

Pre-plating Treatment——Degreasing

The surface of steel materials and their parts is easy to generate or adhere to foreign substances during processing, storage and transportation, such as oxide scale, oil stains, processing debris and dust, so they cannot be directly hot-dip galvanized, and appropriate surface treatment is required. The quality of the pre-plating treatment of steel workpieces has a great impact on the quality of the coating, so special attention should be paid to it.

The main contaminants on the surface of steel workpieces and their effects on the coating properties are shown in Table 3-2.

Table 3-2 Main contaminants on the surface of steel workpieces and their effects on the properties of the coating

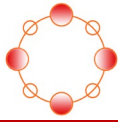
Type		Sources	Main components	Impact on coating performance
Oil stains	Lubricating oil, cutting oil, deep drawing oil, calendaring oil, grinding oil (paste)	Machining process, hot place management process, storage and transportation process	Mineral or animal and vegetable oils, paraffins, resins, various organic additives and inorganic filling materials	Leakage plating may occur
oxides	Oxide scale, yellow rust	Processed and stored Process	ferric oxide, ferric oxide and iron oxide, etc	may cause leakage plating, The amount of zinc slag increases
Solid attachments	Metal shavings, solder slag flux, dust	process, welded process and storage and transportation process	Metal shavings, welding slag, dust	Leakage plating may occur
	Alkali and alkaline salts, neutral salts, acids and acidic salts	heat treatment process, welding process and pickling process	Various salts	Leakage plating may occur
Old coating	Old paint, old plastic	markings, temporary anti-rust coatings and repair parts	Natural oils, resins, fibers, synthetic resins, fibers, various pigments, filler materials	Leakage plating may occur

As can be seen from Table 3-2, the pre-plating treatment in the hot-dip galvanizing process is actually to completely remove the dirt on the surface of the steel workpiece, and at the same time, the surface of the workpiece must be activated, so that the workpiece can quickly react with zinc in the zinc bath, so as to obtain a satisfactory hot-dip galvanized layer. Therefore, the process steps of pre-plating treatment are→: degreasing (or removing old paint), washing→ pickling and rust removal→ washing→ solvent assisted plating→ drying.

1.1 Degrease

1. The effect of degreasing on the subsequent process

In the process of processing, storage and transportation of steel workpieces, oil products with



various organic additives or inorganic substances are often used as the basic components of mineral or animal and vegetable oils, which is the main source of oil pollution on the surface of steel workpieces, and the oil stains must be completely removed through the degreasing process. Degreasing is one of the basic processes of hot-dip galvanizing pre-treatment. For most steel structure hot-dip galvanizing plants, the oil stain on the surface of the workpiece is usually not serious, and the process is often ignored or not paid much attention to its treatment effect. In fact, the quality of the degreasing process will directly affect the subsequent process and the quality of hot-dip galvanizing.

1) Affect the quality of rust removal. The grease and dirt on the surface of the rust layer or oxide scale will hinder or reduce the dissolution and peeling effect of the pickling rust removal solution on the rust layer or oxide scale on the surface of the workpiece, and slow down the rust removal speed.

2) Affect the quality of solvent auxiliary plating. Before hot-dip galvanizing of the workpiece, it should be auxiliary plating in zinc ammonium chloride solution, and a thin solvent layer should be formed on the surface of the workpiece after auxiliary plating. The formation of this thin layer of solvent depends on the good contact of the solvent with the surface of the workpiece, which will determine the quality of the hot-dip galvanizing of the workpiece. To ensure this, it is necessary to do a good job of degreasing and rust removal. If the foreign matter on the surface of the workpiece is not completely removed, these foreign substances will play a mechanical barrier role when the workpiece is plated, delaying the chemical effect of the solvent on the workpiece, and affecting the formation of a good solvent thin layer on the surface of the workpiece.

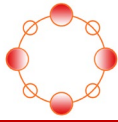
3) Affect the quality of the coating. If the degreasing is not thorough, the coating effect of the workpiece is not good, and the coating solvent layer covered on the surface of the workpiece is uneven or not activated, which will lead to leakage of plating during hot-dip galvanizing.

2. Classification of oils

Industrial oils and oils can be divided into two categories according to their chemical properties: saponified and non-saponified oils. Any greasy substance prepared from animal and plant systems that is insoluble in water and has a smaller density value than water is called grease. These oils and oils can work with alkalis to break down into lipaates (soaps) and glycerol that dissolve in water, a reaction called saponification. This type of oil is called saponified oil.

Mineral oils (such as gasoline, petroleum jelly and various lubricants, etc.) are also called oils, but they are different from the composition and properties of oils. Mineral oil is a mixture of hydrocarbons such as paraffin hydrocarbons and epoxy hydrocarbons. This type of oil is insoluble in water and does not saponify with alkali, so it is called non-saponified oil.

3. Degreasing method



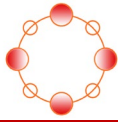
After mastering the different characteristics of oil and the degree of contamination on the surface of the workpiece, you can choose the degreasing method in a targeted manner. The basic methods and characteristics of degreasing steel workpieces are shown in Table 3-3.

Table 3-3 Basic methods and characteristics of degreasing steel workpieces

Degreasing method		How to use	Features	Scope of application
Organic solvent degrease		Soaking, spraying, etc way	Both saponified and non-saponified greases can be dissolved and generally do not corrode the workpiece. Degreasing is fast, but not complete, and requires chemical or electrochemical supplementation of degrease. Organic solvents are flammable, toxic, and costly	It can do preliminary degreasing of small workpieces with complex shapes, workpieces with serious oil stains and workpieces that are easily corroded by alkali solution
Chemical degreasing		Soak, spray or Roller and other methods	The method is simple, the equipment is simple, the cost is low, but the degreasing time is long	General workpiece degrease
Electrochemical degrease		Cathodic electrolytic degreasing, anodic electrolytic degreasing	The degreasing efficiency is high, and it can remove mechanical impurities such as floating ash and erosion residues on the surface of the workpiece, but the cathodic electrolytic degreasing workpiece is easy to permeate hydrogen, and the oil in the deep hole is slow to be removed, and DC power supply equipment is required	General workpiece degreasing or anodizing to remove erosion residues
Physical and mechanical degrease	Wipe method	Use a brush or rag Stick degreaser wipe	The operation is flexible and convenient, not limited by the workpiece, but the labor intensity is high and the productivity is low	Workpieces that should not be degreased by other methods
	Combustion method	The workpiece heats up 300~400°C	Grease can be completely burned, but residual charcoal may remain on the surface of the workpiece	
	Sandblasting (Pellet)	Sandblasting (dry or wet blasting), shot blasting	Degreasing and rust removal can be done in one go, but it is not suitable for workpieces with small section thickness	

For workpieces with serious surface oil stains, one of the methods in Table 3-3 can be used for degreasing, or several methods can be combined, such as chemical degreasing first and then electrochemical degreasing first. However, for most hot-dip galvanized steel workpieces, the oil stain on the surface of the workpiece is usually not particularly serious, and the degreasing method can be relatively simple, and the commonly used hot-dip galvanized degreasing method is described below.

(1) Hot alkali solution method Most steel structural parts are large in size and light in oil stains, so it is advisable to choose a low-cost chemical degreasing method in the degreasing method. The hot alkali solution method is one of the chemical degreasing methods. The hot alkali degreasing solution is suitable for most oily surfaces, such as surfaces with soluble oils, deep drawing or rolling lubricants, etc., and also has a removal effect on certain paints, quick-drying paints and varnishes. The commonly used hot alkali solution is 100~150g/L NaOH concentrated solution, which is a powerful cleaning agent that can remove most of the saponified grease and non-saponified grease.



Particular care should be taken to prevent splashing when preparing this solution to prevent burns. The alkali degreasing solution is usually used at a temperature of 85°C, and the impregnation time is 1~20min according to the nature and degree of pollution. The general processing time is less than 5 minutes. If you increase agitation, you can also shorten the time. If the oil on the surface of the workpiece is light, it can also be immersed in an ordinary surfactant solution with a mass fraction of 0.5%~1.0% at 60°C to remove it. The workpiece is suspended in a degreasing bath, so that the circulating solution flows freely on the surface of the workpiece, and the reaction products will sink to the bottom of the pool. If there is foam accumulation on the surface of the degreasing bath, it should be removed in time, and the silt formed by the reaction products sinking to the bottom of the pool can be left until the solution is replaced.

The workpiece should be washed immediately after degreasing in hot water or, if possible, in cold running water. If the workpiece enters the pickling process without washing, the alkali attached to the surface of the workpiece will react with the acid, resulting in unnecessary waste of acid. In addition, cleaning after degreasing should not be carried out in the same pool as cleaning after pickling, because if the cleaning pool is weakly acidic, it will cause the decomposition of the degreaser attached to the workpiece after degreasing, forming foam on the surface of the workpiece, and affecting the subsequent pickling effect. If the workpiece is simply degreased in a dilute detergent, it does not need to be cleaned.

For enterprises engaged in hot-dip galvanizing of special workpieces, the method of degreasing and electrolytic degreasing of hot alkali solution can also be used at the same time to completely degrease the workpiece.

(2) Cold alkali solution method This method can be degreased at room temperature, and cold alkali solution is usually based on phosphate. The cold alkali solution method is suitable for cases where the oil on the surface of the workpiece is light. The cleaning step of degreasing is still more important.

(3) Other methods If there is only a small oil stain on the workpiece, it can be removed by manually dipping the solution and wiping, but the wiped surface should be clean to avoid expanding the contaminated surface.

For workpieces with slight oil stains, some companies also use shot peening to remove them. In addition, heating in the furnace to decompose the oil on the surface of the workpiece is also a degreasing method used by some enterprises.