



Finishers' Think Tank

Marty Borruso
26 Flagship Circle
Staten Island, NY 10309
Phone: 1-500/FINISH1
Internet: dpjh50a@prodigy.com

Have a problem on the finishing line? To send your question, use the convenient, postpaid form on our Readers' Service Card, or send a letter to: "Finishers' Think Tank," 12644 Research Parkway, Orlando, FL 32826-3298.

Barrel Plating in Nickel

Q. We barrel-plate parts in a nickel solution and sometimes get "double nickel" layers that peel between the layers. What causes this and how do we stop it?

A. Nickel is a very sensitive metal to plate because there are many reasons that the surface may become passive. When this happens during the plating cycle, there will be subsequent plating on that passive surface, forming a bilayer that tends to peel. Passivation can result from:

- Current interruption
- Induction of a bipolar effect
- Parts removed from the solution
- High organic concentration (does not directly cause the bilayer, but contributes to the sensitivity that results in bilayers)

If the parts lose contact or show a difference in potential application from each other, the surface of the nickel deposit will become passive, causing a bilayer to form. In barrel plating, loss of contact results from improper seating on the saddles or a misconnection in the bussing system. If the barrel is unstable and rocks off the saddles, the current is interrupted. In addition, if the bussing is not clean and salts get between the contact areas, there will be a loss of conductivity in the line. There does not need to be a complete loss of current—just a high enough difference in potential to cause the bipolar effect within the

barrel load, or between other barrels on the line. Overloaded barrels also create problems—when parts come out of solution, they will passivate.

Because a passive nickel surface will take on a subsequent deposit, it is vital that a clean, organic-free solution be used to avoid peeling.

Rack Coatings

Q. I run a small silver-cyanide plating line, and the coating on my racks breaks down easily, requiring constant recoating. Is there a coating that will last longer in our operation?

A. Rack coatings should be very resistant to alkaline cyanide solutions, especially those that operate at low temperatures. It is possible that you are using the wrong coating or that it is being applied improperly. A commercial rack manufacturer can recommend the proper materials, as well as the appropriate equipment to bake and cure the coating. Despite claims to the contrary, I have found that coatings applied and air-cured at room temperature do not stand up very well.

If your coatings are breaking down prematurely and you are only presenting the coating with room-temperature alkaline plating solutions, a commercial rack manufacturer can assist you in finding the right materials, and will take into account the final properties and the environmental and safety issues involved.

Iron in HCl Pickle Solutions

Q. How can iron be removed from an HCl pickle solution?

A. Iron in an HCl pickle solution is a major concern and a major waste problem for platers of iron and steel. Pickle solutions become spent

as the concentration of iron builds up in the HCl solution. Although there are several recovery techniques commercially available, they are expensive, cumbersome and not widely employed. (If anyone has information concerning successful, economical recovery techniques, please contact me.)

Several techniques use ion exchange or sophisticated membranes that make them very expensive. Because there is a perception that HCl is an inexpensive commodity, when you consider the amount of HCl used by our industry and the expense involved with disposal of the spent solutions, the problem becomes enormous.

One technique I have examined in my laboratory is the distillation of the acid solution. With a solution of iron in HCl, the iron represents a dissolved solid that will not be entrained in the distillate. This is a valid method of separation, but if handled incorrectly, a very dangerous one. In addition, the materials of construction must be able to handle hot HCl. If there is a breach in the system, the effluent is very dangerous, so a failsafe reactor should be included. The main advantage of this method is cost—application of <8,000 BTUs per gal of solution is all that is necessary. With a national average natural gas cost of ~\$4 per million BTUs, this technique is very inexpensive to operate. *Please note:* I am not endorsing this technique, nor do I recommend it for those without the appropriate background in working with hot acid systems.

Vacuum evaporators may also be appropriate but, because of the high temperatures, a sophisticated condenser system must be employed to fulfill the recovery.

I welcome your comments and suggestions. **P&SF**