



## Finishers' Think Tank

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*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 Pkwy., Orlando, FL 32826-3298.*

Blistering, Peeling, Pitting & Discoloration Under Lacquer

**Q.** We deposit different metals over 90-percent tin, 8-percent lead, and 2-percent antimony for centrifugally cast jewelry and badge blanks. Occasionally we see blistering, peeling, pits and discoloration under lacquer coatings. Is there a fool-proof way to plate over this kind of substrate without these problems?

**A.** No: A simple answer to a difficult problem, because you are describing casting and pre-finishing difficulties, rather than deposit problems. Centrifugally cast items are notorious for the porosity of the surfaces produced. It is difficult to provide a controlled, uniform alloy for depositing other metals. Because of the speed and simplicity of the casting equipment, it is hard to control the migration of the alloy components during the melting and casting process and provide a reliable, uniform surface for finishing. This process lends itself to short runs of jewelry items, and quality control should look for the following:

*Casting Defects*—These can include: (1) Too much parting compound (a talc-type material that aids in removing parts from molds) tends to become imbedded in the surface of the parts. It is difficult to remove by cleaning, so the surface may retain much of this material, causing porosity in the subsequent deposit, as well as peeling and poor adhesion of the deposits.

(2) Migration of the alloy materials on the surface, or pooling of various

metals in certain areas. Lead is a minor part in the casting alloy, but it will be removed preferentially in the alkaline cleaning process, leaving pits and voids in the surface that can entrap process solutions (cleaners, acids and plating chemistry). The migration of lead can also cause environmental problems because of lead concentration in the cleaners and acids that must be disposed.

(3) General porosity of the casting. This is caused by poor casting techniques, as well as by the inherent porosity of the type of material used. One advanced technique now available uses a vacuum in the mold cavity to prevent some of the porosity.

*Finishing Deficiencies*—In cleaning and preplate preparation, it is important not to over-clean these parts because they are very sensitive. The mildest cleaner should be used, and preplate preparations should use a fine medium and a neutral compound. Casting operations are high-tech, and operating personnel should be well-trained. Issues of quality control on incoming materials, mold maintenance, and casting techniques should also be addressed.

Plating Nickel & Silver Over Tungsten Parts

**Q.** Is there a cycle that can be used to successfully plate nickel and silver over parts made of tungsten?

**A.** Tungsten (*Reference: Wolfram*) is a steel-grey to tin-white metal, with unusual characteristics. It is known for its hardness and electrical properties, and is a prime material in the manufacture of incandescent filaments, electron tubes, and for contact points on some electronics. It is also used as a catalyst as an alternative to platinum. To apply the properties of this metal, it may be necessary to deposit another metal or alloy onto the surface of the tungsten.

The preparation cycle would be as follows:

1. Preclean, blast or vapor degrease.
2. Treat anodically in 10–20 percent sodium hydroxide solution at 200 A/ft<sup>2</sup> at 160 °F, or etch in 10 percent hydrochloric acid solution at 50–60 A/ft<sup>2</sup> at 100 °F.
3. Activate in 25–50 percent hydrochloric acid using 1–5 volts AC.
4. Woods nickel strike.
5. Plate as you would any nickel deposit.

Mid-phos EN Over Aluminum

**Q.** We are running a mid-phosphorus electroless nickel (EN) over aluminum and occasionally run into darkness of the deposit in areas of high agitation. Why is that happening and how can it be prevented?

**A.** The key to the problem is that you are running the EN deposit over zincated aluminum surfaces. The fact that the deposit is a different color in areas of high agitation is an example of what happens when the bath becomes contaminated. Agitation generally creates a higher level of contaminants in the deposit, causing a change in color. The probable cause is a higher-than-acceptable concentration of zinc in the plating solution. With the advent of complex alloy zincates, however, it may very well be the inclusion of either iron or copper in the deposit.

Conventional zincates contain only zinc, but newer alloy zincates include copper, iron and sometimes cobalt. All of these metals will cause darkness in the EN deposit.

To prevent this problem, try rinsing all the zincate from the surface of the parts before processing. Most zincates are extremely alkaline, however, so rinsing of this caustic film is difficult. Sodium bicarbonate (2–4 oz/gal)

added to the rinse cycle will buffer the pH of the rinsewater to 8.5–10. At this pH level, the solution will rinse better and there will be less drag-in of zincate films to the process tank. The bicarb, at that level, will not attack the zincate film and parts can be processed normally. This will not only improve the quality and consistency of the parts, but will also improve and extend the life of the EN solution.

Shop Talk from Marty . . .

*Report from The American Institute for Pollution Prevention (AIPP)—*

As your representative to the AIPP, I attended a meeting in Washington, DC, in October. The meeting featured speakers from the U.S. EPA and the Department of Energy (DOE), both of which presented mechanisms and programs that centered on pollution prevention as a goal for sustainable development. Some of these programs will be featured in future "Finishers' Think Tank" columns for your information. The following is the formal press release from the meeting.

November 3, 1995—"Cooperation and collaboration between industry and government as a new and more effective way of protecting human health and the environment was the theme of discussions at the Fall meeting of The American Institute for Pollution Prevention (AIPP), held October 17–19 in Washington, DC. Speakers from EPA and the Department of Energy were prominent on the agenda and explained how pollution prevention has become an integral component of government programs during continued reorganization and downsizing. Alan Rimer, president of AIPP, described this new way of doing business as 'the only way in which this country can meet the sustainability goals of ecological integrity, economic prosperity and social equity.'

Programs from DOE's Office of Industrial Technologies (OIT) were showcased during the meeting. OIT has fostered numerous successful partnerships with industries and continues to link energy efficiency, pollution prevention and improved productivity in its programs. One of these programs is *Climate Wise*, in which DOE and AIPP are cooperating to encourage businesses to initiate, expand or accelerate a set of organization-specific measures to reduce greenhouse gases in an effective manner.

OIT-sponsored programs, such as *Climate Wise*, have already saved U.S. industries more than \$1.6 billion from reduced energy use alone.

Wednesday's featured luncheon speaker was Assistant Administrator Dr. Robert Huggett, who discussed how prevention and risk became the cornerstones of the EPA Office of Research and Development's recent reorganization. Dr. William Sanders, Director of EPA's Office of Pollution Prevention and Toxics, described a variety of Toxic Release Inventory expansion initiatives currently under way, and emphasized the need to involve all stakeholders as chemical stewardship programs advance. Other topics on the meeting agenda included

the reinvention of environmental regulations initiative, EPA participation in ISO 14000, and how the Office of Compliance is using pollution prevention to achieve its mission of compliance with environmental laws.

During the evening reception, AIPP members and guests had the opportunity to interact with other environmental organizations, federal agency staff, and a variety of environmental professionals." P&SF

**Editor's Note:** Dr. Huggett will be one of the featured speakers at next month's 17th AESF/EPA Conference on Pollution Prevention and Control, held during AESF Week in Orlando, FL, February 5–9.