

**20 万 m<sup>3</sup>/a PB 生产线干燥烟气超净排放环保项目技术文件  
(澳大利亚)**

**Technical proposal for  
Dryer gas emission cleaning treatment system  
of 200,000m<sup>3</sup>/a PB line in Australia**



福建气好克环保科技有限公司

Fujian 7mg Environmental Technologies Co., Ltd.

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## 总体阐述

### SYSTEM INFORMATION

福建气好克环保科技有限公司在工厂废气、烟气净化处理方面具有丰富的设计和工程实施经验，特别是在人造板生产烟气除尘、除臭、除甲醛、消白应用上积累了一整套的解决方案，专注为人造板生产厂家解决生产过程中产生的大气污染环保问题。

**Fujian 7mg Environmental Technologies Co., Ltd** (Fujian 7mg or QHK in abbreviation) has abundant experiences in design and construction of exhaust air, exhaust gas and process gas purification systems, especially on solutions for dust separation, deodorization, formaldehyde removing, and depluming for wood based panel factories, concentrated on solving the air pollution problems in wood based panel board industry.

公司产品有高效喷淋塔、湿式电除尘、等离子、湿电等离子一体化设备、烟气消白设备、工频电源、高频脉冲电源、臭氧脱硝、湿法脱硫等涵盖人造板烟气污染物（烟尘、NOX、SO<sub>2</sub>、甲醛、VOCs）净化需求的所有配套技术产品。

Fujian 7mg provides technologies and products such as high-efficiency scrubber, Wet-Electro-Static-Precipitator (WESP), plasma and wet plasma aggregate, gas depluming device, frequency power supply unit, high-frequency pulse power supply unit, ozone de-nitration and wet-desulfurization of the exhausted gas (contains fine dust, NOX, SO<sub>2</sub>, formaldehyde and VOCs) from wood based panel industry.

本项目干燥尾气环保处理配套装置的设计、土建、供货、调试、试验及检查、试运行、考核、最终交付等符合相关的中国法律及规范、以及最新版的ISO和IEC标准。

The design, civil construction, supply, commissioning, test and inspection, trial running, acceptance and final handover of the dryer gas treatment system for this project are following the relevant China laws and regulations, and the latest version of ISO and IEC standards.

系统优势如下：

The system merits as following:

- 湿法静电除尘器可高效净化尾气
- Wet-Electro-Static-Precipitator (WESP) for effective gas cleaning;
- 压力损失较低
- Low pressure loss on the gas side;

- 所有易腐蚀部分采用 304 不锈钢或其他抗腐蚀材料
- construction of all corrosion-susceptible parts in stainless steel 304, or non-corroding material;
- 用滚筒筛去除大颗粒杂质
- absorbent pre-filtration by rotation screen with coarse material discharge;
- 通过水泵将循环水引入自清洗过滤器进行处理
- absorbent filtration of solids, self-cleaned in the pump pressure cycle, with back flush filters;
- 除尘器底部集成循环水循环系统
- bottom part of precipitator, floor-mounted to contain the liquid circulation components;
- 仪表、水泵、控制和调节组件均安装在方便维护的支架上
- instrumentation, control and regulating components, pumps and so on in the floor-mounted frame, providing for easy maintenance;
- 电控和可视化系统集成化安装在除尘器内部
- electronic cabinets and visualization in the user's cab beside the cleaning system;
- 可提供应急水用于消防和喷淋系统冲洗
- feed for emergency water supply in case of fire, connected to the field flushing spraying nozzle system;
- 在断电情况下为水泵提供紧急应急电源供应
- feed for emergency power supply for pumps in case of voltage break-down;
- 较低的维护成本
- low maintenance work requirement;
- 较低的运行成本
- low operating costs;
- 混凝剂或絮凝剂提高气浮机效率
- flocculant/coagulant for efficient flotation;
- 没有其他所需的化学品（如果没有硫化物/氯化物或其他腐蚀性物质）
- no other additional chemicals (if there are no Sulphur/chloride or other corrosive emissions).

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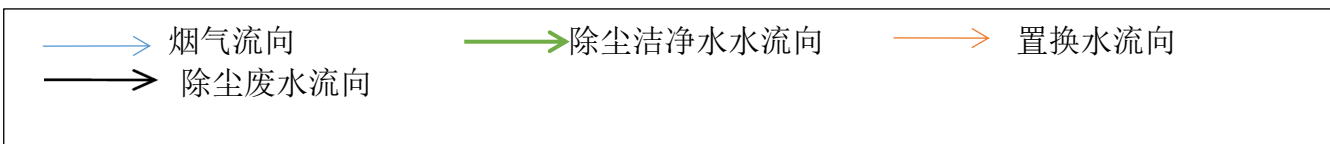
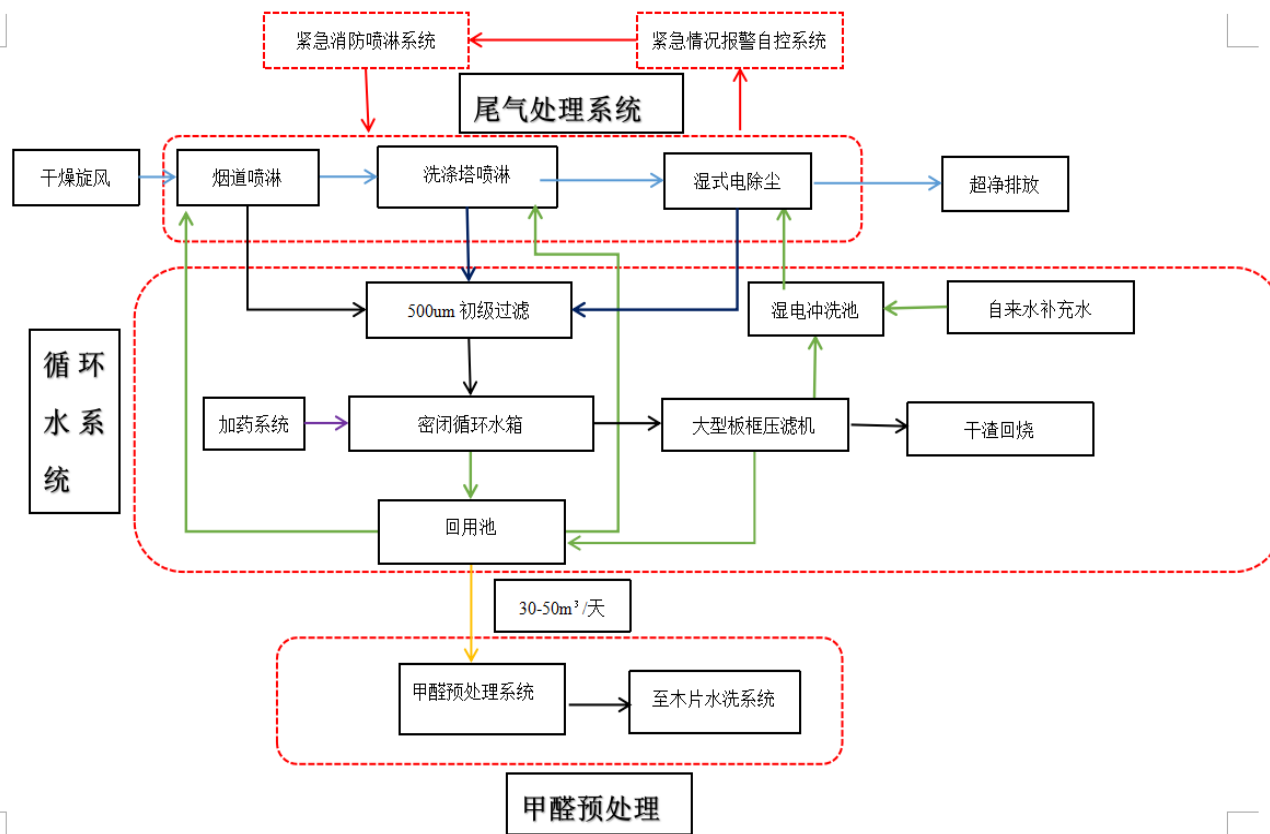
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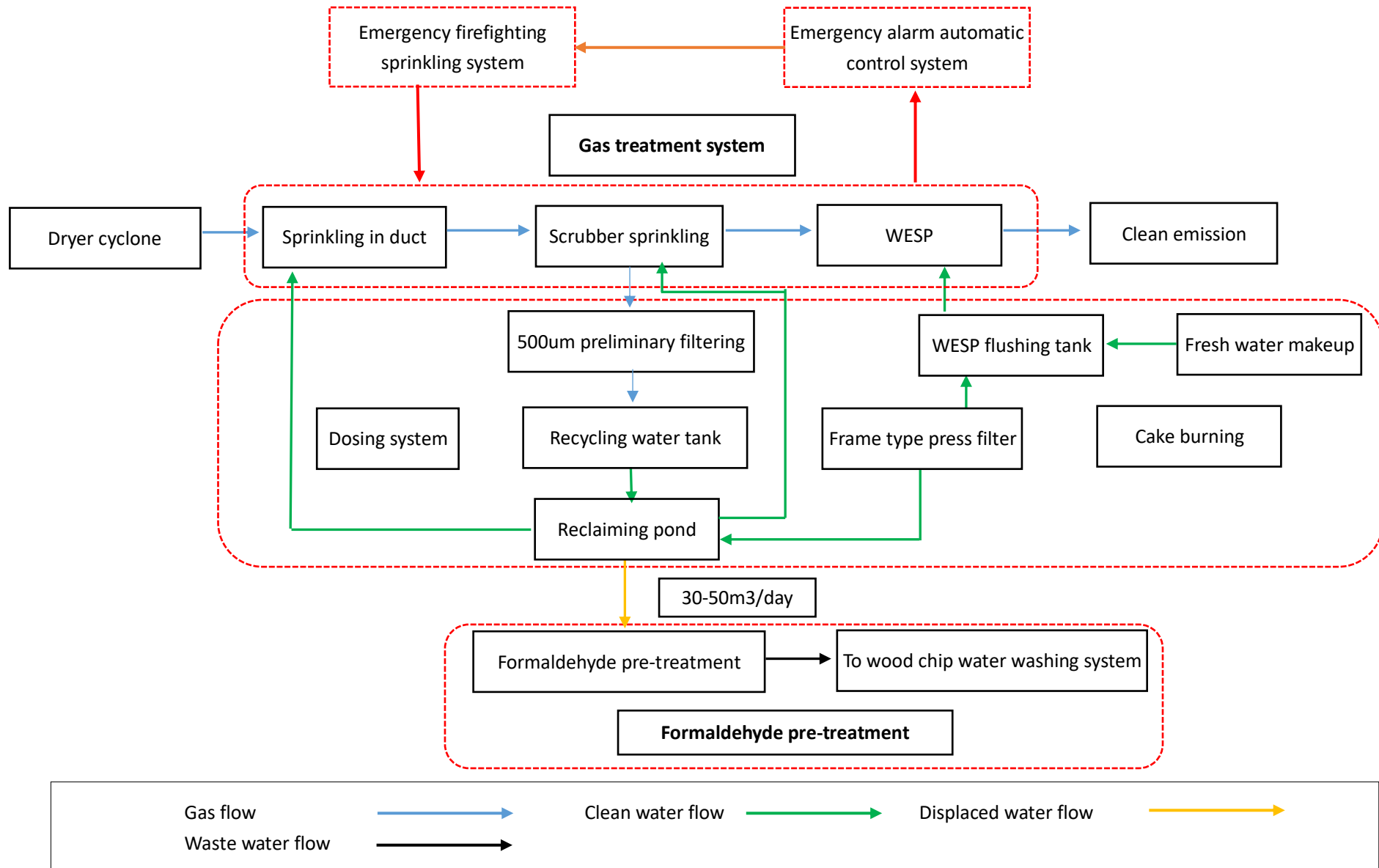
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### 1. 系统工艺流程说明



1. System description



本项目有2台干燥机总风量为220,000Am<sup>3</sup>/h，考虑到设计预留余量，本装置处理能力设计值按250,000Am<sup>3</sup>/h考虑，除尘设备入口粉尘浓度设计值为≤350mg/m<sup>3</sup>。

There are 2 units of dryer fans with total air volume of 220,000Am<sup>3</sup>/h on this project, and in consideration of allowance, we propose the total treatment designed capacity as 220,000Am<sup>3</sup>/h, and the designed particle concentration led into this system as ≤350mg/m<sup>3</sup>.

在烟道管上设有烟道喷淋，烟气经过3道喷淋水预湿润并冷却。冷却喷淋水由烟道进入湿电装置，并通过底部的锥斗直接进入初级水箱。

There are sprinkling nozzles integrated inside the crude gas ducts, the crude gas is premoistened and cooled down while it goes through 3 sets of water sprinkling. Sprinkling water will subsequently goes to WESP and further goes through its bottom cone then finally enters a preliminary water collecting tank.

烟气经初级预除尘后通过均风装置进入喷淋湿电一体化装置，通过下部的喷淋塔进行喷淋处理后，烟气中的水溶性木质颗粒和吸收带入循环水，同时，焦油、挥发性油和一些表面含焦油的物质与颗粒物都被分离出来。在烟道预冷却的喷淋水中的大颗粒粉尘先进入全自动滚筛，通过物理过滤的方式对水中较大的杂质进行分离，刮出的浓渣和油脂落到浓渣箱，并通过泵抽取到叠螺机挤压成干渣（含水率在75%以下）落到干渣箱，直接送到锅炉回烧。

After being preliminarily dust separated, the flue gas will goes through a gas distributor and led into to an aggregate of scrubber and WESP, by sprinkling treatment of the scrubber that located in the lower position of this aggregate, the water soluble wood particle will be absorbed and carried away by circulating water, at the same time, the tar, volatile oil and some other tar containing substances and particles in the flue gas will be separated. The sprinkling water will be fed into the automatic rotation screen, and the coarse particles it carries will be filtered and separated, the separated thick dregs and oil will be discharged into a thick dreg tank. The dregs will be pumped to an MSD press for dewatering (moisture content <75%) and the dewatered cakes will be kept in a dry dreg tank, and finally sent to boiler for burning.

经过喷淋除尘的烟气进入上部湿电除尘区域，气体从下至上通过静电场，剩余部分的颗粒物，气溶胶及烃类都会被高压电场分离并吸附在阳极板上，通过湿电除尘精处理后的清洁气体进入烟囱排入大气

The gas that has been treated by water sprinkling and scrubber will enter the WESP area located in the upper position of the aggregate. The gas flows from bottom to up through the electrostatic field, the remaining solids, aerosols and condensed hydrocarbons are separated by the high-tension electric field and absorbed



onto anode plate. The cleaned waste gas leaves the precipitation area and reaches the stack.

湿电装置上部的喷淋管路将阳极板上的颗粒物冲洗到除尘器底部，和喷淋塔的水一起进入到初级水箱中。

The sprinkling pipes located on top of the WESP will flush away the particles that absorbed on the anode plate and flows to the bottom, and enters a preliminary water collecting tank.

除尘废水经过初级水箱布水器进入板框压滤机进行除渣处理，板框压滤机挤压出来的干渣（含水率在65%以下）落到干渣箱，直接送到锅炉回烧。

The waste water will go through a water distributor of the preliminary water tank and to be dewatered by a frame type press filter (moisture content < 65%) and kept in a dry cake tank, and directly send to the boiler for burning.

为了减少湿静电阳极板表面附着物的沉积，提高湿静电的处理效果，设定点喷淋系统定时对极板板面进行冲洗，冲洗时间和冲洗的频率间隔可根据生产线运行的实际工况在上位机上进行调整。水箱为循环水泵提供循环水源，当干燥机启动时，水箱必须保持有水状态。正常运行时系统需要补水，干净的水通过液位传感器控制自动补充到洗涤喷淋回用水箱。

To reduce deposits at the precipitation surfaces of WESP's anode plates, and enhance the treatment efficiency, a system of nozzles injects flushing water to the electrode plates' surface for a certain long time in specified intervals. The flushing time and intervals can be adjusted at the computer according to PB line's actual operation status. A water tank supplies recycling water for the recycling water pump, when start up the PB line dryer, make sure there is water in the water tank. Regarding the makeup water, the fresh and clean water will be controlled by a level sensor that automatically fed into a recycling water tank for sprinkling and scrubber.

为了操作方便，电气控制柜均就地安装在湿静电装置的底部，高压整流器安装在湿静电顶部。

#### **安全运行：**

For convenient operation, the electrical control cabinets are located in the bottom of WESP system, high voltage rectifier is located at the top of WESP.

针对生产线干燥尾气有存在火星的可能性，增加了一套紧急消防喷淋装置，保障本系统的安全，并可通过手动模式用应急水源对整个系统进行冲洗。

In view of the possibility of fire sparks in the dryer flue gas, an emergency firefighting sprinkling system is recommended, which is also can be manually operated to flush cleaning the whole system.

当系统关闭后，烟气管道上的电动风阀（位于烟道入口处）会自动关闭，烟道冷却喷淋泵会处于持续运行状态，直到烟道内温度和循环水温度低于安全设定值位置。

After the system shut down, the electric air damper in the crude gas duct (located at the gas duct inlet) will be closed automatically, but the sprinkling pump for gas duct cooling will be keep on running until the temperature inside the duct and circulating water temperature are lower than the designed safe values.

如果系统已经完全关闭但处在备用模式，PLC 系统仍然保持运行状态并通过监控系统的温度来自动判断选择系统的启停。

Even the system is completely shut down but it is still in standby mode, the PLC will remain the operation status, monitors the system's temperature, and select to start or stop the system.

系统引入一路用电源（来自客户的应急柴油发电机），在突然停电的情况下为烟道冷却喷淋泵水泵提供应急电源，保证装置最低限度的安全运行。

An emergency power supply (diesel power generator) is required for sprinkling water pump for gas duct cooling purpose, for the system's safe operation.

## 2. 技术参数

### 2. Technical data

#### 2.1 干燥尾气处理装置设计依据

##### 2.1 Dryer gas treatment system design data

干燥机风机（2台）	Am <sup>3</sup> /h	<u>220,000</u>
Dryer fan (2 units)		
干燥出口温度	°C	<u>≤145</u>
Temperature at dryer fan outlet		
干燥出口粉尘含量	mg/Nm <sup>3</sup> dry	<u>≤350</u>
Dust content at dryer fan outlet		
甲醛含量	mg/Nm <sup>3</sup> dry	<u>35</u>
Formaldehyde content		

## 2.2 排放保证值

### 2.2 Guarantee data

粉尘含量	mg/Nm <sup>3</sup> dry	<u>&lt;15.0</u>
Dust content		
甲醛含量	mg/Nm <sup>3</sup> dry	<u>&lt;5.0</u>
Formaldehyde content		
VOC 含量	mg/Nm <sup>3</sup> dry	<u>&lt;120.0</u>
VOC content		
蓝烟去除效率	%	<u>&gt;95</u>
Blue haze eliminating		

## 2.3 运行参数及消耗量

### 2.3 Operation and consumption data

除尘器压损	Pa	<u>≤ 250</u>
WESP pressure loss		
管道压损	Pa	<u>≤150</u>
Piping pressure loss		
总压损	Pa	<u>≤400</u>
Total pressure loss		
压缩空气	MPa	<u>0.6</u>
Compressed air		
压缩空气消耗量	m <sup>3</sup> /h	<u>20</u>
Compressed air consumption		
药剂消耗		
Chemicals consumption		
絮凝剂	kg/h	<u>根据运行工况</u>
Flocculant		depends on operation status
碱	kg/h	<u>根据运行工况</u>

Alkali		depends on operation status
总污泥产生量	kg/d	<u>1800</u>
Total sludge volume		
循环水置换水量	t/d	<u>30-50</u>
Total water displacing volume		
补充水量	t/d	<u>50</u>
Makeup water volume		
补充水水质指标		
Makeup water quality		
氯离子	mg/l	<u>&lt;50</u>
Chloride		
硬度 cao	mg/l	<u>&lt;60</u>
Hardness		
循环水量	t/h	<u>500</u>
Recycling water volume		
噪音	dB (A)	<u>&lt;80</u>
Noise		
装机功率	KW	<u>520</u>
Total installed power		
实际运行功率	KW	<u>320</u>
Operating power		
应急电源 (客户提供)	KW	<u>75</u>
Emergency power supply (Buyer supply)		
UPS 电源	KW	<u>2</u>
UPS power		

## 2.4 主要部件工艺参数

### 2.4 Main unit technical data

#### 喷淋湿电一体化湿静电除尘器

**Wet Absorber/Wet Electrostatic Precipitator**

壳体采用 304 不锈钢，壁板厚度≥4mm

Casing is made of SS304, wall thickness≥4mm

断面尺寸 mm 8000\*7000

Section size

高度 mm >45,000

Height

高压变频电源 pcs 1

HV variable frequency power supply

高压变频电源输出 A/KV 1.2A/72KV

HV variable frequency power output

有效功率 kW 120

Active power

收尘极面积 m<sup>2</sup> 1,250

Precipitation surface

收尘极板厚度 mm 1.5

Plate electrode thickness

收尘极板材质 304

Plate electrode material

阴极线材质 2205 双相不锈钢

Wire electrode Duplex stainless steel 2205

阴极框架材质 2205 双相不锈钢

Wire electrode material Duplex stainless steel 2205

阴极紧固件材质 2205 双相不锈钢

Wire electrode fasteners' material Duplex stainless steel 2205

**初级水箱**

**Preliminary water collecting tank**

壳体采用 304 不锈钢，厚度 4-6mm

Made of SS304, wall thickness 4-6mm

数量	pcs	<u>1</u>
Quantity		
容积	m <sup>3</sup>	<u>100</u>
Volume		
使用容积	m <sup>3</sup>	<u>80</u>
Working volume		
容积裕量	m <sup>3</sup>	<u>20</u>
Volume allowance		

### 洗涤喷淋回用水箱

#### **Recycling water tank for scrubber sprinkling**

壳体采用 304 不锈钢，厚度 4-6mm

Made of SS304, wall thickness 4-6mm

容积	m <sup>3</sup>	<u>140</u>
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Volume

使用容积	m <sup>3</sup>	<u>120</u>
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Working volume

容积裕量	m <sup>3</sup>	<u>20</u>
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Volume allowance

### 清水箱

#### **Fresh water tank**

设置于回用水箱内，壳体采用 304 不锈钢，厚度 4mm

It is integrated inside the recycling water tank, made of SS304, wall thickness 4mm

容积	m <sup>3</sup>	<u>20</u>
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Volume

使用容积	m <sup>3</sup>	<u>18</u>
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Working volume

容积裕量	m <sup>3</sup>	<u>2</u>
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Volume allowance

### 自清洗转鼓过滤器

**Rotation screen with automatic self-cleaning**

过滤精度	um	_____	500
Filter fineness			
数量	pcs.	_____	1
Quantity			
功率	kW	_____	1.5
Power			

**板框压滤机（带自清洗）**

**Frame type press filter (with self-cleaning)**

过滤面积	m <sup>2</sup>	_____	200
Filtering area			
数量	pcs.	_____	1
Quantity			
处理能力	绝干泥量 kg/d	_____	2000
Capacity	Bone dry sludge volume		
功率	kW	_____	15
Power			

**叠螺机（单通道）**

**MDS press (Single channel)**

处理能力	绝干泥量 kg/h	_____	50
Capacity	Bone dry sludge volume		
数量	pcs.	_____	1
Quantity			
功率	kW	_____	1.5
Power			

**烟道冷却喷淋泵**

**Sprinkling pump for crude gas duct cooling**

数量	pcs.	_____	1
Quantity			

功率	kW	<u>90</u>
Power		

洗涤塔喷淋泵

**Sprinkling pumper for scrubber**

数量	pcs.	<u>2 (与烟道泵备用)</u>
Quantity		2 (also as standby pumps for gas duct)
功率	kW	<u>90</u>
Power		

湿电冲洗泵

**Flushing pump for WESP**

数量	pcs.	<u>2 (一用一备)</u>
Quantity		2 (one operation one standby)
功率	kW	<u>75</u>
Power		

板框进料泵

**Sludge feed pump for frame press filter**

数量	pcs.	<u>1</u>
Quantity		
功率	kW	<u>37</u>
Power		

絮凝剂加药系统

**Flocculant dosing system**

数量	pcs.	<u>1 套</u>
Quantity		1 set

液碱添加系统

**Liquid alkali dosing system**

数量	pcs.	<u>PH 检测自动控制 1</u>
Quantity		PH automatic control 1 set

液位控制系统



**Level control system**

数量 pcs. \_\_\_\_\_ 2

Quantity

**3. 供货范围和技术特征**

**3. Supply scope and technical specifications**

3.1 烟道喷淋（冷却）管道系统，包括：

3.1 Crude gas sprinkling (cooling) ductwork, includes,

湿电装置入口连接法兰

Connection flange at inlet of WESP

预喷淋系统的管路、管道配件及喷嘴

Crude gas ductwork, accessories and nozzles of preliminary sprinkling system

**选择项：连接烟道及配套的钢支架**

**Optional: The steel structure frames for crude gas duct**

3.2 喷淋湿电一体化装置本体，包括：

3.2 Scrubber and WESP aggregate, includes,

304材质的洗涤塔壳体，工厂预制，现场组焊

SS304 scrubber casing, prefabricated in workshop, onsite assembly

304材质的湿电壳体，工厂预制，现场组焊

SS304 WESP casing, prefabricated in workshop, onsite assembly

所有内部所需的支撑、梁、悬架

All required supporting sections, girders, and suspensions

湿静电内部阳极板及阴极框架

Plate electrodes and wire electrodes inside WESP

阴阳极系统悬挂装置

Suspensions for electrodes

绝缘子箱

Insulator box

绝缘子箱冲洗系统

Flushing air sockets at insulator boxes

洗涤塔区域的喷淋系统

Sprinkling system for scrubber

湿电区域的喷淋洗涤系统

Sprinkling system for WESP

3.3 阴极高压放电系统，包括：

3.3 Wire electrode HV discharge system, include,

高压整流器总成

HV rectifier aggregate

接地装置

Grounding device

热风吹扫系统

Hot air purging system

陶瓷绝缘子

Ceramic insulator

高压控制系统

HV control system

3.4 机械连锁系统（选择项），包括：

3.4 Mechanical interlocking system (Optional), includes,

高压控制箱的一套附件

HV control cabinets, one set

1 个中央连锁单元

One central interlock unit

3.5 喷淋及循环水处理系统，包括

3.5 Sprinkling and recycling water treatment system, includes,

2套不锈钢水箱，304材质，工厂预制，现场组焊，包括：

2 sets of stainless steel water tank, SS304 material, workshop prefabricated, onsite assembly welding, includes,

初级水箱：用于装除尘污水及气浮机布水用

Preliminary water collecting tank: for storage of waste water and air flotation water distribution.

洗涤喷淋回用水箱：用于烟道、洗涤塔喷淋和湿电冲洗

Recycling water tank: for water sprinkling inside gas duct and scrubber, and WESP flushing

配套的出口法兰，检修人孔，检修梯，检测口

Required outlet flanges, inspection manholes, ladders and stairs, inspection ports.

2台湿电冲洗泵，一用一备

2 sets of WESP flushing pumps, one operation one standby

3台洗涤塔喷淋泵和烟道冷却喷淋泵，二用一备

3 sets of sprinkling pumps for scrubber and ductwork cooling, two operation one standby

1套板框压滤机

1 set of frame type press filter

1台板框进料泵

1 set of sludge feed pump for frame press filter

1台叠螺机

1 set of MDS press

1台浓渣输送泵，从浓渣箱输送到叠螺机

1 set of thick dreg transfer pump, from thick dreg tank to MDS

1套絮凝剂加药系统

1 set of flocculant dosing system

1套PH值在线监测+碱液自动添加系统

1 set of PH value online monitor + liquid alkali automatic dosing system

2套液位监测系统

2 sets of level monitoring system

1套自动补水系统

1 set of automatic water make up system

不锈钢管道及相关配件

Stainless steel piping and pipe fittings

电动阀

Electric control valve

压力传感器

Pressure transmitter

温度传感器

Temperature transmitter

流量传感器

Flow sensor

应急水补给

Emergency water make up

钢结构支撑

Steel structure supports

3.6 净化后尾气排放烟囱，包括：

3.6 Clean gas emission stack, includes,

不锈钢 304材质，直径DN3000mm的独立式排气筒

Free standing, SS304 material, diameter DN3000mm

烟囱长度20米，顶部标高45米（暂定）

Stack length 20 meters, top level 45 meters (depends on local regulations)

烟囱支撑钢架、测试平台，包括平台栏杆，楼梯踏步等

Stack supporting, platform, includes handrails and stairs

测试口

Inspection ports

3.7 电气（接到本装置主配电柜的电缆及配套桥架由客户负责），包括：

3.7 Electrical (The cables and cable trays run to the system's main power panel are in Buyer's scope), includes,

主配电柜

Main power panel

高压整流柜

HV rectifier panel

低压控制柜

LV control panel

变频柜

Frequency control panel

PLC柜

PLC panel

可视化上位机系统

Visualization master computer system

装置区域内镀锌电缆桥架及管道

Galvanized cable tray and conduits

装置配套的低压电缆（动力+控制）

LV power cable and control cable

现场控制箱

Local control boxes

连接件

Connection accessories and parts

### 3.8 辅助设备，包括：

#### 3.8 Auxiliary devices and parts, include,

用于限位开关，模拟信号，控制开关的接线盒

Terminal boxes for limit switches, analogue signals, control switches

主要部件和管道的标签

Labels and tags for main components and piping

所有电子元器件的标签

Labels and tags for all electrical components

所有电机的自动控制开关

Automatic control switches for all motors

气浮机、叠螺机的维修开关

Maintenance switches for air floatation and MDS press

设备间通风风扇

Air ventilators for equipment rooms

设备间照明灯具及配套管线，开关

Lighting fixtures, power distribution and switches for equipment rooms

### 3.9 钢结构件，包括

#### 3.9 Steel structures, include,

钢构支撑、平台、楼梯、踏步、栏杆及配套的紧固件

Steel structure supports, platform, stair, ladder, handrail, and fasteners.

### 3.10 防腐

#### 3.10 Corrosion prevention

碳钢部分：喷砂除锈达到Sa2.5级，两道环氧富锌底漆、两道环氧面漆（颜色客户指定）。楼梯踏步采用镀锌钢格板，钢平台采用镀锌钢格板或镀锌钢板网

Carbon steel parts: sand blasting up to grade Sa2.5, 2 coats of epoxy zinc-rich primer, 2 coats of epoxy topcoat (color decided by buyer). Stair steps are galvanized gratings, and galvanized grating or galvanized wire mesh are used for platform.

不锈钢部分：外壁焊缝酸洗钝化，整体喷涂不锈钢油漆，内壁焊缝酸洗钝化

Stainless steel parts: for outer surface, all welds to be passivated, and then stainless-steel paints are applied; for inner surface, all welds to be passivated, but no painting.

### 3.11 保温

#### 3.11 Heat insulation

室外的喷淋管、补水管、消防应急喷淋管采用岩棉保温层，不锈钢或铝材质保护壳

Rockwool insulation is applied for outdoor sprinkling pipe, makeup water pipe, firefighting emergency sprinkling pipe, insulation cladding uses stainless or aluminum sheets.

## 4. 设计与供货范围划分

### 4. Design and supply scope

#### 4.1 设计范围

##### 4.1 Design scope

项目描述 Item description	客户范围 Buyer	供方范围 Supplier	备注 Remarks
1、土建设计 1. Civil work design			
1) 桩基及地基处理设计 Pile foundation and foundation design	√		供方提供荷载设计院设计复核 Supplier provides loading data to Buyer
2) 设备基础设计 Equipment foundation design	√		供方提供荷载，设计院设计复核 Supplier provides loading data to Buyer
3) 建（构）筑物设计 Building & architectural design	√		供方提供设计参数，设计院设计复核 Supplier provides design data to Buyer
4) 其他土建相关设计 Other civil design	√		供方提供设计参数，设计院设计复核 Supplier provides design data to Buyer
2、机械设计 2. Mechanical design			
1) 管道喷淋降温除尘系统 Crude gas duct sprinkling and cooling dedust system		√	
2) 洗涤塔喷淋除尘系统 Scrubber sprinkling dedust system		√	
3) 湿法静电除尘系统 WEST dedust system		√	
4) 水循环处理系统 Recycling water treatment system		√	
6) 压缩空气配套系统 Compressed air system		√	供方提出用气量需求，气源由业主提供 Supplier provides volume data for

项目描述 Item description	客户范围 Buyer	供方范围 Supplier	备注 Remarks
			compressed air; Buyer supply the compressed air.
7) 连接烟道及烟囱 Gas ductwork and stack		√	
8) 钢结构及防腐油漆 Steel structure and anticorrosive paint		√	
9) 密闭循环水箱 Recycling water tank		√	
10) 系统内管路、平台楼梯 Piping, platforms and stairs within the system		√	
3、电气及热控设计 3. Electrical and heat control design			
1) 电气设计 Electrical design		√	
2) 热控及仪表设计 Heat control and instrument design		√	
3) 人机屏界面控制系统 HMI control system		√	
4) 防雷接地系统设计 Lightning protection and grounding design		√	



## 4.2 供货范围

### 4.2 Supply scope

项目描述 Item description	客户范围 Buyer	供方范围 Supplier	备注 Remarks
<b>1 、机械设备及辅助工艺系统</b>			
<b>1. Mechanical equipment and auxiliary process systems</b>			
1) 管道喷淋降温除尘系统 Crude gas duct sprinkling and cooling dedust system	√	√	供方提供喷淋管道、喷头、电动风门及配套的控制系统，连接接烟道和配套的钢架为选择项，可由客户提供 Supplier provides sprinkling duct section, nozzles, electric air damper and supporting control systems; the gas duct for connecting dryer fan to the system and supporting steel structures are optional supply items, or to be supplied by Buyer.
2) 湿式喷淋除尘系统 Scrubber sprinkling dedust system		√	两级湿电 2-stage WESP
3) 湿法静电除尘系统 WESP dedust system		√	两级湿电 2-stage WESP
4) 水循环处理系统（含密闭水箱） Water recycling treatment system (incl. recycling water tank)		√	客户提供自来水源到指定位置 Buyer provide fresh water supply to a designated location.
5) 压缩空气配套系统 Compressed air system		√	客户提供气源到指定位置 Buyer provide compressed air supply to a designated location.
6) 烟囱		√	

项目描述 Item description	客户范围 Buyer	供方范围 Supplier	备注 Remarks
Stack			
7) 钢结构及油漆 Steel structure and painting		√	
8) 自动加药系统 (絮凝剂+热碱水) Automatic chemical dosing system (Flocculant + hot alkaline liquid)		√	
9) 系统内管路、支撑、保温、油漆 Piping, supports, heat insulation and painting within this system		√	
<b>2、电气系统</b>			
<b>2. Electrical system</b>			
1) 进线电缆及电缆接头 Incoming line cable and connector	√		客户提供进线电缆到主配电柜上端头 Buyer connect power incoming line to the terminals in main power distribution panel
2) 低压开关柜 Low Voltage switchgear		√	
3) 控制系统 Control system		√	
4) 系统内的动力和控制电缆及其敷设用保护管、桥架、就地控制柜 Power cable and control cable, conduits, tray and duct, and local control cabinets within the system		√	
5) 防雷接地	√		客户负责接地体，并提供 4 个引出

项目描述 Item description	客户范围 Buyer	供方范围 Supplier	备注 Remarks
Lightning and grounding			点 Buyer responsible for grounding electrodes, and should provide 4 grounding points.
<b>3、仪表及控制系统</b>			
<b>3. Instrument and control system</b>			
1) 控制系统 Control system		√	
2) 监测仪表 Monitoring instruments		√	
3) 控制盘、箱、柜、接线盒 Control panel, box, cabinet, and junction box.		√	
4) 电磁阀、电动阀门 Solenoid valve, electric valve		√	
5) 电缆、电缆导管、仪表阀门等 Cable, cable conduit, instrument, valve and etc.		√	
<b>4、基础与上部建筑</b>			
<b>4. Foundation and building</b>			
1) 承台以下桩基及地基处理 Pile foundation and base treatment below the pile cap.	√		
2) 设备基础、排水沟、地面硬化 Equipment foundation, drainage ditch, concrete pavement.	√		

项目描述 Item description	客户范围 Buyer	供方范围 Supplier	备注 Remarks
3) 基础地脚螺栓、预埋件 Foundation bolts, pre-embedment	√		锚固于一次浇筑层内预埋件 Anchor pieces to casted in concrete
4) 混凝土平台(放置滚筛+板框压滤机) Concrete platform (for rotation screen and frame type press filter)	√		高度约 4.8 米 Top level 4.8 meters approx.
5) 设备间(湿电钢架底部)墙体 Equipment room wall panels (located in the bottom of WESP)	√		包括复合彩钢板围护的墙体和门窗 Incl. color sheet sandwich panel for walls, doors and windows.

## 5. 客户责任

### 5. Buyer's work scope

负责土建施工，包括基础、地面、道路、水沟等

Civil work construction, incl. foundation, ground, road, drainage ditches and etc;

负责提供连接烟道管(含配套的电动风阀)至湿电本体入口法兰处(选择项，双方协商)

Gas ductwork to the connection flange at the inlet of this treatment system, incl. electric air valve. (This item can be optional, can be discussed);

负责设备间(湿电下部循环水和电控区域)四周墙体、门窗

Equipment room's wall panels, doors and windows, for recycling water in the lower section of WESP and electrical control area;

在装置区域内提供接地，接地电阻 $< 2 \Omega$

Provide grounding connection points, grounding resistance  $< 2 \Omega$ ;

到系统主配电柜上端的电缆，桥架及所需配件

Cables, cable tray and duct, and necessary fittings for running to main power panel of the treatment system;

到系统指定位置的补充水管道，补充水可以是自来水、厂区中水或雨水（经雨水收集池沉淀的）

Fresh water make up pipeline to designated location, the water can be municipal tap water, reclaimed water or rainwater;

到系统指定位置的消防管道

Firefighting pipeline to designated location;

到系统指定地点的压缩空气管道

Compressed air pipeline to designated location;

提供电控室的通风系统或空调系统

Air ventilation or air conditioning system for electrical and control room;

提供渣箱

Sludge and dreg tanks;

提供调试和正式运行期间所需的化学药剂

Chemicals for commissioning and operation;

提供网络通信，用于系统的在线支持服务

Internet communication, for system online technical service;

定期检测循环水中的氯离子，及时置换循环在运行前100天要保证氯离子低于650mg/l

Periodically check chloride content in recycling water, chloride content must less than 650mg/l;

定期通过手动模式整个系统进行冲洗，保证湿电上部框架的清洁

Periodically flushing the whole treatment system by manual operation mode, assure WESP's upper frame is clean;

提供现场施工用水电点至供方施工区域

Water supply for construction in work area for Supplier;

提供现场材料堆放区域和设备拼装区域，不小于1000平方

Storage area and assembly work area, not less than 1,000m<sup>2</sup>;

保证现场具备汽车吊作业的空间

Enough space for lifting works.

## 6. 设备材料首选供应商品牌

### 6. Recommended brand names for equipment and materials

## 6.1 机械部分

### 6.1 Mechanical part

阴阳极系统	气好克
Plate and wire electrodes	Fujian 7mg
泵	KSB/格兰富/ITT
Pump	KSB/Grundfos/ITT
泵电机	西门子/ABB
Motor for pump	Siemens/ABB
板框压滤机	上海大张/山东景津
Frame type press filter	Shanghai Dazhang/Shangdong jingjing
叠螺机	康泰/三辉/琴鑫
MDS press	Kangtai/Sanhui/Qinxing
电动阀	天津塘沽/埃美柯/凯斯特
Electric valve	Tianjin Tanggu/Amico/KST
阀门	天津塘沽/埃美柯/凯斯特
Valve	Tianjin Tanggu/Amico/KST
电磁流量计	美控/米科/和利时
electromagnetic flowmeter	Meacon/Meike/Helishi
高频变压器	气好克/STOCK/阿尔斯通
High frequency transformer	Fujian 7mg/STOCK/Alstom

## 6.2 电气部件

### 6.2 Electrical parts

PLC 系统	西门子 S7-1200或1500
PLC system	Siemens S7-1200 or 1500
变频器	西门子/施耐德/ABB
Frequency inverter	Siemens/Schneider/ABB
电控低压元器件	西门子/施耐德/穆勒
LV electrical component	Siemens/Schneider/Moller

开关电源	西门子/施耐德/穆勒
Switch power supply	Siemens/Schneider/Moller
气动元件	Festo
Pneumatic component	Festo

## 7.时间进度计划表

### 7. Time schedule

总工期：合同签订后27周，装置具备投入试运行条件。具体如下：

Total project duration: 27 weeks after contract signed, the system is ready for test run, details as below,

签订合同	合同生效后项目开始执行
Sign contract	Project starts after contract come into effective
初步总图	合同生效后 2周
Preliminary general layout	2 weeks after contract effected
基础提资图	合同生效后 2周
Foundation drawing	2 weeks after contract effected
总 图	合同生效后 4周
General drawing	4 weeks after contract effected
主设备制造完成	合同生效后10周
Main equipment manufacture completed	10 weeks after contract effected
运输清关	合同生效后16周
Customs procedures & shipping	16 weeks after contract effected
现场开始安装	合同生效后17周
Onsite installation	17 weeks after contract effected
机械完工时间	合同生效后25周
Mechanical completion	25 weeks after contract effected
调试	合同生效后26周
Commissioning	26 weeks after contract effected

<b>试运行</b>	<b><u>合同生效后27周</u></b>
<b>Test run</b>	<b><u>27 weeks after contract effected</u></b>
验收	投入运行后 4周
Acceptance	4 weeks after the system put into operation

所有进度计划安排均基于双方合同约定商务条款的基础上执行，前提条件是客户应按合同要求及时完成相关的工作。

All scheduled dates are based on a technically and commercially clarified order and on condition that all works of other contractors will be carried out in time.

## 8. 验收

### 8. Acceptance

验收检测指标为：湿电出口颗粒物浓度 $<10\text{mg}/\text{m}^3$ ，甲醛浓度 $<5\text{mg}/\text{m}^3$ 。验收以第三方检测为准。验收以书面形式完成，验收时间不超过装置投入运行后1个月，如超过1个月客户尚未组织验收，则自动视为验收合格。

Acceptance criteria: values measured at the system's out, particle content  $< 10\text{mg}/\text{m}^3$ , formaldehyde content  $< 5\text{mg}/\text{m}^3$ . The third-party test results shall be taken for accreditation. The acceptance shall be recorded in writing. The acceptance shall be executed within one month time after the system has been put into operation, in case of over one month time and the acceptance can't be arranged, then it shall be deemed as the acceptance has been made and accepted.

客户不能因为气好克公司需要对装置运行中存在的部分小瑕疵进行整改（以不影响正常运行为判断标准）而拒绝验收和交货。

Acceptance may not be refused by the Buyer because of minor defects and required remedying by Fujian 7mg. The defects shall be recorded and remedied within an acceptable period.



## 9. 风险转移

### 9. Risk transfer

本装置交付使用后风险自动转移到客户方，因装置自身原因造成的风险，在保修期内由气好克公司承担。

Transfer of risk and title shall occur upon delivery to the Buyer; any risk that caused due to the system's own reason within the warranty guarantee period, Fujian 7mg is responsible for.

## 10. 操作培训

### 10. Training for operation

气好克公司在设备正式投入使用前将会为客户培训不少于2两名的操作人员，培训记录将会以书面的形式提交给客户。

Fujian 7mg will give training to Buyer's operators (not less than 2 persons) before the system put into operation, the training records will be in writing and submitted to Buyer.

## 11. 质量保证

### 11. Warranty

客户操作人员在按气好克公司的培训要求正确操作、定期保养和维护的条件下，我们承诺保证值指标在技术文件的保证范围之内。质保期为第一次验收后 12 个月。

With the preconditions of Buyer's operators are doing operation, maintenance and repairing that follow Supplier's training and instructions, we guarantee the system performance up to designed and specified targets. Warranty expires 12months after the first acceptance.

在 12 个月内所发生的一切设备故障（非操作原因）均由气好克公司免费无偿解决。

Any malfunctions in this system not resulted from maloperation, Supplier is responsible to fix on his own costs.

对于气好克公司的供货范围内如运转设备、仪器仪表等各单体设备的保修期限，在所承诺的保修期内发生的故障将无偿维修。

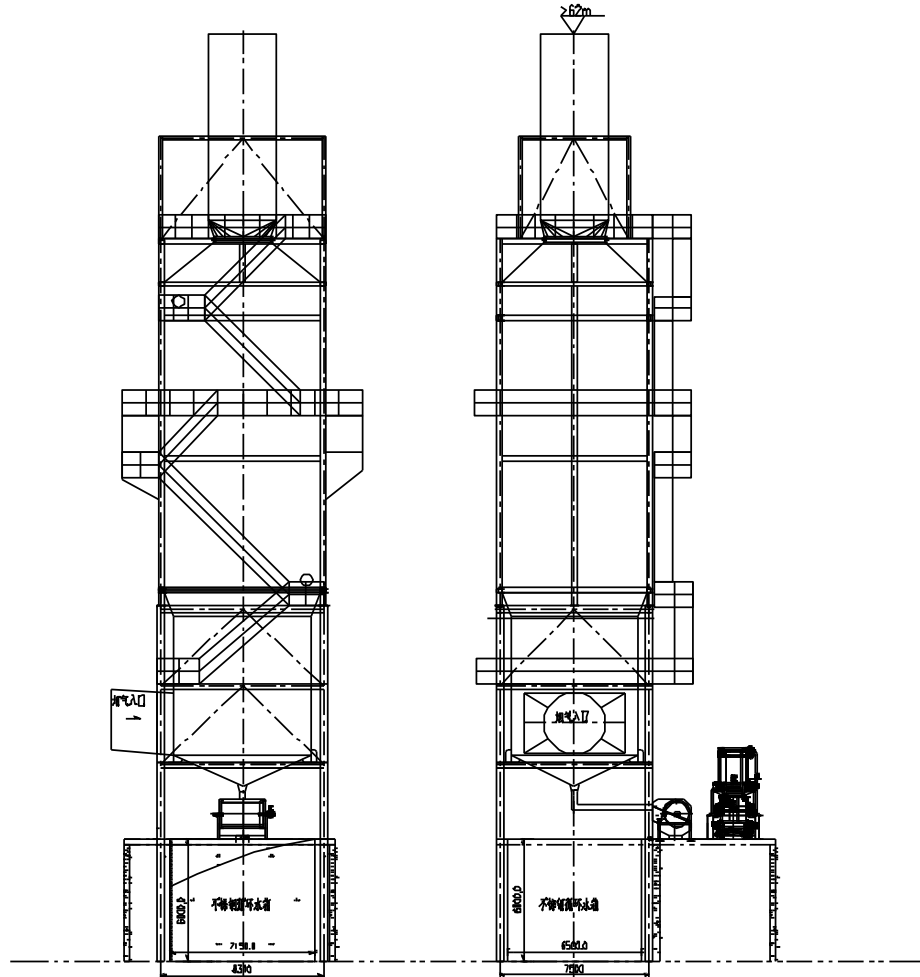
For the malfunctions happened within the warranty time on the rotating machines, instrument and sensors,

and other equipment that supplied by the supplier, the supplier is responsible to fix on his own costs.

客户发现质量问题或设备出现故障后，气好克公司在接到通知后半小时内给予电话答复，2小时内作出处理意见。如需现场解决，保证24小时内派专业维修人员到达现场，先抢修恢复生产，保证问题不解决，技术人员不撤离

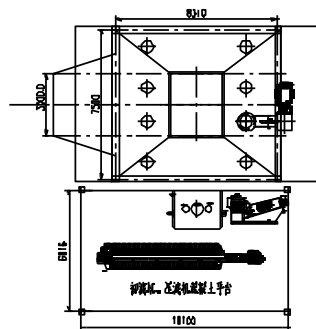
Upon receiving Buyer's notification of quality problem or system malfunction, Supplier shall give reply within 2 hours, and give instructions within 2 hours. In case the problem has to be fixed on site, Supplier shall send professional personnel to site for fixing the problem.

## 12.方案图 Schematic design



The system equipment weight 260t, dust accumulated inside about 30t.

Recycle water tank is made of stainless steel, dimension 7.15x6.5x6m, total weight incl. tank body, contained water and sediment, is 330t;



1. 本册图相对标高±0.00同主厂房±0.00, 上部结构安全等级二级
2. 除尘设备重量为260吨, 包括设备净重, 内部粉尘堆积量连接烟道重约30吨;
3. 循环水水箱使用不锈钢密闭水箱, 尺寸为7.15米\*6.5米\*6米, 水箱本体及内部循环水、沉渣等计算重量330吨, 强电基础设计时应当考虑该部分重量
4. 桩型及桩长. 抗震设防类别具体由设计院根据地质勘探报告设计为准.
5. 电除尘器接地系统要求接地电阻小于 $2\Omega$ , 要求桩基施工时同步考虑;
6. 设计混凝土平台放置桩基压滤机等设备, 重约25吨;
7. 设计院图纸设计完成建议由承包方再次进行确认;

Piling and pile length, seismic design shall be approved locally;

Concrete platform for frame type press filter, about 25t.

审核(小)设计/制图/日期		福建气好克环保科技有限公司	
姓名	日期	姓名	日期
签字	日期	签字	日期
审核	日期	审核	日期
审批	日期	审批	日期

### 13. 工程业绩及案例

#### 13. Reference job list

序号 No.	项目名称 Project names	项目内容 Work description	运行时间 Time
1	丰林木业集团南宁工厂湿电改造项目 Fenglin Wood Industry Group Co., Ltd Nanning Plant WESP Upgrading Project.	40 万 m <sup>3</sup> /a PB 生产线湿电优化改造项目（更换湿电及喷淋系统+污水系统改造）两级湿电 Annual capacity 400,000m <sup>3</sup> PB line WESP upgrading project (replace WESP and scrubber + waste water system upgrading), 2-stage WESP.	2020 年 5 月 Work accepted in May of 2020
2	湖北华盛新板业有限公司 OSB 生产线干燥尾气环保治理 EPC 总包工程 Hubei Xinquasheng Wood Panel Industry Co., Ltd. OSB Line Dryer Gas Cleaning treatment EPC project.	40 万 m <sup>3</sup> /a OSB 生产线干燥尾气湿式电除尘器环保项目（两级湿电） Annual capacity 400,000m <sup>3</sup> OSB line dryer gas WESP (2-stage).	在建 Under construction
3	福人木业（莆田）有限公司干燥尾气环保改造 EPC 总包工程 Furen Wood Industry (Putian) Co., Ltd. Dryer Gas Treatment Upgrading EPC project.	25 万 m <sup>3</sup> /a MDF 生产线干燥尾气湿式电除尘器改造（配套甲醛预处理） Annual capacity 250,000m <sup>3</sup> MDF line dryer gas WESP upgrading (incl. pre-treatment for formaldehyde)	2019 年 9 月 已验收 Work accepted in Sept of 2019
4	寿光市鲁丽木业股份有限公司湿式电除尘器改造项目 Shouguang Luli Wood Industry Joint Stock Co., Ltd. WESP upgrading project.	30 万 m <sup>3</sup> /a OSB 生产线干燥尾气湿式电除尘器改造（两级湿电） Annual capacity 300,000m <sup>3</sup> OSB line dryer gas WESP (2-stage).	2018 年 11 月 已验收 Work accepted in Nov of 2018
5	山东新港企业集团有限公司干燥尾气环保治理 EPC 工程总包 Shandong Xingang Group Co., Ltd. Dryer Gas Treatment EPC project.	30 万 m <sup>3</sup> /a 刨花板生产线干燥尾气环保治理 EPC 总承包 Annual capacity 300,000m <sup>3</sup> PB line dryer gas environmental protection	2019 年 3 月 已验收 Work accepted in March of 2019

		EPC works.	
6	台山市威利邦木业有限公司干燥尾气环保治理 EPC 工程总包合同 Taishan Welibang Wood Industry Co., Ltd. Dryer Gas Treatment EPC project	22 万 m <sup>3</sup> /a 刨花板生产线干燥尾气环保治理 EPC 总承包 Annual capacity 220,000m <sup>3</sup> PB line dryer gas environmental protection EPC works.	2018 年 10 月 已验收 Work accepted in Oct of 2018
7	广西高峰桂山人造板有限公司干燥尾气治理 EPC 工程总包 Guangxi Gaofeng Guishan Wood Based Panel Co., Ltd. Dryer Gas Treatment EPC Project.	35 万 m <sup>3</sup> /a 刨花板生产线干燥尾气环保治理 EPC 总承包 Annual capacity 350,000m <sup>3</sup> PB line dryer gas environmental protection EPC works.	2018 年 8 月 已验收 Work accepted in Aug of 2018
8	广西都庞岭木业有限公司干燥尾气治理 EPC 工程总包 Guangxi Dupangling Wood Industry Co., Ltd Dryer Gas Treatment EPC Project.	20 万 m <sup>3</sup> /a 刨花板生产线干燥尾气环保治理 EPC 总承包 Annual capacity 200,000m <sup>3</sup> PB line dryer gas environmental protection EPC works.	2018 年 8 月 已验收 Work accepted in Aug of 2018
9	福人木业（福州）有限公司干燥尾气处理系统及脱渣净水系统技改项目 Furen Wood Industry (Fuzhou) Co., Ltd. Dryer Gas Treatment and Water Purification Upgrading Project.	22 万 m <sup>3</sup> /a 刨花板生产线干燥尾气环保治理 EPC 总承包 Annual capacity 220,000m <sup>3</sup> PB line dryer gas environmental protection EPC works.	2018 年 5 月 已验收 Work accepted in May of 2018
10	广东始兴县华洲木业有限公司 PB 生产线干燥尾气环保治理 Guangdong Shixing Huazhou Wood Industry Co., Ltd. PB Line Dryer Gas Treatment Project.	22 万 m <sup>3</sup> /a 刨花板生产线干燥尾气环保治理 EPC 总承包 Annual capacity 220,000m <sup>3</sup> PB line dryer gas environmental protection EPC works.	2018 年 4 月 已验收 Work accepted in April of 2018
11	鸿伟木业（仁化）有限公司干燥尾气环保治理	35 万 m <sup>3</sup> /a 刨花板生产线干燥尾气环保治理 EPC 工程总包	2018 年 4 月 已验收

	Hongwei Wood Industry (Renhua) Co., Ltd. Dryer Gas Treatment Project.	Annual capacity 350,000m3 PB line dryer gas environmental protection EPC works.	Work accepted in April of 2018
12	衡水巴迈隆木业有限公司干燥尾气环保治理 Hengshui Boom Long Wood Industry Co., Ltd. Dryer Gas Treatment Project.	22 万 m <sup>3</sup> /a 刨花板生产线干燥尾气环保治理 EPC 总承包 Annual capacity 220,000m3 PB line dryer gas environmental protection EPC works.	2017 年 10 月 已验收 Work accepted in Oct of 2017

**福人集团 25 万 m<sup>3</sup>/a MDF 生产线干燥尾气处理 EPC 总包工程**

**Furen Wood Industry Group Annual Capacity 250,000m3 MDF Line Dryer Gas Treatment EPC project**

**(干燥尾气处理+甲醛预处理)**

**(Dryer gas treatment + Formaldehyde pre-treatment)**





高压开启前效果  
Before system start up



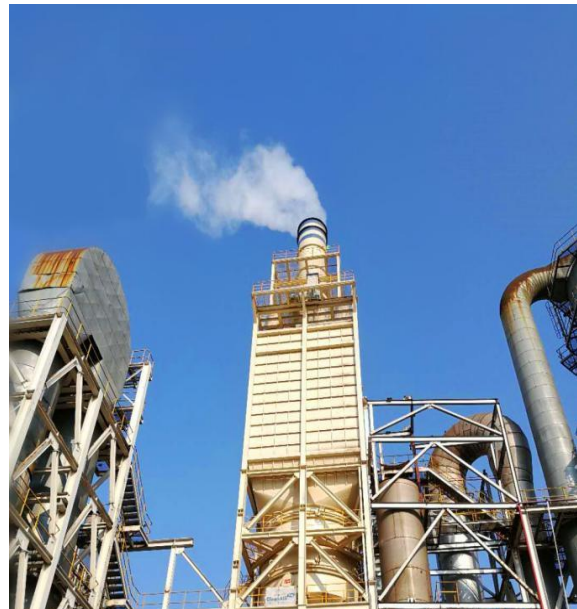
高压开启后效果  
After system start up

福人集团 30 万 m<sup>3</sup>/a PB 生产线

Furen Wood Industry Group Annual Capacity 300,000m<sup>3</sup> PB Line Dryer Gas Treatment EPC project



改造前  
Before upgrading work



改造后  
After upgrading work

我公司克服了旧厂改造空间小、周期短、超净排放压力大等难度节点，在保证客户生产的同时，60 天完成了环保技改，创国内人造板干燥尾气环保改造记录。投入运行后在线监测数据粉尘排放值稳定在 10mg/Nm<sup>3</sup> 以内，配套的水处理系统完善。

Under the difficult situation such as small work space, short time, super clean emission request and etc., and executed the works while the customer continued production, Fujian 7mg completed this upgrading job in 60 days, which is a record breaking of wood-based panel dryer gas treatment technical upgrading projects in China. After put into operation, all technical data collection of dust separation operation is stably controlled, the dust emission value that monitored online is controlled below  $10\text{mg}/\text{Nm}^3$ , and the water treatment is running well.

### 河北巴迈隆 22 万 $\text{m}^3/\text{a}$ PB 生产线

#### Hebei Boom Long Annual Capacity 220,000 $\text{m}^3$ PB Line Dryer Gas Treatment Project



湿电开启前

Before WESP start up

湿电开启后

After WESP start up

在原有洗涤塔的基础上进行技改，包括水处理系统完善配套，40 天完成项目的改造工作，项目投入运营后，经多次第三方测试，粉尘排放值均在  $10\text{mg}/\text{Nm}^3$  以下。在北方环保形势严峻的背景下，有力的保障了业主生产的正常运行。

The upgrading was done to the existing scrubber, incl. water treatment upgrading works. The system was successfully installed and commissioned within 40 days, and put into operation successfully. Under the very severe situation of strict environmental protection control, the successful operation of this system is a strong support to customer's production. It has been several times tested by the third parties, and the results are all below  $10\text{mg}/\text{Nm}^3$ .





广东鸿伟 35 万 m<sup>3</sup>/a PB 生产线  
Guangdong Hongwei 350,000m<sup>3</sup>/a PB Line



广东华洲 25 万 m<sup>3</sup>/a PB 生产线  
Guangdong Huazhou 250,000m<sup>3</sup>/a PB Line



国旭集团都庞岭 22 万 m<sup>3</sup>/a PB 生产线  
Guoxu Group Dupangline 220,000m<sup>3</sup>/a PB Line



山东新港集团 30 万 m<sup>3</sup>/a PB 生产线  
Shandong Xingang 300,000m<sup>3</sup>/a PB Line



威利邦台山 30 万 m<sup>3</sup>/a PB 生产线  
Taishan Weilibang 300,000m<sup>3</sup>/a PB Line



国旭集团高峰桂山 35 万 m<sup>3</sup>/a PB 生产线  
Guoxu Group Gaofeng Guishan 350,000m<sup>3</sup>/a PB Line



鲁丽木业股份有限公司 30 万 m<sup>3</sup>/a OSB 生产线  
Luli Wood Industry Joint Stock Co., Ltd. 300,000M<sup>3</sup>/a OSB Line