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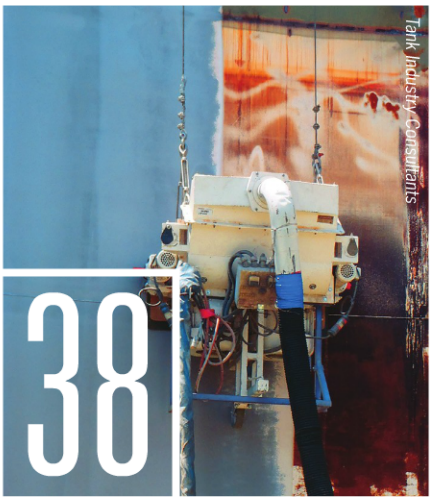
Features



From the Offices of SSPC

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Staff

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The Value of G.S.T.

In my previous career in the U.S. Army, we used the term "G.S.T." — we would say that "this was G.S.T." or "good solid training." Training is something we did nearly everyday. It was engrained in our minds that in order to get the job done in the most cost-effective and efficient manner, we had to have the best-trained individuals and teams out there. In the coatings industry, some type of introductory training is the best way to get an individual started on the right foot in your company. If a new employee has no basic industry knowledge, how can he or she relate to what you do on a daily basis?

It was no different for me when I joined SSPC in 1994. I came from the Army as the post commander at Fort A.P. Hill, Virginia. I had no coatings experience, nor did I have any association management expertise. One of the prerequisites of getting the job as associate director of SSPC was to attend the annual conference in Atlanta. I went to Atlanta to attend SSPC 1994 on leave as an active duty Army officer. It was the best thing I did to get oriented to the new career I was entering. To this day, I require new employees at SSPC to attend the conference no matter what position they hold on staff.

Good training, whether formal or "O.J.T." (on-the-job training), lays the foundation for developing competency in your job. However, even good quality training is no substitute for experience. I was not truly effective at my job here at SSPC until I had been here about a year and a half. I had to go through one yearly cycle to know the processes and procedures. Another one of the most important things I had to learn quickly was who the key people were in the association and in the industry. That is something that I have to continue to refine on a regular basis, because the movers and shakers change depending on the issue and the circumstances.

We all know that training should not end with one course. Your people need to adapt to the changes in coatings and equipment technology that are happening on a regular basis in this industry. When I first joined SSPC, lead was a hot topic. Now we rarely talk about it because we have put in effective measures to control that hazardous waste. High-performance coatings have changed. We now do two-coat systems, and, in some cases, we have one-coat systems that perform adequately depending on the environment and the substrate.

We still have contractors who complain about having to do formal training of their employees. The contractors complain because of the high turnover in the industry and the cost involved. We understand that. There has to be a balance. If an employee feels that the employer invests in him or her, this might reduce the employee's desire to move. The employee feels appreciated and is more motivated to stay. For the company, there should be increased efficiencies, which should result in increased financial gain. And lastly, having a professional and trained workforce should enhance the company's image.

SSPC offers 47 different training and certification programs for entry-level employees and even those who have many years of experience. We have courses in surface preparation, coatings technology, management, control of hazardous wastes, health and safety, coating of concrete, and numerous inspector courses, to name a few. New courses include Bridge Maintenance: Conducting Coating Assessments, Concrete Coating Inspector Supplement: Determining the Level of Moisture in Concrete, and Inspecting Containment.

I have written many pieces about training because I feel strongly about the subject. I do believe that learning is a never-ending process. As I wind down and get close to retirement, I still learn every day by reading something or by listening to someone. I stayed in the Army for over 22 years because of the challenges of the job, the training I received and the feeling of being appreciated. Pay was not the issue. I stayed at SSPC for over 20 years for the same reasons, and because of the investment they made in me.

Bill Shoup
Executive Director, SSPC

New Webinar Offers Asset Management Tips

On Wed., June 17, from 11:00 a.m. to noon, EST, "Asset Management Preservation," the latest installment in the SSPC/*JPCL* Webinar Education Series, will be presented online, free of charge.

Preparing and applying protective coatings to complex steel structures can be complicated, making the maintenance of these assets and their components a challenge. Each asset may have its own maintenance schedule, performance metrics and life-cycle expectations. This webinar will explain how to develop an effective asset management preservation program, based on these considerations, to achieve the optimal life of the coating system. Participants will be eligible to receive credit from SSPC.

Aaron Dacey

Aaron Dacey, a coatings and corrosion engineer with the North Carolina Department of Transportation (NCDOT), will present this webinar. Dacey has more than 18 years of experience in the bridge and metal industry and has been with NCDOT for 11 years. He currently focuses on quality assurance inspection for NCDOT projects. Dacey is a NACE Level 3 (Peer Review) Coating Inspector and an American Welding Society (AWS) Certified Welding Inspector. He also currently serves on the U.S. Army National Guard in North Carolina.

Registration, CEU Credits

This program is part of the SSPC/*JPCL* Webinar Education Series, which provides continuing education for SSPC re-certifications and technology updates on important topics.

SSPC is an accredited training provider for the Florida Board of Professional Engineers (FBPE), and Professional Engineers in Florida may submit SSPC webinar continuing education units to the board. To do so, applicants must download the FBPE CEU form and pass the webinar exam, which costs $25.

Register for this free online presentation at paintsquare.com/webinars.

European Coatings Show Draws Record Attendance

Cementing its status as the world's largest coatings event, the European Coatings Show and Congress shattered attendance, exhibitor and delegate records as it closed a three-day run in Nuremberg, Germany.

The biennial show, held April 21 to 23, drew 1,024 exhibitors and 28,500 trade visitors. The European Coatings Congress, held at the same time, recorded a record 700 delegates.

Even strike-related train cancellations throughout Germany did not derail the numbers for the show, which also covers paints, varnishes, adhesives, sealants and construction chemicals.

The event was spread over seven halls in the Exhibition Centre Nuremberg. The three show dailies, available for download at european-coatings-show.com, captured all the action.

The show's exhibitors hailed from 42 countries, and attendees reflected nearly 110 nationalities, underscoring the event's "position as an international meeting place for the global coatings industry," organizers said.

The European Coatings Congress also drew delegates from 42 countries, yielding 144 presentations by scientists and researchers "focused on the production of high-quality coatings, paints, sealants, construction chemicals and adhesives," organizers said.

Products and presentations "showed the diverse requirements met by modern coatings solutions: functional, safe, environmentally friendly, and firmly committed to the idea of sustainability as bio-based products," sponsors said.

The next European Coatings Show will take place April 4-6, 2017, at the Exhibition Centre Nuremberg. Meanwhile, planning is underway for ECS Reloaded on May 11, 2016. The Reloaded event, which debuted in 2014, offers a virtual update on exhibitors, presenters and topics from the 2015 show. To take in this virtual presentation, visit european-coatings-show.com.

Houston Coating Society Holds Annual Competition, Show

On April 17, the Coating Society of the Houston Area (CSHA) held its annual "Trade Show" at Campbell Hall of the Pasadena Convention Center in Pasadena, Texas.

This annual event, "a unique blend of business and pleasure," according to the CSHA, consists of networking opportunities, a technical program, an exhibition with outdoor demo spaces, awards ceremonies and complimentary food, drinks and entertainment throughout the day.

A week before the annual show, on April 11, the CSHA also held its 25th Annual Painters Competition, co-sponsored by SSPC and NACE International and hosted by Mobley Industrial Services. In this yearly competition, teams of painters take on three different roles – foreman, craftsman and helper – to show off their painting skills. First- and second-place winners received donated blast helmets and facemasks, resepectively.

The winning teams were recognized at the trade show the following week and are listed as follows.

- **1st Place: Brand Energy Solutions/ Lubrizol**
  Richard Garcia (foreman),
  Hugo Magana (craftsman) and
  Bernardo Villagomez (helper)
- **2nd Place: Brand Energy Solutions/Shell**
  Rafael Calindo (foreman),
  Jorge Castro (craftsman) and
  Constantino Vasquez (helper)
- **3rd Place: Accelerated Production Systems, Inc.**
  Josiah Wegenast (foreman),
  Johnny Rodriguez (craftsman) and
  Rafael Casterjon (helper)

The Coating Society of the Houston Area strives to promote education and best practices in corrosion control and to expand the knowledge and proper use of protective coatings to mitigate the effects of corrosion in industry, according to the CSHA website. Today, the members of the Coating Society include persons and companies doing business in Southeast Texas and Southwest Louisiana that are involved in corrosion control and corrosion prevention. Membership consists of facility owners, coating applicators, coating inspectors, coating manufacturers, coatings equipment suppliers and other related services.

For more information about the CSHA, visit hcs.houstoncoatingsociety.org.

(Above) Teams of painters participate in the Coating Society of the Houston Area's 25th annual Painters Competition. Photos courtesy of SSPC.

Abhe and Svoboda, Inc.

CORRECTION

Daniel Markwell, the painter in this photograph, was incorrectly identified in the article, "Coatings and Collaboration: Industry Joins Forces to Restore Historic Tanks" which ran in the April 2015 issue. JPCL apologizes for this error.

SSPC 2015 Video Proceedings Online

Videos of selected technical presentations from SSPC 2015 featuring GreenCOAT are now available online. To view the proceedings free of charge, visit paintsquare.com/sspcvideoproceedings.

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Now Buzzing on *PaintSquare News*...

"ROAD REPAIRS UNEARTH 43 DINOSAUR EGGS" *(April 24)*

A road crew in southern China discovered 43 dinosaur egg fossils, 19 of which were fully intact, while upgrading a road in Heyuan in the Guangdong province on April 19, according to a story by TechTimes.com.

Heyuan has nicknamed itself "Home of the Dinosaurs," and is listed in the Guinness World Records as being home to the world's largest collection of dinosaur eggs with over 10,000 individual samples as of November 2004.

The largest egg was five inches in diameter. The fossils are thought to be from the late Cretaceous period, which dates 89 to 65 million years ago.

Photo: Facebook.com / CCTVNews

PSN TOP 10 *(as of May 1)*

1. Bridge Painting, Blasting Cited Again
2. Falling Concrete Kills Young Family
3. 'Booze and Snooze' Scandal Rocks Plant
4. Nuclear Accident Laid to Kitty Litter
5. Industrial Boom Helps Ease RPM Bust
6. Stopping Corrosion, Slowing Bullets
7. Landowners Sued for Pipeline Surveys
8. Apple Bars Offenders from Construction
9. Contractor Agrees to $1M DBE Settlement
10. Hard Hat Rules Pit Religion v. Safety

WHAT'S GOT US TALKING

(PaintSquare News Weekly Poll, April 20–24)

NIOSH has recommended that all U.S. workplaces be smoke-free (including e-cigarettes). Do you support this idea?

YES. This is a public-health issue. **35%**
NO. Smoking policies should be the employer's call. **65%**

David Lemke: *"I didn't realize I worked in a prison. ... Do we really need Big Brother to tell us one more thing we can and cannot do?"*

Ken Tator: *"I do believe that in some areas, notably public health and safety, the government does have the right to restrict bad or poor practices. ... Cigarettes are the only product that when used in accordance with the manufacturer's recommendations will kill you."*

STUMPER OF THE MONTH

(PaintSquare News Daily Quiz, April 15)

True or false:
Another name for a polyaspartic coating is a hybrid polyurea.

Answer: True. See the *JPCL* article, "Two-Component Aliphatic Polyurea Coatings for High-Productivity Applications" (*JPCL*, August 2002).

Problem Solving Forum

On When to Waterjet Bridges

When should you specify ultra-high-pressure (UHP) waterjetting on bridges?

Lydia Frenzel
Advisory Council

The general project specifications on bridges should include SSPC-SP WJ-1, WJ-2, WJ-3 or WJ-4, in addition to the abrasive blast standards, unless the paint to be applied is incompatible with remnants of the existing coating, or the bridge is known to have no profile, i.e., was never blasted when it was constructed. Situations where WJ standards should be specified include: when there has been road salt placed on the bridge; when the bridge is over marine/salt water; when lead paint is present; when the bridge design needs a small footprint for equipment; or when the amount of waste needs to be reduced. The SSPC/NACE and ISO standards define the end condition; they do not specify the operating parameters such as pressure washing/low-pressure water cleaning (LP WC), high-pressure waterjetting or ultra-high-pressure waterjetting.

Wan Mohamad Nor Wan Abdul Rahman
Antap Semenanjung Sdn. Bhd.

When we specify UHP waterjetting on a bridge, it is probably because we need a more environmentally friendly painting process and more strict safety measures due to heavy traffic flow at the site.

Ramoo Puru
Berken Enterprises Pte. Ltd.

A UHP blast has its advantages and disadvantages. Its main disadvantage is that it does not create a profile; thus, the profile of the blasted surface will be as per the original. I presume this is for a bridge here in Asia; thus, prior salt on the road is never a consideration. Several years ago, we did a cable-stayed bridge deck in Thailand, and we used a mobile autoblast system where steel abrasives were used. This system blasts, sucks and separates the remnants all automatically. Another method requires covering sections of the bridge and then blasting and priming using a "cocoon system," where all debris is captured. Another method is to use a wet-blast system. This prevents dust, if that is your consideration for opting for UHP, but this method creates a profile because abrasive is added into the system. Lastly, check with the paint manufacturers to learn if they will agree to warrant their materials for the UHP selected, as such jobs usually require warranty. Usually, they do give warranties once they know the scope and whether any inhibitor is used.

Andrew Sedor
AECOM

I would never say never… My question is, what percentage of bridges have all the surfaces accessible UHP waterjetting? Waterjetting would not be practical on any of the bridges I've worked on.

Billy Russell
D&R Coating Inspection

UHP is not more environmentally friendly with stricter safety measures on bridges. Using it produces no anchor profile, but the coating systems used on bridges require an anchor profile. Choose blasting with a recycling machine, and a 1A (REAL 1A) containment system. The specification should include cleaning prior to blasting to remove both visible and non-visible contaminants. This method is head and shoulders above UHP on a bridge.

James Schuster
Painting Service Inspection
I have personally used WJ-1 surface preparation on bridges that have been previously blast-cleaned to create a profile and repainted numerous times. This does work very well, but it really depends on the particular situation.

Anthony Washington
Jetstream of Houston, LLC
High-pressure water blasting does not alter the integrity of the bridge's surface during the coatings removal process. More specifically, water blasting prevents microfractures in concrete and allows supportive rebar to remain intact. The use of high-pressure water blasting for surface prep has been shown to effectively eliminate rust, old coatings, product residue or even damaged concrete prior to re-pouring. The process also provides a revitalized surface, making it possible for new coatings to adhere without old particles impeding the surface area. Likewise, in certain bridge coatings removal applications, accessibility to the surface area can be a challenge. In those situations, with the proper equipment, water blasting allows the operator to safely tackle any horizontal, vertical or overhead surface preparation or removal task. Water blasting, or waterjetting, is a proven technology that has been in use since the 1970s. Over time, with the introduction of robotics and automation, the process of waterjetting has become safer and more efficient.

Editor's Note: Problem Solving Forum (PSF) questions and answers are posted on *JPCL's* sister publication, *PaintSquare News,* a daily e-newsletter. To subscribe, visit paintsquare.com/subscribe.

Profiles in SUCCESS

By Charles Lange, *JPCL*

Eric S. Kline

"Eric Kline has the unique ability to see the 'big picture,' and once he sees where he or an organization needs to be, he works tirelessly to get there," said Ken Tator, chairman of the board of KTA-Tator, Inc. (Pittsburgh, Pa.) and a longtime colleague of Kline's. But for this "big picture" thinker, the path that eventually led him to a long and successful career in the protective coatings industry began somewhat modestly.

Humble Beginnings

As Kline himself puts it, "I was a young person born on the wrong side of the tracks. I grew up poor, fed with mouse crumbs." He was eventually able to earn a B.S. degree in chemistry from Ursinus College and an M.B.A. from the University of Pittsburgh. "After that, I didn't know what to do," he admits; he considered starting a business, but now with a wife and daughter to feed at home, "I just didn't see how it was possible financially."

Instead, Kline got a job at the Fort Pitt Bridge Works in Canonsburg, Pa., then part of Spang Industries, where he became plant manager of the company's steel fabricating division. Kline's arrival at the Bridge Works in 1968 coincided with a momentous shift in industry practices that would affect how the rest of his career would play out.

"In 1970, the industry decided to switch new bridges away from being coated with red lead paint, to being coated with zinc-rich primer," said Kline. "Nobody there knew anything about zinc-rich paint, so it was my job to become the paint expert."

Marriage of Steel Bridges and Coatings

From there, Kline dove in and became fully immersed in the coatings world. His job at the Bridge Works "ultimately led me to SSPC, led me to blast-cleaning standards, led me eventually, to Ken Tator," said Kline.

"When I met Ken, we were about the same age, and interested in the same types of things, so little by little, Ken became our consultant," said Kline. After the Bridge Works closed, Kline held another job before receiving a call from Tator. "He told me, 'Look, you've spent so much time screwing up the paint down at the Bridge Works, why don't you come help us?'"

Now a retired executive vice president of KTA-Tator, Kline joined the company in 1982 as a senior consultant, working on failure analyses across a variety of industries and helping to expand the company's training programs as state highway and transportation agencies began specifying zinc-rich coatings in both the shop and in the field. "Eric headed our efforts to work for governmental entities, enabling us to shift away from exclusively private, corporate clients," said Tator. "Now, state governments are our largest client base." Kline was also instrumental in starting KTA's steel inspection group, which Tator said "is now the second-largest growth center in the company."

"I was already in bridges then when the DOTS got in higher demand for paint and painting issues," said Kline. "At KTA, I was the only person who had a long bridge history; I managed a whole plant, and I was the coatings technician. It became an avocation and eventually a vocation, and became my life's interest," said Kline.

Service to SSPC

An SSPC-certified Protective Coatings Specialist with over 45 years of experience, Kline has been one of the most influential figures in the modern steel, bridge and protective coatings industries. According to Bill Shoup, executive director of SSPC, "There is no one who has participated in SSPC throughout the years more than Eric."

Kline chaired several SSPC committees over the years, overseeing establishment of the Painting Contractor Certification Program (PCCP) and the SSPC-QP 3 standard for certifying contractors, modeled after the American Institute for Steel Construction (AISC)'s existing steel shop fabricator standard. Kline was also heavily involved in the writing and revising of SSPC standards regarding surface preparation and coatings for steel structures.

> "Luckily for us, [Eric] chose to focus his energy on the painting industry."
>
> ***Ken Trimber, KTA-Tator, Inc.***

In addition, Kline served as program chair of the SSPC 2003 conference, which he called an "exciting" undertaking. "You start with a blank canvas, you put the show together piece-by-piece, and then you get to go and watch it unfold!"

Even in SSPC's early days, as the Society struggled with compounding debt, Kline offered his fundraising expertise — he had raised funds for a local hospital — to help clear the red, along with former SSPC executive

Kline and wife Suzie pose for a picture on a trip to Guam (left) and Kline accepts SSPC's 2010 Technical Achievement Award from SSPC President (2010-2011) Russ Brown. Family photos courtesy of the Kline Family.

director Bernie Appleman.

Bridges were a natural focus area for growing the organization in its early days, with SSPC's local ties to Pittsburgh's steel and bridge industries, but Kline said the Society's outreach has expanded vastly over the years. "SSPC's footprint is a mile wide and a mile long," he remarked, "and like most footprints, it's deeper in some areas than others."

Michael Kline, SSPC's director of marketing and Eric's son, commented: "My father taught me the importance of volunteering your time. If there is one thing that people will tell you about my father, it's that he's passionate about his job and the coatings industry. I think that has helped me to understand association work and understand the mindset of SSPC members who, like my father, spend a great deal of time and effort on committees, developing technical programs, writing books, speaking at conferences and so on."

"Not only is he an active participant in SSPC, but in other technical groups as well, his contributions have been second to none," said Shoup.

Indeed, sharing his knowledge with the industry has always been a hallmark of Kline's personality. "If I find somebody who wants to know something I know, I'll be glad to teach that person everything I can," he said.

An active participant in SSPC, NACE International, the AISC and other industry associations throughout his career, Kline has been awarded with SSPC's two highest honors, the Honorary Life Member Award (2008) and the John D. Keane Award of Merit (2003), as well as a Lifetime Achievement Award from the AISC in 2014. He was named a *JPCL* Top Thinker in 2009.

"With Eric's drive and determination, he would have been successful in any career he would have pursued," said Ken Trimber of KTA-Tator, another longtime co-worker of Kline's. "Fortunately for us, he chose to focus his energy on the painting industry."

Writing that 'Lit a Spark'

Naturally, Kline's passion for the industry came out through his written work, as well. Over the years, Kline wrote several articles for *JPCL* and other industry publications, and his captivating writing always stood out.

"Eric wrote some of the most influential articles ever published in *JPCL*," said Harold Hower, chairman of the board of Technology Publishing Company and *JPCL*'s founder. Hower pointed to the article, "Prequalifications of Contractors" from the July 1986 *JPCL*, co-authored by Kline and the late John C. Hauck of Bayer, which proposed developing a painting contractor certification program for the industry. "This article lit a spark, and by 1989 SSPC had created PCCP

Kline (second from right) with brothers and sisters Frederick A. Kline, Eleanor Kulikowski, Matthew M. Kline, Suzanne Varley, and Dr. Ernest Richard Kline.

Eric S. Kline

and certified its first contractor," said Hower.

Hower also mentioned "rapid deployment," a process that utilizes fast set-up and coating of overpass bridges with quick-drying materials to minimize traffic delays, which Kline conceptualized in a January 2000 *JPCL* article with co-author Carl A. Angeloff of Bayer; and "beneficial procrastination," which described the steps necessary to decide whether lead-based paint should be overcoated rather than removed, as well as the steps necessary to carry out an overcoating job. "Eric could turn a phrase that would fire the imagination like no other," said Hower.

(Clockwise from left): Kline celebrates the holidays with grandson Brandon Aguiniga, daughter-in-law Maryhelen, son Jonathan, wife Suzie, and grandchildren Stephen and Elizabeth Kline.

"Sometimes, you get lucky and something comes to mind," said Kline, "and at places like KTA, you're free to write articles and work with people who are interested in the subject. That stuff all came out through *JPCL*." He also mentioned, "I still get emails from people who want to talk about rapid deployment!"

Kline's proficient writing is indicative of just how much stock he puts into communication. "In my opinion, people who survive and do well are people who can write well, write clearly and literally so that they can be understood and communicate. People who can't communicate are people who can't adapt to new technology that is based on communication."

Assessing the Industry

Development of this communication-based technology, according to Kline, accounts for one of the largest overall shifts in trends he's seen in the industry. "The era of the PC — especially the tablets and the iPads of the world — has given people the chance to have the connectivity with the guy who has the paint gauge out in the field," said Kline. "We can get instant online results back to the technologist, who can look at them and say whether they're acceptable or not."

While he is enamored by some of this new technology, Kline also stresses staying firmly rooted in what already works. "Embrace the new technology, but don't so quickly abandon the tried and proven things," he said. Kline also suggests using old tools and methods in new ways. "I think there's always a need for what I'd consider 'applied research' — take the technology we have and use it in perhaps different ways and try to help extend the service life of bridges."

Winding Down from Work

Experiencing health issues in recent years has given Kline a unique appreciation for life these days. "When I woke up this morning, I said, 'Ahh, I've got another day.' I'm still here, still able to do the things I want to do. My health sometimes hampers me from being as active as I'd like to be. But I recognize that every day is a gift, and so should everyone else."

While essentially retired, Kline still keeps busy, serving on the local school board and giving time to KTA and SSPC as needed. "When I had to work, I was glad to make a paycheck, but I was glad to have days off," said Kline. "Now that I don't have to work, I want to work. I'm not sailing the seven seas or climbing mountains at this point — maybe in the future, but certainly not at this point. So I want to stay busy, I want to stay engaged, I still want make a difference, and I believe I do."

> "Embrace the new technology, but don't so quickly abandon the tried and proven things."
>
> ***Eric Kline***

When asked to point out career highlights, Kline can spout off notable structures he's worked on around the world — Aloha Stadium in Hawaii, the Quebec Bridge with the Canadian National Railroad, the Gold Star Bridges in Connecticut, and the Forth Bridge over the Firth of Forth estuary in Scotland, to name a few. But Kline ultimately defines his success on his own terms. "I'm a family guy. The thing that makes me proud is that all of our children have jobs, and none of them are in jail."

While Kline said he was "honored" by the awards he's earned over the years, he countered, "I didn't set out to win awards — I set out to try to make things better for the industry, be of service, and of course, top priority, raise my family."

Still, it's hard not to look back on such an accomplished and fulfilled career. "It's been a wonderful ride, it really has," Kline reflected.

And the long list of professional accomplishments aside, it's Eric Kline, the person, who has made the most lasting impression on others.

"Where my father has influenced me the most is how to conduct myself as a person and a professional," said his son Michael. "It may sound cliché, but it's learning the importance of hard work and being driven to accomplish your goals. He taught me the value of networking and associating yourself with quality people, of treating people with respect and supporting those who work for you."

"For those of you who know Eric, think back to any encounter you had with him," said Trimber. "I'll bet you're smiling."

Coating Failure on Motor Housings

By Dwight G. Weldon, PCS, Weldon Laboratories, Inc.

Many *JPCL* readers are well-acquainted with the steps involved in the field or shop painting of large structures, such as bridges, water tanks and concrete floors. However, a very large amount of painting is done every day in the original equipment manufacturer (OEM) area, and when these items fail, the consequences to the parties involved can be equally devastating. This column deals with one such failure — the flaking of paint from factory-coated motor housings.

The motor housings in question were made of steel coil, which was aluminized by hot-dipping in a bath of molten aluminum. The aluminized coil was then shipped to another firm, whose job was to stamp it into parts for the motor housings. The motor housings, which consisted of two half-parts, were in turn sent to a powder coater for coating. The powder coater put the parts through a multi-step cleaning process, followed by pretreating the parts with a zinc phosphate pretreatment. The pretreated parts were then powder coated, using a triglycidyl isocyanurate (TGIC) polyester.

TGIC (Fig. 1) is a crosslinking agent that has three epoxy functional groups and is widely used to cure the carboxylic acid-terminated polyesters often used in powder coatings. It should not be confused with the more familiar bisphenol-A-type epoxies used in the industrial maintenance coatings market. TGIC polyester powder coatings are known for their good exterior durability and mechanical properties.

Once the housing parts were coated, they were shipped to the client's facility, where they were assembled. This involved placing the motor in the bottom half of the housing, aligning the top half of the housing to the bottom half, and then joining the two parts together using a special "clinching" unit. This process involves clamping the two metal housings to a die, where the mating flanges are impacted by a punch. The punch draws (pushes) the painted metal into the die and physically squeezes it against an anvil. The anvil has hinged blades, such that as the metal flows outward the blades open, causing the diameter of the punched metal "button" to expand, locking the two pieces together.

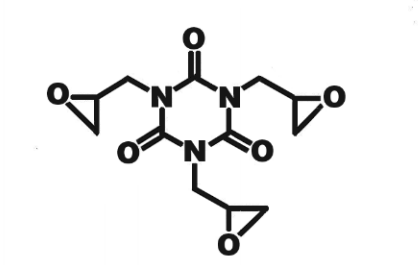


Fig. 1: The structure of triglycidyl isocyanurate (TGIC), showing the three 3-membered epoxy rings. All figures courtesy of Weldon Laboratories, Inc.

Numerous motors were shipped to a large customer, who subsequently complained that many of them exhibited flaking paint. The paint was flaking around the perimeter of some of the connections. To determine the cause of the flaking, samples of the parts were sent to a laboratory for failure analysis.

The samples submitted to the laboratory consisted of one non-failing and one failing motor housing. As is common in failure analysis, the first step in the laboratory consisted of visual and microscopic observations.

The non-failing motor housing had a glossy gray coating on it, which appeared to be in very good condition, even in the flanged area where the two halves were joined. However, because things are not always as they appear, the coating adhesion on this sample was assessed in general accordance with ASTM D3359, Method B, "Standard Test Method for Measuring Adhesion by Tape Test." This test rates adhesion on a scale of 5B (good) to 0B (poor). The coating on the non-failing sample was as good as it looked, with 5B results on both the side of the housing and on the flanged area near the connections.

The connections on the non-failing sample were examined using a stereo zoom microscope with magnification to 30 times (30X). The connections were obviously formed as described above, by using a punch to drive a circular button of metal from the top half of the housing partially through the bottom half,

where it expanded when it exited the bottom half, to form a tight connection between the two parts. The inner walls of these punched holes were quite smooth (Fig. 2). The impact of the punch apparently pushed the coating up slightly around the perimeter of the hole, resulting in a slight "lip" of coating around the top of the hole.

The failing sample was similar to the non-failing sample, except for spots of flaking paint around the perimeters of some of the connections. The flaking occurred on the upper half of the flange, where the punch would have entered the metal. Small chips of coating could be removed at these locations by probing with an X-ACTO knife, but a half-inch or so away from the connections, the coating adhesion was good (5B). The adhesion was also good (5B) on the side of the housing, away from any connections.

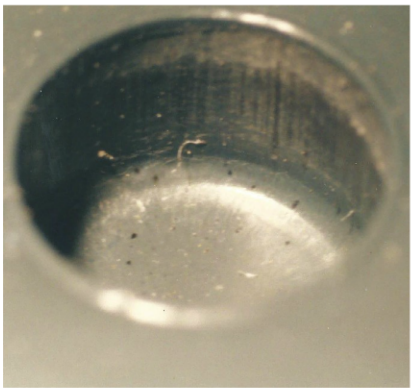


Fig. 2: A punched hole associated with one of the non-failing connections. Note the smoothness of the inner wall.

When examined microscopically, both the back of the disbonded coating from the failing sample and the exposed metal from where it disbonded were clean, and the back of the coating replicated the slight texture of the metal. There were some spots on the back of the coating were there were very small, scattered metallic particles. The disbonded coating consisted of a single coat, 4 to 5 mils thick, and was relatively flexible.

A microscopic examination of the connections that exhibited flaking paint showed a much different appearance than what was observed on the non-failing sample. Instead of the metal walls of the punched cavity being smooth, with an even lip of coating around the perimeter, the walls were badly gouged, with a series of long, parallel gouges or notches. Gouges were also evident around the perimeter of the hole (Fig. 3). Not all of the connections on the failing sample were associated with flaking paint. When these non-failing connections were examined microscopically, the inner walls were found to be smooth, much like the connections on the non-failing sample.

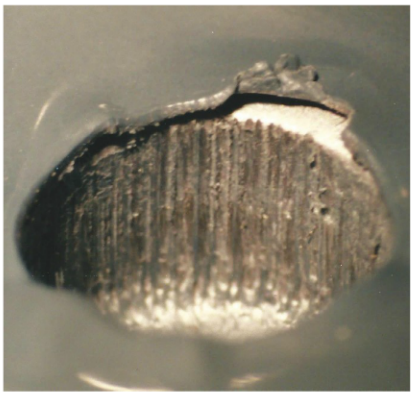


Fig.3: A punched hole associated with a failing connection. Note the lifting paint and the parallel gouges on the inner wall.

When doing a failure analysis, it is often instructive to compare the properties of the coating to the information on the coating's product data sheet. The information contained in this particular product data sheet was rather skimpy, and much of it could only have been verified with thin, flat test panels. However, the data sheet did say that the coating should have a minimum thickness of 1.5 mils (which it did), an impact resistance of 140 inch-pounds (which could not be measured on motor housings), and a minimum pencil hardness of 4H. The data sheet also listed a test to determine if the coating was properly cured. This consisted of doing 50 double-rubs with cheesecloth and methyl ethyl ketone (MEK). According to the data sheet, properly cured coating should not lift or discolor.

Because of the geometry of the housings, it was somewhat difficult to do pencil hardness testing (ASTM D3363, "Standard Test Method for Film Hardness by Pencil Test") but the coatings on the failing and non-failing samples both passed with a 4H. The coatings also passed the MEK rub test. Therefore, it appeared as though they were properly cured.

Infrared spectroscopy, which was discussed in this column in the December 2014

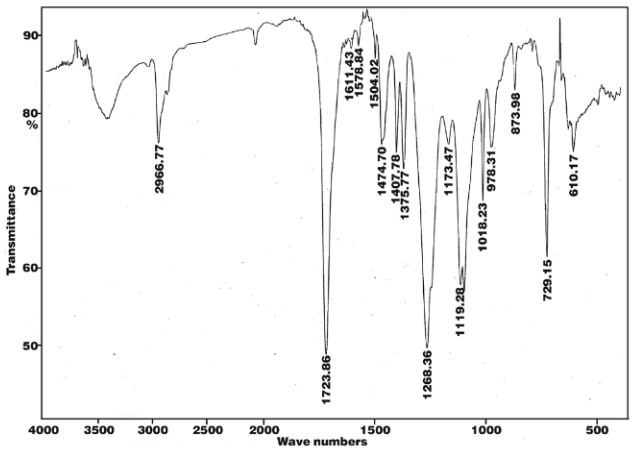


Fig. 4: An infrared spectrum obtained from failing paint, showing it to be a polyester. The spectrum of the failing paint was virtually identical to a spectrum of the non-failing paint obtained from a different motor housing.

JPCL, was employed in this project. Briefly, the analysis showed that the spectra of failing and non-failing paint (Fig. 4) were virtually identical to one another, and consistent with that of a polyester. Although a control sample of the specified virgin powder coating was not available, the analysis shows that the paint that was used was at least generically consistent with what was specified, and that the same coating was used on both the failing and non-failing housings.

When coupled with an attenuated total reflectance (ATR) attachment, infrared spectra can be obtained from surfaces of small samples. This is an excellent technique to use for detection of contaminants such as grease or drawing oils on the back side of disbonded paint chips. The ATR analysis of the front and back sides of a failing chip showed no evidence of any type of organic contamination, ruling this out as a possible cause of failure.

The last analytical technique used on this project was scanning electron microscopy-energy dispersive X-ray spectroscopy (SEM-EDS, discussed in the January 2015 *JPCL*). Whereas infrared spectroscopy is very useful for detection of organic materials such as resins and organic contaminants, SEM-EDS is very useful for detection of inorganic materials, such as pigments, salts and pretreatments. An analysis by SEM-EDS revealed the following.

1. Using cotton swabs, MEK and an X-ACTO knife, coating was carefully removed from a small area of the metal flange from both the non-failing sample and from a non-failing area of the failing sample. The analysis of these areas showed a similar

composition: major amounts of aluminum, minor amounts of carbon, oxygen, zinc, silicon and phosphorous, and traces of iron and manganese (Fig. 5, p. 21). The aluminum, of course, was from the aluminized substrate, and many of the other elements were likely from paint residues. The zinc and phosphorous indicated that the specified zinc phosphate pretreatment was used.

2. The metal surface beneath flaking paint on the failing sample consisted mostly of aluminum, a minor amount of silicon and traces of carbon, potassium, iron and zinc. Although no phosphorous was detected, the trace of zinc again indicated that a zinc phosphate pretreatment was used.

3. The back surface of paint that had flaked from the failing sample was similar in composition to the front surface of the paint, but had much higher levels of aluminum, as well as minor amounts of zinc and phosphorous.

Conclusions

Based on the background information and the laboratory investigation, the primary cause of the failure was the extra stress or impact forces that occurred at some of the connections. The microscopic observations showed that the interior walls of these punched connections were relatively smooth (even at non-failing connections on the failing sample), whereas the interior walls on those connections which exhibited paint failure were much rougher, with relatively deep grooves or gouges. The gouges were likely the result of tooling or processing problems associated with the equipment or the process used in making the punched connections. Apparently, considerably more stress was imparted to the coated metal at the gouged, failing connections than when the holes were punched in a clean, smooth manner. This additional stress or impact was sufficient enough to result in the minor flaking occurring around the perimeter of these connections. The slight lifting or cracking would also make the coating more susceptible to undercutting from any water that the housing may have been exposed to.

Other factors that may have contributed to the coating failure were also investigated, but ruled out. These included the use of a different paint, applying the coating over organic contamination such as grease or oil, and inadequate curing of the paint. The first two possibilities were investigated and eliminated by infrared spectroscopic analysis. Solvent rub tests and pencil hardness testing both indicated that the coating was properly cured.

Another factor that was considered was whether or not the specified zinc phosphate pretreatment had been used. Zinc phosphate was detected by SEM-EDS analysis on both the non-failing sample and at the non-failing location on the failing sample. However, whereas zinc and phosphorous were easily detected on the aluminized substrate at non-failing locations, it was barely detectible on the substrate at a failing location. While this might suggest that, for whatever reason, there was less pretreatment at the failing location, the analysis of the actual flaking paint showed elevated levels of aluminum on the back of it (compared to the front), along with zinc and phosphorous. Apparently, when the paint failed due to the extra impact from the punch, it failed by a combination of adhesive failure between the paint and the substrate, and also, to some extent, by a failure in the upper layer of the pretreated aluminized substrate itself.

Surfaces, Standards and Semantics:

A Close Look at Surface Cleaning Standards

By Rob Francis, R A Francis Consulting Services Pty Ltd

Hand- and Power-Tool Cleaning

Part 1 of this column on surface preparation standards, published in the February 2015 *JPCL*, closely examined ISO and joint SSPC/NACE International blast cleaning standards to investigate differences and similarities. In this second installment the hand- and power-tool cleaning standards will be investigated. Standards for hand- and power-tool cleaning used in North America are prepared by SSPC alone. There are four written standards, which are illustrated pictorially in SSPC-VIS 3. In most other parts of the world, ISO 8501-1 contains written descriptions as well as pictures of hand- and power-tool-prepared surfaces, along with the abrasive blasting standards discussed in Part 1, in a single book.

As with the blasting standards, the pictures are an integral part of the ISO standards. Unlike the joint blasting standards, the written standards do not specifically say that the written standard has precedence over the visual standard, but it is recommended that the use of visual standards be made mandatory in the project specification.

Removing Contamination with Hand- and Power-Tools

The process of removing contamination by hand- and power-tools is different from abrasive blasting. Abrasive blasting typically dislodges contamination by hitting it at right angles to the surface. As a result, the contamination is largely removed in stages — loose contamination first, followed by adherent contamination and then staining. A needle gun or other impact power-tool may remove contamination in a similar manner. However, a sander or grinding disc will largely shear contamination from the surface in a single pass. This shear action means such processes will have little effect on depressions, so the surface could be completely clean over most of the surface but still have contamination in pits. Wire brushing also shears contamination from the surface, but in this case the bristles only remove loose material. Other tools, such as rotary flap or wire bristle impact (wire flail) tools may have a combination of shear- and right-angle-cleaning, resulting in a different appearance again.

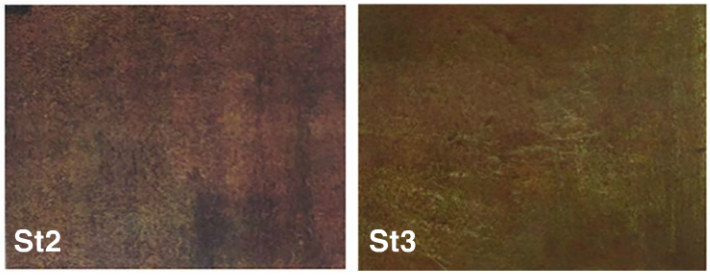


Fig. 1: ISO visual standards for hand- and power-tool cleaning to St2 and St3 for original rust grade C. Photos courtesy of ISO 8501-1.

Hand- and Power-Tool Cleaning Standards

As with blasting standards, a comparison can be made between the ISO and SSPC standards for hand- and power-tool cleaning. However, there are problems when trying to carry out such a comparison. With abrasive blasting, the initial condition is considered the only factor influencing final appearance. But with hand- or power-tool cleaning, whether the tool removes contamination by impact or shear action influences appearance. Furthermore, the tool used has a major effect on the appearance of the cleaned surface. For example, wire brushing, whether hand- or power-operated, gives a completely different appearance than a surface prepared by a needle gun. The ISO standard does not acknowledge this at all. The hand- or power-tool-cleaned surfaces shown visually in this standard appear to be cleaned by wire brushing, although this is not stated. In SSPC-VIS 3, photos of surfaces prepared to the same standard using a power wire brush and sanding disc are included. The two methods show distinct differences in the level of contamination removed.

The definitions for the two levels of hand- and power-tool cleaning from ISO 8501-1 are summarized as follows.

- St2, "Thorough hand and power tool cleaning": When viewed without magnification, the surfaces shall be free from visible oil, grease and dirt, and from poorly adhering mill scale, rust, paint coatings and foreign matter.
- St3, "Very thorough hand and power tool cleaning": As for St 2, but the surface shall be treated much more thoroughly to give a metallic sheen arising from the metallic substrate.

There are some interesting issues here. First, ISO does not distinguish between hand-tool and power-tool cleaning — just the degree of cleaning. Also, as mentioned, the photographs are an integral part of the description, unlike the SSPC standards. Both St2 and St3 require all non-adherent contamination to be removed, but do not require any underlying steel to be exposed. St3 requires a "metallic sheen," which could imply exposed steel, but the photographs for St2 and St3 (Fig. 1, p. 25) show that no underlying clean steel is exposed for either standard with any of the three original grades. The visual requirements of the two grades are identical in that all loose contamination is removed, with no requirement for any exposed underlying metal. The description does require that the surface be "treated much more thoroughly" for St3, although this extra work cannot be detected by visual appearance.

The two lowest SSPC standards for hand- and power-tool cleaning are SSPC-SP 2 and -SP 3, which can be looked at together.

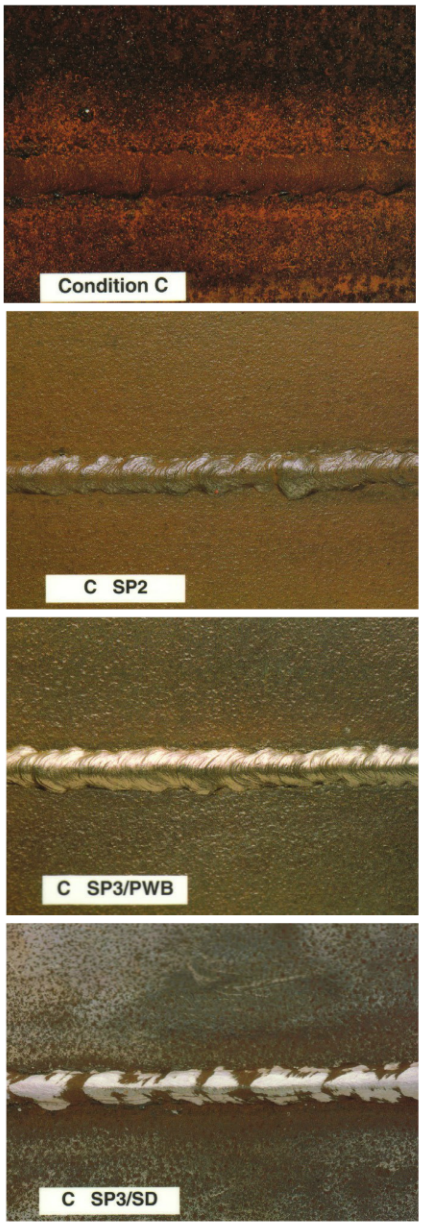


Fig. 2: SSPC visual standards for hand- and power-tool cleaning for original rust grade C. Photos courtesy of SSPC.

The written definitions are as follows.

• SSPC-SP 2, "Hand Tool Cleaning": "… removes all loose mill scale, loose rust, loose paint and other loose detrimental foreign matter. It is not intended that adherent mill scale, rust and paint be removed by this process."

• SSPC-SP 3, "Power Tool Cleaning": "…removes all loose mill scale, loose rust, loose paint and other loose detrimental foreign matter. It is not intended that adherent mill scale, rust and paint be removed by this process."

As you can see, both are defined with exactly the same wording. Adherent contamination is defined, as it is for abrasive blasting, in both cases. As with the ISO standards, all that is required visually is that loose contamination is removed with no requirement for exposure of any underlying steel. SSPC-VIS 3 shows pictures of surfaces prepared to these standards with a hand-tool (SSPC-SP 2) and a power wire brush (SSPC-SP 3/PWB), where no under-

lying steel is shown. However, pictures for SSPC-SP 3 using a sanding disc (SD) with all original grades do show that this tool can remove some adherent contamination and expose underlying steel. Figure 2 (p. 29) shows these grades for initial condition C. Unlike abrasive blasting, the degree of hand- and power-tool cleaning depends on the tool used and effort. The minimum visual cleanliness requirements for the two ISO levels and the two SSPC levels are largely identical, namely that all loose contamination shall be removed, although some tools can clean to a higher level.

SSPC also has two higher standards for power-tool cleaning. These have a requirement for a minimum surface profile of 1 mil (25 microns) but this discussion concentrates on cleanliness. The written standards also define unit areas and refer to information in notes. But the critical levels of cleanliness are defined as:

• SSPC-SP 15, "Commercial Power Tool Cleaning": "…when viewed without magnification, shall be free of all visible oil, grease, dirt, rust, coating, oxides, mill scale, corrosion products, and other foreign matter. Random staining shall be limited to no more than 33 percent of each unit area of surface. Staining may consist of light shadows, slight streaks, or minor discolorations caused by stains of

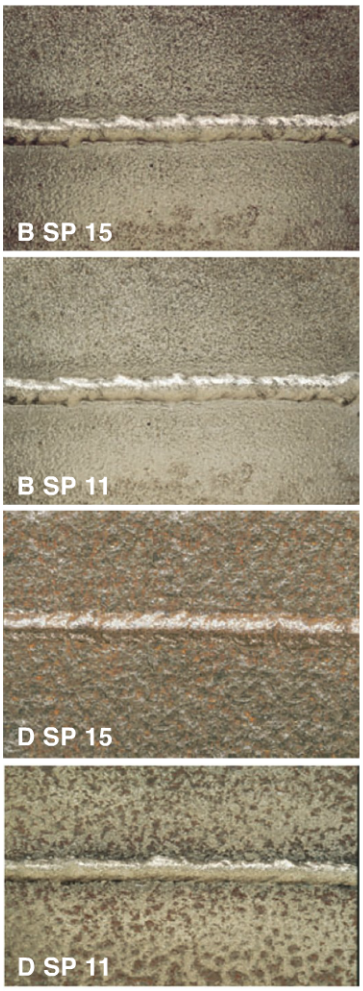


Fig. 3: Example SSPC visual standards for hand- and power-tool cleaning to -SP 15 and -SP 11 showing different visual cleanliness levels. Photos courtesy of SSPC.

Table 1: Coatings and Environments with Suggested Cleanliness Standards

Required Cleanliness	Coatings Selected and Environments	Blast-Cleaning Standards	Hand- and Power-Tool Cleaning Standards	Comments
Best	Exacting coatings and linings for severe environments	SSPC-SP 5/ NACE No. 1 ISO Sa3		Rarely for old steel, Surface profile would be critical
	Exacting coatings for atmospheric exposure	SSPC-SP 10/ NACE No. 2 ISO Sa 2½	SSPC-SP 11 (not pitted)	Surface profile would be critical
	Coatings for less severe atmospheric exposure	SSPC-SP 6/ NACE No. 3	SSPC-SP 11 SSPC-SP 15 (not pitted)	Surface profile would be critical unless surface tolerant primers used
	Surface tolerant coatings for mild environments	SSPC-SP 14/ NACE No. 8 ISO Sa 2	SSPC-SP 11 SSPC-SP 15	Usually no profile requirements
Lowest	Cleaning only and surface tolerant coatings for benign environments	SSPC-SP 7/ NACE No. 4 ISO Sa 1	SSPC-SP 2 SSPC-SP 3 ISO St2, St3	No profile requirements

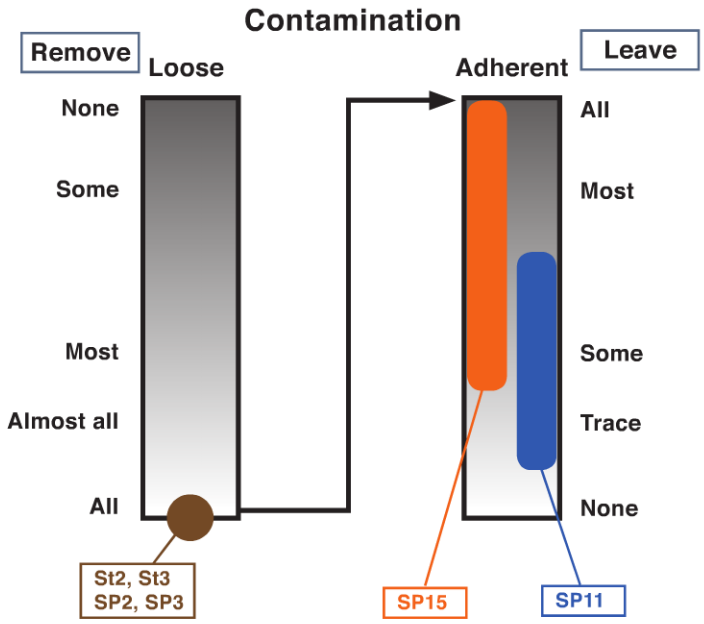


Fig. 4: Relationship between removal of contamination and hand- and power-tool cleaning standards. The amount of adherent contamination left by -SP 15 and -SP 11 depends on amount and depth of pitting. Figure courtesy of the author.

rust, stains of mill scale, or stains of previously applied coating. Slight residues of rust and paint may also be left in the bottoms of pits if the original surface is pitted."

• SSPC-SP 11, "Power Tool Cleaning to Bare Metal": "...when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, rust, paint, oxides, mill scale, corrosion products, and other foreign matter. Slight residues of rust and paint may be left in the lower portion of pits if the original surface is pitted."

Both written standards allow contamination at the bottom of pits, but SSPC-SP 15 allows stains of rust, paint, or mill scale to remain on the surface while SSPC-SP 11 requires a completely clean surface. However, the visual standards show significant variation in the level of surface contamination depending on the extent of pitting, as shown in the examples in Figure 3 (p. 30). For SSPC-SP 15 with original condition B, the surface is fairly clean, but with original condition D there is contamination over most of the surface. Similarly, SSPC-SP 11 is largely contamination-free when there is no pitting (original condition B) but with a pitted surface (original condition D), it can have significant contamination on the surface.

Figure 4 shows the position of the hand- and power-tool cleaning standards on the cleaning 'spectrum'. The level of allowable contamination for ISO St2 and St3 and SSPC-SP 2 and -SP 3 is clearly the same, in that all loose contamination must be removed, but there are no further requirements. This is shown in the first stage of the cleaning spectrum in Figure 4. SSPC-SP 15 and SSPC-SP 11 remove all loose contamination, but also some adherent contamination. But determining their location on the cleaning spectrum is difficult because of the range of contamination levels observed in the photographs. The amount of contamination in the depressions varies from a trace to fairly significant depending on the amount and depth of pitting. The positions of these two levels on the cleaning spectrum are based on the photographs rather than the written descriptions, so SSPC-SP 15 and -SP 11 actually cover a range of levels of adherent contamination depending on the original condition.

Specified Cleanliness Requirements

Having looked closely at both the blasting and the hand- and power-tool cleanliness

standards that are available, how they are specified and used in practice is critical. Surface cleanliness is rarely an end in itself. The level of cleanliness specified depends on the coating selected and desired durability of the system. Table 1 (p. 32) summarizes coating types and environments, along with suggested standards of surface cleanliness. High-quality, exacting coatings for severe environments require a very clean surface with a good profile. Surface-tolerant coatings for less severe environments can be applied to less well-prepared surfaces.

Conclusions

This article, along with Part 1 from the February 2015 *JPCL*, reviewed the various visual standards for blast cleaning and hand- and power-tool cleaning. The articles identified equivalence between a number of the SSPC/NACE standards and the ISO standards, and drew attention to the problem of identifying and differentiating adherent contamination on the surface between the various standards of cleaning, especially with regard to the higher SSPC standards of hand- and power-tool cleaning where pitting will greatly influence level of cleanliness. The articles also identified problems related to written and pictorial standards. However, the range of standards available should enable the specifier to accurately specify the optimum level of cleanliness for any given coating project.

About the Author

Rob Francis is a consultant with over 35 years of experience in metals and materials, especially regarding protective coatings. He is a *JPCL* contributing editor and was named a *JPCL* Top Thinker in 2012. He earned his Ph.D. in corrosion science from the Corrosion and Protection Center at UMIST in Manchester, U.K., and he is a NACE-certified Coating Inspector. His consulting firm, R A Francis Consulting Services Pty Ltd, operates out of Ashburton, Victoria, Australia.

The Flow Must Go On

Rehab of a 1,000,000-Gallon Water Storage Tank

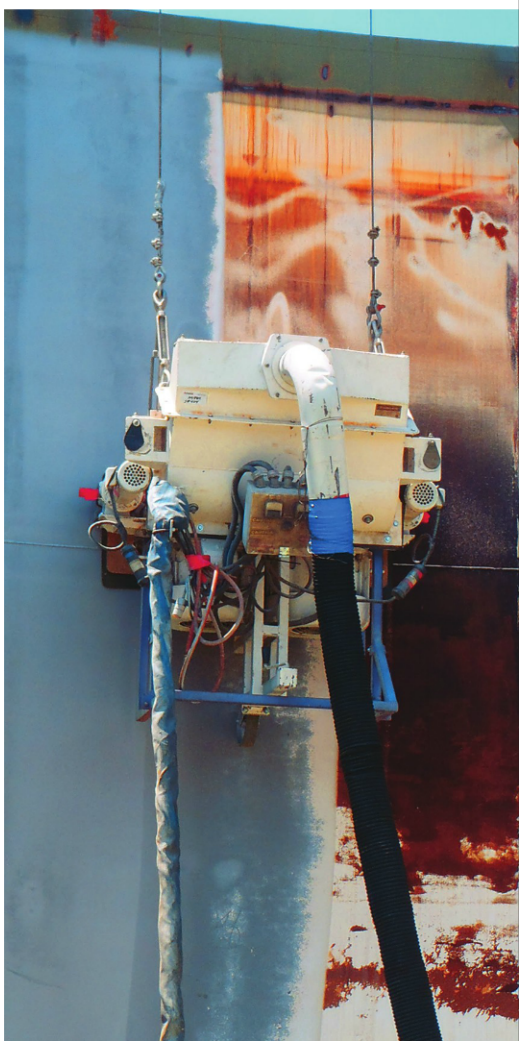
By Gregory R. "Chip" Stein, P.E., Tank Industry Consultants

Water storage tank rehabilitation projects come with challenges beyond battling corrosion — out-of-service time and minimizing distribution interference, to name a few. The subject here is 1,000,000-gallon column-and-rafter-supported ground storage tank located at a water treatment facility in the Midwest. The tank was built in 1993 and measures 90 feet in diameter with a shell height of 22 feet, 6 inches.

The initial evaluation of the tank revealed that the coating on its exterior had marginal adhesion. The high chlorine content of the atmosphere in the tank interior had taken its toll on the interior coatings. Extensive corrosion had developed resulting in metal loss on the steel roof and steel support structure that could potentially inhibit the roof's ability to adequately support snow loads, thereby warranting replacement.

Limited Out-of-Service Time

Rehabilitation of this tank was further complicated by limited available out-of-service



Photos courtesy of Tank Industry Consultants.

(Above and below right) Assembling the new geodesic aluminum tank roof.

time. This tank was the clearwell for one of the treatment facilities serving the community. No other permanent storage was available at the facility, so as an interim measure, three portable standpipe tanks were enlisted to substitute. With a capacity of only 50,000 gallons of storage, two of the pump station's high-service pumps were fitted with variable frequency drives and then tied into the existing SCADA system so that the system operated as if the original tank was still functioning. SCADA systems (supervisory control and data acquisition) are computer-based systems that monitor and control industrial processes and remote equipment. This solution buffered the flows between the well field and the high-service pumps as system demands changed throughout the day.

Roof Replacement

A self-supporting, aluminum geodesic dome roof was specified as the preferred solution, requiring no steel columns and rafters as well as ease of long-term maintenance. An alternative approach was also included in the specification, allowing contractors to bid on conventional roof replacement including new rafters and roof plates — typically less expensive to install but incurring expense in ongoing maintenance. The aluminum geodesic dome was selected and designed, fabricated and erected in accordance with AWWA D108-10, "Aluminum Dome Roofs for Water Storage Facilities." The existing roof was removed prior to the cleaning and painting of the structure, providing better access.

Interior Cleaning & Coating

The tank interior was cleaned to SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning." The contractor elected to utilize self-contained robotic blast equipment on

Positioning the new roof over the tank.

the tank interior. With the roof removed from the tank, the relatively smooth interior vertical surfaces made robotic blasting of the shell and floor an ideal option. The use of recyclable abrasive cut down on the amount of debris to be disposed of.

Project specifications called for the use of a fast-curing, ultra-high-solids epoxy coating system on the tank interior to reduce out-of-service time. According to the manufacturer's data, the coating cure prior to immersion for the epoxy coating system was just 24 hours at 75 F. A three-coat epoxy system and an ultra-high-solids polyurethane system were included in the specification as alternatives, providing opportunity for comparison of initial cost of coating system versus life cycle, and allowing for solicitation of competitive bids.

The fast-curing, ultra-high-solids epoxy was the option chosen by the owner and was applied to the interior shell and floor surfaces with heated plural-component airless-spray equipment. Application time was decreased as the desired film thickness was achieved in a single multi-pass coat. The coating manufacturer's technical representative was onsite during the application of the interior coatings.

Exterior Cleaning & Coating

The exterior of the tank was cleaned to SSPC SP 6/NACE No. 3, "Commercial Blast

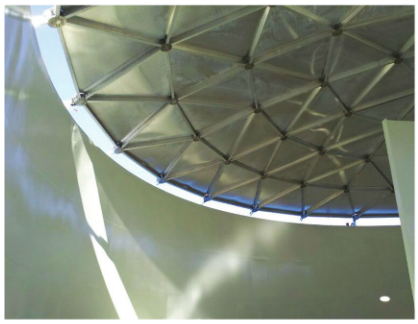
Coating the tank exterior.

Cleaning." The self-contained robotic blast equipment was again used for a majority of the exterior shell surfaces. Localized containment was employed for areas where conventional blasting was required but the robotic blast equipment could not sufficiently clean, such as the surfaces near the base of the shell. The localized containment consisted of tarps which were magnetically sealed against the steel shell to allow the containment to be more easily moved as work progressed around the tank.

The exterior coating system consisted of a zinc primer, an epoxy intermediate coat and a polyurethane finish coat. The tank's logo, which was approximately 26 feet long by 14 feet tall, was painted with a two-coat fluorourethane for improved color and gloss retention of the dark colors.

Project Completion

The project, including installation of the new roof and cleaning and painting the interior and exterior of the tank, was completed in approximately eight weeks. The tank was returned to service and has been in continuous operation since project completion.



Interior of the tank and the new geodesic aluminum roof.

About the Author

Gregory R. "Chip" Stein is managing principal of Tank Industry Consultants, headquartered in Indianapolis and specializing in the evaluation and design of steel plate and concrete structures of all types. Stein is responsible for scheduling and overseeing all work conducted by TIC's staff of civil, mechanical, chemical and structural engineers, as well as specially trained field staff. He reviews all engineering designs, specifications, reports and client invoicing; and is responsible for contract administration duties performed on behalf of TIC's clients. He also supervises TIC's continual development and refinement of environmental and safety information, procedures and training.

Stein is extensively involved in industry-related activities, has chaired the SSPC annual conference twice and has served as seminar and tutorials chair and featured speaker at several previous SSPC annual meetings and lead abatement conferences. He has also presented papers at several American Water Works Association (AWWA), SSPC and NACE regional and national conferences. In addition, Sein has authored

a number of papers including case studies on significant water tank projects.

He is chair of the Steel Tank Institute (STI) Field-Erected Steel Tank Committee, chair of AWWA D101 and member of AWWA D102, D104 and D106 committees. Stein is a principal member of the National Fire Protection Association (NFPA) 22 and 25 and previously served as a member of the Board of Directors for STI.

He holds an MBA from Indiana University and a bachelor of science degree in mechanical engineering from the Rose-Hulman Institute of Technology with a concentration in structural and material analysis. Stein is a registered P.E. in 33 states.

Liquid-Applied Waterproofing Membrane for Bridge Decks

By Dudley J. Primeaux II, PCS, CCI, Joseph Haydu, CEO, and Jonathan Haydu, Bridge Preservation LLC

Photos courtesy of Bridge Preservation LLC unless otherwise noted.

It's no secret that our infrastructure is in bad shape. We can look around and see many obvious problems, and our road and bridge systems need substantial help (Fig. 1, p. 50). Deterioration due to environmental issues, water, salt and chemicals causes serious corrosion and erosion concerns. Over the years, a variety of methods have been employed to help mitigate these issues, but each has individual characteristics and problems. As populations grow in centralized areas, so does wear and tear on the roads, and scheduling repairs can create nightmares for local traffic.

Reinforced concrete, often considered to be one of the strongest construction materials, is being attacked by the aforementioned elements, resulting in contamination that corrodes the reinforcing rebar, causing spalling of the concrete and leading to possible collapse. It has been estimated that repairing our bridge and road systems would cost hundreds of billions in U.S. dollars.

As the primary issue is the infiltration of water and/or moisture, which carries the various contaminants, the use of waterproofing membranes under the asphalt traffic-bearing surface is one solution.

With this waterproofing method, a variety of sheet-good systems have been used based on thermoplastic polymer, including polyethylene (PE), polypropylene

© iStockphoto/snvv

(PP) and polyester-based systems. Even though these polymers are very hydrophobic in nature, problems arise because these sheet-good systems must be thermally sealed at the overlaps onsite, after being laid in place. This is a mechanical process which does not always go as planned and more importantly, the sheets are loosely bonded to the substrate using a bitumen adhesive-type system.

Another option is the use of liquid-applied waterproofing membrane systems. These systems can be either thin-film, typically applied at about 10 mils (254 µm), or thick-film elastomeric systems typically applied at 40 to 120 mils (1 to 3 mm) or more. They are based on a variety of thermoset polymer technologies including epoxy, poly-methylmethacrylate (PMMA), polyurethane (PU) or polyurea (PUA). This article will focus on the properties and installation of these liquid-applied waterproofing membrane systems.

Fig. 1: Concrete bridge deck corrosion.

Performance Standards

Other than a performance test specific to railway bridges published by the American Railway Engineering and Maintenance-of-Way Association (AREMA), there is currently no complete industry performance standard related to bridge deck waterproofing work in North America. For this work, many utilize the specific location's Department of Transportation (DOT) standard specification. These detailed specifications contain proposed performance requirements taken from the product data sheets of various suppliers.

In the European Union, where quite a bit of bridge deck waterproofing is employed, the ETAG 033 standard is utilized. The European Technology Assessment Group (ETAG) standard, "Liquid applied bridge deck waterproofing kits," is a technical approval guideline, outlining all specific requirements that apply to surface preparation, adhesion, flexibility and environmental issues as they relate to liquid-applied waterproofing membrane systems. Many of the requirements listed in this document are being compiled to prepare a similar North American standard relating specifically to performance requirements in this area of bridge deck waterproofing.

In the meantime, there are two standards that can be utilized in bridge deck waterproofing

Table 1: Comparison of 2-K PUA Elastomer to PMMA

	2-K PUA Elastomer	PMMA
Application method	spray	spray
Ambient conditions	< 0 to > 100 F	23 to 86 F
100% solids	yes	no
VOC content	no	yes
Flash point of component	> 250 F	53 F
Elongation, %	> 250	~ 130
Tensile strength, psi, (MPa)	2,500 (17.2)	1,700 (11.7)
Shore D Hardness	50	56
Tear Strength, pli, (N/mm)	~ 390 (~68)	~ 400 (~70)
Adhesion, tensile Concrete, psi Steel, psi	 > cohesive strength > 1000	 ~ 100 ~ 300
CLTE, µin / in / F, (µm / m / C)	2 – 6 (4 – 13)	18 – 20 (29 – 35)
AREMA Ballast Test	pass	pass

CLTE = Coefficient of Linear Thermal Expansion

work with liquid-applied membrane systems. Those are SSPC-PA 14, "Field Application of Plural Component Polyurea and Polyurethane Thick Film Coatings to Concrete and Steel," and SSPC-Paint 45, "Two-Component Thick Film Polyurea and Polyurea Polyurethane Hybrid Coatings, Performance Based."

The Science Behind It

When choosing the type of system, one must take into account the substrate material being waterproofed, the conditions of application and the subsequent exposure. For most decks with steel substrates, the physical demands on the waterproofing system may not be as great as those for concrete substrate decks. With concrete decks there are issues involving substrate movement, cracking and uniformity in composition placement, and exposure to very low temperature seasons during the year (thermal cycling).

Once the waterproofing system itself is installed, the traffic-bearing surface is placed. This surfacing is an asphalt- or bitumen-based material requiring an installation temperature of well over 350 F (176 C). The waterproofing membrane must withstand exposure to that temperature without the occurrence of any detrimental effects or softening. The material must also be flexible at low temperatures as some bridge deck areas will freeze before the road will.

Table 1 provides a comparison of a typical thin-film waterproofing system (PMMA) to a plural component (2-K), fast-set, thick-film elastomeric polyurea (PUA) waterproofing membrane system.

The Installation Process

The steps in a successful installation of a thick-film, elastomeric waterproofing system involve surface preparation and possible repair; primer application; treatment of joint areas; application of the waterproofing membrane system; application of a suitable tack-coat system for the asphalt adhesion (if required); and placement

Fig. 2: Spray application of bridge deck membrane.

of either the ballast or the traffic bearing surface. This same process is utilized whether the bridge deck is steel or concrete. Surface preparation is crucial for any coating and lining application, and these bridge deck waterproofing projects are no different.

For steel substrates, the surface is prepared to SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning." The typical minimum specified profile is 3 mils (76 µm). A primer may or may not be utilized at this point, depending on the overall conditions.

For concrete substrates, SSPC-SP 13/NACE No. 6, "Surface Preparation of Concrete" is used and is achieved by abrasive blasting, steel shot blasting or industrial scarifying. International Concrete Repair Institute (ICRI) Technical Guideline No. 310.2R-2013, "Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair" can provide further information about methods used and guidance about concrete surface profile (CSP) standards. For concrete bridge decks, the typical concrete surface profile (CSP) would start at CSP 4 and can go up to CSP 10 (very rough). For a rougher surface, fill-in may be required, adding an extra step and demonstrating that a thick-film, liquid-applied system would be preferable.

Following surface preparation and application of the primer, the 2-K thick-film, fast-set elastomer system is spray-applied. This elastomeric membrane is normally installed at an average of 80 to 100 mils (2 to 2.5 mm) dry film thickness (DFT). Figure 2 shows the work being performed, while Figure 3 (p. 56) displays the field-application equipment setup.

In cases where large expansion joints are present, a prefabricated bridge deck joint system may be employed, and this can be made from the same type of 2-K thick-film elastomer

system used for waterproofing. The use of this process is not new for the installation of lining systems over concrete floor areas. Regardless of the elongation value or degree of elasticity of the materials used, all moving joints must be treated appropriately. Figure 4 (p. 60) shows the installation of a bridge deck joint system.

After the bridge deck membrane has been applied, the installation is inspected for defects, pinholes and voids. Methods of inspection include flood testing, high-voltage spark testing, adhesion testing and applied thickness evaluation. To achieve consistency of high-voltage spark testing over concrete surfaces, the use of fluorescent pigment-containing primer systems can be used. Any pinholes can be seen quickly using an ultraviolet or black light source.

In complex or undercut areas, both small pinholes and large voids can be missed with spark testing over concrete substrates, and the use of fluorescent pigmented penetrating primer systems allows for non-contact pinhole and holiday detection with the use of an ultraviolet (UV) or black-light source. Conductive primers may help, but physical properties of the primer can be significantly reduced, resulting in overall performance issues.

In some cases, the tie-coat is composed of ethylvinyl acetate (EVA) beads. These beads are a thermoplastic that will soften and melt under the heat of the placed asphalt and have been shown to provide some adhesive strength.

Another viable option for an actual traffic-bearing surface is the application of a slower-set version of the 2-K thick-film elastomeric bridge deck membrane and the subsequent broadcast of a large aggregate to rejection. This can be accomplished in two or three rapid installation lifts and provides excellent adhesion and interaction with the applied asphalt.

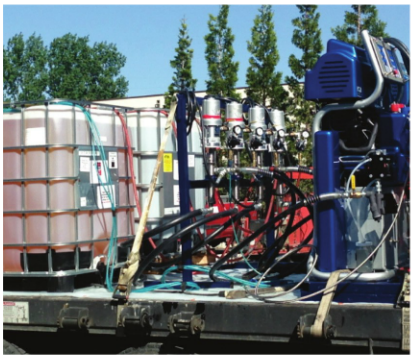


Fig. 3: Bridge deck membrane equipment setup. Photos courtesy of Dudley Primeaux.

To address concerns about the slip resistance of the aggregate driving surface, a comparison of the horizontal slip coefficient of both the concrete surface and the membrane are shown in Table 2 using ASTM F609, "Standard Test Method for Using a Horizontal Pull Slipmeter (HPS)." The slip coefficient values of the aggregate with bridge deck membrane exceed those of the cleaned, bare concrete road surface.

Recent work has shown that the use of robotic systems can significantly improve the uniformity of the applied bridge deck membrane and increase the speed of installation. There are disadvantages and challenges with robot application and the use of a robot cannot replace highly skilled, hand-spray applicators.

On the plus side, because a robot's movements are computer-controlled, the machine performs the same movements over and over throughout the installation process. On smooth, flat surfaces, this consistent application occurs with the spray-applied thick-film system noting a ± 5 mil (± 125 µm) DFT variance. Even highly skilled hand applicators can have DFT variances of ± 10 mils (± 250 µm) with plural-component, thick-film elastomeric systems, and robots do not require breaks or get tired, so worker fatigue can be reduced.

Application over heavily irregular surfaces, penetrations, drain and joint areas and vertical surfaces still requires the presence of skilled hand-spray applicators, and robot application cannot improve the mix of the system done inside the application spray gun.

Table 2: Slip Coefficient Testing Comparison*

	Concrete Road Deck	Thick-Film Elastomer with Aggregate
HPS Slip Coefficient, dry	0.68	0.93
HPS Slip Coefficient, wet	0.68	0.88

* ASTM F609, ASM 825 Slip Meter, Panama Bridge of Americas

Performance

To further illustrate the usefulness of 2-K thick-film elastomer bridge deck membrane systems, one must evaluate the performance of the subsequent driving or wearing course. Because hot mix asphalt (HMA) is placed over the waterproofing system, the HMA must adhere well. If the overlayment is not properly bonded and a heavily loaded truck slams on its brakes, the overlayment would roll up, resembling what we've all seen on Saturday morning cartoons.

There is currently no complete industry performance standard in North America related to

Fig. 4: Installation of a bridge deck joint system.

liquid spray-applied bridge deck waterproofing, but a procedure has been developed by by the engineering firm Simpson, Gumpertz & Heger to evaluate the shear bond strength of the overlay and the membrane, or base substrate, including a testing procedure to determine tensile bond interface after exposure to freeze-thaw cycling.

In this test, an 11,500-pound (5,216-kilogram) load is applied to a 4-square-foot (0.37 square meters) sample area of HMA installed over various substrates. The force required to shear the HMA from the substrate is then noted. For tensile adhesion, prepared complete samples are submerged in water and exposed to 150 thermal cycles of 0 to 40 F (-17 to 4 C). This equates to approximately three years of bridge deck exposure in the northeastern United States. Table 3 illustrates this performance testing using the 2-K thick-film elastomeric system.

Table 3: Performance Properties of 2-K Thick-Film Elastomeric Bridge Deck Membrane

	Concrete*	Thick-Film Elastomer Membrane*	Thick-Film Elastomer Membrane & Aggregate*
Shear Bond Strength			
Lbs-force	7,230	7,100	9,530
Kgs-force	3,280	3,220	4,320
Tensile Adhesion Factor (150 cycles, freeze-thaw)	4.5	4.6	4.7

* Applied HMA over asphalt-based Tackcoat treated substrates

Conclusion

The use of plural component, fast-set, thick-film elastomeric membrane systems for waterproofing applications continues to be a growing market. These systems are generally high-solids systems, up to 100 percent, and offer superior protection over a variety of substrates. The fast set time and cure of the thick-film elastomeric waterproofing system allows for rapid application and return to service of the traffic areas, much to the pleasure of commuters.

The use of the broadcast aggregate significantly improves the overall shear and adhesion performance of the applied HMA, and the embedded and bonded aggregate provides for an alternative driving course. In some cases, robotic processing and application can deliver uniform and consistent delivery of the 2-K liquid-applied waterproofing membrane.

About the Authors

Dudley Primeaux is the director of education and development with VersaFlex Incorporated in Kansas City, Kansas. He holds B.S. and M.S. degrees in chemistry from Lamar University in Beaumont, Texas. Primeaux is active in NACE and SSPC, is an SSPC Protective Coatings Specialist (PCS) and a certified Concrete Coating Inspector (CCI). He serves as chairman of the SSPC C.1.9 Polyurea Committee and is a recipient of the *JPCL*'s Top Thinker Award, the 2012 Wayne Kraus Technical Award, the Philadelphia Society for Coating Technology (PSCT) and the 2013 SSPC Coating Education Award for the new plural component course. Primeaux is an instructor for the new SSPC Plural-Component Application for Polyurea and High Solids Coatings course. He holds 29 U.S. patents, eight European patents and is an accomplished author, having written over 50 technical publications relating to polyurea elastomeric coating and lining technology, performance testing and inspection.

Joseph Haydu is president and CEO of Bridge Preservation LLC and a principal of VersaFlex Incorporated, with over 30 years of experience with plural-component coatings. Formed in 2000, Bridge Preservation LLC specializes in spray-applied waterproofing membranes for the rail and DOT markets.

Jonathan Haydu has over 12 years of experience in the application of spray-applied waterproofing membranes on bridges and provides technical services and field inspections during the application of these systems. He also designs preformed expansion joints for use on rail and highway structures. Haydu currently serves as executive director of Bridge Preservation LLC.

SSPC Updates Two Standards

SSPC committees have announced updates to two standards: one for surface preparation and one for polyurea topcoats. These standards can be downloaded from paintsquare.com or the SSPC Marketplace (sspc.org/market-place/standards).

SSPC-SP 1, "Solvent Cleaning," is used to specify removal of visible deposits of oil, grease and other soluble contaminants from metal surfaces before employing additional mechanical means of surface preparation.

All of SSPC's surface preparation standards require solvent cleaning to -SP 1 before performing additional cleaning required by the project specification.

Revisions include:

- Expansion of the scope to "metallic substrates" (the 1985 version limited use to steel);
- New definitions of "visible" and "solvent";
- Clarification that heavy deposits of oil, grease and other contaminants are best removed by scraping before solvent cleaning;
- Deletion of the inspection section, which is usually addressed in procurement documents; and
- Addition of non-mandatory notes with description of additional verification methods that may be specified to confirm higher levels of contaminant removal than -SP 1 requires.

SSPC-Paint 39, "Two-Component, Weatherable Aliphatic Polyurea Topcoat, Fast or Moderate Drying, Performance-Based," can be used to establish minimum performance requirements for a thin-film aliphatic polyurea topcoat that can be used over compatible corrosion-prevention primers or intermediate coats to protect from ultraviolet light.

Because Paint 39 is a topcoat standard, performance requirements focus on color and gloss retention and physical film properties.

Revisions include:

- Addition of a third level of natural weathering requirements; and
- Reorganization of the standard to parallel other standards recently revised by the Polyurethane Coatings Committee.

Two More Coating Vets Earn MCI Status

SSPC's number of certified Master Coatings Inspectors expanded to 14 as two more protective coatings professionals recently earned the prestigious MCI certification.

The two new MCIs are George Meintanis, project manager, Brock Industrial Services (New Lenox, Ill.); and Nawras Rimawi, director, Al-Jazeera Paints Academy (Saudi Arabia).

To reach the MCI level, one must qualify for certification as a Concrete Coating Inspector (CCI) as well as qualify for two of the four other SSPC certification programs: Bridge Coating Inspector (BCI); Protective Coatings Inspector (PCI); NAVSEA Basic Paint Inspector course (NBPI), which SSPC administers on behalf of Naval Sea Systems Command; or the SSPC Protective Coatings Specialist (PCS) program.

George Meintanis

Meintanis, a project manager with Brock Industrial Services (formerly Atlantic Plant Services), joined the IUPAT Painters Local #33 in Joliet, Ill., at the age of 18. Since then, he has worked primarily in the oil refining industry, including as manager of the coatings group for APS at the BP Whiting Refinery modernization project, where he also oversaw the dense concrete fireproofing contract. He also noted, "I had the pleasure of joining the team working on the Coronado Bridge in San Diego last year, which gave me new insight into the bridge coatings world." Meintanis holds an A.A. degree in business administration from Joliet Junior College and a B.S. degree in political science from Illinois State University. His SSPC certifications include CCI Level 2, PCI Level 3, PCS and Coating Application Specialist (CAS) Level 2.

Nawras Rimawi

Rimawi is the director of Al-Jazeera Paints Academy, the first paint and coatings training academy in the Middle East. He earned a B.S. degree in chemical engineering from the Jordan University of Science and Technology and attended a diploma course in metal coating at Tokyo Polytechnic University in Japan. He has been a chairman and speaker at several international conferences in the field of green coatings, including SSPC 2015 featuring GreenCOAT, the Middle East Coatings Show-Dubai and the ICIS Chemicals & Coatings Conference in the Netherlands. Rimawi holds SSPC's BCI Level 2, PCI Level 2 and CCI Level 2 certifications.

The goal of the Master Coatings Inspector program is solely to recognize and honor those individuals whose experience and training has afforded them the prestige of multiple inspector and coating specialist certifications. SSPC recognizes that it takes tremendous personal commitment and dedication to the industry to maintain professional qualifications, and that task in and of itself is a core reason why so many of those people are so widely respected.

For more information on how to become a Master Coatings Inspector, contact Terry Sowers, 877-281-7772, ext. 2219; sowers@sspc.org.

Photo courtesy of Anaheim Convention Center.

AWWA ACE15 Heads to Anaheim

From June 7 to 10, the American Water Works Association (AWWA) will hold its 2015 Annual Conference and Exposition (ACE15) at the Anaheim Convention Center in Anaheim, Calif.

ACE15 will be composed of workshops, professional program tracks, speeches from industry experts, forums, networking opportunities, facility tours of water and wastewater plants, and other special events.

The following programs held during the ACE15 conference may be of interest to water and wastewater protective coatings professionals. For more information, visit awwa.org.

Mon., June 8

• "That Gnawing Feeling: Understanding Corrosion and Other Aspects of Distribution System Water Quality" (MON15), moderated by Sylvia Hall, 2:00 to 5:00 p.m.

This session will offer an in-depth look at distribution water quality challenges, from plant to tap. Presentations of interest include:

- "Cathodic Protection for Water Storage Tanks," by Jack Ripley, Corrpro Companies, Inc. Waterworks Division, 4:30 p.m.

Tues., June 9

• "No Failure is Acceptable: Large-Diameter Pipe Design, Construction, and Operations" (TUE44), moderated by Kethy Berek, 1:30 to 4:30 p.m.

This session will present information on the design, construction and operation of large-diameter (48-inch and larger) pipelines to minimize failures and ensure longevity and energy efficiency. Presentations of interest include:

- "Tampa Bay Water District Experience With PCCP Failures and Failure Prevention," presented by Suzannah Folsom, Tampa Bay Water, 1:30 p.m.
- "Coatings Research: Implications for Corrosion Control and Soil Interactions," presented by Graham Bell, HDR Schiff, 3:00 p.m.
- "When Failure Prevention Approaches Accelerate Failures: De-Water and Return-to-Service of PCCP Pipe," presented by Martin Coghill, San Diego County Water Authority, 3:30 p.m.
- Panel: "Ensuring Robust Design and Operational Practices While Minimizing Failures," moderated by Suzannah Folsom, Tampa Bay Water, 4:00 p.m.

Wed., June 10

• F.E. Weymouth Treatment Plant Facility Tour, 7:30 a.m. to 12:00 noon.

The F.E. Weymouth Treatment Plant in La Verne, Calif., owned and operated by the Metropolitan Water District of Southern California, is one of the largest water treatment plants in the U.S. This facility tour will include a stop at the plant's maintenance shop, which provides fabrication, machining and coating services, repairing and testing of valves and pumps, equipment refurbishing, diving inspections, floating reservoir cover maintenance, and crane maintenance and annual certification.

• "Time for a Tune-Up: Troubleshooting and Optimizing Major Water System Assets" (WED39), moderated by James Strayer, 2:00 to 5:00 p.m.

This session will present lessons learned and useful tips in the maintenance and optimization of major assets in treatment plants, pump stations and storage tanks. Presentations of interest include:

-- "Water Tank Selection, Maintenance, and Inspection," presented by Matthew Tasch, 4:00 p.m.
- "Tanking Outside the Box," presented by William Collins, Phoenix Fabricators, 4:30 p.m.

• "Pipeline Materials & Liners: Design Considerations for Rehabilitation and Construction" (WED42), moderated by Jay Pastor, 3:30 to 5:00 p.m.

This session will provide a review of standards, activities and planning efforts for the design, construction and rehabilitation of pipelines. Presentations of interest include:

- "Beyond ASTM F1216: A Proposed Design Protocol for Liners in Pressure Service," presented by Chris Macey, AECOM; George Bontus, Lynn Osborn,

Nico Meyer and Scott Arnold, 3:30 p.m.
- "Planning and Design for Relining of a Large-Diameter PCCP Transmission Pipeline," presented by Andrew Stanton and Steven Foellmi, 4:00 p.m.
- "Thinking About an AWWA M28 Class IV Liner? A Suggested Testing Regime to Verify the Manufacture, Design and Construction Process," presented by Chris Macey, AECOM; and George Bontus, 4:30 p.m.

Exhibitors at ACE15

The following ACE15 exhibitors may be of interest to water utility protective coatings professionals. The list is current as of press time. A complete exhibitor list is available on the ACE15 website.

3M Water Infrastructure	2015
Amcorr Products and Services/ VISCOTAQ	247
Ameron Water Transmission Group	301
Aqua Smart, Inc.	823
Caldwell Tanks, Inc.	1755
Corrpro Companies, Inc.	1339
CSI Services, Inc.	415
Denso North America	2801
Farwest Corrosion Control Company	447
Goodwest Linings & Coatings	2912
HydraTech Engineered Products	1573
Induron Coatings Inc.	1850
Insituform Technologies, LLC	1339
International Paint/Devoe Coatings	2247
ITW Engineered Polymers	3039
NACE International	2849
Paso Robles Tank, Inc.	3035
Pittsburg Tank & Tower Maintenance Co., Inc.	1263
PPG Protective and Marine Coatings	201
Protech Powder Coatings	556
Raven Lining Systems	2501
The Sherwin-Williams Company	1563
Short Elliott Hendrickson Inc. (SEH)	913
Specialty Products, Inc.	2952
Spiess Construction	2904
Tnemec Company Inc.	1430/1431
Trenton Corporation	2332
VersaFlex Incorporated	656
Zebron	351

Pittsburgh Welcomes Back International Bridge Conference

The 32nd annual International Bridge Conference (IBC), hosted by the Engineers' Society of Western Pennsylvania (ESWP), will return to the David L. Lawrence Convention Center in Pittsburgh, Pa., from June 7 to 11.

The IBC attracts bridge owners, engineers and designers; policy makers and government officials; construction executives; and manufacturers and suppliers from the U.S. and abroad. The conference will be made up of technical and special interest sessions, workshops, seminars, committee meetings, the annual "Bridge Awards" ceremony, and an exhibit hall.

The following technical presentations and workshops scheduled at the conference may be of interest to bridge and highway protective coatings professionals. For more information, visit eswp.com/bridge.

Mon., June 8

• Workshop: "Hot-Dipped Galvanizing/Metallizing Bridges Case Studies" (SIS-01), presented by Kevin Irving, AZZ Galvanizing Services, 1:00 to 3:00 p.m.

This workshop will describe how zinc coatings, specifically hot-dipped galvanizing/metallizing, can protect against steel corrosion and significantly reduce maintenance costs over the life of a project. The workshop will also showcase studies of steel HDG/metallized bridges that are over 44 years old, have required no maintenance, and still have zinc on them today.

Tues., June 9

• "ABC Methods Keep Berwick Bridge on Track" (IBC 15-14), presented by Steven Hodgdon and Julie Whitmore, VHB, 8:30 a.m. to 12:00 noon.

This presentation will outline how accelerated construction techniques and practical design solutions, including new steel girders with a metalized coating, were

Photo courtesy of Dave DiCello / visitpittsburgh.com.

used to maintain traffic and provide a low-maintenance, durable project solution on the Berwick Bridge, which connects Berwick, Maine and Somersworth, N.H.

• "Easton-Phillipsburg Toll Bridge Rehabilitation Challenges" (IBC 15-21), presented by Edwin Skrobacz, Jr. and Dan Zaleski, Parsons Brinckerhoff, 8:30 a.m. to 12:00 noon.

This presentation will outline the rehabilitation work on the Easton (Pa.)-Phillipsburg (N.J.) toll bridge. Expected to extend the useful life by about 15 years, work included major structural work and recoating of seven structures including a 540-foot-long Pennsylvania through truss.

• "Galvanic Corrosion Protection of Reinforced Concrete Bridge Decks and Substructures" (IBC 15-46), presented by David Whitmore and Rachel Stiffler, Vector Corrosion Technologies, 1:30 to 4:00 p.m.

This presentation will discuss the development, installation and 10-year field performance of galvanic corrosion protection systems on bridges owned by the Ohio Department of Transportation and the Ontario Ministry of Transportation.

Thurs., June 11

• Workshop: "Retrofitting and Service Life Extension of Bridge Structures Using FRP Composites" (W-06), presented by ACMA, 8:00 to 11:00 a.m.

This workshop will offer solutions on extending bridge service life using fiberglass-reinforced polymer (FRP) composites, such as durable marine protection systems for bridge piers or integrating pedestrian access to existing bridge structures.

Exhibitors at IBC 2015

The following IBC exhibitors may be of interest to protective coatings professionals. The list is current as of press time. A complete exhibitors list is available on the IBC website.

AASHTO (American Assoc. of State Hwy. and Transp. Officials)	704
All Access Rigging Co.	306
Anderson Hydra Platforms Inc.	723/725
AZZ Galvanizing Services	613
ChemCo Systems	535
Epoxy Interest Group of CRSI	502
Euclid Chemical Company	428
Evonik Corporation	536
Greenman-Pedersen, Inc.	533
HRV, Inc.	311
International Zinc Association	331
Klass Coatings (North America) LLC	601
Safway Services LLC	629/631/728/730
Sika Corporation	401
Spider	317/319
Vector Corrosion Technologies	605
Watson Bowman ACME	430

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Mega Rust Returns to Newport News

The American Society of Naval Engineers (ASNE) will bring Mega Rust 2015: Naval Corrosion Conference to the Newport News Marriott in Newport News, Va., from June 23 to 25.

Mega Rust is an annual event that attracts representatives from the government and military, ship owners and operators, personnel from shipyards and research facilities, and coatings manufacturers and suppliers to discuss the latest innovations in corrosion control and coating technologies for naval and maritime ships, craft and aviation systems. The conference is composed of technical presentations, guest speakers, an exhibition and accreditation courses from SSPC and NACE International. Mega Rust also combines five annual meetings and conferences: the U.S. Navy and Industry Technology Exchange (the "Rust Conference"); Commander, the U.S. Fleet Forces Command's Fleet Corrosion Control Program; the Naval Shipyard Coatings Group Meeting; the U.S. Coast Guard (USCG) Coatings & Corrosion Control Tiger Team Meeting; and the U.S. Navy Submarine Preservation Conference.

For more information, visit navalengineers.org/megarust2015.

SSPC Courses at Mega Rust

The following SSPC training courses will be offered at Mega Rust 2015. To register, visit sspc.org.

- June 22–26 NAVSEA Basic Paint Inspector (NBPI)
- June 23 Navigating NAVSEA Standard Item 009-32
- June 24 Using SSPC-PA 2 Effectively
- June 25–26 Quality Control Supervisor (QCS)

Exhibitors at Mega Rust

The following Mega Rust exhibitors may be of interest to marine protective coatings professionals. This list is current as of press time. For a complete list, visit the Mega Rust website.

3M Defense	53
ARS Recycling Systems, LLC	9
Advanced Marine Preservation, LLC	7
APC Equipment & Supply Company	23
Automatic Coating Limited	49
Av-DEC	59
DeFelsko Corporation	10
Dehumidification Technologies, LP	55
Desco Manufacturing Co., Inc.	62
Dex-O-Tex Marine by Crossfield Products Corp.	73
DoD Corrosion Policy & Oversight	72
DRYCO	64
Eagle Industries	37
Elcometer	29/30
Fischer Technology, Inc.	57
Industrial Vacuum Equipment Corp.	8
ITW Engineered Polymers	25
International Paint LLC	61
Jessup Manufacturing Company	26
Monti Tools	52
Norton Sandblasting Equipment	11
Penn State Applied Research Lab	43
PK Technology	41/42
Polygon US Corporation	48
Rustibus USA, Inc.	69
Safway Services, LLC	66
Sponge-Jet, Inc.	25
The Sherwin-Williams Company	51
Siplast	22
SSPC: The Society for Protective Coatings	27
Sulzer Mixpac USA, Inc.	28
Sunbelt Rentals, Inc.	70
TFT-Pneumatic, LLC	45
The Warehouse Rentals and Supplies	65
Warren Environmental	58
Western Technology, Inc.	60

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SSPC COURSES

Course information available at sspc.org
** = Courses held at Mega Rust 2015*

June 1–2 CCB Conc Ctg Basics, Portland, Ore.

June 1–5 PCI Prot Ctgs Insp Levels 1 & 2, Yogyakarta, Indonesia

June 1–6 CCI Conc Ctg Insp Levels 1 & 2, Portland, Ore.

June 1–6 BCI Bridge Ctg Insp Levels 1 & 2, Newington, N.H.

June 1–6 NBPI NAVSEA Basic Pt Insp, Bremerton, Wash.

June 7 PCI Level 3, Yogyakarta, Indonesia

June 7 CCI Supplement, Portland, Ore.

June 8 Estimating, Houston, Texas

June 8–9 C7 Abrasive Blast, Poulsbo, Wash.

June 9 Contract, Houston, Texas

June 10–11 Proj Mgmnt, Houston, Texas

June 10–12 High Solids Ctgs Cert, Poulsbo, Wash.

June 13–14 C12 Airless Spray, Chesapeake, Va.

June 15–19 C1 Fundamentals, Norfolk, Va.

June 17 CAS (Ctg App Spclst) Refresher, Zephyrhills, Fla.

June 18–19 CAS Level 2, Zephyrhills, Fla.

June 22–26 NBPI, Newport News, Va.*

June 23 Nav Std Item 009-32, Newport News, Va.*

June 24 Using PA 2, Newport News, Va.*

June 25–26 QCS Qual Cntrl Spvr, Newport News, Va.*

June 25–26 C7 Abrasive Blast, Honolulu, Hawaii

June 29–July 4 PCI Levels 1 & 2, Kuantan, Malaysia

CONFERENCES & MEETINGS

June 7–10 AWWA Annual Conf & Exhibition (ACE15), Anaheim, Calif., awwa.org

June 7–11 ESWP Int'l Bridge Conf (IBC), Pittsburgh, Pa., eswp.com/bridge

June 16–17 ASTM Committee Wk: Traffic Ctgs, Anaheim, Calif., astm.org

June 21–23 ASTM Committee Wk: Pt and Related Ctgs, Materials & Apps, Ft. Lauderdale, Fla., astm.org

June 22–25 A&WMA Annual Conf/Exhibition, Raleigh, N.C., ace2015.awma.org

June 23–26 Brasil Offshore Conf, Macaé, Rio de Janeiro, Brazil, offshorebrasil.com