Hot-dip Galvanizing Process Classification and Process

The hot-dip galvanizing process is first recorded in 1742, when the French chemist Melouin invented a method of protecting iron, that is, immersing iron in molten zinc. In 1836, another French chemist, Sorel, formally applied for a hot-dip galvanizing patent, which clearly described the process of cleaning steel in sulfuric acid, and then hot-dip galvanizing with ammonium chloride assisted plating. In 1837, Britain granted a patent for a hot-dip galvanizing process similar to Sorel's, which was soon used for industrial production. By 1850, the annual output of hot-dip galvanizing of steel structural parts in Britain had reached 10,000 tons. In the following 100 years, hot-dip galvanizing has been widely used as a steel anti-corrosion technology. The hot-dip galvanizing process has also been continuously developed and improved in industrial practice, and a relatively mature process system has been formed.

According to the different types of plating parts, hot-dip galvanizing can be divided into continuous hot dip galvanizing and batch hot-dip galvanizingbatch hot dip galvanizing). Continuous hot-dip galvanizing is a method of obtaining hot-dip galvanized parts through a zinc bath at a continuous high speed (such as the maximum speed of strip steel) at high speed (such as the maximum speed of strip steel can reach 200m/min), and its products are widely used in the automobile industry, construction industry and daily civil products, and the amount is huge. In order to adapt to the large number and rapid production, the continuous hot-dip galvanizing process has gradually developed and produced great changes, and many process methods have appeared, such as solvent method, Cook-Norteman method, Sendzimir method, modified Sendzimir method and American steel joint method. Batch hot-dip galvanizing is a method of immersing steel structural parts into a zinc bath in batches to obtain hot-dip galvanized parts. Its products such as transmission towers, power fittings, highway guardrails, street lamp poles and signs, etc., are widely used in transportation, power and other departments. In recent years, the successful application of batch hot-dip galvanizing in bridges, building steel structures and steel bars, communication microwave towers, mining machinery, shipbuilding, etc. has broadened the application prospects of batch hot-dip galvanizing technology. With the more and more widely used in batch hot-dip galvanizing, the batch hot-dip galvanizing process is becoming more and more perfect. This chapter focuses on the batch hot-dip galvanizing process, and the hot-dip galvanizing process described in the article refers to the batch hot-dip galvanizing process.

The batch hot-dip galvanizing process usually consists of pre-plating treatment, hot-dip galvanizing and post-plating steps. Pre-plating treatment includes degreasing (or removing old paint), pickling and rust removal, solvent assisted plating and drying; Post-plating treatment usually

includes cooling, passivation and workpiece trimming, and some products may also need to be painted. According to its auxiliary plating methods, the hot-dip galvanizing process is usually divided into wet galvanizing and dry galvanizing, and its process flow is shown in Figure 3-1.

As can be seen from Fig. 3-1a, wet galvanizing is to cover the surface of the zinc bath directly with the co-plating solvent, and the solvent layer is thickly covered on the entire surface of the zinc bath, or only on the surface of the zinc bath on the side of the zinc pot partition. In this way, the degreased and pickled steel workpiece can enter and exit the zinc bath through the solvent layer; or directly into the zinc bath and removed through the solvent cover through the underneath of the partition; or pass through the solvent layer as it enters and is removed directly from the zinc bath through the underneath of the partition. Dry galvanizing (see Fig. 3-1b) is a process method in which the co-plating solvent is placed in a separate auxiliary plating solution tank, and the degreasing and pickled workpiece is immersed in the auxiliary plating solvent pool for auxiliary plating, and then immersed in the zinc bath to obtain a hot-dip galvanized layer.

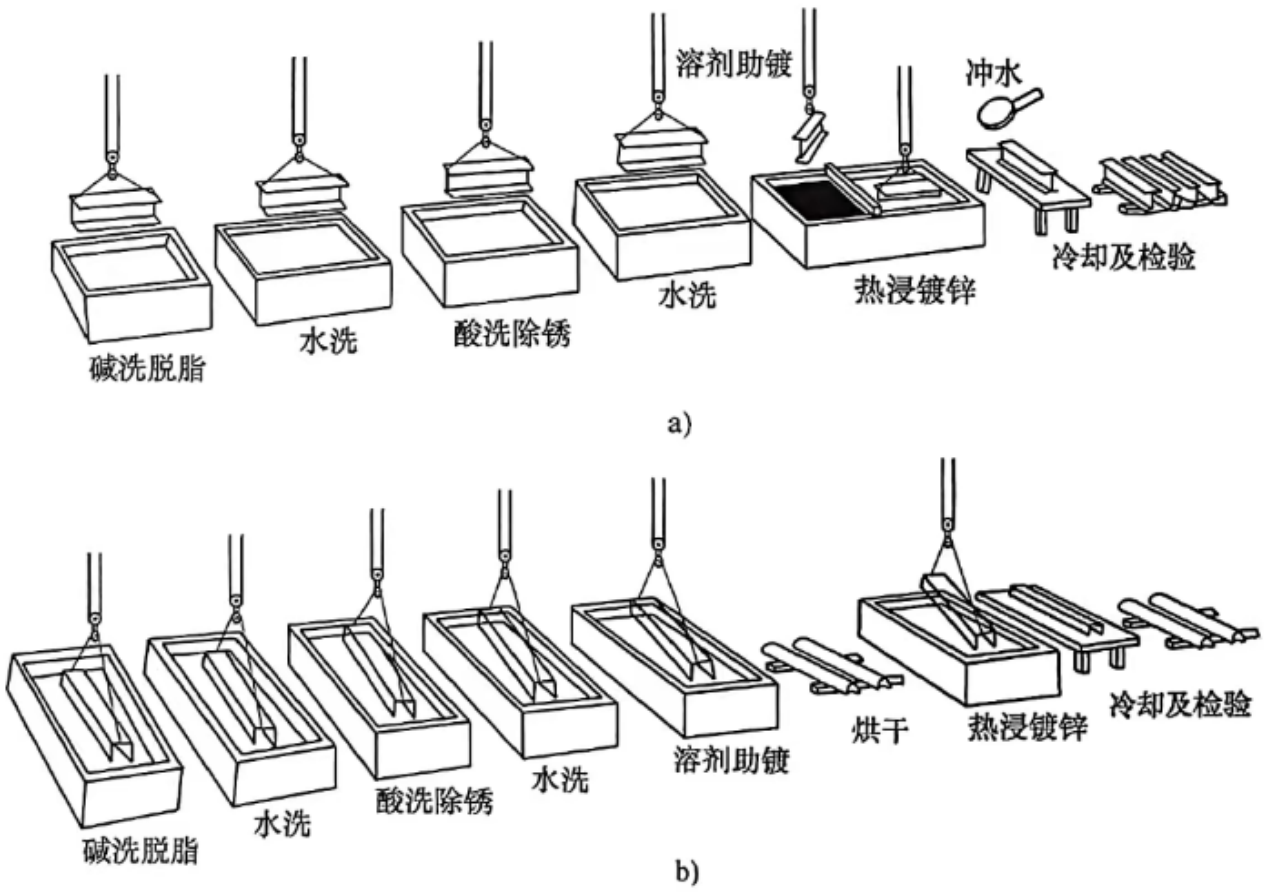

图 3-1　热浸镀锌的工艺流程

a）湿法镀锌　b）干法镀锌

The advantages and disadvantages of wet and dry galvanizing processes are still a topic of

debate in the hot-dip galvanizing industry. In fact, the choice of process should depend on the type and needs of the steel workpiece. Generally speaking, the wet galvanizing process is mostly used to produce thin coatings, because when the workpiece is pulled out of the solvent on the surface of the zinc bath, it is advantageous because the solvent has a wiping effect on the surface of the workpiece The zinc liquid on the surface of the workpiece flows back quickly, so that the coating on the surface of the workpiece is thinner. For complex workpieces, the solvent overlay prevents zinc splashing (commonly known as zinc burst) because the workpiece is not easy to dry. In addition, when using the wet galvanizing process, the number of lifting times of the workpiece can be reduced, and the zinc ash produced is relatively small. However, if there is solvent residue on the surface of the rinsed workpiece, the solvent can contaminate and corrode the plated. Zinc loss is easy to cause when replacing the solvent cover, and the cost of maintaining the solvent layer is also high. The advantages of the dry galvanizing process are high output, low zinc slag generation rate, and cleaner air in the workshop.

With the development of modern hot-dip galvanizing enterprises towards large-scale and high efficiency, wet galvanizing is rarely used, and most hot-dip galvanizing enterprises use dry galvanizing.