**重庆药友水土工厂202车间单抗项目**

**废水灭活系统用户需求**

**URS for Continuous Wastewater Inactivation System of 202 Project**

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1. 目的PURPOSE

本文件目的是定义重庆药友水土工厂202车间单抗项目15,000L生产线的废水灭活系统的用户需求。

The purpose of this document is to define the user requirements of Continuous Wastewater Inactivation system 15,000L fermentation line of 202 project.

1. 范围SCOPE

本文连同其所有附件，涵盖了所有工作范围以及设计、制造、检查、交付、调试和性能测试的最低要求。本项目包括了废水收集罐、碱液清洗罐、泵、流量传感器、换热器、保温装置及其辅助系统（钢平台等）。

This document, together with all attachments, covers the scope of work and the minimum requirements of the design, fabrication, inspection, delivery, start-up, and performance testing. The plant consists of wastewater collection tank, Lye CIP tank, pump, flow meter, heat exchanger, thermal retention device and support system (SS Plate form and so on).

本项目包含以下部分：

The scope of supply includes:

* 2套废水收集罐 wastewater collection tank, 2 set
* 1套碱液清洗罐 media preparation tank, 1 set
* 1套 碱液加药系统 Lye dosing device, 1 set
* 换热器 heat exchanger, 3 sets
* 输送泵 Pump, 2 sets
* 恒温滞留装置 Thermal retention device, 1 set
* 附属的电控柜 Electrical and control Cabinet
* 附属钢平台（如需要） Stainless-steel plate forms (if needed)

本系统服务于202生产楼15,000L生产线。

The system service for production building 202# of 15,000L fermentation line.

需要提供的范围包括 The scope of supply shall include:

详细设计Detail Design

设计确认 Design Qualification

建造 Fabrication

工厂接收测试 FAT

交付 Delivery

调试以及现场接收测试 Commissioning & SAT

安装确认和运行确认 IQ & OQ

性能确认协助 PQ Assistance

操作人员的培训 Operation Personnel Training

文件 Documentation

移交 Handover

1. 系统描述SYSTEM DESCRIPTION
   1. 设施/设备/仪器/系统描述 Facility/ Equipment/ Instrument/ System Description

本系统应满足每天24小时连续工作，并且连续时间不少于每周7\*24小时。

The system should work continuously 24 hours a day, and the continuous time should not be less than 7\*24 hours per week.

本系统内容包括：

The system includes:

灭活系统主要用于对车间生产的发酵生物活性废液，清洗设备后带有发酵产物的废水等具有生物活性的废液的灭活，正常生产情况下废液的体积为8t/d（含固量10%）。三天一个批次。以单批最大处理量为18t/d（含固量10%）来设计。

The inactivation system is mainly used to inactivate the fermentation biological active waste liquid produced in the workshop. After cleaning the equipment, the wastewater with fermentation products and other biological active waste liquid are inactivated. Under normal production, the volume of waste liquid is 8t/d (10% solid content). One batch every three days. The maximum processing capacity of a single batch is 18t/d (10% solid content) to design.

本灭活系统采用连续灭活形式，设计灭活温度为135℃，保持时间为90秒。在三级换热器的作用下，最大的利用设备灭活时产生的高温余热，利用灭活后的高温废水对灭活前的低温废水进行加热，同时灭活后的废水可以被降温。整个灭活工艺过程如下：

The inactivation system adopts the form of continuous inactivation. The designed inactivation temperature is 135℃ and the holding time is 90 seconds. Under the action of three-stage heat exchanger, the maximum use of high temperature waste heat generated when the equipment is inactivated, the high temperature waste water after inactivation is used to heat the low temperature waste water before inactivation, and the waste water after inactivation can be cooled. The entire inactivation process is as follows:

1）灭活前的准备Preparation before inactivation

在每次灭活开始前，首先使用碱液罐中预先配置好3~5%左右浓度的氢氧化钠溶液。用32%浓液碱进行配置，可利用罐上的电导率传感器来转换碱液的浓度。

Before each inactivation, the sodium hydroxide solution of about 3~5% concentration is pre-configured in the lye tank. Configured with 32% concentrated liquid lye, the lye concentration can be converted using the conductivity sensor on the tank.

2）碱液循环清洗Lye cycle cleaning

当系统到达启动液位后，系统会自动对废液将要流通过的管道进行碱液的循环清洗，碱液通过泵分别对管道、一级换热器、二级换热器、三级换热器、保温滞留装置进行循环清洗，碱液循环回流至碱液罐中，循环利用。

When the system reaches the starting level, the system will automatically carry out lye circulation cleaning on the waste liquid will flow through the pipeline, lye through the pump respectively to the pipeline, primary heat exchanger, secondary heat exchanger, tertiary heat exchanger, heat preservation retention device for circulation cleaning, lye circulation back to the lye tank, recycling.

3）预热Preheat

在碱液循环清洗一定时间后，利用工业蒸汽对第三级换热器进行加热，使之在保温盘管两端的温度达到设定的灭活温度。第一次碱液循环清洗的目的是给系统进行预热，当系统管道内的碱液达到了设定的灭活温度后，才可以进行灭活。

After a certain time of lye circulating cleaning, industrial steam is used to heat the third stage heat exchanger to make the temperature at both ends of the insulation coil reach the set inactivation temperature. The purpose of the first lye cycle cleaning is to preheat the system, and the inactivation can only be carried out when the lye in the system pipeline reaches the set inactivation temperature.

4）废液置换碱液Replace lye with waste liquid

碱液加热到设定温度后，切换进水阀门至废液储罐，利用废液将碱液置换到碱液罐中，碱液循环阀门再切换至废液排放阀门，此时保温盘管两端的温度均在设定温度之上。

After the lye is heated to the set temperature, switch the water inlet valve to the waste liquid storage tank, use the waste liquid to replace the lye into the lye tank, and then switch the lye circulation valve to the waste liquid discharge valve. At this time, the temperature at both ends of the insulation coil is above the set temperature.

5）废液的连续灭活Continuous inactivation of waste liquid

当废液置换完碱液后，且保温滞留器进出口两端的温度都达到了设定的灭活温度后，废液就可以排放了。达到该状态后，可以进行边收集，边灭活，边排放。

When the waste liquid is replaced by lye, and the temperature at both ends of the inlet and outlet of the thermal insulation retainer reaches the set inactivation temperature, the waste liquid can be discharged. When this state is reached, it can be collected, inactivated and discharged.

6）灭活完成Completion of inactivation

直到废液储罐中的液位达到最低后，灭活结束。结束的同时，开启自来水通过喷淋球对收集罐进行清洗，防止罐壁山粘附蛋白类杂质，清洗的水也进入灭活处理。

Inactivation ends when the liquid level in the waste liquid storage tank reaches its lowest level. At the end of the process, tap water is turned on to clean the collection tank through the spray ball to prevent the adhesion of protein impurities on the wall of the tank, and the cleaned water is also inactivated.

7）碱液泡洗Soak and wash with lye

灭活完成后，再次利用碱液对所有工艺管道进行清洗，以保证管道内受热变性的蛋白质不会粘附在管道壁上。一定时间后，碱液保存在管道中，至此，整个灭活工艺完成。

After the inactivation is complete, all process pipes are cleaned again with lye to ensure that the heat-denatured proteins in the pipes do not adhere to the pipe walls. After a certain period of time, the lye is kept in the pipe. At this point, the entire inactivation process is completed.

* 1. 布局/安装条件 Layout/ Construction Conditions

供应商需根据业主的平面布局图进行上游不锈钢配储液系统以及辅助设备的设计。若设备有额外的高度要求，应告知业主并由业主批准。

Vendor should design the stainless-steel Media Preparation & Holding Tank system and support system according to the owner's layout. Any additional height requirements for the equipment must be notified and approved by Owner.

* + 1. 布局 Layout

|  |  |  |
| --- | --- | --- |
| **序号No.** | **描述Description** | **信息Information** |
|  | 房间温度要求 Room Temp. Requirement | 18~28℃ |
|  | 房间湿度要求 Room Humidity Requirement | 不控 |
|  | 房间布局图 Room Layout | 参见布局图 See Layout |

* + 1. 公用介质 Utility

业主负责提供以下公用工程。 The owner is responsible to provide the following utility.

|  |  |  |  |
| --- | --- | --- | --- |
| **序号 No.** | **公共设施 Utilities** | **用途 Function** | **范围/容量 Conditions** |
|  | 纯化水 PW | 清洗 Washing | 压力 Pressure：0.3~0.35 MPa  温度 Temp. : 20~25℃ |
|  | 电气 Electric | 供电 Power | 380V/50Hz  220V/50Hz |
|  | 压缩空气  Compressed air | 动力 Drive | 压力 Pressure：0.6 MPa |
|  | 工业蒸汽  Plant steam | 加热 Heating | 压力 Pressure：0.6 MPa |

1. 定义/缩略语DEFINITIONS AND ABBREVIATIONS
   1. DQ：设计确认 Design Qualification
   2. FAT：工厂验收测试 Factory Acceptance Test
   3. SAT：现场验收测试 Site Acceptance Test
   4. IQ：安装确认 Installation Qualification
   5. OQ：运行确认 Operational Qualification
   6. PQ：性能确认 Performance Qualification
   7. P&ID：管道和仪表流程图 Piping and Instrument Diagram
   8. PW：纯化水 Purified Water
   9. WFI：注射用水 Water for Injection
   10. MCC：马达控制中心 Motor Control Center
   11. PCS：工艺自控系统 Process Control System
   12. PD：工艺描述规程 Process description
   13. CU 洁净公用工程 Clean Utility
2. 参考资料及法规符合性 REFERENCES & REGULATIONS

在编写本URS的内容时已参考，且供应商需要满足下列文档的当前修订版：

The contents of this URS have been referenced and the supplier is required to meet the current revision of the following documents.

* 中国GMP (2010版)

NMPA: Good Manufacturing Practice for Drugs (2010 Version)

* US FDA: 21 CFR Part 210 and 211
* US FDA: 21 CFR Part 11
* EU GMP Volume Ⅳ
* ASME BPE 2019
* GB150 (2011版)
* GB50017-2003 钢结构设计规范

1. 需求REQUIREMENTS

URS的每条要求可按如下分类为：

Each requirement in the URS can be classified as following:

* 质量需求: 质量需求是具有法规或合规相关影响的可测量需求，需在确认阶段进行测试，质量需求可能是以下之一：

Quality Requirements are measurable requirements that have a regulatory or compliance related impact and will be tested during qualification. A quality requirement may be one of the following:

* 关键质量属性 (CQA)
* 关键工艺参数 (CPP)
* 关键操作参数（KOP）
* 关键方面 (CA)
* 其他需求如GMP法规及组织质量要求等

Other requirement such as GMP regulatory, organization quality requirement, etc.

* 商业需求：不影响产品质量的商业需求

Business: Business requirements that do not impact product quality

* 安全 EHS (Environment, Health & Safety)
* 商务需求：与商务合同相关的非技术性需求，不影响产品质量，无需在DQ和RTM中追溯

Commercial requirements: non-technical requirements related to commercial contracts that do not affect product quality, do not need to be traced in DQ and RTM.

* 1. 通用要求 General Requirement

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 供应商需提供设备的三维图纸，配合业主完成厂房立体布局图。  The supplier shall provide the 3D drawings of the equipment and cooperate with the owner to complete the 3D layout of the plant. | 质量  Quality |
|  | 系统部件及仪器仪表的品牌参考业主的零部件品牌推荐表。所有零部件选型应依据URS及P&ID要求，提交业主审核；若选型不一致，需提交业主批准后方可执行。  The brand of system components and instruments shall refer to the owner's parts brand recommendation table. The selection of all parts should be submitted to the Client for review according to URS and P&ID requirements; if the type selection is inconsistent, it should be submitted to the Client for approval before implementation. | 商务  Commerce |
|  | 设备应贴有统一的设备铭牌，铭牌上应注明名称、产地、出厂日期、型号、重量及其他重要技术参数。  The equipment should be attached with a unified nameplate. The equipment name, origin, date of manufacture, type, weight and other important technical parameters should be specified on the nameplate. | 质量  Quality |
|  | 所有模块设计需满足附录8.3中工艺仪表流程图的逻辑功能要求。  All the module design shall follow the logical function requirement from the P&ID attached in Appendix 8.3. | 质量  Quality |
|  | 供应商应在业主提供的P&ID基础上深化设计，并提交业主审核，批准后负责执行。  The supplier shall deepen the design based on the P&ID provided by the Client, submit the design to the owner for review, and be responsible for implementation after approval. | 商务  Commerce |

* 1. 工艺需求 Process Requirement

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 灭活处理能力：3m³/H  Inactivation capacity:3m3/H | 质量  Quality |
|  | 灭菌温度以及保持时间：135℃，保持90sec，或于此相当，可证明能完全灭活废液中的活性成分的时间和温度。  Sterilization temperature and hold time:135 ℃,keep90sec. Or equivalent, it can be proved that the time and temperature can completely inactivate the active components in the waste liquid. | 质量  Quality |
|  | 废水排放温度：约60℃以下。  Emission temperature: about 60 ℃ or less. | 质量  Quality |
|  | 工艺控制程序：自动碱液循环，碱液加热、废液与碱液的置换、废液的灭活、碱液与废液的置换、碱液清洗、收集罐的CIP；在碱液配置程序中，可以做到加药装置的碱液搅拌，碱液输送至碱液罐中。  Process control procedures: automatic lye circulation of inactivation system, lye heating, replacement of waste liquid and lye, inactivation of waste liquid, replacement of lye and waste liquid, lye cleaning, CIP of collection tank; In the lye configuration program, it can be done to stir the lye of the dosing device, and the lye is transported to the lye tank. | 质量  Quality |
|  | 应使用CIP站的清洗水来去除废水收集罐和管道内的颗粒、污迹和残余溶液。冲洗将使用纯化水，最终淋洗将使用热注射用水。  Cleaning water from CIP stations should be used to remove particles, stains and residual solutions from wastewater collection tanks and pipes. Purified water will be used for rinsing and hot water for injection will be used for final rinsing. | 质量  Quality |
|  | 罐和管道在每步CIP的结束步骤，可以实现吹扫。  The tank and pipe should be able to blow dry at the per CIP end step. | 质量  Quality |
|  | 废水收集罐的灭菌消毒应设计为工业蒸汽灭菌。  Sterilization and disinfection of the system shall be designed for plant steam sterilization. | 质量  Quality |
|  | 所有走液体管道均需要自排空。最低点的排空坡度考虑至少1%。例如物料输送管路，冷凝水排水管路，CIP清洗管路，排污管路。  All liquid pipelines need to be self-emptying. The lowest point of the drainage slope should be considered at least 1%. Such as product delivery pipelines, condensate drainage pipelines, CIP cleaning lines, sewage pipelines. | 质量  Quality |
|  | 系统模块设计以及物料输送管路设计应尽可能减少死体积，死管段接受标准需满足ASME BPE的L/d对不同管径的对应要求。  System module design and product transfer pipelines design shall minimize dead volume, and the acceptance standards for dead pipe sections shall meet the corresponding requirements of ASME BPE L/d for different pipe sizes. | 质量  Quality |
|  | 对于每台设备，每种公用工程管路（包括进/出）只提供一个确定位置的出入接口。公用工程接口至设备之间的连接（包括材料和安装）属于供应商的范围。若有必要，供应商应在公用工程管道上安装必要减压阀和安全阀。  Only one utility connection will be foreseen for each fluid (including in and out) at agreed position for each equipment. Connections between utility interfaces and equipment (including materials and installation) fall within the scope of suppliers. If needed, Vendor will insert on the utilities lines the necessary pressure-reducing valves and safety devices. | 商业  Business |
|  | 所有可拆连管道和仪表接均为快卡连接。  All detachable pipe and instruments connections are clamps. | 商业  Business |
|  | 管路内容物和流向应在管路上标明，不同内容物采用不同颜色区分。  The contents and direction of the pipeline should be marked, and different contents should be distinguished by different colors. | 商业  Business |
|  | 机械部件和管路的标识样式由业主提供，供应商设计交业主确认。  例如阀门，传感器，泵等。  The identification pattern of mechanical parts and piping shall be provided by the owner, and the supplier's design shall be submitted to the Owner for approval. Such as valves, sensors, pumps, etc. | 商务  Commerce |
|  | 需要考虑CU如何取样，保证有足够的操作空间，安全和人体工程学。取样需要安装接水盘。  The vendor shall simulate the CU sampling to ensure the adequate space, safety, and ergonomics. Sampling requires installation of a water tray. | 商务  Commerce |

* 1. 关键参数 Critical Parameter

| **序号**  **ID No.** | **参数 Parameter** | **要求 Requirement** | **需求分类**  **Requirement Category** |
| --- | --- | --- | --- |
|  | 罐体设计温度  Tank design temperature | -10~150℃ | 质量  Quality |
|  | 罐体设计压力  Tank design pressure | -1~3bar | 质量  Quality |
|  | 工艺电导率测量范围和测量精度  Conductivity measurement range and measurement accuracy for process | 电导率检测范围：0-300mS/cm；  0.1-100mS/cm范围内在精确度≤±3%；100-300mS/cm范围内在精确度≤±5%  电导最低能检测注射用水  Conductivity detection range: 0-300mS /cm;  Accuracy within the range of 0.1-100mS /cm ≤±3%;  Accuracy within 100-300mS /cm range ≤±5%  The conductance is minimum to detect WFI | 质量  Quality |
|  | 液位计测量精度  Measuring accuracy of liquid level gauge | ±5% | 质量  Quality |
|  | 管道耐压  Piping withstand pressure | 不小于5bar | 质量  Quality |
|  | 压力传感器  Pressure sensor | 精度≤0.1bar  Accuracy ≤ 0.1bar | 质量  Quality |
|  | 流量传感器  Flowmeter | 精度≤0.5%  Accuracy ≤ 0.5% | 质量  Quality |

* 1. 部件要求 Components Requirement
     1. 废液收集罐 Wastewater collection tank

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 废水收集罐均应配有带灯视镜、安全阀、罐体压力传感器、压力表、呼吸器、人孔、CIP清洗口、进液口、进气口、罐体温度探头、排放口。采用压差液位计。  The wastewater collection tank shall be equipped with light mirror, safety valve, tank pressure sensor, pressure gauge, air filter, manhole, CIP cleaning port, liquid inlet, air inlet, tank temperature probe, tank outlet. The tank should use differential pressure level gauge. | 质量  Quality |
|  | 在满足设计要求的前提下，由供应商设计确定储罐容积。罐体在设计至少上封环处以下的罐内容积应能满足该要求。  On the premise of meeting the design requirements, the storage tank volume is designed and determined by the supplier. The tank volume below the design of at least the upper sealing ring should be able to meet the requirements. | 商业  Business |
|  | 罐体需要带保温，填充保温材料。  The tank should be insulated and filled with insulation material. | 质量  Quality |
|  | 人孔盖应配制人孔助力器和有限位设施，方便开闭。且开闭不会对操作人员或设备造成损害。  The cover of manhole should be equipped with a manhole booster and a limited bit facility to facilitate opening and closing. And the opening and closing will not cause damage to the operator or equipment. | 商业  Business |
|  | 罐体需要配置混匀含固体的废液的装置（可采用气体搅拌）。只需鼓泡悬浮固体，无需任何机械密封，易于CIP且残渣少。  The tank shall be equipped with a device for mixing waste liquid containing solids (air agitation may be used). Only bubble suspended solids, no need for any mechanical seal, easy CIP and little residue. | 质量  Quality |
|  | 罐体温度探头应能够连续显示温度，采用套筒形式，可与罐体拆卸方便校验。  The tank temperature probe shall be able to continuously display the temperature, sleeve form, which can be easily separated from the tank for calibration. | 质量  Quality |
|  | 供应商需要结合搅拌，罐顶管口布局的清洗要求设置喷淋球的位置和数量，罐体/管道清洁无死角。喷淋球为固定式，清洗压力在1.5~2 bar范围内。  The supplier needs to set the position and number of spray balls according to the requirements of mixing and cleaning of tank top nozzle layout, and the tank / pipeline shall be clean without dead angle. The spray ball is fixed with a pressure of 1.5~2 bar. | 质量  Quality |
|  | 所有喷淋球和内伸管需要设置定位销。  Spray balls and inlet pipe all require directional pins. | 质量  Quality |
|  | 需要配制灭菌消毒所需的蒸汽疏水装置  Instrument required for sterilization to be provided, example steam traps, temperature sensor etc.. | 质量  Quality |

* + 1. 碱液罐 Lye tank

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 碱液罐均应配有人孔、进液口、罐体温度探头、电导率计，排放口。采用压差液位计。  The lye tank shall be equipped with manhole, liquid inlet, tank temperature probe, conductivity sensor, tank outlet. The tank should use differential pressure level gauge. | 质量  Quality |
|  | 在满足设计要求的前提下，由供应商设计确定储罐容积。罐体在设计至少上封环处以下的罐内容积应能满足该要求。  On the premise of meeting the design requirements, the storage tank volume is designed and determined by the supplier. The tank volume below the design of at least the upper sealing ring should be able to meet the requirements. | 商业  Business |
|  | 罐体需要带保温，填充保温材料。  The tank should be insulated and filled with insulation material. | 质量  Quality |
|  | 罐体温度探头应能够连续显示温度，采用套筒形式，可与罐体拆卸方便校验。  The tank temperature probe shall be able to continuously display the temperature, sleeve form, which can be easily separated from the tank for calibration. | 质量  Quality |

* + 1. 碱液加药装置 Alkali dosing device

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 整个装置包括：碱液PP桶、液位计、计量泵、机械搅拌。  The lye tank shall be equipped with manhole, liquid inlet, tank temperature probe, conductivity sensor, tank outlet. The tank should use differential pressure level gauge. | 质量  Quality |
|  | 在满足设计要求的前提下，由供应商设计确定桶容积。  On the premise of meeting the design requirements, the barrel volume is designed and determined by the supplier. | 商业  Business |
|  | 罐体需要带保温，填充保温材料。  The tank should be insulated and filled with insulation material. | 质量  Quality |
|  | 碱液最大浓度32%  The maximum concentration of sodium hydroxide solution is 35% | 商业  Business |

* + 1. 离心泵 Centrifuge pump

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 采用磁力离心泵，属于无轴封结构泵,只有静密封而无动密封,用于输送液体时能保证一滴不漏。  Magnetic centrifugal pump is adopted, which belongs to the pump without shaft seal structure. It has static seal but no dynamic seal. It can ensure that no drop is leaked when transporting liquid. | 质量  Quality |
|  | 配备在线备用泵，泵的选型应满足设备生产的需要。  Equipped with online standby pump, pump selection should meet the needs of equipment production. | 商业  Business |
|  | 在运行时可以耐受碱性液体的腐蚀。  Corrosion resistance of alkaline solution at running time. | 质量  Quality |
|  | 与泵直接连接的管道应采用快速连接的方式。  The pipeline directly connected with the pump should use quick connection. | 质量  Quality |
|  | 泵应安装在机架内，留有足够的空间，便于对设备进行操作和维修。  The pump should be installed in the frame, leaving enough space to facilitate the operation and maintenance of the equipment. | 质量  Quality |

* + 1. 热交换器 Heat exchanger

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 采用螺旋板式换热器,可多台共同工作。供应商根据工艺要求选择合适的数量和换热方式。  Adopt spiral plate heat exchanger, can work together with many sets. Supplier shall select appropriate quantity and heat transfer mode according to process requirements. | 质量  Quality |
|  | 在运行时可以耐受碱性液体的腐蚀。  Corrosion resistance of alkaline solution at running time. | 质量  Quality |

* + 1. 钢平台（如需要） Stainless Steel Platform(If needed)

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 钢平台应符合人体工程学，方便操作人员维护，处理滤器等。  The steel platform should be ergonomic, convenient for operators to maintain, handle filters, etc. | 商务  Commerce |
|  | 钢平台底部需预留足够的空间用于维护。  Sufficient space should be reserved at the bottom of the steel platform for process tank for maintenance. | 商务  Commence |
|  | 钢平台需在合适位置预留电源插座，供辅助设备使用。Power socket shall be reserved in proper position on the steel platform for auxiliary equipment. (such as peristaltic pump, etc.) | 商务  Commence |
|  | 钢平台应考虑对空间气流组织的影响，应安全、坚固、耐用。钢平台上表面/底面均应方便清洁，不得有死角。钢平台下表面用钢板封闭平整，接缝满焊。  The steel platform shall consider the impact on the air distribution of the space, and shall be safe, solid and durable. The upper surface / bottom surface of the steel platform shall be easy to clean without dead angle. | 商业  Business |
|  | 不锈钢平台下方需要考虑300LX的照度。设置开关。  Under the stainless steel platform, the minimum 300LX illumination is required. And it should set the switch. | 商务  Commence |
|  | 在设计上需要考虑EHS的要求，如坡度较陡（40°以上）的钢梯尽量避免使用。  EHS should be considered in design, for example, the steep ladder shall avoid to be used. | EHS |

* + 1. 过滤器 Filter

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 为防止交叉污染，应为罐体提供0.22μm呼吸器，带适配电加热套。To prevent cross contamination, 0.22 μm Gas filter in/out shall be provided for compounding vessel. | 质量  Quality |
|  | 供应商每个过滤器需要配备符合工艺条件的滤芯以满足PQ之前（不包括PQ）的检测使用，直到验证通过为止。  Each filter of supplier should be equipped with filter elements that meet the process conditions to meet the test use before PQ (excluding PQ) until verification is passed. | 商务  Commerce |
|  | 滤芯和滤壳之间的接口应采用Code 7-226型式。  The interface between filter element and filter shell should be Code 7-226. | 质量  Quality |

* + 1. 阀门、排水 Valves/Draining

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 罐上所有阀门应选用不锈钢球阀。  All valves on the tank shall be stainless steel ball valves. | 质量  Quality |
|  | 蒸汽管道上应配备和使用压力相匹配的减压调节阀，可现实气体的压力和调控气体流量。  The steam pipe should be equipped with a decompression regulator matching with the use of pressure, which can realize the gas pressure and control the flow. | 质量  Quality |
|  | 工业蒸汽和冷却水需经过过滤器过滤。气体过滤器不能小于100目，液体过滤器不能小于40目。  Industrial steam and cooling water are filtered through a filter. Gas filter should not be less than 100 mesh, liquid filter should not be less than 40 mesh. | 质量  Quality |
|  | 每根排放总管应设置空气隔断。空气隔断的位置建议设置在模块内部，便于维护。  Each discharge main should be provided with an air breaking. It is recommended that the air breaking should be installed inside the module for easy maintenance. | 质量  Quality |

* + 1. 仪表 Instruments

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 仪器仪表应提供由第三方校验机构出具的检验合格证。检验有效期需覆盖至PQ完成。  Certificates for instruments issued by third-party verification agency shall be provided. The validity period of verification agency should be covered until PQ is completed. | 质量  Quality |
|  | 温度传感器采用卫生型卡箍连接，与介质直接接触的部分采用不锈钢材质，带4~20mA或RTD信号输出。若采用其他连接形式须经过业主同意。  The sanitary tri-clamp connection is for the temperature sensor, and the part in direct contact with the medium is made of stainless steel, with 4-20mA signal output or RTD signal output. Any other connection forms shall be approved by the owner. | 质量  Quality |
|  | 液位计：采用卫生级差压式液位计，与介质直接接触的部分采用316L材质，带4~20mA信号输出，带高低液位和密度输入、现场显示和“零点复位”功能。  Liquid level gauge: sanitary differential pressure type liquid level gauge is used, 316L material is used for the part directly contacting with the medium, with 4 ~ 20mA signal output, high and low liquid level and density input, field display and "zero point reset" function. | 质量  Quality |
|  | 电导率探头：采用卫生型连接（NA或卡箍）。根据不同工艺要求选择相对应的电导率探头。  Conductivity probe: Sanitary connection (NA or clamp). Select corresponding conductivity probe according to different process requirements. | 质量  Quality |
|  | 每个疏水阀（除蒸汽供应管路前端疏水阀以外）上端均应配置温度探头（距离疏水阀至少300mm），用于监控和记录灭菌温度，最冷点的温度探头用于控制。  The front of each steam trap (except the steam supply pipeline trap) should be equipped with a temperature probe (the distance to steam trap at least 300mm) for monitoring and recording the sterilization temperature, the cold point probe for control. | 质量  Quality |

* 1. 机械要求 Mechanical Requirement
     1. 材质及表面处理 Material & Surface Finish

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 所有管路采用304不锈钢材质，外表面抛光度Ra≤0.8μm；管道内壁光滑、平整、易清洗。  All pipes are made of 304 stainless steel, the surface polishing degree Ra≤0.8μm; The inner wall of the pipeline is smooth, smooth and easy to clean. | 质量  Quality |
|  | 所有不接触产品及所有介质的金属材质均应为不锈钢SS304材质（包括所有支腿、框架、外罩、取样口和钢平台等），表面无毛刺。  All metal materials which is not touch the product and all media should be stainless steel SS304 (including all legs, frames, enclosures, sampling ports and steel platforms, etc.) without burrs on the surface. | 质量  Quality |
|  | 抛光：所有与产品接触的表面和焊接必须机械抛光，粗糙度Ra ≤ 0.6 μm。  All product-contact surfaces and welds must be mechanical polished with roughness (Ra) ≤ 0.6 μm. | 质量  Quality |
|  | 所有罐体外表面抛光处理，管件外表面应抛光，光滑无毛刺。外表面应抛光至粗糙度不大于1.0μm。  The external surfaces of all tanks shall be polished and pipe fittings shall be smooth without burrs. The outer surface should be polished to a roughness of no more than 1.0 μm. | 商业  Business |
|  | 设备外表面应易于清洁。不允许出现尖角、锐边、突出物等导致设备难以清洁或清洁用具破损的异常状况。  Equipment external surface shall be easy to clean. No sharp corners, sharp edges or protrusions are allowed, which leads to some abnormal situation, such as difficult to thoroughly clean or easy to break the cleaning tools. | 商业  Business |
|  | 所有设备与产品接触的不锈钢原材料均须追溯至炉批号。  Raw material traceability must be maintained for all materials of construction used to manufacture the equipment. | 质量  Quality |
|  | 制造材料不得释放颗粒物（不脱落、无添加、不反应、不会因清洗或湿热灭菌而降解）。  Materials of construction shall not release particles. (MOC’s shall be non-shedding, non-additive, non-reactive and will not degrade due to cleaning or autoclaving). | 质量  Quality |
|  | 所有需高温灭菌的设备/部件材质应能够耐受135℃高温，持续时间至少30分钟。  All equipment/components requiring high temperature sterilization should be material to withstand temperatures up to 135°C for at least 30 minutes. | 质量  Quality |

* + 1. 保温 Insulation

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 保温材料不得含有氯离子和石棉。  The insulation should be made of high quality insulation material (not including chloride ion and asbestos). | 商业  Business |
|  | 操作员易接触到的设备/部件外表面温度在任何时候都应低于45°C，并且不能表面结霜滴水（特殊位置，如疏水阀以上500mm和罐顶等，除外）。  The external surface temperature of the equipment/parts accessible to the operator should be less than 45°C at all times and no frosting and dripping (except in special locations such as 500mm above the trap and tank roof). | 商务  Commerce |

* + 1. 焊接要求 Welding

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 所有洁净管路应尽可能采用符合现行ASME BPE要求的自动焊接。  All clean tubing will be orbital welded as per requirement of current ASME BPE. | 质量  Quality |
|  | 所有的人工焊接，包括焊工和焊接信息均应记录在供应商焊接记录中。  All manual welding, including welder and welding information, should be recorded in the supplier's welding record. | 质量  Quality |
|  | 所有焊缝均应正确标识，标识号应刻印在管道上且与文件中的记录保持一致。  All weld beams shall be correctly tagged and tag number shall be permanently marked on pipe in correspondence with that in documents. | 质量  Quality |
|  | 供应商应根据交付文件列表中的要求交付焊接相关文件。  Supplier shall deliver the welding documents according to the requirements of the delivery documents list. | 质量  Quality |
|  | 洁净管道需充氩保护焊接，避免内部氧化，接用惰性保护气体纯度必须达到99.999%，需要提供正式的报告。  Hygienic pipes need to be filled with argon protection welding to avoid internal oxidation, and the purity of the inert shielding gas used must reach 99.999%, and an official report needs to be provided. | 质量  Quality |
|  | 自动焊接和手动焊接都必需提供焊接工艺评定。  WPS must be provided for both automatic and manual welding. | 质量  Quality |
|  | 焊样留取的要求：   1. 焊样应保留原色，不得处理。 2. 在更换参数时必需提供焊样。（管道尺寸或焊接参数） 3. 焊样必需是对焊，不得假焊。 4. 焊样的记录必需递交，并对每个焊样进行编号。   焊样应作为竣工资料的一部分保存备查，不得丢弃。  Requirements for the retention of weld samples.  (1) The weld sample shall be retained in its original color and shall not be processed.  (2) Weld samples must be provided when changing parameters. (pipe size or welding parameters)  (3) welding samples must be butt weld, no false welding.  (4) Records of weld samples must be submitted and each weld sample must be numbered.  Weld samples shall be kept as part of the as-built data and shall not be discarded. | 质量  Quality |
|  | 内窥镜摄像要求：   1. 须为实时彩色摄像片段，提供照片，且必需刻制成光盘。 2. 必须显示完整的焊道。 3. 必须可以看到氧化区的颜色。   Borescope video requirements.  (1) Must be a live color video clip, supply photos and must be burned to CD.  (2) The complete weld path must be visible.  (3) The color of the oxide area must be visible. | 质量  Quality |
|  | 焊点验收：   1. 所有焊接质量应至少应达氧含量小于100 ppm，目测内表面显淡黄色。 2. 所有手动氩弧焊必需100%做彩色内窥镜检测，并留有记录。 3. 所有自动氩弧焊，最少随机抽取焊缝总量的20%要做彩色内窥镜摄影，并留有记录。 4. 焊接标准应参照现行版ASME BPE的标准。   焊接位置应该在焊接图上有文件记录可以追溯到焊缝施工人员，焊接记录上要有焊接两侧的材料的炉号。  Welded joint acceptance:  (1) All welding quality should be at least up to oxygen content less than 100 ppm, visual inspection of the inner surface shows light yellow.  (2) All manual argon arc welding must do 100% color borescope inspection and keep records.  (3) All automatic argon arc welding, at least 20% of the total number of randomly selected welds to do color borescope video, and keep records.  (4) Welding standards should refer to the current version of the ASME BPE standards.  Welding position should be documented on the welding diagram and can be traced back to the welder, welding log should indicate the heat number of the material on both sides of the weld. | 质量  Quality |

* 1. 自控系统-硬件部分 Control system-Hardware
     1. 通用 General

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | PCS系统服务器、工程师站、批量服务器、历史服务器、杀毒服务器、OPC服务器等功能站、系统网络交换机及控制器、AI、AO卡件不包含在系统供应商合同范围内。  The PCS system server, engineer station, batch server, history server, antivirus server, OPC server and other functional stations, system network switches and controllers, AI, AO cards are not included in the contract scope of this system vender. | 商务  Commerce |
|  | 以下上游不锈钢配储液系统的电气元器件需支持支持Profibus-DP协议或经甲方许可的通讯协议总线：  The following stainless steel system electrical components shall support Profibus-DP protocol or communication protocol bus approved by Owner:   * 称重仪表；   Weighting system;  - pH、电导率等电极的仪表变送器；  pH, conductivity electrodes;  - 阀岛模块；  Valve island module; | 商务  Commerce |
|  | 系统模块上或系统所在房间需安装声光报警灯，报警灯至少包括3种颜色显示。  The audible and visual alarm shall be install on stainless steel system module or in process room where the stainless steel system is located. The alarm lights shall have three colors at least. | 商业  Business |

* + 1. 远程IO柜及仪表 Remote IO Cabinet and instruments

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 上游不锈钢配储液系统的供应商需配置远程IO控制柜，用于集成和安装系统远程IO模块、阀岛、仪表、开关电源等电气元件。远程IO柜需安装在不锈钢模块上。  The UP SS preparation & holding system supplier shall provide remote IO control cabinet to integrate and install the system remote IO module, valve island, instrument, power supply and required electrical components. | 商务  Commerce |
|  | 远程IO柜材质采用SS304不锈钢。  The remote IO cabinet shall be ss304 stainless steel. | 商业  Business |
|  | 远程IO柜需配置远程IO模块。远程IO模块支持Profibus-DP协议总线或经甲方许可的通讯协议总线，用于集成上游不锈钢配储液系统所有DI、DO信号，DI、DO卡件需预留10%的备用通道。  The remote IO cabinet shall install remote IO module which shall support Profibus-DP protocol bus or communication protocol bus approved by Owner. The remote IO module will be used to integrate all DI, DO signals of the stainless steel system. The remote IO module shall reserve 10% spare channels for DI and DO signals respectively. | 商业  Business |
|  | 远程IO柜需配置单层信号端子用于4-20mA信号线缆接线，4~20mA模拟量传感器及仪表需支持HART协议。  The remote IO cabinet shall install single-layer terminal which is used for connecting 4-20mA signal cable, HART protocol shall be supported for 4~20mA analog sensor and instrument. | 商业  Business |
|  | 远程IO柜需配置阀岛，采用Profibus-DP通讯协议与PCS通讯。每个远程IO柜中阀岛需预留10%的电磁阀片备用量。  The remote IO cabinet shall install Valve Island which will communicate with PCS via Profibus-DP protocol. The valve island shall reserve 10% spare valve blocks in each remote IO cabinet. | 商业  Business |
|  | 远程IO柜需配置磁力搅拌转速信号转换器，转速信号采用4-20mA信号类型接入PCS系统监测磁力搅拌器实际转速。  The remote IO cabinet shall install magnetic stirring speed signal converter. The speed signal, which is 4-20 mA signal, shall be connect to PCS for monitoring the actual speed. | 商业  Business |
|  | 远程IO柜需配置冗余24VDC开关电源。开关电源报警信号需接入PCS。  The remote I/O cabinet shall be equipped with redundant 24VDC power supply. The alarm of 24VDC power supply shall be connected to PCS. | 质量  Quality |
|  | 远程IO柜需配置仪表屏蔽层接线铜条，该铜条需与机柜绝缘。  The remote IO cabinet shall be equipped with shield bar for instrument wiring, the shield bar shall be insulated from the cabinet. | 质量  Quality |
|  | 远程IO柜需配置就地急停旋钮和安全继电器。  The remote I/O cabinet must be equipped with local emergency stop and safety relay. | 安全  EHS |
|  | 远程IO柜需配置过滤减压阀，用以过滤及调节压缩空气。并将压力低报警信号需接入PCS。  The remote I/O cabinet shall be equipped with filter relief-pressure valve to filtrate the compressed air and adjust the pressure of compressed air. The pressure low alarm shall be connected to PCS. | 质量  Quality |
|  | 传感器及变送器由不锈钢工艺系统供应商负责安装。  The installation and wiring of sensor, instrument and transmitter shall be done by stainless steel system supplier. | 商务  Commerce |
|  | 需在合同签署后1个月，提供仪表及变送器信号分配表（I/O 清单）。  Instrument and transmitter signal distribution form shall be provided one month after signing the contract (I/O list). | 商务  Commerce |
|  | IO柜接线与接管的工作应尽可能在系统供应商工厂内完成，系统供应商应根据模块设计设置IO柜数量。  IO cabinet wiring and take-over should be completed in the factory of the system supplier as far as possible. The system supplier should set the number of IO cabinets according to the module design. | 商务  Commerce |

* + 1. 马达控制中心（Motor control center, MCC）

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | MCC柜不在此次招标范围内，由整厂PCS系统供应商供货。  MCC cabinet is not included in the bidding scope and is supplied by PCS system supplier. | 商务  Commerce |
|  | 上游不锈钢配储液系统供应商需提供系统中的电机的详细电气参数。系统供应商需配合完成变频器参数设置。  The supplier of system shall provide detailed electrical parameters of the motor used in the process equipment. The vender should cooperate to complete the parameter setting of frequency converter. | 商务  Commerce |
|  | 上游不锈钢配储液系统供应商需设计和安装电机紧急停止，远程/就地切换按钮、运行和故障状态指示灯。  The supplier of Stainless steel preparation & holding tanks system shall design and install the motor emergency stop, remote/local switch button, run and fault status indicator lamp. | 商业  Business |

* + 1. 现场操作员站 Field operator station

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 现场操作员站HMI将采用悬臂或立柱式安装于模块上，不锈钢供应商需设计HMI的安装位置并安装悬臂或立柱，并在模块上预留安装接口。  The onsite operator station HMI, which will be mounted via cantilever or vertical column, to be installed on the stainless steel system module. The stainless steel system supplier shall design the installation location of HMI and reserve the installation interface on the stainless steel system module. | 商务  Commerce |
|  | 现场操作员站HMI及其悬臂或立柱不在此次招标范围内。现场操作员站的HMI及悬臂或立柱由PCS系统供应商设计、供货。  The onsite operator station HMI and its cantilever and column is not included in the bidding scope of stainless steel system supplier. And the onsite operator station is designed, supplied and installed by the PCS system supplier. | 商务  Commerce |

* + 1. 电缆和接线 Cables and wiring

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 模块内电缆桥架设计及安装由系统供应商完成。罐体和模块应配有合理的管槽用于电缆走线，管槽应美观、坚固。罐体和模块适当位置需有用于固定电缆/电线的支架。电缆的铺设由供应商负责。  Tanks and modules shall be equipped with reasonable wire casing for cable routing, and the wire casing shall be beautiful and solid. Tanks and modules shall be provided with brackets for fixing cables / wires in place. The design and installation of cable tray in the module shall be completed by the stainless steel system supplier. | 商务  Commerce |
|  | 系统至PCS控制系统主桥架的辅助桥架或线缆管，由不锈钢配储液系统供应商负责设计及安装。  The cable tray or cable pipe from stainless steel system to PCS main cable tray shall be designed and install by supplier. | 商务  Commerce |
|  | 系统内部电源、仪表、阀门反馈、各类传感器至远程IO柜内线缆由系统供应商提供并完成接线。  The cabling and wiring from power supply, instrument, valve feedback and other device within stainless steel system module to remote IO cabinet shall be done by stainless steel system supplier. | 商务  Commerce |
|  | 系统内所有的信号电缆要求为阻燃屏蔽或以上线缆，4~20mA线径≥1.0 mm2。  The signal cable within system shall be anti-flaming and shield cable, the cable diameter shall be more than 1.0 mm2. | 商业  Business |
|  | 系统内的Profibus-DP链路线缆敷设、接线由系统供应商完成。所有采用Profibus-DP的电气元件必须支持DP V0协议，必须与甲供PCS系统兼容。系统供应商需提供DP通讯设备的GSD文件及数据交互表。  The system supplier shall be in charge of cabling and wiring of Profibus-DP segment within stainless steel system. All Profibus-DP device must support DP V0 protocol and must be compatible with the PCS, and supplier shall provide the GSD files and data exchange list. | 商务  Commerce |
|  | 系统供应商需为其提供Profibus-DP设备配备Profibus-DP通讯接头，该通讯接头具备ON/OFF选择终端电阻的功能。  The system supplier shall provide the Poribus-DP connecter for Porfibus DP device, the DP comment shall have terminal resistance ON/OFF switch. | 商业  Business |
|  | 远程IO柜至PCS的信号线缆及网线由PCS供应商提供，本系统侧信号接线和线缆连接由系统供应商负责完成。  The signal cable and network cable from PCS cabinet to remote IO cabinet shall be provided by PCS supplier. The cable wiring on this system side shall be done by system supplier. | 商务  Commerce |
|  | 远程IO柜及上游不锈钢配储液模块至接地箱之间的接地线缆，由系统供应商提供和敷设。  The grounding cable from remote IO cabinet and system to grounding box shall be laid and wired by system supplier. | 商务  Commerce |
|  | 远程IO柜、仪表接线箱等柜内及接线端子电缆线号标识清晰。  The cable numbers in the valve terminal cabinet, instrument junction box and terminal block shall be clearly marked. | 商务  Commerce |
|  | 上游不锈钢配储液供应商应提供上游不锈钢配储液模块系统信号接线图，并配合完成系统至PCS的信号接线图。  The system supplier shall provide the wiring diagram of system, and support to design wiring diagram of wiring from the system to PCS. | 商务  Commerce |
|  | MCC柜到上游配储液系统及其辅助设备电机电缆由PCS供应商提供，PCS供应商完成MCC柜侧接线，系统供应商完成上游配储液系统设备侧接线。  The cable of motor from MCC cable to US preparation and holding system shall be provided by PCS supplier, the PCS supplier shall be responsible for wiring the motor cables on MCC cabinet side and the system supplier shall be responsible for wiring the motor cable on motor side. | 商务  Commerce |
|  | 每一根电缆需配置电缆标签，模块内电缆标签由上游配储液系统供应商提供，与PCS系统连接电缆标签由PCS供应商提供，电缆标签规则需协商一致。  Each cable shall be equipped with cable label. The label of the cable in the module shall be provided by the system supplier. The label of the cable connected with the PCS system shall be provided by the PCS supplier. The cable label rules shall be agreed by consensus. | 质量  Quality |
|  | 上游配储液模块与PCS控制系统联合FAT调试期间的临时线缆由上游配储液模块供应商提供，并负责完成PCS控制系统侧接线和测试后线缆的拆除工作。联合测试期间的线缆走线需采用桥架或穿线管，线缆不可以直接敷设在地面上。  The cable used for integrated test shall be provided by system supplier, and the cable connection and disconnection on PCS side shall be done by system supplier as well. The cable shall be laid within cable tray or cable pipe, it is not allowed to lay cable on the ground directly. | 商务  Commerce |
|  | 上游配储液系统供应商需为联合FAT期间的PCS系统提供UPS电源，并确保PCS系统在联合测试期间的环境满足如下需求：  The US preparation & holding system supplier shall provide the UPS for the PCS during integrated FAT, and ensure the environment for PCS system as follow:   * 温度在10-35℃之间；   Temperature within 10-35℃   * 湿度在20-80%之间；   Humidity within 20-80%; | 商务  Commerce |

* 1. 安全要求 Safety Requirement

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 设备、钢平台、标识和铭牌等任何部位不应有锋利的边缘和尖角。  There shall be no sharp edge and sharp angle at any part of equipment, steel platform, logo, nameplate, etc. | 安全  EHS |
|  | 所有设备应满足在最大负荷和运行速度的情况下，距设备任何方向1m处的噪音不超过80dBA。  All equipment shall conform to peak noise of 80 dBA measured at 1 meter in any direction from the equipment when operating at all maximum loads and speeds. | 安全  EHS |
|  | 设备的安全阀、爆破片的出口管应导向地面，防止喷溅到人员。  The outlet pipe of the safety valves and the rupture discs of the equipment should be directed to the ground to prevent splashing to the personnel. | 安全  EHS |
|  | 供应商应在冷、热或高压工况管道，以及超重设备/部件的周边设置明显的标识和保护措施。  The supplier shall provide evident identification and protection measures in the vicinity of the cold, hot or high pressure utility pipeline and superheavy equipment/components. | 安全  EHS |
|  | 设备框架和钢平台需充分考虑人员的安全防护（如护栏、台阶宽度和防滑）。  The safety protection of personnel should be fully considered in the design of system frame and steel platform. (e.g. Guardrails, wide steps and anti-skidding) | 安全  EHS |
|  | 热点周边应有标识和保护措施。  Hot spots access shall be signaled and protected. | 安全  EHS |
|  | 系统供应商应负责设备模块和建筑接地装置的接线工作。  The system supplier should be responsible for the wiring of equipment modules and building grounding devices. | 安全  EHS |

* 1. 验证要求 Validation Requirement

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 供应商应提供一份质量计划，由业主审核批准。  The supplier shall develop a Quality Plan for owner’s review and approval. | 商务  Commerce |
|  | 供应商需要完成的质量工作须包括，但不限于：  The quality work required by the supplier shall include, but not limited to:   * 验证计划 Verification Plan * 风险评估 Risk assessment * 设计确认 DQ * 预FAT(工厂内部测试) Pre-FAT(VIT) * 工厂验收测试 FAT * 现场验收测试 SAT * 调试 Commissioning * 安装/运行确认 I/OQ * 协助性能确认 PQ assistance | 商务  Commerce |
|  | DQ工作应在设备开始制造前完成，避免DQ结果对设备制造过程造成影响。  It is recommended to complete DQ before equipment manufacturing to avoid DQ results affecting equipment manufacturing process. | 商务  Commerce |
|  | 在进行正式的工厂验收测试之前，供应商必须完成以下测试项目。测试项目的相关文件需在FAT时可以查阅。  Prior to the performance of the main Factory Acceptance test, the supplier must complete the items listed below. Documentation of these activities will be available for review at the FAT.   * 100%图纸检查(机械和电气) 100% Drawings checks (Mechanical & Electrical) * PID一致性检查 P&ID compliance check * 布局图一致性检查 GA compliance check * 制造材质确认 Material of construction verification. * 100%表面抛光度确认   100% Surface finish verification   * 坡度确认 Slope verification. * 电气检查，包括接线、终端等 Electrical verification including wiring, terminations etc. * 绝缘检查 Insulation inspection * 控制面板检查、设备盘点及实物检查 Control panel visual inspection, equipment inventory & physical checks * 标签标牌检查 All items tagged and labelled as per specification * 100%文件检查 Documentation check; all documents * 容器、管道压力测试 Pneumatic/vacuum testing of vessels & pipe works. | 商务  Commerce |
|  | 出厂前系统供应商需与PCS系统供应商配合完成联合FAT，所有的设备须接受工厂验收测试（FAT）确认。  Before delivery, system supplier shall cooperate with PCS system supplier to complete joint FAT, and all equipment shall be subject to factory acceptance test (FAT). | 商务  Commerce |
|  | FAT方案由系统供应商和PCS系统供应商共同起草并在FAT执行前由业主批准。联合FAT测试将在系统供应商工厂进行，业主将见证所有的测试执行。  Fat protocol shall be drafted jointly by system supplier and PCS system supplier and approved by the owner before FAT execution. The joint FAT will be carried out at the system supplier's factory, and the owner will witness the execution of all tests. | 商务  Commerce |
|  | 只有在所有FAT文件经业主验收关闭后设备方可打包运输以交付。  The system will only be released for delivery when all FAT documents are closed out by the owner | 商务  Commerce |
|  | 在FAT期间，须编制故障日志以及偏差/备注日志，记录每天FAT中发现的问题。  During FAT, the fault log and deviation/comment log should be compiled to record the problems found in FAT every day. | 商务  Commerce |
|  | 在FAT前，供应商应对温度、压力和流量仪表进行校准。  Primary calibration will be carried out by the Vendor, prior to FAT, on temperature, pressure and flow instruments. | 商务  Commerce |
|  | FAT测试应包括，但不限于：  The FAT tests shall include, but not be limited to, the following tests:  - 设备尺寸检查Dimensional Check  - 与房顶/墙壁/地面的界面检查Interface with Ceiling / Walls / Floor  - 公用工程连接位置检查 Utilities Connection Location x, y and z  - PID检查 P&ID Check  - 核黄素和全排放测试Riboflavin and Full Discharge Test  - 坡度检查 Slopes  - 排水检查 Drainability  - 组件安装及方向检查 Component installation and orientation Check  - 仪器仪表安装检查 Instrument Installation  - 保温检查 Insulation inspection  - 标签检查 Labeling inspection  - 材质证书检查 Material Certificates  - 焊接检查 Welding Certificates  - 100%内窥镜检查 100%Endoscope Welding Shots  - 焊工资质检查 Welders Certification  - 压力容器报告检查 Pressure Vessel Certificates  - 压力测试报告检查 Pressure Test Reports  - 管道清洁报告检查 Welding and Piping Cleaning Reports  - 管道钝化报告检查 Welding and Piping Passivation Reports | 商务  Commerce |
|  | 工厂验收测试的内容应在现场验收测试中重复执行，但根据项目质量计划和验证计划中关于测试引用的描述，部分的测试可以引用FAT的结果或进行抽样检查。  In general FAT tests shall be repeated in SAT. According to the description of test references in Project Quality Plan and Validation Plan, part of the tests can refer to the results of FAT or be confirmed by spot check. | 商务  Commerce |
|  | SAT的方案由供应商起草，业主审核批准。  Protocols for the site acceptance test (SAT) shall be produced by the Vendor and approved by Owner. | 商务  Commerce |
|  | IQ方案由供应商起草并在IQ执行前由业主批准。IQ测试将在业主现场进行，业主将见证所有的测试执行。  IQ protocols are to be prepared by the supplier and approved by owner prior to the IQ. The supplier shall execute tests on the owner’s site and owner will witness all the tests. | 商务  Commerce |
|  | OQ方案由供应商起草，必要时方案中应包含程序运行时的功能检查，最终OQ方案由业主审核批准。  OQ protocol should be drafted by the supplier. If necessary, the plan shall include the functional inspection during the operation of the program. The final OQ protocol should be reviewed an approved by Client. | 商务  Commerce |
|  | 系统供应商应与自控系统供应商积极配合，共同完成设备运行/系统功能方面的测试，业主将见证所有的测试执行。  The stainless steel system supplier shall actively cooperate with the automatic control system supplier to complete the equipment operation / system function test together, and the owner will witness the implementation of all tests. | 商务  Commerce |
|  | 供应商需协助业主进行PQ方案的起草和执行。  The supplier shall assist the owner in the drafting and implementation of PQ scheme. | 商务  Commerce |
|  | 调试阶段包括校准、回路调整和确保设备运行满足需求说明的所有调整。  The commissioning stage shall include calibration, loop tuning and all other adjustments required to ensure the equipment performs as specified in the Requisition. | 商务  Commerce |
|  | 供应商应对整个调试阶段负责，包括配合现场施工团队。供应商应估计完成调试所需的天数，并给出每日工作安排。  The supplier shall be responsible for the entire commissioning phase, including cooperation with the site construction team. Vendor shall estimate the number of days required to complete the commissioning and quote a daily rate for Site attendance. | 商务  Commerce |
|  | 供应商应配备足够的备件和材料以确保调试过程能够顺利完成。调试用的备件和材料应与设备一同运至业主现场。  The Vendor shall include for adequate spares and materials to ensure that the commissioning process can be successfully carried out. These shall be delivered to Site in the same shipment as the equipment. | 商务  Commerce |

* 1. 培训要求 Training

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 供应商负责所有技术指导和人员培训，包括：图纸、工艺、操作、设备维护、设备性能及问题解答等。  Supplier is responsible for all technical guidance and personnel training, including drawings, processes, operations, equipment maintenance, equipment performance and problem solving. | 商务  Commerce |
|  | 供应商应给出培训计划，并在计划内明确培训内容和时长。  The supplier should provide the training plan, and specify the training content and duration in the plan. | 商务  Commerce |
|  | 提供每台设备不少于10个名额的培训，培训内容应包括设备基本原理和操作技能培训，应确保培训的系统全面。  The provision of not less than 10 training places for each equipment should include training in basic principles and operational skills of the equipment, and ensure that the training system is comprehensive. | 商务  Commerce |

* 1. 维护保养 Maintenance

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 设备所有部件必须便于维护、维修和清洗。供应商应提供常规维护中必须拆卸部分的吊装点。供应商应告知设备维护中哪些部分需要提吊。  All parts of the equipment must be readily accessible for maintenance, servicing and cleaning. The Vendor shall provide lifting points for equipment that must be removed for routine maintenance. The Vendor shall advise where lifting aids are required to maintain equipment. | 商务  Commerce |
|  | 设备周围应留有足够的维护空间，开门方向应满足车间布局和维修要求；  There should be enough maintenance space around the equipment.. The opening direction should meet the layout and maintenance requirements of the workshop. | 商务  Commerce |
|  | 供应商的维护手册中应包含一个预防性修护计划，其中包含了各种维护活动的次数、频率和成本。  The Vendor’s maintenance manual shall include a preventive maintenance plan with times, frequencies and costs for each activity. | 商务  Commerce |
|  | 设备保修期自设备最终移交后算起24个月。  24 months warrant period from final hand-over of all systems in scope of work. | 商务  Commerce |
|  | 维修响应时间不超过48小时。  Maintenance response time is less than 48 hours. | 商务  Commerce |

* 1. 后期服务 Service

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 保修期内免费更换和重新安装任何因制造原因出现的问题零件。保修期外，长期提供优惠的维修服务及零部件。  During the warranty period, replace any parts found defective due to manufacture and reinstall new ones at no cost to owner.  Over the warranty period, provide long-term preferential maintenance services and spare parts. | 商务  Commerce |

* 1. 备品备件 Spares

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 提供可满足两年设备运行需要的易损零部件，以及详细的零部件清单（零件编号、数量、价格和交货期）。  Provide vulnerable parts to meet the requirements of two-year equipment operation, and a detailed list of parts (part number, quantity, price and delivery date). | 商务  Commerce |
|  | 提供必要的设备维修专用工具及相应的工具清单表。  Provide necessary special tools for equipment maintenance with tool list. | 商务  Commerce |
|  | 设备的主要部件必须进行编号且记入说明书，提供一份部件清单。同时注明主要零部件的建议更换周期。  The main parts of the equipment must be numbered in a parts list in the specification. The recommended replacement cycle for major components should be indicated in the parts list. | 商务  Commerce |

* 1. 包装运输要求 Packing and Transportation

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 设备需经过业主工作人员到供应商处进行FAT，确认合格后方能打包发货  The equipment can be packed and shipped only after the FAT is confirmed by owner’s staff. | 商务  Commerce |
|  | 货物包装的形式应考虑运输的形式和运输、装卸和储存过程中将要遇到的环境条件。  The type of packing to be used shall be selected with due regard to the chosen shipping media to be used and the environmental conditions to be encountered during shipping, handling and storage. | 商务  Commerce |
|  | 设备在运输至现场的过程中应受到足够的保护，所有松动的部件都应装箱或装袋。  Equipment shall be adequately protected during shipping to site. All loose parts shall be adequately boxed crated or bagged. | 商务  Commerce |
|  | 类似螺栓、螺母垫圈、垫片、封隔器等设备小部件应保存在防水无尘的容器中。  Small items such as bolts, nuts washers, shims, packers and small items of equipment shall be provided in waterproof grit free containers. | 商务  Commerce |
|  | 所有旋转设备，如电机、风扇等，其中活动的部件可能由于运输震动而损坏，必须根据制造商的建议进行保护。  All rotating equipment such as motors, fans etc., in which moving parts could be damaged due to shipping vibration must be secured per the manufacturer’s recommendations. | 商务  Commerce |
|  | 管道、软管及其他敞口部件都应封口，防止湿气、灰尘和其他可能污染工艺流体任何外来物质的侵入。与工艺流体接触的管件和设备应装袋并标记防止与湿气和灰尘接触。  Pipe, tubing and all openings shall be end capped to prevent the ingress of moisture, dust and any foreign matter that may contaminate the process fluid. Pipe fittings and equipment which contacts the process fluid shall be bagged and tagged to prevent contact with moisture and dust. | 商务  Commerce |
|  | 暴露在外的机加工表面或抛光表面应用可剥离膜进行保护或涂覆合适的保护剂，保护剂要求能在不使用溶剂的情况下轻松去除。  Exposed machined and/or polished surfaces shall be protected with a strippable membrane or coated with a suitable protective compound that shall be easily removable without the use of solvents. | 商务  Commerce |
|  | 供货商应承担由于包装、运输不妥引起的货物锈蚀、损伤和丢失的责任。  The supplier shall bear the responsibility of rust, damage and loss caused by improper packing and transportation. | 商务  Commerce |
|  | 从设备合同签订到设备抵达业主指定场地，时间不超过8个月。  It is not more than 8 months from the signing of the equipment contract to the equipment to the owner's designated site. | 商务  Commerce |

* 1. 最终设备的成品保护 System

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 供应商应负责罐体及焊接前后的洁净管道进场后的保护，保护措施需能防止长时间土建或净化施工过程中对罐体的损伤及污染。  The supplier should be responsible for the protection of the tank body and clean pipes before and after welding after entering the site, and the protection measures should be able to prevent the damage and pollution of the tank body in the process of long time civil construction or purification construction. | 商务  Commerce |
|  | 供应商应负责最终设备的成品保护，防止土建或净化施工过程中对系统的损伤及污染。  The supplier should be responsible for the protection of the finished product of the final equipment to prevent the damage and pollution of the system during the construction of civil engineering or purification. | 商务  Commerce |

* 1. 文件要求 Documentation

| **序号**  **ID No.** | **需求描述**  **Requirement Description** | **需求分类**  **Requirement Category** |
| --- | --- | --- |
|  | 需提供1份纸质以及一份电子版的“竣工版”文件。图纸应使用AUTOCAD绘制，文件使用Microsoft Office编写。  One (1) hard copy as “AS BUILT” documentation plus electronic form. Drawings and documents shall be made in AUTOCAD and Microsoft Office. | 商务  Commerce |
|  | 需提供三份纸质以及一份电子版的安装、维护手册。  Three (3) hard copies of Installation and Maintenance Manuals plus electronic form | 商务  Commerce |
|  | 供应商文件应以中英文双语形式编写（在设计文件中另有说明的除外），所有计量单位均为公制单位。  The Vendor documents shall be written in bilingual (unless otherwise specified in design documents) and all units of measurement shall be metric units. | 商务  Commerce |
|  | 供应商需采用业主的图纸、管道和部件编号系统。  The supplier shall use the owner's drawing, piping and part numbering system. | 商务  Commerce |

1. 版本历史REVISION HISTORY

| 版本 Version | 修订内容 Change Content | 备注Note |
| --- | --- | --- |
| 01 | 新建文件 New document | N/A |
|  |  |  |

1. 附录 APPENDIX
   1. 供应商提供文件的要求 Vendor Documents Requirements

供应商提供的文件要求属于商业约定，需要在文件交付过程检查，但无需在RTM中追溯。

The document requirements provided by the vendor are commercial agreements and need to be checked during the document delivery process, but there is no need to trace back in the RTM.

| **序号**  **No.** | **文件名称**  **Document Name** | **语言**  **Language** | **纸质版/电子版**  **Hard copy**  **/Electronic** | **电子版格式(Word, Excel, PDF. Etc.)** | **纸版份数**  **Num of Hard copy** | **文件提供时间**  **Doc Provide Time** |
| --- | --- | --- | --- | --- | --- | --- |
|  | URS响应表  Compliance to URS | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | DQ 开始前  Before DQ |
|  | 项目质量计划  Project Quality Plan | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | DQ 开始前  Before DQ |
|  | 项目执行计划  Project Execution Plan | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | DQ 开始前  Before DQ |
|  | 图纸清单  Drawing list | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | DQ 开始前  Before DQ |
|  | 竣工PID图  As-built P&ID | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 3 | 系统交付时  System Handover |
|  | 组织结构图  Project Organization Chart | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | DQ 开始前  Before DQ |
|  | 3D模型图  3D GA | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | DQ 开始前  Before DQ |
|  | 容器机械图  Vessel mechanical drawings | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | DQ 开始前  Before DQ |
|  | 装配图  General assembly drawing | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | 系统交付前  Before System Handover |
|  | ISO证书  ISO certificate | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | DQ 开始前  Before DQ |
|  | 文件递交日期  Document delivery date | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | DQ 开始前  Before DQ |
|  | 设备重量信息  Weight information of equipment | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 变更控制规程  Change Order Procedure | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | DQ 开始前  Before DQ |
|  | 项目及建设进度表  Project and production schedule | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | DQ 开始前  Before DQ |
|  | 仪表标签列表  Instrument Label Schedule | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 公用介质消耗列表  utilities consumption schedule | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | DQ 开始前  Before DQ |
|  | 供应商文件列表  Vendor document schedule | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | DQ 开始前  Before DQ |
|  | 子供应商容器文件  Vessel documentation of sub-supplier | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | DQ 开始前  Before DQ |
|  | 铭牌信息  Nameplate data's | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 货运文件  Shipping documentation | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | 系统交付前  Before System Handover |
|  | 钝化规程  Passivation procedure | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 校准规程  SOP for Calibrations | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 焊接规程  Welding procedure | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 液压/气动测试规程  Hydrostatic & Pneumatic test procedure | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 电抛光规程  Electro polishing procedure | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 机抛光规程  Mechanical polishing procedure | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 维护手册  Maintenance manual | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 3 | 系统交付时  System Handover |
|  | 安装手册  Installation manual | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 3 | 系统交付时  System Handover |
|  | 消耗品及耐耗品/配件清单  List of consumables and wear/spare parts | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | SAT开始4周前  4 weeks before the start of SAT |
|  | 设备数据表  Equipment data sheets | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | SAT开始4周前  4 weeks before the start of SAT |
|  | 仪表数据表  Instrument data sheets | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | SAT开始4周前  4 weeks before the start of SAT |
|  | 标签清单  Tag list | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 组件清单  Component list | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 部件数据表 Component datasheet | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | DQ 开始前  Before DQ |
|  | PID图  P&IDs | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | CAD | 1 | DQ 开始前  Before DQ |
|  | 容器图及接口清单  Vessel drawings & Nozzle list | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | DQ 开始前  Before DQ |
|  | 布局图  Layout | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | CAD | 1 | DQ 开始前  Before DQ |
|  | 运行描述  Operation Description | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | Word | 1 | DQ 开始前  Before DQ |
|  | I/O列表  I/O list | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | Excel | 1 | DQ 开始前  Before DQ |
|  | 功能说明  Functional specification | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | Word | 1 | DQ 开始前  Before DQ |
|  | 焊接设备及参数  Welding equipment and parameters | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 焊接规程  Welding procedure | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 焊点总表  Weld summary | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 焊接记录及检查记录  Welding and inspection log | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 20%焊缝照片  20% Weld seam pictures | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 焊接样品（每个程序及每个工人） Weld samples(per program and per manual welder) | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 其他测试的报告（内窥镜，X光，铁素体） Test result of other tests (borescope, x-ray, ferrite) | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 脱脂证明  Degreasing certification | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 校验证书  Calibration certificate | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 钝化证明  Passivation certification | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 焊工及检查员资质证明  Welder &Inspector Certificates | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | CE认证证书  CE conformity declarations | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 测试仪器设备校验证  Certificates for test instruments/equipment | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 液压/气动测试证明  Hydrostatic & Pneumatic certificate | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 电抛光证明  Electro polishing certification | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 清洁证明  Certificate about cleaning and rinsing | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 金属部件的材质证明  Material certificates for metallic parts | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 非金属部件的材质证明  Material certificates for non-metallic parts | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 表面抛光度证书  Surface finishing certificates | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | 验证计划  Validation Plan | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | Word | 1 | DQ 开始前  Before DQ |
|  | 风险评估及报告  Risk Assessment and Report | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | Word | 1 | DQ 开始前  Before DQ |
|  | DQ方案/报告  DQ protocol /report | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | Word | 1 | DQ 开始前  Before DQ |
|  | 需求追溯矩阵  RTM | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | Excel | 1 | DQ 开始前  Before DQ |
|  | FAT方案/报告  FAT protocol/report | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | Word | 1 | FAT开始2周前  2 weeks before the start of FAT |
|  | SAT方案/报告  SAT protocol/report | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | Word | 1 | SAT开始4周前  4 weeks before the start of SAT |
|  | IQ方案/报告  IQ protocol/report | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | Word | 1 | IOQ开始4周前  4 weeks before the start of IOQ |
|  | 备品清单  Spares part list | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | SAT开始4周前  4 weeks before the start of SAT |
|  | 特殊工具清单  Special tools list | 中英文双语  Bilingual | 纸质和电子版  Hard copy &Elec | PDF | 1 | SAT开始4周前  4 weeks before the start of SAT |

\* 默认为报告批准后，于系统交付前统一交付 After the report is approved, it will be delivered before the delivery of the system.

* 1. 相关区域布局图 Relevant Layout
  2. 相关工艺仪表流程图 Relevant P&ID
  3. 零部件品牌推荐表 Component brand recommendation list
  4. 管道等级表 Piping Class Index