P&SF Retrospective

Originally contributed by Ronald Kornosky
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Spotting on zinc

Q: ***We are zinc plating steel parts to a specification finish but getting terrible spotting after chromating. We have a feeling this is because of part nesting during barrel plating. I have two questions: (1) how can we eliminate the spotting and (2) in lieu of that, have we got much to lose if we just eliminate the chromating step?***

A: If you're using a cyanide bath, high carbonate levels could be causing the spotting. If you're using an acid zinc bath, high iron contamination in the bath could be the culprit, so iron treatment would be indicated. It is also possible that your barrel loads are too large, and that good tumbling is not occurring. Depending on part configuration, especially with flat plates, your work may be sticking together when wet. You may want to mix barrel loads with other types of parts to avoid this. Also, other materials such as steel balls can be co-plated to prevent sticking. Barrels with dividers may also be helpful. As a last resort, you might want to investigate rack plating.

Elimination of the chromating step is not desirable. I found no reference to the specification you mentioned, but you probably mean ASTM B633-78, which covers electrodeposited coatings of zinc on iron and steel. The Type II finish would have to resist 96 hr of salt spray without showing corrosion products on the zinc or base metal. Skipping the chromate, and taking into account your nesting problem, could mean a tremendous loss of corrosion protection. Also, remember that you must check thickness frequently and on many areas in order to bid for and fulfill contracts on specification plating.

Residue on brass

Q: ***We are brass plating a variety of products, then applying a clear powder coating for surface protection. However, our experience is that hot air drying prior to the powder coating leaves a spot corresponding to residual water drops and that wipe-off methods are expensive. Can you help?***

A: The "hot air spots" to which you refer probably come from materials dissolved in your rinsewater. If we assume proper rinsing after processing, the calcium/magnesium carbonates (characteristic of hard water) or any other chemical dissolved in your final rinse will run to a tear (or puddle) at the lowest point. When this dries, a residue is left on the work.

Rinsing in deionized water is suggested. By continually circulating the final rinsewater through a DI unit, the impurities would be removed, giving pure water. I am sending you a booklet entitled *Control and Treatment Technology for the Metal Finishing Industry - Ion Exchange*, by the U.S. EPA (http://www.p2pays.org/ref/23/22186.pdf). Further information can be found by contacting a resin manufacturer. Another good source is the *Nalco Water Handbook*, by F.N. Kemmer, McGraw-Hill Book Co., New York, NY (http://www.amazon.com/Nalco-Water-Handbook-Company/dp/0070458723/ref=pd_bbs_sr_1/102-5392089-6864932?ie=UTF8&s=books&qid=1188905758&sr=8-1). It has an entire chapter on DI rinsing.

Bumper refinishing

Q: ***I need a good way to clean used bumpers before replating. My real problem is pitting left by corrosion.***

A: Used bumpers that show pitting from corrosion after chromium and nickel stripping are polished to obliterate the pits, as a general rule, before they are replated. If the pits are shallow, the bumpers can be plated with 0.001 inch of copper (after nickel stripping) and buffed before replating with nickel. The option of buffing the copper could be expensive, but the use of an acid copper bath might help to minimize costs.

If you elect not to strip off the old plating, the cleaning and/or derusting steps will become very important. Use of an alkaline deruster, with or without current, may work better than rust removal with acids. If heavy rust is removed, etching will not occur in the alkaline bath.

Stripping silver

Q: ***How do I strip silver off of copper and brass?***

A: Naturally, you should contact your local dealers of proprietary materials for their suggestions. Alternatively, you might try immersing the parts in a mixture of 5 vol% nitric acid and 95 vol% sulfuric acid at 170 to 180°F (77 to 82°C). This should be done with great care and following all safety procedures. The process will work at lower temperatures, but at a very slow rate. Make sure the part is dry and free of lacquer or wax. Also, keep water out of the bath to avoid dilution.

Sludge in brass bath

Q: ***What could be the cause of excess sludge formed in a brass bath in a short time? The solution is operated at 90°F (32°C) and allowed to cool to room temperature when not in use. The pH is about 9.0 and mostly zinc die castings are plated after they have received a copper strike and plate.***

A: The bath pH seems a bit off, but if the work looks good, maybe not. The pH in a normal cyanide bath is in the range of 9.8 to 10.3. If yours is lower, there is the possibility that zinc may be dissolving from anodes, forming an insoluble zinc hydroxide (gray-white) sludge.

Carbonate formation is a likely cause of the sludge problem, according to [the late] *P&SF* Technical Editor Bill Safranek. Some of the carbonate you generate may be formed by the reaction between carbon dioxide in the air with sodium hydroxide in the bath and some by cyanide hydrolysis. However, the large volume you experience might be attributed largely to cyanide oxidation at polarized anodes. To avoid anode polarization, maintain a large anode area (at least two times the cathode area) and increase the concentration of free sodium cyanide to a level at least one-half that of the copper concentration.

It may be necessary to remove and clean your present anodes if, after standing in solution at 90°F (32°C) overnight, a black film is observed on the anode surface. After thorough rinsing and scrubbing to remove all traces of cyanide, immerse the anodes in HCl to remove the black film.

A reduction in the concentration of dissolved carbonates may also be necessary to insure good anode efficiency. Carbonates can be removed by freezing at temperatures below 0°F (-18°C) or by reaction with calcium hydroxide (lime). After determining the concentration of your sodium carbonate, pump your solution to a treatment tank, add 0.7 lb. of calcium hydroxide per lb. of sodium carbonate, settle and filter. The removal of dissolved carbonates by precipitation or freezing will entrap cyanides, so you will be creating a hazardous sludge. You also may shift the composition of your brass deposits. Some adjustments in the copper or zinc concentration may be required to readjust the brass deposit composition. ***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 21^{st} 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.