More Challenges for the Industry at the 4th Washington Forum 2008

Once again, Spring in Washington, D.C. heralded an event of critical importance for the surface finishing industry. The NASF Washington Forum again provided a conference containing information vital to all industry players. As was the case with the other three, the 4th Washington Forum took place at L'Enfant Plaza Hotel, just blocks from Capitol Hill. Held on April 22-24, the Forum began on Earth Day 2008, which was symbolic of the fact that representatives of the industry were in dialogue with those from such agencies as the EPA, OSHA and DoD. As with the last three successful Forums, the program offered critical information to inform the industry of the regulatory and social challenges and pitfalls that lay in the future. And of course, the Washington venue allowed dialogue with our legislators on Capitol Hill, to lay out what is at stake for the surface finishing industry and to anchor the credibility of the industry.

As ever, Christian Richter of the Policy Group did a yeoman's job in organizing and chairing the Washington Forum. In his introduction, he noted that the meeting was designed to focus on emerging issues and policy trends, including the economic challenges of global competition, the latest status of regulatory efforts, from process to product requirements and the technological implications of "green chemistry." The program was designed to educate the industry on the latest status of critical issues including:

- The dual realities of globalization: economics and regulation
- The major U.S. and E.U. metals and chemicals regulation, in particular, REACH and nickel
- Trends and opportunities in such areas of concern as PFOS, OSHA, Defense, metals and nanotechnology

Mr. Richter discussed the impact of climate change, noting that, despite those voices who continue to deny its existence, it is a new reality. He noted that climate change is now a *fact* of political life, and the U.S. and other authorities will continue to respond with potentially far-reaching regulations. Businesses that do not factor in climate change as a business issue may be in for a big surprise. Yet the finishing industry has already responded. Indeed, compared to other industrial sectors, finishing is not a major source of greenhouse gases.

On the other hand, Mr. Richter noted the challenges of carbon caps. The current Lieberman-Warner bill being taken up by the Senate (s.2191) will boost costs for energy use, transportation and chemicals, giving an advantage to developing nations. This and the need to open up new U.S. domestic energy sources that are now "off limits" were issues that Mr. Richter, and speakers to follow, deemed critical to raise in the attendees' meetings on Capitol Hill.

China

China's emerging economic power has become a concern for the Western world in the early years of this century. Mr. Dan Slane, Commissioner for the U.S.-China Economic & Security Review Commission, discussed the implications of developments in China on U.S. manufacturing competitiveness.

Noting that he was expressing his opinions and not those of the government, Mr. Slane outlined several key points. He explained that there is a global shift of power to China with unprecedented speed. The new China is emerging primarily along the Pacific coast, while 800 million souls live in the interior in poverty. Within the new China is an emerging middle class who "want what we have." The 200M middle class will grow to 700M by 2025. There are not enough resources to support that. This means shortages and price increases, which are being felt globally.

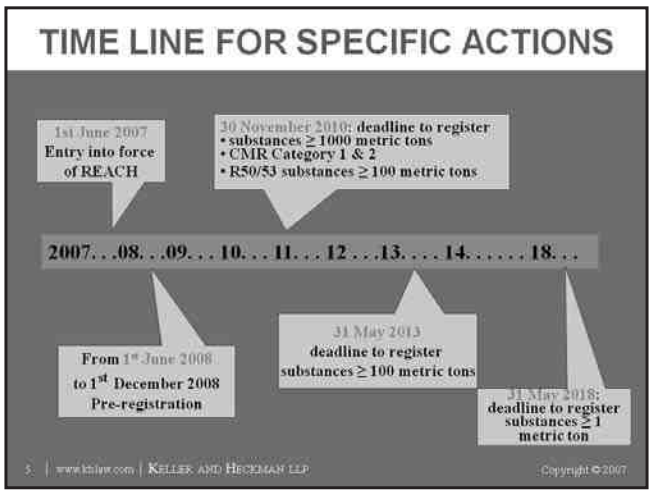
As for the environment, pollution has become so bad that there is a serious question that it can be reversed. With 2000 coal-fired power plants, the pollution gathers on the East Coast and drifts across the Pacific to inundate the North American West Coast. The attitude has been "economic development at all costs." While this attitude may be changing, it may be too late. Other issues that Mr. Slane discussed included consumer product safety. There are no regulations, and the attitude is that this issue is the responsibility of the importing countries. He also noted the high potential for a global influenza pandemic.

But the critical issue to our industry is trade. He noted that we have a $256B trade deficit with China. The dollar is sinking and the U.S. is consuming more than it is producing. Chinese sovereign wealth funds of $20B are being used to buy companies in the U.S. On

the other side of the coin, foreign firms are required to invest in China in order to manufacture products for China, and the trend is toward high-tech products. Mr. Slane said that if U.S. efforts drive Chinese exports, all is well, but if one tries to break into the domestic market, there are difficulties. These are many of the critical factors that, if not addressed, could render life in the U.S. to "second rate."

REACH

Among the more daunting programs to be discussed at the Washington Forum was the European Union REACH regulation, ably covered by Martha Marrapese, Partner at Keller & Heckman, LLP (Washington, DC). It is appropriately named as it is indeed far-reaching. REACH stands for the **R**egistration, **E**valuation and **A**uthorization and Restriction of **Ch**emicals. Those three words and the fourth unbolded word are quite descriptive of the scope and intent of the regulation.

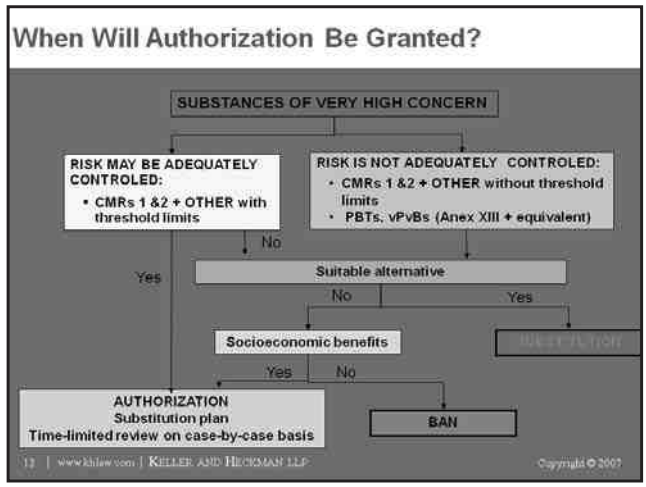


REACH will replace most of the European Union chemicals legislation in place. It applies to both *new* and *existing* substances. Ms. Marrapese noted that the ramifications of this regulation still appear to be emerging.

REACH went into force on June 1, 2007. A pre-registration phase is currently ongoing until December 1, 2008. In essence, this "buys time," allowing potential registrants to identify each other and organize themselves in a way that facilitates registration of their products.

Official registration then follows. It applies to each EU manufacturer or importer and to each component of a preparation. Non-EU actors (*i.e.*, North American manufacturers) cannot pre-register or register directly. Rather, they can only work through their representatives in the European Union. Polymers are not registered but monomers and other reactants will be. There are several deadlines up to 2018, depending on usage and the nature of the chemicals involved, as seen in the time line diagram above.

During all of this, data on 30,000 chemical substances is expected to arrive in a central database (although comprehensive data only exists for *hundreds*). Most high tonnage chemicals have at least SIDS (Screening Information Data Set) level data. However, this data is merely preliminary screening information and includes no data on chronic human health effects, where chemicals are used or workplace and environment effects, if any. SIDS data falls short of what will ultimately be required for REACH. It will take several years to fill the data gaps in the case of animal studies for higher tonnage chemicals. On the other hand, data requirements for low volume substances are modest.



The heart of REACH is in dealing with SVHCs, or so-called Substances of Very High Concern. These are (1) Category 1 and 2 carcinogens, mutagens and reproductive toxins (CMR) or (2) persistent, bioaccumulative and toxic or very persistent and very bioaccumulative substances (PBT or vPvB). In addition there are substances where there is scientific evidence of probable serious effects to human health or the environment.

Once all of this is filtered through the evaluation process, the authorization or restriction phase will finally be reached. The outcome for each individual chemical - and in particular the SVHCs - will depend on the degree to which the chemical is already adequately controlled, whether there is a viable substitute or whether damage can accrue to society and the economy without it.

Of course, this all begs the question on the effects within the plating industry. In particular, electroplated articles (ignoring post treatments for the moment) contain the metal layers, not the chemicals used to produce them. Ms. Marrapese said that the question of whether plated articles are exempt for REACH has yet to be determined.

Like previous regulations in the European Union, any North American manufacturer doing business there is affected. Yet the status today remains nebulous. As noted earlier, companies do not work directly with the EU regulators. If you have business in the EU, preparation is wise. It is recommended that you (1) conduct an internal inventory, (2) identify exemptions and SVHCs and (3) map out and engage the supply chain. It was evident that much remained to be worked out.

Of course, underlying all of this is the prospect of REACH-type legislation within the U.S. In another presentation, Mr. Jamie Conrad, of Conrad Law & Policy Counsel (Washington, DC), reported on what was in the wind. He discussed the California Green Chemistry Initiative, called a "preemptive strategy to stop toxic substances before they contaminate the environment and our bodies." Spearheaded by the California Department of Toxic Substances Control (http://www.dtsc.ca.gov), Phase 1, consisting of brainstorming options, ended in 2007. Phase 2, a discussion of the options, is ongoing. Mr. Conrad reports that the recommenda-

tions will be sent to the Secretary of Environmental Protection by July 1.

Mr. Conrad also discussed the EPA Chemical Assessment & Management Program (ChAMP), under which the EPA, by 2012, will complete screening-level risk characterizations and take action, as appropriate, on more than 6,750 chemicals produced above 25,000 pounds per year (http://www.epa.gov/champ/).

Nickel

Among the issues of major concern to the industry, developments concerning the regulation of nickel have been near the top of the list. Again, activities in the European Union have raised further concerns, and most of them are concerned with the effects of REACH on nickel chemicals. Two presentations dealt with this issue.

Ms. Claire Mattelet, of the Nickel Institute discussed the current status of EU activity on nickel and its impact on U.S. manufacturers. She first reported on the current EU deliberations on Nickel Risk Assessment and Nickel Risk Reduction Strategy. Discussion on the Risk Assessment was finished at the EU level in April 2008, and the Organization for Economic Cooperation and Development (OECD) is expected to confirm the outcome in October. However, there has been no publication in the European Union's Official Journal. The EU review of the Nickel Risk Reduction Strategy was planned for April 23, but there was no follow-up at the OECD level. These efforts provide the basis for REACH regarding nickel.

For REACH, the nickel registration issue involves a timeline of three to five years, not ten, if the CMR classification holds. Authorization will apply to manufacturers, including importers and downstream users. Authorization would be granted if the applicant demonstrates "adequate control" of risks or if socio-economic benefits of specific use outweigh the risk to human health or environment *and* if there are no suitable alternatives available.

Ms. Mattelet reviewed the ongoing efforts with the EU plating industry to comply with the nickel requirements. She discussed the Nickel REACH Consortia effort, a voluntary initiative from the nickel industry to anticipate REACH obligations. The Consortia are organized by nickel chemical categories. The consortia programs deal with gathering effects assessment and exposure data, risk assessment, characterization and management, and other administrative tasks. In these ways, there is growing collaboration amongst the EU plating sector. Ms. Mattelet concluded by noting the increasing need for the nickel supply chain to obtain regulatory advocacy on a global basis.

Mr. Christopher Bell, of Sidney & Austin (Washington, DC) continued the discussion on nickel regulation in the EU. He noted that "REACH is not the only regulation in town." Important decisions are being made in the EU in advance of REACH. Environmental, safety and health classification decisions are already being made for over 140 nickel compounds. Mr. Bell characterized the scientific basis of these classification efforts as "questionable." Considering the legal and commercial implications for the global supply chain, there are still advocacy opportunities to affect changes in this arena.

One of the imminent decisions under consideration by the EU relates to the 30th and 31st Adaptations to Technical Progress (ATPs) of the Dangerous Substances Directive (67/548/EEC). The 30th ATP brands nickel carbonate, nickel sulfate and a few others as carcinogenic, mutagenic and reproductive toxins (CMRs) - conclusions not grounded in science. Member States agreed to implement the 30th ATP on June 1, 2009. The 31st ATP is due to be finalized shortly, and aims to classify 140 additional nickel compounds as CMRs. Included here are sulfamate, acetate, hydroxides (in batteries) and oxides. Mr. Bell noted that some of the conclusions are based on the weak assumption that if compound "A" is a CMR, compound "B" with a similar chemical structure must also be a CMR.

The consequences are numerous. There could be automatic labeling requirements, with questionable skull and crossbones symbols on prominent display on products. There would be a limitation on the use and distribution of CMR substances. There would be global supply implications as companies restrict the presence of these chemicals in products. Businesses would be receiving letters requesting certification that CMRs are absent.

There is some hope as the current status is still open for both ATPs. For the 30th, recent studies indicating potential errors may provide an opening. For the 31st, it is not yet cast in stone, and advocacy opportunities still exist at the EU level. The World Trade Organization takes the position that such environmental regulations cannot be any more trade restrictive than necessary to protect health and the environment. Seventeen countries have raised concerns about the 31st ATP at the recent WTO Geneva meeting, something unheard of in WTO annals.

The United States' voice in these meetings is the U.S. Trade Representative. The U.S. will challenge EU environmental rules if (1) there is a demonstrated U.S. commercial interest, (2) the rules are most restrictive than necessary and/or (3) the challenge is consistent with U.S. policy. While in Washington for the Forum, a representative group of NASF members met with the U.S. Trade Representative on April 22, including Bill Saas, John Lindstedt, Joelie Zak, Tony Rivera and Mike Kelly, among others. The outcome was deemed to be successful.

Chemical Security Regulations

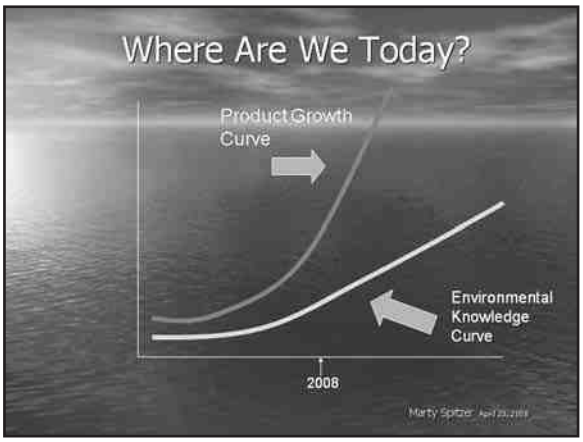
While REACH and nickel issues were among the paramount regulatory issues of interest, they were not the only issues of concern. Mr. Jamie Conrad, mentioned earlier with regard to REACH issues, covered other new and future U.S. chemical regulatory developments.

Mr. Conrad discussed the Department of Homeland Security's (DHS) Chemical Facility Antiterrorism Standards. The standards apply to chemical facilities presenting "high levels of security risk." More specifically, this pertains to facilities possessing greater than the "screening threshold quantity" of any of 335 Appendix A "chemicals of interest." The DHS is to notify the estimated 7,000 to 8,000 covered facilities that they are "high risk," and provisionally assigned to one of four risk-based tiers. The high risk facilities will be required to perform a Security Vulnerability Assessment (SVA) and develop and implement a Site Security Plan (SSP). Notifications were to be sent out in May and the SVAs were to be submitted between September and December 2008, depending on the tier assigned.

This wasn't the only security measure affecting the metal finishing industry. A House measure is under consideration to support the development of voluntary private sector preparedness standards.

Also, in August, DHS/DOT will report to Congress on security risk assessment of the trucking industry. This involves trucks over ten tons carrying placarded amounts of hazardous materials.

Nanomaterials



Mr. Conrad also briefly alluded to the EPA Nanoscale Materials Stewardship Program, noting that it was still under development (http://epa.gov/oppt/nano/nmspfr.htm). Continuing on the subject of nanotechnology policy was Dr. Martin Spitzer, of the H.J. Heinz Center for Science, Economics and the Environment (Washington, DC).

Dr. Spitzer noted that the field of nanotechnology has been developing rapidly and the product technology curve has been notably outrunning the environmental knowledge curve. The gap needs to be narrowed. Dr. Spitzer made a number of thoughtful points. He noted that nanotechnology has great promise, but getting it wrong is a terrible outcome when there is so much at stake in getting it right. If we don't answer the environmental questions before an actual or perceived risk grabs the public imagination, we could undermine the growth of nanotechnologies irreparably. As an example, he cited the image of genetically-modified products. Nonetheless, we still have time to get it right, but he is concerned we are dawdling when we need to be running. He stressed that the surface finishing industry has a strong interest in the federal government doing a better job getting the needed science done and establishing a rational governance framework so these technologies can flourish. He ended his presentation on a cautionary note, mentioning that internationally, "REACH is out there."

PFOS

Another item for discussion dealt with controls on PFOS, or perfluoroctane sulfonate, a primary surfactant used in chromium plating. PFOS is one of several man-made perfluorochemicals in use today. Mr. Keith Anderson, of Keystone Automotive (Brainerd, MN) gave his perspective as a plater, beginning with a history of PFOS. Historically, it was the primary ingredient in 3M's Scotchguard®. Unfortunately, it was found to be extremely resistant to breakdown in the environment and will bioaccumulate in humans and animals. Mr. Anderson related his experiences in negotiating with local government and his efforts to reduce and ultimately remove PFOS from his operations, including the use of non-PFOS surfactants and switching to trivalent chromium. His story is still ongoing.

Mr. Seth Diblee, of the US EPA Region 5, related his perspective on the issue. He reviewed the EPA history leading up to the promulgation of a PFOS Significant New Use Rule in October 2007, which "requires manufacturers, including importers, to notify EPA at least 90 days before commencing the manufacture or import of the PFAS chemicals." Current activities involve gathering data for the Clean Air Act residual risk analysis in accordance with Cr MACT (Maximum Achievable Control Technology) standards. He noted that EPA monitoring had "not reached critical mass."

Ms. Joelie Zak, of Scientific Control Labs (Chicago, IL) discussed measurement and testing. She noted that analysis for PFOS required very sophisticated instrumentation. The impact of more regulation would be considerable difficulty in finding new sources to perform the tests. Inevitably, the cost of testing would increase.

Mr. Mike Barnstead (MacDermid), Mr. Brian DeWald (Enthone) and Dr. Ken Newby (Atotech) gave the suppliers' perspective. They noted that PFOS was a very stable surfactant and had been very successful. The alternatives are not as stable, and are more costly to use. Though alternatives are available for five commercial chromium processes, no alternatives really fit all applications.

Government Agencies

The NASF has been justifiably proud in their cooperative efforts with a number of government agencies. As in previous Washington Forums, there were important things to report.

U.S. Environmental Protection Agency

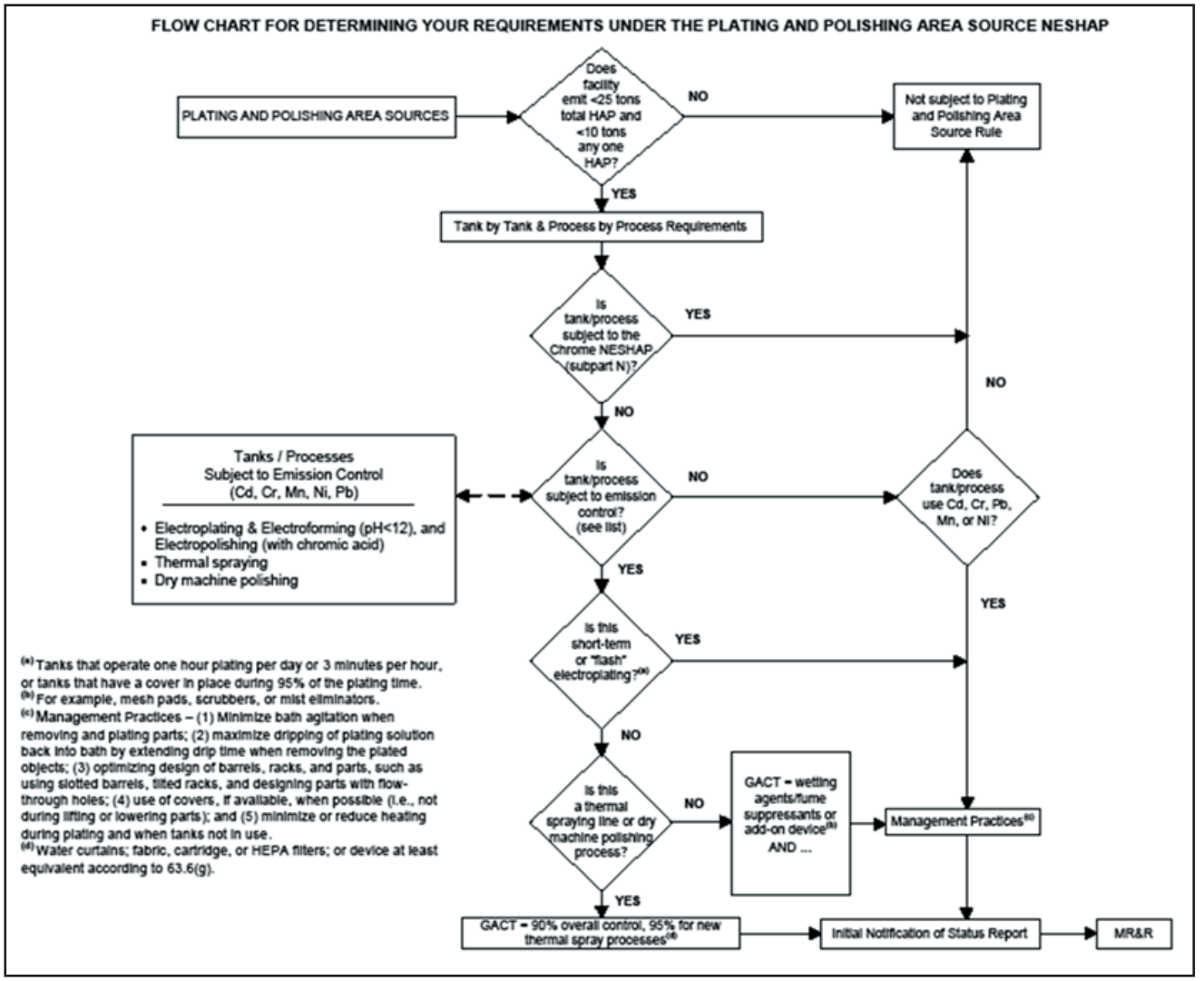
Working with the U.S. EPA over the years, the NASF and its predecessor organizations have benefited from a number of cooperative efforts and have exchanged information to provide perspective on a number of government regulatory actions. Dr. Donna Lee Jones of the U.S. EPA was on hand to report on the latest developments in the Plating & Polishing Rule.

The National Emission Standards for Hazardous Air Pollutants (NESHAP): Area Source Standards for Plating and Polishing Operations (40 CFR, part 63, subpart WWWWWW) was proposed on March 14, 2008 and the deadline for public comment was April 14, 2008. It applies to any plating and polishing facility that is an area source of HAP emissions (Cd, Cr, Pb, Mn and Ni). It does not apply to chromium electroplating tanks at these facilities or at R&D facilities. It does apply to any tank that contains compounds of any of the five metal HAPs and is used for non-chromium electroplating, electroforming, electropolishing, electroless plating or other electroless coating processes (*e.g.*, Cr conversion, Ni acetate seal, etc.).

Emissions can be minimized by:

- Minimizing bath agitation when removing tank parts
- Maximizing dripping of the solution back into tank by extending drip time and using drain boards
- Using tank covers, if available, when practicable
- Optimizing the design of barrels, racks and parts to minimize dragout and
- Minimizing or reducing heating during tank operation and when tanks are not in use.

Ms. Jones discussed the compliance requirements and noted that records should be kept for five years. She estimated that 2,900 plants would be impacted by the rule. The court-ordered deadline for issuance of the final rule was to be June 15, 2008.



Department of Defense

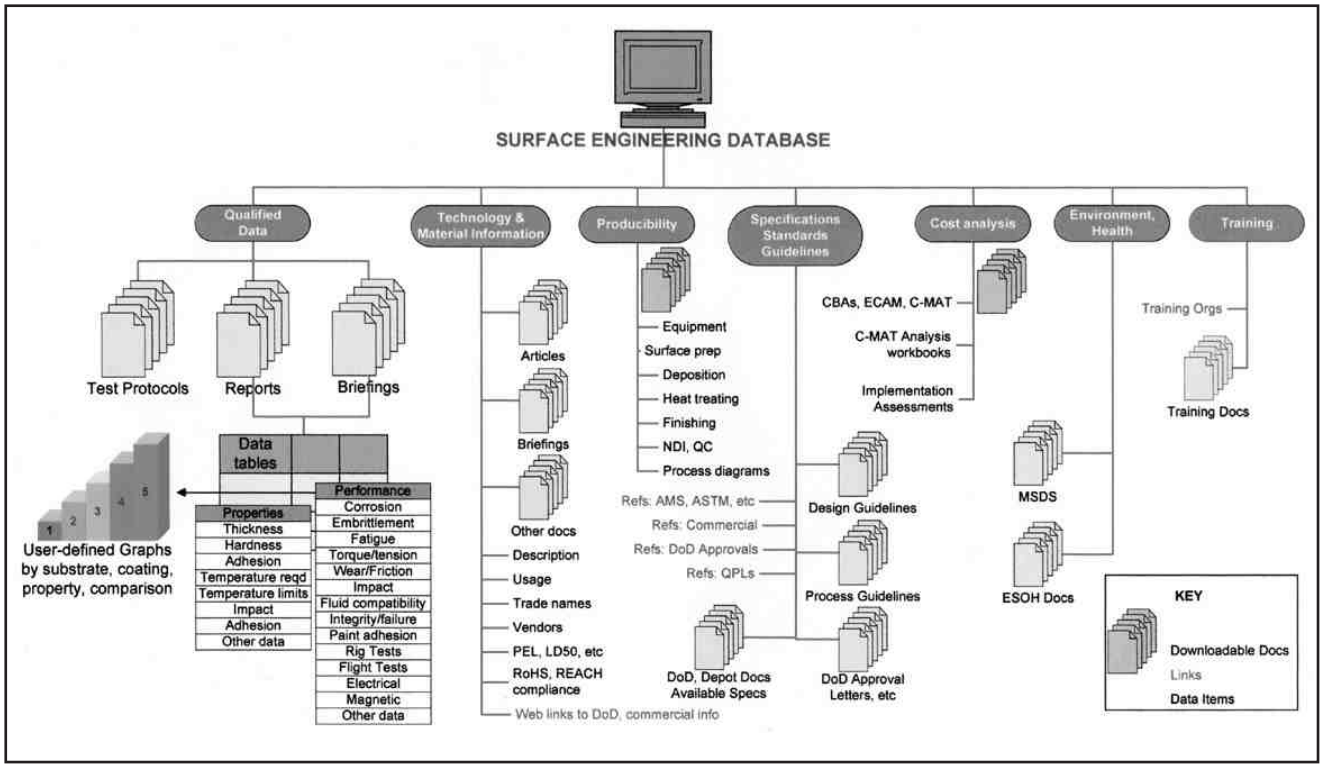
Work in the "greening for surface finishing" at the Department of Defense was reported by two speakers. Dr. Carole LeBlanc, Special Expert, Emerging Contaminants in the Office of the Deputy Under Secretary of Defense was on hand to describe green chemistry and the Department of Defense Emerging Contaminants Program. She defined green chemistry as "the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances." She went on to discuss the efficacy of various databases on chemical systems available to the DoD.

From this information, a chemical ranking survey was established. Surprisingly, far more systems were identified within DoD (17) than previously thought (out of ~100 systems examined). Not so surprisingly, the systems identified were found to be application-specific. However, Dr. LeBlanc noted that no one existing system was likely to meet all of DoD's needs.

Dr. Keith Legg, of Rowan Technology (Libertyville, IL) followed with a discussion of "greening" DoD with respect to surface finishing operations. He reviewed a number of successful workshops that had taken place in recent years, involving both DoD and industry personnel. These workshops endeavored to explore such areas as surface finishing and repair issues for sustaining new military aircraft, chromate alternatives for metal treatment and sealing and others.

He reviewed a number of technologies that have shown promise as alternatives to hexavalent chromium and cadmium. Non-Cr primers are taking over and HVOF coatings are taking over from hard chromium for external surfaces (electroless Ni for internals). The challenges with these lies in people not being comfortable with having no Cr^{+6} in the finish (Old habits die hard.). Also, non-chromate finishes require much more careful preparation. Finally, in many cases, one must replace a single technology or material with several, owing to part design and requirements. No one alternative serves all.

On the other hand, there are two viable cadmium alternatives. Electroplated zinc-nickel has been found to be as good as or better than cadmium. Further, it can be incorporated into existing lines fairly easily. The overall best cadmium alternative however, is Alumiplate®, the direct electrodeposition of aluminum metal from a non-aqueous electrolyte. Because of the nature of the electrolyte, an enclosed plating line is needed, necessitating additional capital cost. Nonetheless, Dr. Legg deems it to be the best alternative to cadmium.



Following on Dr. LeBlanc's theme, Dr. Legg noted that, "to implement clean technologies quickly and efficiently, engineers need ready access to engineering data on surface engineering materials and processes adequate for making engineering decisions. There are numerous web sites for different agencies, but none contain real engineering data, production details, etc." To this end, he described a new Surface Engineering Database. It is currently an ASETS (Advanced Surface Engineering Technologies for a Sustainable Defense) passworded resource for the DoD programs. It is expected that establishment of readily available engineering data for some materials will drive the release of commercial engineering data for others.

Occupational Health and Safety Administration

At the 2007 NASF Washington Forum, an OSHA Alliance Program was formally signed into existence by representatives of the surface finishing industry, including NASF. This year, Ms. Lee Ann Jillings, Director of the OSHA Office of Outreach Services and Alliances reported on the OSHA Alliance and finishing workplace trends. She reviewed the OSHA Alliance program, including programs and resources available to the industry. For the surface finishing industry, the Alliance is focused on (1) small businesses, (2) chemical hazards, including trivalent chromium, and (3) issues of immigrant workers and employers. Ms. Jillings referred to a number of speeches that had been made by OSHA as part of the program, including the 2007 and 2008 Washington Forums, as well as a joint meeting of the AESF-Detroit Branch and the Michigan Association of Metal Finishers in March 2008. She also noted that a Metal Finishing Work Practices Manual was under development. She also reviewed the issues involved with the Chromium PEL regulation.

Carbon Cap-and-Trade

Whether or not you agree that global warming and climate change are real, there is no doubt that it is a subject for debate and discussion and its impact on the country is increasing with time. Clearly, the ramifications are having an effect on American industry and the surface finishing industry in particular.

Currently, the U.S. Senate is considering America's Climate Security Act (s. 2191), also known as the Lieberman-Warner Bill, which in essence institutes a carbon cap-and-trade policy on greenhouse gas emissions. Paul N. Cicio, Industrial Energy Consumers of America (Washington, DC) discussed the ramifications of the act, should it be passed. Similar to the policies operating in the European Union, carbon prices are traded like an energy commodity with no relative value to abatement costs. Mr. Cicio described the bill as "the most overarching regulation in U.S. history." He went on to state that "it will weaken economic growth rates, increase the cost of energy, inflation, manufacturing trade deficit and reduce quality of life." He termed it "a huge tax and wealth transfer" and noted that it would provide more motivation to drive manufacturing from the U.S.

The bill would regulate all major greenhouse gas emissions, including those from oil refineries, natural gas processing, coal electric utility and the industrial/manufacturing sector. The action threshold would be 10,000 tons of carbon equivalent. It would create a new registry and mandate quarterly reporting. The program would begin in 2012, reducing emissions to 1990 levels by 2020, and to 65% of 1990 levels by 2050. There would be a cap-and-trade scheme, which would allow anyone to buy, sell or retire carbon allowances, opening the door to hedge funds and speculators.

Mr. Cicio noted that its impact would be to raise costs, and increase uncertainties of costs, capital planning and the reliability of the energy supply. Because low cost options are not available in the short term, only alternative would be natural gas. He explained that nothing in the bill would prevent coal-to-natural gas fuel switching, which would lead to higher natural gas and electricity prices.

He also noted that there was still time to influence the nature of the bill. The Senate bill was to be taken up in June and a similar cap-and-trade bill would be considered by the House of Representatives later in the year. He urged those attendees who would be making visits to their legislators on Capitol Hill during the Washington Forum to express their concerns.

Visits to Capitol Hill

The NASF provided a briefing to participants before their meetings on Capitol Hill, Mr. Christian Richter led a discussion of the lay of the land regarding the carbon cap-and-trade bill. He noted that climate change is a *fact* of political life and that NASF supports cost effective action to reduce greenhouse gas emissions. Nonetheless, it was felt that, in the cap-and-trade bill, the U.S. is pursuing a potentially far-reaching regulation that may impose major costs on manufacturing. However, the industrial sector emissions are already below 1990 levels and finishing is considered to be an insignificant greenhouse source. Furthermore, most U.S., EU and Japanese manufacturers favor alternative policies over cap-and-trade schemes.

On the left, Rep. Ron Kind of Wisconsin and right Eric Olander.

He also stressed that the U.S. domestic energy sources are being kept off limits. The focus is away from domestic energy security. Mr. Richter noted that it was not just the well-publicized Alaskan fields; new offshore drilling on the continental shelf is virtually written off. At the same time, somewhere in the Straits of Florida, the Chinese are drilling on the same continental shelf, just across the U.S.-Cuban border.

Unilateral U.S. action that increases costs will drive manufacturing jobs offshore along with its emissions. Mr. Richter affirmed that the NASF would continue its valuable cooperative work with the EPA, OSHA and other organizations to maximizing energy efficiencies in surface finishing operations.

With that information fresh in mind, the final day was spent by participants in making their case to their legislators on Capitol Hill. This opportunity was the final phase of another successful Washington Forum.

For additional details on the presentations given at the 2008 NASF Washington Forum, the Powerpoint slide presentations are available for study at the NASF website, www.nasf.org. Click on "2008 Forum Presentations" after your member log in.

AESF Foundation Fall 2008 Courses

Aluminum Finishing Technology Course
Chicago, IL, November 3-4; Exam: November 5, 2008
This is a two-day course covering the subject of finishing processes for aluminum.
Target audience: Line operators, managers and engineers who work in the jobshop anodizing industry or in the airline/aerospace industry.

Chromium Plating for Engineering Applications Course
Providence, RI, September 17-18; Exam: September 19, 2008
The course is particularly useful to job shops, aerospace and airline plating operations. A background in both chemistry and metallurgy is provided, so that the students can better understand the problems involved in plating chromium onto a wide variety of substrates. Detailed information is provided on analytical control of the plating solutions, preparation, masking and polishing operations. Clean Air Act compliance information is also covered, along with equipment design, including scrubbers and mesh pad systems.

Electroforming Course
Rochester, NY, August 18-19; Exam: August 20, 2008
Lesson-1, Introduction to Electroforming
Lesson-2, Electrochemistry for Electroforming
Lesson-3, Operation of Nickel Electroforming Solutions
Lesson-4, Copper & Other Electroforming Solutions
Lesson-5, Operational Variables and their Effect on the Properties of Electroformed Nickel
Lesson-6, Mandrels, Types Materials, Design and Preparation
Lesson-7 & 8, Applications-Part-1 & 2

Zinc & Zinc Alloy Plating Course
Cleveland, OH, October 15-16; Exam: October 17, 2008
Target audience: Line operators, managers and engineers who perform zinc & zinc alloy plating or are considering adding this to shop's capabilities

Environmental Stewardship Course-New!
Los Angeles, CA, December 8-11 (Part 1 & 2); Exam: Dec. 12, 2008
Los Angeles, CA, December 8-9 (Part 1); Exam Part 1: Dec. 10, 2008
Los Angeles, CA, December 10-11 (Part 2); Exam Part 2: Dec. 12, 2008

Part-1 Pollution Prevention Concepts & Technologies
Lesson-1 Introduction & Examples of Facilities Employing P2
Lesson-2 Best Operating Practices for P2
Lesson-3 P2 for Cleaners & Acids
Lesson-4 Ion Exchange Concepts for P2
Lesson-5 Electrolytic Systems for P2
Lesson-6 Evaporative Systems for P2
Lesson-7 Membrane Systems for P2
Lesson-8 Crystallization & Diffusion Systems for P2
Lesson-9 Process Ventilation & P2
Lesson-10 Spill Prevention & Countermeasures

Part-2 Wastewater Treatment Technologies
Lesson-1 Chemistry-1
Lesson-2 Chemistry-2
Lesson-3 Water & Waste Segregation, Flows & Balances
Lesson-4 Introduction to Wastewater Treatment
Lesson-5 Treatments for Oily & Greasy Wastewater
Lesson-6 REDOX Treatment Methods
Lesson-7 Advanced Wastewater Treatments
Lesson-8 Solid-Liquid Separation
Lesson-9 Zero Discharge Concepts
Lesson-10 Process Instrumentation & Control

To register go to: www.nasf.org (click on "education")