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

HYBN-T4-10-0002-2019-01

CDU/VDU Start-Up Plan

炼油一部开工方案

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Start-Up Plan of CDU/VDU
炼油一部开工方案

1 Overview of Unit 装置概况

According to the arrangement of the company's start-up network, No.1 Refinery Dept.'s Atmospheric and Vacuum Distillation Unit, Light Ends Recovery Unit and Acid Gas & LPG Treating unit started on 6th September 2019 and was shutdown on 14th September 2019 after the preparation of materials for downstream units (Kerosene Hydrotreating, Diesel Hydrotreating, Hydrocracking and Aromatics Complex). After shutdown, the atmospheric and vacuum distillation unit has implemented some technical renovation projects.

按公司开工网络安排，炼油一部常减压装置、轻烃回收装置、产品精制装置于 2019 年 9 月 6 日开车，为下游装置（航煤加氢、柴油精制、加氢裂化、芳烃联合）备料结束后，于 9 月 14 日停车。停车后常减压装置实施了部分技改项目。

Present situation of CDU/VDU: 1) The electric desalter D-101 and D-102 need to withdraw oil, undergo maintenance for the mixing valve and need to be filled with oil; 2) Withdraw oil from pre-distillation column and atmospheric column; 3) The atmospheric column is protected by nitrogen. Technical changes have been made to atm. 2-sidedraw and atm. 3-sidedraw gas return line in the gas stripper. Atmospheric column and gas stripper requires nitrogen displacement; 4) Maintenance of the atm. OVHD vapor/ crude oil heat exchanger E-301C and pressure test is concluded; 5) Change the vac. 4-sidedraw/ desalted crude oil heat exchanger E-510 to mixed wax oil water cooler and undergo pressure test of the pipeline. The vac. 4-sidedraw and desalted crude oil should be isolated by a plind plate; 6) Steam purge furnace tubes of atm. furnace and replace the thermocouple (temporarily installed during furnace dryout) at the furnace outlet with blind flange.

Present situation of LER Unit: After stopping the circulation, material is not discharged. System maintains pressure. There is no need to handle it before start-up.

Present situation of Acid Gas & LPG Treating Unit: After stopping the circulation, material is not discharged. System maintains pressure. There is no need to handle it before start-up.

常减压装置现状：1）电脱盐罐 D-101、D-102 退油，检修混合阀，需要装油；2）初馏塔、常压塔退油；3）常压塔蒸塔、氮气保护，汽提塔常二线、常三线段气相返回线实施技术变更，常压塔和汽提塔需要氮气置换；4）常顶油气/脱前原油换热器 E-301C 检修，试压结束；5）减四线/脱后原油换热器 E-510 改为混合蜡油水冷器，管线试压，减四线和脱后原油盲板隔离；6）常压炉炉管蒸汽吹扫，炉出口热电偶（烘炉时临时加装）更换为盲法兰。

轻烃回收装置现状：停循环后未退料，系统保压。开工前不需要处理。

产品精制装置现状：停循环后未退料，系统保压。开工前不需要处理。

2 Organization and Responsibilities 组织机构及职责

Group Leader: Zhang ChongLin

组长：张崇林

Deputy Leader: Wei ChengYao, Song YuLong

副组长：魏城瑶、宋玉龙

Process Team: Responsible person is Wei ChengYao. The team members include: Cao Qiang, Li HouLiang, Zhao Jie, Wo LunYue, Li XueQiang, Zhang Cheng. Mainly responsible for the preparation of the start-up plan, the organization of staff training on the start-up plan and undergo assessment for the staff. The relevant work on the start-up is divided. The team is organized to complete relevant works on the start-up and solutions to the problems that could exist when undergoing start-up is also proposed. Relevant responsible person is urged to implement the solutions.

工艺组：由魏城瑶负责。组员：曹强、李厚亮、赵杰、沃轮跃、李学强、张诚。 职责：主要负责编制开工方案，组织员工对开工方案的培训，并对员工进行考试，开工的相关工作进行分工，组织班组完成开工的相关工作内容，并对开工过程中存在的问题提出解决方案，并督促相关责任人落实。

Equipment Team: Responsible person is Song YuLong. The team members include: He JianGang, Qian Zhen, Zhao Jie, Wo LunYue, Li XueQiang, Zhang Cheng. Mainly responsible for the equipment inspection and maintenance, transportation system and to be responsible in establishing an inventory on equipment, must be equipped with special tools and have spare parts for certain equipment. Must also train team members on the operation of the equipment. There must be implementation of temporary measures while must resolve equipment failures and problems during start-up. Organize the construction team to work with the process team to complete relevant works of start-up.

设备组：由宋玉龙负责。 组员：何建刚、钱震、赵杰、沃轮跃、李学强、张诚。 职责：主要负责建立设备检维修、保运体系，负责建立设备台帐，配备专用工具和落实设备备品备件，对班组员工开展设备操作的培训，落实开工期间的临时措施，解决开工过程中出现的设备故障与问题，组织施工力量配合工艺组完成开工相关工作。

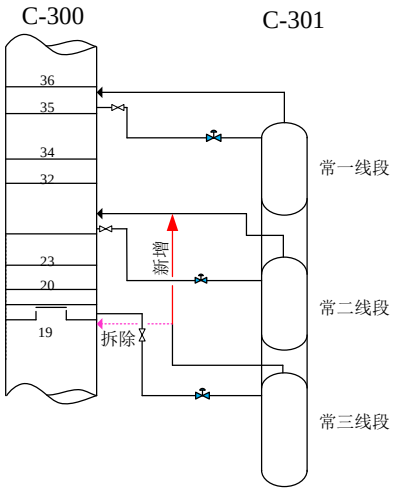
HSE Team: Responsible person is Lin Jun. The team members include: Zhao Jie, Wo LunYue, Li XueQiang, Zhang Cheng. Mainly responsible for establishing the guarantee system in HSE, organizing the implementation of safety, fire protection and occupational health protection facilities. Organize a risk assessment on start-up and establish an inventory of personal protective equipment. Organize inspection and accepatance of pressure vessels, safety accessories, fire alarm, occupational health and other safety facilities. Responsible for safety during start-up, responsible for the safety and security of

personnel and material during start-up as well as HSE works.
HSE 组：由蔺君负责。 组员：赵杰、沃轮跃、李学强、张诚. 。职责：主要负责建立开工 HSE 保证体系，组织落实安全、消防、职业卫生防护设施，组织开工的风险评估，建立安全技术台帐，配备劳动保护用品，组织检查验收压力容器、安全附件、火灾报警、职业卫生以及其它安全设施，负责开工的装置安全、现场开工人员和物质物料的安全保卫工作，对开工过程的 HSE 工作负责任。

3 Major Changes of the Project 主要变更项目

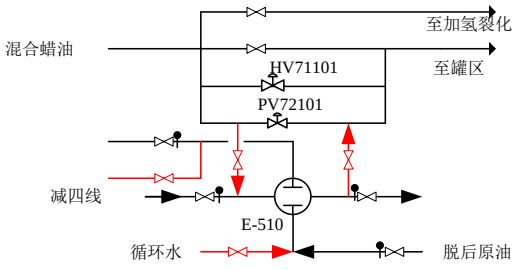
3.1 Adjustment of Gas Phase Return Port for Atm. 3-sidedraw in Stripping Column 汽提塔常三线段气相返回口调整

Gas phase return line for atm. 3-sidedraw and atm. 2-sidedraw is combined together in the stripping column. Blind plate is added to the original gas phase return port for atm. 3-sidedraw 汽提塔常三线段气相返回线与常二线气相返回线合并，原常三线气相返回口加装盲板。



3.2 Addition of vac. water cooler of vac. mixed wax oil 减压混合蜡油增减水冷器

E-510 is used as water cooler for mixed wax oil, to reduce the temperature of mixed wax oil to storage.
利用闲置的 E-510 作为混合蜡油水冷器，以降低混合蜡油至罐区的温度。



3.3 Process Index Changes 工艺指标变更

The temperature of mixed wax oil to storage is adjusted from 115-135℃ to 90-110℃.
The temperature of mixed diesel to storage is adjusted from 40-60℃ to 30-50℃.
The temperature of residual oil to storage is adjusted from 140-180℃ to 110-160℃.
混合蜡油至罐区温度由 115-135℃调整为 90-110℃
混合柴油至罐区温度由 40-60℃调整为 30-50℃
渣油至罐区温度由 140-180℃调整为 110-160℃

4 Preparation Works for Start-Up 开工准备工作

4.1 Detailed disclosure of the start-up plan, on-site technical training activities, training of operation staff in process, equipment, instruments, safe operation and other aspects. All personnel involved in the start-up plan should be familiar with the start-up plan and aware of clear procesures so as to ensure safe, stable and high quality start-up, do all the preparations before start-up and do a good job in the identification of start-up risks.
对开工方案进行详细交底，开展现场技术练兵活动，对操作员工进行工艺、设备、仪表以及安全操作等方面知识的培训，要使所有参与开工方案的人员对开工方案熟悉，步骤清楚，以确保安全、平稳、优质开工，做好开工前各项准备工作，做好开工风险识别工作
4.2 Prepare the operation records, shift records and process cards for each post
准备好各岗位操作记录，交接班本，工艺卡片
4.3 Arrange the start-up personnel well
安排好开工人员
4.4 Prepare the fire- and gas-fighting facilities well
准备好消气防器材
4.5 Prepare the ignition rods and tools well
准备好点火棒及点火工具
4.6 Ensure sufficient demulsifier, low temperature corrosion inhibitor, high temperature corrosion inhibitor, neutralizing inhibitor and other agents
破乳剂、低温缓蚀剂、高温缓蚀剂、中和剂等药剂足够使用
4.7 Confirm that the cold and hot residual oil line, cold and hot wax oil line and crude oil to ISBL are unblocked
确认冷热渣油线、冷热蜡油线、原油进装置线畅通
4.8 All the equipment are in good condition and in normal standby condition
各设备检查完好，处于正常备用中

5 Overall Planning of Start-Up Progress 开工进度统筹

5.1 CDU/VDU 常减压装置

Table 1 Start-Up Schedule of CDU/VDU

表 1 常减压装置开工进度表

Date 日期	Item 项目	Remarks 备注
First day of start-up 开工第一天	Unit introduces crude oil in a closed circulation 装置引原油闭路循环	
Second day of start-up 开工第二天	Ignite the furnace and increase temperature. Constant temperature dehydration at 150℃ for 8 hours 加热炉点火升温，150℃恒温脱水 8 小时 Increase temperature to 250℃ for hot bolting 升温至 250℃局部热紧	
Third day of start-up 开工第三天	Increase temperature and switch crude oil to start sidedraw 升温切换原油开侧线	
Fourth day of start-up 开工第四天	Product quality adjustment and load adjustment 产品质量调整，负荷调整	

5.2 LER Unit 轻烃回收装置

Table 2 Start-Up Schedule of LER Unit

表 2 轻烃回收装置开工进度表

Date 日期	Item 项目	Remarks 备注
Second day of start-up 开工第二天	Unit is in a closed circulation 装置闭路循环	
Third day of start-up 开工第三天	Put 1.0MPa steam hot circulation of E-630R into service 投用 E-630R1.0MPa 蒸汽装置热循环	
Fourth day of start-up 开工第四天	Introduce naphtha for start-up 引石脑油开工	

5.3 Acid Gas & LPG Treating Unit 产品精制装置

Table 3 Start-Up Schedule of Acid Gas & LPG Treating Unit

标 3 产品精制装置开工进度表

Date 日期	Item 项目	Remarks 备注
First day of start-up 开工第一天	Introduce amine for circulation 引胺液循环	
First day of start-up 开工第一天	Establish caustic for circulation 碱液建立循环	
Fourth day of start-up 开工第四天	Introduce LPG for start-up 引液化气开工	2 hours 2 小时

6 Crude Oil Processing Plan 计划加工原油

Table 4 List of Crude Oil Processing Ratio

表 4 原油加工比例一览表

Nampe 名称	Sulfur content 硫含量 wt%	API°	Acidity value 酸值	First until third day of start-up 开工第一天至第三天	Fourth day of start-up 开工第四天	Fifth day of start-up 开工第五天	Sixth day of start-up 开工第六天
Seria 诗里亚	0.07	39.00	0.21	34.00%	25.00%	25.00%	20.00%
CPC	0.56	43.00	0.06		25.00%	25.00%	25.00%
Zafiro 扎菲洛	0.25	30.20	0.74			5.00%	5.00%
Upper Zakum 阿布扎库母	1.10	39.70	0.07	66.00%	50.00%	45.00%	45.00%
Light Basra 巴士拉轻	2.92	30.20	0.01				10.00%

7 Analysis Plan 分析计划

7.1 CDU/VDU analysis project 常减压分析项目

Table 5 Product Quality Temporary Analysis Items for Start-Up of CDU/VDU

表 5 常减压装置开工期间产品质量临时分析项目一览表

Name 名称	Pre-dist. OVHD oil 初顶油	Atm. OVHD oil 常顶油	Kerosene 常一线				Heavy diesel 常三线	Mixed diesel 混合柴油	Mixed wax oil 混合蜡油		Vac. residual oil 减压渣油
Item 项目	Distillation range dry point 馏程干点	Distillation range dry point 馏程干点	Density 密度	Distillation range dry point 馏程干点	Flash point 闪点	Freezing point 冰点	95% point 95%点	95% point 95%点	Final boiling point 终馏点	Carbon residue 残炭	Carbon residue 残炭
Unit 单位	℃	℃	mg/m3	℃	℃	℃	℃	℃	℃	m%	m%
Index 指标	≤175	≤175	776～839	≤260	≥40	≤-49	≤358	≤365	≤560	≤0.3	17-23
Frequency 频次	Once/ 2 hours 1 次/2 小时	Once/ 2 hours 1 次/2 小时	Once/ 2 hours 1 次/2 小时	Once/ 2 hours 1 次/2 小时	Once/ 2 hours 1 次/2 小时	Once/ 2 hours 1 次/2 小时	Once/ 2 hours 1 次/2 小时	Once/ 2 hours 1 次/2 小时	Once/ 2 hours 1 次/2 小时	Once/ 2 hours 1 次/2 小时	Once/ day 1 次/天

Note: The product has passed the test at two consecutive points and the analysis frequency was changed to follow the company's distillate output inspection plan

说明：产品连续两个点合格，分析频次改为按公司馏出口检验计划执行

7.2 LER Unit 轻烃回收装置

Table 6 Product Quality Temporary Analysis Items for Start-Up of LER Unit

表 6 轻烃回收装置开工期间产品质量临时分析项目一览表

Name 名称	Stabilized naphtha 稳定石脑油	Absorber dry gas 吸收干气	Stabilizer LPG 稳定塔液化气	Remarks 备注
Item 项目	Distillation range dry point 馏程干点	C_3 and above components C_3 及以上组分	C_5 and above components C_5 及以上组分	
Unit 单位	℃	V%	V%	
Index 指标	≤175	≤5	≤1.9	
Frequency 频次	Once/ 2 hours 1 次/2 小时	Once/ 2 hours 1 次/2 小时	Once/ 2 hours 1 次/2 小时	

Note: The product has passed the test at two consecutive points and the analysis frequency was changed to follow the company's distillate output inspection plan

说明：产品连续两个点合格，分析频次改为按公司馏出口检验计划执行

7.3 Acid Gas & LPG Treating Unit 产品精制装置

Table 7 Product Quality Temporary Analysis Items for Start-Up of Acid Gas & LPG Treating Unit

表 7 产品精制装置开工期间产品质量临时分析项目一览表

Name 名称	Purified saturated dry gas 净化饱和干气	Purified saturated LPG 净化饱和液化气	Remarks 备注
Item 项目	H_2S content 硫化氢含量	Mercaptan content 硫醇硫含量	
Unit 单位	mg/m^3	mg/m^3	
Index 指标	≤8	≤20	
Frequency 频次	Once/ 2 hours 1 次/2 小时	Once/ 2 hours 1 次/2 小时	

Note: The product has passed the test at two consecutive points and the analysis frequency was changed to follow the company's distillate output inspection plan

说明：产品连续两个点合格，分析频次改为按公司馏出口检验计划执行

8 Start-Up Materials and Path 开工物料及走向

8.1 CDU/VDU 常减压装置

Table 8 List of Materials and Paths of CDU/VDU during Start-Up

表 8 常减压装置开工期间物料及走向一览表

No. 序号	Name 名称	Path 走向	Flowrate 流量（t/h）	Estimated total 预计总量(T)	Remarks 备注
1	Crude oil 原油	Enter unit 进装置	650		Continuous 连续
2	Pre-dist. OVHD naphtha 初顶石脑油	Light slop oil line 轻污油线	95	475	After it is qualified, change to enter LER 合格后改进轻烃回收
3	Atm. OVHD naphtha 常顶石脑油	Light slop oil line 轻污油线	80	400	After it is qualified, change to enter LER 合格后改进轻烃回收
4	Kerosene 常一线	Light slop oil line 轻污油线	87	435	After it is qualified, change to qualified tank 合格后改合格罐
5	Light diesel 常二线	Light slop oil line 轻污油线	80	400	After it is qualified, change to qualified tank 合格后改合格罐
6	Heavy diesel 常三线	Light slop oil line 轻污油线	95	475	After it is qualified, change to qualified tank 合格后改合格罐
7	Mixed wax oil 混合蜡油	High temperature heavy slop oil 高温重污油	92	460	After it is qualified, change to qualified tank 合格后改合格罐
8	Vac. residue 减压渣油	High temperature heavy slop oil 高温重污油	120	600	When it is below 60℃, enter crude oil tank 低于 60℃进原油罐

8.2 LER Unit 轻烃回收装置

Table 9 List of Materials and Paths of LER Unit during Start-Up

表 9 轻烃回收装置开工期间物料及走向一览表

No. 序号	Name 名称	Path 走向	Flowrate 流量（t/h）	Estimated total 预计总量（T）	Remarks 备注
1	Stabilized naphtha 稳定石脑油	Light slop oil line 轻污油线	170 t/h	510T	After it is qualified, change to qualified tank 合格后改合格罐
2	Absorber dry gas 吸收干气	Flare system 火炬系统	200～500m^3/h	600～1500m^3/h	After it is qualified, change to Acid Gas & LPG Treating 合格后改产品精制
3	Stabilizer LPG 稳定塔液化气	Flare system 火炬系统	1～2t/h	2～3t/h	After it is qualified, change to Acid Gas & LPG Treating 合格后改产品精制

8.3 Acid Gas & LPG Treating Unit 产品精制装置

Table 10 List of Materials and Paths of Acid Gas & LPG Treating Unit during Start-Up

表 10 产品精制装置开工期间物料及走向一览表

No. 序号	Name 名称	Path 走向	Flowrate 流量（t/h）	Estimated total 预计总量（T）	Remarks 备注
1	Purified saturated dry gas 净化饱和干气	Flare system 火炬系统	20～500m^3/h	600～1500m^3/h	After it is qualified, change to enter system 合格后改进系统
2	Purified saturated LPG 净化饱和液化气	Unqualified LPG tank 不合格液化气罐	1～2t/h	2～3t/h	After it is qualified, change to qualified tank 合格后改合格罐

9 Utilities 公用工程

9.1 CDU/VDU 常减压装置

Table 11 List of Utility Consumption of CDU/VDU

表 11 常减压装置公用工程用量一览表

No. 序号	Name 名称	Unit 单位	Consumption 用量	Remarks 备注
1	Fuel gas 燃料气	Nm^3/h	9738	Continuous 连续
2	Circulating water 循环水	t/h	1909	Continuous 连续
3	1.0MPa steam 1.0MPa 蒸汽	t/h	9.4	Continuous 连续
4	0.5 MPa steam 0.5MPa 蒸汽	t/h	3.5	Continuous 连续
5	Electricity 电	kWh	3615.3	Continuous 连续
6	Demineralized Water 除盐水	t/h	55	Continuous 连续
7	Nitrogen 氮气	Nm^3/h	300	Continuous 连续

9.2 LER Unit 轻烃回收装置

Table 12 List of Utility Consumption of LER Unit

表 12 轻烃回收装置公用工程用量一览表

No. 序号	Name 名称	Unit 单位	Consumption 用量	Remarks 备注
1	Circulating water 循环水	t/h	590	Continuous 连续
2	1.0MPa steam 1.0MPa 蒸汽	t/h	6	Continuous 连续
3	Electricity 电	kWh	951.8	Continuous 连续
4	Refrigerated water 冷冻水	t/h	156	Continuous 连续

5	Nitrogen 氮气	Nm^3/h	86	Continuous 连续
6	Condensate 凝结水	t/h	5.8	Continuous 连续

9.3 Acid Gas & LPG Treating Unit 产品精制装置

Table 13 List of Utility Consumption of Acid Gas & LPG Treating Unit

表 13 产品精制装置公用工程用量一览表

No. 序号	Name 名称	Unit 单位	Consumption 用量	Remarks 备注
1	Electricity 电	kWh	300	Continuous 连续
2	Nitrogen 氮气	Nm^3/h	45	Continuous 连续
3	Plant air 工厂风	Nm^3/h	165	Continuous 连续
4	Circulating water 循环水	t/h	679	Continuous 连续
5	Demineralized water 除盐水	t/h	30	Interruption 间断

10 Start-Up Procedures 开工步骤

10.1 Introduce utilities 公用工程引入

10.1.1 Introduce instrument air (already introduced)

仪表风引入（已引入）

10.1.2 Introduce plant air (already introduced)

工厂风引入（已引入）

10.1.3 Introduce circulating water (already introduced)

循环水引入（已引入）

10.1.4 Introduce industrial water (already introduced)

工业水引入（已引入）

10.1.5 Introduce domestic water (already introduced)

生活水引入（已引入）

10.1.6 Introduce 0.6MPa nitrogen (already introduced)

0.6MPa 氮气引入（已引入）

10.1.7 Introduce 1.0MPa steam (already introduced)

1.0MPa 蒸汽引入（已引入）

10.1.8 Introduce demineralized water (already introduced)

除盐水引入（已引入）

10.1.9 Introduce 0.5MPa steam

0.5MPa 蒸汽引入

1）Close the 0.5MPa superheated steam branch to C-300, C-301 and C-400 column bottom stripping steam valve.

关闭 0.5MPa 过热蒸汽分支至 C-300、C-301、C-400 塔底汽提蒸汽阀。

2）Open 0.5MPa superheated steam F-301 vent valve

开 0.5MPa 过热蒸汽 F-301 放空阀

3）Open the front and back hand valves of control valves PIC-82102 and TIC-30202, and close the auxiliary line valve

开控制阀 PIC-82102 和 TIC-30202 前后手阀，关副线阀

4）When steam is seen at the front water discharge valve of 0.5MPa steam entering the unit, open the boundary valve and discharge water at D-822 until steam is seen

0.5MPa 蒸汽进装置阀前开导淋排水见汽后，开界区阀，在 D-822 排水见汽。

5）Introduce steam at PIC-82102 to drain water until steam is seen.

引汽分别在 PIC-82102 导淋排水见汽

6）After steam is seen from the F-301 furnace OVHD vent, control pressure of PIC-82102 at 0.4MPa.

F-301 炉顶放空见汽后，控制压力 PIC-82102 在 0.4MPa

7）Introduce steam to the front of C-300, C-301 and C-401 column bottom stripping steam valves and drain the liquid until steam is seen.

引汽至 C-300、C-301、C-400 塔底汽提蒸汽阀前导淋放空见汽.

Note: During introduction of steam, the speed of introducing steam should be controlled and the steam should be slowly introduced to warm the pipe to avoid water hammer in the pipeline.

注意事项：引汽时要控制引汽速度，缓慢引入进行暖管，避免管线水击

10.2 Local System Process Treatment 局部系统工艺处理

10.2.1 Atmospheric Furnace 常压炉

1）After steam purging of the atmospheric furnace is completed, stop steam and after the steam pressure is reduced to 0.3MPa, change to nitrogen gas.

常压炉蒸汽吹扫结束后，停蒸汽，蒸汽压力降低至 0.3MPa 以后，改为氮气。

2）After nitrogen displacement, remove the thermocouple that was temporarily installed

during furnace dryout and replace it with blind flange.
氮气置换结束后，拆除烘炉时临时加装的热电偶，更换为盲法兰。
3）Continue supply nitrogen to atmospheric column for displacement.
继续给氮气往常压塔置换。

10.2.2 Atmospheric Column and Stripping Column 常压塔和汽提塔

1）By using the furnace tubes of the atmospheric column, undergo nitrogen displacement for the atmospheric column.
利用常压炉炉管置换的氮气置换常压塔。
2）Nitrogen displacement for stripping column's atm. 1-sidedraw section.
汽提塔常一线段给氮气置换。
3）Change the atm. column OVHD D-301 drum to vent and close the to flare gas section.
常压塔塔顶 D-301 罐顶改为放空，至火炬气关。
4）Open the vents of stripping column's atm. 2- and 3-sidedraw to discharge gas.
汽提塔常二线、常三线段底部放空打开排气。
5）After D-301 drum OVHD sampling analysis is qualified, stop nitrogen displacement.
D-301 罐顶采样分析合格后，停止氮气置换。

10.2.3 Mixed Wax Oil Line 混合蜡油线

1）E-510 vac. 4-sidedraw and desalted crude oil lines are isolated using blind plates.
E-510 减四线、脱后原油线盲板隔离。
2）E-510 vac. 4-sidedraw and desalted crude oil lines will be supplied with steam for the steam pressure test.
E-510 原减四线、脱后原油扫线蒸汽给蒸汽试压。

10.3 Introduce Fuel Gas 引燃料气

1）Dismantle every fuel gas hoses of F-301 and F-401 burners.
拆下 F-301、F-401 各燃烧器燃料气软管
2）Put D-861 steam coil into service with steam.
投用 D-861 蒸汽盘管蒸汽
3）Slowly open the valves of fuel gas to ISBL and control the fuel gas pressure at about 0.35MPa.
缓慢打开燃料气进装置界区阀门，控制燃料气压力在 0.35MPa 左右

10.4 Introduce sealing oil (already introduced) 引封油（已引入）

10.5 Introduce crude oil to establish a closed circulation 引原油建立闭路循环

1）Contact electrical department to send electricity to all pumps and blowers.
联系电气各机泵、风机送电
2）Contact dispatch and port and storage department to start the crude oil pump.
联系调度、港储部启动原油泵
3）Slowly open the crude oil valves at the B.L. and the crude oil flowrate passing through the heat exchanger system to electric desalters D-101 and D-102 should be controlled at 400t/h.
缓慢打开界区原油阀门，经脱前换热系统至电脱盐罐 D-101、D-102,控制进油流量 400t/h
4）When oil is seen from the D-101 and D-102 OVHD vent, close the vent and after the desalted crude oil passes through the heat exchanger system, load the oil to pre-dist. column C-200.
D-101、D-102 顶部放空见油关阀，经脱后换热系统装油至初馏塔 C-200
5）When the liquid level of C-200 column bottom reaches 80%, start P-230 and let the crude oil pass through 3 stages of the heat exchanger system and enter atmospheric furnace F-301 to atmospheric column C-300.
C-200 塔底液位装至 80%，启动 P-230 经原油三段换热系统进常压炉 F-301 至常压塔 C-300
6）When the liquid level of C-300 column bottom reaches 70%, start P-330 and pass through vacuum furnace to vacuum column C-400.
C-300 塔底液位装至 70%，启动 P-330 经减压炉至减压塔 C-400
7）When the liquid level at the bottom of C-400 reaches 60%, start P-430 and oil is discharged from the crossover of vacuum residual oil heat exchanger to slop oil discharge line and then to the crude oil storage tank.
C-400 塔底液位装置 60%，启动 P-430 经减压渣油换热系统跨至污油退油至原油罐区甩油 20 分钟
8）Contact dispatch and port and storage department to stop the crude oil pump and change the unit a closed circulation.
联系调度、港储部停原油泵，装置改闭路循环

10.6 Ignition and Increase Temperature to 150℃ for Constant Temperature during Dehydration Stage 点火升温 150℃恒温脱水阶段

1）Contact the quality inspection department to sample and analyse if F-301 and F-401 furnace chambers' oxygen content is ＜21% and the hydrocarbon content is ＞0.5%.
联系质检部采样分析 F-301、F-401 炉膛氧含量＜21%，烃含量＞0.5%
2）Open the natural ventilation doors of F-301 and F-401 and open PIC-86930 and

PV-86908A/B. Control the furnace chamber pressure at -20~-50Pa.
打开 F-301、F-401 自然通风门，打开 PIC-86930 和 PV-86908A/B、PV-86918A/B 控制炉膛在-20～-50Pa
3）Follow according to the furnace operation steps and requirements.
按点炉操作步骤和要求点炉
4）Increase the temperature to 150℃ at a rate of 40℃/h~50℃/h for constant temperature dehydration.
按 40℃/h～50℃/h 速度升温至 150℃恒温脱水
5）If the liquid level of three columns is lower than 35%, contact dispatch and port and stoprage department to replenish oil.
三塔液位低于 35%联系调度、港储部补油
6）Pre-heat the column bottom pump and switch the standby pump once.
塔底泵预热，并切换备用泵一次。

10.7 Increase Temperature to 250℃ for Constant Temperature during Hot Bolting Stage
升温至 250℃恒温热紧阶段

1）The temperature of the atmospheric furnace is increased to 250℃ at a rate of 40℃/h.
常压炉以 40℃/小时的速度升温至 250℃。
2）Organize personnel to engage in hot bolting the required sections during this shutdown.
组织人员对本次停车期间，检修过的部位进行热紧。
3）After the hot bolting is completed, contact dispatch to introduce the start-up diesel from port and storage department. Fill the oil in the vac. 1-, 2- and 3- sidedraw oil sumps.
热紧结束后，联系调度，从港储引开工柴油，将减一线、减二线、减三线集油箱收满。
4）Arrange the shift team to drain water from the low point vents of atm. PA, atm. sidedraw and vac. sidedraw pumps.
安排班组常压中段回流、常压侧线、减压侧线泵低点排水。
5）Switch the standby pumps once.
切换备用泵一次。

10.8 Raising Temperature during Circulation, Changing Crude Oil to an Open Circulation and Start-Up Atmospheric System 循环升温，切换原油改开路，常压系统开工

1）After there are no problems with the constant temperature hot bolting, the two furnaces should start to raise the temperature again.
恒温热紧无问题后，两炉再次开始升温
2）The outlet temperature of F-301 is increased to 320℃ at a rate of 40℃/h~50℃/h. F-401 should be properly ignited to maintain the outlet temperature of the vacuum furnace at

around 300℃.

F-301 出口温度以 40℃/h～50℃/h 速度升温至 320℃，F-401 适当点火，维持减压炉出口温度在 300℃左右

3）When the pre-dist. OVHD temperature is higher than 150℃ and the atm. OVHD temperature is higher than 150℃, start the OVHD reflux and control the column OVHD temperature to 110-150℃.

当初顶温度高于 150℃、常顶温度高于 150℃时，开始打顶回流，控制塔顶温度 110-150℃。

4）In accordance with the column OVHD load conditions, put the atm. OVHD circulation into service.

视塔顶负荷情况投用常顶循

5）According to the condition of the two furnaces, increase the amount of the fire nozzles, start the blower, the two furnaces are switched to forced ventilation, the flue gas of the two furnaces should go through the air preheater and the induced draft fan and be discharged to the stack.

两炉视情况适当增点火嘴，开引送风机，两炉改强制通风，两炉烟气改经空气预热器、引风机排往烟囱

6）If the liquid level of the three columns drops, contact crude oil storage and the unit will receive crude oil; contact dispatch and send the residual oil to storage. Pay attention to control the temperature of the residual oil to OSBL well; After the residual oil is changed to an open circulation, control the crude oil amount to ISBL at 650t/h. Pay attention to adjusting the flowrates of the eight routes of the two furnaces well and control the liquid level of the three columns, and stop one of the vac. residue pump at the correct timing.

若三塔液位下降，联系原油罐区，装置收原油；联系调度，渣油改外送至罐区，注意控制好渣油出装置温度；改收原油、渣油开路后，进装置原油量按 650t/h 控制，注意调整两炉八路流量并控制好三塔液位，适时停一台减压渣油泵

7）When the superheated steam reaches 250℃, start the atm. column bottom stripping steam.

当过热蒸汽达 250℃，开常压塔底汽提蒸汽

8）Start the PA reflux of the atm. column from the upper part to the bottom. After there is liquid level in each sidedraw of the stripping column, start the sidedraw pump respectively and the light slop oil is sent to OSBL. At the same time, sampling and analysis are carried out and after it is qualified, request instructions from dispatch.

常压塔自上而下开各中段回流，各侧线汽提塔有液面后分别启动侧线泵，走轻污油线出装置，同时采样分析，合格后请示调度

9）After atm. 2# PA is normal, atm. 1-sidedraw reboiler can be started.

常二中开正常后，可启用常一线重沸器

10）The panel operator should pay close attention to the temperature changes at various points of the vacuum column and when the OVHD temperature is higher than 120℃, start

the vac. 1-sidedraw pump for reflux and control the OVHD temperature well.
内操要密切注意减压塔的各点温度变化，顶温大于 120℃时启动减一线泵打回流控制好顶温

10.9 Vacuum Ejector and Start Vacuum Sidedraw 减压抽真空，开减压侧线

1）After the atmospheric column is normal, raise the temperature of the vacuum furnace uniformly to 385℃ at a rate of 40℃/h~50℃/h (depending on the condition of the vac.column, it can be appropriately increased.
常压塔基本正常后，减压炉开始按 40℃/h～50℃/h 速度均匀升温至 385℃（视减压塔情况可适当提高）
2）When the outlet temperature of F-401 reaches 330℃~350℃, adjust the circulating water consumption of EJ-411, EJ-421 and EJ-431, and put the third-stage ejector into service. After the vacuum degree is stable, put the second-stage ejector into service again. After the vacuum degree is stable, put the first-stage ejector into service. Pay attention to slowly increase the vacuum degree during the vacuum column ejecting process and start the sidedraw pump to establish the PA reflux timely to control the temperature of each point of the vacuum column.
当 F-401 出口温度达 330℃～350℃时，调整好 EJ-411、EJ-421、EJ-431 循环水用量，投用三级抽真空器，待真空度稳定后，再投用二级抽真空器，真空度稳定后投用一级抽真空器，减压塔抽真空过程中注意缓慢提高真空度，及时启动侧线泵打中段回流控制好减压塔各点温度
3）According to the conditions of the liquid level of D-401, start the vac. OVHD oil pump and water pump timely to discharge oil, water and to prevent the drum from caving.
视 D-401 液面情况及时启动减顶油泵及水泵向外排油、排水，防止冒罐
4）Depending on the liquid level of every sidedraw oil sump of the vac. column, send an appropriate amount of wax oil to storage. Adjust the water circulation amount of E-510 and control the temperature of the wax oil to OSBL well to be ≯110℃.
视减压各侧线集油箱液面情况可适量将蜡油送至罐区，调整 E-510 循环水量，控制好蜡油出装置温度≯110℃
5）Put the quench oil of vac. column C-400 into service and control the vac. bottom extraction temperature to be not higher than 360℃ to avoid coking.
及时投用减压塔 C-400 急冷油，控制减底抽出温度不大于 360℃，避免发生结焦

10.10 Operation Adjustment 调整操作

1）Adjust the heat extraction ratio of the OVHD reflux and PA circulation reflux of the atmospheric column to increase the heat extraction ratio at high temperature as much as possible.

调整常压塔顶回流、中段循环回流取热比例，尽可能提高高温位取热比例

2）Adjust the heat extraction ratio of the vac. column PA circulation reflux to increase the heat extraction ratio at high temperature as much as possible.

调整减压塔中段循环回流取热比例，尽可能提高高温位取热比例

3） Contact dispatch to implement the product quality control plan. After the sidedraw yields product, the quality inspection should sample and analyze it once every 2 hours. After two consecutive samples passed the analysis and are qualified, timely contact dispatch to change the product to go to qualified line to OSBL.

联系调度落实产品质量控制方案。侧线出产品后，即通知质检采样分析，每 2h 一次，连续两个样分析合格后，及时联系调度将产品改走合格线出装置

4）Adjust the flame to stabilize the outlet temperature of the atmospheric and vacuum furnaces and continue to increase the ignition of the fire nozzles of the two furnaces so that more nozzles with have short and even flames. After wax oil is qualified, contact dispatch and change to the qualified line to OSBL.

调整火焰使常、减压炉出口温度稳定，两炉继续增点火嘴，做到多嘴、短焰、齐火苗，蜡油合格后联系调度改走合格线出装置

5）Adjust the temperature, pressure and flowrate to its normal condition according to the process index and quality analysis conditions. Stabilize the flowrate and temperature of each sidedraw and contact instrument to calibrate all the instruments that are being used.

将温度、压力、流量按工艺指标及质量分析情况调整正常，稳定各侧线流量、温度，联系仪表校准所有在用仪表

6）Start the light HC compressor and change the pre-dist. and atm. non-condensable gas to the light HC compressor and send it to the LER Unit.

启轻烃压缩机，将初、常不凝气改至轻烃压缩机送往轻烃回收装置

7）Put the C-410 into service to introduce the vac. OVHD non-condensable gas to enter D-862 and into the atm. furnace burners.

投用 C-410 将减顶不凝气改进 D-862 引入常压炉燃烧器

10.11 LER Unit 轻烃回收装置

1）Check that the process flow of the unit is in a normal state.

检查装置流程处于正常状态

2）Put the refrigerated water of E-615 into service.

投用 E-615 冷冻水

3）Check the condensate flow and change the condensate to D-110.

检查凝结水流程，将凝结水改至 D-110

4）Introduce 1.0MPa steam to E-630 and put the desorber column bottom reboiler into service to raise temperature circulation.

引 1.0MPa 蒸汽至 E-630 投用脱吸塔塔底重沸器循环升温

5）After the CDU/VDU atm. 2# PA is normal, put E-640R/S into service.

常减压常二中正常后投用 E-640R/S

6）After the CDU/VDU pre-dist. and atm. naphtha is qualified, introduce it to LER.

常减压初常顶石脑油合格后，引入轻烃回收

7）Continue to raise the temperature for desorber and stabilizer and follow in accordance to the normal process index.

脱吸塔、稳定塔底继续升温，按正常工艺指标控制

8）Control the desorber column OVHD temperature to be ≯55℃.

控制脱吸塔塔顶温度≯55℃

9）At the early stage of start-up, the unqualified dry gas and LPG can be discharged to the flare pipe netwok and not to OSBL.

开工前期干气、液化气质量不合格，可排至火炬管网不外送

10）After the dry gas and LPG is qualified, it should be changed to Acid Gas & LPG Treating timely.

干气、液化气质量合格后及时改至产品精制

10.12 Start-Up of Light Hydrocarbon Compressor 轻烃压缩机开工

1）Check whether anchor bolts and counter wheel bolt of the machine are fastened, whether the air, water and oil system are completely connected, whether there is leakage and whether the valve switch is flexible

检查机组地脚螺栓、对轮螺栓是否紧固，气路、水路、油路系统是否连接完全，有无泄漏，阀门开关是否灵活

2）Check whether instrument air, electricity, circulation water, nitrogen, etc. is normal. Open all pressure switch, pressure gauge, pressure transmitters, level gauges and all the valves leading to instrument.

确认仪表风、电、循环水、N_2等是否正常，打开系统上各压力开关、压力表、压力变送器、液位计及所有通向仪表的阀门

3）Open the nitrogen differential pressure valve at the nitrogen seal of each stage.

打开去各级氮气密封处的氮气差压阀

4）Rotate the shaft of the machine for 2~3 rotations.

机组、辅油泵盘车 2 圈～3 圈

5）Open the upstream and downstream valves of each pressure control valves of all stages of the machine circuits and close the auxiliary line valves.

打开机组各级回路压控阀前后手阀，关闭其付线阀

6）The 1st PA outlet return to 1st PA inlet and 2nd PA outlet return to 1st PA inlet's reflux control valves and the temperature control valve at the outlet of the first and second stage

compressor can operate and should be checked; the front and rear hand valves of the control valves should be fully opened and the bypass line should be closed

一回一、二回一循环回流控制阀和两级压缩机出口的温控阀投手动，并进行校验；控制阀前后手阀全开，副线阀关闭

7）Open the inlet and outlet valves of the lubricating auxiliary oil pump and put the outlet safety valve of the oil pump into service.

打开润滑辅油泵出入口阀，投用油泵出口安全阀

8）Start the lubricating oil pump, check the differential pressure of the oil filter, adjust the automatic regulating valve on the lubricating oil circuit and control the pressure of the lubricating oil main pipeline after the filter at around 0.4MPa.

启动润滑油泵，检查油滤器压差，调节润滑油回路上的自力式调节阀，控制过滤器后润滑油总管压力在 0.4MPa 左右

9）Adjust the oil pressure at each lubricating oil injection point to the appropriate level.

调节各润滑油注入点油压至合适

10）Check whether the compressor interlock system is normal and press the button that allows the compressor to start.

检查压缩机联锁系统是否正常，按下允许启动压缩机按钮

11）Start the main motor to make the compressor run for a period of time under the condition of no load.

启动主机，使压缩机在空负荷情况下运转一段时间

12）After normal operation, gradually close the 1st PA outlet return to 1st PA inlet and 2nd PA outlet return to 1st PA inlet's reflux control valves and pay attention to the operation conditions, current, vibration, flowrate, temperature and pressure of the machine during adjustment.

运转正常后，逐步关闭一回一、二回一循环回流阀，调整中要注意机组运转情况，电流、振动、流量、温度及压力情况

10.13 Acid Gas & LPG Treating Unit 产品精制装置

1）Contact dispatch and No. 4 Refinery Department to start P-101 and P-102 to establish amine circulation.

联系调度、炼油四部启动 P-101、P-102 建立胺液循环

2）Start P-201 and P-204 to establish caustic circulation.

启动 P-201、P-204 建立碱液循环

3）Start P-202 to establish demineralized water circulation.

启动 P-202 建立除盐水循环

4）Control the liquid level and interface level of C-101 and C-102 well within the process index.

控制好 C-101、C-102 液位、界位在工艺指标内

5）The unqualified dry gas from the early stage of start-up can be discharged to the flare pipe network and the unqualified LPG is sent to the unqualified LPG tank.

开工前期干气不合格，可排火炬管网，液化气质量不合格，进不合格液化气罐

6）After dry gas is qualified, change to enter pipe network and the qualified LPG is sent to the qualified tank.

干气合格后改进管网，液化气合格进合格罐

11 Risk Assessment and Environmental Factor Identification 风险评价和环境因素识别

11.1 Hazard Identification during start-up, problem-prone in each nodes and its countermeasures 开工过程危害识别、各节点易出问题环节及采取措施

Nodes 节点名称	Problem-prone 易出问题	Countermeasures 应对措施	Comments 备注
Ignition temperature rise and constant temperature 点火升温，恒温	This stage is easy to leak and catch fire 此阶段易泄漏着火	Warming should be slow, inspection should be strengthened. If leakage is found, contact the on-site maintenance personnel to handle it on time and there should be fire-fighting truck should be on site to monitor. 升温宜缓慢，加强巡检，发现泄漏及时联系现场保运人员处理，消防车现场监护。	
	Gas flash explosion 瓦斯闪爆	If the analysis of furnace chamber is not qualified or have not done analysis yet, it is strictly prohibited to ignite the fire. Analysis is considered qualified when oxygen content is less than 21%. 炉膛不做分析或分析不合格严禁点火，氧含量小不于 21%为合格。	
	The top pressure of the three columns tends to be excessively high 三顶顶温顶压力易超高	Timely start the OVHD reflux and control the OVHD temperature of the column. 及时打顶回流，控制塔顶温度。	If naphtha is more than enough, send it out in an appropriate amount 若石脑油有余，适量外送。

	After cooling temperature at pre-dist. and atm. OVHD is too high 初常顶冷后温度过高	Turn on the water cooler in time and put some of the air cooler into operation. According to the load at the top of column, the atm. OVHD PA should be used. 及时打开水冷，投部分空冷，视塔顶负荷情况投常顶循。	
	Vacuum furnace tubes are easily damaged 减压炉炉管易损坏	Control the vacuum furnace feed quantity properly. Each route should be controlled at ＜25t/h. 控制好减压炉进料量，每路按＜25t/h 控制。	
Switching of crude oil during start-up 切换原油开工过程	Sealing leakage at high temperature oil pump 高温机泵密封漏	Put the seal oil system into use and inject oil into the high temperature oil pump 及时投用封油系统，给高温机泵注入封油。	
	D-401 vacuum OVHD oil drum is full and leak D-401 减顶油罐满跑油	Vacuum pump should be done slowly and pay attention in controlling the liquid level of the vacuum K.O. drum. Timely pump the oil to prevent the tank from being full. 抽真空宜缓慢，注意控好减顶油水分液罐的液位，有油及时起泵外送，防止罐满跑油。	
	Wax oil and residual oil exiting the unit is extremely high 蜡油渣油出装置温度超高	When wax oil and residual oil is sent to the storage area, the circulating water of E-510 and E-744A-D shall be adjusted. Properly control the temperature of wax oil and residual oil exiting the unit 蜡油渣油外送至罐区时，投用调整 E-510、E-744A-D 循环水，控制好蜡油渣油出装置温度。	

	Amount of oil in the atmospheric column is too little, hence, the column cannot meet the heat balance requirements 常压塔油少，塔内达不到热平衡要求	Timely put the steam injection at the bottom of the column into use 及时投用塔底汽提蒸汽。	
	The vacuum OVHD temperature is too high 减顶温度超高	When vacuum OVHD temperature is more than 120℃, start P-401 for reflux and put the cooler into use 减顶温度＞120℃时启动 P-401 打回流，投用冷却器	
	The water discharge at the top of the 3 columns have very strong smell. There are many toxic and harmful gases on-site. 三顶切水气味重，现场有毒有害气体较多。	Wastewater from the top of the 3 columns are not allowed to be discharge to underground well. It must be sent to No. 4 Refinery Department wastewater gas stripping unit for further treatment. 三顶污水不得外排至下水井，需起泵送至四部污水汽提装置处理。	
	The water discharge at the top of the 3 columns is black in color 三顶切水发黑	Timely put the injection of ammonia, corrosion inhibitor, water into use and control the pH value of the water discharge. 及时投用三顶注氨、注缓蚀剂、注水，控制好切水 pH 值。	
Start-up of LER Compressor 轻烃压缩机开工	Components of the unit have abnormal noise and vibration 机组各部件有异常响声、杂音、振动不正常	Electrical personnel, instrument personnel and maintenance personnel should be on-site to do maintenance. If there is any problems, handle it on time. 电修、仪修、维修人员到现场保运，有问题及时处理。	
LER 轻烃回收	Temperature at the top of the stabilizing column is easy to overheat 稳定塔顶易超温	Slowly put the desorber and stabilizing column’s reboiler into use and timely put the column OVHD reflux into use. 缓慢投用脱吸塔、稳定塔底重沸器，及时打塔顶回流。	

Acid Gas & LPG Treating Unit 产品精制	Dry gas and LPG is entrained with water 干气、液化气带液	Liquid level should be controlled properly and liquid should be discharged at the K.O. drum 控制好液位，分液罐及时切液	

11.2 Hazard Identification during Construction 开工过程危害识别

Safety Checklist Analysis Record Form

安全检查表分析（SCL）记录表

Unit: No. 1 Refinery Department Area/Process: Safety Education for Contractors and Foreign Construction Personnel

单位：炼油运行一部区域/工艺过程：承包商与外来施工人员安全教育

Inspection/Analysis Personnel and Position: Cao Qiang (Process Engineer), Li Hou Liang (Process Engineer), Qian Zhen (Equipment Engineer), Lin Jun (Safety Engineer)

Name and Equipment Number of Facilities: Atmospheric and Vacuum Distillation Unit (Including Light Ends Recovery Unit)

检查/分析人员及岗位：曹强（工艺工程师）、李厚亮（工艺工程师）、钱震（设备工程师）、蔺君（安全工程师）设施名称及位号：常减压装置（含轻烃回收）

Reviewers and their positions: Wei Cheng Yao (Process Deputy HOD), Song Yu Long (Equipment Deputy HOD)

Date: 4th October 2019

审核人员及岗位：魏城瑶（工艺副部长）、宋玉龙（设备副部长）日期：2019 年 10 月 4 日

No. 序号	Inspection Item 检查项目	Standard 标准	Consequences of not following requirements 不符合要求产生的后果	Previous occurrence frequency and existing control measures 以往发生频率及现有安全控制措施					L	S	R	Suggested Control Measures 建议改进/控制措施
				Frequency of occurence 发生频率	Management measures 管理措施	Staff Competency 员工胜任程度	Status of Equipment 设备设施现状	Safety Measures 安全设施				
1	Qualified Contractor 合格承包商	Contractor Management Procedure 《承包商管理程序》	Violation of Procedure Requirements 违反程序要求	Low 低	Branch List of Qualified Contractors 分公司《合格承包商名录》	Competent 胜任			1	2	2	
2	Entry Permit for Foreign Personnel 外来人员入厂证		Does not have Level 1 Safety Education 未进行一级安全教育	High 高	Administrative Measures for HSE Training and Education 《HSE 教育培训	Competent 胜任			1	2	2	现场核对

3	HSE Education for Foreign Construction Personnel 外来施工人员 HSE 教育	Administrative Measures for HSE Training and Education 《HSE 教育培训管理办法》	Failed the exam 考试不合格	Low 低	管理办法》	Competent 胜任			1	2	2	
4	Check on the construction personnel at site 施工现场核对外来人员	Administrative Measures for HSE Training and Education 《HSE 教育培训管理办法》	Did not undergo safety education 没有进行安全教育	High 高	HSE Education Records《HSE 教育台帐》	Competent 胜任			2	2	4	现场核对
5	Work location, objects, content and work procedures 作业地点、对象、内容和作业程序	Contractor Management Procedure 《承包商管理程序》	Causes an accident 引发事故	Low 低	Relevant safety management regulations 相关安全管理规定	Competent 胜任			3	3	9	
6	Whether construction equipment and machines conform to relevant safety regulations		Causes an accident 引发事故	High 高		Competent 胜任			3	3	9	现场检查

	施工设备、机具是否符合安全有关规定											
8	Car entering and exiting the unit 车辆出入装置	OccupationalHealth and Safety Management Procedure 《职业健康安全管理程序》	No permit, Illegal car entry 无进车票，违章进车	Low 低	Safety Management on Car Entry Permit 进车票安全管理	Competent 胜任			2	3	6	
9	Whether HSE behaviors of construction personnel conform to HSE regulations 施工人员的 HSE 行为是否符合 HSE 规定	Standardized behavior 规范行为	Damage to equipment or personal injury 设备扣坏或人身伤害	High 高	Safety Agreement 安全协议书	Competent 胜任			2	2	4	
10	Work permit inspection 作业票证检查		Illegal operation, causing accident 违章作业，引发事故	Low 低	Relevant safety management system 相关作业安全管理制度	Competent 胜任			3	3	9	

Safety Checklist Analysis Record Form

安全检查表分析（SCL）记录表

Unit: No. 1 Refinery Department Area/Process: Safety Education for Contractors and Foreign Construction Personnel

单位：炼油运行一部区域/工艺过程：承包商与外来施工人员安全教育

Inspection/Analysis Personnel and Position: Cao Qiang (Process Engineer), Li Hou Liang (Process Engineer), Qian Zhen (Equipment Engineer), Lin Jun (Safety Engineer)

Name and Equipment Number of Facilities: Atmospheric and Vacuum Distillation Unit (Including Light Ends Recovery Unit)

检查/分析人员及岗位：曹强（工艺工程师）、李厚亮（工艺工程师）、钱震（设备工程师）、蔺君（安全工程师）设施名称及位号：常减压装置（含轻烃回收）

Reviewers and their positions: Wei Cheng Yao (Process Deputy HOD), Song Yu Long (Equipment Deputy HOD)

Date: 4th October 2019

审核人员及岗位：魏城瑶（工艺副部长）、宋玉龙（设备副部长）日期：2019 年 10 月 4 日

No. 序号	Inspection Item 检查项目	Standard 标准	Consequences of not following requirements 不符合要求产生的后果	Previous occurrence frequency and existing control measures 以往发生频率及现有安全控制措施					L	S	R	Suggested Control Measures 建议改进/控制措施
				Frequency of occurence 发生频率	Management measures 管理措施	Staff Competency 员工胜任程度	Status of Equipment 设备设施现状	Safety Measures 安全设施				
1	Anchor bolt, counter wheel bolt and the connection of gas, water and oil circuits 机组地脚螺栓、对轮螺栓和气、水、油路连接情况	Acceptance requirements after inspection and maintenance 检维修后验收要求	Does not have startup conditions 不具备开机条件	Low 低	Equipment Inspection System, Operating Procedure, Start-up Plan 设备检查制度 操作规程 开工方案	Competent 胜任	Complete 完好	Self Protection System 自保系统	2	2	4	

2	Confirm the condition of water, electricity, gas, wind and nitrogen system 确认水、电、气、风和氮气系统状态	Start-up Plan 开工方案		Low 低		Competent 胜任			2	2	4	
3	Check if the pressure gauge, level gauge, pressure switch are in good condition 检查压力表、液位计、仪表控制、压力开关及变送器完好	Acceptance requirements after inspection and maintenance 检维修后验收要求		Low 低		Competent 胜任	Complete 完好		2	2	4	
4	Confirm water cooling system is in use 确认水冷系统投	Start-up Plan 开工方案	Stop if overheat 超温停机	Low 低		Competent 胜任			2	3	6	

	用											
5	Check the differential pressure of the filter 检查过滤器压差	Operating Procedures 操作规程	Filter blockage 过滤器堵	Low 低		Competent 胜任			2	2	4	
6	Gas in Nitrogen displacement is qualified 氮气置换机内气体合格	Start-up Plan 开工方案	Explosion 爆炸	Low 低		Competent 胜任			3	3	9	
7	Machine and lube oil pump is rotated properly 机组、润滑油泵盘车良好	Operating Procedure 操作规程	Machine malfunction 机械故障	Low 低		Competent 胜任	Complete 完好		2	2	4	
8	Status of each safety valve's front and rear hand valves 各安全阀和前后手阀状态	Operating Procedure 操作规程	Overpressure 超压	Low 低		Competent 胜任	Complete 完好	Safety Valve 安全阀	2	2	4	

9	Inspection of luve oil system 润滑油系统检查	Operating Procedure 操作规程	Water entrainment or emulsification 带水或乳化	Low 低		Competent 胜任			2	2	4	
10	Check oil leakage of the machine, self-protection interlock is in good condition 检查机组跑油情况、自保联锁完好	Operating Procedure 操作规程	Overheat or self protection system is not working 超温或自保不动作	Low 低		Competent 胜任			2	3	6	

Pre-Hazard Analysis (PHA) Record Form

预先危险性分析(PHA)记录表

Unit: No. 1 Refinery Department Area/Process: Safety Education for Contractors and Foreign Construction Personnel

单位：炼油运行一部区域/工艺过程：承包商与外来施工人员安全教育

Inspection/Analysis Personnel and Position: Cao Qiang (Process Engineer), Li Hou Liang (Process Engineer), Qian Zhen (Equipment Engineer), Lin Jun (Safety Engineer)

Name and Equipment Number of Facilities: Atmospheric and Vacuum Distillation Unit (Including Light Ends Recovery Unit)

检查/分析人员及岗位：曹强（工艺工程师）、李厚亮（工艺工程师）、钱震（设备工程师）、蔺君（安全工程师）设施名称及位号：常减压装置（含轻烃回收）

Reviewers and their positions: Wei Cheng Yao (Process Deputy HOD), Song Yu Long (Equipment Deputy HOD)

Date: 4th October 2019

审核人员及岗位：魏城瑶（工艺副部长）、宋玉龙（设备副部长）日期：2019 年 10 月 4 日

Dangers 危险	Reasons 原因	Main Consequences 主要后果	Existing Safety Control Measures 现有安全控制措施	L	S	Risk Degree 风险度（R）	Suggested Corrections 建议改正/控制措施
Easy to form explosive gas 易形成爆炸气体	When opening the sidedraw, it is easy for the vacuum to vacuate as there is water stored in the pipelines.	Fire, Flash Explosion or Oil Leakage Polluting Environment	Fire Safety Management System Operating Procedures Accident Emergency	3	2	6	

	Hence, drain the water from the vent valve and at this time, the oil and gas will diffuse in the pump area 开侧线时因设备管线内有存水，泵易发生抽空，往往先从泵放空阀排水，此时泵区常会油气弥漫	着火、闪爆 或跑油污染环境	Plan 用火安全管理制度 操作规程 事故应急预案				
Overpressure 超压	Change process in storage area or error in opening valves罐区改流程或开关阀错误	Safety valve trip 安全阀跳	Production Communication System Accident Emergency Plan Emergency Plan for Environmental Accidents 生产联系制度 事故应急预案 环保事故应急预案	3	3	9	
Safety Valve not in use 安全阀未投用	Overpressure 超压	Leakage of equipment or explosion accident 整漏设备或爆破事故		3	3	9	
Leakage 泄漏	Oil gas leakage at flange, manhole, etc. 设备管线法兰、人孔等，泄漏油气	Spillage and leaking of oil gas can affect the environment or will causes flash	Start-up Plan Operating Procedures Routine Inspection System	3	2	6	

		explosion 跑、漏油气影响环境或着火闪爆	开工方案 操作规程 巡检制度				
Water entrainment in reflux 回流带水	Interface level too high, Water entrainment in oil at OVHD reflux, which causes the oil-vapor imbalance in the upper part of the column 界位超高，顶回流油带水，致塔上部汽液失衡	Column flushing accident or safety valve trip 冲塔事故或安全阀跳	Operating Procedures 操作规程	3	2	6	
Sudden boiling accident 突沸事故	Bottom of storage tank has stored water，＞110℃ hot oil enters the tank which causes sudden water vaporization 储罐底有存水，＞110℃热油进罐致水汽化发生突沸	Explosion accident in storage tank 储罐爆破事故	Operating Procedures 操作规程	3	2	6	
Gas drainage 瓦斯排空	Unstable plant production or other reasons 装置生产不稳定或其它原因	Pollution to environment and flash explosion 污染环境 闪爆	Operating Procedures Start-up Plan 操作规程 开工方案	2	2	4	

Pre-Hazard Analysis (PHA) Record Form

预先危险性分析(PHA)记录表

Unit: No. 1 Refinery Department Area/Process: Safety Education for Contractors and Foreign Construction Personnel

单位：炼油运行一部区域/工艺过程：承包商与外来施工人员安全教育

Inspection/Analysis Personnel and Position: Cao Qiang (Process Engineer), Li Hou Liang (Process Engineer), Qian Zhen (Equipment Engineer), Lin Jun (Safety Engineer)

Name and Equipment Number of Facilities: Atmospheric and Vacuum Distillation Unit (Including Light Ends Recovery Unit)

检查/分析人员及岗位：曹强（工艺工程师）、李厚亮（工艺工程师）、钱震（设备工程师）、蔺君（安全工程师）设施名称及位号：常减压装置（含轻烃回收）

Reviewers and their positions: Wei Cheng Yao (Process Deputy HOD), Song Yu Long (Equipment Deputy HOD)

Date: 4th October 2019

审核人员及岗位：魏城瑶（工艺副部长）、宋玉龙（设备副部长）日期：2019 年 10 月 4 日

Dangers 危险	Reasons 原因	Main Consequences 主要后果	Existing Safety Control Measures 现有安全控制措施	L	S	Risk Degree 风险度（R）	Suggested Corrections 建议改正/控制措施
Pressure buildup 蹩压	Valve not open or process flow at storage of the downstream is wrong	Leaking equipment or blast 蹩漏设备或爆破	1. Start-up Plan 2. Operating Procedures 3. Safety Inspection Sytem	2	2	4	

	阀未开或罐区及下游流程有误		4. Accident Emergency Plan 5. Emergency Plan for Environmental Accidents 1、开工方案 2、操作规程 3、安全检查制度 4、事故应急预案 5、环保事故应急预案				
Intermix of oil 串油	Open the wrong valve 开错阀	Affect quality or pollute storage tank 影响质量或污染大罐		2	2	4	
Caving of drum 冒罐	Change the wrong process flow 改错流程	Energy wastage 能源浪费		2	2	4	
		Pollute environment 污染环境		2	2	4	
		Personal injury 人员伤害		3	2	6	
		Spark Explosion 着火闪爆		3	2	6	
Medium are connected with each other, water, gas, wind and other utilities system 介质互串或串入水、汽、风公用系统	Open the wrong valve 开错阀	Unqualified quality 质量不合格		2	2	4	
		Affect other unit or products 影响其它装置或产品		2	2	4	
		Fire 着火		3	2	6	
		Spark Explosion 闪爆		3	2	6	

		Energy Wastage 能源损失		2	2	4	
		Other Accidents 其它事故					
Posterior route exiting the unit is obstructed 出装置后路不通	Valve not open 阀未开	Leaking equipment 蹩漏设备		2	3	6	
	Error in process modication 改流程出错	Oil Linkage 串油		2	3	6	

12 Precautions 注意事项

12.1 When entering the site, proper protection equipment such as safety clothes, safety shoes, safety gloves and walkie-talkie should be worn
进入装置现场，必须穿戴好劳保服、劳保鞋、劳保手套，佩戴好安全帽、对讲机
12.2 Before opening and closing the valve, confirm the opening and closing direction of the valves and F spanner should be used properly and correctly. When opening and closing valves that are at a higher point, it is needed to stand on a stable and fixed platform. It is strictly prohibited to knock the equipment with brute force and also prohibited to stand on other process pipelines to open and close the valves
开关阀门前，要先确认阀门开、关方向，并正确使用“F”扳手，开关高处阀门时要在站在固定的平台上，严禁蛮力敲打设备，严禁站在其他工艺管线上开关阀门
12.3 Before changing the process flow, confirm the content of the command. Two personnel should work together, one who work and one who observes while paying attention to the changes in the surrounding environment, equipment, personnel and etc. at all times. Strictly implement the “Three-level Confirmation System for Process Change”
动改流程前，确认指令内容，两人协同作业，一人作业、一人观察，并时刻注意作业周围环境、设备、人员等变化情况，严格执行“流程动改三级确认制”
12.4 In the process of constant temperature or increasing temperature during start-up, field operator must conduct multi-directional inspection on site. Report any leakage found on site and contact relevant personnel to deal with it on time to prevent the occurrence of any safety accidents
开工升温或恒温过程中，外操要对装置现场进行多方位检查，发现泄漏情况及时汇报，并及时联系处理，杜绝安全事故的发生
12.5 During start-up period, on-site operation and maintenance forces should be properly arranged and on-site inspection shall be strengthened. If there is any hidden danger, personnel should be arranged to deal with it in a timely manner
开工期间，需布置现场运维力量，同时需加强现场检查，发现现场隐患及时安排人员进行处理
12.6 After the unit has its temperature increased, on-site inspection shall be strengthened. Any abnormal situation shall be handled in tiem to prevent the occurrence of any unexpected accidents
装置升温后，要加强现场检查，出现异常情况及时进行处理，防止突发事故的发生
12.7 Strictly monitor the operation condition of the column bottom pump and the high temperature oil pump. Timely handle any abnormalities such as pump vacuation
严密监控塔底机泵及高温油泵的运行情况，出现抽空等异常及时进行处理