

Metallurgical - Continuous Galvanizing and Annealing Furnace for Steel Strips



In the hot-dip galvanizing process, depending on the method of pre-galvanizing treatment, it can be classified into two categories: in-line galvanizing and off-line galvanizing. The continuous galvanizing and annealing furnace for steel strips falls under the in-line galvanizing category, which involves heating and annealing the hot-dip galvanized raw steel sheets. Based on the production process, there are two types of these furnaces: vertical (tower) and horizontal. The horizontal furnace is similar to a conventional direct-type continuous annealing furnace and consists of three basic parts: a preheating furnace, a reduction furnace, and a cooling section. The vertical furnace, also known as a tower furnace, is comprised of an heating section, a homogenizing section, and a cooling section.



1. Tower Structure Furnaces (Vertical Furnaces)

The preheating furnace uses liquefied petroleum gas as fuel and is equipped with gas burners arranged along the height of the furnace walls. Steel strips are heated as they travel along the furnace in the opposite direction of the gas flow, creating a weakly oxidizing atmosphere. The preheating furnace has a horseshoe-shaped structure, and the high-temperature areas of the furnace top and burner placement experience high temperatures and fast gas flow rates. Therefore, these areas use CCEFIRE high-alumina lightweight bricks, insulating bricks, and calcium silicate boards as lining materials. In the low-temperature area of the preheating furnace (where steel strips enter), lower temperatures and slower gas flow rates are encountered, so CCEWOOL ceramic fiber modules are often used as lining materials.

2. The homogenizing section (reduction furnace) employs gas radiators as the heat source for steel strip reduction. Gas radiators are arranged along the height of the furnace chamber. Steel strips pass between two rows of gas radiators and are heated. The furnace maintains a reducing atmosphere, always operating at positive pressure. In reducing atmospheres under positive pressure, the heat resistance and insulating properties of CCEWOOL ceramic fiber significantly decrease. To ensure both excellent refractory insulation and minimized furnace weight while preventing slagging, the homogenizing section (reduction furnace) uses a double-layer structure with high-temperature insulation materials (CCEWOOL ceramic fiber blankets and mats) sandwiched between two layers of heat-resistant steel plates.

3. The cooling section utilizes air cooling radiators to cool steel strips from the outlet temperature of the homogenizing section (700-800°C) to the required temperature for galvanizing in a zinc pot (460-520°C). A reducing atmosphere is maintained within the cooling section. The lining material for the cooling section consists of CCEWOOL high-purity fiber blankets in a flat laying structure.

4. Connection sections between the preheating furnace, homogenizing section, and cooling section.

The above shows that the annealing process of cold-rolled strip steel before hot-dip galvanizing needs to go through processes, such as heating-soaking-cooling, and each process is performed in different structure and independent furnace chambers, which are called the preheating furnace, the reduction furnace, and the cooling chamber respectively, and they constitute the continuous strip annealing unit (or an annealing furnace). During the annealing process, the strip steel continuously passes through the

above-mentioned independent furnace chambers at a maximum linear speed of 240m/min. In order to prevent oxidation of the strip steel, the connecting sections realize the connection between the independent rooms, which not only prevents the strip steel from being oxidized at the joints of the independent furnace chambers, but also ensures sealing and heat preservation.

The connecting sections between each independent room use ceramic fiber materials as lining materials.

The specific materials and structures are as follows:

The lining adopts CCEWOOL ceramic fiber products and the full-fiber structure of tiled ceramic fiber modules. That is, the hot surface of the lining is CCEWOOL zirconium-containing ceramic fiber modules + tiled CCEWOOL ordinary ceramic fiber blankets (cold surface).

Horizontal structure furnace



According to the different technological requirements of each part of the horizontal furnace, the furnace can be divided into five sections: a preheating section (PH section), a non-oxidizing heating section (NOF section), a soaking section (radiant tube heating reduction section; RTF section), a rapid cooling section (JFC section), and a steering section

(TDS section). The specific lining structures are as follows:

(1) The preheating section:

The furnace top and the furnace walls adopt the composite furnace lining stacked with CCEWOOL ceramic fiber modules and ceramic fiber blankets. The low-temp lining uses a layer of CCEWOOL 1260 fiber blankets compressed to 25mm, while the hot surface uses CCEWOOL zirconium-containing fiber folded blocks. The lining on the high-temp parts adopts a layer of CCEWOOL 1260 fiber blanket, and the hot surface uses ceramic fiber modules.

The furnace bottom adopts the stacking composite lining of light clay bricks and ceramic fiber modules; the low-temp parts adopt the composite structure of light clay bricks and zirconium-containing ceramic

fiber modules, while the high-temp parts adopt the composite structure of light clay bricks and ceramic fiber modules.

(2) No oxidation heating section:

The top of the furnace adopts the composite structure of ceramic fiber modules and ceramic fiber blankets, and the back lining adopts 1260 ceramic fiber blankets.

The common parts of the furnace walls: a composite furnace lining structure of CCEFIRE lightweight high-alumina bricks + CCEFIRE lightweight thermal insulation bricks (volume density 0.8kg/m³) + CCEWOOL 1260 ceramic fiber blankets + CCEWOOL calcium silicate boards.

The burners of the furnace walls adopt a composite furnace lining structure of CCEFIRE lightweight high alumina bricks + CCEFIRE lightweight thermal insulation bricks (volume density 0.8kg/m³) + 1260 CCEWOOL ceramic fiber blankets + CCEWOOL calcium silicate boards.

(3) Soaking section:

The top of the furnace adopts a composite furnace lining structure of CCEWOOL ceramic fiberboard blankets.

