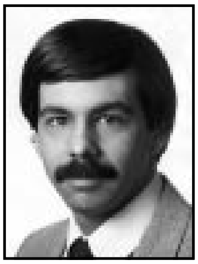

Finishers' Think Tank

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Rain & Other Natural Disasters

Q. We recently had a problem that most likely affects other platers at one time or another. Because of the wet weather this winter, we had a situation where part of our ceiling in the plating area fell down into our tanks. How do we purify our solutions, and what do we need to look for?

A. Winter is always an interesting time, especially this year in the Northeast. Freeze and thaw, snow, rain, ice, sun ... these cause all kinds of problems for the metal finisher. Roofs and ceilings in plating shops tend to be especially problematic—you don't really want to touch them. "Stuff" (dust, dirt, etc.) falls down into your tanks if you try to maintain them, so platers generally don't look up. It is important, however, to maintain these areas in a controlled way to minimize the effects of a ceiling disaster.

One of the best ways to maintain the ceiling—and the shop infrastructure—is to be sure to remove moisture from the building by running adequate ventilation systems, 24 hr/day. It is important to control the humidity in a shop, not only for the work you are processing, but also for the sake of the building itself.

It is also necessary to understand *what* has fallen into the tanks. If it's plaster, there will be one kind of treatment, and if it's shop dirt, there will be another. Removal of the gross materials is the first step; filtration and an analysis by your process supplier is the next. You might be surprised at the kinds of materials removed from a plating tank with purification techniques. Once the ceiling is repaired, proper maintenance should avoid future problems.

Determining Copper Concentration in Solution

Q. When electrowinning copper from waste cyanide copper concentrates, it is difficult to determine the concentration of copper in solution, because the analysis differs from lab to lab. How can we solve this problem?

A. Copper plating solutions become waste when the process is either discontinued or is contaminated with other metals, necessitating disposal. Cyanide dissolves many metals and brings the ions into solution. It is sometimes used as a final cleaner and deoxidizer, or to do some final descaling before further processing. When working with iron components, it is important to remember that iron oxides are very soluble in cyanide copper systems. Iron, as well as zinc and nickel, will also cause problems in the copper analysis, interfering with both wet and atomic absorption analysis.

To address this situation, you must configure your analytical approach to isolate the copper in the presence of other similar metals in the solution. The method of choice for the most reliable atomic absorption analysis of cyanide copper is to use a graphite furnace to remove most of the interference, and to isolate the copper. In a wet analysis program, it is necessary to tie up the interfering materials so that they do not enter into the analysis. Ammonium bifluoride is commonly used to react with the contained iron. To design the best analytical approach for an individual solution, you should first run an absorption emission scan on the sample to identify what metals are contained. With that information, you can then determine the best approach to the problem.

Blisters & Exfoliation Resulting From Plating Copper Over EN

Q. We deposit copper, electroless nickel (EN), and copper and silver on aluminum. Whenever we plate copper over the EN, small blisters appear and exfoliation of the deposit occurs. Why does this happen and how can we prevent it?

A. It was necessary to talk with the people involved in this process cycle before recommending a course of action. The cycle they had been performing was: Non-etch clean; rinse; etch clean; rinse; zincate; rinse; strip zincate; zincate; rinse; cyanide copper; rinse; electroless nickel; rinse; copper; rinse; silver.

Looking at this cycle, you might say that it is a common one in finishing aluminum. On further questioning, however, it was determined that an alloy-type zincate was being used. Alloy zincates are not always amenable to full removal by nitric alone between zincate coatings, as evidenced by streaking on the initial copper deposit. The first zincate deposit, therefore, was not being completely removed. This causes a zincate-on-zincate coating that is non-adherent, making it difficult to achieve an integral EN deposit (which ends up being very porous). By applying a subsequent cyanide copper, the solution attacks through the pores and onto the base metal, causing laminar attack on the aluminum (*i.e.*, exfoliation of the deposit). To correct this, it is necessary to experiment with the concentrations of the nitric between the zincates, with the possible inclusion of hydrofluoric acid at two percent, to fully remove the initial zincate film. This will allow the copper, as well as the electroless nickel, to be deposited without porosity, and the final copper coating will not be able to penetrate the initial coatings to attack the aluminum.

Shop Talk from Marty: *Energy Efficiency—Recovery Of Lost Heat from Condensate*

Sometimes it is good to brainstorm with other industries and other disciplines when appraising your operation. I was recently involved in the installation of a new plating line. The contractors did a very good job, but did a double-take when we told them not to plumb the steam condensate back to the boiler. I explained that metal finishers are generally pragmatic people—once burned, twice shy—and that there is very little confidence in the integrity of steam coils on a continual basis. I further explained that, when the steam is shut, a vacuum is formed, and it may aspirate some of the solution into the system and cause severe damage to the boiler, or cause the errant chemistry to enter areas that are out of the waste-treatment loop.

The contractor was perplexed at this, and the shop owner and I had to explain that plating solutions are very aggressive, and the damage they can cause may far outweigh the cost benefits of recovery.

About an hour later, the contractor returned with a suggestion: Why not run the condensate through a heat exchanger? This process would isolate the condensate from the boiler and would recover a significant amount of lost heat. We were astounded! Imagine, an idea from outside the metal finishing industry that we could not refute!

Now, what to do with that recovered low-grade heat? It could be used to preheat the water entering the boiler, thereby reducing the amount of fuel needed to make steam. It could also be used to warm up the rinsewaters, allowing for better rinsing and reducing the amount of rinsewater needed on the line. This would also reduce the temperature difference between the rinsewater and the plating tanks, which would, in turn, reduce the heat load on the system during operation.

As platers, we have all been somewhat stubborn on how we run our process systems. Some of the details concerning why and how we do things are buried in our memories of some catastrophic event that may have occurred (to us directly, or to our predecessors), and drummed the techniques into our heads until they became law. Sometimes, however, it is smart to move out of our comfort zone and take a fresh look at what we are doing.

An old Italian adage, loosely translated, says it best: “If you do what you have done, you’ll get what you got.” *P&SF*

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