Some Production Plating Problems & How They Were Solved—Part 14

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1. Some comments on cleaning

Being a sports fan, I'm aware that even the best professional teams spend a considerable amount of time practicing the fundamentals of their art. I feel that we in this plating game often underestimate the fundamentals of our art in our search for esoteric answers to mundane problems. One of the fundamentals of plating is cleaning. About 50 percent of the battle is knowing the dirt that has to be removed prior to plating or painting. The other 50 percent is knowing the material you are going to plate on and using the proper techniques for its preparation. Armed with that information, most cleaner suppliers can come up with a cleaning cycle that will solve a particular problem. The trick, however, is to solve the problem with the equipment on hand. The other side of the coin is acknowledging when you don't have sufficient equipment to do the job properly.

There are many tools with which to do an efficient cleaning job, and they bear consideration. Many people have found it good practice to preclean excessively oily parts before starting a cleaning cycle through the line, whether it be automatic or manually operated.

I've had my plater come up to me and say, "But I just changed the cleaner over the weekend and it's only Tuesday." Investigation showed that someone in the shipping department used the cleaner to wash out some very oily pans, thus loading up the cleaner.

Some auxiliary tools that promote good cleaning are electrocleaners, direct or reverse current, and, where economically feasible, ultrasonics. Alkaline descalers using periodic reverse current are an excellent means of cleaning a heavy heat treat scale from steel.

2. Peeling problems: How to pinpoint where peeling occurred

Quite often a plater may come up to his supervisor with the comment, "The nickel is peeling" or "The copper doesn't stick on the work—you'd better get the solutions fixed." In this case, chances are that the parts weren't cleaned or prepared properly.

If a part is peeling, the first thing is to find out at what stage it peeled. One way of determining this is to pull back the non-adherent plate and examine the underside of the peeled surface and the exposed basis metal. If this was a multiple plate, and the strike, whatever it was, shows up on the underside of the flake, exposing the basis metal, the chances are that the metal was poorly prepared. If the peeled plate exposes the strike, then the difficulty occurred between the strike and the final finish. Poor rinsing and improper dips in between plates may have been the cause of peeling.

3. Plating on leaded brass

***Problem*:** At times I have difficulty plating on leaded brass.

***Solution*:** Although a very common material, leaded brass must be treated with great care in its preparation prior to plating. Chromate bright dips, although excellent for most copper-base alloys, can be a serious source of trouble with leaded brass. Lead chromate, a very insoluble material, can be formed on the surface, leading to no end of trouble when attempting to plate. The common sulfuric-nitric bright dip with a little chloride can also be troublesome, if leaded brass parts are processed through it. There are special bright dips for leaded brass and an excellent pre-plate dip is two parts water to one part fluoboric acid.

4. Double nickel layer problem

***Problem*:** When I bend or crimp some nickel plated parts, particularly when barrel plated, I sometimes get a double nickel layer.

***Solution*:** Current interruptions are a likely cause, because the basis metal is nickel plated and not exposed. Where flexible contacts are used, instead of being immersed in the work load, they may float on top of the load and the current can be interrupted in that manner too. Other times a loose electrical contact in the barrel may be a cause. It doesn't take too much to cause a current interruption, because in a barrel load, under the best of conditions there are always areas with a very low current density, and the slightest amount of resistance can cause a current break. Consequently a multi-layered nickel plate will be the result.

5. Dull deposits from cyanide copper

***Problem*:** My bright cyanide copper plating tank is producing blotchy, dull work. Although it seems to be bright when I first start in the morning, the work turns dull after a short time. I also have a difficult problem in maintaining the metal in the bath.

***Solution*:** It is possible that the cause of this problem is anode polarization. This would be indicative of the blotchy

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work which begins about an hour after production starts and also loss of metal in the bath. This also, of course, is accompanied by a sharp rise in the free cyanide and a heavy consumption of caustic. Generally anode polarization is caused by anode bags which are either too coarse for cyanide copper or are plugged from use. I would suggest removing the anode bags and either cleaning them or replacing them with 6-oz cotton duck bags. A tremendous help in reducing the tendency for anodes to polarize is the use of current interruption or slight periodic reversal. This not only has a favorable effect on the anode but also increases the tolerance of the bath to impurities and increases the bright plating range.

6. Cloudiness in nickel in new installation

***Problem*:** I recently installed a new bright nickel solution and, after a few days run, the deposit became cloudy. This cloudiness was removed or corrected by a carbon treatment but again returned within a few days. It would appear that I am introducing some kind of contamination. This is a brand new nickel line and was put in a new rubber-lined tank. Could it be that the rubber lining is acting as an interference?

***Solution*:** Yes, your supposition is possible; sometimes it is very difficult to properly or completely leach a new rubber-lined tank and the subsequent result would be what you described, for the nickel plating solution would then continue the leaching process with the result that a white haze might well develop. When installing rubber linings, it is well to pre-test these materials in the sample of the bright nickel solution itself to determine their compatibility. In this regard, it is also well to check with the supply house providing you with these materials.

7. Low current density dullness in silver plate

***Problem*:** I have a bright silver tank in which I plate rack work with deep recesses. Normally this solution gives me outstanding work with good throw and brightness in the low current density area along with high speed, but once in a while I encounter milky white dullness in the low current areas which does not respond to either brightener or wetting agents addition. What could be the source of my problem?

***Solution*:** Assuming the chemistry of the bath to be correct with the normal free cyanide at the recommended concentration, it might well be that the bath temperature is in excess of the normal 21 to 27°C (70 to 80°F) range at which bright silver should be operated. If this phenomenon occurs principally during times of warm weather or if the tank is positioned close to another tank that is heated, this might well be your problem.

8. "Black burn" in nickel

***Problem*:** Periodically, the work coming out of the nickel tank on my fully-automatic machine has black burnt areas on the undersurface of the work. This looks almost as if the part had touched the anode and yet I have thoroughly raked the tank and know that this condition is really impossible. What is the explanation?

***Solution*:** This might well be a condition called "black burn" which results from too low boric acid concentration in the bright nickel tank. I would suggest you add 7–15 g/L (1 to 2 oz/gal) of boric acid to your nickel tank or even hang a bag of boric acid in the nickel tank and allow whatever will dissolve into the solution to do so.

9. Milky chromium

***Problem*:** I have a fully-automatic, copper-nickel-chromium plating machine. Every once in a while the leading edges of the parts on the rack coming out of the chromium tank are milky white. I have consulted with people who supply the chromium process but they only verify that the chromium solution is performing normally. Is this an electrical problem?

***Solution*:** Milky chromium on the leading edge of a rack can have several causes. I would suggest you try the following:

1. Reverse the rack as it comes out of the nickel tank and see if the milky chromium follows the reversal.
2. Be sure that current is on the rack as it enters the chromium tank.
3. Rearrange your anode configuration at the entrance to the chromium tank and determine whether this will result in a change in the location of the milky chromium on the rack.

The foregoing suggestions will not give you the answer to your problem, but might help locate its source.

10. "Spotting out"

***Problem*:** Our company, from time to time, receives work back from the customer "spotted out." How can we minimize this condition?

***Solution*:** Spotting out is not an uncommon problem to platers, but it can be very frustrating when it occurs after plated parts have been visually inspected, packaged and then discovered, after several months of storage in a customer's plant, to have become discolored. In a similar case, the approach taken to solve the problem was to determine what the discoloration was and then modify the process to overcome this condition. The culprit basically was that traces of cyanide were left after plating and drying. Depending on the atmosphere, breakdown occurred, and the end result was spotting out. It must be pointed out that parts barrel plated are a greater problem when traces of cyanide are present. Generally, parts in bulk and not in a completely dry state present an ideal condition to speed cyanide breakdown, and the resulting discoloration and spotting. In this case, even though the answer obviously is better rinsing, we found that slight redesign of the part in question to allow better rinsing was one step, but more thorough rinsing of the parts themselves, and a final warm water rinse containing a 5% neutral soap solution at 50 to 55°C (120 to 130°F) prior to complete drying was the answer.

Did You Know. . .

. . . that when plating a threaded part, the pitch diameter is increased by four times the plating thickness. Thus, a plating thickness of 0.3 mil on a threaded part will increase the pitch diameter by 1.2 mil (0.0012 in.).

. . . chromate coatings will adhere better on a dull cadmium surface than on bright cadmium.

. . . many people still use soot in a sulfuric-nitric acid bright dip to cut down on excessive etching.

. . . the slightest amount of silver contamination in copper cyanide plating solution will cause a peeling problem.

. . . in trying to get out a rush job of small brass tubes, the bright dip operator selected a lot that "looked clean," and dipped the tubes without cleaning. The parts were passable for use but the acid dip solution was a mess with oil contamination. In order to save the acid bath, a layer of lampblack was built on top of the acid solution and allowed to stand overnight. The next morning, the layer of lampblack, which had absorbed the contamination, was skimmed off. The necessary acid additions were made, and we were back in production. P&SF