**Research on Valve Epoxy Coating Technology**

With the continuous development of modern industrial technology, different production fields have put forward higher requirements for industrial processing methods. Traditional industrial production materials and processes have been difficult to meet the development needs of the current production field. Epoxy coating technology is currently a relatively advanced industrial processing technology. By using this technology, a coating with good wear resistance, corrosion resistance, and high-temperature oxidation resistance can be produced on the surface of mechanical parts, thereby protecting the working surface of the part, and extending its working life. Ensure the safe operation of equipment.

Epoxy coating technology is a process technology in which the coating powder material is fed into a heat source to be heated and melted, and then sprayed on the surface of the substrate with a high-speed airflow to form a protective coating. The protective coating made by epoxy coating technology has the characteristics of corrosion resistance, wear resistance, high-temperature resistance, and heat insulation. In addition, this technology can also repair some parts whose dimensions have changed due to wear and corrosion. Today, epoxy coating technology has been widely used in machinery manufacturing, petrochemical, aviation equipment manufacturing fields.

**1. Epoxy coating technology**

Epoxy coating technology is one of the surface modification technologies and is also an important part of the development and application of surface engineering. The so-called Epoxy coating technology uses a heat source to heat and melt or soften the sprayed material, relying on the heat source itself or an external compressed air flow to atomize or push the droplets to form a sprayed particle beam and spray it to the preheated particle at a certain speed. The processing method of the surface of the workpiece to form a firm coating with certain special properties.

According to the formation principle of epoxy coating, the epoxy coating process can be divided into four stages:

1. the spraying material is melted;
2. the molten material is atomized;
3. the atomized spraying material is sprayed forward Stage;
4. the spraying material deposition and forming stage.

When the sprayed material is melted at a high temperature and touches the surface of the substrate at a certain speed, the material particles will have a certain kinetic energy, and then continue to impact and collide on the surface of the substrate. At the moment when the spray material particles contact and collide with the substrate, the kinetic energy contained in the particles will be converted into heat energy and transferred to the substrate, thereby causing unevenness on the surface of the substrate. At this time, the cooled particles will be flat and adhere to the substrate. Surface, and then fill the potholes. The sprayed particle beam continuously impacts the surface of the substrate and repeats the process of collision-deformation-condensation-shrinkage. The deformed particles and the surface of the substrate and between the particles are interlaced and bonded together to form a coating surface.

**2. Category analysis of epoxy coating technology**

**a. Flame spraying technology**

The basic characteristics of flame spraying technology are: general metal and non-metal substrates can be sprayed, and the shape and size of the substrate are usually not limited, but small holes cannot be sprayed at present; the coating materials are wide, including metals, alloys, ceramics, and composites. The materials can be coating materials, which can make the surface have various properties, such as corrosion resistance, wear resistance, high temperature resistance, heat insulation, etc. The porous structure of the coating has oil storage lubrication and antifriction properties, and contains hard phases. The macroscopic hardness of the sprayed coating can reach 450HB, and the spray welded coating can reach 65HRC; flame spraying has little effect on the matrix, the matrix is ​​deformed, and the material structure does not change. Disadvantages of flame spraying technology: the bonding strength of the spray coating and the substrate is low, and it cannot withstand alternating loads and impact loads; the preparation of the substrate surface requires high; the flame spraying process is affected by a variety of conditions, and there is no effective detection method for coating quality. Common flame spraying methods include acetylene-oxygen flame powder spraying and acetylene-oxygen flame wire spraying. The equipment used for acetylene-oxygen flame powder spraying is simple and can be constructed on-site and is suitable for equipment maintenance.

**b. Plasma spraying technology**

Plasma spraying technology is a technology that can strengthen the surface of the substrate or change the surface properties. This technology can enhance the wear resistance, corrosion resistance, insulation, thermal insulation, and radiation protection of the substrate surface. Plasma spraying technology uses a direct current drive as a spraying heat source, then heats ceramics, alloys and other materials to a molten state or a semi-molten state, and then uses high-speed airflow to spray to the surface of the substrate. Plasma spraying technology is a new type of multi-purpose precision spraying method vigorously developed after flame spraying. It has ultra-high temperature characteristics and is convenient for spraying high melting point materials. The spraying speed of particles is high, the coating is dense, and the bonding strength is high. advantage. In addition, since the plasma spraying technology uses an inert gas as the working gas, the plasma sprayed coating is not easily oxidized.

**c. The principle and application of supersonic flame spraying technology**

Supersonic flame spraying (HVOF for short) is a new type of epoxy coating technology developed since ordinary flame spraying in the early 1980s. It uses hydrogen, acetylene, propylene, kerosene, etc. as fuel, and oxygen as a combustion-supporting agent. It is burned in a combustion chamber or a special nozzle to produce a supersonic combustion flame up to 2000-3000°C and a speed above 2100m/s. The powder is sent into the flame to produce melted or semi-melted particles, which are deposited on the surface of the substrate by high-speed impact to form a coating. The coating prepared by the supersonic flame has higher bonding strength and denser than the coating prepared by ordinary flame spraying or plasma spraying.

**d. Arc spraying technology**

　　 The work efficiency of arc spraying technology is very high, at the same time the work cost is relatively low, the substrate is less affected by heat, so this technology is widely used in anti-corrosion, repair, special coating, etc. However, compared with plasma spraying and supersonic flame spraying, the coating quality of arc spraying is lower, the bonding strength is about 20MPa, and the porosity is 3%-10%, which limits the application range of arc spraying technology.

**3. Application of epoxy coating technology in petrochemical industry**

In the petroleum industry, some oilfield drilling equipment parts, lifting equipment parts, pumps, ball valves, pipe joints, various pipelines and other parts that require corrosion resistance and wear resistance may consider using epoxy coating technology to extend their service life. In the existing research, the inner coating technology of the sucker polished rod has made a breakthrough, and it has been promoted and applied in the Tarim Oilfield. This technology mainly solves the problem of the corrosion of the sucker rod caused by crude oil. The coating on the inner wall of the polished sucker rod is also a breakthrough in spraying technology. For the wear problem of drilling tools, epoxy coating Ni, Cr, Si and other alloys on the coupling can increase the service life of the coupling by 5-8 times, and spraying or laser cladding WC/Co alloy on the drill bit to improve The hardness and wear resistance of the drill bit greatly improve the use efficiency of the drill bit. In addition, epoxy coating technology is also widely used in screw pumps in heavy oil exploitation. Due to serious scaling and abrasion, the pump can not work normally due to the short pump inspection cycle. Nano-doped Al2O3+TiO2 plasma spraying is used in the oil field exploration test. Application, and achieved good results. The catalytic equipment of the oil refinery is in a severely corrosive environment, and the equipment is plasma sprayed with cemented carbide powder to extend the service life of the equipment. Through the epoxy coating and sealing treatment of aluminum alloy on the steel structure of the offshore drilling platform, the problem of seawater corrosion to the platform is well solved.

After years of development, my country's epoxy coating technology has made great breakthroughs and progress, and has made a very important contribution to my country's national economic growth. In the future, the development and research process of epoxy coating technology should be based on the function and failure analysis of products and components, coating system design, epoxy coating materials, equipment production and R&D, quality inspection and product certification, market development and marketing, and industrial development. In terms of technical consultation and services, a complete industrial system has been formed and the continuous development of epoxy coating technology in China has been promoted.