Some Production Plating Problems & How They Were Solved—Part 22

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The purpose of technical sessions is educational, and if one has the patience to sit through the sessions much can be learned from them and from the ensuing discussions. Some of the following problems and their answers were gleaned from several talks at the 4th Annual Mid-Atlantic Regional held in New York in the Fall of 1968.

1. Anodes—bipolar action

Unless we're doing anodizing, most of us have a tendency to relegate the happenings on the anode bar to the background. One of the speakers at the recent Mid-Atlantic Regional spoke of an excessive gold loss and one of the areas of loss was due to several anodes having an accumulation of gold. One must consider this phenomenon a bit unusual, especially when you're starting out with platinized titanium anodes!

This problem was solved by making sure that the contact on the anode bar was a good positive contact. Sometimes anodes just hang in the solution, becoming insulated by an accumulation of salts and corrosion products. A bipolar action is set up between the "insulated" anode and the anodes that are performing their function so that the "insulated" anode becomes cathodic to the rest. This is similar to the "backlash" effect, wherein the area behind the anodes of a steel tank will plate up despite the fact that the tank itself may be well insulated, electrically.

In plating solutions other than gold, this effect may be seen when you see "treeing" on the non-working anodes.

2. Some barrel plating problems

Problem: How does one barrel plate parts that are insulated from the main body by a glass to metal seal?

Answer: This problem will be solved by use of a conductive filler material like plated plastic balls or various shaped metal shot (Using burnishing shot is a common practice.) in with the load of parts to be plated. Care, of course, must be exercised to use the proper shaped shot, that will not stick between the protruding contacts and will lend itself to easy separation. This conducting medium must be clean and must be able to be processed with the same cycle as the plating load. If, for instance, you are going to use unplated steel shot and you are plating copper parts with silver or gold, the shot must be copper-plated before mixing with the load. If you are plating to a specification, it's a very good idea to know precisely the area of the amount of shot you are going to use and add that to the area for the plating load.

Question: How do you overcome the wide spread in plate distribution with a difficult-to-tumble part?

Answer: Difficult-to-tumble parts should be plated with a very low current density. It has been shown that with intricately shaped parts that don't tumble too well, the exposed parts in the load will receive an extraordinary amount of plate as compared to the inner mass. If the load doesn't tumble too well, some of the parts in the inner mass won't reach the outside of the load too frequently. Plating at a low current density will mitigate this condition and allow more time for a more even distribution of the plate.

3. Rusting of stainless steel—poor heating and excessive etching

Our colleague, Nat Hall of *Metal Finishing* has been on an editorial binge these past few months advising his readers to "look under the plate as the source of many of their problems"—and we couldn't agree with him more, because much too often the condition of the basis metal is a constant source of trouble. Mr. Hall cites a case of stainless steel, its passivation and subsequent rusting. The passivation treatment is done only to remove surface contaminants. Stainless, as its name implies, is air-passivating and the rusting is caused by carbide precipitation in the grain boundaries because of a poor heat treating job.

Other cases of poor heat treating are often encountered with beryllium copper items. If the plater gets them with a uniform black color, the parts are heat treated properly. If the color ranges from black to various shades of red, then there's something amiss. The black color is cupric oxide, and easily cleaned by the ordinary bright dips. The dull red area is cuprous oxide which is much more difficult to remove. While trying to remove the cuprous oxide, the parts with the more easily removed cupric oxide become over-etched.

This condition is often caused by submitting oily parts for heat treating. A clean degreaser in the hands of a heat treater is subsequently a very valuable tool for the plater.

The plater can save himself a lot of grief later if he examines the parts to be processed before plating in order

Based on an original article from the "Plating Topics" series [*Plating*, **56**, 293 (March 1969)]

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to anticipate problems. For example, excessive "cold shots" in a zinc die casting will cause many plating problems that really aren't the plater's fault.

4. Peeling on brass

Problem: Peeling was experienced when plating some brass parts through a copper-nickel-chromium cycle which got progressively worse.

Answer: Cleaning could be the obvious answer, but where was the lapse in this plater's cycle? The cleaning and plating cycles were checked, and, chemically, everything seemed to be in tip-top shape. The plating supervisor, in looking over the procedure, noticed that a barrel with steel parts, previously cleaned to remove scale from a descaler, was dripping into the brass cleaner as it passed overhead. Dissolved iron from the descaler .was contaminating the brass cleaner and putting an immersion deposit on the unplated brass. A change in the cycle, eliminating the dripping from the descaler into the brass cleaner solved that problem.

5. Plating on 1213 steel

Problem: Nickel plating rejects on 1213 Steel which had to be furnace treated at 1010°C (1850°F) for glass to metal seal work.

Answer: The original cycle for plating 1213 steel was an alkaline cleaner and followed by a 50/50 hydrochloric acid pickle. It was felt that the 50% hydrochloric acid was an important factor in the rejects, and subsequent experiments showed that tumbling the parts in a 10% hydrochloric acid solution was the best procedure to use on this steel.

This particular steel, a screw machine stock, contains manganese and sulfur, with the manganese sulfide precipitated along the grain boundaries for better chip control to expedite faster screw machine production. The more concentrated hydrochloric acid apparently dissolved the manganese sulfide out and left voids in the metal. The more dilute acid dissolved less of the basis … metal and gave just as clean a surface to plate on. The subsequent better results bore this out.

Technical Editor's note: *The edited preceding article [Plating, **56**, 293 (March 1969)] is based on material first compiled and contributed by Dr. Samuel Heiman, as part of the Plating Topics series that ran in this journal. It dealt with everyday production plating problems in the late 1960s, many of which are still encountered in the opening years of the 21st century. Much has changed ... but not that much. The reader may benefit both from the information here and the historical perspective as well. For many, it is fascinating to see the analysis required to troubleshoot problems that might be second nature today. In some cases here, words were altered for context.*