江苏省苏豪控股集团有限公司
JIANGSU SOHO HOLDINGS GROUP COMPANY LIMITED

Jiangsu Soho Honry Wuxi Co. Ltd.
In association with

中粮科工 COFCO TECHNOLOGY & INDUSTRY 中粮科工股份有限公司 COFCO TECHNOLOGY & INDUSTRY CO., LTD.

100 ton/day Coconut Oil Solvent extraction plant

(rotocel extractor + negative pressure + automatic control + high configuration) scheme

CONTENT

I. Overview

1. Introduction: This project uses coconut cake as the main raw material, with a daily processing capacity of 100 tons and a designed annual production days of 300 days.

2. Construction scale

Item	Name	Construction Scale	Remarks
1	Solvent extraction workshop	100t/d coconut cake	

II、 Process technology scheme for solvent extraction workshop

1. Engineering service content

1) Provide a complete set of process design for the daily (24-hour) processing of 100t/d extraction workshop production line;

2) Provide auxiliary equipment inside and outside the extraction workshop production line workshop (see equipment list for details);

3) Provide engineering installation and commissioning services (see quotation summary for details).

4) The workshop building structure can be designed according to the owner's requirements (frame or steel structure), with the provision of qualification drawings (included in the quotation) or separate civil engineering design (cost to be negotiated separately).

2. Main technical parameters and consumption indicators

2.1 Immersion material indicators

No.	Item	Indicator
1	Oil content	≤11%
2	Water content	≤6%
3	Immersion material temperature	50~55℃
4	Powder size	≤ 10% (30 mesh sieve) Maximum grain size of cake (block diagonal) ≤ 30mm

2.2 Product Quality Indicators

No.	Name	Item	Indicator
1	Extracted meal	Water content	12.5% (adjustable)
		Residual oil (dry basis)	≤1.0%
		Explosion test	qualified（≤500ppm）
		Meal temperature	≤ 45 ℃ or ambient temperature+10 ℃
2	crude oil	Moisture and volatile matter content	≤0.2%
		Insoluble impurities	≤0.2%
		Dissolved	≤100ppm

2.3 Consumption indicators

No.	Item	Extraction workshop
1	Total installed capacity (including outdoor and standby	~184kW
2	Electricity consumption (excluding outdoor)	~17kWh/t material
3	Steam consumption	≤280kg/t material
4	Water consumption (excluding outdoor)	0.05~0.1m^3/t material
5	solvent consumption (national standard n-hexane)	≤2.5kg/t **Immersion material**

2.4 Requirements for Public Works and Auxiliary Materials

No.	Item	Indicator
1	Water	temperature ≤ 30 ℃, pressure ≥ 3bar, chloride ion content ≤ 25PPm
2	Electricity	**three-phase power supply, voltage 380V, frequency 50Hz. Workshop lighting 220V**
3	compressed air	6 bar (G), dry, oil-free, and ion free air
4	steam	Clean saturated water vapor with a pressure greater than 10 bar (G) entering the workshop
5	solvent (industrial n-hexane)	**with a distillation range of 63~71 ℃, meets the standard**
6	paraffin oil	volatile point of paraffin oil above 190 ℃ (Mobil or equivalent quality food grade mineral oil)
7	Lubricating oil	VG250~320 or in accordance with the requirements of the gearbox manual

3. Process characteristics and energy-saving design

1) PLC automatic control;

2) Adopting negative pressure evaporation technology to reduce steam consumption and improve the quality of crude oil;

3) The fixed bottom rotary extractor adopts a new design of V-shaped oil hopper, with top gear transmission, smooth operation and convenient maintenance, and more thorough oil extracting; Innovative V-shaped oil bucket design, no accumulation of material in the oil bucket, safer operation; In response to the characteristics of coconut cake, a storage box with a stirring knife was used to eliminate the bridging phenomenon caused by the high viscosity of peanut cake;

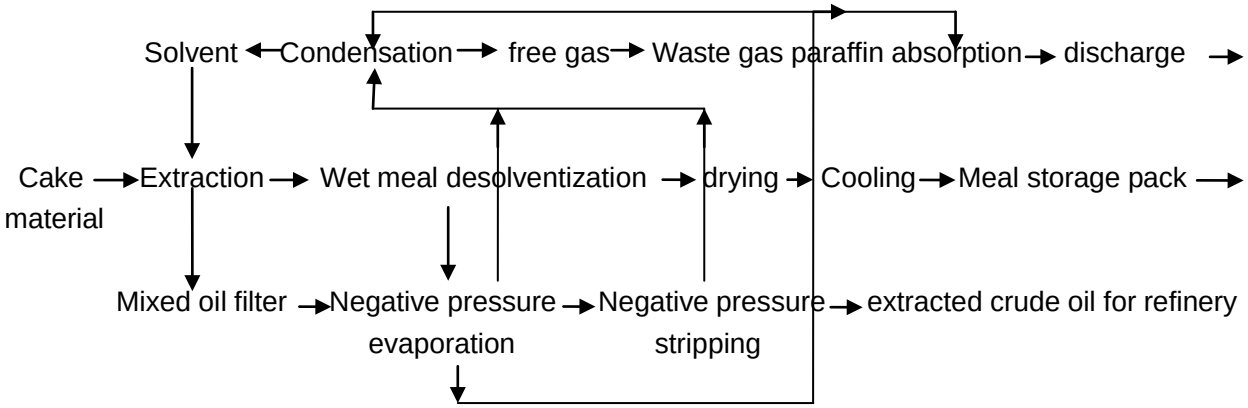
4) Utilize the DT-C solvent degreasing machine, integrating solvent removal, drying, and cold cake processing; employ secondary steam for solvent removal to save energy and reduce consumption; the solvent vapor from the degreasing machine serves as the heat source for the primary evaporator, preheating fresh solvent again;

5) A fixed-tower tray disc-type stripping column is employed, featuring low stripping temperature and high-quality crude oil;

6) All steam condensate is recovered, and the collected hot water is returned to the boiler workshop to achieve energy savings and consumption reduction;

7) Mineral oil tail gas absorption ensures the thorough recovery of solvents from non-condensable gases;

4. Process Flow Description



The solvent extraction section is the process of extracting and evaporating crude oil from the material through solvent countercurrent circulation. The production of the extracting section includes solvent extraction, wet meal evaporation, mixed oil evaporation, solvent gas condensation recovery, waste gas paraffin absorption, and other processes.

1) Extraction process:

The materials sent from the pre-processing workshop enter the storage box, and after being sealed and twisted, they enter the extractor. The materials circulate in a circle from the inlet to the outlet in the extractor, and are sprayed and drained in reverse by mixed oil with a concentration gradient. Finally, they are sprayed and extracted with fresh solvent, and then continuously sent to the wet

meal scraper after being drained. The thickest mixed oil is separated from impurities and enters the mixed oil tank for evaporation.

2) Wet meal steaming:

The wet pulp containing dissolved water from the extractor is sent to the pre stripping layer of the DT-C evaporator through a wet pulp scraper and a pulp sealing screw. After indirect steam heating of the material for pre stripping, it enters the mixed steam counter current stripping layer. The direct steam from the bottom is used to counter current contact with the descending wet pulp for stripping, removing most of the solvent, and then enters the direct steam stripping layer to remove the residual solvent in the pulp. During the final desolvation process of direct steam, some steam will condense in the meal, and the moisture content of the meal will increase. The high moisture meal is sent to the drying layer to remove moisture, and then enters the cold air layer for cooling. Finally, it is lifted by a buried scraper and sent to the meal storage by a horizontal scraper after being discharged.

3) Evaporation of mixed oil:

After settling in the mixed oil tank, the mixed oil is sent to the first long tube evaporator tube side by a steam feed pump (the mixed steam of the desolventizer is the heating medium of the first evaporator). The solvent and mixed oil are separated in the separator under negative pressure by rising film evaporation, and the gas enters the condenser. The concentrated mixed oil from the first distillation enters the second long tube evaporator through the heat exchanger for evaporation. The second evaporator also evaporates under negative pressure, and the shell side is heated by indirect steam. The evaporated solvent gas enters the condenser through the separator, and the separated mixed oil enters the lower part of the separator to maintain liquid seal. The oil is heated by the heater by the feed pump of the stripping tower and then enters the stripping tower.

The mixed oil enters the oil distribution tray inside the tower from the top of the stripping tower, and directly exchanges heat with the superheated steam entering from the bottom of the stripping tower under vacuum to remove residual solvents. The top outlet is connected to the condenser, and the vacuum jet pump keeps the stripping tower working under negative pressure to ensure that the crude oil residue is qualified. The crude oil is extracted from the bottom of the tower by the stripping pump, and after heat exchange and cooling, it is sent to the refining section or crude oil tank.

4) Solvent condensation cycle and exhaust gas absorption process:

The negative pressure condenser is installed at a height of over 10m to ensure that the condensed solvent can be smoothly extracted and enter the water distribution tank under negative pressure (-0.05~0.07MPa) working conditions. The DT condenser, exhaust gas, extracting condenser, and one shell stage condensate are directly fed into the water separator, and the solvent is recycled after water separation.

The wastewater separated by the water separator is discharged into the cooking tank, and the wastewater discharged after heating and cooking enters the water seal tank.

The tail gas discharged from the tail gas condenser enters the paraffin absorption tower and absorbs residual solvent gas in reverse flow with the paraffin oil inside the tower. The final non condensable tail gas is sucked out by a variable frequency controlled tail gas fan and then discharged into the atmosphere through a flame arrester. After absorbing the solvent, the paraffin oil (rich oil) is sent to the heat exchanger and heater for heating before entering the analysis tower. The absorbed solvent is analyzed under high temperature and vacuum, and the analyzed solvent gas is condensed and recovered in the condenser. The analyzed paraffin oil (lean oil) is heated in the heat exchanger and cooled in the condenser before entering the absorption tower for absorption circulation.

5. Description of the automatic control system in the extracting workshop

1) Overview

All hardware and software in this system are high-end products from Siemens, Germany. The system adopts a stable and efficient PLC+configuration software structure. This system intends to use Siemens' S7-1500 PLC system, and the upper computer will use Siemens WINCC 7.4 configuration software (SCADA).

2) Main functions of the system

Automated Network System

The workshop adopts a set of S7-1500 PLC to connect various sensors, control valves, frequency converters, motors, etc. in the workshop. At the same time, the workshop is equipped with computers and connected to PLCs for fast and reliable communication.

Centralized monitoring and control of logistics dynamics in the production process

The control system in the workshop connects all electrical equipment, sensors, and actuators in the workshop, achieving complete monitoring and control (start stop) of all motors from the computer screen. Use a large screen LCD display to dynamically display all process flows.

Monitoring, control, and data recording of important process parameters

Collect, display, store and provide out of limit alarms for process parameters such as temperature, liquid level, pressure, etc. during the production process. Implement computer automatic control for important process parameters. The computer automatically adjusts the corresponding actuators based on the parameter settings set by the user, so that the actual parameter values remain near the set values, while providing an over limit alarm. Archive and record parameters such as temperature, liquid level, pressure, etc. during the production process. All production records can be queried and displayed in the form of curves, and the required parameters can also be selected for report printing.

Alarm system and high reliability design

Warning and alarm

This system provides unique warning and alarm functions. Warning and alarm values can be set for production process parameters to improve operational convenience. Provide alarms for hardware failures, motor failures, valve failures, etc. in the electronic control system. All alarms and warnings provide flashing text reminders and workshop alarms.

High level reliability

The motor control, process control and other control programs in the workshop are all completed in the PLC, and the upper computer system plays a role in monitoring, modifying parameters and storing data. The system is equipped with a high-capacity UPS (uninterruptible power supply), which can maintain normal operation of the computer system, PLC system, and all temperature, liquid level, and pressure sensors during emergency power outages, ensuring effective monitoring of the production line and greatly increasing the safety of the system.

3) Characteristics of the system

This system has the following main features:

All process screens of the entire production line can be dynamically displayed directly on the computer;

It is possible to directly control the start and stop of all electrical equipment on the computer (all

operating equipment is equipped with on-site start and stop control buttons), and provide alarms;
The interlocking relationship between devices is implemented by the internal program of the PLC.
All basic control functions (such as motor control, interlocking relationships, process parameter monitoring, etc.) are completed by the internal program of the PLC, and the upper computer is responsible for operation, display, and data recording.
It can display parameters such as liquid level, temperature, and current of the process (parameters are subject to process requirements), record data, and provide over limit alarms;
Automatically control important liquid levels and temperatures, while recording data and providing over limit alarms;
User hierarchical management can assign different permissions to different users, achieving the security and reliability of the control system;
Provides rich alarm functions and can provide text and sound alarm prompts.
Humanized report printing function. You can print on duty and historical reports to obtain the required process parameters. The report format can be designed according to the manufacturer's requirements.

III. Machine List in the Workshop

No	Tag Number	Machine model	Machine name	QTY	Power (kw)	Remarks
1.	A101	JP480C×220	Flat rotation extractor (V-shaped oil hopper)	1	0.75	Explosion proof variable frequency motor, variable frequency control; Upper gear transmission and V-shaped oil hopper design; Shell and rotating body Q235B; Spray pipe material 304, grating surface 304 (grating frame carbon steel); Shell cone top and 300mm below cone top, shell 304. Note: On site assembly, Rotating body speed self-control.
2.	A101-1	YCL120	Storage box	1	3	Explosion proof motor with mixing fins; The shell material is Q235B. Material level self-control.
3.	A101-2	YPL50	Large spray tank	1		Shell Q235B。
4.	A101-3-1~5	Dg50	Mixed oil heating tube	5		Material 20
5.	A102	DT-C220×6	DTDC Solvent removal machine	1	30 +0.75	Explosion proof motor, hard tooth surface universal gearbox (Boneng, with forced lubrication); Shell Q235B; Material door and material swing shaft made of 304; Material level control of angle displacement valve for dissolution layer; The material of the air box is 304 (up to the lower cone). Non pressure vessel bottom structure. Self-control of dissolution layer material level and temperature.
6.	C102	GSZ20	Wet meal lifting scraper machine	1	5.5	Explosion proof motor, shell Q235B; Conveyor chain: forging chain, elbow partition NM360; frequency conversion control
7.	C201	YLS25	Feeding screw conveyor	1	3	Explosion proof motor, shell Q235B
8.	C202	YLS25	Meal seal screw conveyor	1	3	Explosion proof motor, shell and blades 304
9.	C203	YGF25	Intermediate material transfer valve	1	1.5	Explosion proof motor, shell and blades made of 304.; frequency conversion control
10.	C204	YLS35	Extracting machine material transfer screw conveyor	1	3	Explosion proof motor with 304 blades.; frequency conversion control
11.	D101	TFQ30	Main steam distributor	1		pressure vessel
12.	D102	TFQ25	Solvent removal system steam	1		pressure vessel

No	Tag Number	Machine model	Machine name	QTY	Power (kw)	Remarks
			distributor			
13.	D103	TFQ25	Evaporation system steam distributor	1		pressure vessel
14.	D201	VS50	Coarse filter	1		Shell 304, rotary liquid filtration
15.	D202	N30	Scraper filter	1	0.15	Material 304; Electric mechanical self-cleaning, filtration accuracy 90μm
16.	D203	YYGHZ120	Safe oil tank	1		Shell Q235B, liquid level self-control
17.	D204	YYGH120	Mixed oil tank	1		Shell Q235B, Liquid level self-control
18.	D205	YRSG80	Hot water collection tank	1		Shell Q235B
19.	D206	YFLQ110	1 vapor-liquid separator	1		Vacuum container, shell 304
20.	D207	YFLQ90	2 steam liquid separator	1		Vacuum container, shell 304. Oil level self-control.
21.	D208	YJNQ60	Energy saver	1		Shell 304; Spray nozzle 304
22.	D212	ZHK200	Solvent water separator	1		Shell Q235B, internal partition and reinforcement 304
23.	D213	YZSG100	Waste water cooking tank	1		Shell 304. Temperature self-control
24.	D215	YJXT25	Paraffin analysis tower	1		Shell 304, stuffing 304
25.	D216	YXST25	Paraffin absorption tower	1		Shell 304, stuffing 304
26.	D217	SLG80	Paraffin storage tank	1		Shell Q235B
27.	D301	YBJS100	Meal catcher	1		Shell 304; Spray nozzle 304
28.	D303	XL90	Cold air dust collector	1		Shell 304
29.	E101	ZFG60	First evaporator	1		Shell Q235B; Heat exchange tube Φ 25 × 1.2 made of 304 material
30.	E102	ZFG20	Second evaporator	1		Pressure vessel; Heat exchange tube made of Φ 25 × 1.2 304 material. Temperature self-control
31.	E103	QDT65A	Stripping tower	1		Vacuum container, shell Q235B; Stamped disc 304. Oil level self-control.

No	Tag Number	Machine model	Machine name	QTY	Power (kw)	Remarks
32.	E201	YLNL100	DT condenser	1		Horizontal two-way; Shell Q235B, Heat exchange tube made of Φ 19 × 1.2 304 material.
33.	E202	YLNL120	Evaporative condenser	1		Horizontal two-way; Vacuum container, shell Q235B, Heat exchange tube made of Φ 19 × 1.2 304 material.
34.	E203	YLNL30	Stripping condenser	1		Horizontal one-way, vacuum container, shell Q235B, Heat exchange tube made of Φ 19 × 1.2 304 material.
35.	E204	YLNL20	Extraction condenser	1		Horizontal one-way, shell Q235B, Heat exchange tube made of Φ 19 × 1.2 304 material.
36.	E205	YLNL40	Waste air condenser	1		Vertical two-way, shell Q235B, Heat exchange tube made of Φ 19 × 1.2 304 material.
37.	E301	RHZ6	Steam heater	1		Pressure vessel, shell Q235B, Heat exchange tube made of Φ 25 × 220 material.
38.	E302	RHZ3	Steam heater	1		Pressure vessel, shell Q235B, Heat exchange tube made of Φ 25 × 220 material.
39.	E303	RJR4	Solvent heater	1		Pressure vessel, heat exchange tube made of Φ 19 × 1.2 304 material. Temperature self-control.
40.	E304	YJR6	Mixed oil heater	1		Pressure vessel, Heat exchange tube made of Φ 19 × 1.2 304 material.
41.	E305	BR0.2-8	Paraffin oil cooler	1		Plate heat exchanger; The board material is 316 and the design temperature is 150 ℃.
42.	E306	YJR6	Paraffin oil heater	1		Pressure vessel, shell Q235B, heat exchange tube Φ 19 × 1.2 304 material. Temperature self-control.
43.	E307	YHR8	Crude oil/oil heat exchanger	1		Shell Q235B, heat exchange tube Φ 25 × 1.2 made of 304 material.
44.	E308	BR0.2-8	Paraffin oil/oil heat exchanger	1		Plate heat exchanger; The board material is 316 and the design temperature is 150 ℃.
45.	E312	BR0.2-8	Crude oil cooler	1		Plate heat exchanger; The board material is 316 and the design temperature is 150 ℃.
46.	P101~106		Mixed oil circulation pump	6	3×6	Explosion-proof motor
47.	P110		Concentrated mixed oil extraction pump	1	3	Explosion-proof motor
48.	P111		Return slag pump	1	1.1	Explosion proof motor, semi open impeller.

No	Tag Number	Machine model	Machine name	QTY	Power (kw)	Remarks
49.	P112		1 steaming feed pump	1	1.5	Explosion-proof motor
50.	P113		2 steaming feed pump	1	1.5	Explosion proof motor, high-temperature pump.
51.	P114		Stripping tower feed pump	1	1.5	Explosion proof motor, high-temperature pump.
52.	P115		Stripping tower extraction pump	1	2.2	Explosion proof motor, high-temperature pump. Accumulated volume.
53.	P116		Hot water extraction pump	1	0.75	Explosion proof motor, high-temperature pump.
54.	P117		Paraffin rich oil pump	1	1.1	Explosion proof motor, high-temperature pump.
55.	P118		Paraffin lean oil pump	1	1.1	Explosion proof motor, high-temperature pump.
56.	P119		Fresh solvent pump	1	2.2	Explosion-proof motor
57.	P120		Water distribution pump	1	0.75	Explosion-proof motor
58.	P121		Capture pump	1	4	Explosion proof motor, high-temperature pump.
59.	P122		Energy-saving pump	1	3	Explosion-proof motor
60.	P201	FZP200-10/6	Single-stage steam jet pump	1		evaporate
61.	P202	FZP200-10/6	Single-stage steam jet pump	1		stripping
62.	P301	9-26-4.5A	Fan	1	7.5	Explosion proof motor; Equipped with air doors.
63.	P303	9-11-2	Waste air fan	1	2.2	Explosion proof variable frequency motor, aluminum impeller; Variable frequency automatic control.
64.	P304	GFW8	Electric air damper	1	0.75	Explosion-proof motor
65.	total				~104	

Note: 1. Motor power or quantity may change with process design;

2. All equipment (including processes) are designed, manufactured, and accepted in accordance with Chinese National standards(GB);

3. All stainless steel heat exchange tubes in the list are welded steel pipes that comply with the heat exchanger standard (GB/T12771).

IV. List of peripheral machines

No	Tag Number	Machine model	Machine name	QTY	Power (kw)	Remarks
1.	C101	GSS16×25m	Feeding flat scraper machine	1	3	Explosion proof motor, shell Q235B (pre treated to extracting) Long pitch dedicated chain.
2.	C104	GSS16×25m	Discharge flat scraper machine	1	3	Explosion proof motor, shell Q235B (leached into the pulp warehouse) Long pitch dedicated chain.
3.	C103	GSZ20	Meal lifting scraper machine	1	4	Explosion proof motor, shell Q235B; Conveyor chain: forging chain, elbow partition NM360
4.	W101-1~2	RJG220	Directly buried solvent tank	2		Single tank capacity of 40 m3 with exterior waterproof treatment. The storage capacity is transmitted far away.
5.	W102-1~2		Solvent replenishment pump	2	1.1×2	Explosion proof motor, self-priming pump, spare 1 unit. Accumulated volume.
6.	W103	$DBNL_3$-250	Cooling tower	1	7.5	Flow volume 186m^3/h，⊿t=8℃
7.	W104-1~2		Circulating water pump	2	30×2	Explosion proof motor, spare 1 unit.
8.	total				79.7	

Note: 1. Motor power or quantity may change with process design;

2. All equipment (including processes) are designed, manufactured, and accepted in accordance with Chinese National standards(GB).

V. Quotation （exw USD）

No.	Name	Price (EXW USD)	Remarks
1.	Process equipment (indoor)	371800	Please refer to the equipment list for details on the quantity and material specifications of the equipment.
2.	Installation materials (indoor)	45900	All dissolution pipelines and pipelines containing dissolved free gas are made of 304 material, and all flanges of 304 material pipelines are made of carbon steel; The valve is Shanghai Hugong or Shanghai Jinggong; Excluding incoming and outgoing material overpasses, pipe racks, and pipe galleries; Excluding all workshop operation platforms (excluding local equipment operation platforms); Excluding installation water and electricity costs.
3.	Installation and commissioning fee (indoor) ※ Note 1	0	Guide installation, debugging, and training, regardless of the quota, and settle according to the actual salary on the date of payment (costs to be negotiated separately); Excluding travel, accommodation, and visa expenses.
4.	Peripheral devices (outdoor)	76500	Please refer to the equipment list for details on the quantity and material specifications of the equipment.
5.	Peripheral installation materials (outdoor)	5900	Excluding all pipe racks and pipe galleries.
6.	Installation fee for supporting equipment (outdoor) ※ Note 1	0	Guide installation, debugging, and training, regardless of the quota, and settle according to the actual salary on the date of payment (costs to be negotiated separately); Excluding travel, accommodation, and visa expenses.
7.	PLC and host computer	29400	siemensS7-1500；WINCC 7.4 configuration software PC：lenovo；Printer：HP。
8.	MCC Cabinet	36800	Electrical components Schneider or equivalent, frequency converter Siemens or equivalent.
9.	Automatic control instruments and meters	36800	Temperature and pressure sensors E+H; The rest are domestically produced high-quality products such as Shangyi or Chuanyi.
10.	Electrical installation materials	22100	Including wires, cables, cable trays, signal lines, equipment lighting, Excluding workshop lighting.
11.	Electrical installation fee ※ Note 1	0	Guide installation, debugging, and training, regardless of the quota, and settle according to the actual salary on the date of payment (costs to be negotiated separately); Excluding travel, accommodation, and visa expenses.
12.	Painting and insulation※ note 2	0	Due to regulations, transportation, and other reasons, it is recommended that the owner bring their own equipment.
13.	Domestic transportation and packaging costs ※ note 3	14700	Excluding international transportation fees.
14.	**total**	**639,900.00**	

Note: 1. Installation and commissioning costs need to be negotiated separately, and guidance installation or full package installation services can be provided;
2. Due to regulations (insulation materials), transportation (dangerous goods) and other reasons, it is recommended that the owner bring their own equipment.
3. The international transportation cost is not included in this quotation;
4. All equipment (including processes) are designed according to Chinese National standards (GB).