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Uni-TechSpace

Surface Treatment

A member of SFS

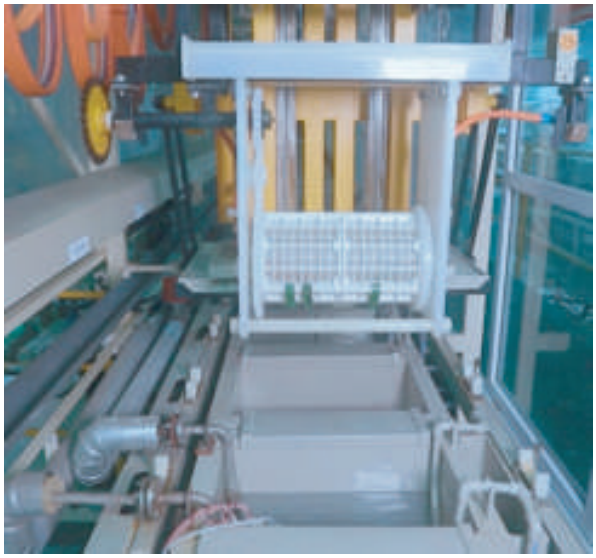
Surface treatments are applied on parts to achieve specific purposes. While there are many varied reasons for parts to be surface treated, it is mainly employed to improve appearance (cosmetics), adhesion, wettability, solderability, corrosion resistance, electrical conductivity, chemical resistance and even be used to meet specific cleanliness requirements such as LPC, IC, FTIR & HPA, amongst others. Usually, it is carried out at the last stage of the manufacturing process. provides a variety of different high-quality treatments on our parts to meet and exceed the customer's requirements.

Some of the common available technologies on Surface Treatment in are briefly described as follows.

Zinc Plating

Acid & Alkaline Zinc plating processes are most common Barrel types used in Zinc plating system.

Hydrogen de-embrittlement is necessary to prevent catastrophic failure. The process is based on 4hrs, 8hrs or 12 hrs with 200^{o}C baking.



Advantages

- Increases corrosion resistance with an additional increase in resistance when chromates and sealers are used
- Increases part lubricity therefore improving clamp load of a fastener
- zinc plating serves as a good paint base and is available in many colours (black, clear, blue, green etc) to improve part aesthetics and for easy identification

Nickel Plating

Nickel plating is a technique of electroplating a thin layer of Nickel onto a metal object. It uses Barrel type with Nickel Sulphate, Nickel Chloride & Boric acid.

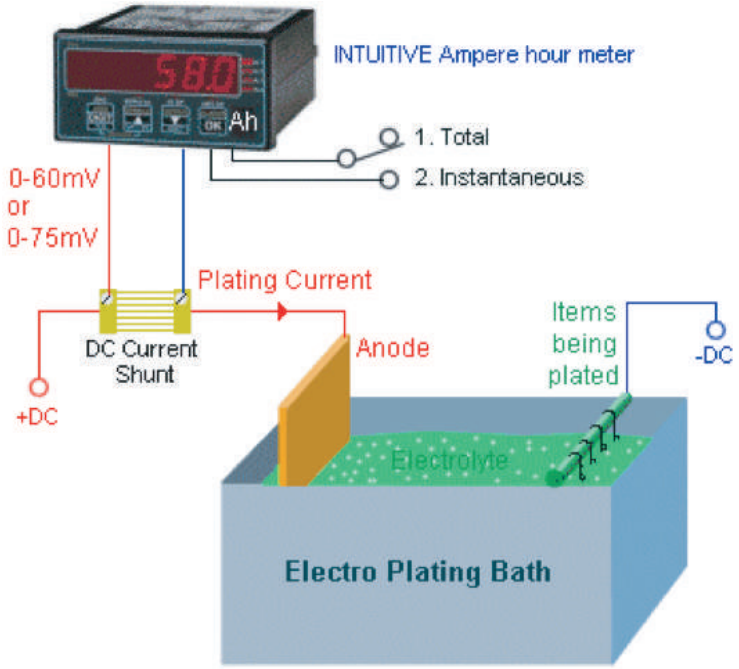
The parts are immersed into an electrolyte solution and are used as cathode. The nickel anode is dissolved into the electrolyte to form nickel ions. The ions will then travel through the solution and deposit on the cathode/parts.

Activating on stainless steel is very important, so to provide excellent adhesion to the final plating. The most common methods used today are Wood's Nickel strike, anodic treatment, cathodic treatment & acid etching process.

Hydrogen de-embrittlement process is necessary by baking the parts at 200°C for several hours.

Advantages

- Nickel layer can be decorative
- High corrosion and wear resistance
- Chemical resistance
- Improve hardness of the parts



Electro Plating Set Up

Electroless Nickel Plating

Electroless Nickel (EN) plating is an auto-catalytic chemical technique used to deposit a layer of nickel-phosphorus or nickel-boron alloy on a solid workpiece, such as metal or plastic. Unlike electroplating, instead of passing electric current through the solution to form a deposit, EN plating relies on chemical reactions to achieve the result.

Advantages

- It provides an even deposit regardless of workpiece geometry, this means parts that are not able to be electro-plated can be plated with EN plating instead
- With proper pre-plate catalyst, EN plating can also be used on non-conductive materials
- EN plating alloys come with different percentage of phosphorus, ranging from 2~5% (low phosphorus), 6~9% (Medium phosphorus) & 10~14% (High phosphorus) are possible. Each offering different performance

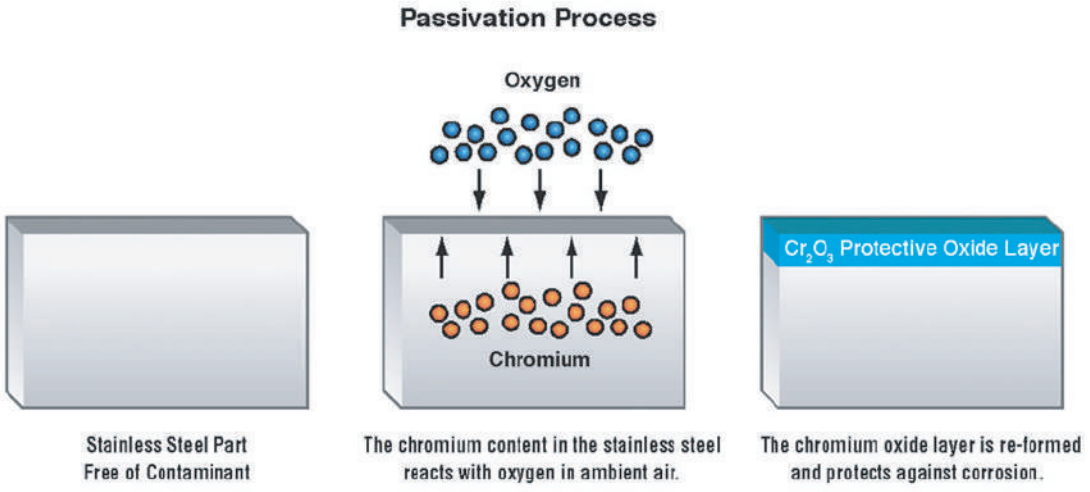
Passivation

Passivation is a treatment process of removing any free iron ions from the surface of stainless steel parts so to achieve optimum corrosion resistance. Passivation system uses both Barrel & Basket type with chemicals consist of Nitric Acid & Citric acid respectively.

When a stainless steel part is newly made in the fabrication process, it was cleaned with detergent or alkaline cleaner to remove oils and greases. During passivation as nitric or citric acid is used, slowly and naturally a passive layer develops on the surface of the steel part when the chromium at the surface reacts with oxygen in the air to produce chromium oxide.

Advantages

- Chromium oxide layer is invisible and only a few molecules thick and it provides a barrier to prevent oxygen and moisture from reaching the iron underneath.
- Prevent rusting of iron in the stainless steel



Passivation Process Chart

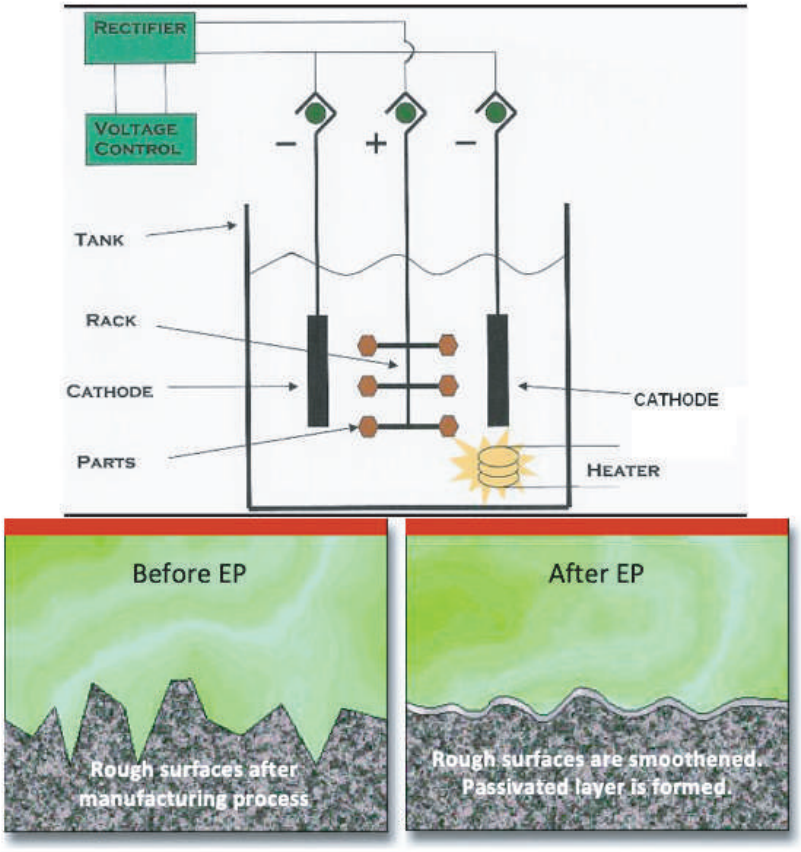
Electro - Polishing

Electro-Polishing (EP) process, also known as electrochemical polishing, anodic polishing, or electrolytic polishing, is a process that removes material from a metallic workpiece and reduces the surface roughness by levelling micro-peaks and valleys, hence improving the surface finishing.

EP process is mostly performed on stainless steel materials and can be often described as the reverse of electroplating. By reversing the current potential, the part's material is removed during the process.

Advantages

- Polish, passivate, and deburr metal parts to achieve smooth and shinny surface finish



EP Process Chart

Aqueous Washing

Aqueous AQ Washing utilises ultrasonic as an effective cleaning method. This method uses high frequency (ultrasonic) waves to induce cavitation bubbles in order to agitate the cleaning fluid with the parts. As a result, high forces are produced on contaminants adhering to substrates like metals, plastics, glass, rubber, and ceramics. This action can also penetrates blind, cracks, and recesses.

Water, solvents and detergents are often used as the cleaning fluid, depending on the type of contamination and the part.

Advantages

- Effective in improving cleanliness of parts by reducing Liquid Particle Count (LPC) and removing contaminants dissolvable by the cleaning agent
- Removal of contaminants adhering or embedded onto solid surfaces and loose burrs from parts

Heat Treatment

Heat treatment, also considered as a type of surface treatments, is used to modify the surface properties of the parts. It is defined as an operation involving the heating and cooling of the metal alloy in a solid state to obtain certain desirable properties (by modifying microstructure of the material) without changing its chemical composition. Heat treatment system uses either a batch furnace and a conveyer mesh belt type furnace.

In carbon steel heat treatment, steel parts can become hard and brittle with high residual stresses after the carburizing process. After which they can be tempered to relieve the internal stresses caused by the initial carburizing process. Tempering can also reduce brittleness, improve ductility, strength and toughness of the part.

Advantages

- Improve ductility, strength and toughness of the part
- Applicable to a variety of materials
- Modify surface properties of material without changing its chemical composition
- Tempering can be done after heat treatment to reduce brittleness and internal stress

Summary

This provides a brief technical overview of the various treatments available in All the processes shown here are our in-house processes, making truly a market differentiator in the production of precision engineered components.

The list of surface treatments does not end here, there are also other specialized surface treatments available in :

- **Uni-Lube®** for friction reducing coating
- **Uni-Patch®** for passive thread locking coating
- **Uni-Seal®** for passive thread locking coating offering water ingression protection
- **Uni-Color®** for cosmetic and color coating
- **PVD (Physical Vapor Deposition) coating** for cosmetic and colour coating
- **Tumbling** process for burr removal and polishing of parts
- **Sand Blasting** process for surface texture modification of parts

For more information on how our process can help in your parts or products, feel free to approach us at ***sales@unisteeltech.com***