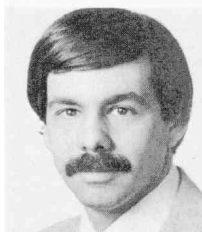


Finishers' Think Tank

By Marty Borruso



Have a problem on the finishing line? To send your question, use the handy post-paid form on our Readers' Service Card or

send a letter to:

Finishers' Think Tank, 12644 Research Pkwy., Orlando, FL 32826-3298.

Cyanide Zinc Bath Problems

Q. In our cyanide zinc plating solution, the anodes are polarizing and limiting the current density that we are able to apply. Our panels are a heavy gray, in the high- and low-current density range. What can we do to correct this?

A. In evaluating the sample you sent, I observed symptoms similar to those in your bath. The analysis of the bath is as follows:

Zinc Metal	2.24 oz/gal
Sodium Cyanide	4.0 oz/gal
Sodium Hydroxide	9.90 oz/gal

The Hull cell panel showed the very same characteristics you describe. One-half-inch areas in both the high-current density edge of the Hull cell panel and lower half of the panel show heavy gray deposit. The anode also turns black, as it polarizes. The black film on the anode and the heaviness of the deposit indicate an organic overload. When the solution was tested for heavy metals, only a nominal amount was found.

This kind of problem typically occurs when there is insufficient anode area in the bath to accommodate the work being done. The anodes in this situation will tend to polarize and oxidize the brightener system; more specifically, only certain components of that system. Generally, cyanide brightener systems are composed of three basic building blocks: Reacted pyridines, aldehydes and resins (polyvinyl alcohols and polyethyleneimines). The resin portion of the system of the brightener is the most sensitive to this kind of problem. If you

are going to run a bath at high-current densities, or with an anode-to-cathode ratio lower than the minimum of 2:1, talk to your supplier, who should be able to give you a maintenance brightener with a low level of the resin material in the product.

The best treatment for this kind of problem is to react the troubling organic material in the solution with potassium permanganate, and remove it by using a batch carbon treatment. Permanganate and carbon treatments are among the messiest we might use, so avoiding them through prevention is by far the easier way to operate.

Black Smut Problem

Q. While stripping nickel from brass in baskets with a dip operation, how do I either prevent a black smut from developing, or remove the smut without the use of cyanide?

A. Much of the smut associated with the stripping of nickel from brass can be traced to the condition of the nickel plating solution and the amount and type of organic materials dissolved in the bath. There are some standard stripping methods that may give you a smut-free surface.

Electrolytic Stripper

60% by volume, 66 deg Be sulfuric acid

40% by volume water

4.0 oz/gal glycerine

Operate at 6V, at room temperature, using a lead cathode.

Immersion Stripper

5-10 oz/gal M- nitrobenzene sulfonic acid (sodium salt)

10% by volume sulfuric acid

Operate at room temperature, to 1500 F. Additions of ammonium thiocyanate, 0.5 to 1.0 oz/gal, may be necessary with some newer nickel additives.

If these formulations fail to yield smut-free surfaces, you might try to bright-dip off the smut, with a standard brass bright dip:

55% by volume phosphoric acid

20% by volume nitric acid 26 deg Be

25% by volume acetic acid

Operate at room temperature, to 150° F.

Or, if you just want to clean up the surface, you might try this:

8 fluid oz/gal sulfuric acid

4 oz/gallon sodium bichromate

This will clean and deoxidize the surface of the brass and leave a surface that is protected by a light chromate film.

Hydrogen Embrittlement On Cr-Plated Steel

Q. How does hydrogen embrittlement affect chromium plate on high-strength steels, and where can I find appropriate information?

A. Hydrogen embrittlement and methodology to deal with its effects have been covered extensively in print, over the years. The effects of hydrogen embrittlement is becoming ever more important, because they are most pronounced on newer, high-strength steels.

Many aqueous electroplating processes favor the absorption of large quantities of hydrogen by the substrate materials. Embrittlement may be caused by the formation of hydrides and by strain imposed by the occlusion of molecular hydrogen in submicroscopic rifts in the surface of the substrate and the deposition of hydrated ions.

The effect of hydrogen embrittlement maybe relieved by driving off the hydrogen from the surface of the substrate by baking at elevated temperatures. The temperatures of the stress-relieving will vary, according to the type of substrate; and the type, characteristics and thickness of the deposit.

Hydrogen embrittlement was discussed briefly by Frank Altmayer, CEF, in his column ("Advice and Counsel") in the June 1991 issue of P&SF. For more specific information about the particular jobs you are doing, I recommend the following references:

Continued on page 50

Marty Borruso
26 Flagship Circle
Staten Island, NY 10309
71 8/984-8683

Electroplates Engineering Handbook, 4th Edition, by Larry Durney; *Hydrogen Embrittlement In Metal Finishing*, by Harold Read; Zapffe and Faust, 28th Proc. American Electroplaters Society, 1-25, (1940); "Physical Properties of Electro-deposited Chromium," Journal of Research, National Bureau of Standards, 40, (1948).

EXOTIC SUBSTRATES— Kovar

Q How do we maximize adhesion and corrosion resistance of flat, Kovar parts that we barrel-plate with sulfamate nickel and gold?

A Kovar (53% iron, 29% nickel and 17% cobalt) was developed specifically to be sealed to glass or ceramic, or to pressure-tight devices, such as electron tubes. It is often plated with nickel and gold. The surface of Kovar is extremely passive, because of the oxidation of the nickel and cobalt. To properly activate the surface, you must remove the oxides that have formed and have a mechanism for preventing repassivating and further oxidizing and keeping an adherent coating from being deposited.

Here is a typical cycle for depositing nickel and gold onto Kovar:

1. Degrease the parts, in either an organic degreaser or an aqueous alkaline detergent.
2. Clean cathodically, in a mildly caustic electrocleaner.
3. Pickle in an electrolytic sulfuric acid solution (10% H_2SO_4 , at 120 °F 3 ASF).
4. Woods Nickel Strike:
Nickel chloride, 24 oz/gal
Hydrochloric acid, 10-15%
Room temperature
20-100 ASF

The appropriate rinses should be used between the steps in the cycle. After the Woods nickel is applied, the part may be plated in either sulfamate nickel or gold. Adhesion will be as good as the quality of the nickel strike. Purification of the Woods strike is very important. It should be kept clean, carbon-filtered and free of heavy metal contamination.

This technique will assure adhesion and full coverage of the parts and increase the reliability of the components processed. •