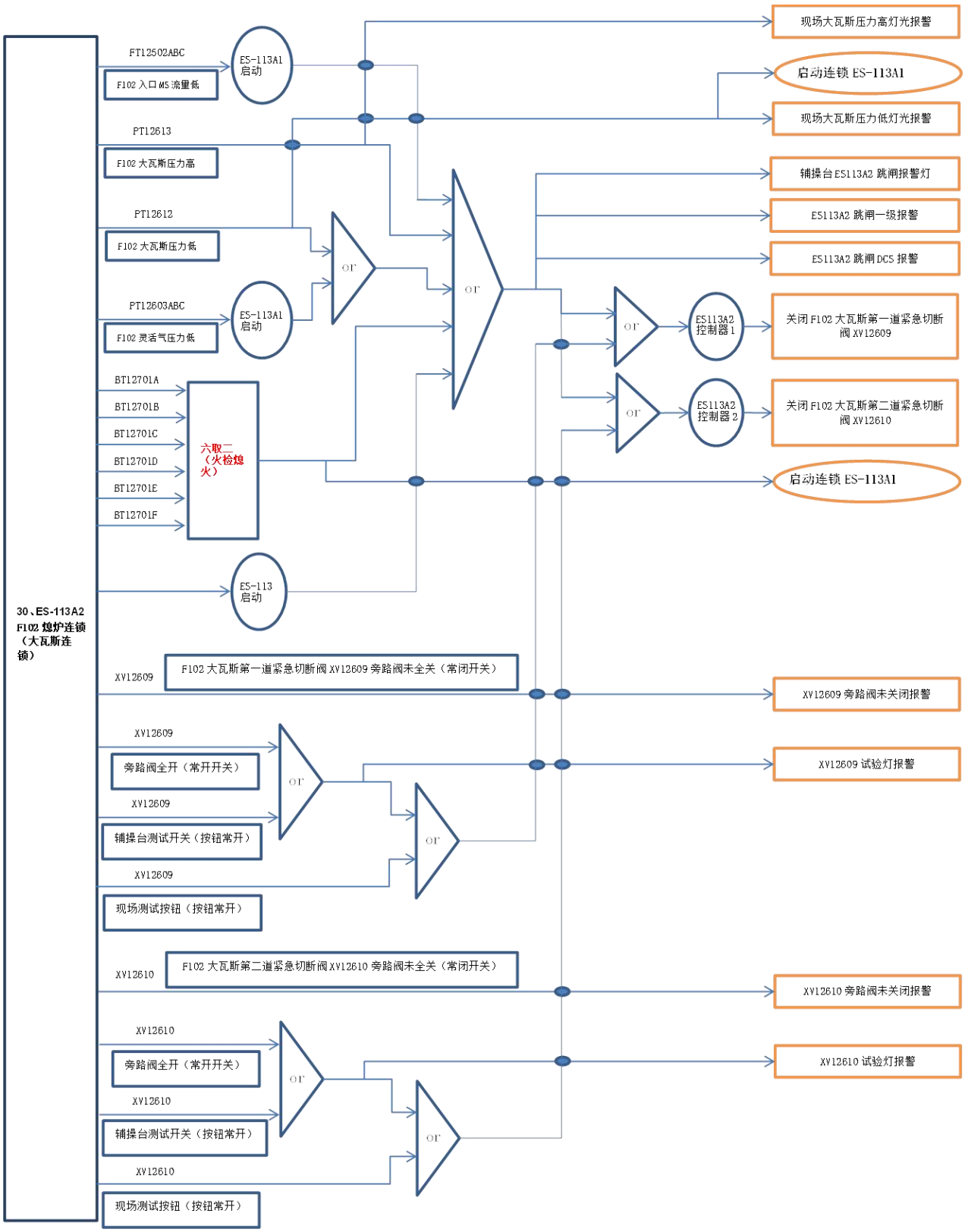

27、ES-117B F104 熄炉连锁（长明灯连锁）
PT12604A
PT12604B
PT12604C
三取二（）
长明灯瓦斯压力高
PT12604A
PT12604B
PT12604C
三取二（）
长明灯瓦斯压力低
ES-117 启动
OR
现场长明灯瓦斯压力高灯光报警
现场长明灯瓦斯压力低灯光报警
辅操台 ES117 跳闸报警灯
ES117 跳闸一级报警
ES117 跳闸 DCS 报警
OR
ES-117B 控制器 1
关闭 F104 长明灯瓦斯第一道紧急切断阀 XV12603
OR
ES-117B 控制器 2
关闭 F104 长明灯瓦斯第二道紧急切断阀 XV12604
XV12603
F104 长明灯瓦斯第一道紧急切断阀 XV12603 旁路阀未全关（常闭开关）
XV12603 旁路阀未关闭报警
XV12603
旁路阀全开（常开开关）
XV12603
辅操台测试开关（按钮常开）
XV12603
现场测试按钮（按钮常开）
OR
OR
XV12603 试验灯报警
XV12604
F104 长明灯瓦斯第二道紧急切断阀 XV12604 旁路阀未全关（常闭开关）
XV12604 旁路阀未关闭报警
XV12604
旁路阀全开（常开开关）
XV12604
辅操台测试开关（按钮常开）
XV12604
现场测试按钮（按钮常开）
OR
OR
XV12604 试验灯报警

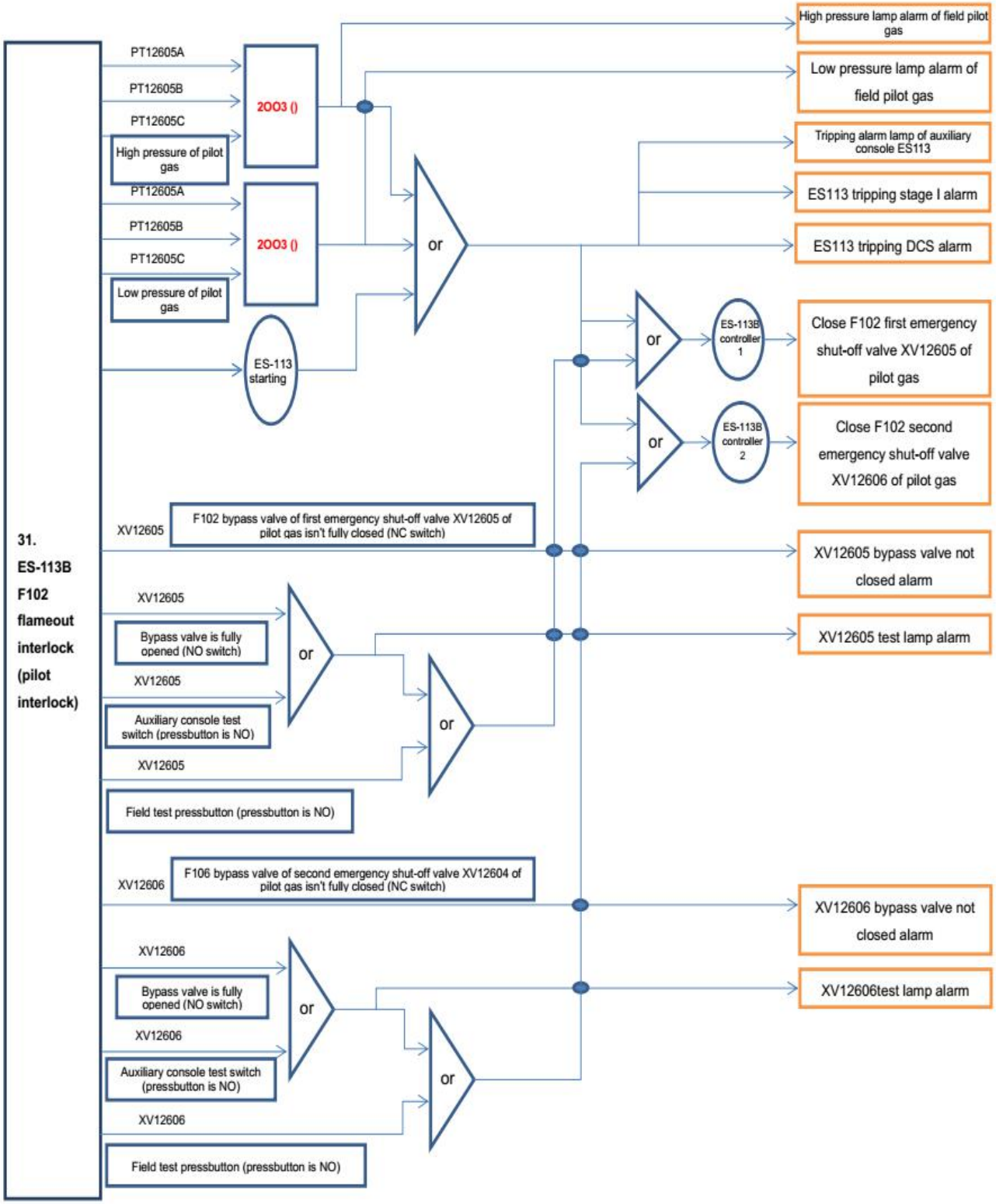

28. ES-117
F104
flameout
interlock
Manually starting
HS-ES117
Locally starting
HS-ES117
or
ES-117
Auxiliary console alarm
DCS alarm
Starting ES117A
Starting ES117B
28、ES-117
F104 熄炉连
锁
手动启动 HS-ES117
现场启动 HS-ES117
OR
ES-117
辅操台报警
DCS 报警
启动 ES117A
启动 ES117B

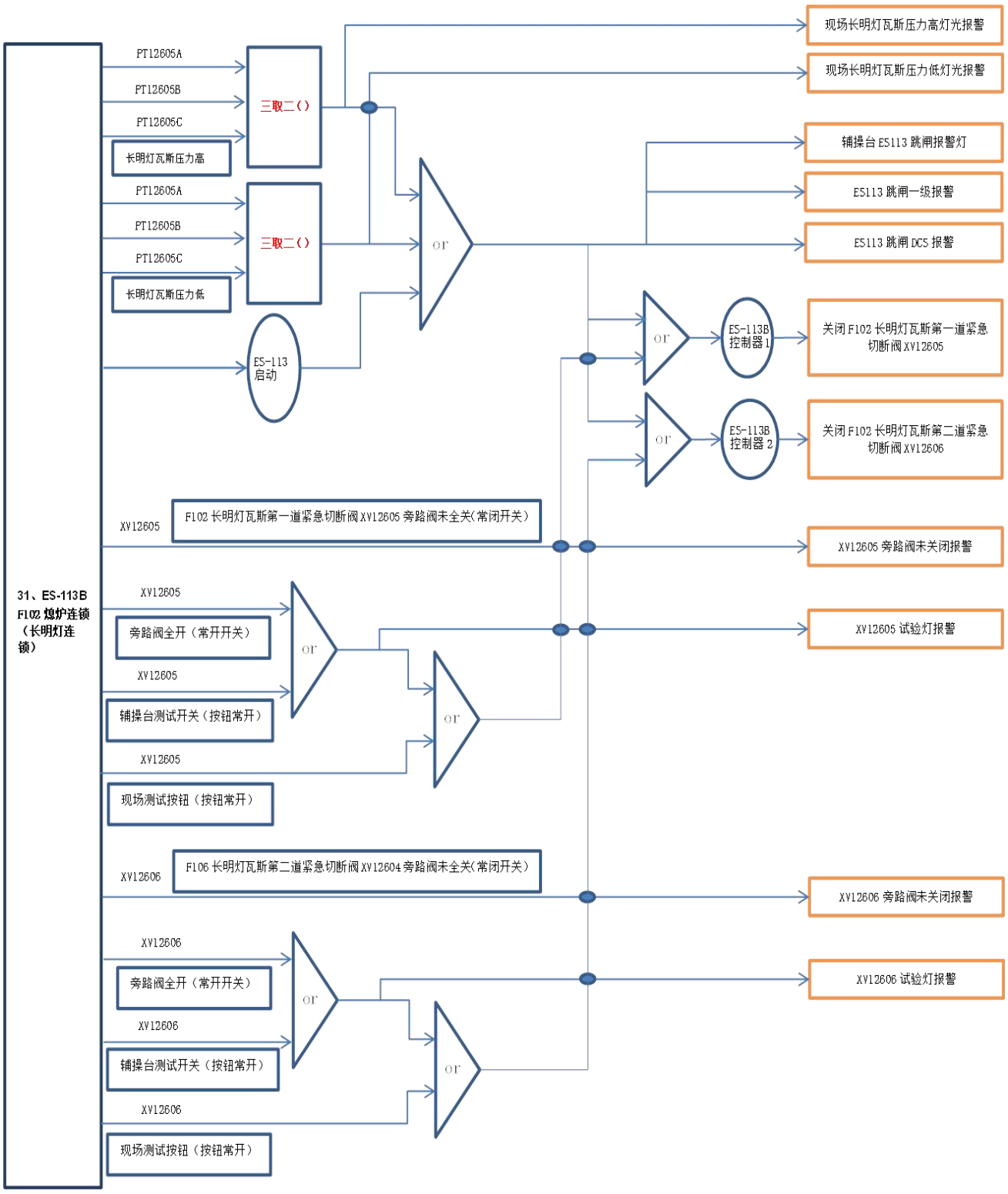

29. ES-113A1 F102 flameout interlock (Flexigas interlock)
FT12502A
FT12502B
FT12502C
Low flow of MS at F102 inlet
2OO3 ()
Time delay 15s
Low flow lamp alarm of field MS
Starting interlock ES-113A2
PT12603A
PT12603B
PT12603C
High pressure of Flexigas
2OO3 ()
High pressure lamp alarm of field Flexigas
Low pressure lamp alarm of field Flexigas
Starting interlock ES-113A2
PT12603A
PT12603B
PT12603C
Low pressure of Flexigas
2OO3 ()
PT12612
F102 low pressure of large gas
ES-113A2 starting
BT12701A-F
F102 flame detection flameout
ES-113A2 starting
ES-113C starting
or
or
Tripping alarm lamp of auxiliary console ES113A1
ES113A1 tripping stage I alarm
ES113A1 tripping DCS alarm
or
ES113A1 controller 1
Close F102 first emergency shut-off valve XV12601 of Flexigas
or
ES113A1 controller 2
Close F102 second emergency shut-off valve XV12602 of Flexigas
XV12601
F102 bypass valve of first emergency shut-off valve XV12601 of Flexigas isn't fully closed (NC switch)
XV12601 bypass valve not closed alarm
XV12601
Bypass valve is fully opened (NO switch)
XV12601
Auxiliary console test switch (pressbutton is NO)
XV12601
Field test pressbutton (pressbutton is NO)
or
or
XV12601 test lamp alarm
XV12602
F102 bypass valve of second emergency shut-off valve XV12602 of Flexigas isn't fully closed (NC switch)
XV12602 bypass valve not closed alarm
XV12602
Bypass valve is fully opened (NO switch)
XV12602
Auxiliary console test switch (pressbutton is NO)
XV12602
Field test pressbutton (pressbutton is NO)
or
or
XV12602 test lamp alarm

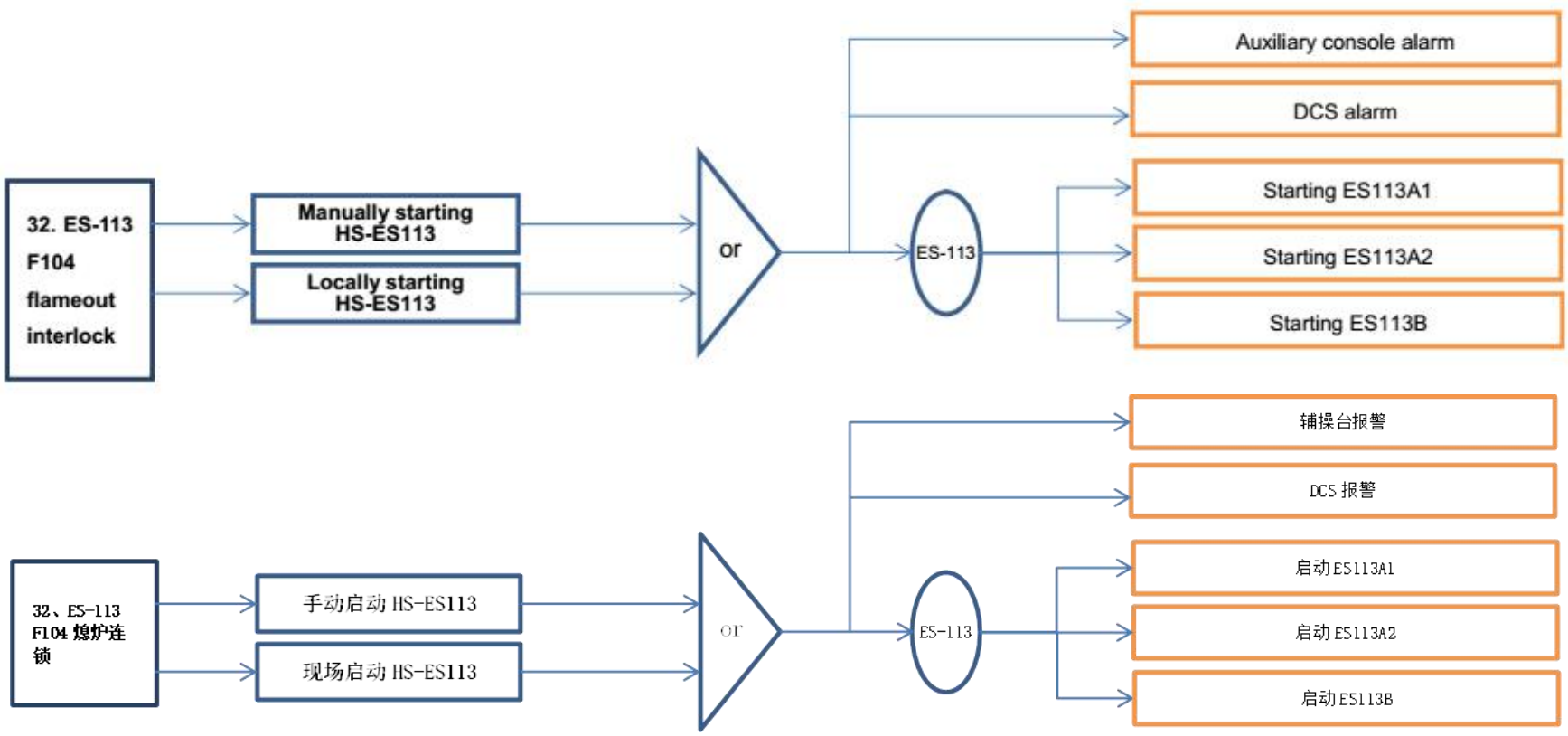

29、ES-113A1 F102 熄炉连锁（灵活气连锁）
FT12502A
FT12502B
FT12502C
F102 入口 MS 流量低
三取二（）
延时 15 秒
现场 MS 流量低灯光报警
启动连锁 ES-113A2
PT12603A
PT12603B
PT12603C
灵活气压力高
三取二（）
现场灵活气压力高灯光报警
现场灵活气压力低灯光报警
启动连锁 ES-113A2
PT12603A
PT12603B
PT12603C
灵活气压力低
三取二（）
辅操台 ES113A1 跳闸报警灯
ES113A1 跳闸一级报警
ES113A1 跳闸 DCS 报警
PT12612
F102 大瓦斯压力低
ES-113A2 启动
or
or
or
ES113A1 控制器 1
关闭 F102 灵活气第一道紧急切断阀 XV12601
BT12701A-F
F102 火检熄火
ES-113A2 启动
or
ES113A1 控制器 2
关闭 F102 灵活气第二道紧急切断阀 XV12602
ES-113C 启动
XV12601
F102 灵活气第一道紧急切断阀 XV12601 旁路阀未全关（常闭开关）
XV12601 旁路阀未关闭报警
XV12601
旁路阀全开（常开开关）
or
XV12601 试验灯报警
XV12601
辅操台测试开关（按钮常开）
or
XV12601
现场测试按钮（按钮常开）
XV12602
F102 灵活气第二道紧急切断阀 XV12602 旁路阀未全关（常闭开关）
XV12602 旁路阀未关闭报警
XV12602
旁路阀全开（常开开关）
or
XV12602 试验灯报警
XV12602
辅操台测试开关（按钮常开）
or
XV12602
现场测试按钮（按钮常开）


30. ES-113A2 F102 flameout interlock (large gas interlock)
FT12502AB
Low flow of MS at F102 inlet
ES-113A1 starting
PT12613
F102 high pressure of large gas
PT12612
F102 low pressure of large gas
PT12603ABC
F102 low pressure of Flexigas
ES-113A1 starting
or
or
BT12701A
BT12701B
BT12701C
BT12701D
BT12701E
BT12701F
2OO6 (flame detection flameout)
ES-113 starting
High pressure lamp alarm of field large gas
Starting interlock ES-113A1
Low pressure lamp alarm of field large gas
Tripping alarm lamp of auxiliary console ES113A2
ES113A2 tripping stage I alarm
ES113A2 tripping DCS alarm
or
or
ES113A2 controller 1
Close F102 first emergency shut-off valve XV12609 of large gas
ES113A2 controller 2
Close F102 second emergency shut-off valve XV12610 of large gas
Starting interlock ES-113A1
XV12609
F102 bypass valve of first emergency shut-off valve XV12609 of large gas isn't fully closed (NC switch)
XV12609 bypass valve not closed alarm
XV12609
Bypass valve is fully opened (NO switch)
XV12609
Auxiliary console test switch (pressbutton is NO)
or
or
XV12609
Field test pressbutton (pressbutton is NO)
XV12609 test lamp alarm
XV12610
F102 bypass valve of secod emergency shut-off valve XV12610 of large gas isn't fully closed (NC switch)
XV12610 bypass valve not closed alarm
XV12610
Bypass valve is fully opened (NO switch)
XV12610
Auxiliary console test switch (pressbutton is NO)
or
or
XV12610
Field test pressbutton (pressbutton is NO)
XV12610 test lamp alarm


30、ES-113A2 F102 熄炉连锁（大瓦斯连锁）
FT12502ABC
F102 入口 MS 流量低
ES-113A1 启动
PT12613
F102 大瓦斯压力高
PT12612
F102 大瓦斯压力低
OR
PT12603ABC
F102 灵活气压力低
ES-113A1 启动
BT12701A
BT12701B
BT12701C
BT12701D
BT12701E
BT12701F
六取二（火检熄火）
ES-113 启动
OR
OR
OR
ES113A2 控制器 1
ES113A2 控制器 2
现场大瓦斯压力高灯光报警
启动连锁 ES-113A1
现场大瓦斯压力低灯光报警
辅操台 ES113A2 跳闸报警灯
ES113A2 跳闸一级报警
ES113A2 跳闸 DCS 报警
关闭 F102 大瓦斯第一道紧急切断阀 XV12609
关闭 F102 大瓦斯第二道紧急切断阀 XV12610
启动连锁 ES-113A1
XV12609
F102 大瓦斯第一道紧急切断阀 XV12609 旁路阀未全关（常闭开关）
XV12609 旁路阀未关闭报警
XV12609
旁路阀全开（常开开关）
XV12609
辅操台测试开关（按钮常开）
XV12609
现场测试按钮（按钮常开）
OR
OR
XV12609 试验灯报警
XV12610
F102 大瓦斯第二道紧急切断阀 XV12610 旁路阀未全关（常闭开关）
XV12610 旁路阀未关闭报警
XV12610
旁路阀全开（常开开关）
XV12610
辅操台测试开关（按钮常开）
XV12610
现场测试按钮（按钮常开）
OR
OR
XV12610 试验灯报警


31. ES-113B F102 flameout interlock (pilot interlock)
PT12605A
PT12605B
PT12605C
High pressure of pilot gas
2003 ()
PT12605A
PT12605B
PT12605C
Low pressure of pilot gas
2003 ()
ES-113 starting
or
High pressure lamp alarm of field pilot gas
Low pressure lamp alarm of field pilot gas
Tripping alarm lamp of auxiliary console ES113
ES113 tripping stage I alarm
ES113 tripping DCS alarm
or
ES-113B controller 1
Close F102 first emergency shut-off valve XV12605 of pilot gas
or
ES-113B controller 2
Close F102 second emergency shut-off valve XV12606 of pilot gas
XV12605
F102 bypass valve of first emergency shut-off valve XV12605 of pilot gas isn't fully closed (NC switch)
XV12605 bypass valve not closed alarm
XV12605
Bypass valve is fully opened (NO switch)
XV12605
Auxiliary console test switch (pressbutton is NO)
or
or
XV12605
Field test pressbutton (pressbutton is NO)
XV12605 test lamp alarm
XV12606
F106 bypass valve of second emergency shut-off valve XV12604 of pilot gas isn't fully closed (NC switch)
XV12606 bypass valve not closed alarm
XV12606
Bypass valve is fully opened (NO switch)
XV12606
Auxiliary console test switch (pressbutton is NO)
or
or
XV12606
Field test pressbutton (pressbutton is NO)
XV12606test lamp alarm


31、ES-113B F102 熄炉连锁（长明灯连锁）
PT12605A
PT12605B
PT12605C
长明灯瓦斯压力高
三取二（）
PT12605A
PT12605B
PT12605C
长明灯瓦斯压力低
三取二（）
ES-113 启动
or
现场长明灯瓦斯压力高灯光报警
现场长明灯瓦斯压力低灯光报警
辅操台 ES113 跳闸报警灯
ES113 跳闸一级报警
ES113 跳闸 DCS 报警
or
ES-113B 控制器 1
关闭 F102 长明灯瓦斯第一道紧急切断阀 XV12605
or
ES-113B 控制器 2
关闭 F102 长明灯瓦斯第二道紧急切断阀 XV12606
XV12605
F102 长明灯瓦斯第一道紧急切断阀 XV12605 旁路阀未全关(常闭开关)
XV12605 旁路阀未关闭报警
XV12605
旁路阀全开（常开开关）
XV12605
辅操台测试开关（按钮常开）
XV12605
现场测试按钮（按钮常开）
or
or
XV12605 试验灯报警
XV12606
F106 长明灯瓦斯第二道紧急切断阀 XV12604 旁路阀未全关(常闭开关)
XV12606 旁路阀未关闭报警
XV12606
旁路阀全开（常开开关）
XV12606
辅操台测试开关（按钮常开）
XV12606
现场测试按钮（按钮常开）
or
or
XV12606 试验灯报警


32. ES-113 F104 flameout interlock
Manually starting HS-ES113
Locally starting HS-ES113
or
ES-113
Auxiliary console alarm
DCS alarm
Starting ES113A1
Starting ES113A2
Starting ES113B
32、ES-113 F104 熄炉连锁
手动启动 HS-ES113
现场启动 HS-ES113
or
ES-113
辅操台报警
DCS 报警
启动 ES113A1
启动 ES113A2
启动 ES113B

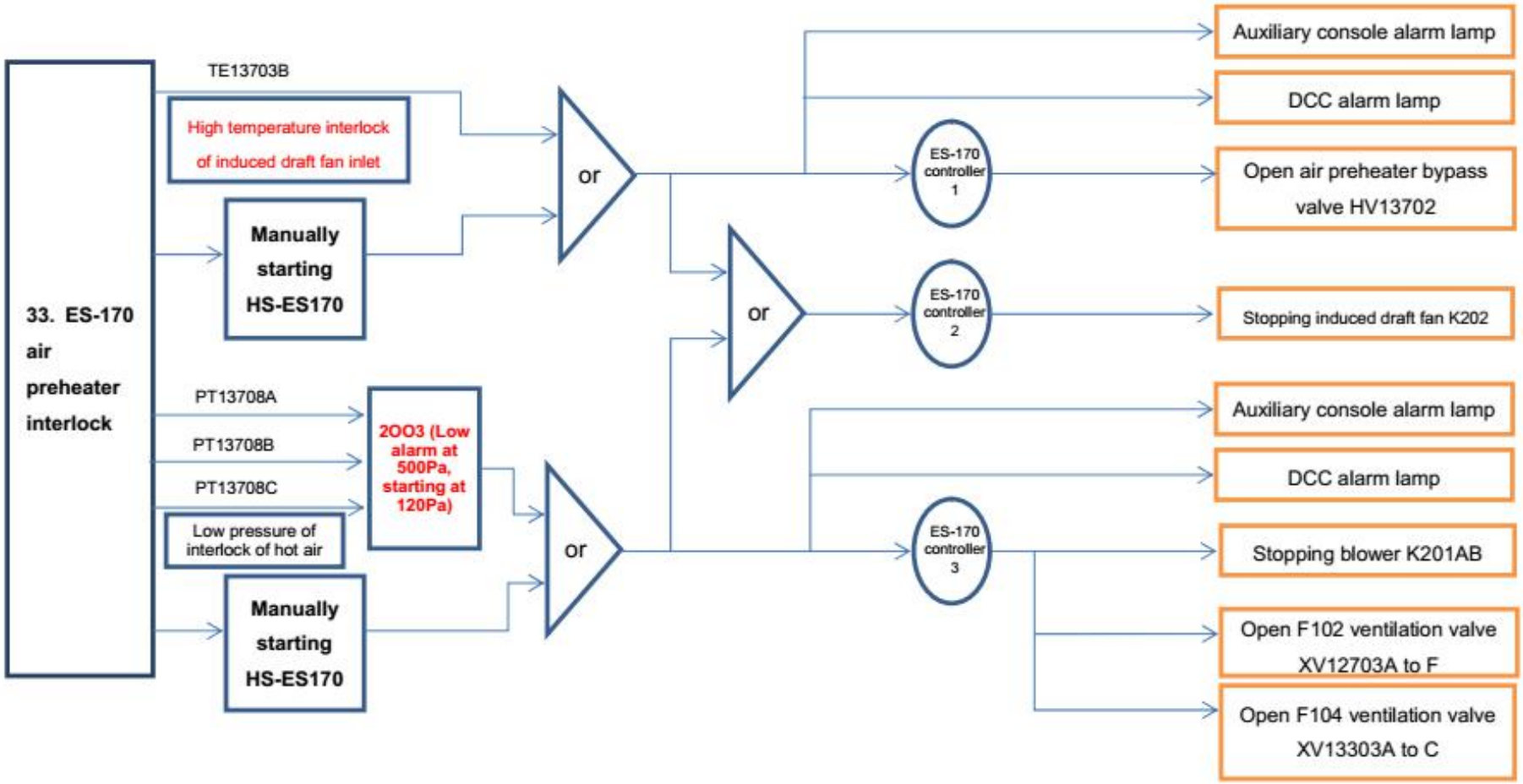


Figure 31: Process Interlocking Logic Diagram (PS System Interlock)
图 31：工艺联锁逻辑图（PS 系统联锁）

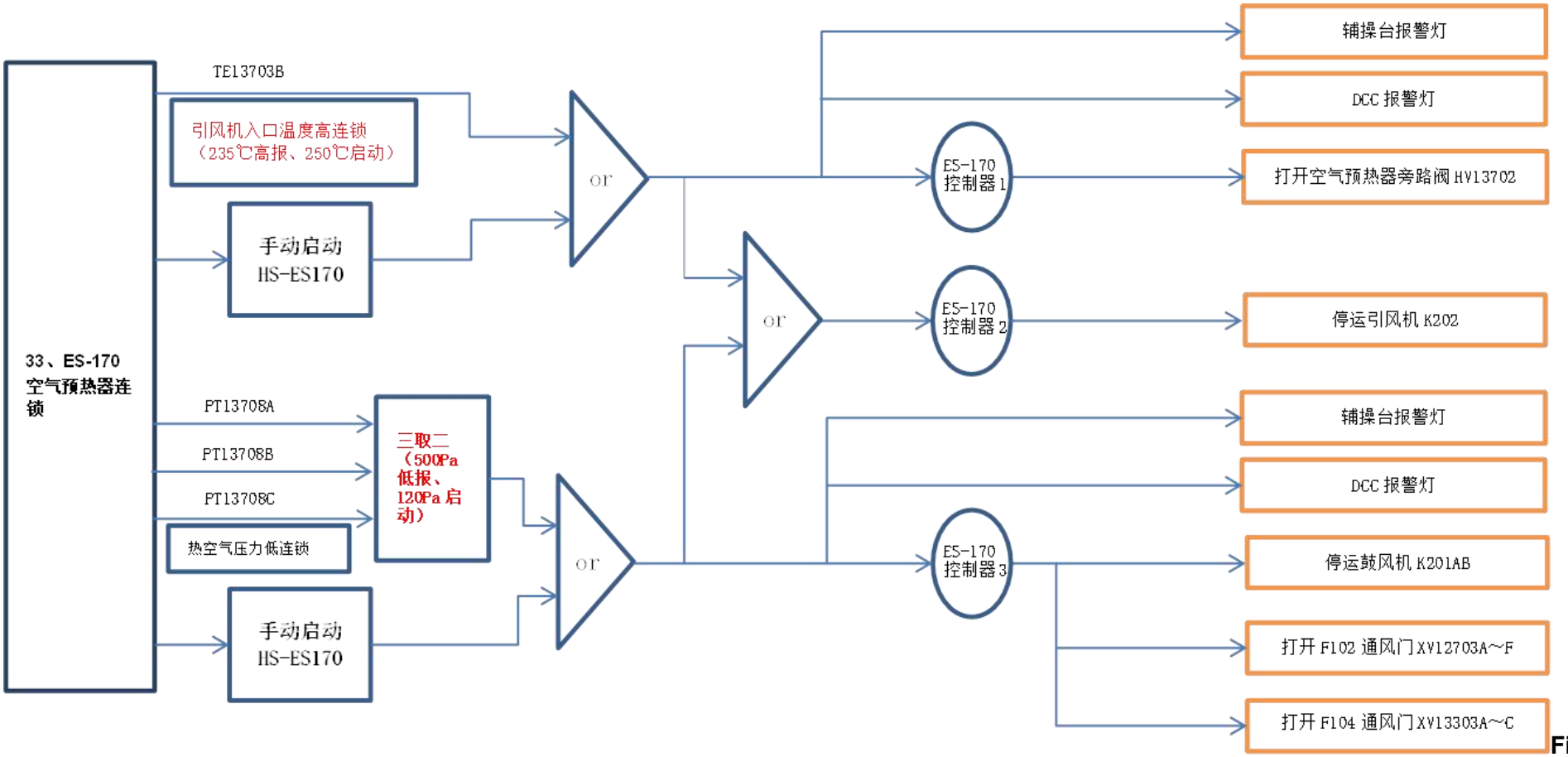


Figure 31: Process Interlocking Logic Diagram (PS System Interlock) (Continued)
图 31：工艺联锁逻辑图（PS 系统联锁）（续）

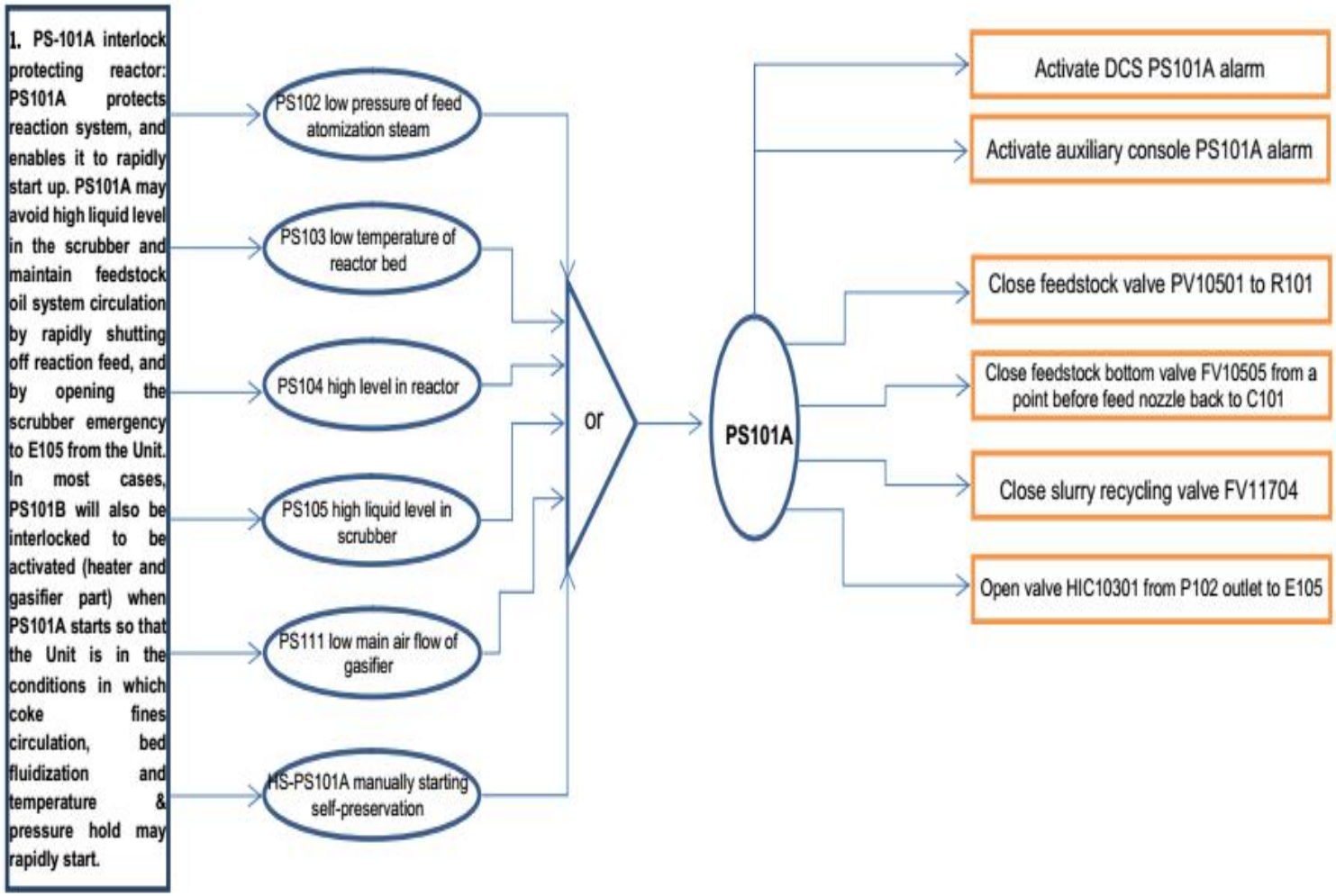


Figure 31: Process Interlocking Logic Diagram (PS System Interlock)
图 31：工艺联锁逻辑图（PS 系统联锁）

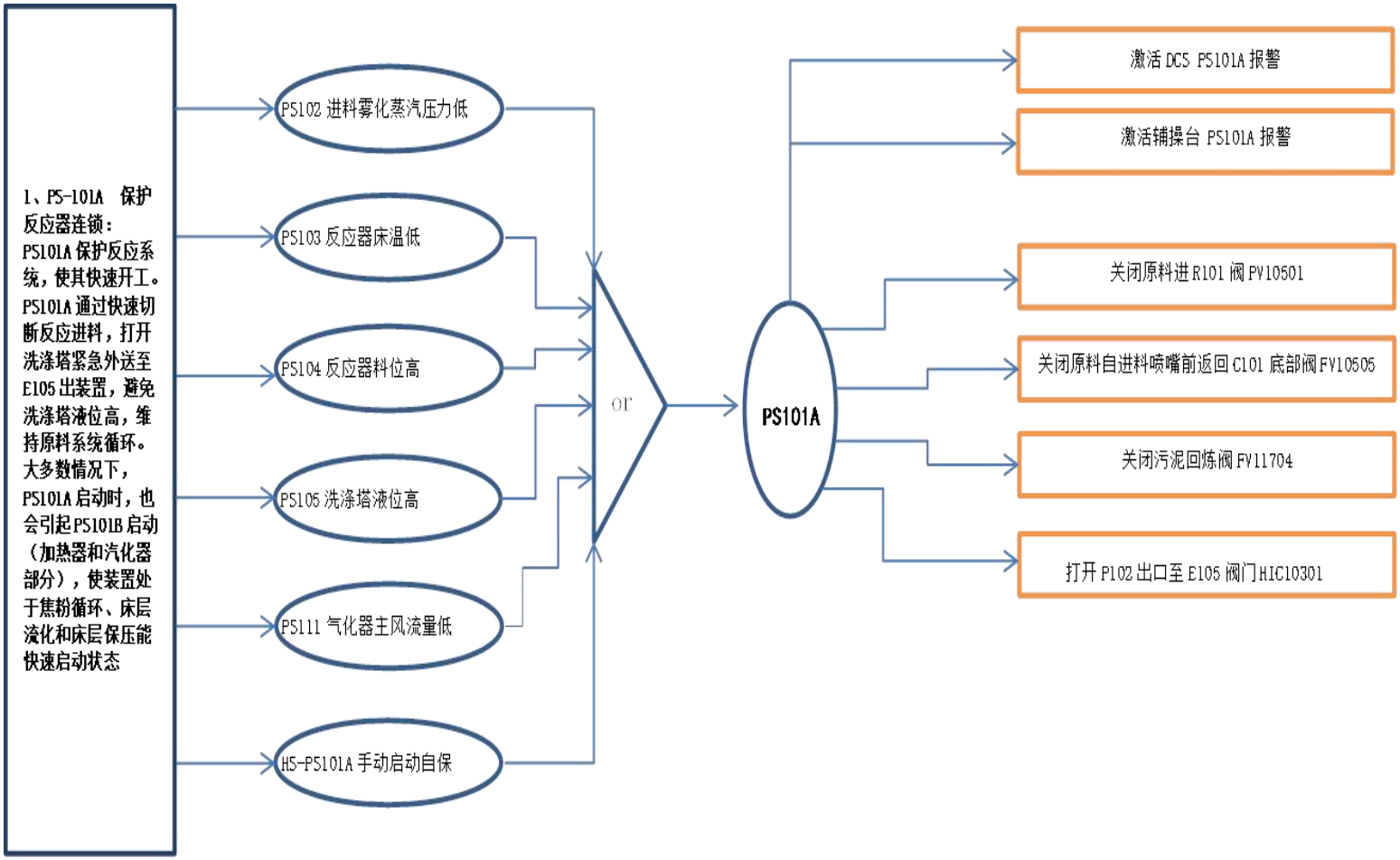
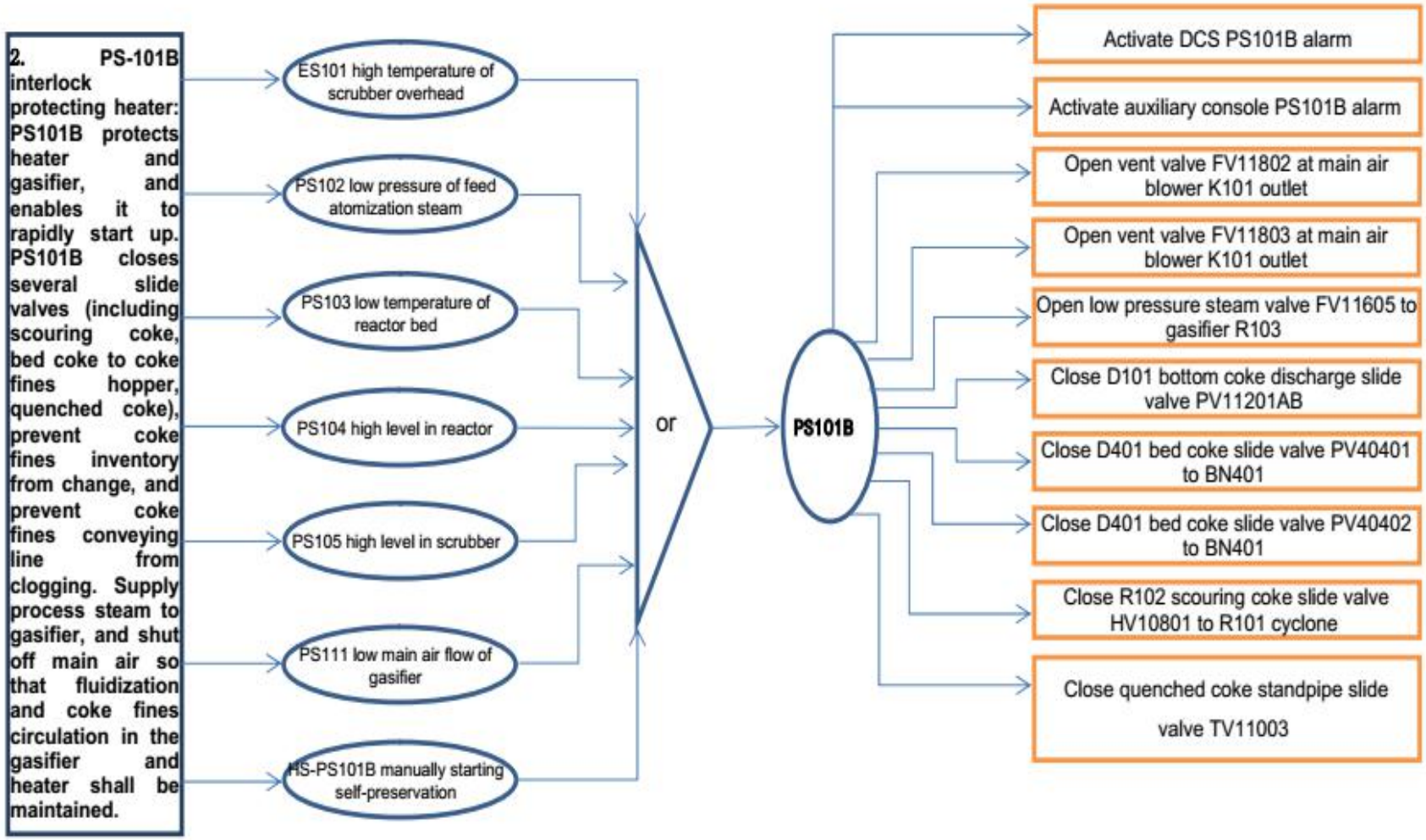
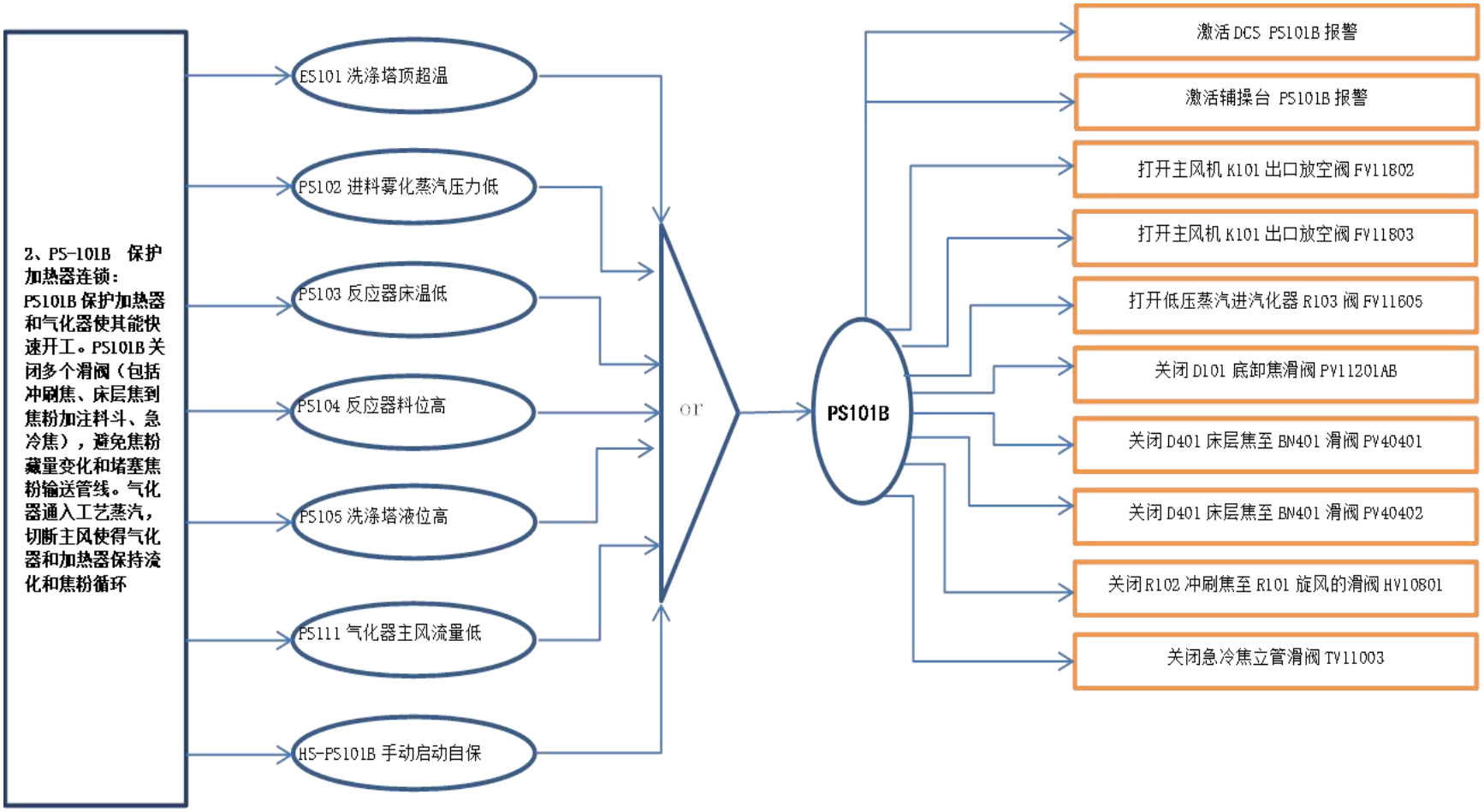
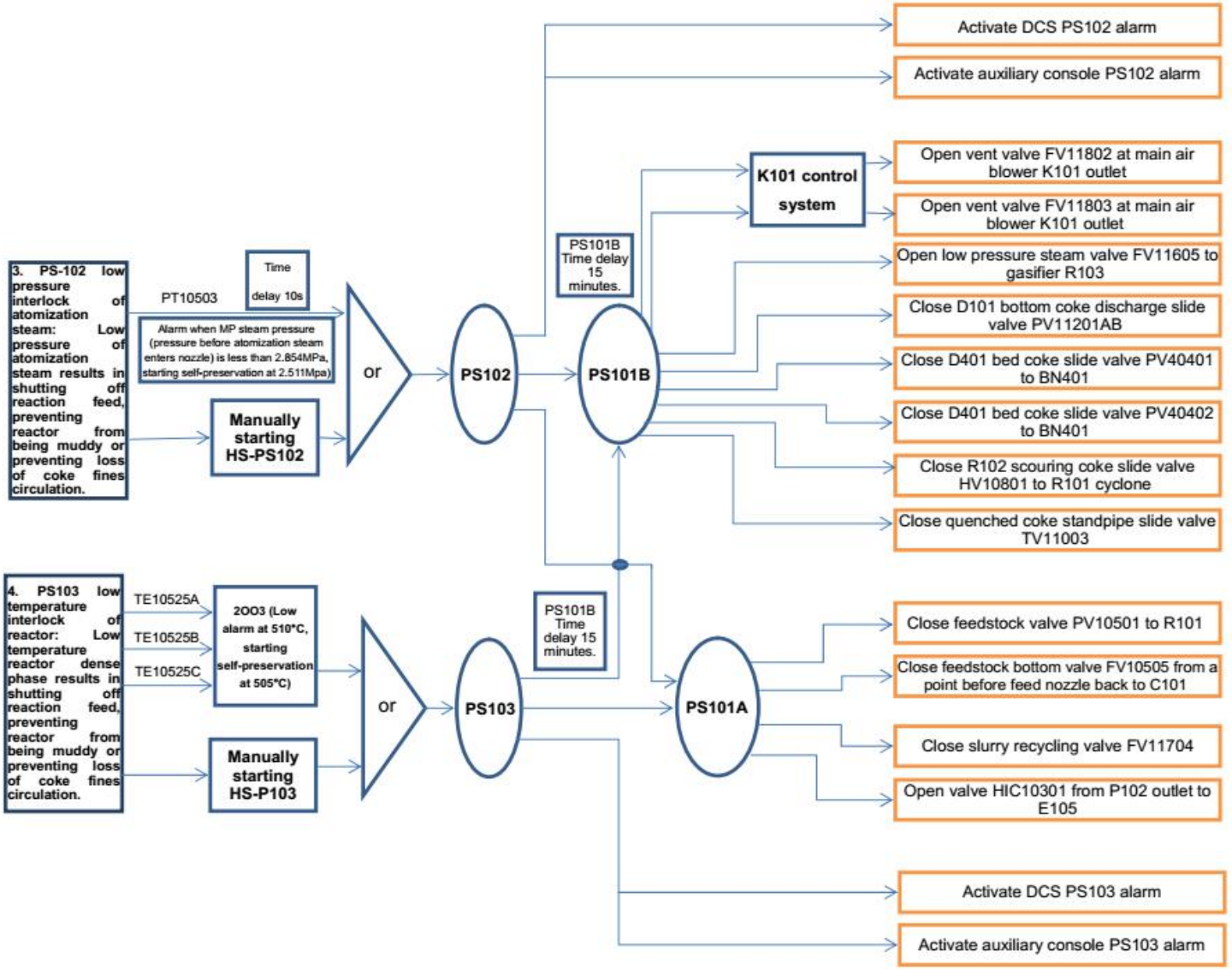
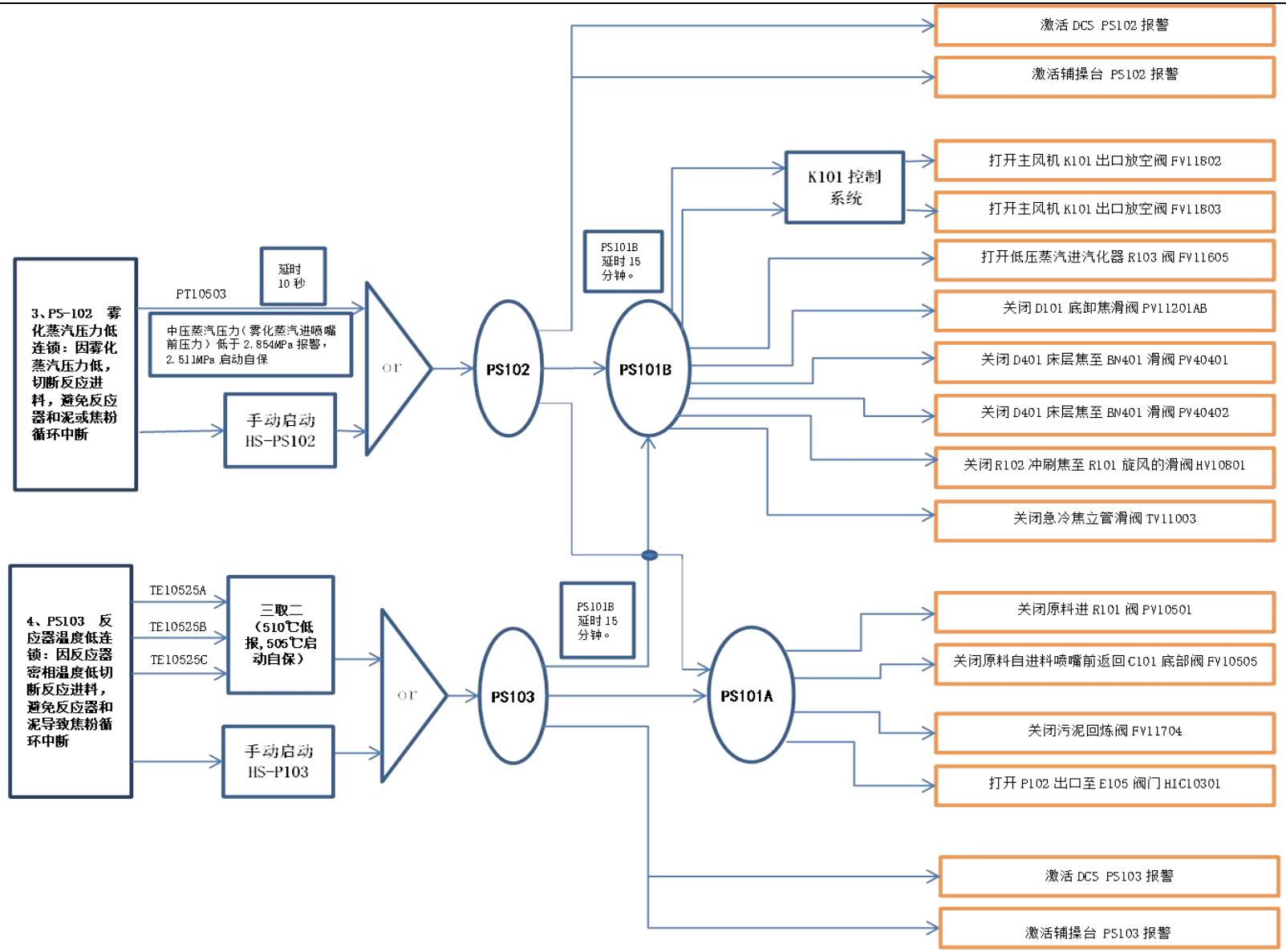


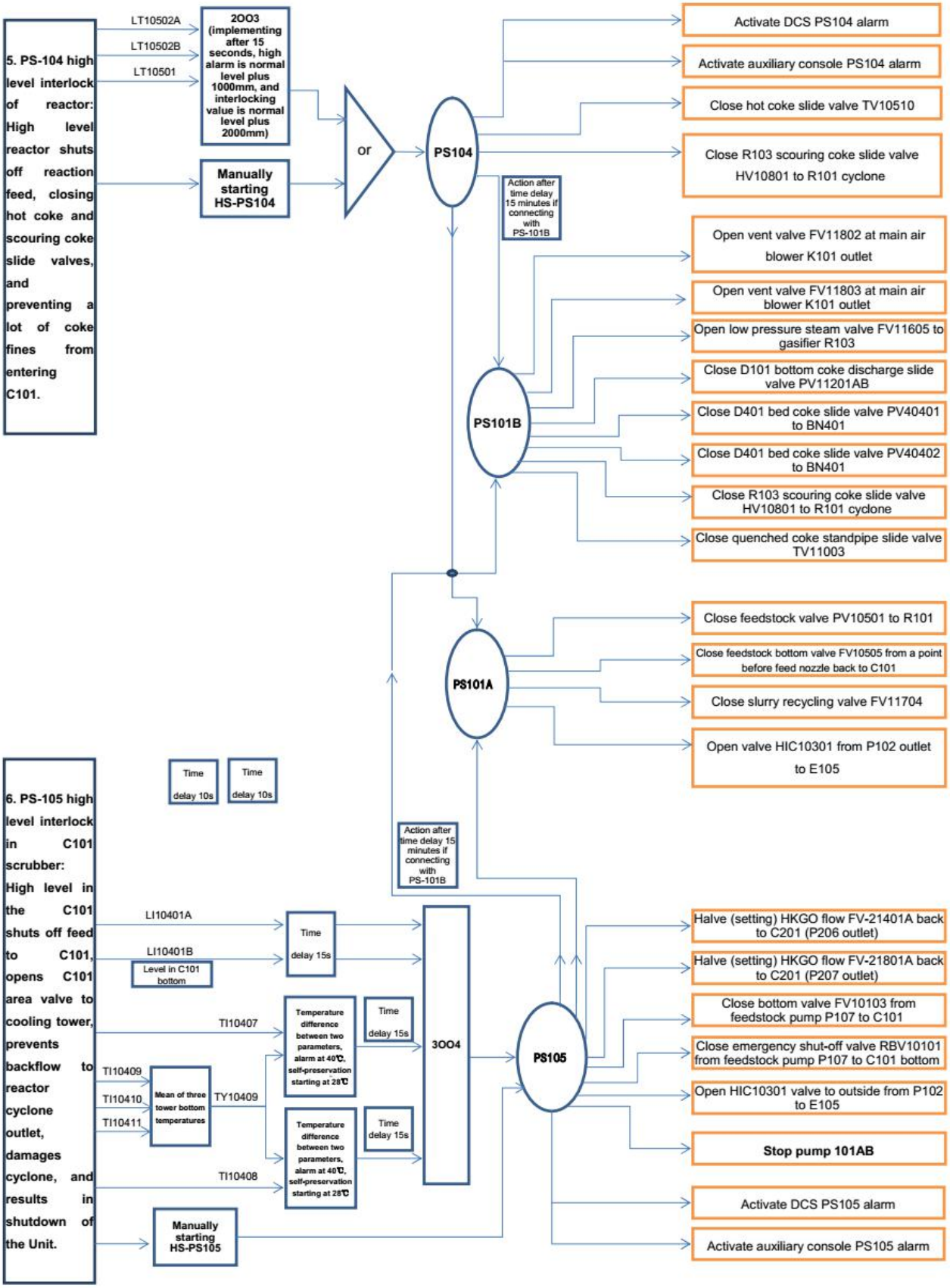
Figure 31: Process Interlocking Logic Diagram (PS System Interlock) (Continued)
图 31：工艺联锁逻辑图（PS 系统联锁）（续）

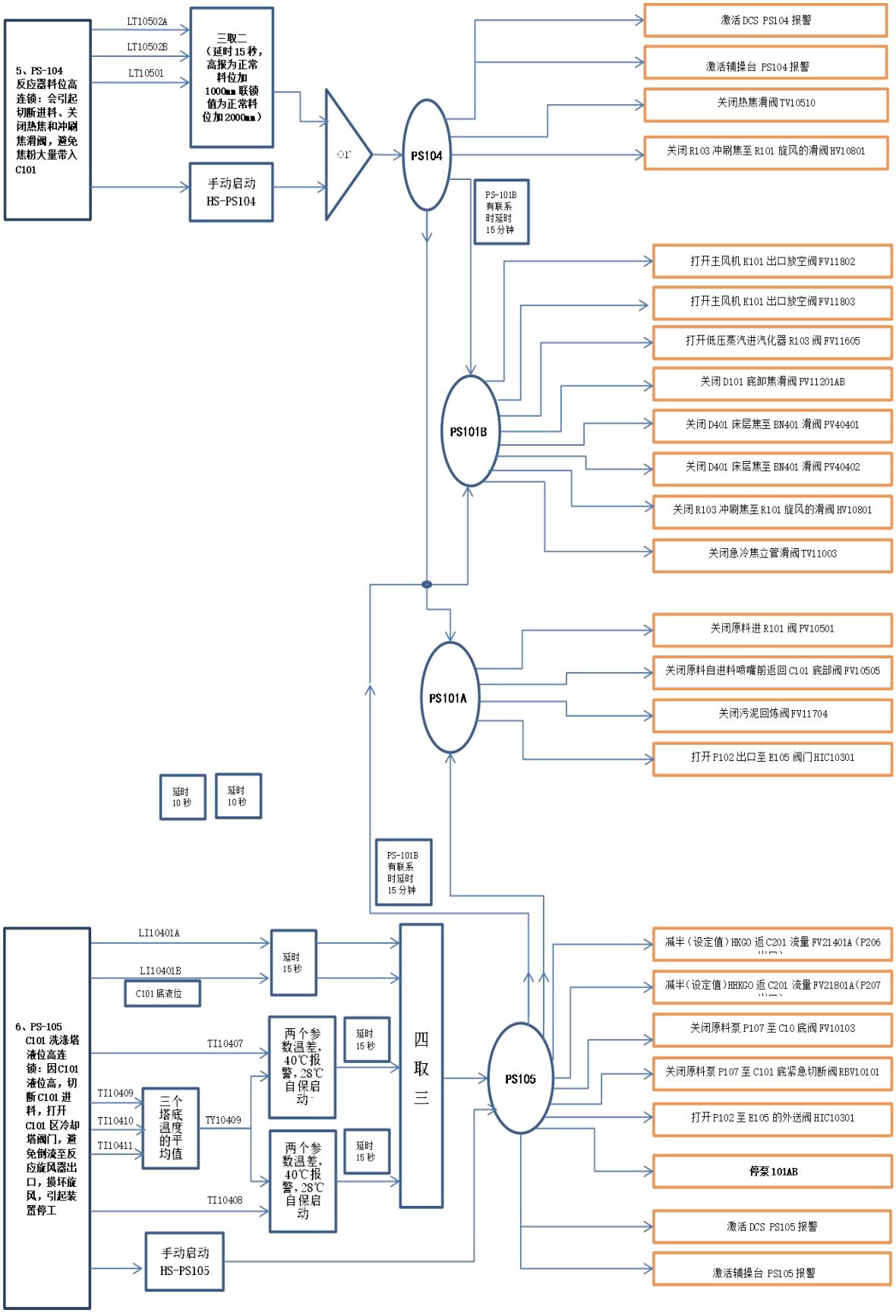

2. PS-101B interlock protecting heater: PS101B protects heater and gasifier, and enables it to rapidly start up. PS101B closes several slide valves (including scouring coke, bed coke to coke fines hopper, quenched coke), prevent coke fines inventory from change, and prevent coke fines conveying line from clogging. Supply process steam to gasifier, and shut off main air so that fluidization and coke fines circulation in the gasifier and heater shall be maintained.
ES101 high temperature of scrubber overhead
PS102 low pressure of feed atomization steam
PS103 low temperature of reactor bed
PS104 high level in reactor
PS105 high level in scrubber
PS111 low main air flow of gasifier
HS-PS101B manually starting self-preservation
or
PS101B
Activate DCS PS101B alarm
Activate auxiliary console PS101B alarm
Open vent valve FV11802 at main air blower K101 outlet
Open vent valve FV11803 at main air blower K101 outlet
Open low pressure steam valve FV11605 to gasifier R103
Close D101 bottom coke discharge slide valve PV11201AB
Close D401 bed coke slide valve PV40401 to BN401
Close D401 bed coke slide valve PV40402 to BN401
Close R102 scouring coke slide valve HV10801 to R101 cyclone
Close quenched coke standpipe slide valve TV11003

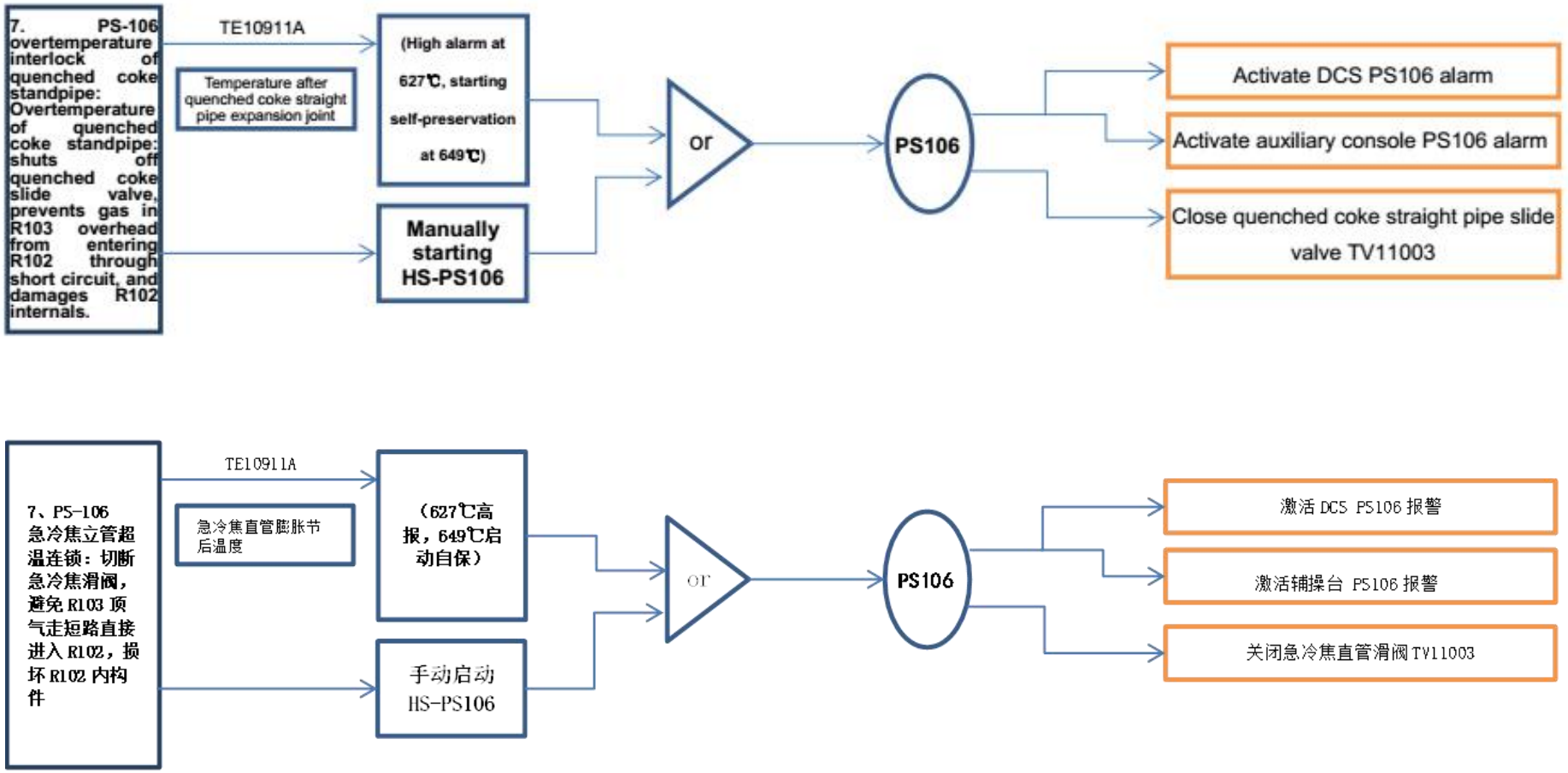

2、PS-101B 保护加热器连锁：PS101B 保护加热器和气化器使其能快速开工。PS101B 关闭多个滑阀（包括冲刷焦、床层焦到焦粉加注料斗、急冷焦），避免焦粉藏量变化和堵塞焦粉输送管线。气化器通入工艺蒸汽，切断主风使得气化器和加热器保持流化和焦粉循环
ES101 洗涤塔顶超温
PS102 进料雾化蒸汽压力低
PS103 反应器床温低
PS104 反应器料位高
PS105 洗涤塔液位高
PS111 气化器主风流量低
HS-PS101B 手动启动自保
OR
PS101B
激活 DCS PS101B 报警
激活辅操台 PS101B 报警
打开主风机 K101 出口放空阀 FV11802
打开主风机 K101 出口放空阀 FV11803
打开低压蒸汽进汽化器 R103 阀 FV11605
关闭 D101 底卸焦滑阀 PV11201AB
关闭 D401 床层焦至 BN401 滑阀 PV40401
关闭 D401 床层焦至 BN401 滑阀 PV40402
关闭 R102 冲刷焦至 R101 旋风的滑阀 HV10801
关闭急冷焦立管滑阀 TV11003

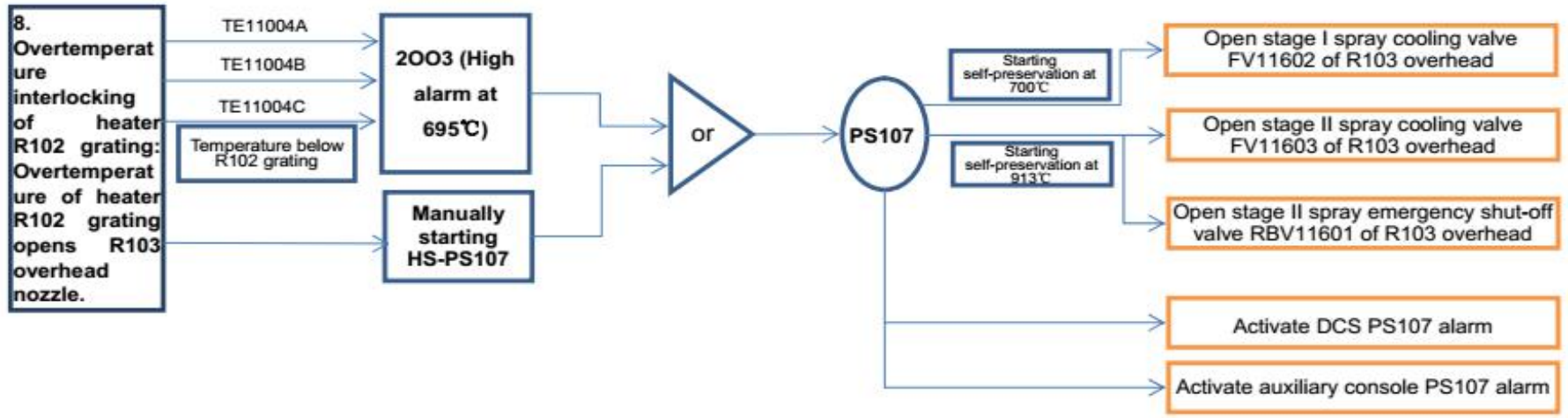

Activate DCS PS102 alarm
Activate auxiliary console PS102 alarm
K101 control system
Open vent valve FV11802 at main air blower K101 outlet
Open vent valve FV11803 at main air blower K101 outlet
Open low pressure steam valve FV11605 to gasifier R103
Close D101 bottom coke discharge slide valve PV11201AB
Close D401 bed coke slide valve PV40401 to BN401
Close D401 bed coke slide valve PV40402 to BN401
Close R102 scouring coke slide valve HV10801 to R101 cyclone
Close quenched coke standpipe slide valve TV11003
PS101B Time delay 15 minutes.
3. PS-102 low pressure interlock of atomization steam: Low pressure of atomization steam results in shutting off reaction feed, preventing reactor from being muddy or preventing loss of coke fines circulation.
PT10503
Time delay 10s
Alarm when MP steam pressure (pressure before atomization steam enters nozzle) is less than 2.854MPa, starting self-preservation at 2.511Mpa)
Manually starting HS-PS102
or
PS102
PS101B
4. PS103 low temperature interlock of reactor: Low temperature reactor dense phase results in shutting off reaction feed, preventing reactor from being muddy or preventing loss of coke fines circulation.
TE10525A
TE10525B
TE10525C
2OO3 (Low alarm at 510°C, starting self-preservation at 505°C)
Manually starting HS-P103
or
PS103
PS101B Time delay 15 minutes.
PS101A
Close feedstock valve PV10501 to R101
Close feedstock bottom valve FV10505 from a point before feed nozzle back to C101
Close slurry recycling valve FV11704
Open valve HIC10301 from P102 outlet to E105
Activate DCS PS103 alarm
Activate auxiliary console PS103 alarm

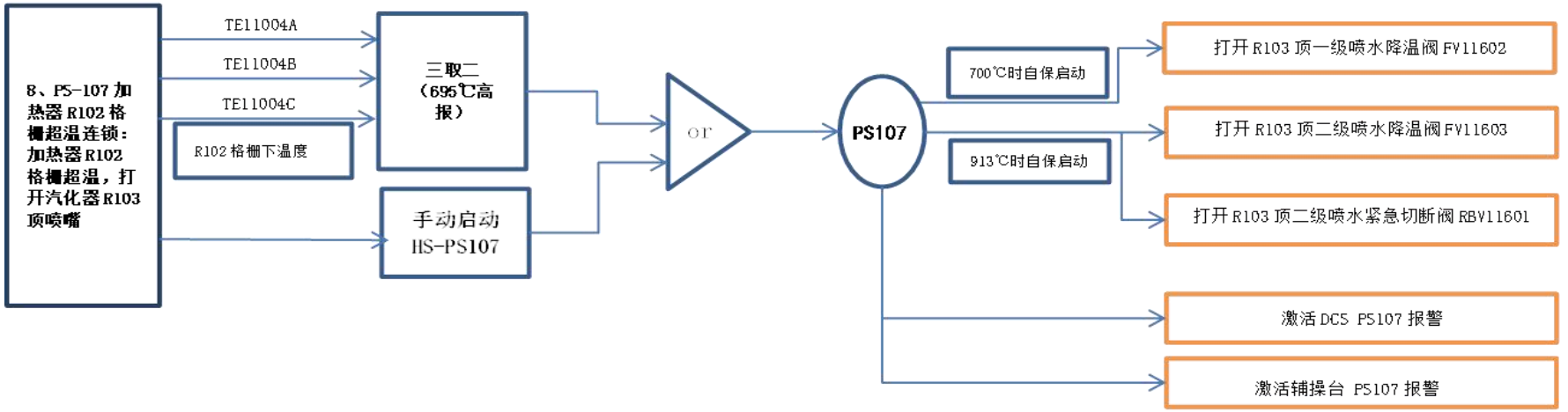

3、PS-102 雾化蒸汽压力低连锁：因雾化蒸汽压力低，切断反应进料，避免反应器和泥或焦粉循环中断
PT10503
延时 10 秒
中压蒸汽压力（雾化蒸汽进喷嘴前压力）低于 2.854MPa 报警，2.511MPa 启动自保
手动启动 HS-PS102
or
PS102
PS101B 延时 15 分钟。
PS101B
K101 控制系统
激活 DCS PS102 报警
激活辅操台 PS102 报警
打开主风机 K101 出口放空阀 FV11802
打开主风机 K101 出口放空阀 FV11803
打开低压蒸汽进汽化器 R103 阀 FV11605
关闭 D101 底卸焦滑阀 PV11201AB
关闭 D401 床层焦至 BN401 滑阀 PV40401
关闭 D401 床层焦至 BN401 滑阀 PV40402
关闭 R102 冲刷焦至 R101 旋风的滑阀 HV10801
关闭急冷焦立管滑阀 TV11003
4、PS103 反应器温度低连锁：因反应器密相温度低切断反应进料，避免反应器和泥导致焦粉循环中断
TE10525A
TE10525B
TE10525C
三取二（510℃低报，505℃启动自保）
手动启动 HS-P103
or
PS103
PS101B 延时 15 分钟。
PS101A
关闭原料进 R101 阀 PV10501
关闭原料自进料喷嘴前返回 C101 底部阀 FV10505
关闭污泥回炼阀 FV11704
打开 P102 出口至 E105 阀门 HIC10301
激活 DCS PS103 报警
激活辅操台 PS103 报警

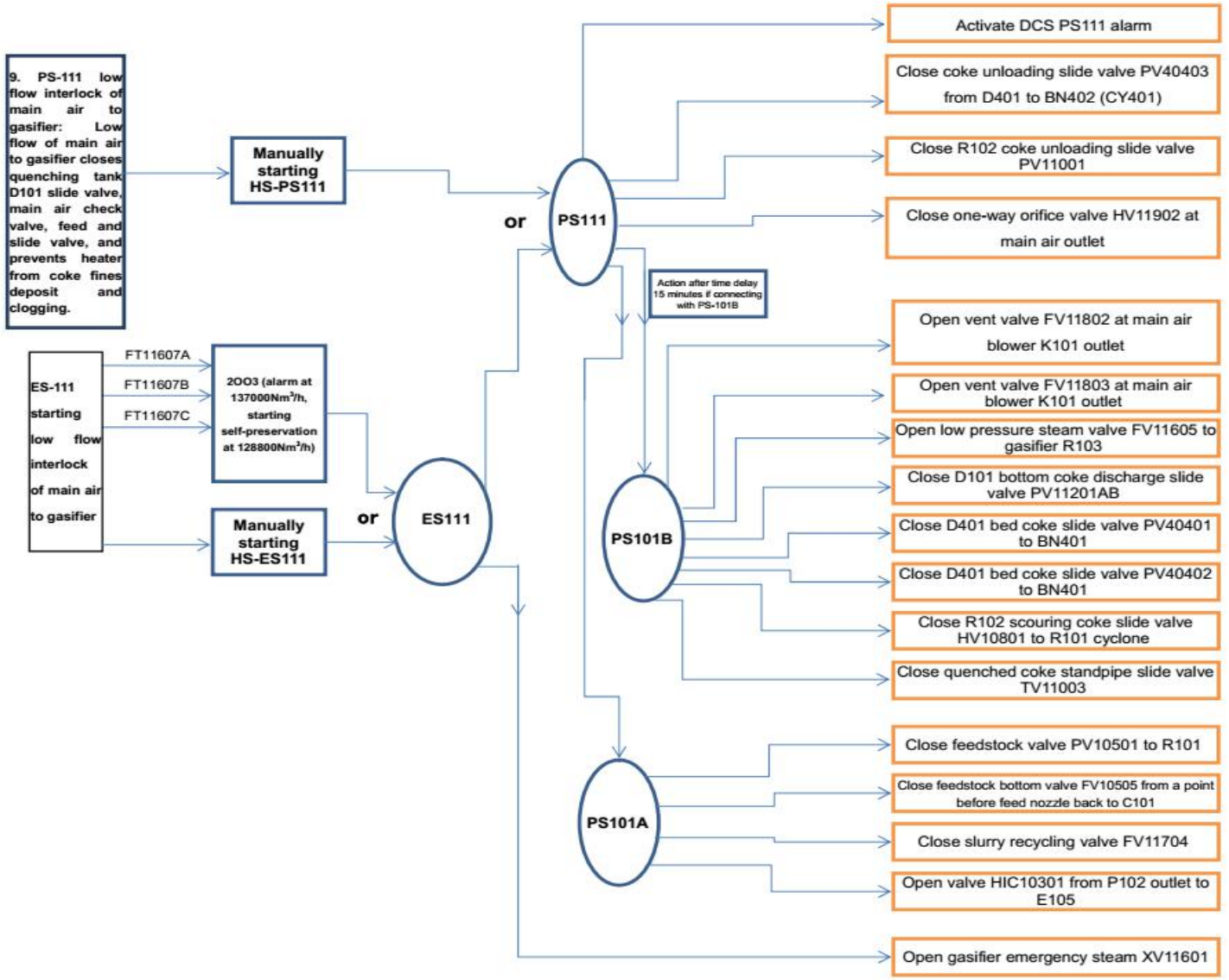

5. PS-104 high level interlock of reactor: High level reactor shuts off reaction feed, closing hot coke and scouring coke slide valves, and preventing a lot of coke fines from entering C101.
LT10502A
LT10502B
LT10501
2OO3 (implementing after 15 seconds, high alarm is normal level plus 1000mm, and interlocking value is normal level plus 2000mm)
Manually starting HS-PS104
or
PS104
Action after time delay 15 minutes if connecting with PS-101B
Activate DCS PS104 alarm
Activate auxiliary console PS104 alarm
Close hot coke slide valve TV10510
Close R103 scouring coke slide valve HV10801 to R101 cyclone
PS101B
Open vent valve FV11802 at main air blower K101 outlet
Open vent valve FV11803 at main air blower K101 outlet
Open low pressure steam valve FV11605 to gasifier R103
Close D101 bottom coke discharge slide valve PV11201AB
Close D401 bed coke slide valve PV40401 to BN401
Close D401 bed coke slide valve PV40402 to BN401
Close R103 scouring coke slide valve HV10801 to R101 cyclone
Close quenched coke standpipe slide valve TV11003
PS101A
Close feedstock valve PV10501 to R101
Close feedstock bottom valve FV10505 from a point before feed nozzle back to C101
Close slurry recycling valve FV11704
Open valve HIC10301 from P102 outlet to E105
6. PS-105 high level interlock in C101 scrubber: High level in the C101 shuts off feed to C101, opens C101 area valve to cooling tower, prevents backflow to reactor cyclone outlet, damages cyclone, and results in shutdown of the Unit.
Time delay 10s
Time delay 10s
Action after time delay 15 minutes if connecting with PS-101B
LI10401A
LI10401B
Level in C101 bottom
Time delay 15s
TI10407
TI10409
TI10410
TI10411
Mean of three tower bottom temperatures
TY10409
Temperature difference between two parameters, alarm at 40℃, self-preservation starting at 28℃
Time delay 15s
Temperature difference between two parameters, alarm at 40℃, self-preservation starting at 28℃
Time delay 15s
TI10408
3OO4
PS105
Manually starting HS-PS105
Halve (setting) HKGO flow FV-21401A back to C201 (P206 outlet)
Halve (setting) HKGO flow FV-21801A back to C201 (P207 outlet)
Close bottom valve FV10103 from feedstock pump P107 to C101
Close emergency shut-off valve RBV10101 from feedstock pump P107 to C101 bottom
Open HIC10301 valve to outside from P102 to E105
Stop pump 101AB
Activate DCS PS105 alarm
Activate auxiliary console PS105 alarm

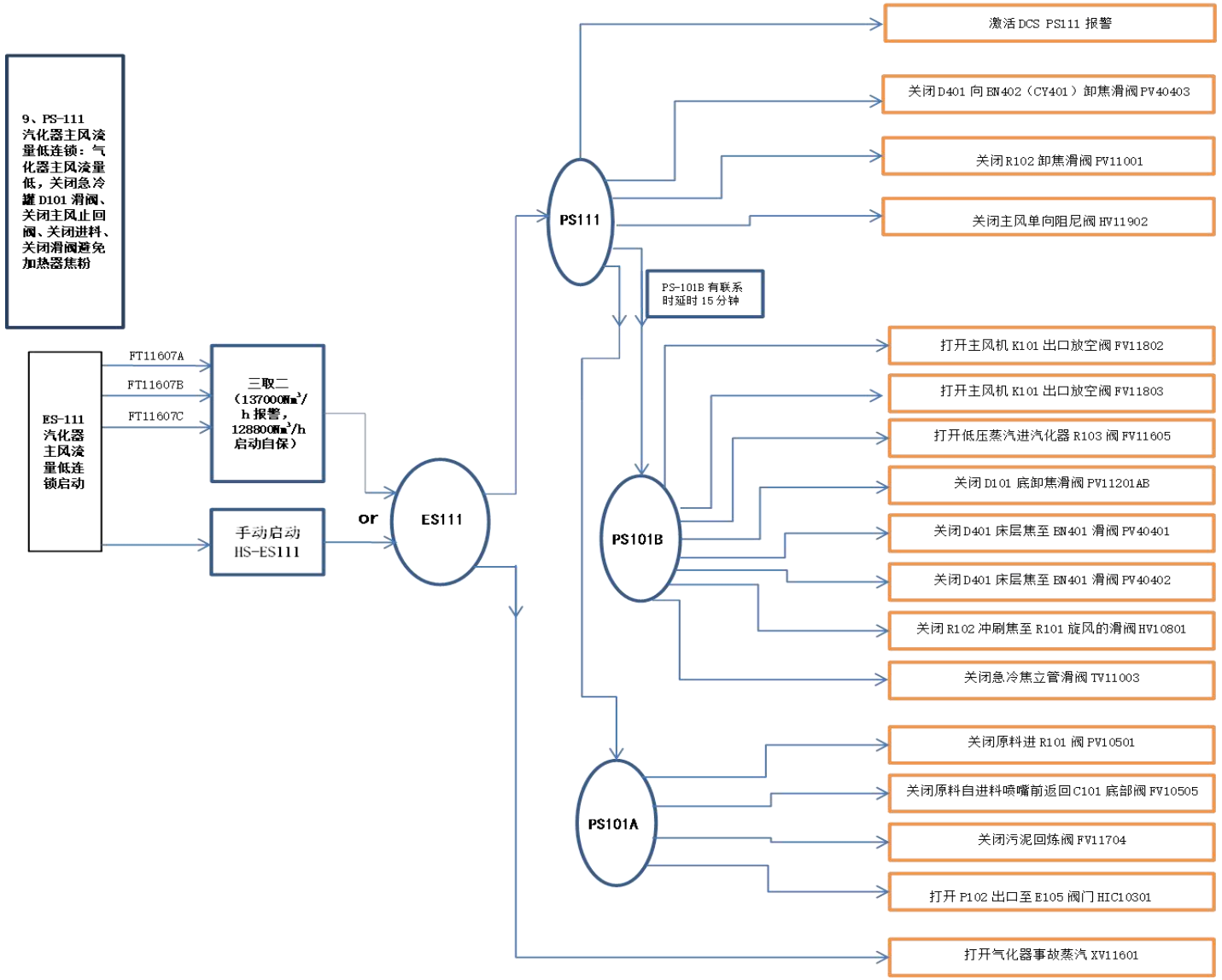

5、PS-104 反应器料位高连锁：会引起切断进料、关闭热焦和冲刷焦滑阀，避免焦粉大量带入C101
LT10502A
LT10502B
LT10501
三取二（延时15秒，高报为正常料位加1000mm联锁值为正常料位加2000mm）
手动启动 HS-PS104
OT
PS104
激活DCS PS104报警
激活辅操台 PS104报警
关闭热焦滑阀TV10510
关闭R103冲刷焦至R101旋风的滑阀HV10801
PS-101B有联系时延时15分钟
PS101B
打开主风机K101出口放空阀FV11802
打开主风机K101出口放空阀FV11803
打开低压蒸汽进汽化器R103阀FV11605
关闭D101底卸焦滑阀PV11201AB
关闭D401床层焦至EN401滑阀PV40401
关闭D401床层焦至EN401滑阀PV40402
关闭R103冲刷焦至R101旋风的滑阀HV10801
关闭急冷焦立管滑阀TV11003
PS101A
关闭原料进R101阀FV10501
关闭原料自进料喷嘴前返回C101底部阀FV10505
关闭污泥回炼阀FV11704
打开P102出口至E105阀门HIC10301
延时10秒
延时10秒
PS-101B有联系时延时15分钟
6、PS-105 C101洗涤塔液位高连锁：因C101液位高，切断C101进料，打开C101区冷却塔阀门，避免倒流至反应旋风器出口，损坏旋风，引起装置停工
LI10401A
LI10401B
C101底液位
延时15秒
TI10407
TI10409
TI10410
TI10411
三个塔底温度的平均值
TY10409
TI10408
两个参数温差，40℃报警，28℃自保启动
两个参数温差，40℃报警，28℃自保启动
延时15秒
延时15秒
四取三
手动启动 HS-PS105
PS105
减半（设定值）HKG0返C201流量FV21401A（P206
减半（设定值）HHKG0返C201流量FV21801A（P207
关闭原料泵P107至C10底阀FV10103
关闭原料泵P107至C101底紧急切断阀REV10101
打开P102至E105的外送阀HIC10301
停泵101AB
激活DCS PS105报警
激活辅操台 PS105报警

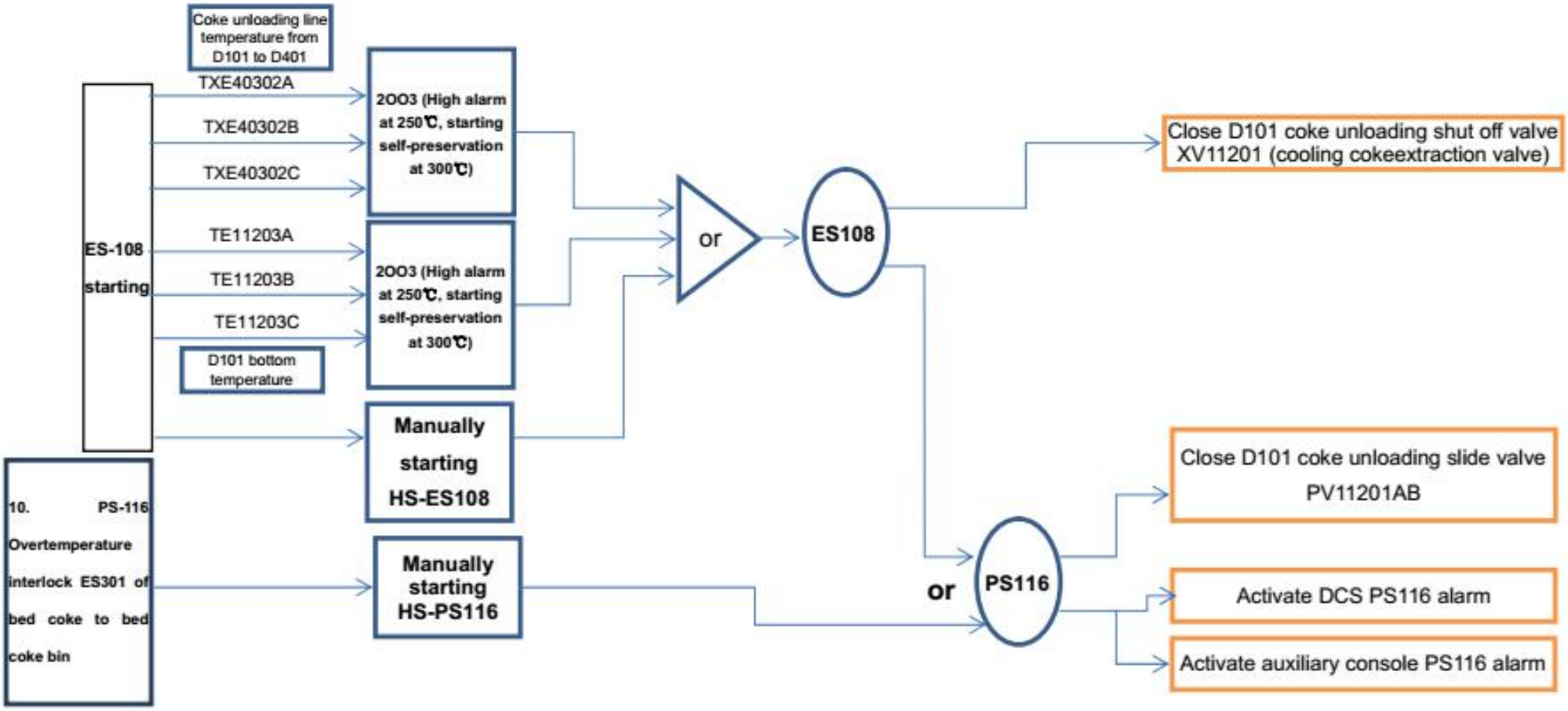

7. PS-106 overtemperature interlock of quenched coke standpipe: Overtemperature of quenched coke standpipe: shuts off quenched coke slide valve, prevents gas in R103 overhead from entering R102 through short circuit, and damages R102 internals.
TE10911A
Temperature after quenched coke straight pipe expansion joint
(High alarm at 627℃, starting self-preservation at 649℃)
Manually starting HS-PS106
or
PS106
Activate DCS PS106 alarm
Activate auxiliary console PS106 alarm
Close quenched coke straight pipe slide valve TV11003
7、PS-106 急冷焦立管超温连锁：切断急冷焦滑阀，避免 R103 顶气走短路直接进入 R102，损坏 R102 内构件
TE10911A
急冷焦直管膨胀节后温度
（627℃高报，649℃启动自保）
手动启动 HS-PS106
or
PS106
激活 DCS PS106 报警
激活辅操台 PS106 报警
关闭急冷焦直管滑阀 TV11003

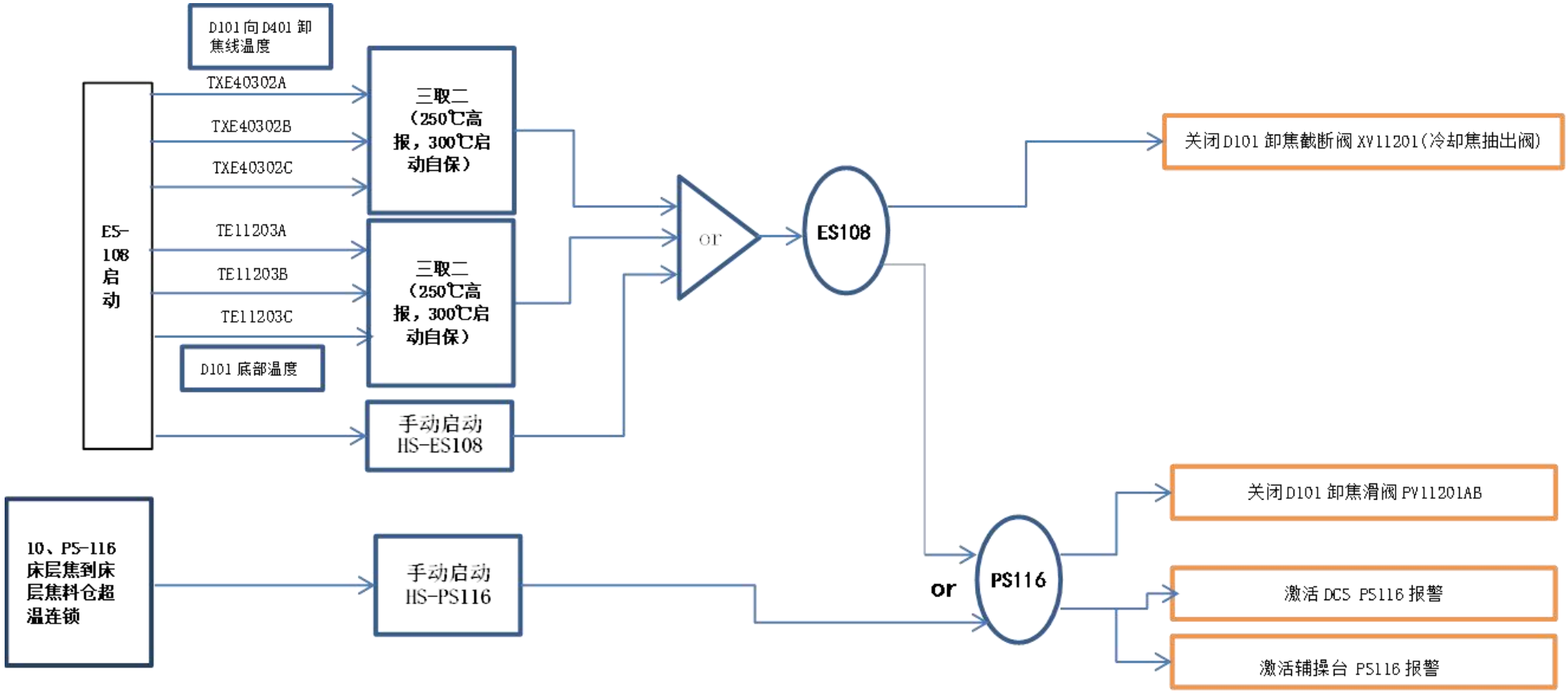

8. Overtemperature interlocking of heater R102 grating: Overtemperature of heater R102 grating opens R103 overhead nozzle.
TE11004A
TE11004B
TE11004C
Temperature below R102 grating
2OO3 (High alarm at 695℃)
Manually starting HS-PS107
or
PS107
Starting self-preservation at 700℃
Starting self-preservation at 913℃
Open stage I spray cooling valve FV11602 of R103 overhead
Open stage II spray cooling valve FV11603 of R103 overhead
Open stage II spray emergency shut-off valve RBV11601 of R103 overhead
Activate DCS PS107 alarm
Activate auxiliary console PS107 alarm

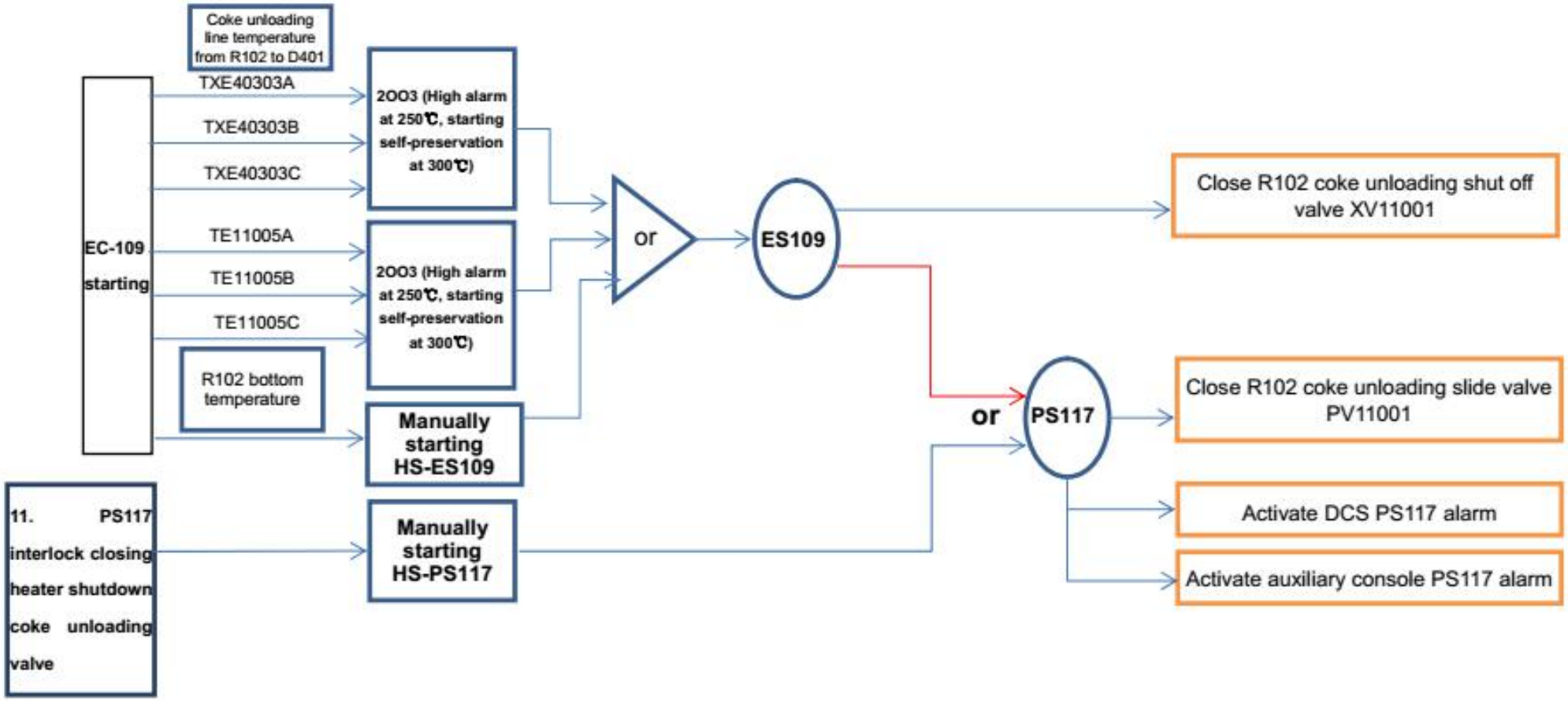

8、PS-107 加热器 R102 格栅超温连锁：加热器 R102 格栅超温，打开汽化器 R103 顶喷嘴
TE11004A
TE11004B
TE11004C
R102 格栅下温度
三取二（695℃高报）
手动启动 HS-PS107
or
PS107
700℃时自保启动
913℃时自保启动
打开 R103 顶一级喷水降温阀 FV11602
打开 R103 顶二级喷水降温阀 FV11603
打开 R103 顶二级喷水紧急切断阀 RBV11601
激活 DCS PS107 报警
激活辅操台 PS107 报警

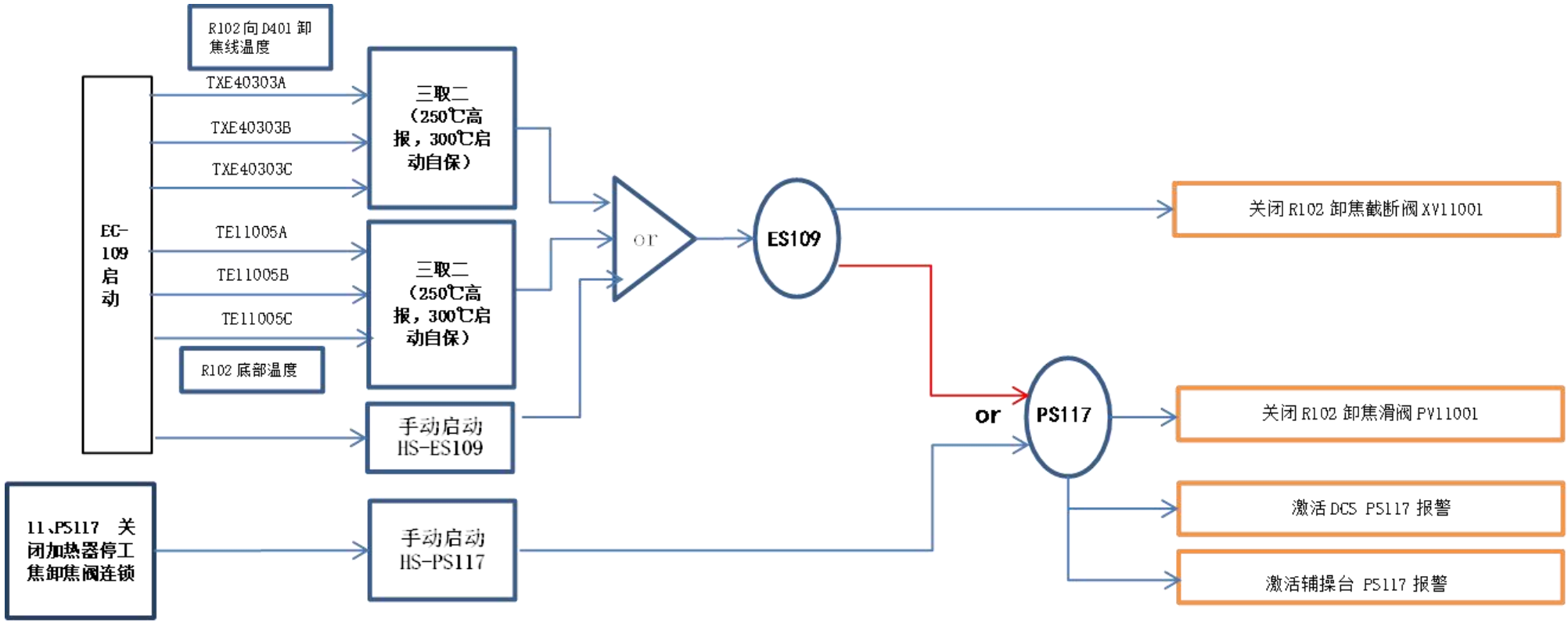

9. PS-111 low flow interlock of main air to gasifier: Low flow of main air to gasifier closes quenching tank D101 slide valve, main air check valve, feed and slide valve, and prevents heater from coke fines deposit and clogging.
Manually starting HS-PS111
or
PS111
Activate DCS PS111 alarm
Close coke unloading slide valve PV40403 from D401 to BN402 (CY401)
Close R102 coke unloading slide valve PV11001
Close one-way orifice valve HV11902 at main air outlet
Action after time delay 15 minutes if connecting with PS-101B
ES-111 starting low flow interlock of main air to gasifier
FT11607A
FT11607B
FT11607C
2OO3 (alarm at 137000Nm³/h, starting self-preservation at 128800Nm³/h)
Manually starting HS-ES111
or
ES111
PS101B
Open vent valve FV11802 at main air blower K101 outlet
Open vent valve FV11803 at main air blower K101 outlet
Open low pressure steam valve FV11605 to gasifier R103
Close D101 bottom coke discharge slide valve PV11201AB
Close D401 bed coke slide valve PV40401 to BN401
Close D401 bed coke slide valve PV40402 to BN401
Close R102 scouring coke slide valve HV10801 to R101 cyclone
Close quenched coke standpipe slide valve TV11003
PS101A
Close feedstock valve PV10501 to R101
Close feedstock bottom valve FV10505 from a point before feed nozzle back to C101
Close slurry recycling valve FV11704
Open valve HIC10301 from P102 outlet to E105
Open gasifier emergency steam XV11601

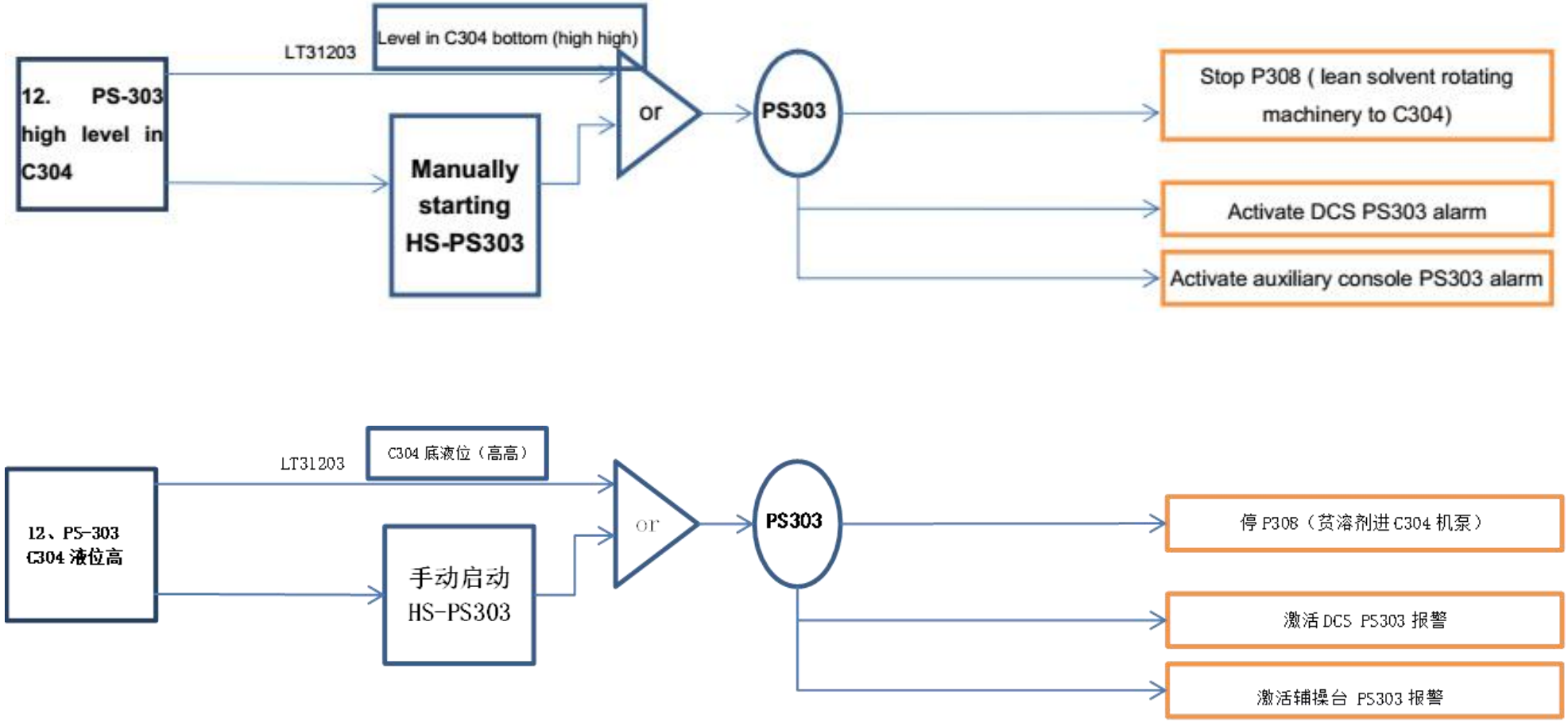

9、PS-111 汽化器主风流量低连锁：气化器主风流量低，关闭急冷罐 D101 滑阀、关闭主风止回阀、关闭进料、关闭滑阀避免加热器焦粉
ES-111 汽化器主风流量低连锁启动
FT11607A
FT11607B
FT11607C
三取二（137000Nm³/h 报警，128800Nm³/h 启动自保）
手动启动 HS-ES111
or
ES111
PS111
PS-101B 有联系时延时 15 分钟
PS101B
PS101A
激活 DCS PS111 报警
关闭 D401 向 EN402（CY401）卸焦滑阀 PV40403
关闭 R102 卸焦滑阀 PV11001
关闭主风单向阻尼阀 HV11902
打开主风机 K101 出口放空阀 FV11802
打开主风机 K101 出口放空阀 FV11803
打开低压蒸汽进汽化器 R103 阀 FV11605
关闭 D101 底卸焦滑阀 PV11201AB
关闭 D401 床层焦至 EN401 滑阀 PV40401
关闭 D401 床层焦至 EN401 滑阀 PV40402
关闭 R102 冲刷焦至 R101 旋风的滑阀 HV10801
关闭急冷焦立管滑阀 TV11003
关闭原料进 R101 阀 PV10501
关闭原料自进料喷嘴前返回 C101 底部阀 FV10505
关闭污泥回炼阀 FV11704
打开 P102 出口至 E105 阀门 HIC10301
打开气化器事故蒸汽 XV11601

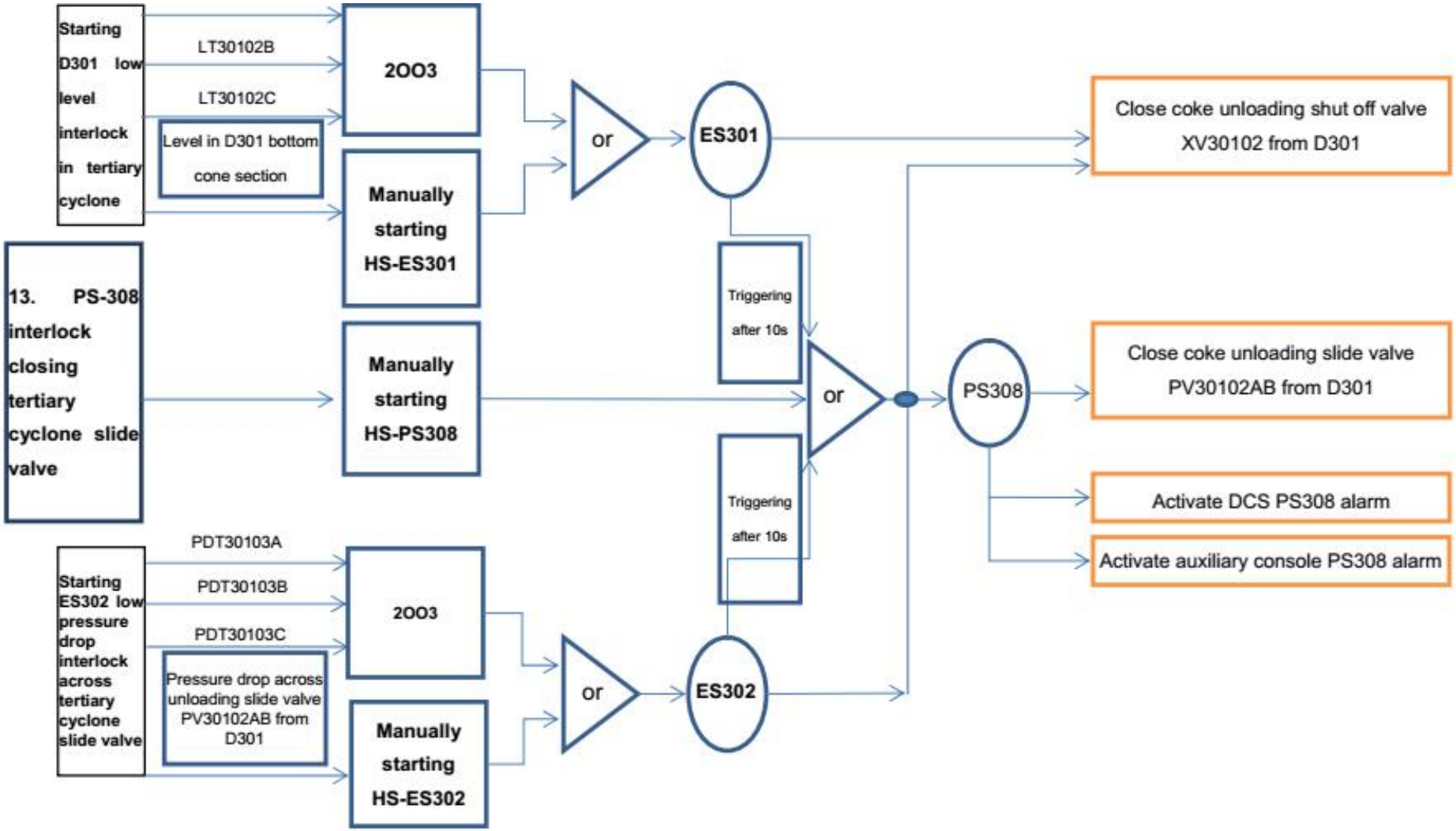

Coke unloading line temperature from D101 to D401
TXE40302A
TXE40302B
TXE40302C
2OO3 (High alarm at 250℃, starting self-preservation at 300℃)
ES-108 starting
TE11203A
TE11203B
TE11203C
D101 bottom temperature
2OO3 (High alarm at 250℃, starting self-preservation at 300℃)
Manually starting HS-ES108
10. PS-116 Overtemperature interlock ES301 of bed coke to bed coke bin
Manually starting HS-PS116
or
ES108
Close D101 coke unloading shut off valve XV11201 (cooling cokeextraction valve)
Close D101 coke unloading slide valve PV11201AB
or
PS116
Activate DCS PS116 alarm
Activate auxiliary console PS116 alarm

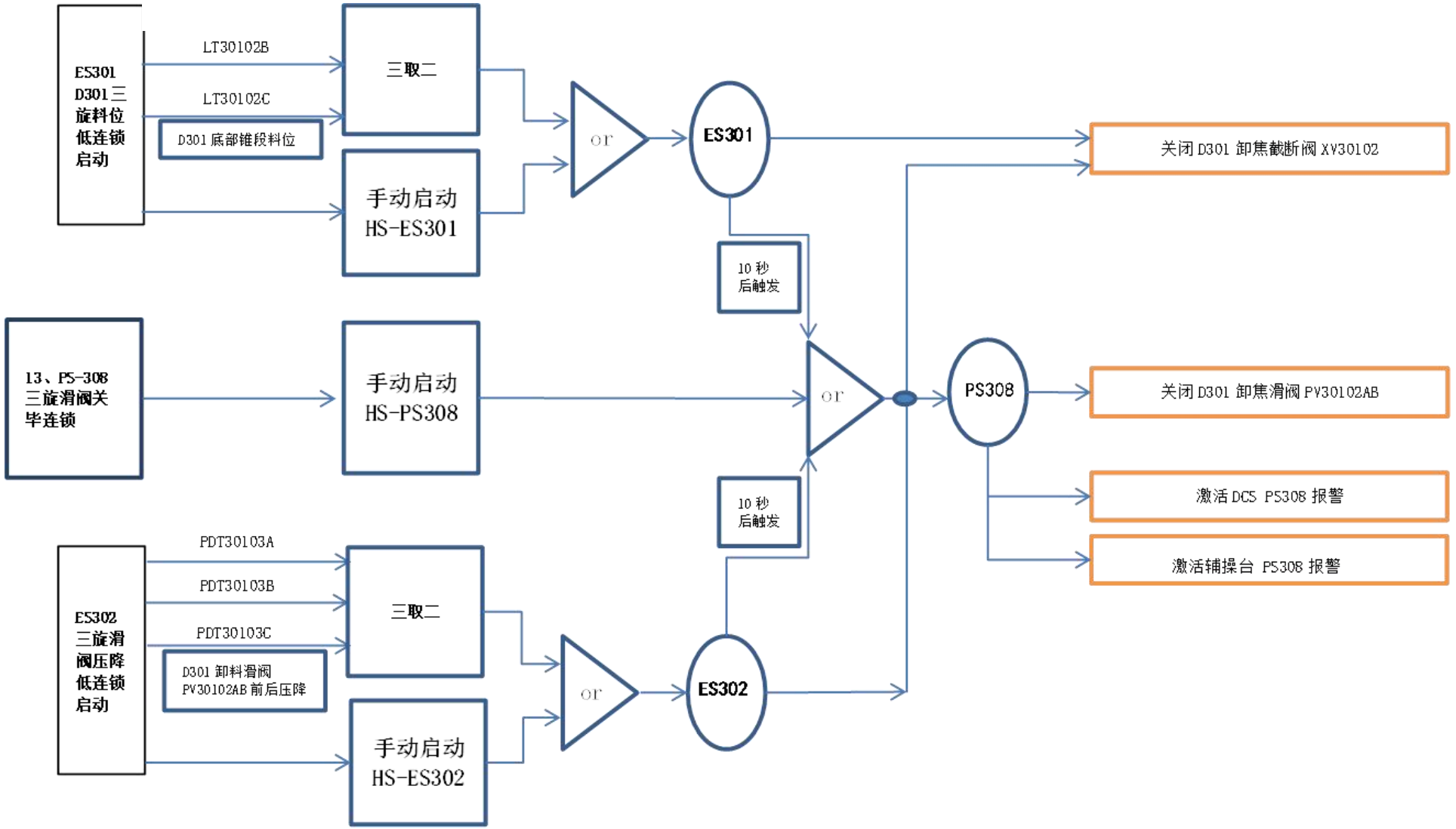

D101 向 D401 卸焦线温度
TXE40302A
TXE40302B
TXE40302C
三取二（250℃高报，300℃启动自保）
ES-108 启动
TE11203A
TE11203B
TE11203C
D101 底部温度
三取二（250℃高报，300℃启动自保）
手动启动 HS-ES108
OR
ES108
关闭 D101 卸焦截断阀 XV11201(冷却焦抽出阀)
10、PS-116 床层焦到床层焦料仓超温连锁
手动启动 HS-PS116
or
PS116
关闭 D101 卸焦滑阀 PV11201AB
激活 DCS PS116 报警
激活辅操台 PS116 报警

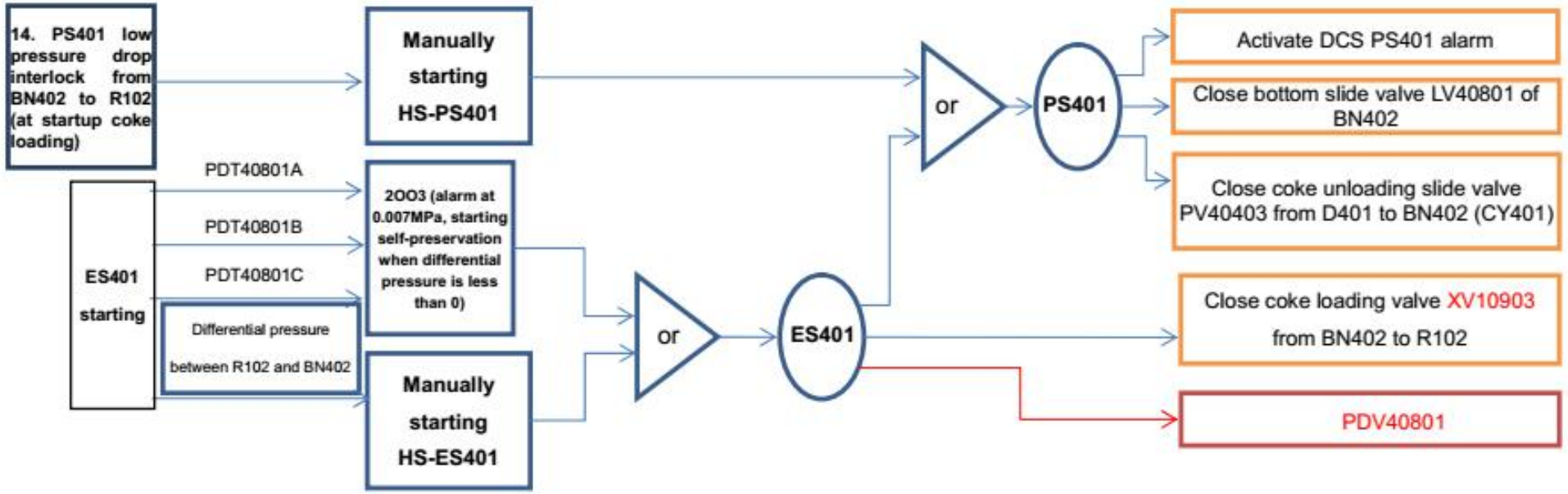

Coke unloading line temperature from R102 to D401
TXE40303A
TXE40303B
TXE40303C
2OO3 (High alarm at 250℃, starting self-preservation at 300℃)
EC-109 starting
TE11005A
TE11005B
TE11005C
2OO3 (High alarm at 250℃, starting self-preservation at 300℃)
R102 bottom temperature
Manually starting HS-ES109
11. PS117 interlock closing heater shutdown coke unloading valve
Manually starting HS-PS117
or
ES109
Close R102 coke unloading shut off valve XV11001
or
PS117
Close R102 coke unloading slide valve PV11001
Activate DCS PS117 alarm
Activate auxiliary console PS117 alarm

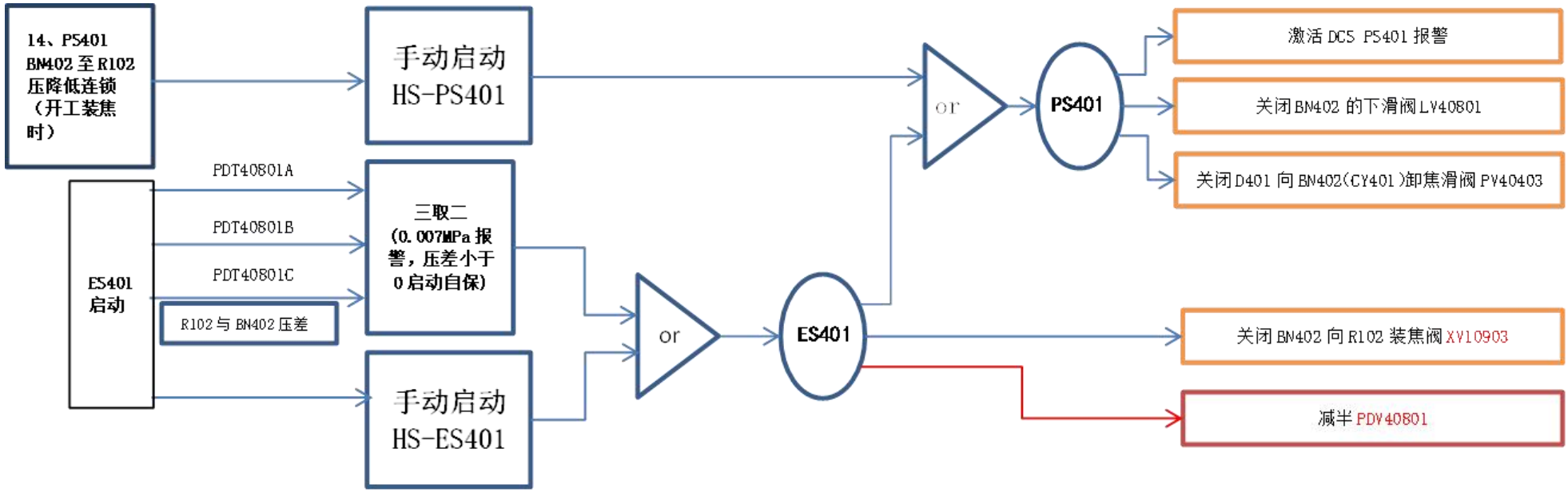

R102向D401卸焦线温度
TXE40303A
TXE40303B
TXE40303C
三取二（250℃高报，300℃启动自保）
EC-109启动
TE11005A
TE11005B
TE11005C
三取二（250℃高报，300℃启动自保）
R102底部温度
手动启动HS-ES109
OR
ES109
关闭R102卸焦截断阀XV11001
or
PS117
关闭R102卸焦滑阀PV11001
激活DCS PS117报警
激活辅操台 PS117报警
11、PS117 关闭加热器停工焦卸焦阀连锁
手动启动HS-PS117


12. PS-303 high level in C304
LT31203
Level in C304 bottom (high high)
Manually starting HS-PS303
or
PS303
Stop P308 (lean solvent rotating machinery to C304)
Activate DCS PS303 alarm
Activate auxiliary console PS303 alarm
12、PS-303 C304 液位高
LT31203
C304 底液位（高高）
手动启动 HS-PS303
or
PS303
停 P308（贫溶剂进 C304 机泵）
激活 DCS PS303 报警
激活辅操台 PS303 报警


Starting D301 low level interlock in tertiary cyclone
LT30102B
LT30102C
Level in D301 bottom cone section
2OO3
Manually starting HS-ES301
or
ES301
Close coke unloading shut off valve XV30102 from D301
13. PS-308 interlock closing tertiary cyclone slide valve
Manually starting HS-PS308
Triggering after 10s
or
PS308
Close coke unloading slide valve PV30102AB from D301
Activate DCS PS308 alarm
Activate auxiliary console PS308 alarm
Triggering after 10s
Starting ES302 low pressure drop interlock across tertiary cyclone slide valve
PDT30103A
PDT30103B
PDT30103C
Pressure drop across unloading slide valve PV30102AB from D301
2OO3
Manually starting HS-ES302
or
ES302


ES301
D301三旋料位低连锁启动
LT30102B
LT30102C
D301 底部锥段料位
三取二
手动启动
HS-ES301
OR
ES301
关闭 D301 卸焦截断阀 XV30102
10 秒
后触发
13、PS-308
三旋滑阀关毕连锁
手动启动
HS-PS308
OR
PS308
关闭 D301 卸焦滑阀 PV30102AB
激活 DCS PS308 报警
激活辅操台 PS308 报警
10 秒
后触发
ES302
三旋滑阀压降低连锁启动
PDT30103A
PDT30103B
PDT30103C
D301 卸料滑阀
PV30102AB 前后压降
三取二
手动启动
HS-ES302
OR
ES302


14. PS401 low pressure drop interlock from BN402 to R102 (at startup coke loading)
Manually starting HS-PS401
PDT40801A
PDT40801B
PDT40801C
ES401 starting
Differential pressure between R102 and BN402
2OO3 (alarm at 0.007MPa, starting self-preservation when differential pressure is less than 0)
Manually starting HS-ES401
or
or
ES401
PS401
Activate DCS PS401 alarm
Close bottom slide valve LV40801 of BN402
Close coke unloading slide valve PV40403 from D401 to BN402 (CY401)
Close coke loading valve XV10903 from BN402 to R102
PDV40801


14、PS401 BN402 至 R102 压降低连锁（开工装焦时）
手动启动 HS-PS401
PDT40801A
PDT40801B
PDT40801C
ES401 启动
R102 与 BN402 压差
三取二 (0.007MPa 报警，压差小于 0 启动自保)
手动启动 HS-ES401
or
or
ES401
PS401
激活 DCS PS401 报警
关闭 BN402 的下滑阀 LV40801
关闭 D401 向 BN402(CY401)卸焦滑阀 PV40403
关闭 BN402 向 R102 装焦阀 XV10903
减半 PDV40801

5.3 Interlocking logic diagram of the Units 机组联锁逻辑图

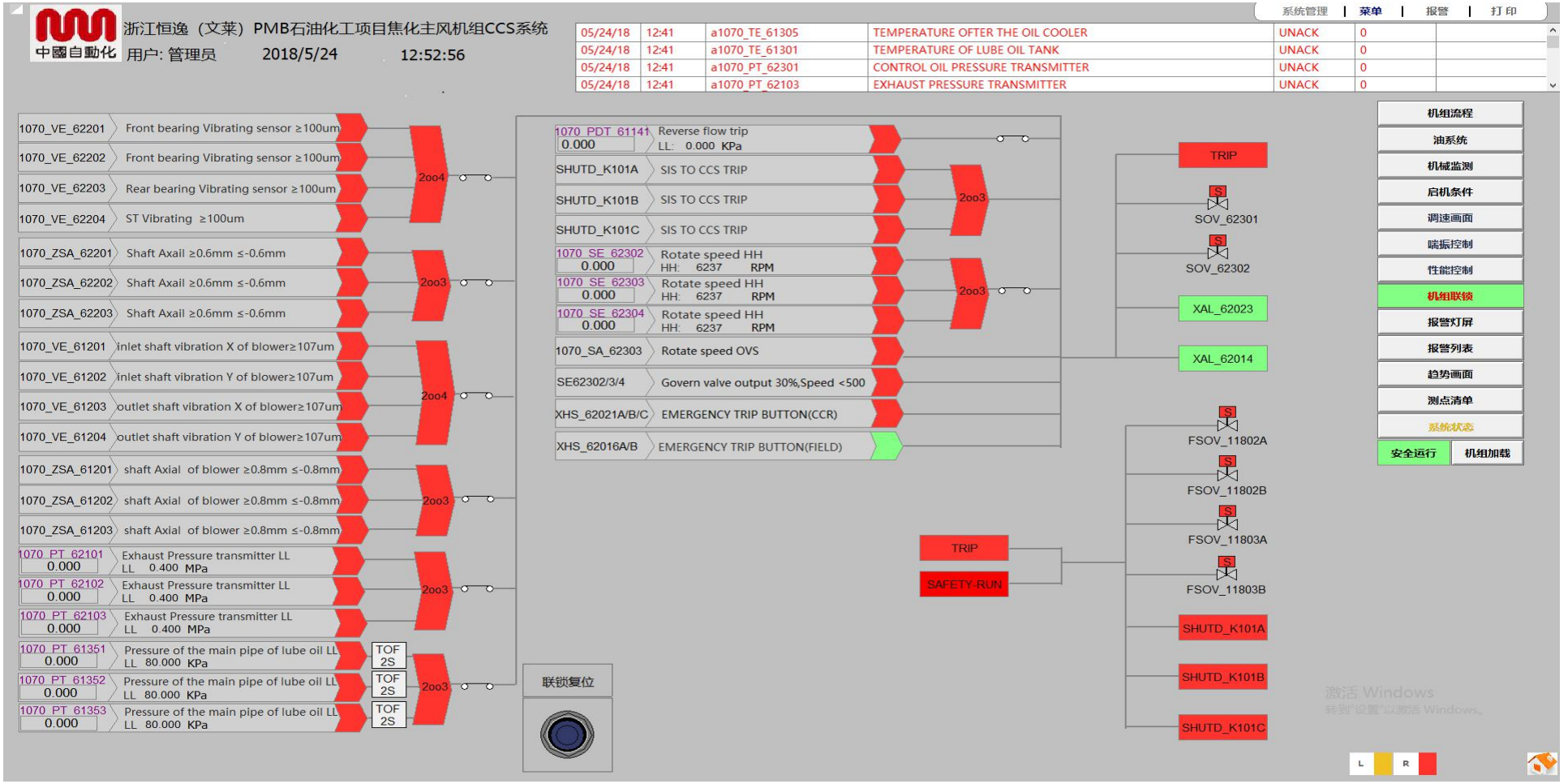


Figure 32: Interlocking logic diagram of main air blower
图 32：主风机联锁逻辑图

Figure 33: Interlocking logic diagram of Compressor -1
图 33：气压机联锁逻辑图-1

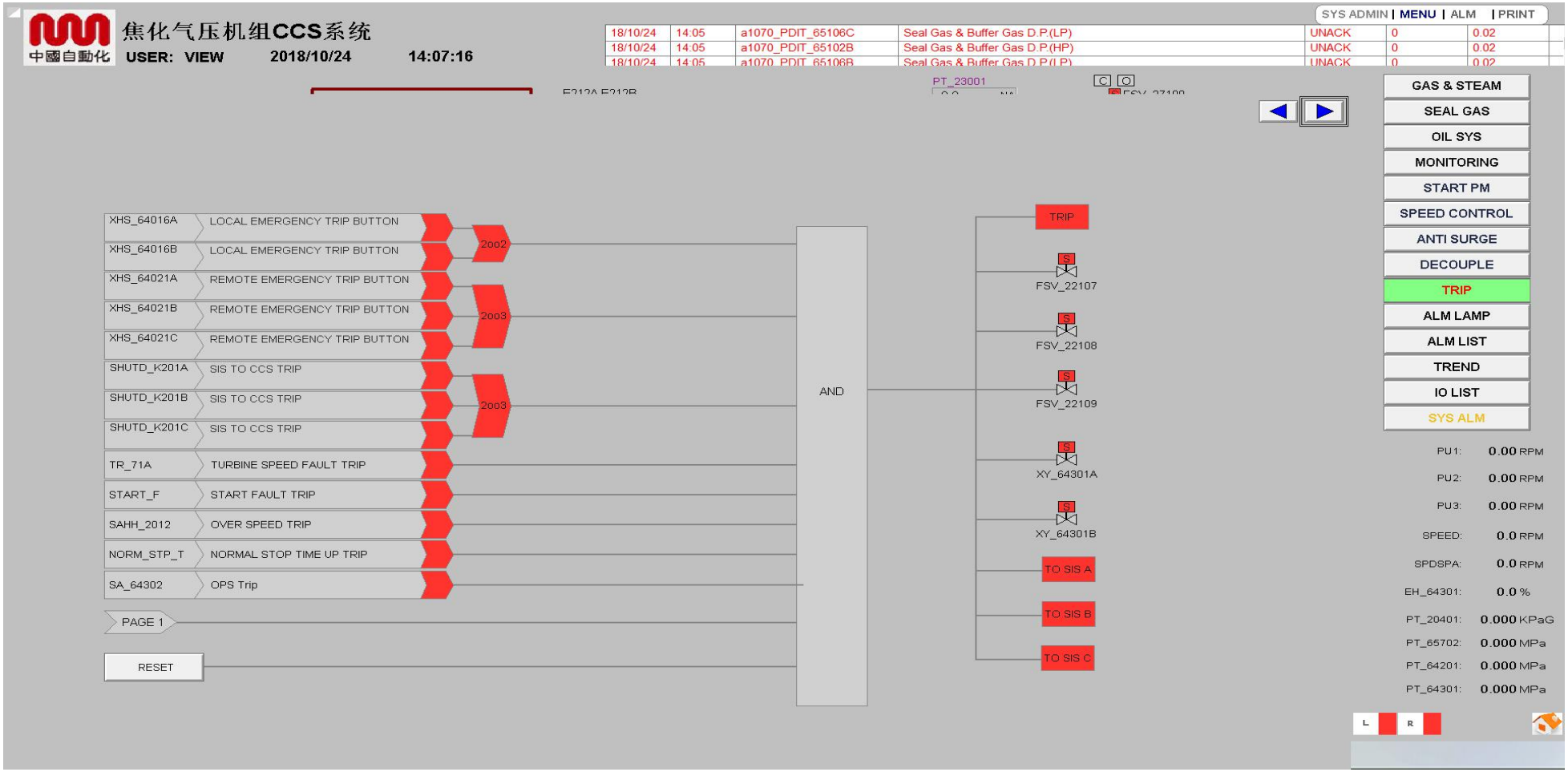


Figure 34: Interlocking logic diagram of Compressor-2
图 34：气压机联锁逻辑图-2