

Research Progress of Hot Dip Coating Technology

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Abstract

Hot dip plating, referred to as hot plating, is a common surface treatment method used to make metal products for a long time. Generally, the treated parts to be plated are immersed in molten metal liquid, and the base material reacts with the coating metal for metallurgical bonding, so as to have specific properties.

Keywords

Hot Dip Plating; Characteristics; Hot Dip Aluminum Zinc Alloy.

1. Introduction

Hot dip plating, referred to as hot plating, is a common surface treatment method used to make metal products for a long time. Generally, the treated parts to be plated are immersed in molten metal liquid, and the base material reacts with the coating metal for metallurgical bonding, so as to have specific properties. Hot dip galvanizing is one of the most widely used steel anti-corrosion methods in the world; Hot dip aluminizing process is difficult, but it has also realized industrial production; Hot dip aluminum zinc alloy is one of the new coatings developed rapidly in recent years.

Hot dip coating has the advantages of simple process, reliable performance, low cost, high production efficiency, convenient mechanized production and rapid application of coating; The hot-dip coating is beautiful and has good corrosion resistance. Therefore, hot dip coating is widely used in steel corrosion protection. Such as steel plates (pipes), profiles, bridges, iron towers, offshore trestles, drilling platforms and derricks, civil buildings, etc.

2. Characteristics of hot dip coating process

Hot dip coating process mainly includes pretreatment, hot dip coating and post-treatment.

Pretreatment: remove the oil stain (alkali washing or high-temperature degreasing) and oxide (pickling) on the surface of the plated parts.

Hot dip plating: the clean substrate surface of the plated part is immersed in molten metal liquid to form a coating.

Post treatment: carry out chemical treatment (such as passivation) and physical treatment (such as oiling, protection and shaping) on the products.

According to different pretreatment methods of hot-dip coating, the hot-dip coating process can be divided into flux method and shielding gas reduction method:

(1) The flux method uses the chemical action of the flux to protect the surface of the steel that has been degreased and derusted from oxidation and further activate it before immersion in the plating solution, so as to ensure the infiltration of the plating solution and the surface of the clean steel substrate, and form an alloy layer through chemical reaction and diffusion. This method has the advantages of simple equipment, low cost, simple operation, easy learning and flexible production. It can be used for batch production or single piece dip coating. Continuous or intermittent dip coating can be adjusted at any time according to the product batch. Moreover, the range of dip coating products is wide and can adapt to products of various varieties and specifications. Therefore, it is of great popularization value in China and it is necessary to conduct in-depth research.

(2) Shielding gas reduction process, also known as senjimir process, is the most common and widely used process for continuous hot dip coating of modern strip steel. This method has the advantages of high production speed, high efficiency, good coating adhesion and no pollution. In addition, the reduction production line has high temperature radiation heating temperature and long annealing time, which can produce well processed products; However, the equipment is complex, the investment is large and the technology is difficult, which is suitable for the mass production of a single product. Because the funds of most hot-dip galvanizing manufacturers in China are relatively weak and the process level can not meet the requirements of this law, the development of shielding gas reduction method in China is greatly limited.

3. Hot dip aluminum zinc alloy

Although hot dip aluminum coating has many performance characteristics better than zinc coating, it can not provide electrochemical protection to steel substrate like zinc coating. In order to integrate the advantages of aluminum and zinc coatings, aluminum zinc alloy hot dip coatings have been developed.

So far, 55% Al Zn alloy hot dip coating is the most successful one among the hot dip coatings of aluminum zinc alloy that have been put into production and Application on different scales. The nominal group of 55% Al Zn alloy hot dip coating is 55% Al, 43.5% Zn and 1.5% Si. The coating is also a double-layer structure. The outer layer is roughly the same as the aluminum coating, and the inner layer is Al Zn Fe intermetallic compound. The purpose of adding a small amount of silicon to the plating solution is to limit the growth of brittle layer. The hot dip coating of 55% Al Zn alloy shows excellent corrosion resistance in a variety of media. The results show that the corrosion resistance of 55% Al Zn alloy coating is much better than that of zinc coating, and can be compared with aluminum coating in some cases; Its high temperature oxidation resistance is better than that of zinc coating, which is close to that of aluminum coating; The coating also has good thermal reflection performance. 55% Al Zn alloy hot dip coating has been used in construction, automobile, household equipment and other industries. Aluminum zinc alloy coating is the main development direction in the field of hot dip coating in the future.

4. Development significance

It is well known that the corrosion of metal materials is widespread in all fields of national economy and people's life. Corrosion has brought great economic losses and harm to mankind. According to incomplete statistics, 230 million tons of metal are lost due to corrosion in the world every year, accounting for about 30% of the steel output of that year. According to the statistics of developed countries, the economic loss caused by corrosion accounts for about 1% ~ 5% of the gross national product of that year.

The problem of metal corrosion in China is also quite serious. The economic loss caused by corrosion accounts for about 4% of the GDP every year, and the indirect loss caused by corrosion is difficult to estimate. For a long time, people have been looking for various methods to reduce the harm of corrosion. Since corrosion begins on the metal surface, surface modification by surface engineering technology has become one of the most active frontier fields of material science. The surface modification of steel can prolong the service life of steel and improve economic and social benefits. As a surface modification technology, hot dip coating is a good anti-corrosion technology.

In recent years, new materials and processes have been widely used in industrial production. Hot dip coating has become the main anti-corrosion method of metal materials all over the world because of its low price and excellent performance. With the further optimization of equipment and process and the common progress with other interdisciplinary disciplines, the hot-dip coating technology will be continuously improved, the application of hot-dip coating technology will be more extensive and the prospect will be broader.

References

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