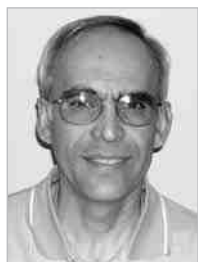


Finisher's Think Tank



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A New Year with More New Challenges

The new year brings with it new challenges to the metal finishing industry, such as:

- maintaining and increasing economic growth
- a strong contribution to the GNP
- meeting discharge and related effluent regulations
- introducing and expanding new and improved technologies related to quality surface preparation and finishing.

This is all in the works plus the immense task of North American finishers being competitive with respect to offshore metal finishing sources. Suppliers provide effective stewardship of equipment / proprietary product manufacturing to help finishers produce consistency and ship quality parts to industry users. Dedicated basic research and development conducted by suppliers, independent labs and universities continues to identify new finishes to replace environmentally targeted ones.

End product users help to clarify required specifications. Some of them develop or change specifications to accommodate new processes and/or revised environmental mandates or regulations. Others appreciate the introduction of effective, compliant systems and cycle steps that reduce: process costs and rejects, while increasing overall productivity. They especially appreciate a marketing advantage if the new process replaces an environmentally hazardous one, touting an Earth-friendly manufactured product.

We all have a full agenda of related projects to keep us busy. Perhaps the most important one that affects just about everyone in this industry is the requirement to eliminate the use and application of defined hazardous materials. The following directives should be acknowledged:

- **ELV - End of Life Vehicle Directive.** It was initially implemented by the European Parliament in July 2003. The focus of this directive is based on environmental concerns related to hexavalent chromium. Specifically, it mandates that only non-hexavalent chromium containing products can be supplied to the automotive industry, while not compromising corrosion protection.
- **Directive 2002/96/EC (part of Annex II).** It permits a maximum concentration of 0.1 wt% of hexavalent chromium, lead, mercury, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE). Additionally, there is a maximum of 0.01 wt% of cadmium allowed in homogeneous materials. This is clarified to confirm a uniform composition throughout the part or finish treatment.
- **RoHS.** The European Union, based on committee meetings of the member nations, developed a critical directive on Jan. 27, 2003. It outlines the related issues concerning the sale of electrical and electronic products in the European Union. Specifically as of July 1, 2006, new electrical and electronic equipment put on the market "shall not contain lead, mercury, cadmium, hexavalent chromium, PBB and PBDE."
- **WEEE Directive.** This is an acronym for Waste Electrical and Electronic Equipment. It is a combination of the 2002/96/EC regulation on waste electrical and electronic equipment together with RoHS Directive 2002/95/EC. It sets the requirements for collecting, recycling and recovering mandates covering all electrical goods. The responsibility of disposing WEEE materials is the responsibility of specific manufacturers. European Union member nations met this mandate as of August 2005.

The replacement of hexavalent-containing passivates or chromates has been the main driving force to meet a majority of these new environmentally-related directives. Effective and compliant trivalent chromium-based chromates have been developed and are in production use, meeting for example ELV. These products are available as liquid concentrates. Their application and operating parameters are similar to the traditional hexavalent chromates. Salt spray protection meets specific hours as required by ASTM B-117. Colored finishes are currently available in clear (blue), yellow and black. The clear trivalent chromates have been favorites of finishers for over 20 years. It has been the emergence of RoHS, ELV and WEEE, with specific deadlines that have been the driving forces for development of trivalent yellow and black chromates. The yellow chromates may be applied in two possible treatments:

- Chromate directly in the process tank, forming a yellow-to-green iridescent colored passivation film.
- Add a suitable dye that absorbs into the yellow chromate or in a clear trivalent chromate bath. This develops a more aesthetically yellow appearing passivation film.

A major benefit to development of the trivalent black chromates is the silver-free formulations, which eliminate the potential for brown discoloration as the chromate ages in field use. Top coats and sealers markedly increase salt spray protection of the chromate finishes. Active agents to achieve improved corrosion protection include inorganic silicates, organic silicates, specialty polymers, waxes and hydrocarbon-in-water emulsions. Specialty lubricants can also improve corrosion protection.

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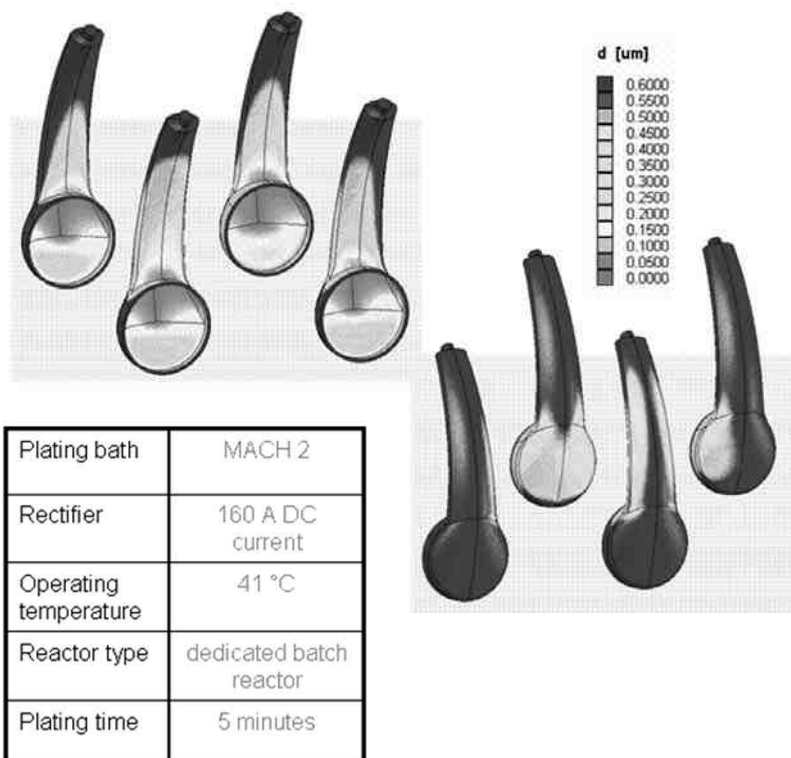


Figure 3—Plating simulation results from Cr(VI) bath.

bath. The results showed that, although the Cr(III) plating process was less efficient, the throwing power was better, giving a more uniform deposit thickness for the conditions selected.

Summary

In summary, modeling can be used to identify opportunities for improving existing surface finishing processes; for rapidly retooling fixtures and tanks when workloads change; for estimating the best and most cost effective ways of finishing parts when bidding on jobs; deciding if purchasing new bath chemistries, fixtures or equipment makes sense; preparing business cases for facility expansions or improvements and evaluating ways to remain in compliance with environmental regulations. Modeling also can bring some science to the art of plating and is an excellent opportunity for academe and industry to work together. Finally, such modeling tools could even be used to predict the capabilities of emerging surface finishing technologies and make comparisons with existing processes. *P&SF*

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There has been a great deal of practical experience with the trivalent clear (blue) chromates. Compared to the hexavalent clear chromates, the trivalent formulations:

- Typically extend a bath service life by two to three times in meeting salt spray requirements.
- Required less aggressive polishing, removing less zinc deposit, especially in low current density areas.
- Form a more distinctive blue color and are more tolerant to hot air drying.

From a waste treatment perspective, many trivalent chromates are much easier to waste treat. In most applications, pH adjustment of the spent solution with lime or dilute caustic solution precipitates trivalent chromium. The yellow and black trivalent chromates may require additional steps, depending on the requirements, based on formulation constituents.

ELV, RoHS and WEEE are neither formidable tasks nor should they be considered insurmountable. Dedicated research and development efforts have produced and marketed effective products, meeting or exceeding service life specifications. Diligent work continues as we can expect the introduction of newer generation products. The committees which authored the specific directives have also issued exceptions, to ease the requirements for compliance. The challenges include:

- Prioritizing what needs to be done by listening carefully and understanding the goals
- Developing a sense of urgency with regard to categorizing each part of a project's importance and when it should be completed
- Confirm the appropriate field evaluation meets the practical requirements.

These indicate the project or new system meets or exceeds the goals.

Change is good. Change is ongoing. It is a part of improvement that makes all the dedicated work and effort worthwhile. We are part of a worldwide industrial network working together in a young millennium. Wishing you all a healthy and prosperous New Year! *P&SF*