Ji'nan ShengTai Painting Equipment Co.,Ltd.

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This production line consists of pre-treatment equipment, drying, powder spraying, powder curing, an overhead conveyor system, and an electrical control system.

Note: Secondary combination hangers and other accessories are to be provided by the clients.

I Technical Parameters

No.	Name	Design Basis
1	Product Name	Aluminum Profile
2	Product Material	Aluminum
3	Material Thickness	Less than 5.0 mm
4	Pretreatment Method	Spray
5	Surface Coating Method	Powder
6	Coating Surface of Workpiece	External Surface
7	Max Hanging Dimensions of Workpiece	L7000 *W300 *H1500
8	Hanging Method	Double-Point Hanging
9	Maximum Weight of Workpiece	≤50 kg
10	Conveyor Chain	QXG-250-50KG Light-Duty Conveyor Chain
11	Production Capacity	1000 kg/day
12	Hanging Spacing	
13	Process Speed (Determined by client)	1.0 m/min
14	Speed Adjustment Range	0.2—2 m/min

II Process Flow

Production Line Process Flow:

Uploading → Powder Coating → Powder Curing → Cooling → Unloading

III Equipment Configuration

1. Powder Drying Oven: 1 set

Its structure and dimensions are as follows:

External dimensions: L30.0m × W1.20m × H4.0m. For details, refer to the cross-sectional diagram in the plan.

The drying chamber adopts a "sandwich" insulation panel assembly structure. The air supply ducts inside the chamber are made of δ1.2 galvanized steel sheets. The outer panels of the insulation boards are made of δ0.60 color steel sheets, while the inner panels are made of δ0.60 galvanized steel sheets, with embossing on both sides. The insulation layer has a thickness of 120mm. The drying chamber employs a hot air circulation heating method. Its advantage lies in the uniform temperature distribution within the chamber, with a temperature difference of less than ±8°C between the upper, middle, and lower points along the cross-section of the track, thereby ensuring consistency in the color of the workpiece coating.

The drying tunnel adopts natural gas heating method;

The curing drying tunnel is equipped with: one 500,000 kcal unit.

The specific parameters of the curing tunnel:

No.	Name	Parameters
1	Overall structural Type	Box
2	External cavity dimensions	L30.0m×W1.20m×H4.0m
3	Thickness of insulation layer	120mm
4	Insulation material	High-quality rock wool board
5	Density of insulation material	120Kg/m^3
6	Inner panel material of curing oven insulation board	δ0.60mm galvanized steel sheet with ribs
7	Outer panel material of curing oven insulation board	δ0.60mm color steel sheet with ribs
8	Air supply duct and outlet	δ1.2mm galvanized sheet
9	Average surface temperature of drying room	Not exceeding ambient temperature by 10°C
10	Heating of drying room	Time to reach 120°C ≤ 30min
11	Heating chamber power	Natural gas 500,000 kcal, 1 set; Burner: Riello RS50 dual-stage fire
12	Circulation fan	4-72-6C 11KW; 1 unit

13	Exhaust pipeline	1 set (galvanized steel sheet, directly rising from the side of the workshop to the roof)
14	Bridge frame columns and framework of drying room	Various shapes made from δ2.5 hot-rolled plate with folded edges, and 75×50 special-shaped angle steel as the base plate
15	Upper and lower corner protectors of drying room	Upper corner protector made of δ2.5mm carbon steel, lower corner protector made of δ2.5mm carbon steel plate, with paint treatment

2.Conveying System

The QXG-250-50Kg conveyor is selected for the system.

Chain Pitch: 250mm;

Single Point Lifting Capacity: 50Kg;

Process Speed: 1.00 m/min;

Adjustment Range: 0.2—2.0 m/min;

Speed Control Method: Frequency conversion speed control;

The total length of the overhead conveyor chain is 120m, utilizing one drive unit and one tensioning device. The tensioning device employs a counterweight tensioning mechanism. Emergency stop switches are installed at necessary locations along the entire line, specifically at the loading point, unloading point, and near the powder spraying chamber. The curing oven is equipped with thermal expansion joints.

To enhance the service life of the conveyor, all curved tracks are made of manganese steel, and the turning radius is maximized wherever possible.

The conveyor chain features a bidirectional hinge design with a double chain plate structure. Its traveling wheels and guide wheels are ball-type rollers, arranged alternately with double guide wheels and single guide wheels to minimize track wear. The supplier provides both single and combined hangers.

The parameters of the conveyor

No	Name	Parameters
1	Drive Unit Model	QXG-250
2	Quantity of Drive Units	1 set
4	Overload Protection of Drive Unit	Adjustable Safety Clutch + Limit Switch
5	Power of Drive Unit	3.0KW
6	Type of Tensioning Device	Counterweight Tensioning

7	Quantity of Tensioning Devices	R3500mm，1 set；
8	Structure of Conveyor Chain	Double-directional hinged, suitable for horizontal and vertical turns
9	Length of Conveyor Chain	Total 120m
10	Pitch of Conveyor Chain	250mm
11	Single Point Lifting Capacity of Conveyor Chain	50Kg
12	Process Speed of Production Line	1.00m/min；
13	Speed Adjustment Range of Production Line	0.2～2.0m/min
14	Speed Adjustment Method of Production Line	Variable Frequency Speed Control
15	Lubrication Device	Automatic Spray Lubrication
16	Quantity of Lubrication Devices	1set(No oil dispenser for the drive unit after pre-treatment)
17	Steel Structure of Overhead Conveyor	100*100 square tube, #8 channel steel, painted
18	Oil Drip Pan	Included
19	Secondary Hanger (Lifting Hook)	Provided by the customer

3.The Spraying Booth

(1) Manual Powder Spray Booth Description:

The powder spray booth is an enclosed space where powder coating operations are performed on workpieces. The structure and airflow design of the spray booth are crucial to the powder coating process. Based on the process requirements of the production line workpieces, the powder spray booth has the following features:

① Powder spray booth dimensions: 6.0*1.60*2.80 meters (length * width *height)

② Each side of the spray booth is equipped with a manual powder spray opening.

③ The wall panels and roof panels of the booth are made of cold-rolled steel plates. The inner surface of the booth is smooth and clean, with sealant applied between panel seams to ensure no powder leakage. Powder cleaning is convenient and easy.

④ The entrance and exit of the spray booth feature an arc-shaped structure with ear channels, ensuring smooth movement of workpieces in and out while minimizing the opening area of the booth. The design is aesthetically pleasing and effectively prevents powder overflow.

⑤ The top of the spray booth and the manual repair door are equipped with quick-replacement fluorescent lamps, ensuring sufficient lighting inside the booth.

⑥ The bottom of the booth is flat, making powder cleaning convenient.

⑦ The spray booth utilizes side-bottom ventilation and an equalizing pressure device, ensuring rational airflow organization inside the booth. The airflow is gentle, increasing the retention time of powder in the booth to improve powder adhesion efficiency. This reduces the load on the recovery system and extends its service life. Color change and powder cleaning are cleaner and faster, with a major color change and powder cleaning time of within 45 minutes.

⑧ All air pipes are connected with quick couplings, making disassembly and assembly simple and enabling fast color changes.

(2) Effective Indicators of the Powder Spray Booth:

No	Item	Specification
1	Overall Dimensions	L6000*W1600*H2800(mm)
2	Workpiece Entry/Exit Dimensions	W1000mm*L1600mm
3	Recovery Method	Cartridge Recovery
4	Type	Through Double-Sided type Spraying
5	Compressed Air	0.5-0.7MPa

6	Open Face Velocity	0.5m/sec
7	Exhaust Air Volume	14000 m^3/h
8	Spraying Method	Manual Powder Spray Gun (Dual-Station Layout for Right and Wrong Sides)
9	Installed Power of Equipment	15kW

(3) Material Usage in the Powder Spray Booth

No	Name	Specification
1	Side Wall Panels and Roof Panels of the Booth	Galvanized Sheet δ=1.2mm
2	Floor Plate of the Booth	Galvanized Sheet δ=1.5mm
3	Inlet and Outlet Ports	Galvanized Sheet δ=1.2mm
4	Floor Support	Hot-Rolled Steel Plate δ=2.5mm
5	Light Box	Galvanized Sheet δ=1.2mm
6	Recovery Tank	Galvanized Sheet δ=1.2mm
7	Recovery Fan	7.5kW Centrifugal Fan, 2 units in total
8	Filter Element	Quick-Release Type 3290, 16 units in total
9	Air Duct	0.7mm Galvanized Sheet
10	Lighting	40W Fluorescent Lamp

(4)Secondary Filtration Recovery Cabinet

No.	Name	Specification
1	Chamber Side Wall Panel and Top Panel	Galvanized Sheet δ=1.2mm
2	Support Frame	Square Tube 100*2.0
3	Filter Element	Quick-release Type, 3290, Total 9
4	Air Duct	0.7MM Galvanized Sheet

4. Electrical Control System: 1 set

5.1 This system includes all control boxes, wires, cables, conduit pipes, cable trays, etc., used in the electrical control system.

5.2 The main electrical control system adopts a combination of centralized and decentralized control via electrical cabinets. Conventional operations such as start/stop and temperature control can be performed on the electrical cabinets of each device.

5.3 All electrical cabinets are equipped with a three-level protection system, including a main power air switch, branch circuit air switches, and thermal relays. This effectively protects against short circuits, overloads, and phase failure faults, while sending alarm signals to the host computer.

5.4 All motors with a power exceeding 11 kW utilize a Y-Δ (star-delta) starting method.

5.5 The temperature control in the drying oven uses platinum thermal resistance sensors for temperature measurement and digital display temperature controllers to regulate the combustion chamber. A dual temperature control protection system is employed: the temperature controller maintains the stability of the furnace temperature, while the

overtemperature controller is typically set 10—15°C above the furnace temperature. If a system malfunction causes the furnace temperature to exceed the control value and reach the overtemperature control value, all heaters will be forcibly shut off, and an alarm signal will be triggered.

5.7 An electrical interlock protection is implemented between the drying oven's circulation fan and the heaters, supplemented by an air pressure switch protection. The heaters can only be activated after the fan is started and the fan impeller is confirmed to be operating. Regardless of whether the fan is manually or protectively shut down, the heaters will delay for 20—30 minutes before turning off to ensure sufficient cooling of the heat exchanger.

5.9 The following abnormalities will be indicated on the pretreatment control cabinet, with alarm lights activated and an audible alarm triggered:

5.10 Upper/Lower Liquid Level Abnormalities—Exceeding the upper or lower liquid level limits of each tank.

5.11 Temperature Abnormalities—The temperature of the heating process liquid exceeds the set value.

5.12 Overload—The current value of the motors for each pump and fan exceeds the set value.

5.13 Other necessary items for abnormality detection. (Alarm stop switches and abnormality reset switches are installed on the control panel.)

IV Energy Consumption Table:

No	Item		Consumption
1	Water Consumption	Average: 3.00 T/h	
2	Electricity Usage	Powder Drying Oven	12KW
		Overhead Conveyor	4.0KW
		Powder Spray Booth	15.0KW
		Installed Power	Approx.31KW
3	Natural Gas	Max 50m³	