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February 2008

Finishing TODAY

Trends & Technologies for Coatings Professionals

Plural-Component Coatings

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INSIDE: Quality Control • Polyureas

11TH ANNUAL

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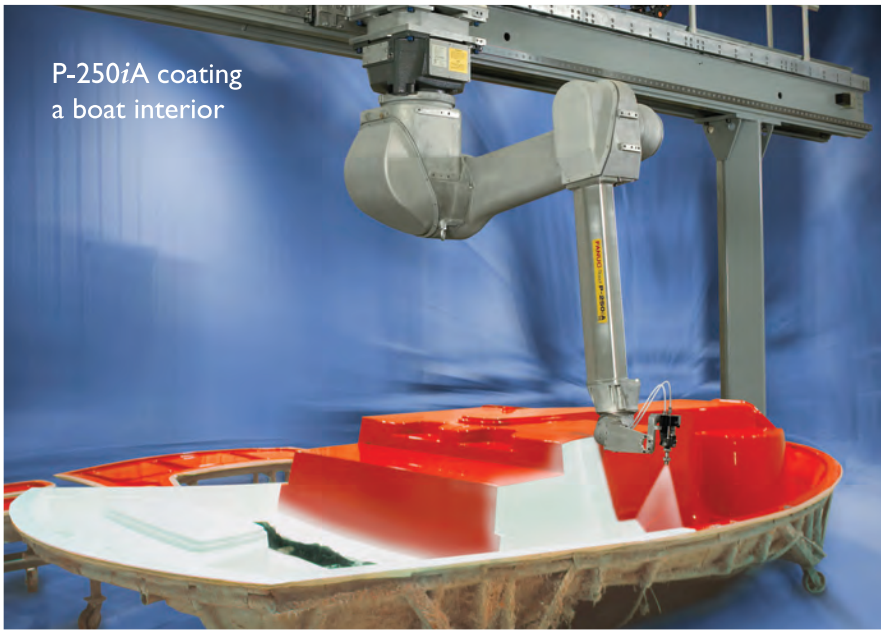
FIT for COATINGS

P-250*i*A applying finish to an automotive fascia



P-250*i*A coating a boat interior

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Don't Underestimate Your Competitive Edge

Christine Grahl, Managing Editor

Recession. It started as a whisper late in '07, primarily among talking heads in the financial sector, as news of the subprime mortgage woes and resulting credit crisis at the large banks began to spread. By mid-January, the whisper had turned into a buzz that was impossible to ignore. All the chatter is enough to make anyone in business nervous. While economists are still divided on whether a U.S. recession will actually occur, everyone agrees on one thing: It feels like a recession. Banks aren't eager to lend money, and consumers aren't eager to spend it. Whether growth simply slows or stops altogether, the effect on many businesses is the same. The prospect of lower sales and profits has many companies tightening their seatbelts in preparation for what could be a wild ride in the coming months.

But sitting tight and doing nothing might be exactly the wrong way to weather a challenging economic environment. Whether your finishing operation has already felt the effects of a slowdown or is simply bracing for the possibility, implementing processes and technologies that improve efficiency, productivity and quality can have a substantial impact on where your profit margins end up during 2008.

This issue covers several technologies that can help finishing professionals gain a competitive edge. For example, plural-component coatings, also called reactive-cure or two-component coatings, can reduce energy costs related to curing when compared to single-component materials. Some reactive-cure coatings can be applied in substantially less time than conventional formulations, enhancing production efficiency and increasing throughput (see pp. 18-21). Such coatings can be optimized by using cutting-edge fluid handling systems that eliminate pot life concerns while simultaneously reducing the amount of waste produced (pp. 22-23).

Modern quality control technologies also offer ways to improve efficiency and cut costs. For instance, precise thickness measurements can ensure that material is being applied correctly, with a minimal amount of waste, and can reduce the number of customer returns due to finishing defects. Advanced ultrasonic coating thickness measurement instruments are providing a way for finishing professionals working with wood and plastics to achieve accurate thickness measurements nondestructively, thereby saving material costs (pp. 24-27). New temperature measurement technology can allow weathering tests to provide a more accurate picture of how a coating will perform over time, thereby helping to ensure the long-term satisfaction of customers with a given product, and possibly leading to repeat purchases due to brand loyalty (pp. 28-31). And the advanced data management capabilities of today's quality control instruments can help finishing professionals streamline their analysis efforts for improved quality and productivity (pp. 32-35).

We can't control the economy. However, we can position our businesses to have the best competitive advantage, regardless of what the future might bring. Lean, cost-effective operations that produce high-quality products will be better able to shrug off a downturn, and will be ready to reach new levels of success when the economy rebounds.

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ft inside

FEBRUARY 2008
VOLUME 84, NUMBER 2

FEATURES

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Corrosion Prevention Basics

Knowing what to look for in a coating can help you achieve the optimum finish.

COLUMNS

FINISHING DEPARTMENTS

ON THE COVER

Plural-component coatings provide a high-quality, durable finish in a variety of applications, from bridges to OEM equipment. Story on p. 18.

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Finishingagenda

MEETINGS, SHOWS AND SEMINARS IN 2008

FEBRUARY 26-28
Surface Finishing and Repair Issues for Sustaining New Military Aircraft, Fiesta Resort and Conference Center, Tempe, AZ, 847.680.9420, hlegg@rowantechnology.com, *http://events.hazmat-alternatives.com*

27-29
Smart Coatings 2008, Grosvenor Resort, Disney World Resort, Lake Buena Vista, Orlando, FL, 734.487.2203, *www.emich.edu/public/coatings_research/smartcoatings/index2.html*

MARCH 2-6
NASF Management Conference, Sheraton Hacienda Del Mar Resort and Spa, Cabo del Sol, Los Cabos, Mexico, 202.457.8404, lweber@nasf.org, *www.nasf.org*

16-20
Corrosion 2008 Conference & Expo, Ernest N. Morial Convention Center New Orleans, LA, 800.797.NACE, cindy.euton@nace.org, *www.nace.org*

18-20
Spray Finishing Technology Workshop, Mount Wachusett Community College (MWCC), Robert D. Wetmore Technology Center, Gardner, MA, 978.630.9179, Khanson@mwcc.mass.edu, *www.mwcc.mass.edu/programs/FWP/FINISHINGWORKSHOP.html.*

APRIL 8-10
ExpoCoating 2008 - The International Exhibition and Conference for Coatings and Surface Treatment, WTC Congress Center, Moscow, Russia, *www.expocoating.ru/eng*

8-11
Polyurea Development Association Applicator Spray Course, Polyvers Facility, Houston, TX, *www.pda-online.org*

20-23
Southern Society for Coatings Technology (SSCT) 2008 Annual Technical Conference, Sandestin Beach and Golf Resort, San Destin, FL, 800.969.1606, dr@mccanda.com

21-23
11th Annual Coatings for Plastics Symposium, Westin Yorktown Center, Lombard, IL, 888.530.6714, *www.coatingsforplastics.com*

22-24
2008 NASF Washington Forum, L'Enfant Plaza Hotel, Washington, DC, *www.nasf.org*

MAY 4-7
RadTech UV & EB Technology Expo & Conference 2008, McCormick Place, Chicago, IL, 240.497.1242, uveb@radtech.org, *www.uveb2008.com*

14-16
Electrocoat 2008, Marriott of Indianapolis, Indianapolis, IN, 816.496.2308, kmcglothlin@electrocoat.org, *www.electrocoat.org*

JUNE 3-5
American Coatings Show and Conference, Charlotte Convention Center, Charlotte, NC, 202.462.6272, cmatthews@paint.org, *www.american-coatings-show.com*

15-18
ASTM International Committee D01 on Paint and Related Coatings, Materials, and Applications, Hyatt Regency Vancouver, Vancouver, BC Canada, 610.832.9738, jadkins@astm.org, *www.astm.org/COMMIT/D01.htm*

16-18
SUR/FIN 2008, Indiana Convention Center, Indianapolis, IN, *www.sur-fin.net*

JULY 8-11
Polyurea Development Association Applicator Spray Course, Houston, TX *www.pda-online.org*

SEPTEMBER 10-11
Powder Coating Forum, Cleveland, OH 888.530.6714, *www.pcimag.com/pcforum*

FEBRUARY '08

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MORE EVENTS CAN BE FOUND IN OUR ONLINE AGENDA AT WWW.FINISHINGTODAYMAG.COM.

DuPont, American Trim Collaborate on Hex-Chrome Alternative

DuPont Coating Solutions and American Trim have teamed up to promote an innovative coating technology. American Trim recently took delivery of a physical vapor deposition chamber (PVD) that allows for the processing of a chrome-like finish without the use of hexavalent chrome. The PVD process employs a base powder coating supplied by DuPont, which serves as a protective, functional layer and smoothes out the surface. Therefore, no sanding or buffing is required on rough parts, like castings. The PVD chamber is used to deposit the very thin layer of metal. Parts are then coated with a clear acrylic topcoat for protection of the metal layer and added durability.

This technology represents added potential for coatings for numerous industries. The PVD process was primarily designed for decorative finishing in the heavy duty truck and automotive industries, but there is added interest from other markets such as appliances, recreational vehicles, furniture and building products. PVD coating provides a viable alternative to the traditional method of applying chrome and electroplating. In most instances, the result is a less expensive and better performing, chrome look.

For more information, visit www.dupontpowder.com or www.amtrim.com.

Braggone Secures Funding to Advance Polymer Coatings

Braggone, an optoelectronics materials company based in Oulu, Finland, has received multimillion dollar funding from TEKES (The National Technology Agency of Finland) to commercialize its polymer materials worldwide. The company's proprietary material technology reportedly allows for custom tuning of inorganic-organic polymer material properties to suit specific electronics applications. These flexible yet stable materials coat or print onto substrates at greater efficiency, lower temperatures and higher yields. The TEKES funding is specifically targeted toward taking the materials production and sales from the lab to a commercial scale. These materials are part of an intellectual property portfolio of 17 filed patents, four of which have already been granted.

Braggone's research for the semiconductor industry reportedly has resulted in an innovative set of nanoengineered siloxane compounds for silicon-containing anti-reflective coatings (ARCs). Out of this same polymer research, Braggone recently announced a new product line designed to greatly increase the efficiency of solar cells and allow manufacturing facilities to cost-effectively increase their capacity. According to the company, the custom-designed compounds can dramatically reduce the reflection from glass and silicon, and therefore deliver substantially more light to the active regions of the solar cell. Even when compared to materials such as silicon nitride, the Braggone materials reportedly can cut reflection by half, and costs associated with deposition tools by even more than half. Braggone tunes the optics of the cell by spray, slit, spin, or dip coating layers of molecularly tailored material, rather than having to use expensive chemical vapor deposition (CVD) tools.

For more information, visit www.braggone.com.

Researchers Develop "Practical" Water-Repellent Coating

John Simpson at the Department of Energy's Oak Ridge National Laboratory has developed a super-water-repellent (superhydrophobic) powder that is easy to fabricate and uses inexpensive base materials. The patent-pending process could lead to the creation

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of a new class of water-repellant products, including windshields, eyewear, clothing, building materials, road surfaces, ship hulls and self-cleaning coatings.

The nanostructured material maintains a microscopic layer of air on surfaces even when submerged in water, resulting in a profound change in the basic water-solid interface. Simpson refers to this as the "Moses effect." The powder's porosity and nano-scale-sharpened features amplify the effect of water's surface tension and causes the powder to become "unwettable." Only a small amount of inexpensive superhydrophobic powder is needed to coat a relatively large surface area.

Another feature of this powder is its thermal insulation characteristics. Water does not enter the grain pores because the powder grains are superhydrophobic. This results in a dry breathable coating with trapped insulating air throughout. And, because the powder consists almost entirely of porous amorphous silica, it also makes a very good electrical insulator. In addition, since the powder creates a layer of air between the coated substrate and any water on the surface, water-based corrosion of the substrate is greatly reduced or entirely eliminated.

For more information, visit www.ornl.gov.

North American Galvanizing Opens New Tech Center

North American Galvanizing & Coatings, Inc. has opened a new technical center in Tulsa, OK. The technical center will house the company's current engineering department, which is being reorganized to incorporate an expanded customer "tech support" function and product and process development activities pertaining to hot dip galvanizing.

The new technical center can be reached at 918.281.6760 or techcenter@nagalv.com. For more information, visit www.nagalv.com.

Professional Plating Achieves Powder Coating Certification

Professional Plating, Inc., Brillion, WI, has received a certificate of qualification as a certified applicator for architectural powder coatings from Tiger Drylac USA Inc. To achieve this certification, the company had to demonstrate that it meets the stringent quality and processing standards necessary to become an approved applicator.

The company's website is at www.pro-plating.com.

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HP&C Issued License for Innovative "Diamond" Coating Process

Houston Plating & Coatings (HP&C), a Houston-based provider of corrosion prevention services, has been awarded the first Houston-area license for InnerArmor™, a new, proprietary interior coating process for corrosion control developed by Pleasanton, CA–based Sub-One Technology.

According to Bill Howard, CEO of HP&C, "InnerArmor is a remarkable new patented process that applies a diamond-hard coating to the internal surfaces of a variety of components. Tests have shown it to be a significant technological breakthrough — putting a hard, ultrasmooth, corrosion-stopping surface on the interiors of everything from small precision components to industrial piping."

The InnerArmor technology uses hollow cathode plasma immersion ion processing, which requires special application equipment. Installation and calibration of the InnerArmor production equipment at HP&C's plant in South Houston was completed in September, and volume production began in November.

In a separate move, HP&C and Diversified Mechanical Services (DMS) have formed a joint venture, Gulf Coast Mechanical & Coatings (GCMC), to operate and expand the current DMS production facility. DMS provides custom anti-corrosion coating services using Heresite™ through an exclusive license, as well as other mechanical services for commercial air conditioning and air handling units. Heresite is a flexible coating with excellent anti-corrosion and heat transfer capabilities and is used for coating air conditioning fins and coils. It is a modified phenolic epoxy that uses a process that combines immersion and oven curing and is applied in one or more thin layers. Paul Brown, owner of DMS, will assume the role of president of the new company and have overall operating responsibilities.

For more information, visit www.sub-one.com or www.houstonplating.com.

Sherwin-Williams Acquires Flex Recubrimientos

The Sherwin-Williams Co. has acquired certain assets of Flex Recubrimientos, Acabados Automotrices and related companies. The purchase price was not disclosed. Headquartered in Monterrey, Mexico, the privately owned companies are said to be leading manufacturers and distributors of automotive after-market body fillers, putties,

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primers and other vehicle refinish products. The Flex group of companies has 150 associates and sales of approximately US$14 million. The group currently operates a manufacturing facility in Monterrey with distribution warehouses in Monterrey, Mexico City, Guadalajara and Tijuana.

For more information, visit www.sherwin-automotive.com.

Aleris to Close Ontario Coil Coating Facility

Aleris International, Inc. has decided to permanently close its Toronto, Ontario, coil coating facility. Production will be phased out during the first quarter of 2008, and the site will be permanently closed shortly thereafter.

The facility, which was acquired by Aleris when it acquired the downstream aluminum business of Corus plc in 2006, employs 64 people and supplies coated aluminum coil for building and construction, transportation, distribution and consumer durables applications. Aleris expects to take a restructuring charge of approximately $5 million to $6 million related to severance, shutdown costs and asset impairment. Production will be transferred to other Aleris facilities in North America.

The company's website is at www.aleris.com.

Enthone Expands in Eastern Europe

Enthone Inc., a business of Cookson Electronics, has opened newly formed companies in Romania (Enthone S.R.L.) and Slovakia (Enthone s.r.o.).

Enthone S.R.L. is located in Bucuresti, Romania and was acquired from Galvano Bial, Enthone's long-time sales representative. The former owners of Galvano Bial, Franz Hoffner and Petrisor Popescou, have been appointed to lead the Enthone S.R.L. management team. Hoffner has been named the country manager and Popescou has been named sales director. Enthone also has retained all former Galvano Bial technical service personnel to ensure the continuity of the technical support Romanian customers have experienced for many years.

Enthone s.r.o. is located in Piestany, Slovakia, and was acquired from GV Service Slovakia, Enthone's previous sales agent. Mirek Miskech, the former owner of GV Service, has been appointed country manager, and Jozef Gall has been appointed sales representative for the company.

Enthone's European marketing organization and the company's East of Europe product specialists will provide further support to both Enthone S.R.L. and Enthone s.r.o.

For more information, visit www.enthone.com.

Bodycote Opens New Testing Center Near Detroit

Bodycote Testing Group has established a new Bodycote Center of Excellence in Warren, MI. The 83,000 ft^2 facility combines activities from the Sarnia, Ontario, facility and Michigan facilities in Dearborn, Hillsdale, and Wixom into one location in Warren.

The new facility features state-of-the-art computer and life simulation testing, as well as expanded materials testing for polymers/plastics, metals, coatings, textiles and failure analysis. The Center of Excellence also provides robotic test centers, instrumentation design and build, durability testing, and environmental conditioning/corrosion testing. The facility is intended to provide support and service for the transportation market with the ability to test to worldwide standards for both import/export requirements and conformance validation demands.

For more information, call 866. BODYCOT(E) or visit www.bodycotetesting.com or www.bodycote.com.

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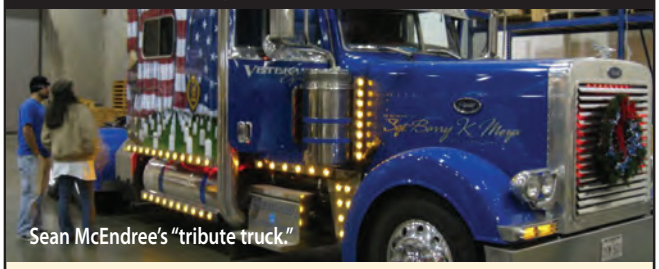
Akzo Nobel Restructures to Accommodate ICI Acquisition

Akzo Nobel completed the acquisition of Imperial Chemical Industries (ICI) on January 2, 2008, and restructured the company to accommodate the acquisition. The integrated organization operates in three business areas: Decorative Paints, Performance Coatings and Specialty Chemicals. Under this more focused structure, ICI's retained Specialty Polymers and Regional and Industrial activities have moved to Akzo Nobel Specialty Chemicals, while ICI's Packaging Coatings operation has joined Akzo Nobel's Performance Coatings portfolio.

ICI's decorating activities are now part of the new Akzo Nobel Decorative Paints organization, which consists of seven businesses: Decorative Paints Continental Europe; Decorative Paints Northern & Eastern Europe; Decorative Paints UK, Northern Ireland and South Africa; Decorative Paints Asia; Decorative Paints America; Decorative Paints Canada; and Decorative Paints Latin America. The Performance Coatings business includes Car Refinishes, Marine & Protective Coatings, Powder Coatings, Industrial Finishes and Packaging Coatings. The Specialty Chemicals business includes Base Chemicals, Functional Chemicals, Polymer Chemicals, Pulp & Paper Chemicals, Surfactants, Specialty Polymers, and regional and industrial activities.

For more information, visit www.akzonobel.com.

Col-Met Supports Wounded Warrior Project



Sean McEndree's "tribute truck."

On December 10, 2007, Col-Met Spray Booths hosted a special event at its facility in Rockwall, TX, at which it presented the Wounded Warrior Project with $10,000 that the company had collected through fundraising efforts. Juan Arredondo, Sergeant U.S. Army (retired), was there on behalf of the Wounded Warrior Project to accept the donation check.

Sean McEndree, a driver whose truck Ryno (from Trick My Truck on CMT) painted, drove his "tribute truck" to Rockwall to be a part of this event. McEndree's truck honors fallen and wounded soldiers by displaying an Arlington Cemetery scene, a Purple Heart and an American flag. McEndree was a specialist in the 96th Transportation Company in Iraq.

For more information about the Wounded Warrior Project, visit www.woundedwarriorproject.org. More information about Col-Met can be obtained at www.colmetsb.com.

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NY State Awards Xiom Grants to Expand Coating Technologies

Xiom Corp., a Long Island, NY-based company that manufactures plastic powder spray systems and polymer-based coatings, has been awarded grants totaling $500,000 from two New York state agencies.

The first grant, from The New York State Department of Economic Development, Environmental Services Unit, will focus on reducing liquid paint/coating use and decreasing curing oven requirements through XIOM technology substitution. The project aims to replace multiple coating steps — e.g., prep, dry, prime, dry, basecoat, cure, topcoat, cure, cool — to improve productivity and output. Additionally, because the technology is a powder coating, each company that adopts the Xiom approach could significantly cut VOC emissions, solvent/water use, and sludge generation from their coating operations.

The second grant, from the NY State Energy Research Development Authority (NYSERDA) and the Industrial Technology Assistance Corp. (ITAC), focuses on a demonstration project at a door manufacturing company. The project will entail designing and integrating the new automated coating system into the door company's main continuous paint line and bypassing the large curing oven. Project benefits, amounting to estimated annual savings of over $145,000, will result from reducing process fuel use by more than 50%, process travel time by 30%, powder material loss by 40%, and cutting electricity consumption and line maintenance. In addition, by avoiding the oven and employing a high deposit efficiency process, significant reductions in NO_x, CO, and CO_2 emissions and fine particulate powder waste will result. The project is expected to result in the development of a "green" coating system that can be replicated and potentially disseminated to a NYS target audience of 3,000 establishments.

For more information, call 631.643.4400 or visit www.xiom-corp.com.

Nanotechnology Improves Water-Based Coatings

Nanophase Technologies has developed new nanoengineered dispersions that can increase the scratch resistance and gloss retention of water-based systems to be equal to solvent-based organic systems. The new nanoengineered dispersions enabled an applied coating to resist scratching and marring and retain high gloss by up to 80% after rigorous industry testing. The dispersions produced a 300 to 400% improvement in scratch resistance for commercially available water-based coatings tested by the company.

For more information, contact Kevin Wenta at 630.771.6743 or kwenta@nanophase.com, or Dr. Richard Brotzman at 630.771.6717 or rbrotzman@nanophase.com.

Final OSHA Rule Requires Employer-Paid PPE

The U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) announced a final rule in November on employer-paid personal protective equipment (PPE). Under the rule, all PPE, with a few exceptions, are to be provided at no cost to the employee. OSHA anticipates that this rule will have substantial safety benefits that will result in more than 21,000 fewer occupational injuries per year.

Exceptions to the rule include ordinary safety-toed footwear, ordinary prescription safety eyewear, logging boots, and ordinary clothing and weather-related gear. The final rule also clarifies OSHA's requirements regarding payment for employee-owned PPE and replacement PPE. According to Edwin G. Foulke Jr., assistant secretary of labor for OSHA, the final rule addresses only the issue of who pays for

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PPE; it does not require employers to provide PPE where none has been required before. The new PPE payment requirements must be implemented by May 15, 2008.

For more information, visit www.osha.gov.

BASF Expands Waterborne Basecoat Production

BASF Coatings has broken ground on a €21 million expansion of production and lab capacities for waterborne basecoats at its Würzburg, Germany, site. Basecoat development will be concentrated in a newly built lab building, and additional application facilities are being set up to cover lab and production needs. State-of-the-art dispersion and dispensing techniques will be implemented. Overall, the capacity at the Würzburg site will be expanded by around 30%. The first facilities are scheduled to start up in the second half of 2008. The production launch of the entire project is then planned for the first quarter of 2009. Approximately 20 new jobs will be created as a result of the expansion efforts.

For more information, visit www.basf-coatings.com.

PPG Expands Alliance with Kansai, Acquires Brown Brothers

PPG Industries and Kansai Paint have expanded their alliance, known as PPG Kansai Automotive Finishes (PKAF), to include the sale of automotive coatings to Japanese-owned or operated original equipment manufacturers (OEMs) in Hungary. The business was transferred from a previous venture between Akzo Nobel and Kansai Paint.

In a separate move, PPG Industries, through a European subsidiary, has agreed to purchase the bodyshop distribution business of Unipart Automotive. The transaction was expected to close on or about January 31, 2008. The business will operate as a subsidiary of PPG under the name Brown Brothers Distribution UK Ltd. Financial terms were not disclosed.

The acquisition includes 34 distribution branches that supply refinish paint to bodyshops. In addition, acquired assets are to include inventory, selected equipment, brand names and customer lists. Following the change of ownership, approximately 475 Unipart Automotive bodyshop employees will transfer with the business under Transfer of Undertakings (Protection of Employment) (TUPE) regulations.

For more information, visit www.unipart.co.uk or www.ppg.com.

Valerie Reese

Sales and Marketing Manager, Hentzen Coatings Inc.

Valerie Reese has been appointed sales and marketing manager – Powder Coatings for Hentzen Coatings Inc. Her primary responsibility is expanding the sales of color cards and custom products throughout the U.S. Reese's past experience includes powder coating sales, marketing and inventory management, logistics and production administration. She is based in western Pennsylvania and is responsible for marketing, advertising and public relations for Hentzen's powder coatings division.

Roger Sieja

Director of Market Development, PPG Coil Coatings

PPG Industries' industrial coatings business has named Roger Sieja director of market development for coil coatings. In his new post, Sieja will be responsible for directing PPG's marketing efforts in the coil coating industry and for providing strategic direction to the sales and marketing teams. Roger has more than 30 years of experience in the industry encompassing the three key elements of the coil coating industry: metals, coatings and the coil coating process. He is currently president of the National Coil Coating Association.

Rick Weiler

President and CEO, Atlas Material Testing Technology

Atlas Material Testing Technology has named Rick Weiler as its new president and CEO. Weiler joins Atlas from PerkinElmer Optoelectronics where he was the vice president, general manager of Specialty and Commercial Lighting. His tenure with PerkinElmer Optoelectronics included serving as vice president of sales and marketing, responsible for worldwide sales.

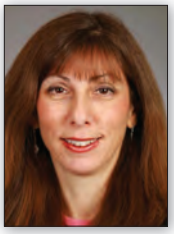
Maurice A.S. Stephenson, Ph.D.

Chief Chemist, SEI Chemical

SEI Chemical has appointed Dr. Maurice A.S. Stephenson as chief chemist, a new position that has facilities in Los Angeles and sales around the globe. Dr. Stephenson previously was a leading polymer chemist at DuPont, where he synthesized new monomers and polymers for coating applications. His background also includes working as a professor for ITT Tech and holding positions as chief research scientist for three multinational corporations. According to SEI, Dr. Stephenson has been engaged in top-level research programs for the development of new chemical polymers and products. A multi-patent holder and prolific writer, Dr. Stephenson has dealt directly with the FDA, EPA, ASTM Council and state-level compliance agencies.

Susan Guerin

Senior Vice President, Sun Chemical



Sun Chemical has named Susan Guerin senior vice president and chief financial officer. In this role, Guerin will provide both operational and strategic support to Sun Chemical's global leadership team. Guerin has more than 20 years of experience in financial management and operations at major global organizations. She has served as the vice president and CFO at Lerner New York, senior vice president and CFO at Cendant's Vehicle Services Division, and most recently as president of the Americas Apparel Group at Paxar Corp., with full financial responsibility for the North American and Latin American businesses. Guerin also spent 15 years with the Unilever Group, which included a five-year assignment in London, England as the total quality officer and corporate finance manager for the Asia Pacific Region.

Alan Blake

CFO and VP Finance, Michelman

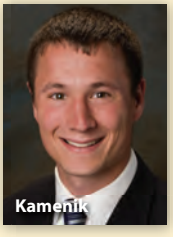
Michelman has hired Alan Blake as its new CFO and vice president, finance. Blake will assume responsibility for all aspects of the Finance and IT Departments and will lead the retooling of the company's IT infrastructure and financial systems to support and improve efficiencies in Michelman's growing global operations.

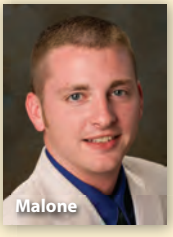
Dan Sweetwood

VP Sales and Marketing, Allied PhotoChemical

Allied PhotoChemical has promoted Dan Sweetwood from director of sales and marketing to vice president of sales and marketing. Sweetwood also has been nominated and voted to be an Allied PhotoChemical Board Member. ft

Columbia Chemical Expands Technical Support Staff





Three new professionals have joined the technical support staff of Columbia Chemical, a supplier of zinc plating additives. Technical Service Representatives **Adam Anderson** and **Evan Kamenik** will provide technical assistance and sales support to domestic and foreign customers, while Quality Control Technician **Corey Malone** will analyze and maintain quality standards on raw materials, intermediates and finished goods. All three report to Technical Service Manager **Jeff Grodecki**.

Seaworthy Coating Solutions

New powder coatings and thermal spray application technologies are improving the fuel efficiency and reducing the environmental impact of modern marine vessels.

BY LINDA COMAC
Xiom Corp.

"Water, water everywhere, nor any drop to drink…" laments the ancient mariner in the poem of the same name. Though many of us remember this line from our school days, few of us recall the next line, "The very deep did rot." Even without remembering the text, many of us today would repeat the ancient mariner's complaints: The water around us is barely fit to drink, and the pollution problem indeed runs deep. Polluted coastal waters cost the world economy more than $12.5 billion dollars annually in death and disease. At least part of the problem stems from the burning of fossil fuels, which account for 80% of the world's total energy supply. Total world consumption of these fuels is estimated to be the equivalent of 10,000 million tons of oil per year. And the problem is increasing. The world's emerging economies, like China and India, are expected to double their per capita energy use in the coming decade. It is not surprising that scientists now believe that the burning of these fuels will dramatically alter marine life.

It is estimated that the shipping industry uses 350 to 410 million tons of fuel annually, resulting in millions of tons of carbon dioxide emissions. Global emissions of CO_2 from shipping are believed to be twice the amounts emitted from aviation. Reducing the amount of fuel used by ships could therefore have a significant impact on pollution, as well as save substantial amounts of money.

One way to achieve this goal is to use coatings that prevent the growth of marine organisms. By eliminating the surface resistance caused by the buildup of these organisms on the hulls of marine vessels, such coatings can reduce the amount of fuel needed to propel the vessel. New powder coatings and thermal spraying devices are making it easier and more cost-effective to apply these coatings to today's marine vessels.

Powders in a Polymer Matrix

One such advance is an environmentally safe, self-cleaning, marine vessel hull protective powder coating. Developed for both steel and fiberglass boat bottoms, the coating significantly reduces maintenance costs and fuel consumption caused by marine growth. The polymer/cupric oxide-based coating contains no tributyl tin (TBT)

or volatile organic compounds (VOCs), and it does not ablate or wear away. It is estimated that the new marine coating will last five times longer than conventional paints, reducing the need for scraping or repainting the hull.

The patent-pending powder coating contains a network of evenly dispersed active cupric oxide and silver ions in a polymer matrix that is fully melted when applied with a proprietary thermal spray process. The polymer matrix serves to hold the cupric oxide in place for years. With conventional paints that contain cupric oxide, the particles closest to the surface quickly ablate, leaving a space so that water gets leverage on the surface of the paint. This ablation is accelerated, limiting coating life. With the new powder coating, the active ingredients are always strongly held and available in the coating, and the coating leaches at less than 1/10 the rate permitted by the EPA, while providing superior protection. Even if there should be some break or "tear" in the coating, a nylon-modified fuse bond epoxy between the hull and coating will maintain the coating's integrity.

"The secret was to develop a matrix that would hold the copper and silver oxides in place and prevent them from quickly wearing away."

To enhance the action of the cupric oxide, the new marine coating has micro-channels in the surface. These micro-channels serve to increase the effective surface area of exposed cupric oxide — like microscopic plastic "fists," with the fingers tightly holding the copper oxide. Water swirls around the fist and between the fingers, touching copper at many points, but the fist never releases its grip on the copper.

"Copper has been used to protect boat coatings for centuries. The secret was to develop a matrix that would hold the copper and silver oxides in place and prevent them from quickly wearing away," said Andrew Mazzone, president of Xiom Corp. Testing at the Florida Institute of Technology has confirmed the results that can be achieved with the new coating (see Figure 1).

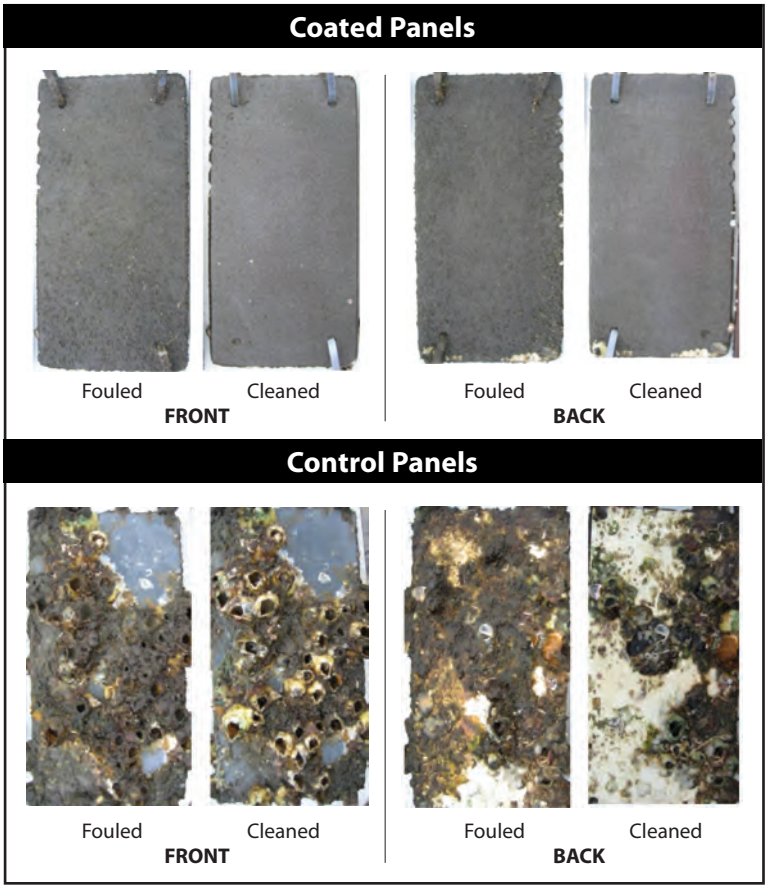


Figure 1. These images illustrate test results obtained from the Center for Corrosion and Biofouling Control at the Florida Institute of Technology, Melbourne, FL. The test was performed on a series of 4 x 8-in. static immersion panels that were held 3.3 ft (1 m) under the surface in the Indian River Lagoon in Florida from May 24, 2006 to June 1, 2007. The front and back of the control panels was uncoated and exhibited extensive macrofouling from barnacles and tubeworms; the other panels, which remained relatively free of macrofouling, were coated with the new protective powder coating.

Closing the Gap

One other way to reduce the fuel consumption of marine vessels is by improving the hydro-drive device known as a Kort nozzle, which is used on thousands of fishing boats, supply vessels, inland river boats and passenger boats around the world. This nozzle is a cylindrical tube that surrounds a screw propeller and provides increased control of the water turbulence passing through it (see Figure 2). Designed according to the principles of physics regarding fluid velocity, the Kort nozzle has a wide diameter at the intake and is thinnest at the center where the propeller turns. The diameter is also thinner at the outlet than at the inlet so that there is an increase in net velocity and energy of the water flow, leading to greater propeller efficiency.

The gap between the propeller blade tips and the nozzle barrel is designed to ensure that the propellers do not come into direct contact with the Kort nozzle barrel due to metal shrinkage or expansion caused by pressure. However, this gap also reduces the amount of thrust available to the vessel.

A new thermally applied spray coating and proprietary automated spraying device can be used together to coat Kort nozzle barrels with a thermoplastic composition that reduces the clearance between the propeller blade tips and the interior of the Kort nozzle (see Figure 3). The coating is applied at a minimal thickness over the entire interior of the cylinder. A thicker coating is applied to the area in which the propeller blades rotate, ensuring that the inside diameter of

the nozzle is equal to the diameter circumscribed by the blade tips: There is no gap between the propeller blade tips and the wall of the Kort nozzle barrel. A zero-degree gap results in increased pressure and momentum while preventing cavitation (the bubbles that form when a liquid is being pumped), dampening sound and eliminating "blow-by" (unburned fuel and exhaust gases that escape around the piston rings and enter the crankcase, potentially compromising engine performance). The concept is similar to that used in jet engines, where a coating is used to bridge the gap between the jet engine housing and the fan blades.

When the coating is applied on the inside surface of a Kort nozzle, the available thrust is increased with no additional energy input. The coating makes the nozzle more efficient, substantially reducing fuel consumption and protecting the structure from corrosion. The coating can be used on both new and used Kort nozzles and can stand up to a concentration of water movement that normally produces severe wear on the inside of the nozzle, which further reduces efficiency.

The proprietary thermal spray device designed for coating Kort nozzles uses specialized software and a robotic arc to follow the contour of the wall of the Kort nozzle and remediate concentricity imperfections that may exist as a result of wear or from manufacturing. Kort nozzles are rarely manufactured concentric; machining a perfectly concentric barrel would be time-consuming and expensive. The coating can be applied while the vessel is out of the water and the Kort nozzle is still installed on the vessel, reducing the labor and time associated with removing the nozzle from a vessel to apply the coating.

A sea trial recently was conducted on a 75-ft steel fishing boat operating out of New Bedford, MA. The vessel's 6-ft-diameter Kort nozzle had been coated with the new zero-degree clearance coating. The fuel savings were approximately 16%. The vessel's normal fuel consumption averaged 510 gallons per day at 4.3 knots pulling a drag line. With the modified Kort nozzle, the vessel averaged 430 gallons of fuel per day pulling a drag line at 5 knots against a 35 knot wind.

According to Charlie Quinn, captain of the vessel, "Usually the gap is ¾-1 in. between the blade and nozzle. We took the Xiom coating and spray welded it onto the nozzle and got the gap down to ¼ in. We saved 15-20% on fuel and got more thrust with less rpm, as well as less wear and tear on the engine shaft for the boat's first trip. Because we'll be using less fuel, we'll be able to travel farther and spend more time out on the water."

Cleaner Waters

Advanced powder coatings and application technologies are providing new levels of performance, economy and safety in the marine industry. Boat and ship owners can now enjoy reduced maintenance and fuel costs, and all of us can look forward to cleaner waters.

Figure 2. A Kort nozzle provides increased control of the water turbulence passing through it.

Figure 3. Coating Kort nozzle barrels with a thermally applied spray coating can eliminate the gap between the propeller blade tips and the wall of the Kort nozzle barrel, thereby making the nozzle more efficient.

Linda Comac *is director of marketing for Xiom Corp., West Babylon, NY, developer of the coatings and application devices discussed in this article. She can be reached at lindac@xiom-corp.com. For more information, call 866.688.9466 (XIOM) or 631.643.4400, or visit* **www.xiom-corp.com**.

Do you know of an innovative new product that should be featured in our Innovation Spotlight? If so, contact Managing Editor Kristi Grahl at 248.366.6981 or grahlk@sbcglobal.net.

Get Reactive

Reactive-cure coatings can increase production throughput up to 50% while lowering VOCs and reducing curing costs.

BY MIKE BOURDEAU
Valspar Corp.

Industrial manufacturing OEMs often experience bottlenecks at the paint line that impact throughput times. Relatively simple process changes, coupled with the use of reactive-cure coatings, can increase manufacturing volumes from 20 to 50%. Also called plural-component or two-component coatings, reactive-cure finishes offer several production advantages to improving efficiency. But not all manufacturers take full advantage of the benefits they can provide.

Environmentally, reactive-cure coatings minimize volatile organic compounds (VOCs) and reduce energy/curing costs when compared to single-component material. Certain reactive-cure coatings can be applied in one-third of the traditional time for this type of coating, significantly enhancing production efficiency and increasing throughput.

Reactive-Cure Technology Options

With three basic product platforms available, reactive-cure coating solutions provide a substantial amount of performance flexibility. Many are capable of wet-on-wet application, so the product can move straight from priming to painting with no cure time required.

Epoxy Technology. Epoxies consist of an epoxy resin with tough corrosion protection that can be sprayed wet-on-wet with a urethane or non-isocyanate (NISO) topcoat. They typically are used in primer applications and provide robust chemical resistance.

ABOVE: Reactive-cure coatings often are used to finish heavy-duty construction equipment and other OEM products.

Urethane Technology. Urethanes can be used as a topcoat in direct-to-metal applications but most often are used over a primer for improved corrosion protection. At the upper end of the spectrum, they can provide a high-end quality finish comparable to the coatings used in the automotive industry, with exceptional weathering characteristics and strong chemical resistance.

NISO Technology. NISO coatings can be used either as a topcoat or a direct-to-metal primer application with comparable performance capabilities to urethane technology, yet they don't contain isocyanates like urethane. They provide durable weathering characteristics, solid chemical resistance and a high-quality finish. With a significantly longer pot life than urethanes, they minimize material waste. This coating tends to cost more than other reactive-cure options.

Application Considerations

A higher-quality, more durable finish often can be achieved with reactive-cure coatings, along with significant material and productivity savings. Even with an investment in plural-component equipment, payback often is achieved within two years or less. Following are some considerations when using this type of coating.

Mixing and Applying. Materials can be hand-mixed, but this process typically creates more material waste. It's difficult to determine exactly how much coating will be required, and the pot life has to be longer — typically three to four hours — to allow adequate time to mix, prepare, apply and clean up. Any product not used within the pot life has to be disposed of, creating additional costs. An electronic proportioning system can eliminate a significant amount of labor, energy and waste from your painting process. In essence, there is no pot life because the material is mixed near the spray gun when it's needed.

Cure Time. Two-part coatings typically cure faster than single-component materials and at lower temperatures than baking products, so they spend a shorter time in the oven or air drying (see Figure 1). They don't have to be fully cured when removed from the drying area, so less energy is required to get top performance. When using a wet-on-wet application, one step of the curing cycle can be eliminated by going straight from the primer coat to topcoat. And if you use electronic proportioning, you can formulate the coating to cure in as little as 30 minutes.

Coverage. Reactive-cure coatings typically are applied using air spray, high-volume low-pressure (HVLP), air assisted airless or airless technology, depending on the type of finish required. With a high-performance coating, operators may only need to apply one pass rather than multiple applications, saving time and labor costs.

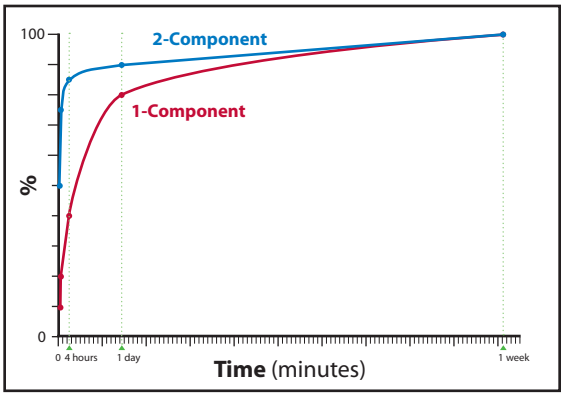


Figure 1. Cure rate comparison between single-component and reactive-cure coatings.

A higher-quality, more durable finish can be achieved with reactive-cure coatings, along with material and productivity savings.

Standard vs. Custom Formulations

Nearly every coatings manufacturer offers custom color matching, but not all offer custom formulating of the coating itself. For example, if you purchase an off-the-shelf coating, you do not have control of the pot life or cure rate.

In addition to OEM products, outdoor structures such as bridges benefit from the fast cure speed and long-term durability of reactive-cure coatings.

REACTIVE-CURE TECHNOLOGY

If you want to maximize efficiency on your production line, consider a custom formulated coating that takes into consideration your production line and how you'll be mixing, applying, and curing your painted products. You can achieve significant productivity enhancements by ensuring that you've selected the right formulation for your specific application needs.

In addition, when making a purchase, consider the total cost for the product. If it is premixed, it's ready to use. If you need to add solvent, you increase your material costs and preparation time.

Performance Based on Industry Trends

Within the coatings industry, there is a trend toward continuing to lower solvent emissions levels. In the U.S., the trend is to reduce VOCs with reactive-cure products. Two-component materials have the capability of achieving VOC levels of 2.3 to 2.8 lb/gal. In Europe, there is a growing trend toward water-based technology, and a wide range of plural-component coatings are available to meet this need.

Reactive-cure coatings offer excellent opportunities to meet goals related to lower VOC emissions, lower total cost solutions and lean manufacturing.

Engines and engine components are another common application for reactive-cure coatings.

There's also a growing global trend to focus on total cost solutions — not just on the price of paint, but on the entire paint process, from operator time to throughput efficiency. The lowest-cost coating isn't necessarily the most cost-effective solution. Achieving a lower total cost in the manufacturing process is often possible by streamlining the production process used with reactive cure coatings.

Another industry trend is lean manufacturing, which is focused on eliminating all waste in manufacturing processes and aligning production with customer demand. Some of the steps that may be taken to improve efficiency within coating operations range from redesigning the paint line to reducing the cost of operating paint ovens by using a faster curing product.

Reactive-cure coatings offer excellent opportunities to meet goals related to lower VOC emissions, lower total cost solutions and lean manufacturing. ft

Mike Bourdeau *is business director, general industrial, for Valspar Corp., one of the largest global manufacturers of coatings and coating intermediates. Bourdeau can be reached at 800.825.7727, ext. 8888. For more information, visit* **www.valsparglobal.com/corp**.

Steps to Maximize Cost Savings Using Reactive-Cure Coatings

1	Install plural-component equipment for effective use of two-component materials. Improve painting efficiency by eliminating the need for hand mixing of kits and cleaning of hot pots.
2	Optimize the application of coating materials through both hands-on and painter training programs.
3	Eliminate waste created from residual material/flush solvents in hot potting and residual in 1-gallon kits. This includes the cost of original material loss along with costs for disposal.
4	Reduce cycle time/work in process and increase capacity by using a faster-curing material, which can be used in conjunction with plural-component equipment

NEED MORE INFORMATION ON REACTIVE-CURE COATINGS?
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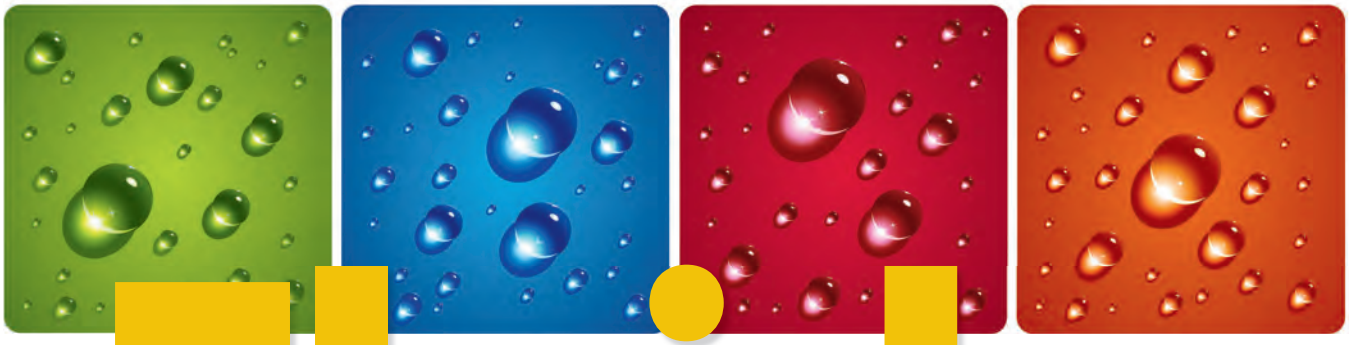
www.finishingtodaymag.com!



Fluid Control

An effective fluid management system is key to optimizing the efficiency and finish quality of a plural-component coating line.

In the two decades plural-component coatings have been used in manufacturing, they have become the first choice for many manufacturers for their abrasion resistance, durability and color quality. Plural-component coatings, particularly those using epoxies and urethanes, are applicable to a wide range of products, from automotive interior and exterior components and off-highway and agricultural vehicles, to such consumer products as golf balls.

Advanced fluid management systems are designed to optimize the efficiency of the m aterials and equipment, minimizing waste, downtime and changeover. Shown is ITW's Smart Pump.

"Plural-component coatings offer a wide range of benefits to surface finishes, especially on products that will be used in extreme conditions," says Larry Blum, account manager for ITW Ransburg.

Plural-component finishes possess a range of qualities:

- Excellent durability in varied weather conditions
- Critical gloss controls (ranging from low to high gloss finishes)
- Resistance to becoming brittle as it ages
- Adhesion to a wide range of substrates, including most plastics and metals
- Superior flexibility, along with impact and chip resistance
- Flexibility in curing temperature and time

However, like other high-performance coatings, achieving the optimal properties requires the right fluid handling equipment.

Defining an "Efficient" System

Efficient plural-component coating operations use cutting-edge fluid handling systems that eliminate concerns of pot life while simultaneously reducing the amount of waste produced.

"Because of the variations in pot life among coatings, the location of the mix and metering equipment optimal to their application is critical to the success of the coating operation," Blum says. "The advantage to mixing at the applicator is when the pot life of the mixed material is very short, or when color changes are not required," he explains. "Mixing near the metering equipment reduces the effect of differing viscosities, hose length and volume, flow versus pressure drop, high ratios and pressure differential between the components."

Blum recommends the use of coating systems that closely monitor the amount of material being mixed at

any one time, and that can be used in low to high pressure operations.

"These systems provide high productivity, consistent quality and optimum fluid delivery. In addition, the systems produce much less waste for disposal, along with lower volatile organic compound (VOC) emissions and lower cure temperatures," he says.

Coating equipment typically is divided into three categories, according to Blum: dosed metering systems, air-piloted servo-valve coating systems and gear pump systems. Dosed metering systems offer the lowest-cost solution for coating operations, but often don't allow for precision control, and they typically result in more waste. Air-piloted servo-valve coating systems are effective in high-pressure applications, while precision gear pump systems can be used in most low-pressure applications.

An effective fluid management system can help a coating line minimize energy consumption, solvent use, equipment wear and maintenance.

"Look for control systems that optimize color change, flushing and load sequences. In addition, the color pump should be flushable for no color carryover," says Blum.

Advanced fluid management systems are designed to optimize the efficiency of the materials and equipment, minimizing waste, downtime and changeover.

"We do a lot of work with epoxy and urethane coatings, and we recommend use of positive displacement gear pumps," Blum says.

Golf balls, for example, require critical weight control over coating materials. This control is maximized through efficient fluid management equipment, including adaptability to rotary atomizers, bells, disks and electrostatic or non-electrostatic spray guns. Flow and ratio should be controllable for either manual or handgun application.

Improving Control

An effective fluid management system can help a coating line minimize energy consumption, solvent use, equipment wear and maintenance. It also can help reduce paint waste and shear, thereby improving process control.

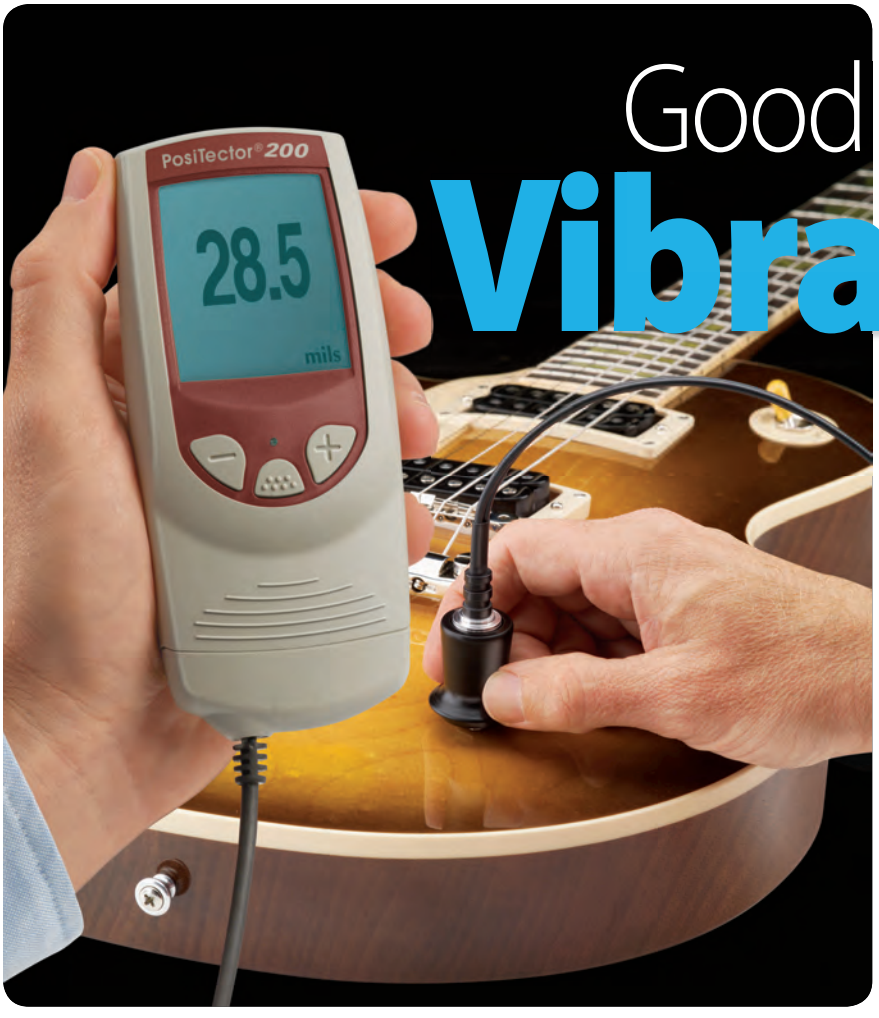
When considering plural-component coatings, don't overlook the fluid handling equipment. The right equipment can make all the difference in achieving an efficient, high-quality finish.

Air-piloted servo-valve coating systems are effective in high-pressure applications.

Control systems should optimize color change, flushing and load sequences, and the color pump should be flushable for no color carryover. Shown is ITW's ratio control system (gear pump metering).

ITW Ransburg, an Illinois Tool Works Company, develops custom electrostatic coating system configurations based on the coating selected and the need for color changeover. For more information, call 800.909.6886 or 419.470.2000, or visit **www.itwransburg.com**.

Good Thickness Vibrations



Handheld ultrasonic instruments provide an easy-to-use, accurate, nondestructive way to measure coating thickness on wood and plastic substrates.

BY DAVID BEAMISH
DeFelsko Corp.

Coatings are designed to perform their intended function best when they are applied within the tight thickness range specified by the manufacturer. For example, conversion varnishes used on wood are harder than other coatings and should not be used in excess of 5 mils dry thickness in order to prevent cracking or other finish failures. Nitrocellulose lacquer usually should be kept lower than 3 mils. A *consistent* mil thickness is paramount when applying lacquer basecoats and crack coats to achieve a desired crackle finishing effect.

On medium density fiberboard (MDF), powder coating thickness typically ranges between 3 and 9 mils. Usually, the thicker the mil coverage, the more durable the finish. Factory specifications often call for a stated ±1 mil tolerance. This level of quality cannot be determined just by looking at the coating; instead, it must be measured with precise instruments.

There are other benefits to measuring the finish thickness precisely. When companies check and verify the coating quality of incoming material, they avoid wasting money reworking product. By checking the spray operators' technique, they ensure that the coating is being applied in compliance with the manufacturers' recommendations. Additionally, applying the right film thickness can ensure a high level of overall efficiency. Finally, regular testing can reduce the number of customer returns due to finishing defects.

Over metal, the coating thickness commonly is measured for quality control and inspection purposes. When the base metal is carbon steel, a magnetic method is used. Eddy current devices are used for other metals, such as copper and aluminum. However, since these instruments can't measure the thickness of finishes over wood or plastics, alternate techniques have been used including:

- Optical cross-sectioning (cutting the coated part and viewing the cut microscopically)
- Height measurement (measuring before and after with a micrometer)
- Gravimetric measurement (measuring the mass and area of the coating to calculate thickness)

ABOVE: Modern ultrasonic coating thickness measurement instruments are simple to operate, affordable and reliable.

- Dipping wet film thickness gages into wet paint and calculating dry-film thickness using the percent of solids by volume
- Substitution (placing a steel coupon alongside the wood or plastic part and coating it at the same time)

These tests are time-consuming, difficult to perform, and are subject to operator interpretation and other measurement errors. Applicators find destructive methods impractical. To get a statistically representative sample, several wood or plastic products from a lot might need to be scrapped as part of the destructive testing process.

With the arrival of advanced ultrasonic instruments, many finishers have switched to nondestructive inspection using this accurate measurement technique.

Ultrasonic Breakthrough

Quality professionals are already familiar with various aspects of ultrasonic testing, in which high-frequency sound energy is used to conduct examinations and make measurements. Ultrasonic testing can detect and evaluate flaws in metal, measure dimensions, ascertain material characterization and accomplish other measurement tasks.

Wall-thickness measurement is perhaps the most common and simple of ultrasonic tests. Precision ultrasonic wall-thickness gages permit quick thickness measurement of objects without requiring access to both sides. For coating measurement, however, these gages are not ideal. They do not have sufficient sensitivity to measure the thickness of acrylic fillers, factory primers, lacquers, ultraviolet (UV) finishes, powder coatings and other materials used over wood and plastics.

The first handheld instruments designed specifically for coating thickness measurement appeared on the market 14 years ago. Modern versions of these instruments use a single-element transducer and advanced numerical techniques to filter and enhance digitized echoes, making the instruments even more accurate and reliable (see Figure 1).

A Sound Measurement Technique

Ultrasonic coating thickness measurement works by sending an ultrasonic vibration into a coating using a probe (transducer) with the assistance of a couplant applied to the surface. The vibration travels through the coating until it encounters a material with different mechanical properties —typically the substrate but perhaps a different coating layer. The vibration, partially reflected at this interface, travels back to the transducer. Meanwhile, a portion of the transmitted vibration continues to travel beyond that interface and experiences further reflections at any material interfaces it encounters (see Figure 2).

Because a potentially large number of echoes could occur, the ultrasonic measurement gage is designed to select the maximum or "loudest" echo from which to calculate a thickness measurement. Instruments that measure individual layers in a multilayer application also favor the loudest echoes. The user simply enters the number of layers to measure, say three, and the gage measures the three loudest echoes. The gage ignores softer echoes from coating imperfections and substrate layers.

Figure 1. The PosiTector 200 ultrasonic coating thickness gage.

Measurement Accuracy

The accuracy of any ultrasonic measurement directly corresponds to the sound velocity of the finish being mea-

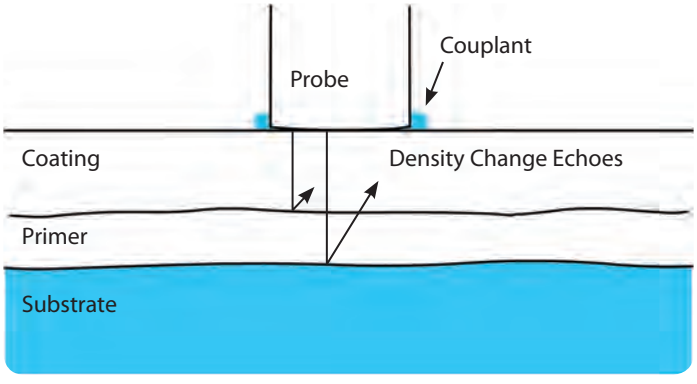


Figure 2. Ultrasonic vibrations reflect off coating interfaces.

Figure 3. Two examples of uneven coating/substrate regions.

sured. Because ultrasonic instruments measure the transit time of an ultrasonic pulse, they must be calibrated for the "speed of sound" in that particular material.

From a practical standpoint, sound velocity values do not vary greatly among the coating materials used in the wood or plastics industries. Therefore, ultrasonic coating thickness gages usually require no adjustment to factory calibration settings.

However, one factor that does influence the accuracy and repeatability of ultrasonic measurement is how these coatings interface with the substrate. Figure 3 shows two examples of coated wood. These photos, taken at higher resolution than most field destructive tests are capable of, clearly show the boundary between the finish and the wood. The finish may look smooth on top, but the thickness might be inconsistent. Wood substrates often are grainy with varying degrees of surface roughness and primer penetration. Such porosity and roughness may promote adhesion, but they increase the difficulty of attaining repeatable thickness measurements by any means.

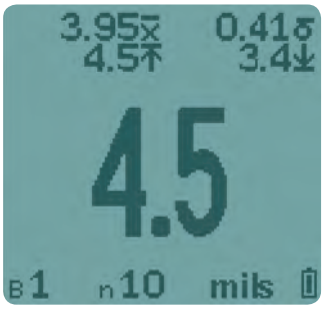


Figure 4. Some instruments provide statistical analysis. In this example, 10 measurements have been taken. The last measurement of 4.5 mils is displayed along with the average, standard deviation and maximum/minimum values of all 10 readings.

Ultrasonic gages are designed to average small irregularities to produce a meaningful result. On particularly rough surfaces or substrates where individual readings may not seem repeatable, comparing a series of averaged results often provides acceptable repeatability (see Figure 4).

Ensuring the Right Sound

Ultrasonic testing brings distinct benefits to the wood industry. Wood furniture, flooring and musical instrument manufacturers often apply several layers of lacquer or similar finishing materials. Some processes require the ability to identify the thickness of individual layers or series of layers. When applied at the wrong thickness, the coating layer that beautifies and protects a high-quality guitar, for example, can easily detract from its sound. Too much coating can dampen the guitar's acoustic resonance; too little can have the reverse effect.

Musical instrument manufacturers now use ultrasonic gages to measure the lacquer accurately and nondestructively on their valuable products. As a result of using this new technology, they have not only decreased their lacquer usage, but they are able to take meaningful measurements without excessively disrupting their production process. There's no need to scrap product to measure a coating thickness, and the thickness over the entire surface can easily be measured to ensure a smooth, even coating. Rework is minimized due to an increased ability to control the coating process.

Measuring in Layers

The ability of ultrasonic coating thickness instruments to measure individual layers in a multilayer coating application is particularly useful in the coating of plastics (see Figure 5). For example, finishes on automotive plastics involve applying several coating layers to attain full aesthetic appearance and protective properties.

Manufacturers and applicators alike have long believed that there is no simple and reliable means for nondestructively measuring coatings on plastic substrates. Their common solution was to place metal (steel or aluminum) coupons next to the part and then measure the thickness applied to the coupon with either a mechanical or electronic (magnetic or eddy current) gage. This labor-intensive solution is based on the (usually inaccurate) assumption that a flat coupon placed in the general coating area receives the same paint profile as the plastic part in question.

An ultrasonic solution enables the user to measure the total coating thickness of the actual part, as well as to identify multiple distinct layers,* thereby ensuring a higher level of accuracy and a better finish quality.

A Final Echo

Ultrasonic coating thickness measurement is now an accepted and reliable testing routine used in the wood and plastics industries. The standard test method is described in ASTM D6132-04, "Standard Test Method for Nondestructive Measurement of Dry Film Thickness of Ap-

*Paint application processes such as wet-on-wet may not provide a sufficient boundary interface between layers for the ultrasonic gage to pick up the reflective signal. Also, to identify the thickness of an individual layer, coatings applied greater than 25 microns (1 mil) provide the best measurement results.

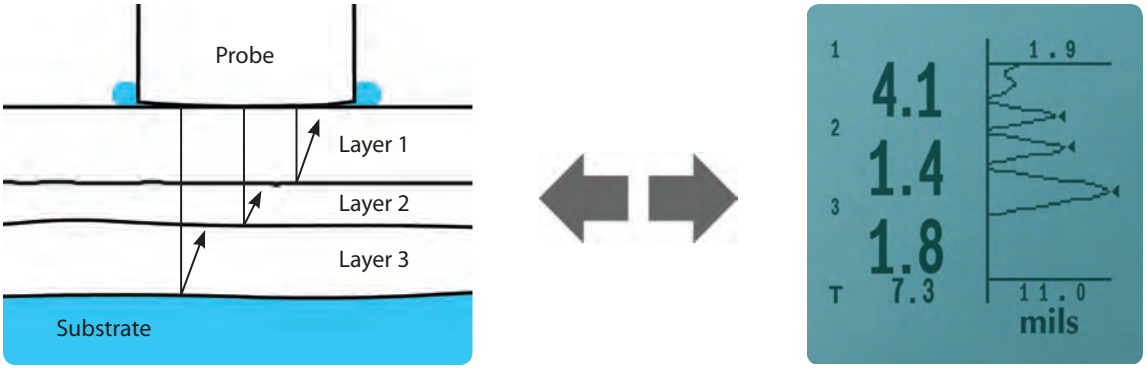


Figure 5. Some instruments measure the individual layers in a multilayer system. In this example, layer 1 is 4.1 mils thick, layer 2 is 1.4 mils thick, layer 3 is 1.8 mils thick, and the total thickness is 7.3 mils. The graphical LCD displays three "peaks" representing three material interfaces.

plied Organic Coatings Using an Ultrasonic Gage" (2004, ASTM). To verify gage calibration, epoxy coated thickness standards are available with certification traceable to national standards organizations.

Quick, nondestructive thickness measurements can now be taken on materials that previously required destructive testing or lab analysis. This new technology improves consistency and throughput in the finishing room. Potential cost reductions include:

- Minimizing waste from over-coating by controlling the thickness of the coating being applied
- Minimizing rework and repair through direct feedback to the operator and improved process control
- Eliminating the need to destroy or repair objects by taking destructive coating thickness measurements

This technology improves consistency and throughput in the finishing room.

Today, these instruments are simple to operate, affordable and reliable. ft

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Real-Time Temperature Measurement

New advances in laboratory weathering instrumentation allow coatings to be measured in real-time temperatures to provide more accurate and reliable results.

BY KURT P. SCOTT, ZHIJUN ZHANG, PH.D., AND WILLIAM BUTTNER, PH.D.

Weathering is caused by environmental stresses that create generally unfavorable chemical and physical changes in any exposed organic material. The main weathering stresses are light and moisture in any of its forms. However, heat also is extremely important since any reaction initiated by light is driven kinetically and therefore tends to increase significantly with temperature.[1]

The importance of the coating temperature is suggested by the "rule of thumb" that states that reaction rates double for every 18°F (10°C) increase. Fischer, *et. al.*, found factors ranging from 1.2 to 1.8 per 18°F increase, depending on the material tested.[1]

Most laboratory weathering devices used for temperature characterization are equipped with a "black panel" that usually complies to either of the designs generically described by ASTM G 151.[2] During the course of a weathering test, the black panel is intended to provide an estimate of the worst-case sample surface temperature. This test assumes that the panel, primarily because it is coated with an efficient, black solar absorber, will record a higher surface temperature than most, if not all, other "real" coatings.

Researchers have used the instrument-provided black panel temperature to estimate temperatures of the coatings of real interest.[1] However, such estimates are error-prone for three main reasons: 1) operational variability among different designs of black panel is well documented;[3] 2) the properties of black panel coatings change during the course of their service life, effectively creating a moving baseline; and 3) changes in coatings being tested cannot be expected to parallel changes occurring in black panels.

In short, the critical coating temperature parameter is unknown in today's laboratory weathering tests. Additionally, there are no current reliable means to estimate these temperatures.

The need to know the temperatures of specific materials while under test has been expressed repeatedly throughout various literature,[4] but until now, presumably because of the inherent challenges, laboratory instrumentation has been incapable of providing this information.

Specific Sample Surface Temperatures

Recently, new technology* has been developed to measure and provide the specific sample surface temperature of materials under test (see Figure 1). The technology has been thoroughly evaluated for its ability to provide accurate surface temperature measurements for a variety of materials under a range of weathering test conditions.

The infrared (IR) sensor was chosen to respond in a spectral range exclusive of the xenon output wavelength range to make it insensitive to light. The device has a facility to keep the non-contact IR sensor head free of any condensation for proper performance. The unit's operating air temperature range of 32 to 185°F (0 to 85°C) and relative humidity range of 0 to 100% encompass all known weathering test methods. The system incorporates a small-volume sensor so that it is minimally obtrusive to test specimens, and its spot size and response time are appropriate to obtain adequate signal response from rotating specimens.

The device was successfully tested in an Atlas MTT Ci4000 WeatherOmeter® for the following performance criteria:

- Sensor sensitivity and sample tracking capability
- Performance under various test conditions
- Performance on various types of materials and different surface finishes
- Performance using different sensor configurations (exhibiting sensitivity to variations in physical setup).

Preset Emissivity

A coating's emissivity depends on its temperature, its specific material property and the wavelengths of its emmitance. Thus, a single, constant emissivity setting for IR temperature measurements of all materials is a potential source of error and is not considered ideal. Fortunately, for most frequently tested materials, the emissivity falls in the fairly narrow range of 0.85 to 0.96 for temperatures ranging from 32 to 212°F (0 to 100°C).

Tests with various materials were conducted with preselected emissivity settings of 0.85, 0.90 and 0.95, while all other test conditions were kept constant (black panel temperature [BPT] at 140°F/60°C, chamber temperature [CHT] at 100°F/38°C, and relative humidity [RH] at 50%). Minimal temperature differences were observed between the various emissivity settings. These results suggest that a single, nominal emissivity setting is sufficient to provide acceptable accuracy on a wide variety of materials.

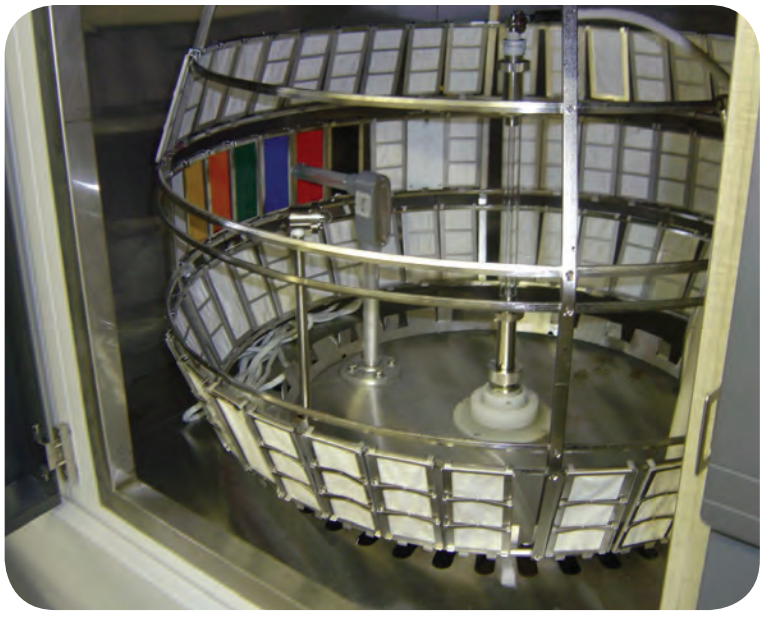

Figure 1. The interior of the S³T system.

Sensitivity

A cross-section of typical weathering samples, including painted surfaces (coatings), textiles and polymers, was used to test the technology's sensitivity to different materials. Due to space limitations, only the time profiles of the coated specimens are shown in Figure 2. However, the mean and standard deviations of temperature measurements for a variety of materials are summarized in Table 1.

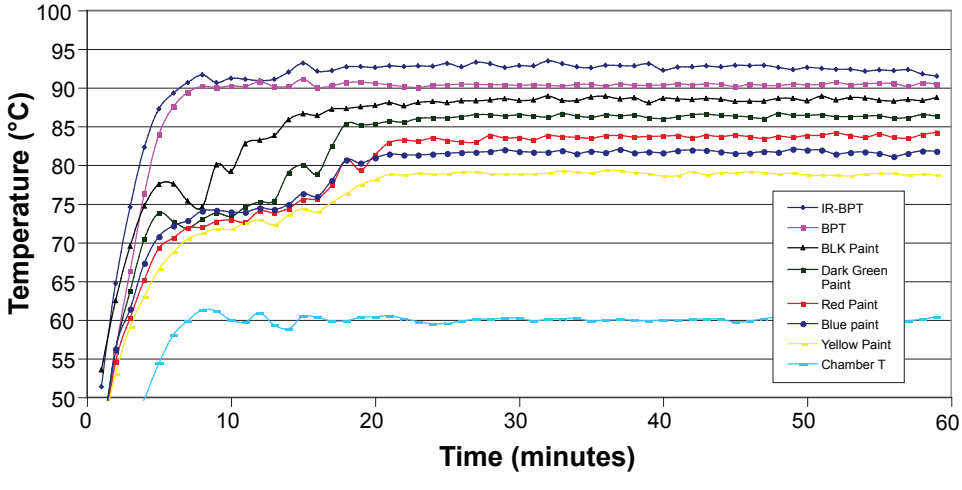

Figure 2. S³T temperature history of various colored coatings.

*The technology is commercially available as S3T™ or S³T™ through Atlas Material Testing Technology LLC, Chicago, IL.

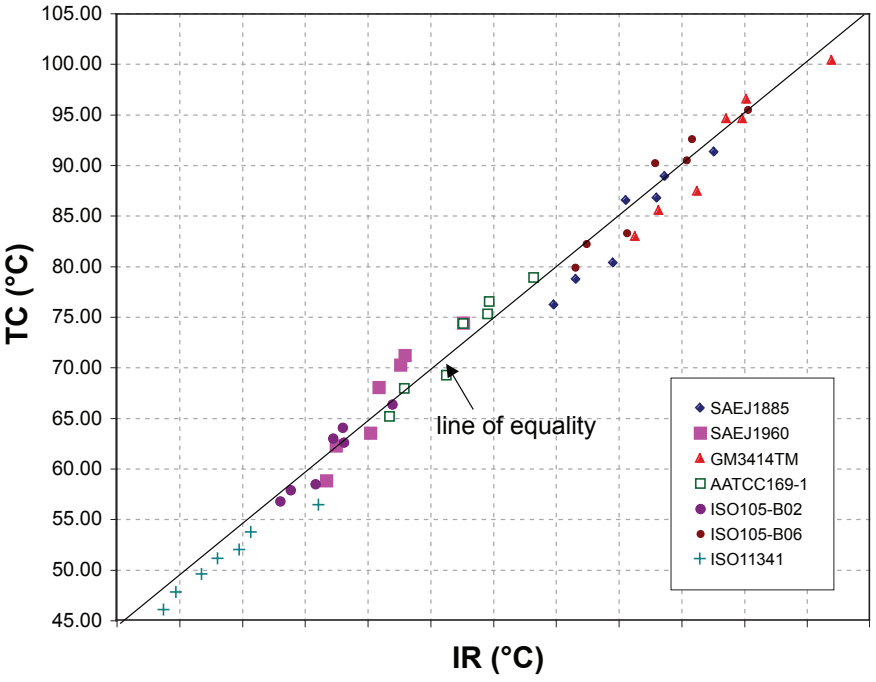

Figure 3. S³T PVC temperature measurements compared to the embedded thermocouple method.

Accurate weathering tests are an important part of ensuring a customer's long-term satisfaction.

The measurements indicate that the specific sample surface temperature measurement system is usable on the wide variety of materials with different surface finishes that are typically weathered. Additionally, the low standard deviation numbers are an indication of the system's good repeatability when performing a significant number of sequential measurements on each type of surface.

Validation

A replicate set of the colored polyvinyl chloride (PVC) coatings on aluminum panels with embedded thermocouples, described by Fischer, *et. al.*, in "Surface Temperatures of Materials in Exterior Exposures and Artificial Accelerated Tests,"[1] was provided courtesy of 3M. The surface temperatures of these panels were measured by the new technology and simultaneously by the method using embedded thermocouples described in the paper. The comparisons were conducted under the widely disparate conditions of the test methods outlined in SAEJ1885,[5] SAEJ1960,[6] AATCC169-1[7] and GM 3414TM,[8] as well as the following International Standards Organization Weathering Standards: ISO195-B02, ISO105-BO6 and ISO11341-1.

The averages and standard deviations were plotted for the two measurement methods. The data for the SAE J1885 test method shown in Figure 3 was representative of all the test methods. Generally, there was good agreement between the average temperatures as measured by both techniques, while the measurements obtained with the new technology were more repeatable, as indicated by lower standard deviations.

Figure 4 compares the average temperature readings for all test methods referenced earlier. The near 45 degree "line of equality" illustrates good agreement between the specific sample surface temperature measurement method and the established 3M, fixed thermocouple technique under the very different conditions embodied in the test methods.

Redefining Weathering Testing

Manufacturers of durable products such as automobiles constantly are challenged to satisfy appearance demands, both for "showroom appeal" and for the in-service maintenance of original appearance — a challenge that is compounded by the ever-increasing array of coating materials and colors. Accurate weathering tests, with an increasing reliance on accelerated laboratory tests, are an important

TABLE 1. S³T Temperatures (°C) for Various Materials During the Stable Stage

Sample	BPT (reference)	IR-BPT	Black C	Green C	Red C	Blue C	Yellow C	Mixed Color T	Gray T	Purple T	Blue T C	PS P	PC P
Mean	90.38	92.59	88.5	86.33	83.71	81.69	78.88	87.92	85.58	73.68	78.98	65.28	65.84
Standard Dev.	0.13	0.40	0.22	0.18	0.20	0.20	0.20	0.97	2.21	0.33	0.42	0.18	0.25
Relative Uncertainty	0.15%	0.43%	0.25%	0.21%	0.24%	0.25%	0.25%	1.10%	2.59%	0.45%	0.54%	0.28%	0.39%

Note: The type of material is indicated by the letter suffix following the color: T for textile, C for coatings and P for plastic.

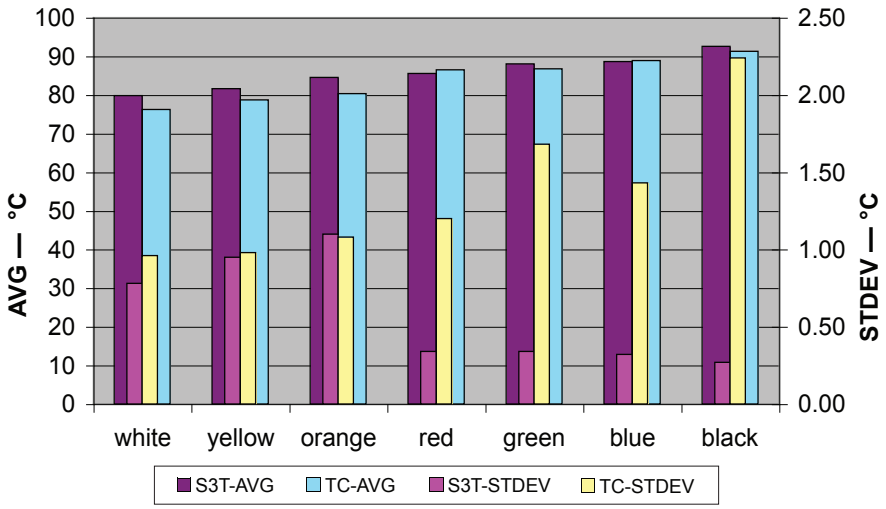

Figure 4. A comparison of temperature measurement techniques over a range of conditions.

part of ensuring a customer's long-term satisfaction with the finished product.

By providing the capability to record *in situ* coating surface temperatures in real time, the new specific sample surface temperature measurement technology can redefine how weathering tests are conducted. The system makes it possible for researchers to conduct investigations in materials durability testing that were either very difficult or impossible before, thereby providing more accurate and reliable test results. ft

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Managing Data

Modern digital instruments allow paperless management of coating thickness, dewpoint and surface profile data for enhanced productivity and quality control.

BY JOHN F. FLETCHER
Elcometer Instruments Ltd.

Modern digital gauges such as coating thickness gauges, relative humidity gauges and surface profile gauges incorporate features that aid in the collection and management of data on coatings applied to a variety of metal products and components. Memory in these gauges allows readings to be stored in batches for analysis and archiving; onboard calculation capabilities allow statistical information to be displayed and stored for decision making and further analysis; and data output allows the gauge memory to be uploaded to a PC for analysis, reporting and archiving in an efficient and accurate manner.

Coating Thickness Measurements

Some of the most advanced coating thickness gauges are designed as both an integral probe unit and a separate probe unit so that the user can select the most suitable gauge for the measurement application. Some of these instruments also feature maximized capacity for data storage.

Some coating thickness instruments have the option of two measurement systems: magnetic induction for measurement of coatings on ferrous metal substrates and eddy current for measurement of coatings on nonferrous substrates. A dual-principle option combines ferrous and nonferrous measurement principles in a single probe that automatically determines and displays the substrate. These probes mainly are used for applications where mixed metal substrates are used, for example automotive bodies, where steel and aluminum alloys are used for different body components for the vehicle.

The separate probe gauge design has probes that are programmed for interchangeability, so different probe siz-

es and ranges can be connected to a single gauge to maximize the flexibility of the gauge in its applications, such as on small parts or difficult-to-access areas. Probes are not interchangeable on integral probe designs, but these gauges can be used one-handed and are pocket-sized for convenience in many field applications, particularly for large areas such as ships hulls or the easily accessed areas of a vehicle body.

Some of the latest versions of coating thickness gauges with memory also have Bluetooth® connectivity to allow wireless communication of readings over a distance of up to 49 ft to a PC using proprietary software for coatings data management. Some instruments allow readings to be sent directly to data devices such as PDAs and mobile phones and are used in conjunction with Windows® Mobile Software.

Some of the most advanced coating thickness gauges are designed as both an integral probe unit and a separate probe unit so that the user can select the most suitable gauge for the measurement application.

Data Collection

The memory of some of the most advanced coating thickness gauges is organized for collecting batches of readings, and each batch automatically is given unique batch identification numbers in the range of 1 to 999. Each batch can have unique calibration adjustment settings so that different parts or areas of the job in hand can be given an adjustment that is relevant to the work for maximum accuracy of thickness readings. For example, rounded items will have a different calibration adjustment than flat areas, and rough areas (shot or grit blasted) will have a different calibration adjustment than smooth areas.

With a capacity for up to 40,000 readings in 999 batches, up to 250 of which can be active at any time, these advanced instruments can collect large volumes of data in the field. The reading rate of these gauges is greater than 60 readings per minute, so at full speed the gauge memory will take more than 11 hours to fill. However, these gauges also have data output capability, so that the memory can be uploaded conveniently to a computer either as a data transfer to a spreadsheet or more usefully to a data management program.

Data Transfer

Data transfer uses a Windows-style program running in the background to send the readings from the memory to the spreadsheet as a column of values. When the coating thickness gauge is selected from the set of gauge options in the transfer program, an operations wizard is activated to take the user through the steps to upload the data. When the readings have been uploaded into the cells, the calculating and presentation features of the spreadsheet can be used to analyze the data,

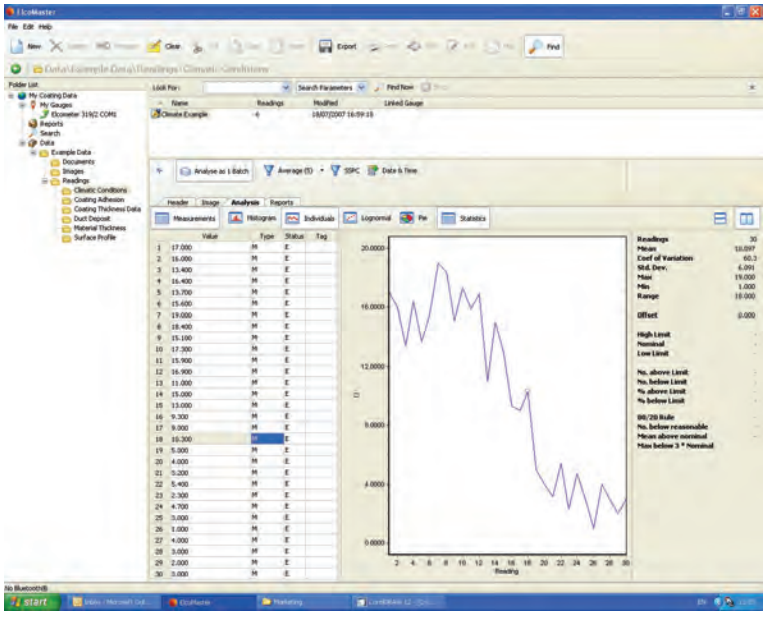
Advanced coating thickness gauges, such as the Elcometer 456 shown above, are designed as both an integral probe unit and a separate probe unit so that the user can select the most suitable gauge for the measurement application.

Some of the newest dewpoint meters, such as the Elcometer 319/2 shown above, have been designed to incorporate all relevant climatic condition monitoring in a single gauge.

Some of the latest surface profile gauges, such as the Elcometer 224 shown above, feature an electronic design that incorporates memory and statistical calculations, and allow readings to be downloaded to a PC in seconds.

calculate statistics and produce the required charts. The setup includes the appropriate RS 232 protocol, including the data transfer rate (the number of data bits, number of stop bits, parity, hand shaking and baud rate [19200 baud]).

It is possible to construct a job record so that the reading number corresponds to a location on the job.



A run chart shows all the readings in a batch in sequence so that trends can easily be seen.

The value in the cell can then be related to similar cells to drill down and present information from particular areas. For example, for a coating thickness survey, it is possible to designate the first batch to be the thickness of the galvanized layer, the second batch to be the primer thickness readings, the third batch to be the basecoat and the fourth batch to be the topcoat. If the readings are taken at the same points on the structure each time, the spreadsheet can be used to calculate the individual layer thicknesses by subtraction, i.e. the thickness of the topcoat is batch 4 minus batch 3.

Alternatively, for thickness readings on an I-beam, readings 1-10 can be taken on the web, 11-20 on the upper flange and 21-30 on the lower flange, etc., so that each group can be separated and the average, standard deviation, highest, lowest and range of readings can be calculated and presented using the spreadsheet features.

Dewpoint and Surface Profile

Some of the newest dewpoint meters have been designed to incorporate all relevant climatic condition monitoring in a single gauge. Determining the presence of moisture and condensation on surfaces can help to prevent potential coating flaws during the service life of the coating. These gauges measure air temperature (TA), relative humidity (RH), and surface temperature (TS), and then automatically calculate the dewpoint temperature (TD), as well as the difference between the dewpoint and surface temperatures (ΔT). With a reading memory of up to 12,000, these instruments remove the potential for errors when recording values or determining dewpoint. Some instruments also have an additional docking unit that serves as an interface between the gauge and a PC. Using proprietary software, readings can be stored and used to create reports.

Some of the latest surface profile gauges use the well-established peak-to-valley height surface profile measurement technique with a tungsten carbide tip to measure the distance to the bottom of the valley relative to a stainless steel foot that sits on the top of the peaks. These instruments feature an electronic design that incorporates memory and statistical calculations, and readings can be downloaded to a PC in seconds.

The most advanced versions of these gauges can store up to 50,000 readings in up to 999 batches, and readings can be taken at a rate of more than 40 per minute, making them useful for automated steel cleaning processes. The instruments calculate and display the statistics, mean, number of readings and other data points in real time. The assessment of a blast-cleaned surface can be completed quickly by taking up to 15 readings over an area approximately 6 in. in diameter and using the mean of these readings as the typical peak-to-valley height for the profile.

Data Management

When data is collected in batches, the analysis and presentation can be enhanced by the use of effective data management software. Readings can be collected in a gauge that is remote from the computer and then uploaded as a batch or batches for archiving, analysis and presentation.

Modern data management software has a number of gauge transfer options pre-programmed to simplify the transfer of data into the database. It also includes a number of database management features to allow, for example, batches to be combined and notes to be added to make the information more meaningful when further analysis is carried out.

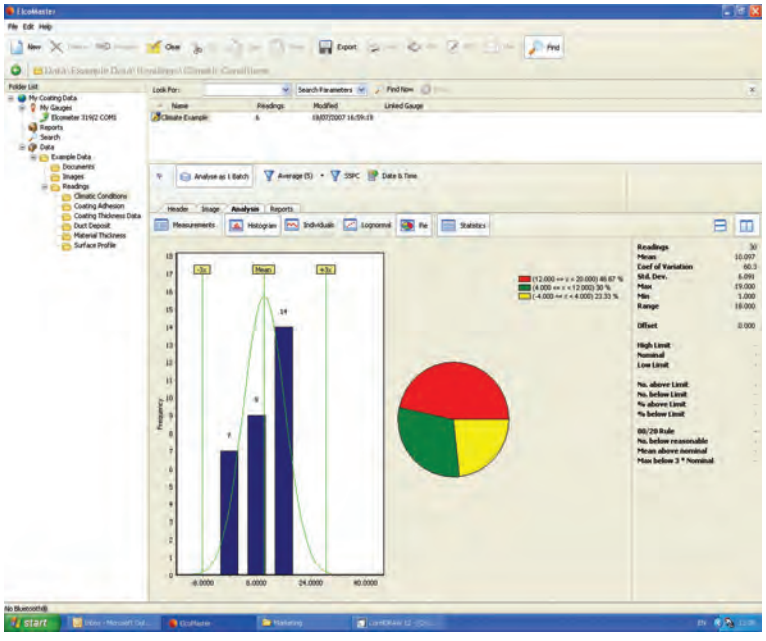
An effective data management program offers enhanced reporting features and allows simple data archiving with database management features.

A number of charts can be displayed to present the data. For example, a run chart shows all the readings in a batch in sequence so that trends can easily be seen. A histogram can be calculated and presented with a normal distribution superimposed so that the spread of data values can be compared easily to the target values and upper and lower limits. A lognormal chart can be used to determine how much variation there is in the data set from the statistical normal distribution, to determine the degree of control exhibited by the coating process.

In some cases, specialized charts can be set up so that the specified coating thickness is equal to the lower drawing limit. In this way, 80% of target value becomes the lower specification limit and the 120% of target value becomes the upper specification limit. The charts then present the data relative to these values as required for assessment either to SSPC PA-2 or to ISO 19840.

Data uploaded to the data management software can be edited, but the most advanced of these programs records the edit so that fabrication of data to pass or fail inspection criteria is not possible. Values and limits can be changed on a "what if" basis so that the effects of the changes can be seen. However, the batch record will carry the note "(Edited)" so that the change is visible.

Databases can be managed through the program so that batches of readings can be moved to existing folders or new folders created from within the program to simplify the archiving of data for future reference.



A histogram can be calculated and presented with a normal distribution superimposed so that the spread of data values can be compared easily to the target values and upper and lower limits.

A Paperless System

The management of inspection data for coatings is made simple and effective by the use of data transfer features built into modern electronic inspection gauges. Spreadsheets offer a degree of flexibility in data analysis using the calculation power of the spreadsheet features. However, an effective data management program offers enhanced reporting features and allows simple data archiving with database management features.

In the future, more gauges will have Bluetooth connectivity, allowing comprehensive reports on inspection outcomes. This capability, in turn, will allow data collection through data transmission devices such as PDAs and mobile telephones, which will make field inspection more effective.

Quality control for coating processes has been shown to yield benefits in terms of the service life of coatings, and paperless inspection data will pass these benefits along to more coating processes.

John F. Fletcher *is a technical support manager for Elcometer Instruments Ltd., a Manchester, UK-based manufacturer of coatings inspection equipment. For more information, call 011.44.161.371.6000, e-mail sales@elcometer.com or visit* **www.elcometer.com**.

The Rules of Secondary Containment

Polyurea spray elastomer technology offers a fast-set solution to meeting the new secondary containment rules for hazardous materials.

BY DUDLEY J. PRIMEAUX II, PCS
Primeaux Associates LLC

The Code of Federal Regulations (CFR) 40, Protection of the Environment, requires by federal law that all hazardous wastes or constituents be positively contained. In 1987, the Environmental Protection Agency (EPA) passed a regulation under CFR 40 requiring a secondary means of containing spilled materials that include hazardous chemicals (Section 265.190-265.193, 40 CFR); however, this regulation is really only just now starting to be enforced.

Two deadlines are rapidly approaching, one for the secondary containment of underground storage tanks (USTs) and the other for aboveground storage tanks (ASTs):

- December 31, 2009 – Corrosion-protected single-wall USTs and small-diameter piping in contact with the soil must have secondary containment.
- January 1, 2010 – Single-wall, field-erected ASTs must have secondary containment beneath the tank, and single-wall bulk product piping in contact with the soil must have secondary containment unless deferred by an API 570 Integrity Assessment.

In both cases, the secondary containment must function effectively for a period of time sufficient to allow proper spill cleanup without damage to the environment (Section 265.196, 40 CFR).

Many USTs and ASTs are made of concrete. The regulation notes that concrete is porous, and that the most reliable means of secondary containment on concrete is with a liquid-applied monolithic polymer membrane. One polymer membrane that meets the new requirements is polyurea spray elastomer technology.

ABOVE: A finisher applies a poyurea spray coating to an AST. Photo courtesy of GlasCraft, Inc.

POLYUREA SPRAY TECHNOLOGY

For containment areas where solid substrates are not present, geomembranes can be used with an applied layer of a polyurea system. Photo courtesy of GlasCraft, Inc.

CASE STUDY: Cape Canaveral Air Force Station

Cape Canaveral Air Force Station (CCAFS) is the East Coast space launch facility of the U.S. Department of Defense. Located on Cape Canaveral, Brevard County in Florida, it depends on Patrick Air Force Base, home of the 45th Space Wing, and is adjacent to the John F. Kennedy Space Center.

The 11,000 ft^2 fuel truck pad area was in need of an improved liner system. The existing concrete pad was experiencing severe cracking, and there were concerns over potential spills of fuel seeping into the groundwater. CCAFS chose a polyurea system (PV 350 supplied by Poly-Vers International) due to its excellent performance history in similar application areas, flexibility, toughness for heavy traffic and speed of installation.

Installation of the polyurea spray elastomer technology took place in December 2007. The concrete area was pressure washed using a hot aqueous solution of BioSolve® (supplied by The Westford Chemical Corp.) to remove any contaminants and rinsed. The prepared concrete had a profile of CSP 4 to 5, which would provide for excellent bonding of the applied liner system.

The complete area was primed with a proprietary polyurethane primer system for adhesion enhancement and reduction/elimination of outgassing in the concrete area. The PV 350 polyurea system was then applied at a minimum average thickness of 100 mils (2.5 mm). A 1/4-inch (6.35 mm) saw cut joint was used to assist in terminating the PV 350 system around the perimeter area. The area was prepared one day and followed by primer and application of the PV 350 system during the next few days. A finish stipple texture was provided to aid in slip resistance

The PV 350 system was applied using a GUSMER® H-25/25 unit fitted with a GlasCraft® Probler® P2 spray gun with an "02" chamber and tip to provide a controlled output and spray pattern at a 2000 psi (138 bar) processing pressure.

Polyurea Spray Technology

Polyurea spray technology is a plural-component, fast-set elastomeric membrane system that provides for a monolithic, impervious layer. Various formulated systems address the numerous requirements related to secondary containment, including adhesion to the various substrates commonly encountered in these containment areas. For containment areas where solid substrates are not present, geomembranes can be used with an applied layer of a polyurea system incorporating low shrinkage characteristics designed for the area.

The fast set time of the polyurea spray technology allows for a rapid return to service of the area in a variety of ambient conditions, including cold weather. The polyurea systems also remain flexible at low temperatures, thus eliminating cracking issues found in other liquid applied coatings and sheet-good installed membranes.

Many tanks and piping areas may be prone to leakage. However, it has been shown that most leakages found in these areas are actually due to overfilling of the storage tanks, possibly a result of faulty equipment or operator error.

The polyurea spray elastomer technology has been evaluated under the Florida Department of Environmental Quality (DEQ) requirements for secondary containment liner systems. The technology has passed this testing and is classified as an acceptable secondary containment lining material.

Polyurea Installations

Fully aware of the impending environmental regulations, the U.S. military has used the polyurea technology successfully for lining various fuel storage containment areas. As a matter of fact, this technology currently is being specified by engineering contract firms working with the U.S. Air Force and U.S. Navy. Work includes applications at Patrick Air Force Base, Cape Canaveral Air Force Station, AUTEC U.S. Navy Base and a variety of fuel storage areas for municipal airports (see the sidebar at right). Most of these areas have an existing epoxy paint system applied to the concrete. The epoxy has cracked with the movement of the concrete over time, thus allowing for a breach in the containment area and potential environmental issues. The polyurea technology, as an elastomeric system, bridges those cracks and yields a superior containment lining material.

For existing asphalt, earthen berm or gravel containment areas, the polyurea system is applied on top of a geotextile membrane, as noted previously. The polyurea system bonds to the geotextile membrane, as well as the existing tanks, pipe pentrations and sump areas, and provides for a seamless installation without the use of mechanical fastening, as is required with sheet-good installed material. Many such applications have been successfully completed at major fuel, oil and chemical storage facilities. The polyurea systems used in these cases is specifically formulated to provide for a low cure shrinkage as applied over

CASE STUDY: BBL Falcon Industries

BBL Falcon Industries has taken full advantage of the resurgence of the oil drilling activities in Texas, Oklahoma and New Mexico. In field work, secondary containment areas are constructed prior to the placement of condensate tanks. These areas, typically measuring 24 x 56 x 2.3 ft, are fabricated on-site. FSS-45DC polyurea system from VersaFlex, Inc. is applied over the geotextile and on the perimeter walls, as opposed to the sheet-good liner systems that have seams and are susceptible to leaks. The FSS-45DC is applied at a minimum average 80 mils (2 mm) on the 12-oz geotextile fabric.

BBL Falcon Industries has a patent-pending procedure for rehabilitating existing tank drilling sites, as well as new installation areas. Designed areas are cleaned and leveled, the metal perimeter installed and the geotextile fabric laid. The FSS-45DC is applied up and onto the geotextile and perimeter wall area. Once the material has been laid in place and sprayed with the FSS-45DC, the tanks and piping are set in place.

The FSS-45DC system is applied using a GlasCraft MH-III proportioning unit fitted with a GlasCraft Probler P2 spray gun. An "02" chamber is used with an "01" insert tip to provide a controlled output and spray pattern at a 2000 psi (138 bar) processing pressure.

the unsupported geotextile membrane. Recent work in North America includes projects that are in the 300,000 to 450,000 ft^2 (28,000 to 42,000 m^2) range. These large projects typically are completed within one month using application-trained installation crews.

With the resurgence of oil and gas exploration in the U.S., containment areas for the fractionation fluid are required at each drilling site. For this work, a designed containment area is prepared, metal support walls are constructed, and a designed polyurea spray system is applied over a geotextile fabric. The polyurea system bonds to the wall area and geotextile fabric to provide for a seamless, leak-free area. The storage tanks are then set within the area and piped in the same day as the liner system installation.

A Compliant Solution

For any companies or organizations that deal with hazardous materials, the new secondary containment rules are looming on the horizon. With polyurea spray elastomer technology, companies can meet the new regulations with a durable coating solution, without incurring excessive downtime.

Dudley J. Primeaux II, *PCS, is owner of Primeaux Associates, plural component equipment/materials consultants specializing in polyurea systems. He can be reached at 512.285.4870 or polyurea@flash.net. The company's website is at* **www.primeauxassociates.com**.

Author's note: *Thanks to Steve DeReu at GlasCraft, Inc.* **(www.glascraft.com)** *for his assistance with this article.*

High-Performance "Green" Pretreatment

A new automotive pretreatment technology addresses environmental concerns and offers cost-saving advantages while also meeting the performance requirements of today's automakers.

BY RICH MOYLE, MARK SIMPSON AND ERIK EHINGER
PPG Industries

For decades, automakers have turned to phosphate-based technologies for their pretreatment needs — and with good reason. Tricationic zinc phosphate conversion coatings predictably and reliably deliver protection against corrosion, and years of process and chemistry refinements have generated pretreatment products with excellent paint-adhesion properties.

However, these products are not free from drawbacks. Sludge produced as a byproduct of the zinc phosphate pretreatment process contains heavy metals such as nickel, zinc and manganese, and discharge of this sludge is limited due to increasingly strict environmental regulations. In addition to creating challenges in the handling and disposal of the sludge, the presence of heavy metals in the process also results in significant wastewater management concerns.

To meet the needs of automakers worldwide, researchers at PPG Industries have developed a new pretreatment system* that not only addresses environmental concerns, but also offers economic advantages while delivering the high performance that automotive manufacturers require. The pretreatment is based on technology that uses a proprietary blend of additives and zirconium-based chemistry to deposit a zirconium oxide conversion coating on clean metal surfaces.

Global production capacity for zinc is rapidly being outpaced by growth in the demand for galvanized steel and a myriad of other products that require zinc. As a result, there is substantial pressure on zinc suppliers worldwide. By using chemistry based on zirconium — a more economically stable raw material — as opposed to traditional

*The new pretreatment system is available under the tradename Zircobond™ from PPG Industries, Inc.

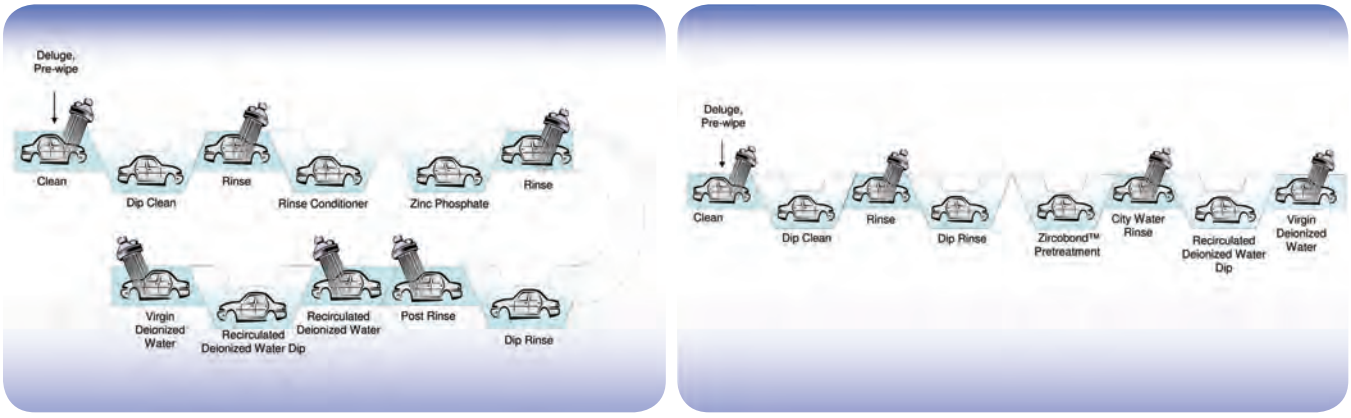


Figure 1. Comparison of a conventional zinc phosphate pretreatment footprint and the new zirconium-based pretreatment footprint.

NOTE: OEM pretreatment process designs can vary from plant to plant and line to line. The above diagram is only one example of a conventional automotive pretreatment process. Introduction of Zircobond technology to a pretreatment line will require a design review by PPG specialists to determine the potential for process optimization.

zinc phosphate chemistry, the new pretreatment removes uncertainty regarding the zinc supply and provides a more secure alternative.

Benefits of Innovation

A process using the new pretreatment system produces minimal toxic, regulated heavy metals and generates at least 80% less sludge byproduct compared to the standard zinc phosphate pretreatment process. The pretreatment can be used in existing pretreatment lines and is safe for the conventional waste treatment systems in most automotive production facilities following a simple pH adjustment. Pretreatment lines incorporating the new system also require fewer boilouts and stage cleanings. Therefore, in addition to addressing the growing regulatory and environmental concerns surrounding pretreatment technologies, the new zirconium-based pretreatment offers potential cost savings in maintenance and waste disposal.

The new pretreatment also has the potential to increase efficiency and generate additional cost savings in production. Specifically, its chemistry allows for the use of ambient-temperature baths that require minimal agitation and fewer rinse cycles than the current processes (see Figure 1). As a result, using the new zirconium-based pretreatment could lead to substantial energy savings on the production line.

Estimates show that, depending on the manufacturing footprint, there is potential for annual savings of up to several hundred thousand dollars with the use of the new pretreatment due to reductions in associated costs, such as energy, maintenance and labor. Potential savings are even greater in greenfield applications, where fewer process stages could generate up to several million dollars in savings on new facility capital investments.

The new pretreatment is an environmentally responsible, "green" solution that addresses regulatory concerns and delivers economic incentives.

Proven Performance

Today's quality control standards are tighter than ever, and the tougher OEM requirements for automotive coatings performance have posed challenges for other zirconium-based pretreatments. The new pretreatment contains a proprietary combination of additives that is the key to making the technology work. The performance of the pretreatment has been evaluated in various testing scenarios to ensure that it can produce the adhesion, corrosion protection and electrocoat compatibility necessary for complex automotive applications.

Using standard automotive testing protocol such as cyclic corrosion, water soak and chipping adhesion tests, PPG researchers have demonstrated that the performance of the new zirconium-based pretreatment is at least equivalent to the tricationic zinc phosphate technologies currently used throughout the industry. The pretreatment is also colored to allow visual confirmation of application.

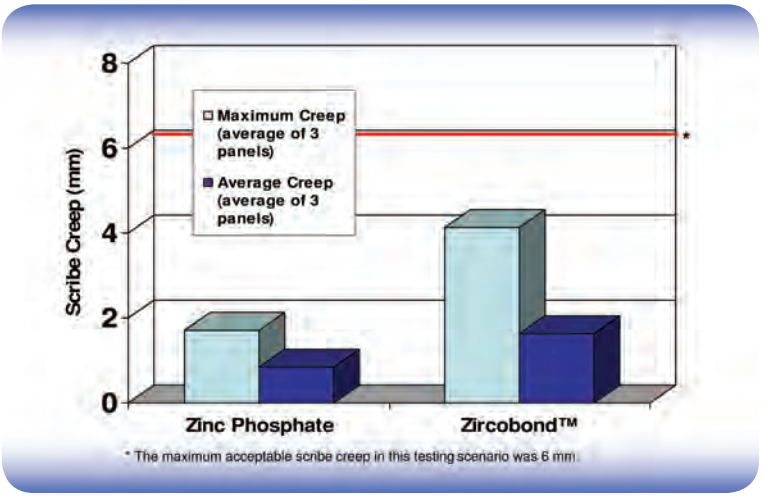


Figure 2. The new pretreatment developed by PPG approaches the anti-corrosion performance of industry-standard zinc phosphate on cold-rolled steel.

For several years, the development of an alternative, "greener" pretreatment technology was focused on optimizing the anti-corrosion performance on cold-rolled steel, while maintaining excellent corrosion protection on zinc and aluminum alloys used in the auto industry. Based on recent findings, the new pretreatment approaches the anti-corrosion performance of industry-standard zinc phosphate on cold-rolled steel (see Figure 2). This breakthrough has brought the product closer to commercialization.

The presence of multiple metal substrates in automotive bodies in white adds another level of complexity to the application of alternative pretreatment. Specifically, the zirconium process produces free fluoride, the presence of which must be controlled in order to preserve the integrity and performance of a pretreatment bath. The new zirconium pretreatment is formulated to control free fluoride easily, and the result is a multi-metal friendly product. This characteristic is especially important given the increasing amount of aluminum used in today's automotive applications.

Delivering on Goals

As automakers search for an environmentally responsible, cost-effective, high-performance pretreatment technology, the new zirconium-based system offers a promising solution. Companies such as General Motors and Ford have been working closely with PPG on the development of this technology.

"Continued leadership in the use of environmentally friendly technologies is imperative at General Motors," said GM global process pretreatment lead Kevin Cunningham. "[This] innovative pretreatment coating material offers many advantages, including energy savings, water conservation and a smaller footprint. GM is aggressively pursuing global implementation opportunities."

According to Tim Weingartz, manager of paint materials and strategy at Ford, "Pretreatment is an important anti-corrosion step in the paint process, but the conventional method is harder on the environment. With this new pretreatment technology, Ford continues to lead the industry in environmental solutions to manufacturing processes."

Rich Moyle *is the global product manager for automotive OEM pretreatment at PPG Industries, Inc., developer of the new Zircobond pretreatment system. Moyle can be reached at 248.641.2000 or moyle@ppg.com.* **Erik Ehinger** *is the market development manager for automotive coatings at PPG Industries, and* **Mark Simpson** *is the manager of product development for automotive pretreatment and substrate protection systems. For more information about the new pretreatment system, visit* **www.ppg.com.**

State-of-the-Art Plating

From masking and racking products to RoHS-compliant materials and self-contained plating equipment, today's suppliers offer numerous solutions for high-quality plating.

Masking Products

Mighty Hook

This company's new 80-page catalog features all of its hooks, racks and masking products, plus several new masking products. These products include lightweight tapered hollow plugs, double washer pull plugs, conical pull plugs, conical stoppers, flanged pull plugs, metric hollow stoppers, rectangle caps, vented caps and Q-bolts. The company's selection of masking products also includes a variety of masking caps, plugs, tapes, tubing and mesh, as well as several accessories to perfect finishing processes, such as a grounding tester that determines whether hooks and racks are sufficiently grounded. Call 773.378.1909 or visit www.mightyhook.com.

Racking Devices

Burlingham International Inc.

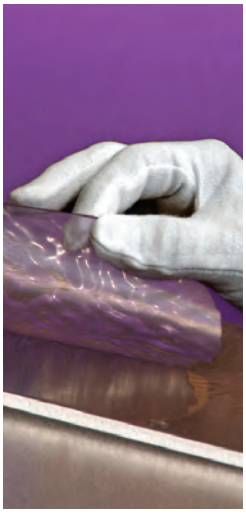
This company manufactures the Duraclamp, a high-strength plastic racking clamp for anodizers and platers.

The company also produces and distributes a full complement of engineering grade plastic racking devices, fasteners and equipment, including the Hexie polypropylene insulation float, the Quick-Grip plier, the Quick-Set clamp, and a line of plastic nuts and bolts. Call 800.659.5506 or 949.645.1529, or visit www.duraclamp.com.

RoHS-Compliant Materials

MacDermid Inc.

This company offers RoHS (Restriction of Hazardous Substances), ELV (End-of-Life Vehicles) and WEEE (Waste Electrical and Electronic Equipment)-compliant processes for virtually every finishing application. All products are commercially available today, off-the-shelf and ready to use. MacDermid's RoHS-, ELV-, and WEEE-compliant brands include the ZinKlad® and TriPass systems for zinc and zinc alloy passivation; NiKlad ELV and NiKlad LMO™ electroless nickel processes; TriMacIII and Enviro-chrome decorative trivalent chrome plating systems; and the Metex, IsoPrep, Clepo, and Iridite NCP lines of surface conditioning processes. For a more in-depth listing of RoHS-compliant products, request the company's "RoHS, ELV, WEEE and REACH Compliant" selector wheel. Call 203.575.5680 or visit www.macdermid.com.



UV-Curable Masking Resins
DYMAX Corp.

SPEEDMASK® UV curable masking resins offer protection against most metal finishing processing environments. The maskants seal cooling cavity openings and prevent contamination of blade and vane cooling holes and cores from acid, alkaline and plating solutions and the debris from air plasma spray, HVOF, peening and grit blasting. Combined with UV curing lamps and UV accessories, the UV-curable maskants can simplify regulatory compliance, increase efficiency and reduce costs. Call 860.482.1010 or visit www.speedmask.com.

Direct Metallization on Plastics
Atotech

Futuron® ULTRA is a new generation direct metallization process for plating on plastics that features a considerably wider working window through the optimized interaction between the activator and copper (Cu) link. This expanded work time allows for an enhanced Cu adsorption on the activated substrate, and therefore significantly increases the conductivity of the seed layer. Even acrylonitrile butadiene styrene (ABS)/polycarbonate (PC) blends with a PC content up to 65% can be plated for applications in automotive, sanitary or fashion. The better Cu adsorption allows finishers to work with a reduced Pd-content in the activator, which provides additional economical advantages. Additionally, due to improved conductivity of the seed layer, the speed of the subsequent electrolytic Cu-deposition is much faster. Visit www.atotech.com.

Self-Contained Plating Units
Technic Equipment Division

This company has developed the new Mini Mod series of self-contained plating for use in laboratory or small-scale manual production and testing. Designed for easy access, use and maintenance, these tabletop systems provide an affordable solution for plating and processing. Mini Mod 3 features two 3-gal process tanks, one 3-gal rinse tank, a 500 W Teflon® heater with a digital thermostat, a low level probe, and one 10-amp, 12-V DC rectifier with analog amp and volt meters. Mini Mod 2 features one 7-gal process tank, one 7-gal rinse tank, a 1000 W Teflon heater with a digital thermostat, a low level probe and a 25 Amp, 12-V DC rectifier with analog amp and volt meters. Call 401.781.6100 or visit www.technic.com.

Grid Coils
Allied Plating Supplies, Inc.

The G Series grid coils can be used in alkaline solutions, acid solutions and rinse tanks and offer superior chemical resistance, rugged construction and leak-free operation. The coils feature a 2-in.-thick, low-profile design, and every inch of coil surface is active exchange area. They are available in sizes from 4.6 to 89.9 ft^2 with a variety of options, including mounting hangers, vertical or horizontal configurations, heavier-gauge tubing or pipe, anti-floatation weights for high-specific-gravity or highly viscous solutions or fluoropolymer coatings for corrosion protection at the solution/atmospheric interface. Call 800.432.8692 or 305.681.8531, or visit www.alliedplating.com.

Editor's note: *The products highlighted in this article were compiled from press releases submitted by the companies named. Additional plating supplies will be featured in the Plating Directory in the March issue of* Finishing Today *and in future issues. To submit a press release, e-mail grahlk@sbcglobal.net.*

MATERIALS

Leather Brown Finish

BIRCHWOOD CASEY: Antique Brown® M38 solution or gel can be used to achieve oil-rubbed bronze and leather brown finishes. The liquid product can be applied as an immersion browning solution or as a brush-on. The gel is a thickened version of the product designed for application on large flat surfaces or for components that are already installed. The gel works with the same color formation and timing as the liquid while staying in place where applied without forming runs and drips. Visit www.birchwoodcasey.com.

Coating Stripper

SOLVENT KLEENE, INC.: D-Zolve 917 is a safe, fast-acting paint and powder coating stripper designed to be used at low temperatures in an immersion tank. According to the company, the product's ability to quickly penetrate and break the chemical bond between the coating's layers and the substrate eliminates the need for costly, high-energy-consuming burnoff, blasting or heating of the solution to high temperatures. Designed to minimize health and environmental hazards, the stripper is nonflammable, nontoxic, and does not contain any ozone-depleting components or carcinogenic compounds. The product is compatible with most ferrous and nonferrous metals. Call 978.531.2279 or visit www.solventkleene.com.

Enviro-Friendly Paint

DIVERSIFIED COATINGS INC.: Morwear Skyair™ is a new water-based paint line. Skyair Odorless paint reportedly has no paint odor and extremely low volatile organic compounds (VOCs). Skyair Easy-Clean paint provides an easily cleaned and highly scrubbable surface, low VOCs, excellent hide and long-lasting color. Both paints are available in 1- and 5-gal sizes with different sheen options and two primers that can be tinted to thousands of colors. Call 800.605.2627 or visit www.morwear.com.

Pigment Black

THE SHEPHERD COLOR CO.: High-heat-resistant Pigment Black 10C931 is jet black in color. It is designed for applications where the absence of chromium is desired and resistance to heat, light, and weather are needed. The new product is a 100% high-performance inorganic pigment, also known as a complex inorganic colored pigment (CICPs) or mixed metal oxide (MMO) pigment. According to the company, the pigment is extremely durable, stable in high temperatures, chemically inert, insoluble, resistant to bleeding and migration, weather-resistant, and lightfast. Visit www.shepherdcolor.com.

Cleaning/Activation Process for Electroplating

TECHNIC: Techni Neutredox, a patented, neutral pH cleaning/activation process, is designed for advanced electroplating applications. The product reduces surface oxides, thereby improving electrodeposition onto the treated surface without exposure to substrate damaging acidic or alkaline solutions. Potential applications include wafer level packaging (WLP) and silicon-based photovoltaic cells. Visit www.technic.com.

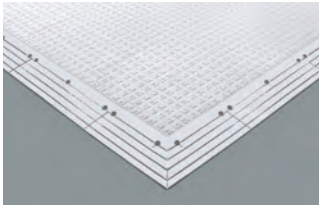
Water-Based Tapping Fluid

ITW ROCOL: SafeTap® Plus is a water-based tapping fluid with a custom blend of synthetic additives that provides the cooling properties of a water-based coolant with the viscosity of a straight oil. The product is designed to prolong tool life and create better threads in tapped holes, while also creating a safer and cleaner work environment for employees. Since the material is water-based and contains no mineral oils or solvents there is no oily residue left on the work pieces. Call 847.657.5343 or visit www.rocolnorthamerica.com.

EQUIPMENT & SUPPLIES

Ergonomic Floor Tiles

WEARWELL: The new ErgoDeck White ergonomic floor tiles are designed for "body in white" applications where metal forms are painted and inspected. The floor tiles reflect light rather than absorbing it, thereby highlighting blemishes in paint. The tiles are made from a silicone-free, soft compound and can be used for large and custom-sized areas. The super-sized, 18" x 18" tiles quickly assemble and securely connect to create "a floor above a floor" and increase worker comfort and productivity. Optional 6" wide safety ramps and corners have countersunk holes so the entire configuration can be attached to the floor as a more permanent installation. The product is 7/8" thick and is available in two designs: No. 564 for areas with vertical airflow, and No. 566 where airflow is not a consideration. Visit www.wearwell.com.



Plural-Component Metering System

EXEL NORTH AMERICA: The Cyclomix™ Micro entry-level 2K metering system is the latest in the company's Constant Flow Meter-Mix™ technology. It features a volumetric ratio range of 0.6 to 20:1, a metering accuracy of ±1% for consistent quality, and data storage on volatile organic compound (VOC) and material consumption. Material is only mixed when needed, minimizing waste. Color changes are easy, and only a small volume of solvent is required for flushing. The system is flexible and can be used on all spray technologies. Call 800.573.5554 or visit www.exel-na.com.

Flytrap

PARACLIPSE: The Paraclipse Terminator is a multi-function flytrap designed to keep finishing rooms and other industrial and commercial areas bug-free. The unit uses special UV lamps and a UV Booster Reflector to attract flies. The system can be wall-mounted or used free-standing for multiple applications. Call 800.856.6379 or visit www.paraclipse.com.

Compressed Air Filtration

LA-MAN® CORP.: The Extractor/Dryer® Series compressed air filtration system is designed as a point-of-use filter that removes moisture and contaminates to improve and extend the life cycle of tools and equipment. The two-stage filter operates most effectively within 25 ft. of the point of use. Each model offers a standard 5-micron rating, with lower micron ratings available. The system features flow ranges of 15 to 2000 scfm and pressure ratings of up to 250 psi. Call 800.348.2463 or visit www.laman.com.

High-Efficiency Burn-Off Oven

ACE EQUIPMENT CO.: The Hybrid RT hybrid burn-off oven reportedly provides 93% efficiency due to its burner design. The main burner fires directly into a stainless steel tube, which is positioned below the single platform cart from back to front. The radiant tube presents convection and radiant heat to the main chamber to provide uniform temperatures of ±10°F. According to the company, the cost to operate the hybrid ovens can be as low as $2/hr. The system can be used to clean paint/powder hooks, racks, fixtures, load bars, grating, reject parts and sensitive materials such as aluminum. The integral afterburner consumes smoke, fumes and odors, making the oven environmentally friendly. Call 800.255.1241 or 216.267.6366, or visit www.armaturecoil.com.

Part Sensing Device

MITSUBA SYSTEMS: The Magic Eye Part Sensing System automatically turns spray guns on and off as needed to optimize spraying efficiency. Optional in/out positioners independently move guns to maintain the correct horizontal gun distances for consistent overall finishes. According to the company, the system provides better film thickness accuracy with less

EQUIPMENT & SUPPLIES

waste to help companies meet tighter tolerances and minimize overspray and edge buildup. Visit www.powdergun.com.

Belt Conveyor Oven

WISCONSIN OVEN: An electrically heated belt conveyor oven with two decks, top-down airflow and a cool down is used for curing adhesive on motorcycle rear fenders. Each work chamber is 5'9" wide x 19'3" long x 2'2" high. This oven was designed with 4" tongue and groove panels, and the equipment included a horizontal split line for ease of shipping. The oven was rated for a maximum operating temperature of 500°F with a heating capacity of 144 kW. Call 262.642.6024, e-mail ttrueman@wisoven.com or visit www.wisoven.com.

Flashlamps for Solar Module Testing

XENON CORP.: Xenon Solar Simulation Flashlamps from are suitable for testing crystalline or thin-film materials. When used with the appropriate optical filter, the lamps can achieve ASTM E925-05, JIS C 8912-1989, IEC 904-09, and related international standards for Class A solar simulators. Providing true sunlight simulation, the pulsed lamps remain off until testing begins, thereby saving energy and eliminating undesired heat buildup in photovoltaic cells and modules. Designed to match requirements for solar simulators with output powers from 100 to 3000 watts, the lamps are available in spiral, bulb, serpentine, U-shape, and linear shapes in lengths up to 6 meters. Visit www.xenoncorp.com.

Enviro-Friendly Soda Blasters

THE EASTWOOD CO.: This company has developed a line of environmentally friendly soda blasters and soda blast conversion kits for popular abrasive blasters. The blasters' efficient design allows refinishers to soda blast with as little as 7 cfm at 80 psi with precision and control. They can be quickly converted to blast with standard or other more aggressive media to clean up rusty areas. The units are available as a 2-in-1 soda and standard abrasive blaster (EW#50095) that requires a small compressor generating 6 CFM at 80 to 125 PSI to operate, or as a 110 lb professional unit (EW#50096) designed for heavy-duty paint removal. Visit www.eastwoodco.com. ft

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Ask Joe Powder

Dear Joe,

We are using tap water in our pre-cleaning and rinse bath. I have heard that we should be using DI water. What is your take?

Craig

Hi Craig,

If you want any kind of corrosion resistance you should switch your final rinse in your precleaning system from tap to DI (deionized) water. Tap water can contain varying amounts of impurities, such as water soluble salts, that act as propagation points for corrosion.

The rinse after your alkali cleaning stage can be a tap water rinse as long as you keep it clean. This is usually accomplished by overflowing it to keep the concentration of drag-in from the previous process low.

DI water can be obtained through a reverse osmosis or ion exchange process.

Hello Joe,

Is there a system or formula I can use to estimate powder coating service charges if I know the surface area of the part in square inches and the number of pieces to be produced in an eight-hour shift?

Unni

Dear Unni,

I think that you are trying to determine the cost of powder per surface area covered. There is a simple conversion to calculate how many square feet a pound of powder will cover at a given film thickness. Take 192 and divide by the specific gravity of the powder. This will give you the theoretical number of square feet a pound of powder will cover at 1.0 mil thickness and 100% efficiency. Powders typically are applied at approximately 2.0 mils, and the efficiency can range from 50 to 95%.

For example: 1.0 lb of a powder with a 1.6 specific gravity theoretically will cover 60 ft2 at 2.0 mils. (192 divided by 1.6, then divided by 2.0 mils). Estimating an efficiency of 65%, you could expect to cover around 39 ft^2/lb.

If you are paying $3/lb for this powder, then your material cost per square foot would be approximately $0.077. Of course this doesn't take into account any of your overhead costs such as labor, energy, building, utilities, equipment depreciation or ancillary supplies.

Dear Joe,

I have a customer who wants a white powder coating — very white — and all the powder coatings I have applied are yellowish. Is there a solution?

Aissa

Hybrid and especially epoxy-type powders have a tendency to yellow upon baking.

Dear Aissa,

This is a common problem. While "very white" is a relative term, I think I can still provide some guidelines to allow you to provide the whitest finish for your situation.

First of all, the chemistry of the powder coating affects whiteness. For example, hybrid and especially epoxy-type powders have a tendency to yellow upon baking. Powder types less prone to yellowing include polyesters, polyurethanes and acrylics. Formulating technique also affects the yellowing of these chemistries. The choice of pigment, crosslinker and additives can significantly influence yellowing resistance. So be sure to evaluate more than one version of these types of powders.

Overbaking (at a high temperature and/or extended time) exacerbates this problem. Furthermore, the quality of your oven affects whiteness. Gas ovens cause more yellowing than electric or infrared types. Incorrectly adjusted gas/air mixtures also will cause more yellowing. It is imperative to keep your oven burner adjusted properly and to avoid overbake conditions.

If your customer requires a highly reflective white powder for an application that involves lighting fixtures, then a specifically formulated powder is required. These products will incorporate special grades of titanium dioxide (white pigment) and, quite possibly, an optical brightener and antioxidant. ft

Send your questions to **askjoepowder@yahoo.com.** *Additional questions and answers can be found online at* **www.finishingtodaymag.com**.

Are you a super hero?

You don't have to be a super hero, but you'll sure feel like one by participating at SUR/FIN 2008. Not only will you bring substantial value to both your company and career, but you'll be part of North America's only event that embraces the entire supply chain. You'll learn about recent and emerging technology innovations, collaborate with industry luminaries, and obtain practical business knowledge to help you succeed in today's competitive marketplace. You may not be inspired to jump out of tall buildings or attempt to be faster than a speeding bullet, but you'll leave feeling like you've been given the mental power of a locomotive.

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