P&SF Retrospective

Originally contributed by Ronald Kornosky
Compiled by Dr. James H. Lindsay

Based on an original article from the early Finishers Think Tank series
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Shielding edges

Q: ***In our silver plating operation, we use a lot of wire to hold parts on racks and also to wrap around sharp edges and minimize burning at tips. Is there a better way?***

A: Effective racking and shielding (or robbing) depends on the shape of the parts being plated. For some shapes, plastisol-coated steel shields integrated with the racks will effectively reduce current flow to edges. In other cases, the spacing between parts becomes dominant and the most effective method of improving the uniformity of the deposit and preventing burning at edges. For large parts, anode placement and/or anode shielding are effective.

If steel wire is used for contact purposes, the silver (after buildup) can be reclaimed by loading a steel wire anode basket with the silver-plated wire. However, replacing copper with steel wire may require a larger diameter because conductivity will be reduced about 90%.

Smut problem

Q: ***We replate antique silverware. After stripping in sulfuric/nitric acid, the copper-alloy work is cleaned in a 4-oz/gal solution of NaCN to remove salt corrosion and copper oxides. We've tried fluoboric acid and others, but after a short time the smut on the copper alloy becomes tenacious and can't be removed by scratch brushing. Can you help with a substitute for cyanide? If so, my waste treatment for CN would be cut in half.***

A: One possibility, according to Hrant Shoushanian of Technic Inc., Providence, RI, would be to clean the parts anodically in a strong alkaline solution at 160 to 180°F for 5 to 10 min (or as long as required) to remove or loosen the oxide or scale. Then the part should be rinsed and immersed in concentrated HCl (muriatic acid) for 30 sec to 1 min and rinsed. The part could then be scratch brushed to remove remaining scale. If the scale is still hard to remove, the process should be repeated.

If you find that you still need cyanide after trying this and other alternatives, you should use a stagnant rinse after the CN dip. This should keep most of the cyanide from entering your waste stream. The stagnant rinse then could be added to the dip tank to replace evaporative losses.

Sparking metals

Q: ***Do you know of any literature that prescribes a control procedure or test method for metals that spark, before and after finishing?***

A: The sections entitled "Rapid Identification of Metals and Alloys" and "Spark Testing of Ferrous Alloys," which appear in the *ASM Metals Handbook, 8th Edition, Vol. 11*, under the subject of "Nondestructive Inspection and Quality Control," should be what you're looking for. Write: American Society for Metals, Materials Park, OH 44073. [The corresponding volume in current edition of the *ASM Metals Handbook* is Volume 17 - *Ed.*]

Hard chromium

Q: ***We have a problem with highly machined rolls used to process a material containing abrasive particles (600 - 800 VHN). These cause a combination of indentations and abrasive wear. A maximum of 0.002 in. (50 µm) of hard chromium over hardened low-alloy steel (R_c 53) has been of fair service. The chromium thickness and quality have been variable over the surface, and the wear rate, we feel, is still too high. In addition, if the chromium is penetrated, pitting corrosion takes place at that point. Any suggestions?***

A: I would expect the hardness of a chromium deposit to be between 800 and 1000 Vickers (VHN). Because the required thickness is adequate, I would check bath makeup, temperature and current density used during plating. In a 2.5N chromic acid bath with a 100:1 ratio of CrO_3 to H_2SO_4, a current density of 150 or 200 A/ft^2 (15 or 20 A/dm^2) at a temperature of 115 to 125°F (46 to 52°C) should produce a deposit with a hardness of 900 VHN (or more).

A proper conforming anode should give you the desired uniform thickness. Check this carefully; it may solve a good part of your problem.

Perhaps you would want to look at electroless nickel as well. Heat treating the EN deposit after plating may be necessary to maximize hardness and resistance to wear. Vickers hardness after treatment at 750°F (400°C) will run from 850 to 1000 VHN and the deposit, when properly applied, will be extremely uniform in thickness. A study of the cost and results should help in determining if this is a good alternative to chromium.

Dr. E. J. Seyb of M& T Chemicals in Rahway, NJ, has some good pointers on plating hard chromium:

1. The beginning of all good deposits is the basis metal. It should be examined carefully to assure that pits are absent before plating, because they are enlarged during plating. If present, they should be removed.

2. The basis metal finish must be of high quality, with low microsmoothness to give good-quality, smooth deposits on the entire surface.

3. Finishing of the chromium is also important in the final quality of the rolls. The chromium cannot be rough, chipped or cracked from this operation.

4. The particles as described in the product are reported to be softer than chromium, but care should be exercised that a fraction of them are not harder than chromium. This may create indentations and scratches, and lead to excessive wear.

Finally, Art Logozzo of Nutmeg Chromium Corp., W. Hartford, CT, offers these words: “As for the pitting and corrosion taking place where the chromium plate is penetrated (evidently a thinner spot), this is like sliding on ice and suddenly hitting a patch of dirt. The chromium because of its low coefficient of friction represents the ice. The worn spot in the steel basis metal represents the dirt patch - the wear factor is intensified along with corrosion and pitting. As soon as a breakthrough occurs - and a trained operator can identify this visually or with a simple copper sulfate test - the roll should be removed from production and either patch plated or refinished. I would suggest a more uniform or even thicker deposit of chromium, and concentrate on the best and highest finish possible to capitalize on the low coefficient of friction afforded by the plated coating.” *P&SF*

The edited preceding article is based on material compiled by Mr. Ronald Kornosky, then of Hager Hinge Co., in Montgomery, AL, as part of the Finishers Think Tank series, which began its long run in this journal 26 years ago. It dealt with everyday production plating problems, many of which are still encountered in the opening years of the 21st century. As we have often said, 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.

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