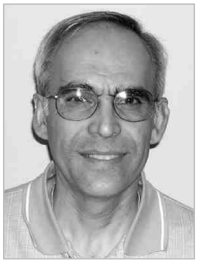
Finisher's Think Tank



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Some Nickel Plating Considerations

The unstable pricing situation with regard to metals has certainly been felt in a major way by platers. Let us consider nickel as an example of what is occurring and how it can be addressed. The direction of intensity is pointed upwards, as the cost of nickel salts and anodes have risen more so than dropping or stabilizing. Consequently, the cost of plating challenges the sales profit margin. This is somewhat balanced by adjusting the price or adding a surcharge. Price increases are passed along the manufacturing and sales chain, ultimately to the final user or consumer. This is not a situation wanted by any of us. Rather, it is a problem that we acknowledge, and to some degree, strive to minimize, absorb or tolerate. How can this be done? There are several consequences of nickel plating that will facilitate the process, and hold or minimize related cost.

The Surface Preparation Cycle

Evaluate the cycle progression and specific treatment and conditioning of parts with respect to meeting the specific plating application. Start with the base metal. Is it a common steel stamping or high-carbon, hardened steel? If non-ferrous, how much do you know about the material? Is it a copper alloy, perhaps high in tellurium? A zinc die casting could be a zamak 1,2, or 3 alloy. Brass might contain anywhere from 0.5 to 2 percent lead. Aluminum could offer a wide range of alloys and castings. These examples of metal types strongly influence what type of surface preparation cycle is appropriate, even before considering the plating section. Knowing what we are to process must also include it's physical appearance. Take note of rust, oxidation, scale, loadings of oil and grease. Perhaps the parts have arrived with some type of protective coating. It could be a flash plating deposit, chromate, wax, oil, or paint. Any of these materials must first be stripped or removed, in line or off line, as the case dictates.

Be certain the process bath chemistry is compatible with the basis material being conditioned or treated. This regards cleaning to remove oils and grease, activation, desmutting, descaling or derusting. Also, confirm that all solutions will not attack the parts, if this is critical. If the application is attack, such as etching aluminum, be certain the right type is applied. Selections include mild or heavy etch, controlled etch, or acidic versus alkaline etching. Activation may require neutralization of alkaline cleaner films and light pickling. Or, it may need aggressive treatment for derusting or descaling, by immersion or in a charged solution. Desmutting aluminum is influenced by the alloy or casting. The optimum desmutting solution will adequately dissolve the metallic oxide smuts. Aluminum undergoes a special zincating step, depending on the material and subsequent plating, that would favor a single versus double zincate.

These examples are given to magnify the importance of surface preparation (cleaning and activation) before plating.

The Plating Cycle

In some instances the nickel deposit may be preceded by a copper strike, copper plate, or similar coatings. For steel, brass, and copper, nickel may be deposited directly over these base metals. Zincated aluminum may receive a protective strike deposit consisting of copper, electroless nickel, or Watts electrolytic nickel. For whatever the plated coating or strike deposit, quality is inherently related to the optimum condition of the plating bath, at correct operating parameters. Therefore, regular, routine analysis is very important to verify correct bath chemistry. Follow the recommended operating conditions (temperature, current density, amp hour additions of additives, etc.). It is most important to accept the fact that Faraday's Law cannot be circumvented. It is what it is as far as the plating rate is concerned.

The Nickel Bath

Selecting the nickel bath is based on the requirement for the job. It may range from a simple bright and leveled deposit to a ductile engineering type. The customer should always provide a specification, be it "shiny look," military, ASTM, or corporate. Automotive finishing may require a duplex nickel before chrome. Plating on stainless steel wouldn't happen without a primary Woods nickel strike. Electroless nickel provides several bath types for brightness, deposit hardness, and corrosion protection. When considering economics versus appearance, nickel brightener systems fill most applications. If nickel thickness is not a critical parameter, rapid leveling with a bright, thinner deposit may be sufficient and save on the cost of depositing nickel. Separate additives are available to control the deposit characteristics, for any given application (*e.g.* semi bright, leveled, ductile). For standardized nickel deposition cycles, the proprietary additives may be continually dosed on an ampere-hour basis by using calibrated ampere-hour meters. This greatly helps to maintain reproducible deposit characteristics from load to load on a continual shift basis, while economizing on the additives.

Keeping it Right

Basic troubleshooting information helps not only to detect and correct nickel plating problems, but also to help avoid them. Whatever can be done should be done as far as incorporating analysis control (wet

chemistry and hull cell) on a routine basis that is practical for the application and work load. Many job and captive installations are ISO certified, which should include good process control efforts. Suppliers provide regular service visits and lab analysis capability. Nickel salts and boric acid should be of acknowledged quality control consistency. Vendors can provide written QC specs for purchased lots of materials. Organic additives, such as brighteners, levelers, wetting agents, and purifiers, are typically blended using raw materials of highest purity assays. Anodes are the primary source of nickel ions in the plating sequence. Replenish the anode baskets as required to keep their levels consistent with the plating requirement.

In spite of high costs for nickel anodes and plating salts, the related expense to nickel plate should not become prohibitive. There are many routine, easily accomplished activities related to maintenance and control, that will keep operating expenses in line. Adherence to control and planning the cycle should provide the optimum, desired nickel deposit characteristics. It is very important to acknowledge the critical effect that proper surface preparation has before the plating step.

The discussion in this article has one basic aim. It is to minimize as much as possible nickel plating rejects. Having to reprocess parts will easily triple the cost of the initial effort. Scrap negates all the expense in labor and equipment that was invested to fabricate the parts. By careful planning and cycle implementation, the related costs of nickel plating can be maintained at reasonable levels.

Fact or Fiction

(Continued from page 25)

bystander watching us create havoc with our environment. We also had help from pre-industrial revolution man.

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