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Nickel Plating— Additional Tips for Good Service Performance

Nickel plating has been a preferred and specified process for a long time, in many finishing applications. Over the years, various methods of control, maintenance, troubleshooting and corrective measures have been developed that have been successfully implemented by platers. Such procedures include analysis, interpretation of deposit (parts and Hull cell), accurate determination of problems, optimum treatments, and timely maintenance.

Let us review some items or tips that may supplement current practices. This infusion of practical information should help the particular nickel plating bath operate better and more consistently.

Surface Preparation

Don't sell yourself short. Nickel solutions are poor cleaners. Characteristically, cleaning problems (insufficient activation, poor rinsing practices, presence of rust and surface oxides) are magnified in nickel plating. Hazing, streaking, miss or skip plates, and ductility problems all become readily evident. If the problem does precede nickel, correct it in the appropriate process bath. Do not load or deluge the nickel bath with chemicals or unnecessary treatments! This will only exacerbate the problems and create new ones, exponentially worsening the general condition.

The Parts

The customer and plater should agree on what type of finish is required. Factors that include desired appearance of nickel and deposit thickness are very important. The particular job may range from from "bright, aesthetic plating" to adhering to a specific MIL or ASTM spec. Getting the facts will help the plater develop the best cycle to process the parts along with production requirements. Base metals are also very important.

Two examples are given as brief reminders of what should be taken into account. Parts such as zinc castings must include a copper strike before nickel. The copper deposit should adequately cover the base metal surface.This seals it for the nickel layer and minimizes zinc contamination in the nickel bath.

Aluminum parts needs special surface preparation and zincating, followed by a strike (typically Watts nickel, copper, or electroless nickel). Deposit failures (blisters, peeling, poor adhesion) after bright nickel plating may be the result of problems before nickel plating.

Controls

Achieving desired nickel deposit thickness is based on several factors. Total surface area of parts must be in proper ratio with rectifier current output, to meet the plating current density. Racking of parts or filling the barrel should conform to the best load size, bonding the production and quality requirements. Plating rejects (caused by burning, formation of nodules or thin deposits), would indicate current-related controls are not properly set.

Bath temperature affects conductivity. Be certain the rectifier has been checked for accurate current output and that AC ripple is within equipment specification. The bath is another control. Confirm that its wet chemistry and levels of plating additives are adjusted correctly for the job.

Look & See

It's hard to prevent complacency when the daily routine may be very repetitive. This could prevent line personnel from observing conditions that may be precursors to serious problems. Make the job interesting and challenging. Stay focused on the project at hand. Count the parts as they enter the processing tanks. Racks exiting the tanks should contain the same number of parts. Observe the flight bar or racks for any missing parts. Loose-fitting barrel clamps or warped doors invite parts to take a plunge. Dropped parts will start corroding, gradually poisoning the bath with dissolved contaminant metals. Accumulated parts could bridge, causing equipment to etch and corrode. Go fishing regularly. Drag the tank for parts. A roller magnet is useful for retrieving small- to mid-size steel parts.

Don't be too complacent about how the equipment is operating. Rotating barrels that jump in the saddle are not making continuous contact. Is that why the deposit flakes? Hooks making contact on the cathode bar should not be red- hot. Make certain the contact is good and the copper bar is of sufficient thickness for the load-carrying requirement. Rack tips and barrel danglers should exhibit a clean, white nickel deposit. A black, gray, smutty condition indicates that a purification treatment is in order. In barrel plating, don't overlook the perforations. If they are plugged, do the obvious: clean them and see the light.

Are there enough nickel anodes in each basket? Try poking them with a rod. Sometimes the top layer nests, while the lower levels of the basket are empty. Maybe no one has recently checked and the level of nickel anodes has dropped way low. Fill'er up to maintain satisfactory current distribution. Is the bath too cold? The tendency for nickel wetting agents to foam increases with decreasing bath temperature. Check the gauge pressure on the nickel filter. If it's high or exceeds the manufacturer's suggested range, the filter could be clogged and useless. One to two turnovers of bath volume per hour certainly beat a trickle.

Why do we dummy? The answer is simply to plate out metallic contaminants. A steel dummy has lots of low current density surface area, in the form of accordion pleats or expanded metal. Observe the deposit appearance in the recesses. If it's gray or black, keep dummying at the correct ASF for the suspected metals, until the deposit is, preferably, white nickel.

Additions

All the proprietary nickel additives available have been developed to provide the optimum dosages for particular deposit characteristics. These products are consumed either by electrolysis and/or by drag-out. Be familiar with how each additive contributes to the maintenance and control of the nickel plate. Always ask the vendor or supplier for guidance. Address specific inquiries. Brightener additives for nickel usually retain an effective shelf life for up to 12-18 months after the manufacturing date. Check with the supplier for specifics and "use it fresh."

The chemistry of a production-functioning nickel bath changes by the amp hour. Proper maintenance of the solution and the right additions will keep it performing at or very near optimum, on a continual basis. Amp-hour meters interfaced with a calibrated feed pump will automatically discharge the optimum, predetermined volume of brightener. Additions, whether manual or automatic, can be made near the filter return, sufficiently away from racks and barrels.

Have you ever watched someone add brightener directly on to a rotating barrel of plating parts? A little extra kick of "Additive B" doesn't necessarily mean that more and more is better. Remember, the best definition of poison: too much.

Purifiers for metallic contaminants and other aids are meant to be temporary "fixes." Their designed function allows for uninterrupted production plating, until the proper purification or corrections can be undertaken. Adding hydrogen peroxide to a bath at 140° F is the same as not having made the addition. Always add it to the solution cooled below 100° F. Give the additive a chance to live and work for the bath's benefit.

What type of anode is best for the particular set up? Available shapes include spears, rounds and chunks. My preference is rounds, because they settle better and evenly in the basket.

Anodes are available with or without sulfur. The addition of sulfur enhances the oxidation and breakdown of the nickel into the solution. If sulfur is to be avoided or minimized in the deposit, using the sulfur-free anodes results in slightly higher voltages. In either situation, the chloride in solution promotes anode corrosion.

Work smart and plate for profit so you can have fun, too, and not be stuck in the shop. Generate sufficient leisure time for real fishing or golf. ***P&SF***