



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

HYBN-T3-07-0014-2024-2



Equipment Maintenance Management System



设备检修管理制度



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|  HENGYI | Hengyi Industries Sdn Bhd 恒逸实业（文莱）有限公司 | | | | |
| | Equipment Maintenance Management System 设备检修管理制度 | | | | |
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1 Purpose

目的

The System is hereby formulated in order to enhance equipment maintenance management and strictly enforce equipment maintenance standards and regulations for safe, civilized and high-quality maintenance.

为了加强设备检修施工管理，严格执行设备检修施工标准、规范，做到安全、文明、优质检修，特制订本制度。

2 Scope of Application

适用范围

The System applies to all departments of the Company and outsourcing departments.

本制度适用于各部门及外协部门。

3 Terms and Definitions

术语和定义

3.1 Three Lines: tools, fittings and materials are placed on one line respectively.

三条线：指工具摆放一条线；配件零件摆放一条线；材料摆放一条线。

3.2 Three Non-exposures: lube oil, cleaned machine parts or opened equipment head and pipe mouth shall not be exposed.

三不见天：指润滑油不见天；清洗过的机件不见天；打开设备封头、管线管口不见天。

3.3 Three Non-contacts with Ground: tools, removed parts or sump oil and stained material shall not fall to the ground.

三不落地：指使用工具、量具不落地；拆下来的零件不落地；油污、脏物不落地。

3.4 Five Prohibitions: hot work is not permitted without hot work permit; entry into site is not permitted without wearing helmet; high-altitude work is not permitted without safety belt; use of lifting equipment which has not been inspected is not permitted; work is not permitted in hazardous areas without safety barrier or supervision.

五不准：指没有火票不准动火；不戴安全帽不准进入现场；不系安全带不准高空作业；没有检查过的起重设备不准起吊；危险区没有安全栏杆或无人监护不准作业。

3.5 Prohibition of Five Misuses: do not misuse sledge hammer, alligator wrench and flat

spade; do not dismantle, unload, pull or jack any item without approval; do not fiddle with other equipment; do not break insulation without approval; do not misuse other equipment accessories.

五不乱用：指不乱用大锤、管钳、扁铲；不乱拆、乱卸、乱拉、乱顶；不乱动其它设备；不乱打保温层；不乱用其它设备零附件。

3.6 Four Construction Prohibitions: construction is not permitted in the event of unclear task, situation or drawings; of unsound safety measures; of unclear clarification of quality standard, safety measures and technical measures; and of nonconforming quality of previous step.

四不施工：指任务不清、情况不明、图纸不清楚的不施工；安全措施不健全的不施工；质量标准、安全措施、技术措施交底不清楚的不施工；上道工序质量不合格，下道工序不施工。

3.7 Three Clean Sites: the sites for shutdown, maintenance and startup shall be clean.

三净：指停工场地净；检修场地净；开工场地净。

4 Management Responsibilities

管理职责

4.1 Specified administrative authority

归口管理部门

4.1.1 As the specified administrative authority of equipment maintenance, the Equipment Management Dept. is responsible for enforcing Equipment Maintenance Management System, Code and Standard; developing and amending the Company's Equipment Maintenance Management System and supervising its implementation by departments.

机械动力部是设备检修的归口管理部门，负责执行有关设备检修管理制度、规程和标准；负责制订修订公司设备检修管理制度，并检查监督各部门执行情况。

4.1.2 It is responsible for organizing and coordinating full shut-down maintenance, local shortcoming elimination and major emergency repair; preparing and submitting technical texts for outsourced items to Materials Supply Dept. to determine the Implementation Unit through bidding; liaison and coordination for external work; and approving substitution of insufficient materials.

组织装置全面停工检修、局部消缺、重要突击性抢修的协调管理；负责编制外协项目的技术文本交物资装备部进行招标确定施工单位；负责对外工作的联系与协调；审批缺口材料的代用。

4.1.3 It is responsible for maintenance management, technical clarification, quality check and acceptance of key equipment; and organizing review/audit of maintenance schemes for key equipment or items.

负责重要设备的检修管理及技术交底、质量检查、和验收工作；组织审核（定）重要设备（或项目）检修施工方案。

4.2 Coordinated management departments

协同管理部门

4.2.1 Scheduling & Dispatch Dept. is responsible for arranging and developing overall startup and shutdown network for full and local shut-down maintenance; determining total duration of shut-down maintenance; and organizing startup confirmation after shut-down maintenance.

计划调度部负责安排并编制装置全面、局部消缺停工的开、停工总体网络，确定装置停工检修总工期；组织装置停工检修后的开工确认。

4.2.2 HSE Dept. is responsible for reviewing HSE content in the maintenance scheme and participating in startup confirmation after shut-down maintenance.

HSE 管理部负责审核检修施工方案中 HSE 内容；参与装置停工检修后的开工确认。

4.2.3 Materials Supply Dept. is responsible for purchasing and supplying materials for equipment maintenance, ensuring the quality of purchased materials and procuring external Implementation Units via bidding.

物资装备部负责设备检修物资的采购和供应，确保采购物资的质量；负责外协施工单位的招标工作。

4.3 Executive departments

执行部门

4.3.1 As an executive department, the Operation Dept. is responsible for developing equipment shut-down maintenance, monthly maintenance and emergency repair plans; for maintenance site management, quality control and acceptance for general equipment; for participating in quality acceptance of key equipment maintenance; and for making evaluation comments on quality of equipment maintenance.

运行部为执行部门，负责编制本部门设备停工检修、月度检修、突击性抢修计划；负责本部门检修的现场管理和一般设备的质量控制、质量验收；参加重要设备检修的质量验收工作；对设备检修维修施工质量提出考核意见。

4.3.2 Equipment Maintenance Dept., Electrical Operation Dept. and Instrument Control Dept. (hereinafter called Maintenance Dept.) are responsible for maintenance, repair and obtaining (applying for) spare parts of static and dynamic operating equipment, electrical equipment and instruments respectively; developing equipment maintenance plans under respective purview; keeping maintenance records; and archiving maintenance data.

设备检修部、电气运行部、仪表控制部（以下简称维保部门）分别负责运行装置动静设备、电气设备、仪表设备的检修、维护、备品配件计划（申报）领用；负责职责范围内设备检修、方案的编制，检修记录的录入、检修资料的存档。

5 Management Content

管理内容

5.1 Shut-down maintenance management

停工检修管理

5.1.1 Equipment Management Dept. organizes and coordinates management of full shut-down maintenance; site management is the responsibility of the corresponding department.

机械动力部组织、协调装置全面停工检修管理工作；现场管理工作由所在部门负责。

5.1.2 After issuing the shut-down maintenance plan, the Equipment Management Dept. shall prepare and submit technical text for outsourced items other than maintenance items to be undertaken by the Maintenance Dept. to Materials Supply Dept. to determine the Implementation Unit through bidding; after signing a contract with the Materials Supply Dept., the Implementation Unit shall promptly arrange outsourced item clarification (to be organized by Equipment Management Dept.), and prepare work plan, method statement and fabrication plans for prefabricated parts. The Equipment Management Dept. shall hold maintenance coordination meetings regularly, inspect departments' preparation for shut-down maintenance and audit maintenance organization plan and method statement for key items.

停工检修计划下达后，除由公司维保部门承担的检修项目外，其它需要外协的项目由机械动力部负责编制外协项目的技术文本交物资装备部进行招标，确定施工单位，施工单位在与物资装备部签订施工合同后应及时组织力量安排外协项目交底（交底工作由机械动力部组织）、编制施工计划、施工方案和预制件制作计划。机械动力部应定期组织召开检修协调会，检查各部门停工检修的准备工作，对检修组织计划及重点项目的施工方案进行审核。

5.1.3 Materials Supply Dept. actively mobilizes resources to secure goods for maintenance according to the equipment, materials and spare parts required in the shut-down maintenance plan. The securing of required materials, equipment and spare parts and solutions to gap as well as supply date shall be promptly fed back to the corresponding department and Equipment Management Dept.

物资装备部根据停工检修计划所需的设备、材料、备品配件积极组织力量落实货源，确保检修用料。所需材料、设备、备件的货源落实情况及缺口解决办法、供货日期等信息应及时反馈给项目所在部门和机械动力部。

5.1.4 Two months before shut-down maintenance, the preparatory work shall be done so that: the Implementation Unit for outsourced items has been secured; the contract has been signed; main materials, equipment and spare parts have been secured.

装置停工检修前二个月，准备工作要求做到：外协项目已落实施工单位，施工合同已签订，主要材料、设备、备品配件已落实。

5.1.5 One month before shut-down maintenance, the preparatory work shall be done so that:

a shut-down maintenance leading group is set up to fully lead the shut-down maintenance across the Company; technical construction plan, lifting plan, safety measures and HSE assessment for key items have been approved; Scheduling & Dispatch Dept. has determined system, plant shutdown and startup network; Maintenance Dept. has assigned all maintenance items to crew and completed site clarification.

装置停工检修前一个月，准备工作要求达到：成立公司停工检修领导小组，全面负责装置停工检修领导工作；重点项目的施工技术方案、吊装方案以及安全措施和 HSE 评价已经审定；计划调度部已确定系统、装置停工、开工网络；检修部门已将检修项目全部落实到班组，并进行了现场交底。

5.1.6 Equipment Management Dept. regularly holds maintenance coordination meetings and relevant departments must strictly implement resolutions of these meetings.

机械动力部定期组织召开检修协调会，相关部门必须认真执行协调会决定的事项。

5.2 Monthly and routine maintenance management

月度检修、日常检修管理

5.2.1 Monthly and routine maintenance work in each department shall be carried out by the respective department.

各部门设备月度计划、日常检维修工作由各部门组织实施。

5.2.2 Equipment Management Dept. approves monthly maintenance plans and allocates maintenance items by discipline to the Maintenance Dept.

机械动力部对月度检修计划进行审批，并将维修项目按专业下达给维保部门。

5.2.3 Routine maintenance of equipment shall be commissioned by discipline by each department to the Maintenance Dept.; if outsourcing is needed, the corresponding Operation Dept. shall seek approval from the Equipment Management Dept.

设备日常检维修由各部门按专业自行委托维保部门，如需外协施工，由所在运行部报机械动力部审批。

5.2.4 For local shut-down maintenance/emergency repair, the Operation Dept. shall develop and submit maintenance plans to Equipment Management Dept. for approval before implementation.

装置局部停工检（抢）修项目由运行部编制检修计划，报机械动力部批准后实施。

5.2.5 For maintenance projects that need to be outsourced, the operations department needs to submit the special work approval process, and the Equipment Management department will arrange the implementation after approval by the company.

对于需要外委的检修项目，运行部需提交专项工作签批流程，经公司批准后机械动力部安排实施。

5.3 Management of equipment maintenance site

设备检修现场管理

5.3.1 Maintenance site management is the responsibility of the department in charge of the equipment.

检修现场管理由设备所在部门负责。

5.3.2 The executive departments (including outsourcing, the same below) must not start maintenance until after receiving maintenance safety permit; in case of hot work, breaking ground, electricity use, entering confined space and high-altitude operation, the Operation Dept. shall go through relevant formalities; in case of relocated or damaged trees and turf, the Operation Dept. shall go through relevant formalities with GM's Office.

施工部门（含外协，下同）必须在接到检修施工安全许可票后方可开始检修；在进行动火、动土、用电、进入受限空间、高处作业时，由运行部办理相关手续；需迁移或损坏的绿化林木、草坪由运行部负责向总经理办公室办理手续。

5.3.3 The executive departments must strictly abide by work disciplines to ensure proper implementation of Three Lines, Three Non-exposures, Three Non-contacts with Ground, Five Prohibitions, Prohibition of Five Misuses, Four Construction Prohibitions and Three Clean Sites.

施工部门必须遵守施工纪律，严格做到“三条线”、“三不见天”、“三不落地”、“五不准”、“五不乱用”、“四不施工”、“三净”。

5.3.4 The executive departments shall take firm blocking measures to prevent foreign material entering the open pipe mouth after equipment disassembly; place maintenance materials and wastes at designated locations; and dispose of the removed equipment, vessel, heat exchanger and pump only after joint confirmation by the department in charge of the equipment and Equipment Management Dept.

施工部门要采取严密牢固的封堵措施，严防设备拆卸后敞开的管口有异物落入；施工用料及检修废料要堆放在指定地点；换下来的设备、容器、整台换热器、机泵等由设备所在部门和机械动力部联合确认后进行处理。

5.3.5 When the plant is started, Equipment Management Dept. must urge the executive departments to appoint personnel to deal with problems arising during startup. The department in charge of the equipment shall directly propose treatment items during operation assurance to the executive departments which must respond promptly; materials needed are the responsibility of the department in charge of the equipment.

装置开工时，机械动力部必须督促施工部门安排保运人员负责处理开工中出现的问题。保运期间的处理项目由装置所在部门直接向施工部门提出，施工部门必须及时给予处理，所需材料由装置所在部门解决。

5.4 Maintenance quality and completion acceptance

检修质量及竣工验收

5.4.1 All departments should implement total quality management during the entire

maintenance process to ensure: clear project disclosures, careful equipment inspections, maintenance in compliance with the system, quality standards, and complete maintenance records.

各部门在检修全过程中应实施全面质量管理，做到：项目交底清楚、设备检查认真、检修符合制度、质量达到标准、检修记录齐全。

5.4.2 After maintenance, handover shall not be carried out unless quality standards are satisfied, maintenance records are kept and health is properly maintained; steam shall not be supplied unless the work item is completed, safety is guaranteed, there is no obvious leakage and health standard is satisfied.

检修结束后必须做到“三不交工”、“四不开汽”。“三不交工”即：不符合质量标准不交工、没有检修记录不交工、卫生规格化不好不交工；“四不开汽”即：工程未完不开汽、安全没保证不开汽、有明显泄漏不开汽、卫生不合格不开汽。

5.4.3 During shut-down overhaul, Equipment Management Dept. shall organize inspection of the executive departments' QA system; each department shall form a quality management team and appoint maintenance assistance personnel to ensure normal operation of the QA system.

装置停工大修期间，机械动力部应组织对施工部门的质量保证体系进行检查，各部门应成立质量管理小组、指定检修配合人员，确保质保体系正常运转。

5.4.4 When supplying raw materials, accessories and equipment, the Materials Supply Dept. shall provide certificates of conformance and quality certificates; substitute materials must be approved by the designer or the corresponding department and go through substitution formalities.

物资装备部在提供原材料、配件、设备时，应同时提供合格证书及质量保证书等资料，代用材料必须经设计人员或项目所在部门同意，并办理代用手续。

5.4.5 The executive departments shall ensure each weld of pressure pipe is recorded, with inspection data available for major welds; the weld and static seal locations on process pipeline are not insulated before pressure test; each piece of equipment is recorded; resetting of maintenance equipment shall be checked and confirmed, with equipment closure sheet completed. Tightening records shall be kept for bolts at special parts with high temperature and high pressure (Tighten with torque wrench with certain sequence and torque, the initial tightening force is controlled at 1/3 of the final value, the second tightening force is controlled at 2/3 of the final value, and the third (final) tightening force is controlled at 100% of the final value).

施工部门要做到压力管道每道焊口有记录，主要焊缝有检验资料；工艺管线在未试压前焊缝及静密封部位不得保温；每台设备有记录，检修设备复位时应做好检查确认并填写设备封闭单；对于高温高压特殊部位的螺栓要做好紧固记录（按照一定的顺序和扭矩采用扭矩扳手拧紧，第一次螺栓紧固力度控制在最终值的 1/3，第二次螺栓紧固力度控制在最终值的 2/3，第三次（最终）螺栓紧固力度控制在最终值的 100%）。

5.4.6 Equipment management personnel in Operation Dept. must certify acceptance of concealed works and intermediate process on the spot; work in the next step shall not proceed unless the certification formalities for the previous step are complete; the completed work shall be accepted with signature in time.

运行部设备管理人员对隐蔽工程及中间工序的验收必须当场办理签证手续，上道工序签证手续不全不得进行下道工序作业，工程竣工后要及时验收签字。

5.4.7 Within 30 days of completing maintenance, the executive department shall submit three copies of as-built data to the department in charge of the equipment, GM's Office, and Equipment Management Dept. These data include as-built drawings, technical proposal and construction organization; technical records, intermediate process acceptance sheet and concealed work acceptance sheet; equipment unpacking data and closure records; certificates of conformance and quality certificates for equipment, materials, pipe fittings and accessories; physical and chemical inspection data; technical records and inspection reports on lining, pipe fitting and insulation.

施工部门在检修工作完工后 30 天内将竣工资料一式三份，完整地交给设备所在单位、总经理办、机械动力部，资料包括：竣工图纸、施工技术方案、施工组织；施工技术记录、中间工序验收单、隐蔽工程验收单；设备开箱资料、设备封闭记录；设备、材料、管道附件、配件的合格证明书及质量保证书；理化检验资料；衬里、防腐、保温施工技术记录及检验报告。

5.4.8 Handover data for pressure pipe also include model and specifications, material and quantity of pipe, fittings and valve; pipe isometric drawing, weld layout drawing and No.; weld record; physical and chemical inspection data on welding, with weld number consistent with its NDT number; pressure test records for pipe and valve.

压力管道交工资料还应增加下列内容：管道、管件、阀门的型号规格、材质及数量，管道的空视图、焊缝布置图及其编号，焊接记录，焊接理化检验资料，其无损检验编号与焊缝编号相一致，管道及阀门的试压记录等。

5.4.9 After shut-down maintenance and before supplying steam or gas, the Scheduling & Dispatch Dept. shall have handover formalities completed (replaceable by startup confirmation sheet), subject to confirmation with signature by Equipment Management Dept., Scheduling & Dispatch Dept., Operation Dept., HSE Dept. and executive departments.

装置停工检修完工后，在引蒸汽或引瓦斯前由计划调度部组织办理交接手续（可用装置开工确认单代替），由机械动力部、计划调度部、运行部、HSE 管理部、施工部门等签字确认。

5.4.10 Handover conditions for shutdown maintenance: hydraulic or tightness test on equipment and piping demonstrates the maintenance quality meets requirements; non-conforming items have been made good; maintenance records are complete, accurate and confirmed by Production Dept.; insulation and painting has been substantially complete; scaffolding is substantially removed; construction tools (excluding tools for operation assurance) have been removed from site; the site is clean upon completion.

装置停工检修交工条件：设备及管道水压试验或气密试验合格，工程质量符合要求；检验不合格

项目的已返修合格；检修记录齐全、准确并经生产部门确认；保温、油漆已基本完成；脚手架基本拆除；施工机具已撤离现场（保运所需机具除外）；现场已达到工完料尽场地清。

5.4.11 Each department shall prepare and submit a summary of system or plant maintenance to Equipment Management Dept. within 30 days of startup; the Equipment Management Dept. shall prepare and archive shutdown maintenance summary within two months.

各部门应当编写系统或装置检修工作总结，在开工正常后 30 天内上报机械动力部，机械动力部在二个月内编写装置停工检修工作总结并归档。

5.5 Pump maintenance management

机泵检修管理

See Appendix 1.

见附件 1

5.6 Management of *maintenance work permit*

检修施工安全许可票管理

See Appendix 2.

见附件 2

6 Inspection and Supervision

检查与监督

Equipment Management Dept. is responsible for inspecting, supervising and evaluating implementation of the Equipment Maintenance Management System.

机械动力部负责对设备检修管理制度的执行情况进行监督检查并考核。

7 Associated Procedures and Records

关联程序和记录

7.1 Associated procedures

关联程序

7.1.1 Equipment Maintenance Management Procedure (HYBN-T2-07-0045-2024-2)

设备检修管理程序 HYBN-T2-07-0045-2024-2

7.1.2 Routine Equipment Maintenance Management Procedure (HYBN-T2-07-0046-2024-2)

设备日常检修管理程序 HYBN-T2-07-0046-2024-2

7.1.3 Procedure for Management of Shutdown Maintenance and Shortcoming Elimination

under Local Shutdown (HYBN-T2-07-0047-2024-2)

装置停工检修及局部停工消缺管理程序 HYBN-T2-07-0047-2024-2

7.1.4 Procedure for Management of Monthly Scheduled Maintenance of Equipment (HYBN-T2-07-0048-2024-2)

设备月度计划检修管理程序 HYBN-T2-07-0048-2024-2

7.2 Associated records

关联记录

7.2.1 Maintenance Work Permit (Type A) HYBN-T6-07-0106-001-2018

检修施工安全许可票(A类) (HYBN-T6-07-0106-001-2018)

7.2.2 Maintenance Work Permit (Type B) (HYBN-T6-07-0107-001-2018)

检修施工安全许可票(B类) HYBN-T6-07-0107-001-2018

7.2.3 Quality Evaluation Sheet for Pump Equipment Maintenance (Installation) (HYBN-T6-07-0108-001-2018)

机泵设备检修(安装)质量评定表 HYBN-T6-07-0108-001-2018

7.2.4 Approval Sheet for Holing (Sealing) on Pipe with Pressure (HYBN-T6-07-0109-001-2018)

管道带压开孔(封堵)审批表 HYBN-T6-07-0109-001-2018

7.2.5 Confirmation Sheet for Startup Conditions of Key Equipment (HYBN-T6-07-0110-001-2018)

重要设备开机条件确认单 HYBN-T6-07-0110-001-2018

7.2.6 Acceptance Sheet for Covering/Uncovering Key Equipment (HYBN-T6-07-0111-001-2018)

重要设备揭(扣)盖验收单 HYBN-T6-07-0111-001-2018

7.2.7 Maintenance Quality Acceptance Records for Key Static Equipment (HYBN-T6-07-0112-001-2018)

重要静设备检修质量验收记录 HYBN-T6-07-0112-001-2018

8 Supplementary Rules

附则

8.1 The System is under the jurisdiction of Equipment Management Dept.

本制度由机械动力部归口管理。

8.2 The System is drafted by Equipment Management Dept.

本制度起草部门：机械动力部。

8.3 Equipment Management Dept. is responsible for the interpretation of the System.

本制度解释权归机械动力部拥有。

8.4 Revision, preparation and approval of the System are shown in Table 1:

本制度版本编制和审批情况见表 1:

Table 1 Revision, preparation and approval of document

表 1 文件版本编制和审批情况

| | | | | | |
|------------|---------------------|--------------------|---------------------|----------------------|---------------------|
| 2 | 2024-04-01 | Hu Chuan 胡川 | Zhao Tingyun 赵挺云 | Xu Ye 徐野 | Chen Liancai 陈连财 |
| Rev. 版本 | Issued date 颁布日期 | Prepared by 编制人 | Reviewed by 审核人 | Authorized by 审定人 | Approved by 批准人 |

9 Appendices

附件

Appendix 1 Pump Maintenance Management

附件 1 机泵检修管理

Appendix 2 Management of Maintenance Work Permit

附件 2 检修施工安全许可票管理

Appendix 1

附件 1

Pump Maintenance Management 机泵检修管理

1 Work Management

施工管理

1.1 Pump equipment maintenance shall follow the *Code for Equipment Maintenance and User Instructions* where applicable.

机泵设备检修执行《设备维护检修规程》，设备使用说明书有规定，按规定时执行。

1.2 Before overhaul and medium repair of general equipment, the Operation Dept. shall write maintenance details on the permit according to equipment operation conditions and existent problems. If defective pump equipment switches to standby pump equipment, maintenance of the defective pump equipment must not proceed until the standby equipment has operated for more than 2h and is confirmed to be free of anomaly.

一般设备大、中修前，运行部应根据设备的运行情况及存在问题，在许可票上详细填写检修内容。缺陷机泵设备切换到备用机泵设备运行后，备用机泵设备须运行 2 小时以上，并经确认无异常后才能对缺陷机泵设备进行检修。

1.3 Before carrying out key maintenance items for pump equipment, the Operation Dept. shall submit pump maintenance requirements according to pump operation problems to Equipment Management Dept. which will review these requirements before informing Equipment Maintenance Dept.

机泵设备重点项目检修前，运行部应根据机泵运行问题填报机泵检修要求，上报机械动力部，机械动力部审核后下发设备检修部。

1.4 Based on the pump maintenance requirements from the Operation Dept., the Equipment Maintenance Dept. shall prepare maintenance plan, planned network and quality control procedure for internal audit and countersigning by Operation Dept. before submitting them to Equipment Management Dept. and HSE Dept. for review. Method statements for key equipment must be approved by the leader in charge before implementation.

设备检修部根据运行部提交的机泵检修要求，编制检修方案、计划网络和质量控制程序，经内部审核、运行部会签后报机械动力部、HSE 管理部审核。重要设备的施工方案须经公司分管领导批准后执行。

1.5 In case of scheduled maintenance of key equipment where there are more than 5 days between determination of maintenance and its implementation, the Equipment Maintenance Dept. shall prepare maintenance plan and network; in case of sudden failure, relevant personnel of Equipment Maintenance Dept., Operation Dept. and Equipment Management Dept. shall determine the scope, depth, priority and duration of maintenance on site.

重要设备属于计划抢（检）修时，从确定检修到检修实施有 5 天以上时间，设备检修部应编写检

修方案和施工网络；突发性故障应由设备检修部、运行部和机械动力部有关人员现场确定检修范围、检修深度、检修重点和施工工期。

1.6 In case of maintenance of key pump equipment, the Equipment Maintenance Dept. must post on site Method Statement for Key Equipment Maintenance, planned network and quality control procedure and lead maintenance work; maintenance data shall be promptly and accurately put in the maintenance record book and QC sheets to be checked and signed by all levels of management according to their responsibility. In case of maintenance of other pump equipment, Equipment Maintenance Dept. shall promptly and accurately put maintenance data in the maintenance record book for spot check by the Operation Dept. and Equipment Management Dept. After key pump equipment is uncovered and before it is covered again, the Equipment Maintenance Dept. shall complete Acceptance Sheet for Covering/Uncovering Key Equipment and conduct acceptance with Operation Dept. and Equipment Management Dept. Before startup, the Equipment Management Dept. together with Equipment Maintenance Dept., Operation Dept., Electrical Operation Dept. and Instrument Control Dept., shall confirm startup conditions and complete Confirmation Sheet for Startup Conditions of Key Equipment.

重要机泵设备检修时，设备检修部须在检修现场张贴重要设备检修施工方案、计划网络和质量控制程序，并组织检修工作，检修数据应及时准确填写在检修记录本及质量控制程序表中，各级管理人员按各自职责进行检查并签字确认；其它机泵设备检修时，设备检修部应将检修数据及时准确地填写在检修记录本上，运行部、机械动力部进行抽检；重要机泵设备检修揭盖后、扣盖前，设备检修部需填写“重要设备揭（扣）盖验收单”，设备检修部、运行部、机械动力部共同验收确认；开机前，由机械动力部组织设备检修部、运行部、电气运行部、仪表控制部对开机条件进行确认，并填写“重要设备开机条件确认单”。

联锁调试相关内容没看到

1.7 When aligning pump equipment, the mounting clearance or discs of the disc coupling shall meet requirements to ensure the pump and motor are not subject to additional axial force; the alignment data and mounting clearance of discs shall be included in maintenance records. After maintenance, the pump equipment shall undergo commissioning for not less than 72h; after maintenance, the motor shall undergo joint commissioning with the pump for not less than 72h, in addition to standalone commissioning.

机泵设备找正时，叠片式联轴器叠片的安装间隙要符合要求，确保泵和电机不受额外轴向力，找正数据和叠片安装间隙要进检修记录。机泵设备检修后试运时间不得少于 72 小时；电机检修后除了进行单试，还应与机泵联合试运，试运时间不少于 72 小时。

2 Acceptance and Quality Assessment after Pump Equipment Maintenance

机泵设备检修后的验收及质量评定

2.1 Basic evaluation standards. Basic evaluation indicators are the requirements that must be satisfied after equipment maintenance (installation); if they are not satisfied, the maintenance shall be considered to be unqualified.

基本评定标准。基本评定指标是设备检修（安装）后必须达到的要求，如达不到基本评定指标，则视为检修不合格。

2.1.1 Maintenance process control and record: the whole process of pump equipment maintenance (installation) shall meet the requirements of relevant systems; the format of maintenance record shall be consistent with the classification in the maintenance code, and contain complete, accurate maintenance data.

检修过程控制及记录：机泵设备检修（安装）的全过程符合有关制度的要求；检修记录格式与检修规程划分类别相符，检修内容和数据齐全、准确。

2.1.2 Site standardization: after maintenance (installation), the pump surface, foundation plate and maintenance area are free of sundries and oil stain; the lube system, sealing oil system, cooling system, tightness, balance header and other auxiliary systems are intact without leakage; accessories such as oil cup, oil leveler, safety shield, valve hand wheel and turning gear are intact; the oil leveler shows clear, normal level; the foundation and base are solid and complete, with anchor bolts and connecting bolts fully and securely tightened; the drain valves are complete and easy to operate; the oil injector for reciprocating pump is intact, with no leakage at the joint, unobstructed injection point and normal injection section. The temperature transducer, vibration-measuring probe and axial displacement probe are normal; the number of aligning gaskets, which shall not be exposed obviously, shall not exceed 3.

现场规格化：检修（安装）后机泵表面、基础台板及检修区域无杂物和油污；润滑系统、封油系统、冷却系统、气体密封、平衡管等辅助系统完好无泄漏；油杯、油标、安全护罩、阀门手轮及盘车机构等附件完好；油标清晰、油位正常；基础、基座坚固完整，地脚螺栓及各部连接螺栓应满扣、齐整、紧固；机体排污、放水阀齐全好用；往复机泵注油器完好，接头不漏油，注油点畅通，注油部位正常。温度计传感器、测振探头、轴位移探头正常；找正用垫片不超过 3 张且不明显外露。

2.1.3 Trial run: operation process parameters of the pump meet requirements; the equipment runs stably without noise, with no obvious anomaly in bearing vibration and temperature or leakage from static seal point.

试运行：机泵运行工艺参数符合要求，设备运转平稳无杂音，轴承振动、温度无明显异常，静密封点无泄漏。

2.2 Vibration evaluation standards. For compressors, steam turbines and other large units equipped with online status monitoring system, the evaluation shall be based on the reading of the sensor, provided the instrument and process operation are normal. The following grades refer only to maintenance; non-conformity, if any, means the maintenance is non-conforming.

振动评定标准。对安装在线状态监测系统的压缩机、汽轮机等大型机组，在仪表及工艺操作正常情况下，以传感器的显示值为判定值。以下评定等级仅指检修行为，如不合格，是指检修不合格。

2.2.1 Good: the vibration value of the unit after maintenance is within 40% of alarm setting;

优良：检修后机组的振动值在设定报警值的 40% 以下；

2.2.2 Acceptable: the vibration value of the unit after maintenance is within a range of 40%~60% of the alarm setting;

合格：检修后机组的振动值在设定报警值的 40%~60% 的区间；

2.2.3 Unacceptable: the vibration value of the unit after maintenance is above 60% of alarm setting, or if:

不合格：检修后机组的振动值在机组设定报警值的 60%以上，或有如下情况之一者：

2.2.3.1 The vibration value is $\leq 10\mu\text{m}$ before maintenance and $> 25\mu\text{m}$ after maintenance;

检修前正常振动值 $\leq 10\mu\text{m}$ ，检修后的振动值高于 $25\mu\text{m}$ ；

2.2.3.2 $10\mu\text{m} < \text{normal vibration value before maintenance} \leq 20\mu\text{m}$ and the vibration value after maintenance is $> 38\mu\text{m}$; or

$10\mu\text{m} < \text{检修前正常振动值} \leq 20\mu\text{m}$ ，检修后的振动值高于 $38\mu\text{m}$ ；

2.2.3.3 The normal vibration value before maintenance is $> 20\mu\text{m}$ and the vibration value after maintenance is higher than 190% of the normal value before maintenance.

检修前正常振动值 $> 20\mu\text{m}$ ，检修后振动值高于检修前正常值 190%。

The order of priority for the above evaluation: 2.2.3.3, 2.2.3.2, 2.2.3.1 under "Unacceptable", "Unacceptable", "Acceptable" and "Good".

上述判定的优先次序是：不合格中的 2.2.3.3、2.2.3.2、2.2.3.1、不合格、合格、优良。

2.2.4 For pump equipment with no online status monitoring system, the evaluation criterion is the effective value of vibration severity on bearing pedestal and based on maximum vibration test value. Measurement shall be made using a hand-held instrument with 10~1000 Hz bandpass frequency to record vibration velocity in root-mean-square.

对没有安装在线状态监测系统的机泵设备以测量轴承座上的振动烈度有效值为判定标准，以测试振动的最大值为判定值。测试仪表使用手持式测量仪器，带通频率为 10~1000 Hz，记录的振速为均方根值。

2.2.4.1 Vibration evaluation criteria are as follows:

振动评定标准如下：

(1) Good: type I pump: effective vibration velocity $\leq 0.71\text{mm/s}$; type II pump: effective vibration velocity $\leq 1.12\text{mm/s}$; type III pump: effective vibration velocity $\leq 1.8\text{mm/s}$; type IV pump: effective vibration velocity $\leq 2.8\text{mm/s}$.

优良：I 类机泵：机泵振速有效值 $\leq 0.71\text{mm/s}$ ；II 类机泵：机泵振速有效值 $\leq 1.12\text{mm/s}$ ；III 类机泵：机泵振速有效值 $\leq 1.8\text{mm/s}$ ；IV 类机泵：机泵振速有效值 $\leq 2.8\text{mm/s}$ 。

(2) Acceptable: type I pump: effective vibration velocity $\leq 1.8\text{mm/s}$; type II pump: effective vibration velocity $\leq 2.8\text{mm/s}$; type III pump: effective vibration velocity $\leq 4.5\text{mm/s}$; type IV pump: effective vibration velocity $\leq 7.1\text{mm/s}$.

合格：I 类机泵：机泵振速有效值 $\leq 1.8\text{mm/s}$ ；II 类机泵：机泵振速有效值 $\leq 2.8\text{mm/s}$ ；III 类机泵：机泵振速有效值 $\leq 4.5\text{mm/s}$ ；IV 类机泵：机泵振速有效值 $\leq 7.1\text{mm/s}$ 。

(3) Unacceptable: pumps with effective vibration velocity exceeding the acceptable range.

不合格：超过合格指标的为不合格。

1) Rotating machinery is divided into four categories: I - small rotating machinery such as motor below 15kW; II - medium rotating machinery mounted on rigid foundation with a power under 300kW; III - large rotating machinery, with rigid supporting system; IV - large rotating machinery,

with flexible supporting system;

旋转机械分为如下四类：I—小型转机如 15kW 以下的电机；II—安装在刚性基础上的中型转机功率 300kW 以下；III—大型转机，机器——支承系统为刚性状态；IV—大型转机，机器——支承系统为挠性支承状态；

2) The vibration criteria for non-rotating machinery are subject to the manufacturer's requirements.

非旋转机械的振动合格标准按制造厂提供要求执行。

2.3 Seal leakage evaluation criteria

密封泄漏评定标准

2.3.1 Mechanical seal for centrifugal pump: light oil < 10 drops/min, heavy oil < 5 drops/min; packing seal for centrifugal pump: light oil < 20 drops/min, heavy oil < 10 drops/min; mechanical seal for screw and gear pumps < 5 drops/min; packing seal for screw and gear pumps < 10 drops/min; packing seal for steam reciprocating pump: light oil < 20 drops/min, heavy oil < 10 drops/min; packing seal for electric reciprocating pump < 20 drops/min; packing seal for electric reciprocating metering pump < 3 drops/min;

离心泵机械密封：轻质油<10 滴/min，重质油<5 滴/min；离心泵填料密封：轻质油<20 滴/min，重质油<10 滴/min；螺杆、齿轮泵机械密封<5 滴/min；螺杆、齿轮泵填料密封<10 滴/min；蒸汽往复泵填料密封，轻质油<20 滴/min，重质油<10 滴/min；电动往复泵，填料密封<20 滴/min；电动往复计量泵，填料密封<3 滴/min；

2.3.2 Mechanical and packing seal leakage for water medium shall be evaluated in accordance with the criteria for light oil.

介质是水的机械密封和填料密封泄漏标准参照轻油执行。

2.4 Bearing temperature evaluation criteria

轴承温度评定标准

2.4.1 It is acceptable if ruling out the effect of medium or high ambient temperature and under the worst operating condition: for forced lubrication system, the temperature rise of lube oil at bearing outlet is not higher than 28°C, the temperature of lube oil at bearing outlet not higher than 71°C and the temperature of bearing metal lower than 93°C; for oil ring lubrication or splash lubrication system, the temperature rise of shell at the mounting position of bearing is not higher than 39°C (or oil bath temperature is lower than 82°C); the manufacturer's design requirements are met.

合格标准，排除介质或环境高温影响，在最不利的运转条件下：对于强制润滑系统，轴承出口润滑油的温升不应超过 28°C，轴承出口润滑油温不应超过 71°C，轴承金属的温度应小于 93°C；对于油环润滑或飞溅润滑系统，轴承安装部位壳体的温升不应超过 39°C，（或油池温度应低于 82°C）；符合制造厂设计要求。

2.4.2 It is unacceptable if the conformity criteria cannot be met, with the effect of medium or environment ruled out.

不合格标准，在排除介质或环境影响的情况下，达不到合格标准的，视为不合格。

2.5 Process performance indicators: it is deemed acceptable if the pressure, flow, temperature and other process parameters of the repaired (installed) pump equipment satisfy, during commissioning, process requirements in the Operating Procedures developed by Production Division.

工艺技术指标：检修（安装）后的机泵设备，试运中压力、流量、温度等工艺参数符合生产处制定的“工艺操作规程”中工艺要求，视为合格。

2.6 Special quality indicator: for special pumps, refer to the manufacturer's relevant requirements.

专用质量指标：对于特殊机泵，参照制造厂的有关要求执行。

2.7 Maintenance quality evaluation

检修质量评定

2.7.1 The maintenance (installation) quality is rated "good" if after maintenance (installation) of the pump equipment, its basic evaluation indicators are acceptable, vibration is good, seal leakage is acceptable, bearing temperature is acceptable and process performance indicators are acceptable. For non-rotating machinery (such as reciprocating pump) and special rotating machinery (such as air-cooling fan, cooling tower fan and Roots blower) which cannot be rated "good" by vibration indicator (or vibration cannot be measured), the assessor shall take holistic approach to their evaluation for "good", provided other indicators are acceptable. For example, the maintenance quality can be rated "good" if packing leakage, temperature and process indicators, considered essential, greatly improve after maintenance, compared with past normal operation of the equipment. The improved indicators shall be given under "General Evaluation Comment".

优良。机泵设备检修（安装）后，满足：基本评定指标合格、振动评定标准达到优良、密封泄漏评定标准合格、轴承温度评定标准合格、工艺技术指标合格的设备，检修（安装）质量评为优良。在对非旋转机械及如往复机泵、特殊旋转机械如空冷风机、凉水塔风机和罗茨风机等无法以振动指标（或无法测振）评优良的设备，由评定人员在其它各项指标合格的基础上，进行综合评优，如可以比较以往设备正常时运行情况，对填料泄漏、温度及工艺指标等认为较重要的指标在检修后明显改观，检修质量可评为优良。同时在“综合评定意见”栏中注明改观指标情况。

2.7.2 The maintenance (installation) quality is rated "acceptable" if after maintenance (installation) of the pump equipment, its basic evaluation indicators are acceptable, vibration is acceptable, seal leakage is acceptable, bearing temperature is acceptable and process performance indicators are acceptable. In evaluating leakage, if the leakage varies around the conformity limit, the evaluation can be postponed 1-3 days until the leakage becomes stable before taking the higher value for evaluation.

合格，机泵设备检修（安装）后，满足：基本评定指标合格、振动评定标准合格、密封泄漏评定标准合格、轴承温度评定标准合格、工艺技术指标合格的设备，检修（安装）质量评为合格。对泄漏评定时，当漏量在合格指标界限左右变动时，评定时间可往后延 1~3 天，待漏量稳定后取高值予以评定。

2.7.3 The maintenance (installation) quality is rated "unacceptable" if after maintenance (installation) of the pump equipment, any of its basic evaluation criteria, vibration criteria, seal leakage criteria, bearing temperature criteria and process performance indicators is unacceptable.

不合格，机泵设备检修（安装）后，其基本评定标准、振动评定标准、密封泄漏评定标准、轴承温度评定标准、工艺技术指标中有任何一项不合格的设备，检修（安装）质量评为不合格。

2.8 Evaluation

评定

2.8.1 After pump maintenance (installation), its maintenance (installation) quality shall be rated "good", "acceptable" or "unacceptable" based on the above conditions and criteria.

对机泵检修（安装）后，依据上述条件和标准，应对其检修（安装）质量分“优良”、“合格”、“不合格”三档予以综合评定。

2.8.2 To evaluate the maintenance of pumps as a result of high vibration or with high vibration before maintenance (at or above zone C), the Operation Dept. shall measure the vibration with maintenance personnel before shutdown, analyze the causes of vibration before maintenance and take targeted measures and enhance quality control during maintenance to reduce vibration after maintenance. It is deemed unacceptable if the vibration after maintenance is not lower than before maintenance (taking the average of 3 records in EM system during normal operation just before maintenance). For pumps whose vibration is in or above zone C, as measured by the Maintenance Dept. during routine patrol inspection, the Maintenance Dept. and Operation Dept. shall reach agreement on a monthly basis to record the vibration value in the EM system.

对于因振动大引起的检修或检修前振动较大（振动在 C 区及以上）的机泵评定，运行部应在停机前通知检修人员一起测振，在检修前进行振动原因分析，检修中要有针对性地采取措施，同时加强检修时质量控制，力争检修后振动有所下降。如检修后振动比检修前（以检修前最近的正常运行时 EM 系统中 3 次记录的平均值）未下降则视为不合格。检修部门平时巡检测振结果振动值在 C 区及 C 区以上运行的机泵，每月与运行部定期对接，双方取得一致意见后由运行上报在每月 EM 系统中。

2.8.3 With regard to the disposal of unacceptable pumps, the interested parties shall identify the causes; the user department may ask the Maintenance Dept. for rework or rectification; the reworked or rectified pump cannot be rated "good", with "reworked or rectified" put down under "General Evaluation Comment"; in case of any rework due to poor maintenance quality, the maintenance quality shall be rated "unacceptable".

对于按指标评定为不合格机泵的处置。有关各方要分析原因，使用部门可要求检修单位返修或整改，返修或整改后的机泵不能评优良，并在“综合评定意见”栏中注明“返修或整改”，如因检修质量引起的第二次返修一律评为“不合格”。

2.8.4 Acceptance on deviation. In addition to post-maintenance evaluation indicators, emphasis shall also be placed on the trend of development after maintenance compared with

past normal operation data of the equipment. The trend moving in a good direction shall be affirmed (accepted on deviation). Where the vibration is reduced after maintenance but evaluated as "unacceptable" due to historical reasons and the evaluation result is "unacceptable", the equipment shall be put into operation, after putting down "accepted on deviation" under "General Evaluation Comment". Equipment Management Dept. shall contact the manufacturer and Installation Dept. to handle "unacceptable" pumps which are newly installed and put into use as part of capital construction or technical renovation. For any other "unacceptable" pumps which cannot be remedied immediately and is urgently needed in production, the Operation Dept. shall accept them on deviation, putting down "needed in production" under "General Evaluation Comment" on the evaluation form; in addition, this information shall be indicated in the summary of Equipment Management Dept. at the end of a month.

让步接收。在实施评定过程中，除了检修后的评定指标外，也应重视检修后评定指标与设备历史正常运行数据相比的变化趋势，如趋势向好的方向发展应予以肯定（让步接收）。对因历史原因采取措施后振动有所下降，但按振动评定指标仍不合格，评定结果为“不合格”，在评定表“综合评定意见”栏注明“让步接收”后投运。对基建、技改新安装投用的评定为“不合格”的机泵，机械动力部要联系厂家、安装部门进行处理。对其它所有最终评定为不合格的机泵，如生产需要一时无法处理而需马上投用的，在评定表“综合评定意见”栏注明“生产需要”，运行部让步接收投用，同时在月底上报机械动力部的汇总表中注明。

2.8.5 Pumps exempt from evaluation. Where process and equipment technicians of the Operation Dept. and technicians of Maintenance Dept. have agreed, after analysis, that the high vibration of equipment and frequent maintenance are caused by non-conforming process conditions, the equipment may be temporarily exempt from evaluation. Relevant departments must carefully identify the causes and improve process or equipment (including updating) so that actual operation parameters are acceptable or better.

不作评定机泵。经运行部工艺、设备技术员、检修部门技术员等一起分析，达成设备振动较大且检修频繁是由于工艺条件不符等原因引起的共识，可暂时不作评定。有关部门要认真分析原因，通过改进工艺或设备（包括更新）使实际运行的评定参数达到（合格或以上）评定指标。

2.8.6 Quality defect of spare parts. In addition to visual and dimensional inspections, the Maintenance Dept. shall coordinate with relevant departments, as necessary, to conduct physical and chemical inspections on key positions of some spare parts; for spare parts with quality defects (to be presented by Maintenance Dept. and confirmed before assembly with equipment technicians of Operation Dept.) that must be used during production, the Operation Dept. and Maintenance Dept. shall reach consensus before assembly; the effect of the quality of this spare part on the corresponding maintenance quality indicator is ignored (this indicator is treated as "acceptable"); other indicators are evaluated as usual; the quality shall not be rated "good" in principle.

备件质量问题。检修部门对机泵备件除了目测和尺寸检查外，必要时与有关部门协商对一些备件

重点部位安排理化检验，对于备件质量存在的问题（检修部门提出并与运行部设备员在装配前确认），有时为了生产必须使用，运行部和检修部门应在装配前协商达成共识，该备件质量对相关某项检修质量指标影响不计（该项指标按合格处理），其它指标按常规进行检修质量评定，原则上不能评优良。

2.9 Within 120h of starting operation following maintenance, the final maintenance quality of pump equipment shall be completed. For general equipment, the equipment technicians of Operation Dept. shall conduct the evaluation together with technicians of the Maintenance Dept.; for key equipment, the Equipment Management Dept., Operation Dept. and executive departments shall conduct the evaluation according to evaluation criteria. Final evaluation requires the pump to run under rated conditions wherever possible; evaluation items shall be confirmed by relevant personnel.

最终评定,机泵设备检修投运 120 小时内，完成检修质量评定，其中一般设备由运行部设备员根据评定标准与检修部门技术员一起进行检修质量的评定；重要设备由机械动力部、运行部和施工部门共同根据评定标准进行检修质量的评定。最终评定要求机泵尽可能运行在额定工况下，有关人员对于评定项目进行最终确认。

2.10 Implementation of evaluation. Initial and final evaluation may concur. The equipment technician of Operation Dept. attaches the assessment form to the permit for equipment maintenance when the permit is issued. The Maintenance Dept. conducts pre-acceptance initial evaluation when the permit is returned. The operator shall notify the shift foreman or chief repairman of Maintenance Dept. to conduct pump test initial evaluation. Equipment technicians of Operation Dept. shall notify technicians of Maintenance Dept. according to equipment operation status (and also Equipment Management Dept. for key equipment) to conduct final evaluation. The evaluation shall be conducted on the site of equipment. After being signed, the assessment form for maintenance quality is collected and kept by the Operation Dept.

评定工作的操作。初评和最终评可一起进行，由运行部设备员在设备检修开许可票时同时把评定表附在许可票后面，检修部门在检修作业许可票交回时进行预验收初评，试泵初评由操作人员通知检修部门班长或主修，最终评定由运行部设备员根据设备投用情况通知检修部门技术员（重要设备同时通知机械动力部），评定人员在设备现场进行评定，检修质量评定签字后评定表由运行部负责回收保管。



Appendix 2

附件 2

Management of Maintenance Work Permit 检修施工安全许可票管理

1 The *Maintenance Work Permit* shall be issued by whoever is in charge of the equipment to be maintained.

现场检修作业施工遵循设备谁管理谁开具《检修施工安全许可票》的原则。

2 The *Maintenance Work Permit* is a must for maintenance of all equipment, piping, valve, pipe fittings, electrical device, instrument and structures in a production plant.

生产装置内设备、管道、阀门、管道配件、电气、仪表和构筑物等各类检修施工作业，均必须办理《检修施工安全许可票》。

3 The maintenance Implementation Unit must obtain the *Maintenance Work Permit* before carryout out maintenance on site; maintenance work is not permitted without valid *Maintenance Work Permit*. The format of the *Maintenance Work Permit* is attached hereto.

检修施工单位必须到装置办理《检修施工安全许可票》后方可进行现场检修施工，无有效《检修施工安全许可票》严禁检修施工。《检修施工安全许可票》格式见附件。

4 The *Maintenance Work Permit* is divided into two types (A and B). Type A shall be obtained by technicians while Type B by crew members.

《检修施工安全许可票》分为：“A类”和“B类”。“A类票”由技术人员负责办理，“B类票”由班组人员负责办理。

4.1 Type A permit is for scheduled work, non-scheduled work, high-risk work and routine defect remedying that requires effective work arrangement; and for work not covered by Type B permit. It is applicable to:

“A类”票划分的原则：计划性工作；非常规性作业、高风险作业；需进行有效的施工安排的日常缺陷处理；“B类”票外的作业。适用范围：

4.1.1 Scheduled maintenance items (including monthly maintenance, shut-down maintenance, technical measure and renovation items);

计划检修项目（含月度计划检修、装置停工检修、技措及技改项目）；

4.1.2 Minor routine outsourced maintenance;

日常零星外委检修；

4.1.3 Maintenance work involving hot work;

需动火的检修作业；

4.1.4 Work involving unconventional treatment means such as blocking and holing with pressure;

带压封堵、带压开孔等非常规处理手段的作业；

4.1.5 Items involving groundbreaking and entry into confined space;

需要破土和进入受限空间作业的项目；

4.1.6 Other items where technicians are responsible for clarification and management;
其它由技术人员负责交底、管理的项目；

4.1.7 Other unspecified items.

分类中还未明确的项目。

4.2 Type B permit is for work that is urgently needed in production yet not serious; easy to do; and of low risk. It is applicable to:

“B类”票划分的原则：生产紧急但不重大；简单易行；低风险作业。适用范围：

4.2.1 Urgent pump maintenance (emergency repair) affecting plant safety and green production;

影响装置安全、环保生产的紧急的机泵检（抢）修；

4.2.2 Leakage treatment and unblocking of equipment that can be handed over, with an impact on plant safety and green production;

影响装置安全、环保生产的可交出的设备泄漏处理、清堵处理；

4.2.3 Fault treatment during operation of safety accessories and measuring instruments, only if they can be handed over for such treatment;

安全附件、测量器具运行过程中的故障处理，限于可交出情况下；

4.2.4 Maintenance work during operation of lifting equipment;

起重设备运行过程的维保内容；

4.2.5 Treatment of tightness leakage point for equipment;

装置设备气密的泄漏点处理；

4.2.6 Low risk maintenance of electric device and instruments;

电气、仪表相应的低风险检修工作；

4.2.7 Other simple work items, i.e. those not involving hot work, groundbreaking or entry into confined space;

其他简单施工项目，即不需动火、破土、不进入受限空间的施工项目；

4.2.8 Other plant hand-over cooperation measures and work with clear instructions or scheme;

其他有明确指令或方案的装置交出配合措施和施工作业；

4.2.9 Scaffolding, civil works, heat/cold insulation and corrosion protection supporting the above work.

配合上述施工作业的架子、土建、保温保冷及防腐作业。

5 Obtaining of Maintenance Work Permit

《检修施工安全许可票》的办理。

5.1 The user department needs to insert its code in the record number on the *Maintenance Work Permit*, the record number is HYBN-T6-____-0106-____-2018 for Type A permit and HYBN-T6- ____-0107____-2018 for Type B permit; the code of user department, as assigned in Appendix I, shall be inserted in the first blank space; the flow record number shall be placed in the second blank space.

使用单位需填写《检修施工安全许可票》记录编号中使用单位代码，记录编号分别为：“A类票”，HYBN-T6-__-0106-__-2018，“B类票” HYBN-T6-__-0107 __-2018，第一空格为使用单位代码，代码分配详见附件一；第二空格为流水记录号。

5.2 Roles and responsibilities of persons obtaining Type A permit: the "maintenance content" and columns above it are filled in by technicians (such as static and dynamic electric instrument technicians and process technicians) and personnel above them; the drafter of maintenance content (new pipeline, pipeline relocation, technical renovation and blind plate assembly/disassembly are the responsibility of process technicians) is responsible for its accuracy, leading the permit obtaining process and site clarification of maintenance content. Safety measures and precautions are inserted by process technicians (or electrical and instrument technicians) by ticking "☐"; they are responsible for the completeness and applicability of safety measures and precautions. Safety measures, precautions and maintenance content are reviewed by personnel whose authority is above the drafter of safety measures and precautions; such personnel are responsible for the feasibility of safety measures, precautions and maintenance content. Safety measures are implemented by operators of Operation Dept. (or electrical and instrument operators) arranged by the production team leader; they are responsible for the accuracy and authenticity of implementation. Precautions are implemented by the maintenance director who is also responsible for implementation of safety measures by the Implementation Unit and authenticity of the outcome. The *Maintenance Work Permit* is issued by the production team leader on duty, who is also responsible for verification of implementation of safety measures and suitability of maintenance timing.

“A类票”办票人员分工及职责：“检修内容”栏及以上各栏内容：技术员（动静电仪等专业技术人员、工艺技术员等）及技术员以上人员负责填写此项内容，检修内容编制人（新增管线、管线改接、技术改造、盲板拆装等作业由工艺技术员负责）对检修内容的准确性负责，同时负责办票过程的牵头工作和检修内容的现场交底。安全措施及注意事项：工艺员（电气、仪表等专业为技术员）负责此项内容的填写（在“☐”内打“√”确定所需内容）并对安全措施及注意事项的完整性、适用性负责。安全措施及注意事项和检修内容的审核：权职高于“安全措施及注意事项制定人”的人员负责审核此项内容并对安全措施及注意事项和检修内容的可行性负责。安全措施的落实：装置生产班长安排的运行部操作人员（或电气、仪表专业操作员）负责落实安全措施并对落实结果的准确性、真实性负责。注意事项的落实：检修负责人负责落实注意事项和需施工方落实的安全措施并对落实结果的真实负责。《检修施工安全许可票》的签发：当班装置生产班长负责《检修施工安全许可票》的签发并对安全措施落实结果的核实和检修时间的适宜性负责。

5.3 Roles and responsibilities of persons obtaining Type B permit: the "maintenance content" and columns above it are filled in by indoor operators and personnel above them (or electrical and instrument team leader and operator), who are responsible for the accuracy of maintenance content and leading the process of obtaining the permit. Safety measures and precautions are inserted by indoor operators and personnel above them (or electrical and

instrument team leaders) by ticking "□"; they are responsible for the completeness and applicability of safety measures and precautions. Safety measures are implemented by operators of Operation Dept. (or electrical and instrument operators) arranged by the production team leader; they are responsible for the accuracy and authenticity of implementation and site clarification of maintenance content. Precautions are implemented by the maintenance director who is also responsible for implementation of safety measures by the Implementation Unit and authenticity of the outcome. The *Maintenance Work Permit* is issued by the production team leader on duty, who is also responsible for verification of implementation of safety measures and suitability of maintenance timing.

“B类票”办票人员分工及职责：“检修内容”栏及以上各栏内容：内操及以上岗位人员（或电气、仪表专业班长、操作员）负责此项内容的填写并对检修内容的准确性负责，同时负责办票过程的牵头工作。安全措施及注意事项：内操及以上岗位人员（或电气、仪表专业班长）负责此项内容的填写（在“□”内打“√”确定所需内容）并对安全措施及注意事项的完整性、适用性负责。安全措施的落实：装置生产班长安排的运行部操作人员（或电气、仪表专业班长、操作员）负责落实安全措施并对落实结果的准确性、真实性负责，同时负责检修内容的现场交底工作。注意事项的落实：检修负责人负责落实注意事项和需施工方落实的安全措施并对落实结果的真实负责。《检修施工安全许可票》的签发：当班装置生产班长负责《检修施工安全许可票》的签发并对安全措施落实结果的核实和检修时间的适宜性负责。

5.4 For *Maintenance Work Permit* (Type A or B) obtained by the Electrical Operation Dept. and Instrument Control Dept., the "relevant unit" is Production Operation Dept and "Implementation Unit" is Electrical Operation Dept. or Instrument Control Dept., subject to countersigning by Production Operation Dept. Type A permit needs to be countersigned by process technician at the "signature by relevant unit"; Type B permit needs to be countersigned by the chief operator on duty or above at the "signature by relevant unit"; after the permit is issued by the production team leader on duty, the Electrical Operation Dept. and Instrument Control Dept. shall carry out and accept the maintenance work.

由电气运行部、仪表控制部负责办理的《检修施工安全许可票》（A类或B类），“相关单位”为生产运行部，“施工单位”为电气运行部或仪表控制部，并经生产运行部会签，其中“A类票”需在“相关单位人员签名”处由工艺技术员会签，“B类票”需在“相关单位人员签名”处由当班装置主操以上会签，当班装置生产班长签发后，由电气运行部、仪表控制部组织实施并施工验收。

5.5 The Production and Operation Department shall be responsible for handling the "Maintenance Work Safety Permit" for the production equipment that needs to be repaired due to instrument failure. The "working unit" shall be the instrument control department. The "Maintenance Work Safety Permit" issued by the Instrument Control Department is responsible for the regular maintenance and repair of instruments or the instrument maintenance and repair in the instrument cabinet room and the instrument maintenance and repair in the non-installation area. The "working unit" is the instrument control department and the "Relevant

unit" is the production and operation department.

因生产装置内仪表故障需要检修，由生产运行部负责办理的《检修施工安全许可票》，“施工单位”为仪表控制部；仪表定期维护保养或仪表机柜间仪表检修及非装置区仪表检修，由仪表控制部负责办理的《检修施工安全许可票》，“施工单位”为仪表控制部，“相关单位”为生产运行部。

5.6 Where site equipment needs to be shut down due to maintenance of electrical equipment in the substation, the Electrical Operation Dept. shall obtain the appropriate Electrical Work Permit which goes into effect once countersigned by production team leader or above; maintenance of power transmission and distribution facilities at the substation shall follow relevant electrical systems.

因变电所内电气设备检修涉及到现场设备需要退出备用的，由电气运行部办理相应的电气工作票，经生产装置当班班长以上会签后生效；变配电所等输配电设施的检修，执行电气专业相关制度。

6 If maintenance items are related to upstream and downstream production plant, safety measures shall also include the requirements and signature of the team leader or process technician of such plant, who is responsible for implementation of these safety measures.

检修施工项目与上、下游生产装置有关联时，安全措施中还应包括上、下游生产装置的生产班长或工艺技术人员的要求和签字并负责落实好所需的安全措施。

7 Maintenance acceptance: where the maintenance is not completed within scheduled time for maintenance, the production team leader shall sign the *Maintenance Work Permit* and repeat the process of obtaining the permit; after maintenance, the maintenance director shall conduct self-inspection and sign the Permit before handover for commissioning; after equipment maintenance work ends, the production team leader (or professionals) shall examine and accept the maintenance quality and site sanitation.

检修施工验收：未在计划检修时间内完成检修时由装置生产班长在《检修施工安全许可票》上签名后并按原程序重新办票；检修结束经检修负责人自检合格并在“许可票”上签字后方可交付试运行；设备检修施工结束后，装置生产班长（或专业人员）对检修施工质量和现场卫生情况进行验收。

8 The validity period of *Maintenance Work Permit* (i.e. scheduled time for maintenance) is as follows:

《检修施工安全许可票》的有效期（即计划检修时间）分三类：

8.1 During production, the *Maintenance Work Permit* is typically valid for not more than 24h or 5 days when necessary.

在生产期间，《检修施工安全许可票》有效期一般不超过 24 小时，确实需要的最长不超过 5 天。

8.2 During shut-down maintenance, the *Maintenance Work Permit* may be valid from equipment handover for maintenance to the end of maintenance.

在装置停工检修期间，《检修施工安全许可票》的有效期可从设备交出检修至设备检修结束。

8.3 During production, the *Maintenance Work Permit* for equipment pipe prefabrication, civil works, insulation, scaffolding and painting not closely related to the production process is valid

for not more than 15 days.

在生产期间对于与生产过程关系不密切的设备管道预制、土建施工、保温、架子、油漆的《检修施工安全许可票》有效期不超过 15 天。

9 During the night, weekends and holidays, the maintenance content on the *Maintenance Work Permit* that should be inserted by technicians shall be done by the person on duty; in emergencies where the normal formalities would take such a long time that affects production, the person on duty shall ask for instructions from the department head and go through the process for Type B permit, as instructed.

夜间、双休日、节假日《检修施工安全许可票》，原属于技术人员填写检修内容的由各单位值班人员组织办理；对于特别紧急，确因办理时间而影响生产时，由值班人员请示部门主管领导后按 B 票程序办理。

10 The *Maintenance Work Permit* is made in two copies and must be fully completed and signed by relevant responsible individuals. The first copy is kept by the permit issuer as part of plant handover; the second copy is kept by the Implementation Unit. For a permit issued by the Instrument Control Dept. and Electrical Operation Dept., the first copy, once signed by the team leader, is kept at the plant while the second copy is given to the Instrument Control Dept. and Electrical Operation Dept. After successful self-inspection following maintenance, the Implementation Unit notifies the team leader on duty of Production Operation Dept. for site acceptance; after successful acceptance, the maintenance director signs each copy of the *Maintenance Work Permit* and delivers it for commissioning (where the maintenance is carried out by the Instrument Control Dept. and Electrical Operation Dept., the Instrument Control Dept. and Electrical Operation Dept. shall perform acceptance of maintenance and deliver the permit to Production Operation Dept. for commissioning). After maintenance content is completed and accepted, the production team leader signs each copy of the *Maintenance Work Permit*. The first copy of the signed *Maintenance Work Permit* is returned to the permit issuer for safekeeping while the second one is kept by the Implementation Unit. For a permit issued by the Instrument Control Dept. and Electrical Operation Dept., both the first and second copies shall be returned, after maintenance, to the Instrument Control Dept. and Electrical Operation Dept. for safekeeping. If the Implementation Unit fails to sign the *Maintenance Work Permit* after completing maintenance, the maintenance work may be deemed to be not accepted. Where the maintenance quality and sanitation on work site fail to pass acceptance, the department in charge of the equipment makes evaluation comment and the Equipment Management Dept. evaluates the Implementation Unit as specified.

《检修施工安全许可票》一式二份，内容必须填写齐全，各有关责任人确认签字。第一联留办票方，作为生产装置工作交接内容；第二联由施工单位保存；由仪表控制部、电气运行部开具的施工作业票，装置班长签发后第一联留生产装置，第二联交付给仪表控制部、电气运行部。施工单位待检修结束自检合格后，通知生产运行部当班班长现场验收，验收合格后检修负责人在各联《检修施工安全许可票》上签字，并交付试运行（仪表控制部、电气运行部组织施工的则由仪表控制

部、电气运行部验收合格后交付生产运行部试运行)。检修施工内容完工验收合格后装置生产班长在各联《检修施工安全许可票》上签字。签字后的《检修施工安全许可票》第一联返回给办票方保存,第二联由施工单位留底,其中由仪表控制部、电气运行部开具的施工作业票,施工完成后第一第二联均交还给仪表控制部、电气运行部保存。施工单位检修结束后,未在《检修施工安全许可票》最后栏签字的,可视作检修工作未经验收处理。检修施工质量和检修施工场地卫生经验收不合格的,设备所在单位提出考核意见,机械动力部按规定对施工单位进行考核。

11 If the Implementation Unit needs to do hot work or enter the tower or tank after handover of the maintenance item, relevant provisions in the applicable systems shall be followed.

检修项目交出后,施工单位如需进行动火或进塔入罐作业的,按照相关制度中的有关条款执行。

12 During production, maintenance of each piece of equipment requires a separate *Maintenance Work Permit*. Execution of painting, insulation, scaffolding and civil works, however, may require a *Maintenance Work Permit* by small areas.

装置生产期间,每一台设备检修,都要分别办理《检修施工安全许可票》,但油漆、保温、脚手架、土建的施工可按小区域范围内办理《检修施工安全许可票》。

13 During shut-down overhaul (from confirmed handover for maintenance to handover for production after maintenance), the Production Operation Dept. shall make careful preparations by specifying the content and requirements in advance on the *Maintenance Work Permit* for scheduled items and appointing technicians, production team leader or program director familiar with the system process for site handover and confirmation. For maintenance items with similar conditions, maintenance content, requirements and safety measures and on the same platform in the same framework or in the same area, one *Maintenance Work Permit* suffices, adopting the more stringent operating parameters.

装置停工大修期间(经确认交付检修开始至检修结束确认交付生产为止),生产运行部要认真做好准备,对计划项目要提前做好《检修施工安全许可票》各项内容和要求的填写工作,并指派熟悉系统流程的技术人员、生产班长或项目负责人负责现场的交出和确认工作。对工况相似、检修内容和要求相似以及安全措施相似,且在同一框架内同层平台或同一区域的检修项目,可用同一张《检修施工安全许可票》,其操作参数按较苛刻的条件填写。

14 The Implementation Unit must carry out work in strict accordance with the maintenance content, requirements and scope of work specified in the *Maintenance Work Permit*, implement precautions in applicable maintenance specifications and permit and safety measures to be taken by the Implementation Unit; value self-protection; and in case of doubt, notify relevant personnel to come to the site for confirmation. For items involving continuous work in multiple trades and cross work by multiple work teams, the Implementation Unit shall develop written safe work requirements.

施工单位必须严格按照《检修施工安全许可票》的检修内容、要求和作业范围进行施工,在施工过程中要严格执行有关安全检修规程及许可票上的检修注意事项和需施工方落实的安全措施,重视自我保护,对有疑问的问题应通知所属单位有关人员到现场再次确认。对于多工种连续作业、多作业组交叉作业的项目,施工单位内部应制定书面安全作业要求。

15 Production Operation Dept. and other departments are entitled to inspect on site the *Maintenance Work Permit* held by the Implementation Unit and individuals; and order the unit or individuals who do not have *Maintenance Work Permit* or fail to carry out work as required by *Maintenance Work Permit* to suspend work immediately and hold them financially accountable. 各部门和生产运行部有权对现场施工单位和个人进行《检修施工安全许可票》检查，对无《检修施工安全许可票》或未按《检修施工安全许可票》要求进行施工的单位和个人，应责令其立即停止施工，并视情况分别进行经济责任制考核。

16 All departments shall have a register for *Maintenance Work Permit*, require the team leader on duty to register each and every *Maintenance Work Permit* and appoint special persons to collect and archive these permits by month; the *Maintenance Work Permit* shall be saved for 6 months (including the current month).

各部门应建立《检修施工安全许可票》登记本，要求生产装置的当班班长登记每一张《检修施工安全许可票》，并指定专人按月收集整理归档，《检修施工安全许可票》保存期为6个月（含当月）。

