

1. Design Criteria of Zinc-aluminum Production Line

- 1) The Equipment is developed base on your brand positioning and development strategy;
- 2) Corrosion resistance of standard parts reaches the internationally advanced level;
- 3) The Equipment has aesthetical and elegant appearance and sense of times, to represent the styles and features of modern enterprise;
- 4) The overall layout of production line has the characteristics such as reasonable space division, smooth logistics, easy operation and maintenance;
- 5) The whole zinc-aluminum production line meets the requirements of high automation and low energy consumption and could lower operation cost significantly;
- 6) The whole zinc-aluminum production line was designed and manufactured according to our advanced products in the same stage and type (technology design, production, installation and commissioning). The materials selected must conform to the technical agreement. If substitute materials are used, their materials and quality must reach or surpass the requirements of the technical agreement.
- 7) Installation site of the line: the Client's site

2. Basic Design Condition of Zinc-aluminum Production Line:

a. Standard of Coated Workpieces

| S/N | Name | Content |
|-----|--------------------|---------|
| 01 | Workpiece type | |
| 02 | Workpiece material | Iron |

b. Design Requirements

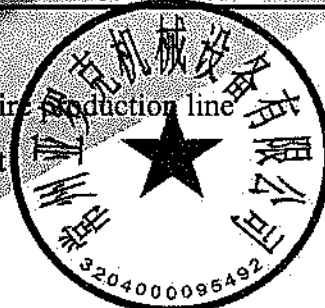
| S/N | Name | Content |
|-----|-------------------|---------------------------|
| 01 | Coating category | Zinc and aluminum coating |
| 02 | Coating thickness | 6-8μm |

c. Power Supplies Provided by Customer:

| S/N | Name | Content |
|-----|----------------------|-----------------------|
| 01 | 3-phase power supply | AC380V 50HZ |
| 02 | Heat source | Nature gas |
| 03 | Compressed air | 5-6kg/cm ² |

3. Business Scope:

- a. Design of drawings for the entire production line
- b. Design and fabrication in plant
- c. Equipment installation at site
- d. Equipment debugging
- e. Equipment maintenance



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4. Technological Process Design of zinc-aluminum Production Line:

Workpiece feeding → Dip-coating → Pre-heating → Sintering → Cooling → Workpiece discharging

Note: The technological process above should be repeated for the two-coating two-drying process or three-coating three-drying process.

5. Process Parameters

| S/N | Process Name | Process Parameters | | Remarks |
|-----|-----------------------|--------------------|------------|---------|
| | | Temperature(°C) | Time (min) | |
| 1 | Workpiece feeding | | | |
| 2 | Workpiece feeding | | | |
| 3 | Pre-heating | 80-120 | 8~10 | |
| 4 | Sintering | 320-330 | 20-30 | |
| 5 | Cooling | RT | | |
| 6 | Workpiece discharging | | | |

6. Sintering Furnace of Mesh Belt

The sintering furnace of mesh belt mainly consists of feeding section, sintering section, discharging section, forced cooling system, hot air generator, mesh belt conveying mechanism and electric control system. The sintering furnace is heated by natural gas. The burner is imported from UNIGAS, Italy brand. The fire of the gas burner is controlled in stages, and it is under the proportional control of gas flow size. Heat-resistant fan is used as hot air circulation fan. The inner cavity of hot air generation furnace is made of heat-resistant stainless steel, to make sure the complete set of hot air generation furnace and circulation system is free from faults for 5 years. The gas pipeline is fitted with high/low-pressure protection switch and protection solenoid valve, while the combustion-supporting air pipeline is fitted with high-sensitivity pressure detection switch and attached with alarm device, in order to improve the reliability and safety.

6.1 Discharging section (5,500mm): It is formed by welding the U-steel and sectional materials in order to provide installation foundation for the mesh belt convey mechanism.

6.2 Forced air-cooling system: The system, which consists of sectional material, plates, cooling exhaust blower and cooling exhaust fan, can realize forced air cooling to workpiece from sintering furnace, to keep the temperature of parts below 10°C at blanking position, facilitate unloading and accelerate the turnover of workpieces.

6.3 Feeding section (4,500mm): It is mainly formed through U-steel and section materials, to provide the installation foundation for workpiece loading/unloading and mesh belt convey mechanism.

6.4 Mesh belt convey mechanism: Be composed of stainless-steel mesh belt, large-pitch chain ($\delta=4.0$), driving shaft, driven shaft, drive sprocket and drive device. Siemens frequency converter is used for variable-frequency speed regulation. Realize continuous conveying of workpiece feeding, pre-dry, sintering, cooling and workpiece discharging.

The feeding section is 4.5 meters, the furnace body section is 18 meters, the discharging section is 5.5 meters, so it is 28 meters in total.



- (8) Load bearing of mesh belt: 300kg/m²
- (9) Mesh belt width: 1,200mm Effective height of furnace door: 350 mm
- (10) Gap of mesh belt: ≤7mm
- (11) Power of drive: 4kw
- (12) Max. power consumption: 35kw
- (13) Max. heating volume of sintering furnace: 450,000 kcal/h

6.14 Main Parameters of Belt Type Continuous Feeder:

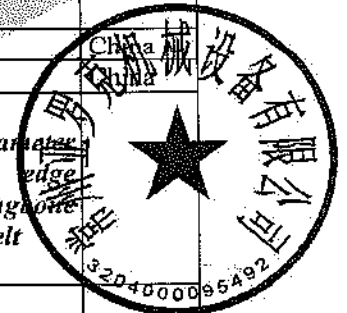
- (1) Belt width: 600mm
- (2) Power of drive: 1.1kw
- (3) Conveying speed: 0 - 1m, adjustable

6.15 List of Main Equipment Components

| S/N | Name | Brand | Place of Origin | Remarks |
|-----|----------------------------------|-------------------|-----------------|---------|
| 1 | PLC | Siemens | Germany | |
| 2 | Frequency converter | Siemens | Germany | |
| 3 | Low-voltage electrical equipment | Schneider | France | |
| 4 | Cable | National Standard | China | |


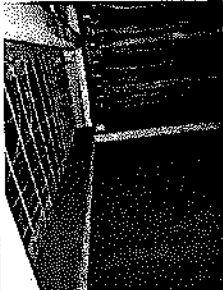

6.16 List of Sintering Furnaces

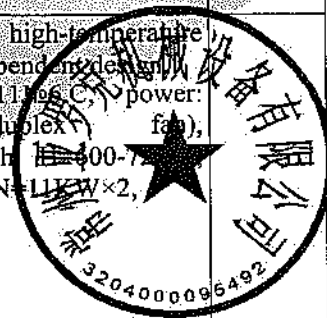
| S/N | Name and Specification | Qty. | Unit | Main Parameters | Remarks |
|-----|--|------|-------|--|---------|
| | Curing oven of gas mesh belt | 1 | Set | | |
| 1 | Feeding section | 1 | Set | Q235 square tube 80*80*3 (mm) | |
| 2 | Furnace skeleton | 1 | Set | Square tube 100*50*3 (mm) | |
| 3 | Discharging section | 1 | Set | Q235 square tube 80*80*3 (mm) | |
| 4 | Forced cooling part | 1 | Set | Q235 cold plate thickness: 1.5mm | |
| 5 | Cooling fan 4-72-FRN0.75A | 2 | Set | Changzhou Fan Plant | |
| 6 | Axial flow fan 0.75KW | 8 | Set | Changzhou Fan Plant | |
| 7 | Mesh belt 1.2M (full width) stainless steel | 60 | m | Width 1,200), mesh diameter 1.6mm×2mm, flanged edge height 25mm, herringbone stainless-steel 201 mesh belt | |
| 8 | Support rod | 450 | Piece | Φ32mm round pipe | |
| 9 | Large-roller chain pitch P=76.2 Jockey pulley for each 14 sections | 200 | | 40MN chain | |



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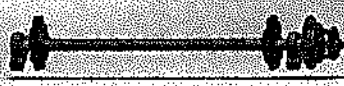
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| S/N | Name and Specification | Qty. | Unit | Main Parameters | Remarks |
|-----|--|------|-------|--|----------------|
| |  | | | | |
| 10 | Furnace track  | | m | 5# stainless-steel guide track + 5mm sizing block | |
| 11 | Drive device XWED-1003 N=4KW | 1 | Set | Changzhou reducer | |
| 12 | Drive/driven shaft, bearing seat | 2 | Set | Fine machining | |
| 13 | External plate of furnace is adopted | | | Q325 cooling plate, 1.5mm thick | |
| 14 | Internal plate of furnace | | | Stainless steel 430, 1.5mm thick | |
| 15 | Furnace door | 4 | Set | Stainless steel thickness 1.5mm | |
| 16 | Decorative plate | 80 | Piece | Self-processing baking paint | |
| 17 | Air distributor in furnace | 1 | Set | Stainless steel thickness 1.5mm | |
| 18 | Air return port in furnace | 1 | Set | Stainless steel thickness 1.5mm | |
| 19 | Exhaust fan | 1 | Set | Q=6000~7200m ³ /h H=800Pa N=2.2KW | Domestic brand |
| 20 | Temperature control fan | 1 | Set | Q=1100~1500m ³ /h H=600~800Pa N=1.1KW | Domestic brand |
| 21 | Circulation fans in sintering zone and high-temperature zone  Advantages: external motor, better protection of the motor! Convenient maintenance and replacement! | 1 | Set | It is used in high-temperature zone, with independent design. Model: 4-72-11.196 C, power: 22KW (duplex fan), Q=25000m ³ /h, H=400-700Pa, n=1450 r/min, N=11KW×2, | |
| 22 | Hot air generation furnace | 1 | Set | The inner liner is made of 304 stainless steel, the outer plate is made of 110S stainless steel with oxidation resistance. | |
| 23 | Exhaust fan at furnace inlet | 1 | Set | Wuxi Jinxi Fan Plant | |



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| S/N | Name and Specification | Qty. | Unit | Main Parameters | Remarks |
|-----|---|------|------|---|---------|
| | | | | Model: 4-72-11N ₂ 6A, Q=9551m ³ /h, n=1450rpm, H=1059Pa, N=2.2KW; | |
| 24 | Electrical apparatus control system (Siemens PLC) | 1 | Set | The Schneider electrical apparatus elements are adopted basically | |
| 25 | Blanking conveyor | 1 | Set | | |
| 26 | Driving torque protector  | 1 | Set | Fine machining | |

7. Tilt-type Full-auto Coating Machine

The loading capacity for each basket of full-auto tilt & dump AIO is 80-150KG. The interval between dip and centrifuge drying of each basket is about 2.5min. The workpieces of 24 baskets can be dipped and coated within 60 min. The full-auto tilt & dump AIO consists of full-auto feeder, transplantation manipulator, straight-line conveying system, workpiece basket, dipping & coating machine, tilt-type centrifugal machine, rotary self-discharging mechanism, elevator of immersion liquid slot, industrial water chiller and hydraulic station.

7.1 Full-auto Feeding Machine

Push the trolley to the feeding position, press "Start button", stretch and retract the cylinder, rotate the trolley directly, drop the materials on the conveyor and discharging machine, to reduce the labor intensity and it can be switched to the manual mode.

7.2 Convey Discharging Machine and Weighing Mechanism

Drop the materials from auto trolley onto the convey machine and send them to the workpiece bucket on weighing mechanism, to provide accurate material weighing and convey.

7.3 Manipulator Feeding System

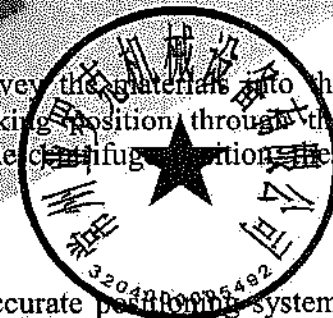
This mechanism can realize the rated feeding of materials, convey the materials into the material drop bucket. Grab the bucket to the designated working position through the manipulator, the bucket convey system will send the bucket to the centrifuge position, then recover the circulating feeding process of working position.

7.4 Bucket Linear Convey System

This mechanism consists of precise guide, travelling rack and accurate positioning system. The maximum transfer weight is 200kg. The distance between transfer bucket and centrifuge working position is 1m. Realize continuous convey at centrifuge, rotation and drop working position. The entire mechanism consists of manipulator, rotation and unloading mechanism.

7.5 Workpiece Bucket

Be made of mesh, fitted with travelling track and locating hole, so the mechanical positioning hook can have precise handling of material frame; it also provides the material storage function.



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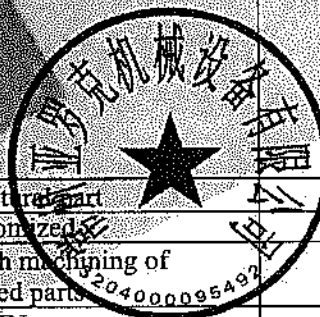
| | |
|---------------|---|
| Main Features | High efficiency, reduce labor intensity |
|---------------|---|

7.12. Main Elements

| S/N | Element Name | Brand | Country | Remarks |
|-----|-------------------------|-----------|---------------|----------------------------------|
| 1 | Low voltage appliance | Schneider | France | MCB: OSMC32; Contactor: LC1D; |
| 2 | Pneumatic components | AirTAC | Taiwan, China | SC100X50S |
| 3 | PLC | Siemens | Germany | smart200 |
| 4 | Human-machine interface | Siemens | Germany | smart1000IE V3 |
| 5 | Cable | Jinhao | China | National Standard |

7.13 Detailed Delivery List

| S/N | Name and Specification | Qty. | Unit | Main Parameters | Remarks |
|-----|---|------|-------|-------------------------------------|---------|
| I | Full-auto dump AIO | 1 | Set | | |
| 1 | Rack fixing bottom plate | 1 | Piece | A3 35 (mm) | |
| 2 | Machine Frame | 1 | Set | Rectangular pipe 200*150*10 (mm) | |
| 3 | Tilting type arm | 1 | Set | 300*100*30 (mm) | |
| 4 | Tilting type hydraulic cylinder | 2 | Piece | Customized | |
| 5 | Arm beam | 1 | Set | Rectangular tube 300*200*10mm | |
| 6 | Spindle spin-dry system | 1 | Set | Fine machining | |
| 7 | Spindle spin-dry reducer | 1 | Set | Guomao 11KW | |
| | Agitation dip-coating slot of bottom machine  with coating filter unit | 1 | Set | SUS 304 3mm | |
| 9 | Dip-coating uplift platform | 1 | Set | Structure part | |
| 10 | Uplift hydraulic cylinder | 2 | Piece | Customized | |
| 11 | Travelling rack | 1 | Set | Finish machining of welded parts | |
| 12 | Linear convey guide | 2.8 | M | HIWIN | |
| 13 | Bucket convey system | 1 | Set | Fine machining | |
| 14 | Mechanical gripper | 2 | Set | Fine machining | |
| 15 | Travelling motor of convey bucket | 1 | Set | Guomao 0.75KW | |
| 16 | Rotary discharging mechanism | 1 | Set | Fine machining | |
| 17 | Rotation discharging reducer | 1 | Set | Guomao 1.5KW | |
| 18 | Stainless steel wire bucket  | 2 | Piece | Stainless steel 304 | |



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| S/N | Name and Specification | Qty. | Unit | Main Parameters | Remarks |
|-----|--|------|------|------------------------------------|---------|
| 19 | Reduction motor of lifting, weighing and feeding | 1 | Set | China | |
| 20 | Walking reducer of basket | 1 | Set | China | |
| 21 | Cooling water machine | 1 | Set | 3P compressor, electric heater 3KW | |
| 22 | Rotation discharging platform | 1 | Set | Structural part | |
| 23 | Hydraulic station | 1 | Set | | |

8. Description of Control System

The control system adopts PLC + touch screen control mode.

8.1 The whole control system adopts PLC + touch screen control mode, which can be switched manually and automatically. PLC and color touch screen

The software application environment refers to the simplified Chinese operating system. The feeding place is provided with a button operation station for manual operation and adjustment.

8.2 Touch screen system:

Due to good programming interface, the various process parameters of different parts can be set conveniently, and the production task of the workpiece can be set automatically through the process setting. The whole production process can be monitored.

8.3 There shall be power-off protection function for the whole control.

8.4 The whole line adopts automatic control, with the manual control function. The control system is equipped with necessary safety warning and fault diagnosis functions (electrical alarm, heating alarm, fan alarm, motor alarm), so as to facilitate troubleshooting. All buttons on site shall be marked in Chinese, eye-catching and easy to operate;

8.5 The key transmission system adopts variable-frequency speed control, which can easily adjust the production takt and meet the production needs;

8.6 The control system adopts PLC control, which leaves additional space for I/O and more than 3% of spare line. The wiring of main control cabinet conforms to relevant standards, and the line number is clear and standardized. All electrical devices conform to national standards, and are grounded reliably. Each live part is installed with protection, marked with "beware of electric shock";

9. Contents of Technical Service:

9.1. The supplier should provide the following data to the buyer prior to final acceptance:

General drawing of off-standard equipment (non-electronic document)

1 copy

Electrical schematic diagram

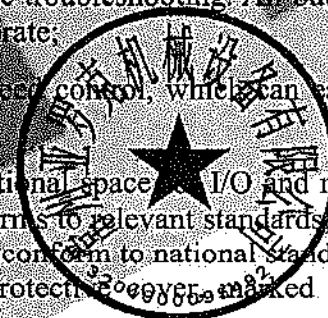
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Operation instructions of equipment

1 copy

9.2. Provide training for the buyer's staff:

Working principle and structural performance of equipment;



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