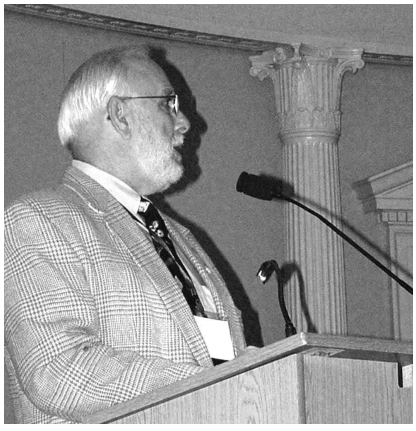
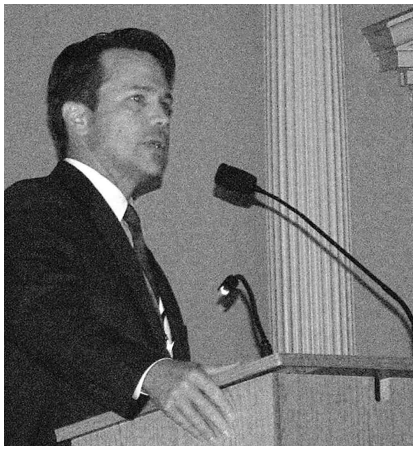
MFSA Conference Examines Science & Impact Of OSHA's Proposed Chromium PEL

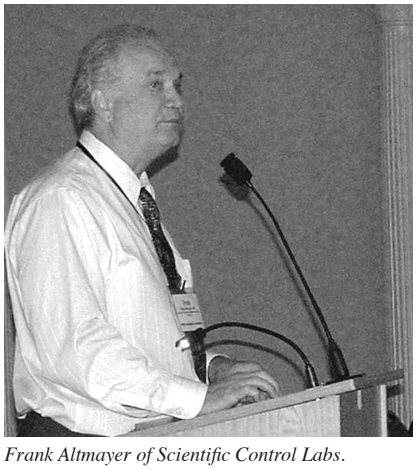
By James H. Lindsay, AESF Fellow



MFSA President Bill Saas.



Christian Richtor of The Policy Group.



Frank Altmayer of Scientific Control Labs.

One of the mainstays of the North American economy, indeed the global economy, is the automotive industry. A current issue that strongly impacts that industry is the OSHA-proposed chromium permissible exposure limit (PEL), which calls for a reduction in occupational hexavalent chromium exposure from 52 $\mu g/m^3$ to a mere 1.0 $\mu g/m^3$. If taken to conclusion, it would all have to be in place by January 2007.

On August 24, 2005, a special conference on the subject was held in Dearborn, Michigan, in the Lovett Hall Ballroom of the Henry Ford Museum complex. Its purpose was to assess the current state of the science, the potential for future regulation and possible market impacts. It was organized by the Metal Finishing Suppliers' Association (MFSA) in conjunction with USCAR, the umbrella organization of Daimler-Chrysler, Ford and General Motors, formed in 1992 to strengthen the technology base of the domestic auto industry through cooperative research. This was the third in a series of such annual events, previous conferences having dealt with chromium passivates and nickel emissions. This valuable forum began with a gracious welcome and introduction by MFSA President Bill Saas of Taskem, Inc.

Chrome PEL Status

Christian Richter, of the Policy Group, Washington, DC, discussed the background and status of the OSHA-proposed chromium permissible exposure limit (PEL) and its potential effect on the automotive industry. He noted that it is a high impact regulation, affecting $2.8 billion of commerce, involving aerospace, defense and shipbuilding sectors beyond the automotive industry. The short list of processes effected includes hard chromium, decorative chromium, chromium anodizing, chromates, plated plastics, passivation, welding, grinding, polishing – and into areas such as the manufacture of stainless steels.

There are alternates, including trivalent chromium, nickel-boron and boron or cobalt-based plating chemistries. Other technologies, including thermal spray, HVOF, nanotechnology and flexible preceramic coating, present substitute opportunities. In nearly all cases however, it is a matter of a cost premium.

Richter noted that the selection of the 1.0 $\mu g/m^3$ limit would give us the lowest exposure limit in the world. The global average is currently 50 $\mu g/m^3$, including the European Union, China and India. He noted that OSHA based the limit on the occupational exposure of chromate production workers, a severe case scenario compared with the bulk of industrial use. They also assumed low compliance costs, which would simply be passed on to the consumer, another questionable proposition.

He said that the industry is taking a hard look at the impact of this drastic measure. With the SFIC leading the effort, an OSHA Chromium PEL Task Group is working to that end. They are looking at such topics as health issues, technical feasibility, compliance costs/impacts and cost/benefit analysis.

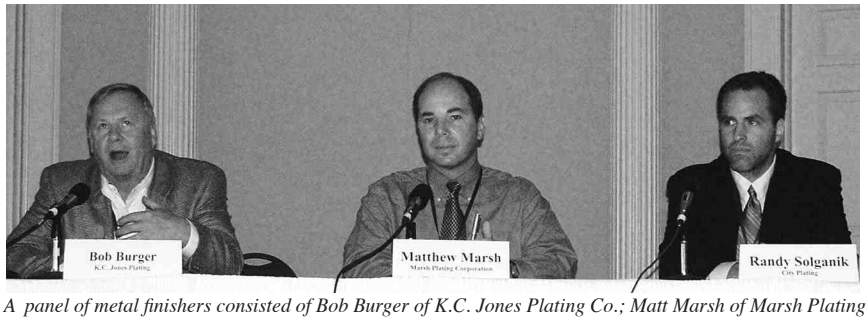
There are other issues that extend beyond the technologies themselves. There are matters of scheduling, once the final regulations are published. Consumer trends and preferences will dictate what substitutes can be used. Customer material specifications can limit the alternative process options. The fact that the compliance level is 1/50 of that of the rest of the world poses competitive issues.

One issue that came up in the question period related to the presence of hexavalent chromium in trivalent chromium processes, through oxidation at anodes. The point was made that the trivalent chromium plating processes had a very low tolerance for hexavalent chromium ions and would shut down long before there was a problem.

Cost & Performance Issues

The next item on the conference agenda was a panel discussion on the subject, "The Challenge of the Automotive Industry of Meeting Performance Specifications and Maintaining Cost Competitiveness." The discussion centered on initiating interaction between the suppliers and the auto companies over these issues. The panelists were metal finishing suppliers, including Bob Burger, of K.C. Jones Plating Co. (Warren,

Claudia Duranceau of Ford Motor Company (at podium) moderated a panel of automotive manufacturers. Panel members included: Harish Bhatt, Visteon Corp.; Angie Coyle, Delphi Corp.; Ross Good, Daimler-Chrysler; Doris Hill, General Motors; Toshi Murai, Dipsol Corp.; and Everett Rezendes, Ford Motor Co.



A panel of metal finishers consisted of Bob Burger of K.C. Jones Plating Co.; Matt Marsh of Marsh Plating Corp.; and Randy Solganik of City Plating.

MI), Matt Marsh, of Marsh Plating Corp. (Ypsilanti, MI) and Randy Solganik, of City Plating (Cleveland, OH).

Much of the discussion centered around trivalent passivates. It was noted that, in the shift to trivalent plating chemistry, there is a cost penalty associated with the actual transition from the hexavalent process. There is plenty of juggling involved. Indeed, in all candor, the panelists said that they will be relieved when matters are actually settled.

Good customer-supplier dialogue was present in this forum. The panelists sent the message to the auto companies: "Allow us to pick the supplier technologies that work for us." It was noted that Daimler-Chrysler did encourage applicators to seek the best trivalent process, which affords flexibility. It was pointed out that the constraints that OEM's place on the supply chain over concerns that they won't get what they want can be costly. Indeed, costs also add up with multiple specifications among customers.

In terms of corrosion resistance and appearance, clear trivalent passivate processes seem to have a technological lead. With yellow passivates, extra effort is required to maintain consistent color. The panelists noted that there was a psychological perception that yellow finishes contained hexavalent chromium, although not true. It was also noted that yellow tends to fade under natural UV radiation. Black passivates provide good color control, but fall short in terms of corrosion resistance.

Still, the panelists cautioned that the technologies for trivalent passivates are still not settled. Coatings are changing quickly, and there is a danger of locking into something too early.

Testing for Hexavalent Chrome

Next, Frank Altmayer, MSF, of Scientific Control Laboratories, in Chicago, IL, discussed the "Test Methods and Challenges for Quantitatively Determining Hexavalent Chromium on Parts." He reviewed the applications where hexavalent chromium is found, adding to Mr. Richter's comprehensive list (dichromate seal in anodizing, pigments in paints, acidulated rinse after phosphating).

He reviewed the three most commonly used test specifications (Delphi DX900356, General Motors GMW-3034 and ISO-3613), and alluded to the fact that there were on the order of 30 others. His main point: they don't all match up. He pointed out the differences between the three primary specs, noting that the differences dealt with assuring that the very last trace of chromium (VI) is extracted from the sample for analysis. He noted that there was a risk of false positives and false negatives related to stray contaminants from the process or even from the laboratory.

Altmayer next presented some interesting data on current chromium exposure levels typically encountered in chromium plating installations. For hard chromium, the chromium exposure ranges from 0.5 to 6.0 $\mu g/m^3$ in manual installations, and 0.4 to 1.7 $\mu g/m^3$ in automatic lines. Similarly for decorative chromium, the values range from 20 to 90 $\mu g/m^3$ in manual installations, and 0.6 to 2.0 $\mu g/m^3$ in automatic lines. Programmed hoists however, tend to raise the value, owing to raising the rack out of the tank, and dragging and dripping the solution along with it.

Concerns of Manufacturers

The final item on the program was a panel discussion consisting of members of the automotive manufacturers, as part of the USCAR effort. The topic was, simply put, "Substances of Concern," that is, those substances in an automobile that are under scrutiny or restriction. This part of the program went beyond the issue of chromium PEL regulations. The bottom line is that the original equipment manufacturers (OEMs) must know what substances are going into their products.

The Moderator was Claudia Duranceau, of Ford Motor Company. Her panelists were:

- Harish Bhatt, Visteon Corporation
- Angie Coyle, Delphi Corporation
- Ross Good, Daimler Chrysler Corporation
- Doris Hill, General Motors Corporation
- Toshi Murai, Dipsol Corp. (with the Asian automotive perspective)
- Everett Rezendes, Ford Motor Company

Each panelist made a brief presentation on an aspect of the substances issue. Duranceau, in her introduction, stressed that in recent years, the market had become a global one, and the development of a global economy had changed the way the automotive industry does business. Thus, environmental issues were global issues, and matters such as the End-of-Life Vehicle (ELV) directive and life cycle considerations impact the entire planet.

Rezendes reviewed the development of the ELV and the subsequent spread of such legislation. Though it originated with the European Union, similar directives have been issued in Japan, Korea,

AESF Director Peter Gallerani, CEF-3 (foreground), attended the conference to meet with automotive professiionals.

China, other parts of Europe and several U.S. States. They prohibit the use of hazardous substances in vehicles, specifically lead, mercury, cadmium and, of course, hexavalent chromium. They specify vehicle recyclability and recoverability, and the percentage of recyclable content is to increase over the next few years.

The International Material Data System (IMDS) was ably described by Hill. The IMDS is an Internet-based system used to track materials in vehicles. In the beginning, it was a joint development of Audi, BMW, DaimlerChrysler, Ford, Opel, Porsche, VW and Volvo. As intended, it has become a global standard, with 76,808 users from 30,346 supplier organizations and 17 car manufacturers. Here, records on all materials used for car manufacture are archived and maintained. This central database makes it a simpler task to compile documentation for substance approval and to calculate recyclability percentages. Only such a unified resource can make it possible to meet the compliance obligations placed on OEMs and suppliers, by national and international standards, laws and regulations. The IMDS website is at www.mdsystem.com/index.jsp.

She also discussed the Global Automotive Declarable Substances List (GADSL). Developed by global automotive stakeholders, it is a common list for reporting declarable substances used by OEMs. The list contains substances expected to be present at the point of sale, as well as regulated substances where sound science dictates their inclusion. The list is accessible at www.gadsl.com. She also alluded to the related sites of the Big Three automakers: Daimler-Chrysler's CS9003, Ford Motor's WSS-M99P9999-A1 and General Motors' GMW-3059 (see www.gmw3059.com).

Coyle discussed the substances reporting issue from the perspective of a Tier 1 supplier. Tier 1 suppliers are faced with varying requirements among their customers. In such a situation, they adopt the most stringent or "worst case" requirements and enforce them on the sub-tiers. She noted that there is plenty of potential for confusion within the supply base, which makes the case for data collection, such as the IMDS, most important, though it is not an easy task. Yet, a Tier 1 supplier is ultimately the responsible party "in the food chain."

She also discussed the issues involved in the elimination of substances of concern. Those involved can be driven to distraction by such matters as the availability of replacement technology, insufficient timing, varying elimination dates (e.g., two years difference between OEMs in the case of eliminating hexavalent chromium) and just plain lack of awareness. Each one of these aggravations drives up costs. The longer the time available, the smoother the transition and the smaller the spike in costs.

Bhatt covered the specific impact of the End-of-Life Vehicle Directive with respect to hexavalent chromium. Hexavalent chromium will be prohibited effective July 2007. However, as noted above, the OEM compliance dates range from July 2005 to July 2007.

The substance at issue here, of course, was chromates, a layer applied for corrosion protection over zinc-plated fasteners and parts. The conversion coating is prized for its self-healing properties, lubricity and torque tension characteristics, in the case of fasteners. Bhatt outlined the substitutes, including trivalent chromium passivates, trivalent chromium sealer/topcoat systems, lead-free paints, chromium-free organic coatings and even metal alloys. None match traditional chromates perfectly, without a cost premium. The cost is dependent on the system chosen and its application.

Bhatt concluded with one important point to be remembered. The supplier should provide only what the specification requires. To provide more, only adds cost.

Murai provided an international perspective, noting that a major issue at hand overseas is the elimination of lead. Beyond batteries, lead has been used in lights, piston rings, spark plugs and carbon brushes. Further, electroless nickel processes often utilize a lead-based stabilizer, which can be co-deposited. Beyond that, there was the problem of lead in electrocoated primers. He noted that automotive electronics must be free of lead by July 2006, as mandated by the ELV.

For the electroless nickel issue, electroplated tin and alloys of tin with copper, bismuth or silver are prime candidates. There still are the historical issues of whisker growth with tin finishes to address. Of course, the sheer effort of handling the issues of transition with the OEMs must always be confronted.

Mr. Rezendes discussed the electroless nickel issue generally. He noted that replacement issues dealt with cadmium-free brighteners, in addition to the lead-free stabilizers.

The MFSA Dearborn Conference was an excellent forum for the various parties to exchange views and, most important, to learn. When the OEMs and suppliers, from every tier level on the chart, can communicate in this way, compliance with these global challenges should be significantly smoother. It is critically important that each entity knows what the others must deal with on a daily basis. ***P&SF***