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SSPC The Society For Protective Coatings
The Voice of SSPC: The Society for Protective Coatings

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FEATURES

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DEPARTMENTS

FROM THE OFFICES OF SSPC The Society For Protective Coatings

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EDITORIAL

A New Adventure

After spending the last 18 years of my career at Bayer MaterialScience, I had made the decision that it was time to search for a new opportunity with different challenges. I had been contacted by a number of recruiters with opportunities, which although intriguing and challenging, did not resonate with my sense of adventure and purpose. I had a great job, but I was looking for something different.

One morning while scanning my LinkedIn page, I came across the job posting for the Executive Director position at the SSPC. I was intrigued by the job description, and my sense of curiosity was aroused. I was looking for a challenging opportunity with another organization like Bayer, one that has a solid reputation, organizational stability, a good financial standing and a staff that was passionate and committed to customer service and excellence. SSPC seemed to meet my requirements, so I initiated my due diligence to determine if this position was the challenge I desired.

During my research I learned that the SSPC was established in Pittsburgh in 1950 and had only four previous Executive Directors during its 65-year history, proving the stability I was looking for. The standards, training and publications offered by the organization are utilized and respected by all in the coatings industry, indicating its solid reputation. The financial standing of the organization was readily available, and another of my criteria was met. In moving from a multi-billion-dollar, for-profit entity to a smaller non-profit, I wanted to convince myself that the SSPC was viable and sustainable, and I more than satisfied myself that this is the case.

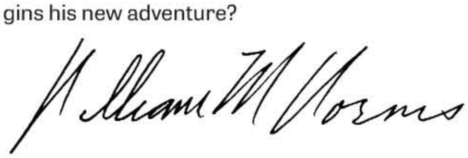
The more challenging portion of my verification process was determining the commitment, dedication and passion of the organization. The great reputation of the organization was undeniable, and this usually comes about as a result of a committed team, but I wanted more concrete confirmation. I started my investigation with the recruiter, Cathy Ross, who had interviewed all of the SSPC staff during the initial phase of her engagement. Cathy verified that the staff was a highly professional, passionate and dedicated group of individuals. I then questioned members of the SSPC Board of Governors search committee and my numerous contacts in the chemical industry, and they too confirmed Cathy's findings. All of my criteria had now been met, and I decided to make the change.

You may ask why I have provided all of this mundane background regarding the due diligence I went through prior to being selected for this position. I wanted this to emphasize a point that I am sure all of you know already: that the SSPC is a first-class organization that puts the needs of our members first and is dedicated to the advancement of the coatings industry. I had to determine this for myself, and I am convinced. If you have not had the opportunity to interact with the SSPC, give me a call, and I am sure I can convince you of the same.

I consider it a great honor and privilege to be chosen as the new Executive Director, and I am looking forward to leading this high-performance organization as we embark on the next phase of its illustrious history.

In closing, I would like to thank the Board of Governors and all of the SSPC stakeholders for the opportunity they have afforded me. I would like to thank Bill Shoup for all of his hard work and dedication over the past twenty years, and for passing on an organization that is well positioned for the future. Also, on behalf of myself, the staff and all of the SSPC family, I would like to extend to Bill and his wife, Diane, our best wishes for health, happiness and prosperity as they enter the next phase of their lives. Bill's presence and contributions will be missed by all.

Finally, I would like to thank the SSPC staff for welcoming me into the SSPC family. Although it is only a little over a week on the job, I have confirmed what my initial due diligence indicated — that this is a staff that is highly skilled, committed, passionate and dedicated to our customers and the betterment of our industry. What more can a leader ask for as he begins his new adventure?



Bill Worms
Executive Director, SSPC

Webinars on Thermal Spray Coating Application and Wastewater Specs Available in October

SSPC credits are available for participants in two new, free webinars in October, the latest in the SSPC/*JPCL* Webinar Education Series.

"Application of Thermal Spray Coating," will be presented by John Kern of SSPC on Wednesday, October 21, from 11:00 a.m. to 12:00 noon, EST. This webinar will discuss the proper procedure for applying metallic thermal spray coatings (TSCs) of aluminum, zinc and their alloys and composites to protect steel from corrosion. Standards, required equipment, application procedures and in-process quality control checkpoints will be discussed. This webinar is sponsored by Thermion, Inc.

Bob Murphy, business development manager for water and wastewater with The Sherwin-Williams Company, will present "Standards, Training and Certification in the Wastewater Industry," on Friday, October 30, from 11:00 a.m. to 12:00 noon, EST. This webinar will provide information on current training and certification programs related to standards and practical aspects of selecting, specifying and using coatings safely, effectively and economically to protect structures in harsh wastewater environments. This webinar is sponsored by The Sherwin-Williams Company.

Murphy has more than 30 years of experience in the corrosion and water/wastewater industries. An active member of SSPC, NACE International, the American Water Works Association, the National Rural Water Association and the Water Environment Federation, he has contributed technical papers to both SSPC and NACE. Murphy holds a Bachelor of Science degree in earth science from Thiel College in Greenville, Pa.

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Webinar Education Series

Registration, CEU Credits

These programs are 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 these online presentations at paintsquare.com/webinars.

Cal/OSHA to Meet on Lead in Construction Rule Changes

The California Division of Occupational Safety and Health, better known as Cal/OSHA, has released a "Discussion Draft" on recommended amendments to its lead in construction rule. Cal/OSHA plans on releasing a proposed rule in the fall of 2015. Below is a table that outlines which items are being suggested as changes, how the current Federal OSHA standard reads, how the current Cal/OSHA standard reads, and what the Cal/OSHA "Discussion Draft" suggests changing it to.

There will be a meeting held in the fall at Cal/OSHA headquarters prior to releasing the proposed regulation. If you would like to participate in this upcoming meeting, please contact Heather Stiner of SSPC at stiner@sspc.org.

Item to Change	Current Federal OSHA Requirements	Current Cal/OSHA Standard	Proposed in "Discussion Draft"
PEL	50 $\mu g/m^3$	50 $\mu g/m^3$	10 $\mu g/m^3$
PEL Action Level	30 $\mu g/m^3$	30 $\mu g/m^3$	
Allowable Employee Exposure Calculation	400 divided by hours worked in the day	400 divided by hours worked in the day	80 divided by hours worked in the day
Medical Surveillance Program	30 days	30 days	10 days
Acceptable Blood Lead Levels	40 $\mu g/dl$	40 $\mu g/dl$	10 $\mu g/dl$

Sherwin-Williams Hires Coatings Vet Derrick Castle

The Sherwin-Williams Company's Protective and Marine Coatings division has hired 20-year industry veteran Derrick Castle to lead project development work for the company's bridge and highway market.

As a project development manager, Castle will assist in directing the development and delivery of coatings solutions designed to maximize the service life of concrete and steel structures. Castle has two decades of chemistry knowledge and structural steel coatings industry experience and will focus on the bridge and highway market in the southwest and midwest United States.

Castle comes to Sherwin-Williams from the Kentucky Transportation Cabinet, where he served as a chemical and corrosion laboratory specialist, managing daily operations for the chemical section of the agency's Division of Materials. He was responsible for specifications development and oversight of chemical and physical analyses for materials used in the construction and maintenance of Kentucky's highway infrastructure. He also served as a chemist and chemist supervisor during his tenure with the Commonwealth of Kentucky.

Castle is the 2013 recipient of SSPC's John D. Keane Award of Merit, which recognizes outstanding leadership and contributions to the development of the protective coatings industry and to SSPC. He also served on the board for SSPC and as chairman of the Society's Standards Review Committee. He is an active member of SSPC, the American Association of State Highway Transportation Officials Subcommittee on Materials (AASHTO/SOM), the AASHTO National Transportation Product Evaluation Program (AASHTO/NTPEP) and the American Society of Testing and Materials (ASTM). Castle has served as chair of the AASHTO/NTPEP protective coatings technical committee and also served two terms on the AASHTO/NTPEP executive committee. He holds a Bachelor of Science degree in chemistry from Morehead State University in Morehead, Ky.

Photo courtesy of DeFelsko Corp.

DeFelsko's SmartLink App Now on Android

Inspection equipment manufacturer DeFelsko Corp. has introduced an app for Android that will allow users to turn their devices into a multi-functional inspection instrument, according to the company.

DeFelsko recently released its PosiTector SmarkLink app for Google devices after a successful launch of the same for Apple devices that debuted in January. The company said the device wirelessly connects PosiTector thickness, surface profile and the environmental probes with the keyboard, microphone, camera and email tools on your device. The app also allows users to share PDF and CSV data via email, AirPrint, Dropbox and other cloud-based applications, according to the company.

PosiTector SmartLink comes in a tri-color LED, is lightweight and uses only one AAA battery, the company said. The apps can be downloaded from the Apple iTunes store or from Google Play.

For more information, visit defelsko.com.

Gardco Releases Ultrasonic Pulse Echo Device

A maker of quality control instruments offers an ultrasonic pulse echo device that the company says is useful on objects where access is restricted to just one side.

The Paul N. Gardner Company, Inc., says the Pundit PL-200PE can be used to determine slab thickness and find voids, pipes, delaminations and honeycombing on the subsurface of a substrate.

Advanced echo tracking helps identify the main echo and the device has an automatic estimation of pulse velocity, the company says. The ultrasonic pulse echo is light, ergonomically correct and comes with several accessories and easy-to-use measurement control buttons with optical feedback, according to the company.

For more information, visit gardco.com.

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"After 40 Years, OSHA Tackles Berylium" *(Aug. 26)*

A new federal proposal to reduce worker exposure to beryllium will not cover those who perform abrasive blasting, according to the Occupational Safety and Health Administration.

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"Occupational Exposure to Beryllium and Beryllium Compounds," which has been long awaited, will not cover the construction or maritime industries. Instead, OSHA said in an Aug. 6 statement and in its proposed rulemaking document that construction workers who use coal-slag, copper-slag or crushed-glass abrasive-blasting methods are already covered by other regulations that would protect them from beryllium exposure. The proposed rule also rejects, in part, a 2014 recommendation from OSHA's own Advisory Committee on Construction Safety and Health (ACCSH), which stated that the construction industry should be included in the scope of the proposed rule reducing beryllium limits.

In its statement, OSHA officials said they would seek comments to determine whether workers who perform abrasive-blasting work — such as highway construction workers renovating bridges or shipyard employees cleaning paint off a ship's hull — should be covered by the final rule. The public can make comments until Nov. 5 through Regulations.gov. Other methods, including via facsimile and by regular mail, are included within the publication and on OSHA's Beryllium Rulemaking website. The site also includes several OSHA-generated fact sheets and information sheets on beryllium health risks, on how to use the metal safely and on the changes outlined in the proposed rule.

For more information on the proposed rule changes and how to submit comments to OSHA, see this month's SSPC News section, p. 17.

Car F.: *"I pity the government agencies that are charged with protecting workers in a climate decisively anti-worker, with anti-worker politicians, with some anti-worker employers. 'Profits first, health and safety after' is a recipe for disaster and a threat to our lives."*

M. Halliwell: *"Car, I don't think the climate is anti-worker, but rather it's just as pro-minimal labor costs as you can get (but I agree, it's all about the dollars, not the quality, durability or the people anymore). Add to that the bureaucracy where if the agencies protecting workers see a need for a change, just the paperwork and approvals take 10 years to get in place."*

PSN TOP 10 *(as of Aug. 30)*

1. Eric S. Kline Remembered
2. Fire Damages Industrial Coatings Plant
3. Concrete Collapse on Bridge 'Very Rare'
4. Castle Moves to Sherwin-Williams
5. Rocker Bearings Roll from Bridge
6. Glass-Based Coating to Protect Ships
7. After 40 Years, OSHA Tackles Beryllium
8. Navy Hopes Coating Will Extend Sub Life
9. First Offshore Wind Farm in U.S. Begins
10. Supplier Agrees to $5M Fraud Settlement

STUMPER OF THE MONTH

What is the common name for aluminum silicate abrasive?

a. Copper slag
b. Coal slag
c. Novaculite
d. Olivine

Answer: Coal slag. Coal slag is a by-product abrasive derived from molten bottom ash in the boilers of coal-fired power plants.

Quiz Leaderboard *(as of Aug. 30)*:

1. Michael Beitzel
2. Matt Burst
3. Shabbir Hussain Shah
4. Douglas Steitz
5. Doug Driscoll, Sr.

On Coating Systems for Exterior Above-Ground Storage Tanks

WHAT IS THE MOST COMMON OR ECONOMICAL COATING SYSTEM FOR REHABBING THE EXTERIOR OF ABOVE-GROUND STORAGE TANKS?

Warren Brand
Chicago Coatings Group

Tough question. I would say the most common would be an epoxy base coat (with or without a zinc-rich primer), followed by a polyurethane topcoat. However, there are many, many different systems out there that are one- and two-coat systems (saving labor costs by reducing an application step over a three-coat system) and may have a higher total installed cost, but exceptional long service life and easy repairability. There's also a system out there that is surface-tolerant and easy to apply (one coat) and has an exceptionally long service life. And maintenance is simple. However, it has a dull and lackluster appearance and remains "soft," thus being prone to damage from physical contact. Many other things must be considered as well, such as the weather during application, condition of the steel (new or existing), use of insulation (CUI issues), proximity to sensitive assets (parking lot or highway, requiring a dry-fall system), etc.

Anthony Asmar
Gulf Silicone

After preparing the surface to Sa 2-1/2, apply two coats of zinc-rich primer at 125 microns DFT. This system will be sufficient to protect the exterior shell of storage tank.

Ronald Lewis
Corrosion Management Ltd.
The most common would be to overcoat whatever is there with an alkyd of any type. Wrong, yes, but that is what most situations will receive. Epoxy is OK if the owner accepts this idea and the failing base coat accepts it. It depends on what's on the tank now and what will be compatible, assuming the base coat is not removed before coating (recoating).

Rodney White
Benjamin Moore & Company
It depends on answers to these questions. What is the current coating system? What is the condition of the current system? Where is the tank situated? What are the prevailing weather conditions? What does the tank contain? Is there a chance of spillage? What type of prep is permitted? Will the tank be recoated by "sometime" painters or will a professional company be engaged to do the work? What is the budget for the rehabilitation? What is the expected duty cycle once completed? There are far too many questions to be answered to arrive at a single, "pat" answer.

Jim Boyce
Insl-x Products Corporation
Although many systems could be applied, my initial thought leans toward a "super low viscosity" epoxy, followed by an epoxy intermediate and a 2-K urethane if long-term gloss and color are important.

Tom Schwerdt
Texas Department of Transportation
Warren, if that's the same "soft" coating I'm thinking of, I heard some DOT guys from the Northeast extolling its virtues as a maintenance coating during their presentation. Upon further query, it turned out they were happy with a 5-year lifespan of the rehab, way too short for me.

Warren Brand
Chicago Coatings Group
Tom, the material that I'm thinking of, which I have not personally vetted for bridges but have specified elsewhere, has an anticipated service life in excess of 20 years when, of course, applied properly.

Trevor Neale
TF Warren Group
Rodney White really has the correct answer to the question. Without the answers to the many questions, the chances of a successful repaint are very limited.

Profiles in SUCCESS

By Charles Lange, *JPCL*

Dr. Brian Skerry

Global Director for Corrosion Programs, The Sherwin-Williams Company

On Using New Technologies for Coatings

In his current position, Brian Skerry is responsible for directing the innovative technological developments of corrosion protection coatings in Sherwin-Williams' three Global Finishes Group divisions: Protective & Marine, Automotive Finishes and Product Finishes.

Skerry's role entails working with each division's innovation and technological investigation teams to develop new coating products for an array of applications. This means "coordinating and helping each team find business solutions for our currently defined problems, with a view toward developing the next generation of better products for the future," says Skerry, who has been with Sherwin-Williams since 1984. "Most of my time is spent working with the scientists and innovation management teams in each division, plus external contacts with other companies — raw materials suppliers, university researchers and so on," he says.

With his background, which includes a Bachelor of Science degree in chemistry and a Ph.D. in corrosion engineering from the University of Manchester in England, Skerry is a natural fit for the research and development side of the industry. An award-winning author of dozens of technical papers and presentations over the course of his career, he relishes the process that goes into developing new paints and coatings.

"My favorite part of what I do is meeting with the innovation teams," he says. "It is a multi-step process — you start with a fairly academic research concept, and ultimately, you've got to formulate that into a paint that's manufacturable and sellable. When we can use a new technology that can give us a paint with much-improved performance with added environmental friendliness or cost effectiveness, it's very rewarding."

On Protecting the Environment

As he alluded to, minimizing negative impacts on the environment is a top-of-mind issue for Skerry and his R&D teams while developing new coating products.

"We're trying to find technologies and innovations that allow our paints to provide asset protection as well as aesthetic properties, but with an ever-increasing emphasis on environmental friendliness and without loss of performance. It's a key issue moving forward across the world," he says, and with all of the environmental and regulatory implications involved with protective coatings work, "it's one of the areas where the paint industry can really provide a great role on behalf of society."

Skerry points to recent developments in new polymer design and nanotechnology as examples of promising areas of progress on the environmental front. "There are so many innovative technologies out there, and the opportunities for application and development of new paint systems that are as good or better than what we've used in the past, and are also environmentally friendly, are endless," he says.

On Globalization in the Industry

As someone who was born and educated in England, has lived and worked in Australia and the United States, and has traveled extensively across the globe, it's no wonder that globalization is another one of Skerry's chief concerns when assessing the state of the paint business.

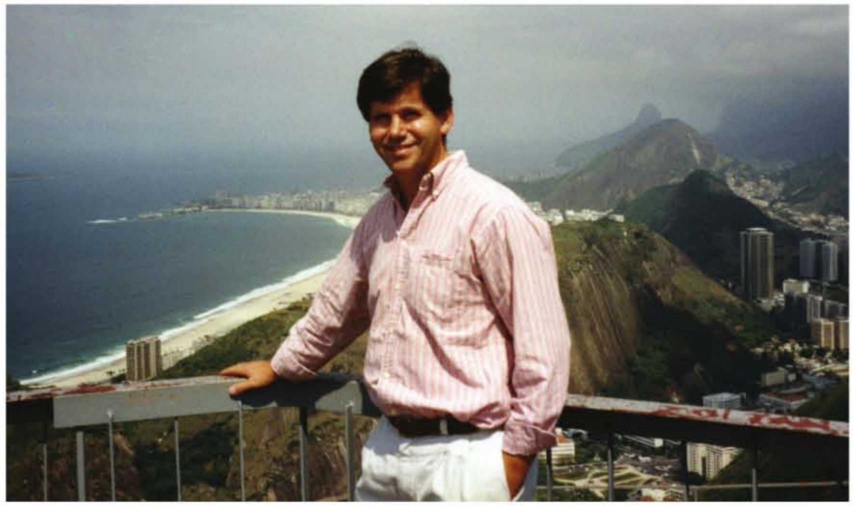
"The coatings industry is becoming more and more of a global business, not just a historically localized or regional business," he says. "We need to be developing coatings that can be manufactured in any region of the world and perform as well as possible for our global customers, irrespective of where the coatings are supplied."

Globalization is a key part of his efforts in his role as vice president of the SSPC Board of Governors. "SSPC can't afford to just be a national or regional organization. The industry is globalizing and the issues of standards and training have become global issues," he says. "Connecting the constituents, developing education and training programs, updating standards and ensuring that the standardization process is well understood and accepted" are just some of his globalization-based goals for SSPC moving forward.

Skerry sees the need for globalization as

Dr. Brian Skerry

a natural reflection of the industry's growth over the past decades. "It's very different from the situation we had when I first joined the industry, when such challenges weren't even on the horizon," he says. "But today, as everybody says, the world has become such a small place, which means that companies like ours have to find ways to be efficient and effective in designing, formulating, manufacturing and distributing paints with the seamless end result of getting the products to the customers, wherever they are."



Skerry's work has afforded him opportunities to travel to many different parts of the world over the course of his career. Here, he is pictured in Rio de Janeiro in 1997, while on a trip to Brazil to present a paper at the fifth annual Congresso Internacional de Tintas (more widely known as the ABRAFATI meeting) in Sao Paulo.

On Engaging the Youth

Yet another prime area of his focus, in both his roles with Sherwin-Williams and on the SSPC Board, is to help guide the next wave of young talent into the paint industry. "The future of coatings is critically dependent on encouraging and attracting the next generation to come into the industry," he says.

Skerry helped organize the Young Professionals group meetings at the past two SSPC conferences and is involved in planning the meeting at the SSPC 2016 conference in San Antonio. In the early 1990s, he also assisted in developing the graduate-level Coatings & Polymeric Materials program at North Dakota State University, which has since helped shepherd many students into careers in the coatings industry.

When speaking with young people, he emphasizes the many different career paths available in coatings. "The paint industry has an incredible array of opportunities available for young people, whether it's in chemistry, engineering, quality control, supply chain management, contracting — the list goes on. But they won't know about these opportunities unless we tell them," he says.

He also believes that the chances to travel and take in new experiences might draw young people into coatings, as well. "There is a great deal of opportunity to travel both domestically and internationally. People can move around as their career and interests develop, so there's no limitation on the sorts of career pathways a young person can follow," he says.

On His Most Rewarding Moments

In fact, Skerry points to his own travel experiences as some of the most rewarding of his career. "I've been really fortunate over the years that the business I do has taken me all over the world," he says.

In addition to the U.S. and Australia, his work has taken him to different parts of South America, Asia and Europe. "Every one of these trips has been truly fascinating and character-building," he says. "You visit with business colleagues in different parts of the world and realize you have a common interest. I've had fun meeting people, gaining an understanding of different cultures, interacting with them and forming long-lasting friendships."

But he doesn't have to travel far to find rewarding moments in his everyday work. "The most rewarding part of what I do is taking new technology and ending up with a practical paint that really helps the customers and has attractive benefits," he says.

On Interests Outside of Coatings

With so much on his plate within the coatings industry, Skerry's schedule tends to be lacking in the "free time" department. But in the little time away from work that he does have, he likes to spend it with his family, play the acoustic guitar and create original watercolor paintings.

He also enjoys taking on do-it-yourself projects at home. "Saturday mornings, my favorite place to be is the local hardware store, where I'm on a first-name basis with the owner," he says.

"However, some of these home improvement projects will just have to wait until more free time is available."

SSPC Seeking Comments on Proposed OSHA Beryllium Rule

A proposed rule has been published in the *Federal Register* in regards to lowering beryllium levels in the workplace. This proposed OSHA regulation, titled, "Occupational Exposure to Beryllium and Beryllium Compounds," suggests lowering the eight-hour permissible exposure limit (PEL) for beryllium from 2.0 micrograms per cubic meter of air to 0.2 micrograms per cubic meter of air. The proposed rule also requires additional protection, including personal protective equipment, medical exams, medical surveillance and mandated worker training.

Currently, OSHA has examined three alternatives that may alter the groups of employers and employees covered by this rule making. If, based on industry feedback, regulatory alternative 2a (which would expand the scope of the proposed standard to include employers in maritime and construction) is selected, it will have the biggest impact on the industrial coatings industry. It will affect the following workers:

- Abrasive blasters;
- Pot tenders; and
- Cleanup staff working in construction and shipyards that have the potential for airborne beryllium exposure during blasting operations and during cleanup of spent media.

SSPC is seeking comments from the membership for submission to OSHA. If you wish to submit comments please do so by Oct 26, 2015, to Heather Stiner of SSPC at stiner@sspc.org.

To review the proposed rule in its entirety, please go to www.osha.gov.

SSPC Chapter Events

(Left): SSPC's Midwest Chapter held a general membership meeting at Frankie's Ristorante in Tinley Park, Ill., on July 23. The meeting featured guest speaker Jamie Rhee (pictured, third from right), the City of Chicago's director of procurement, who spoke to attendees about upcoming project opportunities with the city and discussed its MBE/WBE and veteran certification programs. Photo courtesy of the SSPC Midwest Chapter.

(Right): On Aug. 8, the SSPC Northern California/Nevada Chapter held a night out at the ballpark, where chapter members and their families watched the Oakland Athletics defeat the Houston Astros at O.co Coliseum in Oakland, Calif. Photo courtesy of the SSPC Northern California/Nevada Chapter.

Eight at GPI Earn SSPC PCS Certification

Eight coatings professionals at Greenman-Pedersen, Inc., a national engineering and construction firm, recently completed certification to become SSPC Protective Coatings Specialists (PCSs).

The PCS certification, SSPC's highest level of certification, recognizes industrial coating professionals for their extensive knowledge in the principles and practices specific to industrial coatings technology. Each individual has been evaluated for his or her mastery of coating type, surface preparation, coating application and inspection, contract planning and management, development of specifications and the economics of protective coatings. SSPC congratulates these individuals for their achievements. For more information on PCS certification, visit sspc.org/training.

The recently certified Protective Coatings Specialists from GPI are as follows.

Charles Brown

Paul Forte

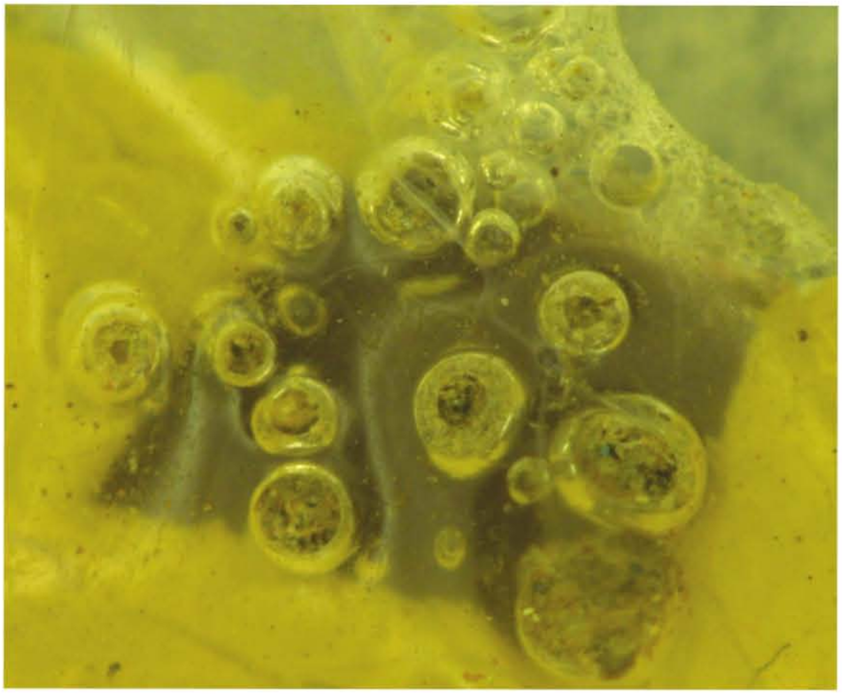


Fig. 1: Foaming of clear topcoat. Photos courtesy of KTA-Tator, Inc.

Concrete Floor Coatings Forensics Case History – Part 2

By Chrissy M. Stewart, PCS
Richard A. Burgess, PCS, Series Editor
KTA-Tator, Inc.

When examining a coating problem in the laboratory, background information gathered during discussions with the involved parties and information obtained during a field investigation help to direct the course of the laboratory investigation. The background information collected for this case was included in last month's F-Files, "Concrete Floor Coatings Forensics Case History – Part 1, Field Investigation Phase." The problem involves a previously painted concrete floor that was overcoated with two coats of beige epoxy and two coats of clear moisture-cured urethane. The floor exhibited blistering and delamination within the newly applied coating system.

The samples collected during the field visit were submitted to the laboratory along with the background information.

After reviewing all of the information, the laboratory chose the following techniques to analyze the problem: detailed microscopic examination, infrared spectroscopy, ion chromatography, and gas chromatography-mass spectroscopy. In addition to samples from the field, the laboratory contacted the coating manufacturer for wet control samples of the materials specified for use.

Where to Begin? Detailed Microscopic Examination

Detailed microscopic examination was the first task performed during the laboratory investigation. The examination was performed to determine the number and thickness of the coating layers, as well as to determine the plane of failure and look for the presence of contamination or other objectionable properties. This gave the analyst the ability to compare and contrast the laboratory findings with the information provided from the field visit.

One interesting discovery made during the laboratory microscopic examination was the presence of foaming in the clear topcoat in a sample taken from the area near the exterior door. During the field interview, it was noted that the door was left open to increase ventilation during the application of the topcoat. However, this was done on a day when it was raining. Although the urethane requires moisture to cure, the moisture from the rain was excessive causing the coating to foam (Fig. 1).

The laboratory microscopic examination revealed the presence of five layers in samples from a non-failing area, and one-to-two layers from samples in failing areas. The five coats in the non-failing area were composed of the previously applied coatings, as well as the newly applied system. The one-to-two layers observed in the failing areas consisted of the clear topcoat as well as a thin layer of the beige coat. During an interview with the coating applicator, it was stated that two layers of the clear topcoat were applied. During the laboratory examination, only one clear coat was observed in the cross-section, but because the coats were the same color (clear) it was not possible to definitively state the number of coats based on the cross-section. However, the total thickness of the clear layer, determined microscopically, supports the claim that two layers of the clear coat were applied (Figs. 2-4, pp. 20-21).

The thicknesses of the coating layers were determined to be in accordance with the manufacturer's recommended

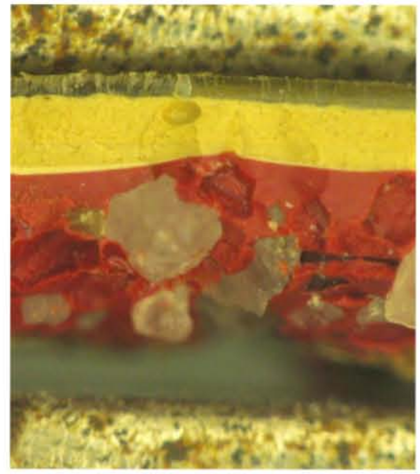


Fig. 2: Cross-section of non-failing area.

thickness ranges. Furthermore, no differences were found between the thicknesses in failing and non-failing areas. No evidence of dirt or debris was detected at the failing interface (Figs. 5, 6, pp. 21-22).

The plane of failure observed in the laboratory investigation sometimes differed from that determined by the field visit. During the field visit, the field investigator concluded that the plane of failure appeared to be between the clear coat and the beige coat with some beige discoloration noted on the bottom surface of the delaminating chips. Laboratory examination indicated that in some cases the failure was between the clear coat and the final beige coat with discoloration present, but in other cases it occurred within the surface of the final beige coat itself, leaving a measurable layer of beige coating (approximately 1 mil in thickness) on the bottom surface of the clear coat. This measurable layer indicated a cohesive break in the surface of the final beige layer as opposed to an adhesion issue between the clear and final beige coat.

The Right Stuff? Infrared Spectroscopy

By analyzing the infrared spectrum produced by a coating material, a great deal of information regarding the

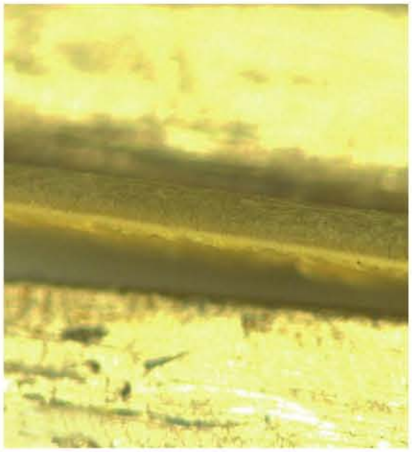


Fig. 3: Cross-section of failing area.

sample is revealed, such as generic resin type, potential problems with mixing, evidence of degradation and more. Just as your fingerprint is unique to you, the spectrum of a particular product is unique to it. While generic resins have similar bands in determined ranges, each product provides a unique spectrum. Two different epoxies will show different spectra even though the spectral bands will be similar.

Analysis of the coating system by infrared spectroscopy indicated that the materials used were chemically consistent with laboratory-prepared control samples of the specified materials. The clear topcoat was consistent with the specified urethane resin and the beige coats were consistent with the specified epoxy resin. These results confirm that the materials used had the same chemical composition as the specified coating system and that the specified materials were not substituted with a different coating system.

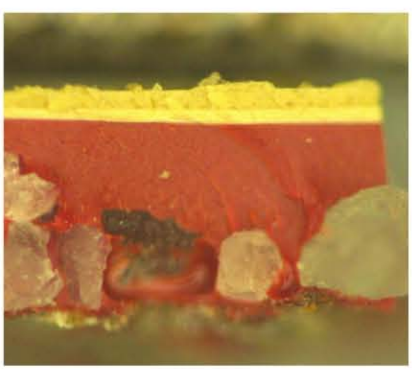


Fig. 4: Cross-section of area below delamination.

The laboratory-prepared control samples of the epoxy were mixed at the proper ratio and over- and under-catalyzed mixes were prepared to determine if mis-mixing of the components could have played a role in the failure. The analysis revealed that the samples obtained from the field were consistent with the properly mixed materials and that mis-mixing was not a concern.

Additionally, the bottom surface of the failing coating chips were rinsed with solvents, the run-off collected and dried, and the resulting residue analyzed for evidence of organic contamination such as oils or waxes. No presence of organic contamination was detected.

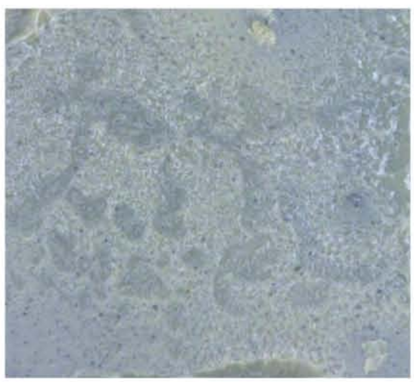


Fig. 5: Discoloration on bottom delaminating chip.

Contamination by Cleaning? Ion Chromatography

Ion chromatography testing was performed to see if contamination from the cleaning agent used in the field or other similar material may have contributed to the failure. Even though the cleaning agent was reportedly used during the preparation of the original coating, it could also have been used to remove any contaminants that may been deposited on the surface between coats. Ion chromatography identifies the presence of certain ions (anions) common in salts such as chloride, nitrite, bromide, nitrate,

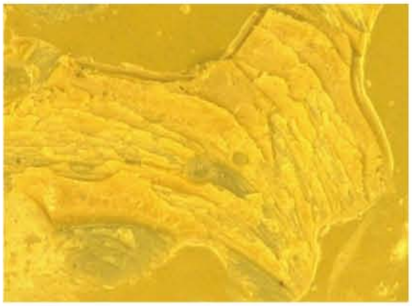


Fig. 6: Cohesive break in bottom delaminating chip.

phosphate and sulfate. The safety data sheet (SDS) for the cleaning agent utilized prior to coating application indicated that the product was composed of phosphate-containing compounds.

Testing revealed no detectable levels of any of the six anions associated with common salts on the submitted samples. Test results indicated that residual contamination from sources such as the cleaning agent were not the cause of the blistering.

Entrapment! Gas Chromatography-Mass Spectroscopy

The background information provided indicated that the clear coat may have been applied before the final beige coat was fully cured. Some of the samples sent to the laboratory were in sealed septum vials. These samples were placed in the vials immediately upon removal in order to trap any solvents that may be present. If any solvents were present in the vials, they could be identified using gas chromatography-mass spectroscopy (GC-MS). The gas chromatograph separates molecules at specific retention times as they travel the length of a specialized column installed in the instrument. Each molecule is fragmented by mass.

The analysis revealed the presence of solvents in the failing samples. The solvents were consistent with solvents listed in the SDS of the beige epoxy coats. The quantity of solvent materials was much higher in areas where blistering occurred as opposed to samples taken from areas that did not experience blistering.

Conclusions

The laboratory findings were provided to the field investigator who issued a report combining the field observations with the laboratory data. The report included the following observations.

- Preparation of the previously existing coating was satisfactory.
- The new coating materials were mixed properly.
- The thicknesses of the new coating materials were acceptable.
- Moisture content of the concrete slab was low and did not create a problem.

- The failure occurred between the clear topcoat and the final beige epoxy coat as well as within the surface of the beige epoxy itself.
- In areas where delamination was noted between the clear coat and the final beige coat, a beige discoloration was visible on the bottom surface of the clear coat.
- There was no contamination present at the plane of failure.
- The failing samples from the area with a high incidence of blistering contained high concentrations of solvents from the beige epoxy.
- The failing samples near the door exhibited foaming of the urethane.

Based on the field and laboratory observations and analysis, the cause of the failure was a combination of several application-related problems.

- The blistering failure in the corner was due to poor ventilation that retarded the cure of the epoxy. The urethane was applied before the epoxy had cured, entrapping solvents and creating a weak plane at the top surface of the epoxy, causing both an adhesion issue between the clear topcoat and the beige epoxy, and a cohesive failure within the top surface of the epoxy.
- The variance in the plane of failure indicated that some areas of the beige coat may have come closer to curing than other areas, but in both cases, it was evident that full cure was not reached.
- The failure near the door was due to exposure of the clear urethane coats to moisture by applying the coating with the doors open while it was raining.

About the Author

Chrissy Stewart is a senior chemist with KTA-Tator, Inc. Employed with KTA since 2006, she is heavily involved in coating failure investigation and comparative coating testing services. Stewart has achieved SSPC Protective Coatings Specialist (PCS) certification, is a voting member of ASTM and a past president of the Pittsburgh Society for Coatings Technology (PSCT) where she currently serves on the Board of Directors. She holds a Bachelor of Science degree in chemistry from Mercyhurst University, has had several articles published in *JPCL* and was featured in *JPCL*'s 2015 annual bonus edition, "Coatings Professionals: The Next Generation."

Advantages, Applications and Unique Considerations of Robotic Waterblast Equipment

By Peter Wright, WaterJet Technology Association and Industrial & Municipal Cleaning Association (WJTA-IMCA)

Robotic waterjetting solutions have been used for some time for surface cleaning, coating removal and surface preparation. While most early applications involved an operator with a handheld lance, drawbacks including operator fatigue, slower rates of material removal and safety concerns were common issues that continue to affect the industry.

Crawling robots were introduced in the 1990s for preparing large surfaces. These early robots increased productivity, minimized hazards created by close proximity of the operator to high-pressure streams of water and allowed for containment of the waste streams with vacuum attachments. These solutions continue to be advantageous for large, difficult-to-access surfaces such as ships and storage tanks and provide access to elevated vertical surfaces eliminating the need for scaffolding.

Semi-automated tools, such as mower-style waterjets have also been commonly used on horizontal surfaces improving productivity and limiting the exposure of operators to high-pressure water (Fig. 1). Although these tools are operated by hand, the operator does not have to contend with reaction forces or exposure to the high-pressure water stream.

In addition to the use of robotics in surface cleaning and preparation, mechanized waterjet systems have also long been in use in other specialty waterjet applications from factories to field cutting to demilitarization and more. Examples range from 6-axis articulating arms used for precision cutting and deburring, to mobile, treaded robots using abrasive waterjets to dismantle dangerous ordnance.

The advantages of removing operators from potential contact with the waterjet have led to wider adoption for cleaning surfaces, but smaller projects and areas with unique geometries with limited access for larger robotic systems continue to be applications for manually operated waterjet tools.

Concerns with Manual Waterjetting

Waterjet is an environmentally friendly alternative to techniques such as abrasive blasting and can create a safer work environment by eliminating exposure to potentially hazardous particulates both during the blasting operations and during post-job clean-up, when respiratory protection can be easily overlooked.

The industry has long been concerned however, with the potential hazards of the high-pressure stream to the worker. Pressures as low as 350 psi are capable of causing tissue damage and high-pressure water carries with it the potential for internal tissue damage and severe infection. Industries such as sewer and drain cleaning have seen rare fatalities from water streams below 5,000 psi — significantly lower than pressures that can be applied in surface-preparation operations.

Another issue limiting the adoption of manual waterjetting is productivity. Even as developments to nozzle and lance design have improved cleaning and surface-prep outcomes, the limitations on force that can be applied through a manual waterjet lance and the variability in human operation can lead to less competitive removal-cost-per-unit area. Lower rates of material removal per-square-foot give the impression that overall costs will be higher for waterjetting compared with other techniques, but when additional factors are considered such as costs to contain and dispose of secondary waste streams, the overall project cost can be lower even with manual waterjet operations.

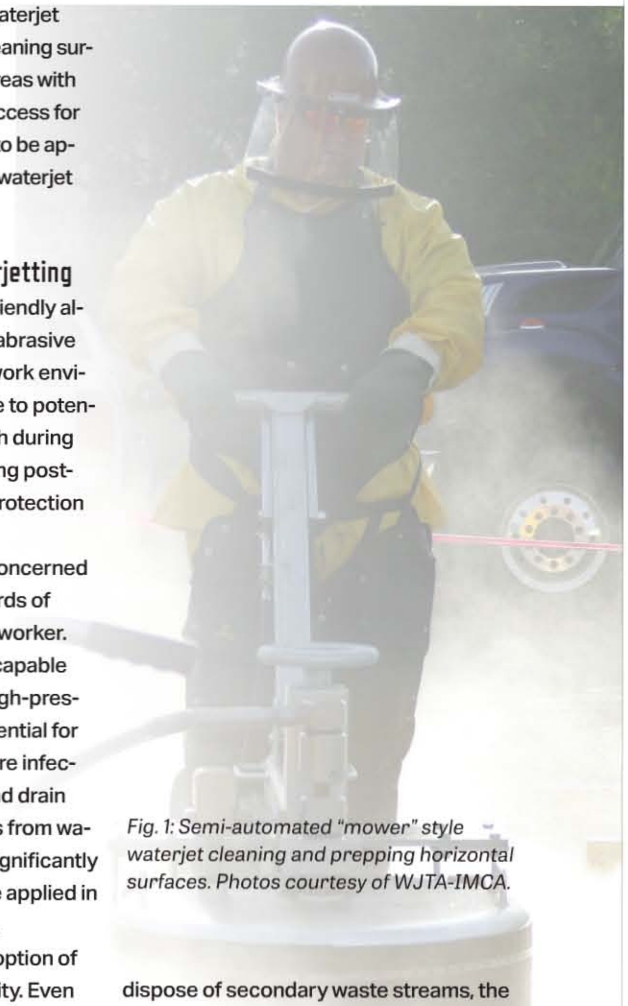


Fig. 1: Semi-automated "mower" style waterjet cleaning and prepping horizontal surfaces. Photos courtesy of WJTA-IMCA.

Advances in Equipment

The market for waterjet equipment is highly fragmented with contractors performing cleaning and coating removal at a diverse range of facilities, from chemical plants to drydocks and shipyards, to offshore platforms and more. Support from end users (i.e. the facility owners and consumers of coatings or industrial cleaning services)

Fig. 2: Mobile robotic waterjet tools controlled by an operator at a distance.

has created varied markets for robotic or more intrinsically safe equipment in a broad range of industries.

Although the waterjet industry has adopted the term "automated" to refer to these mechanized systems, many of these tools, particularly mobile robotic waterjet tools, do not operate truly autonomously and still require an operator to direct the action. Advanced applications of robotics and true automation such as "intelligent" sensors directing the action are another step for the waterjet industry. *See "Maintaining an Old Icon with a New Technology,"* JPCL, *August 2015.*

The application of robotics for cleaning tasks such as cleaning heat exchangers has brought consistency and higher-quality results than manual lancing has, and the same can be said for surface cleaning and preparation.

In addition to the safety and productivity issues, industry best practices allow for personal protective equipment (PPE) requirements to be less stringent than in manual waterjetting in certain situations, since the operator can be stationed outside of the barricaded work area and away from the action of the waterjet. This can have a significant impact on worker comfort and occupational health in situations with extreme conditions such as heat and humidity, which can become dangerous for operators in full gear. PPE requirements should still be assessed for each job and should meet any applicable facility or regulatory requirements. In certain situations, for example when there is a potential for exposure for the workers, full PPE may still be necessary.

The wider adoption and unique safety and operational considerations of newer mechanized waterjetting systems was recognized by the WJTA-IMCA in 2010, when its biennial technical conference expanded to include a tradeshow allowing for the display and demonstration of larger pieces of equipment, and again in 2011, when it added sections to the fourth edition of its recommended practices guidelines that specifically address the use of automated waterjet equipment in a variety of applications. The new expanded safety guidelines cover requirements for operators and equipment that differ from the safety guidelines for manual waterjetting in areas such as PPE, allowing contractors using robotic equipment with greater frequency to maintain compliance with industry-recommended practices.

Parts and Pieces

In general, robotic systems are broken down into the controller, arm, drive, end effector and sensors. The elements directing the high-pressure water stream can come in a variety of forms, depending on the requirements of the task or the environment. Controllers vary as well in robotic waterjet systems, including control boxes with hydraulic lines run directly to the robotic tool to control its motion, as well as fully wireless control systems. Stationary robots used in waterjet cleaning, cutting or deburring can utilize sophisticated six-axis articulating arms. Recently, mobile robots with articulating arms have seen wider adoption in industry either with an operator in a cab or the operator controlling the robot from a distance (Fig. 2).

Limitations of Robotic Equipment

Hard-to-reach surfaces and unique geometric conditions provide a continued challenge to contractors using robotic equipment just as they have with traditional manual waterjetting. Newer robotic lance units have been designed to be able to access smaller spaces and provide superior mobility. Still, many larger systems are limited in their ability to operate above ground level.

While the safety aspect of removing workers from potential contact with a high-pressure water stream is undeniable, it is important for contractors to remain vigilant about hidden hazards introduced when using robotic equipment, such as high-pressure water or hydraulic lines run in proximity to operators, even when the operator is manning a control box at a distance from the blasting operations. It is also imperative that a safety zone be maintained around blasting operations or that hard engineering controls be applied to eliminate the possibility of exposing other workers or bystanders to the effects of the high-pressure waterjet.

Robotic systems also create additional requirements so that operators can troubleshoot the mechanized components onsite. More complex and sophisticated systems have advantages but downtime is not an option for contractors. Manufacturers have worked closely with contractors to alleviate issues and create robust systems that can be quickly set up and repaired without a need for complex tools. Educating the workforce and creating clear opportunities for continuing education and career advancement are key when it comes to profiting from new trends in advanced equipment.

Coating certifications created by SSPC have been crucial to the development of the surface-prep industry, and WJTA-IMCA has provided education specific to the operational and safety considerations of utilizing high-pressure waterjet equipment, both through its publications and events, and through new initiatives in development to create programs for approved waterjet operator training.

Conclusion

The use of robotics to direct the high-pressure waterjet rather than by the direct action of human operators has been adopted in different industries to varying degrees. The exchange of knowledge between contractors, academics, manufacturers, specifiers and facility owners will continue to drive the development and utilization of safer and more productive tools in the waterjet surface prep industry. Conferences and trade shows such as SSPC, NACE and WJTA-IMCA have seen waterjet surface prep continue to evolve in its applications and find acceptance in industry.

About the Author

Peter Wright is association manager of the WaterJet Technology Association and Industrial & Municipal Cleaning Association, a leading global trade association serving the high-pressure waterjet, industrial vacuum and industrial/municipal cleaning sectors. He holds a Bachelor of Science degree in mechanical engineering. Wright has worked with WJTA-IMCA for five years with responsibilities including coordinating committee activities to update recommended practices, managing operations of the association and conferences, communications and business development.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Galvanic Corrosion in Water and Wastewater Structures

By Vaughn O'Dea, PCS, Tnemec Company, Inc.; Travis C. Tatum, P.E. Dunham Engineering, Inc.; Pat Barry and Paul B. Higgins, The Barry Group, L.L.C.

Stainless steel is selected for use in the municipal waterworks industry because of its inherent corrosion-resistance properties. Designers oftentimes overlook the problems associated with coupling stainless steel with carbon-steel metals. When these materials are electrically connected and placed into immersion service, accelerated corrosion of the anodic carbon steel metal is initiated. This article will review the galvanic (bimetallic) corrosion theory and discuss cases where bare stainless steel was connected electrically (coupled) with coated carbon steel in water and wastewater structures.

Galvanic Corrosion

Galvanic corrosion is one of the eight forms of corrosion classified in corrosion engineering. A galvanic cell is formed when two dissimilar metals are connected electrically while both are immersed in a solution electrolyte. Coupling can be created between the metals either by welding, bolting or other electrical contact. As per Mars G. Fontana and Norbert D. Greene in *Corrosion Engineering*, galvanic coupling creates an electrical potential difference between the two metals and produces electron flow between them. This can lead to accelerated pinpoint attack, especially when the stainless steel is uncoated (bare) and the carbon steel metal is topcoated with a protective coating which has holidays. Galvanic corrosion is the major suspect when attack at the junction between two dissimilar alloys is limited to only one of the two metals.

Galvanic Series

Any metal or alloy has a unique corrosion potential when immersed in an electrolytic solution, which can be found in a typical galvanic series chart. When two different metals are coupled together, the metal nearest to the top of the galvanic series will be the anode and will ionize and go into the solution or corrode, while the one closest to the bottom of the list will be the cathode and receive galvanic protection, as per C. G. Munger, author of *Corrosion Prevention by Protective Coatings*. A metal coupled to another metal relatively close to it in the series will corrode more slowly than when it is coupled with a metal farther down in the series. Although the ranking is generally derived for seawater, it is very similar for neutral aqueous solutions, such as those commonly found in water or wastewater treatment, and therefore may be used to assess the general risk of galvanic corrosion in these liquids.

Area Effect

The intensity of corrosion on any metal will also depend upon the relative areas of the cathode and anode. If the area ratio of the uncoated stainless-steel cathode relative to the coated carbon-steel anode is considerable, it would promote accelerated corrosion at any break in the coating film, even if the two metals are separated by considerable distance. The anodic dissolution of the carbon steel is concentrated at coating defects because the larger cathode area provides a greater surface for the reduction reaction and the anodic dissolution current (rate) must increase to compensate. This is sometimes known in applied corrosion engineering as the "catchment area principle" and has important implications in designing to minimize the risk of galvanic corrosion.

Distance Effect

Galvanic corrosion is usually accelerated nearest to the junction of the coupling, with the attack decreasing as the distance from that point increases. Although this distance is a function of many factors, including the area ratio, environment and electrolyte, the authors have observed galvanic corrosion occurring as far as 50 feet or more away from the galvanic junction where bare stainless steel and coated carbon steel were coupled.

Environment

The environment can also have a significant effect on galvanic corrosion rates. Composition, pH and electrical conductivity are electrolyte properties that can have a major influence on galvanic corrosion and affect both its intensity and distribution. The severity of corrosion often increases with the increasing electrical conductivity of the electrolyte because high conductivity is often caused by the presence of aggressive ions, i.e., chlorides, acids or alkalis. The breakdown of passivity due to the presence of aggressive ions such as these can also significantly increase galvanic corrosion rates.

Cases

The following case histories are examples where bare stainless steel and coated carbon steel metals were coupled in water and wastewater structures resulting in accelerated corrosion of the anodic carbon steel metal.

Case No. 1: Two-Million-Gallon Elevated Water Tank

Background

A two-million-gallon elevated potable-water storage tank was lined with two coats of a 67-percent-volume-solids polyamide epoxy with a total dry-film thickness (DFT) of 7-to-11 mils.

Problem

At the two-year anniversary inspection, a number of corrosion sites were observed throughout the belly of the tank from the compression ring down, and up the outside surfaces of the dry riser tube. The size, depth and frequency of the pitting were atypical of pitting corrosion of carbon steel after only two years of service in a potable water storage tank.

Further analysis found that the corrosion sites were typically random blister-like areas ranging from .75 to 1-inch in diameter with rust emanating from a holiday in the center of each blister cap. After removal of the blister caps, the corrosion sites revealed hemispheric pits, many of which measured approximately .125-to-.156-inch deep when measured using a pit gauge (Fig. 1, p. 32). Many of the corrosion sites contained a semi-solid black material, which measured a 5 pH. The blister caps at these sites were also examined and revealed a black scale with yellowish streaks on the back of each cap.

Cause

Holidays or pinholes in barrier coating systems are usually common sources for the initiation of corrosion. The causes of holidays are numerous and generally the result of some type of application deficiency. Once the electrolyte breaches a barrier coating a corrosion cell is initiated.

A field investigation by one of the authors revealed a bare stainless-steel ladder bolted to the carbon-steel dry riser pipe. The stainless steel was uncoated, causing a large area ratio of bare stainless to coated carbon-steel metal. Although the greatest frequency was occurring adjacent to the dissimilar metal coupling junction, there was a large number of random pitting along the tank belly and up the side wall — as far as approximately 30-to-50 feet from the stainless ladder.

Remediation

The stainless-steel ladder was abrasive-blasted in accordance with SSPC-SP 16, "Brush-off Blast Cleaning of Non-Ferrous Metals," to a 3-mil anchor profile using aluminum-oxide media, and then topcoated with a 100-percent-volume-solids amine epoxy at 14-to-16 mils DFT. The carbon steel surfaces were abrasive-brush-off blasted in accordance with SSPC-SP 7/ NACE No. 4, "Brush-Off Blast Cleaning." Any areas of pinpoint corrosion were blasted down to bare steel in accordance with SSPC-SP 10/NACE No. 2, "Near White Blast Cleaning" and filled with a 100-percent-volume-solids epoxy pit filler. All carbon steel surfaces received a coat of the 100-percent-volume-solids epoxy at 14-to-16 mils DFT.

Case No. 2: Wastewater Clarifier

Background

A high-rate, solids-contact industrial wastewater clarifier located in the Caribbean was shop primed and field finished with an 80-percent-volume-solids cycloaliphatic epoxy, with a total DFT of 12 to 16 mils. Upon final curing of the epoxy lining, the clarifier was hydrostatically tested and partially drained to half capacity.

Problem

After several weeks, widespread pinpoint corrosion was observed below the temporary water level. The frequency of the pinpoint corrosion was atypical for coated carbon steel immersion service (Fig. 2, p. 34).

Cause

A field investigation found that the shop-applied primer had exceeded the maximum recoat window and was scarified by the field applicator prior to the application of the second field coat. The field applicator unwittingly used coarse abrasive for the brush-off blasting — 20/65-mesh silica sand — instead of a fine abrasive, which resulted in fracturing the primer coat down to bare metal. The field finish was invariably thin in these areas and allowed the water to reach the carbon steel substrate. The vast amount of bare stainless steel coupled to the carbon steel caused accelerated corrosion.

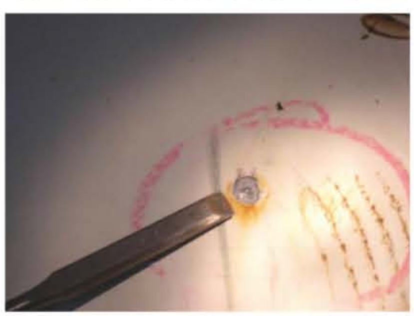


Fig. 1: Blister cap removed revealing pit. Photo courtesy of the authors.

Remediation

The stainless steel components were abrasive-blasted in accordance with SSPC-SP 16 to a 3-mil anchor profile using aluminum-oxide media and topcoated with an 80-percent-volume-solids cycloaliphatic amine epoxy at 8-to-10 mils DFT. The carbon-steel surfaces were uniformly abrasive brush-off blasted in accordance with SSPC-SP 7/NACE No. 4 with fine abrasive. Any areas of pinpoint corrosion were blasted down to bare steel in accordance with a SSPC-SP 10/NACE No. 2. All carbon steel surfaces received two coats of the 80-percent-volume-solids epoxy for a total thickness of 14-to-16 mils DFT.

Case No. 3: One-Million-Gallon Water Tank with Mixer

Background

An existing one-million-gallon, multi-column (legged), elevated carbon-steel water tank located in the southeast United States was retrofitted with a stainless-steel mixing system that was bolted to the inlet/outlet pipe flange in the wet riser and extended up approximately 75 percent of the height of the tank (Fig. 3, p. 35). The carbon-steel tank surfaces were lined with a three-coat system consisting of a zinc-rich, moisture-cured polyurethane primer followed by two coats of a 67-percent-solids epoxy.

Problem
Within six months, the owner found considerable pinpoint corrosion and pitting of the carbon steel.

Cause
The stainless steel was causing a large area ratio of bare stainless to coated carbon-steel metal. Although the greatest frequency was occurring adjacent to the dissimilar metal coupling junction, there was an extensive amount of random pitting along the wet riser and tank belly, and sidewall.

Remediation
The stainless-steel mixing system was abrasive blasted in accordance with SSPC-SP 16 to a 3-mil anchor profile using aluminum-oxide media and topcoated with two coats of a 67-percent-volume-solids amine epoxy at 10-to-12 mils DFT. The carbon-steel surfaces were spot abrasive brush-off blasted in accordance with SSPC-SP 7/NACE No. 4. Any areas of pinpoint corrosion were blasted down to bare steel in accordance with a SSPC-SP10/NACE No. 2 and coated with two coats of the 67-percent-volume-solids epoxy at 10-to-12 mils DFT

Case No. 4: Activated Sludge Sewage Treatment Plant
Background
A 52,000-gallon-per-day package wastewater treatment plant located in the southern United States was factory-built with quarter-inch structural carbon steel (A-36) plate for the sidewalls, bottoms and partitions joined together by welding. Piping, brackets and other miscellaneous materials were constructed of 316 stainless steel (Fig. 4, p. 35). All submerged or intermittently submerged surfaces were coated with a single-component, moisture-cured polyurethane primer containing micaceous iron oxide and zinc particles; followed by two coats of a hydrocarbon-modified moisture-cured aromatic polyurethane. The total minimum DFT was specified at 15 mils.

Fig. 2: Pinpoint corrosion nodules that formed on the coated carbon steel. Photo courtesy of the authors.

Problem

Approximately a year-and-a-half after the plant was put into service the owner noticed areas of pinpoint corrosion and several relatively large pits in the carbon steel. The corrosion was occurring in the welds, on the steel shell away from welds and near the junction of two metals.

Cause

The DFT of the protective coating system was measured and found to range from 4 mils up to approximately 12 mils. This low film thickness, along with the large area ratio of the bare stainless steel coupled with the carbon steel was accelerating the corrosion.

Remediation

The stainless-steel members were abrasive-blasted in accordance with SSPC-SP 16 to a 3-mil anchor profile using aluminum-oxide media and topcoated with the specified, three-coat coating system to achieve a minimum 15 mils DFT. The carbon-steel surfaces were dry-abrasive brush-off blasted in accordance with SSPC-SP 10/NACE No. 2 to remove the nonconforming coating system and then recoated with the specified system.

Case No. 5: Concrete Water Reservoir

Background

An eight-million-gallon, below-grade, concrete potable-water storage reservoir located in the western United States was experiencing accelerated corrosion to the exterior surfaces of the ductile iron (DI) influent pipe and fittings (Fig. 5, p. 36). A contract was issued by the owner to replace a portion (approximately half) of the DI pipe and fittings.

The exterior surfaces of the remaining (existing) DI pipe and fittings were specified to be prepared in accordance with NAPF 500-03, (National Association of Pipe Fabricators, Inc., "Surface Preparation Standard for Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special

STUDY CONCLUSIONS

A simple laboratory experiment was conducted for a period of six months to investigate the appearance and practical effects of galvanic coupling of stainless steel and carbon steel metals. This study demonstrated that the area ratio of the uncoated stainless-steel cathode relative to the coated carbon-steel anode is a significant factor in the corrosion rate at any holidays in the coating film of the anode. The current generated by the stainless-steel cathode is much more intense falling on a highly localized carbon-steel anodic site even if the two metals are separated by considerable distance — approximately 50 feet in our case. This study also revealed the typical corrosion nodule formation and subsequent passive-film staining as a result of galvanic corrosion.

The application of a protective coating to the stainless-steel panel greatly reduced the galvanic corrosion at the artificial pinholes on the carbon-steel panels. However, all protective coatings are semi-permeable and eventual water migration through the protective coating applied to the stainless-steel panel will initiate a galvanic cell, albeit significantly reduced compared to bare stainless coupling. Therefore as demonstrated, the application of a protective coating to stainless steel can reduce, but perhaps not eliminate, the effects of galvanic corrosion.

For more information on this study originally presented at SSPC featuring GreenCOAT, visit sspc.org.

External Coatings and/or Special Internal Linings") and receive two coats of a 70- or 80-percent-volume-solids, NSF/ANSI Standard 61 ("Drinking Water System Components – Health Effects")-certified epoxy at 10-to-14 mils DFT. The painting contractor elected to use the 80-percent-solids-phenalkamine epoxy by "Manufacturer A" for the existing DI pipe and fittings, and the 70-percent-solids-polyamidoamine epoxy by "Manufacturer B"

Fig. 3: Stainless steel mixing system bolted to the carbon-steel inlet/outlet piping. Photo courtesy of Andrew Kirby, PE.

because the new DI pipe and fittings were supplied with this as the prime coat. The new DI pipe and fittings were uniformly abrasive brush-off blasted with a fine abrasive media and topcoated with a field topcoat at 5-to-7 mils DFT. The completed coatings were cured for seven days in a ventilated,

Fig. 4: Bare stainless steel piping and support brackets bolted to coated carbon-steel tank wall. Photo courtesy of the authors.

controlled environment prior to immersion service.

Problem

At the one year anniversary inspection, accelerated pinpoint corrosion was observed on both the existing and newly installed DI pipe and fittings (Fig. 6, p. 36).

Cause

The cause of accelerated corrosion to the ductile iron pipe (and the carbon steel brackets) appeared to be the result of dissimilar-metal corrosion. The uncoated stainless steel, including the valve stem, ladder safety climb and anchor/flange bolts, coupled with the ferrous metals, had

Fig. 5: Accelerated corrosion of the ductile iron pipe surfaces prior to contract. Note stainless steel anchor bolts on pipe support (right). Photos courtesy of Carl Bowers, Amos and Associates.

accelerated the corrosion of the anodic ferrous metals (i.e., the DI pipe and carbon steel). This deduction was based on the following observations:

- Heavily corroded and pitted existing DI pipe;
- The nature of the corrosion tubercles on the existing and newly coated DI pipe;
- Corrosion tubercles forming on the carbon-steel pipe brackets and valve-stem brackets; and
- Similar corrosion occurring with two different coatings.

Notwithstanding the anchor/flange bolts, the other bare stainless-steel components were also believed to be electrically connected via direct contact with rebar and moisture in concrete, thereby establishing the "metallic pathway." Insufficient film thickness or pinholes in the coating were the root cause of the corrosion allowing the electrolyte (water) to contact these metals. However, the surface-area ratio of the coupled bare stainless steel to carbon steel, via pinholes or thin spots, was accelerating the corrosion.

Remediation

A recommendation was made to abrasive-blast the stainless-steel components in accordance with SSPC-SP 16, to a 3-mil anchor profile using aluminum-oxide media, and then topcoat with an 80-percent-volume-solids amine epoxy at 14-to-16 mils DFT. The recommendation was made to abrasive-brush-off blast the carbon-steel and ductile-iron surfaces. Any pits were to be filled with a 100-percent-volume-solids epoxy pit filler. All carbon-steel and ductile-iron surfaces were to receive a coat of the 80-percent-volume-solids epoxy at 14-to-16 mils DFT.

Summary

The best prevention for galvanic corrosion is to eliminate the galvanic couple by design, if possible. If this is not practical, the next best course of action is to apply a protective coating to the stainless-steel components in order to decrease the effects of the area ratio. This will greatly reduce, but not eliminate, the effects of galvanic coupling and can be best accomplished by using 15 mils DFT of an epoxy protective coating.

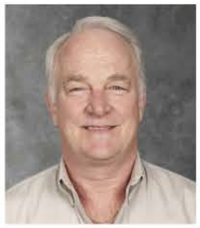
Fig. 6: Existing DI pipe (left) and new pipe at the one-year inspection (center and right). Photos courtesy of Carl Bowers, Amos and Associates.

About the Authors

Vaughn O'Dea is the director of sales for water/wastewater at Tnemec Company, Inc. and has 15 years of experience in the protective coatings industry. He is an SSPC-certified Protective Coatings Specialist (PCS) and a NACE-certified Coating Inspector. A graduate of the University of Kansas, O'Dea is a contributing editor of the *JPCL* and was named a *JPCL* Top Thinker in 2012.

Travis C. Tatum is a licensed Professional Engineer and president of Dunham Engineering, Inc., specializing in engineering inspection, design and corrosion control for structures and tanks. He graduated from Texas A&M University in 2001 and earned a Master's degree in 2008. Tatum holds coating inspection credentials from SSPC and NACE.

Pat Barry of the Barry Group is a NACE-Certified Coating Inspector - Level 3 who has been working in the coating industry since 1992, specifying high-performance protective coating systems and analyzing coating problems throughout the Houston, Austin and Rio Grande Valley areas.



Paul B. Higgins is a senior sales consultant for the Barry Group and is responsible for specifying high-performance protective coating systems throughout southeast Texas. He earned Bachelor's and Master's degrees from Texas A&M University. Prior to his present employment, Higgins managed water tank maintenance programs in Texas with the Utility Service Company, Inc. ***JPCL***

Photo: Pamela Simmons

KNOCKING TWO OUT OF THE PARK

RECOATING HIGHLY VISIBLE WATER TANKS

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

What do you get when you combine two baseball fields, a basketball court, an off-leash dog park, a historic cemetery, picnic pavilions, playgrounds, three football fields, a tennis court, a tot playground, green space, trees, trails ... and two ugly water tanks in need of repainting? A challenge.

The History

The two 1,500,000-gallon-water-storage reservoirs that overlook the 125-acre Fairview Park in South Fayette Township, Pennsylvania were constructed in 1953 on the grounds of Mayview State Hospital. The one-time poor house, home for unwed mothers and mental institution closed its doors in 2008 and the grounds and all structures were sold to a private investor in 2010. In 2011, consultants evaluated the tanks to determine what remediation and maintenance would be required to integrate them into Pennsylvania American Water's existing water-distribution system.

The tanks had been empty for an unknown number of years, allowing time and nature to take their toll on the structures. Although the exteriors of the tanks, dubbed the "North Tank" and the "South Tank," were in relatively good condition (limited coating failures, vines growing up the tank shells, and the usual graffiti commonly found at unsecured sites), the coatings on the tank interiors were in much worse condition. The roof-support structure of each tank interior consisted of a labyrinth of rafters and circumferential stiffeners with peeled and failing coatings abounding. On the South Tank, approximately 55 percent of the roof and support structure was rusted and pitting up to .125-inch deep was found on the interior shell. In addition to the coating issues encountered in and on the tanks, numerous safety, sanitary and operational deficiencies were also noted. However, for Pennsylvania American Water, the tanks represented an opportunity to add significant capacity to their existing system, thereby helping to provide their customers with sufficient water pressure and firefighting capabilities, even during water-main breaks and planned maintenance outages.

According to facility records, the tanks were last repainted in 1995 with what appeared to be an epoxy coating system on the tank interior and an alkyd coating system on the tank exterior. Laboratory testing of the coatings indicated that the exterior coatings contained lead.

Specifications

The tank interiors were to be cleaned to an SSPC-SP 10/NACE No. 2, "Near White Blast Cleaning" using a recyclable steel grit. However, once abrasive-blast-cleaning began, it was discovered that the existing coal-tar epoxy on the tank interiors clung to the abrasive, fouling it and rendering it non-recyclable. The contractor then elected to perform an initial blast on the tank interior using a low dusting and silica-free, expendable media, followed by a brush-off blast using the recyclable steel grit to achieve the required cleanliness and surface profile. Peeled coatings and coating debris tested positive for regulated heavy-metal content and had to be handled and disposed of as hazardous waste.

The tank exteriors were cleaned to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." Due to the heavy-metal content of the existing coatings, a self-contained robotic blast unit was used for the majority of the tank exterior surfaces. A vacuum blast system that met the requirements of a Class II-certified system (suitable for combustible dust) was used to clean the exterior surfaces that could not be effectively contained within the robotic unit. Additionally, mini-containment was used in areas such as the lower portions of the tank shell, portions of the roof knuckle and surfaces around the tank appurtenances. The mini-containment included the use of a 40,000-cfm dust collector.

The Setting

The unique site for these tanks proved to be both advantageous and challenging. There was pedestrian traffic that could complicate the repair, cleaning and repainting operations. Due to public access to the tank site just outside the park grounds, people might have felt free to stroll through the area creating a potential safety hazard not just for themselves, but also for workers at the site. A fence was erected to cordon off the area providing a secure worksite and limiting the owner's liability for future unauthorized access to the tanks and surrounding area.

Because the two tanks were already out of service and located in close proximity to each other (approximately 14 feet apart), cleaning and painting operations were coordinated to be performed simultaneously, with the contractor's crews moving from one phase of the cleaning and coating operations on one tank to the other. This allowed the crews to more efficiently use the specialized equipment, minimizing equipment staging and tear-down time.

AWWA D102, "Coating Steel Water-Storage Tanks" is the industry reference standard for coatings that can be applied to the exterior and interior surfaces of a water storage tank. Coating and lining systems to be applied to the interior surfaces are selected primarily for their permeability ratings as their primary function is to provide a barrier between the steel and water stored in the tank (the electrolyte of a corrosion cell).

For any tank that contains potable water, the interior coating must be NSF/ANSI 61-("Drinking Water System Components – Health Effects") approved.

The exterior coating system's primary function is to provide a barrier between the atmosphere and the underlying steel. However, other important factors such as aesthetics (color and gloss retention) and ultraviolet degradation must be considered as well.

Project specifications called for the tank interior to be coated with AWWA D102 Interior System No. 3, a 100-percent-solids-elastomeric-aromatic urethane and the exterior coated with an AWWA D102 Exterior System No. 2, a three-coat zinc/epoxy/polyurethane coating system. Dehumidification was used during the curing of the interior coating and a 390,000-Btu heater was enlisted on cool mornings to heat the tanks to achieve a proper coating cure. The use of the 100-percent-solids coating has become more prevalent as tank owners have concerns about solvents such as xylene and higher VOC levels potentially leaching into the potable water to be stored in the tank, and also because these coatings can be applied and cured at lower temperatures than can higher-solvent coatings, extending the coating season in colder

Robotic blasting equipment preparing exterior surfaces for coating. Photo courtesy of Tank Industry Consultants.

areas of the country. The 100-percent-solids coating also lends itself to covering difficult-to-coat areas such as the intricate maze of rafters, bolts and connections in the roof support structure because it can be applied at heavier mils than higher-solvent coatings. High-voltage holiday testing was performed on the tank interior shell, floor and roof following coating application to uncover voids in the coating that were then touched up by the contractor's crew.

Zinc primer was used on the tank exterior to extend the life of the coating system. The sacrificial nature of zinc primer has a tendency to "self-heal," protecting the underlying steel at areas of coating failure. The epoxy intermediate coat provided good resistance to abrasion and excellent corrosion resistance. The polyurethane finish coating provided a glossy finish showcasing the Township's and tank owner's logos that were applied to the tanks. The kelly-green color selected for the tank exteriors was a nod to the Township's signature green. The logos painted on the tanks were those of South Fayette High School and the Pennsylvania American Water. The one-time abandoned eyesores now promoted the area's assets.

During the unveiling ceremony in December of 2013, Pennsylvania American Water invited local officials and firefighters to enter the tank for a rare glimpse of the mammoth interior, offering a new perspective into the work that goes into rehabilitating these functional landmarks.

First Anniversary Evaluation

On June 10 and 11 of 2015, the project consultant and contractor returned to the tank site to perform a first-anniversary evaluation. The interior and exterior coatings were in very good overall condition and are expected to fulfill their anticipated service life of 18-to-20 years. The tanks will be evaluated again in June of 2018, for the five-year warranty evaluation.

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

View of interior roof and support system with rigging couplings in place. Photo courtesy of Tank Industry Consultants.

is responsible for scheduling and overseeing all work conducted by TIC's staff of civil, mechanical, chemical, and structural engineers, and 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 presented papers at several AWWA, SSPC and NACE regional and national conferences. In addition, Stein has authored a number of papers including case studies on significant water tank projects. He previously served as a member of the Board of Directors for the Steel Tank Institute and Chair of the STI Field-Erected Steel Tank Committee.

Stein holds a Bachelor of Science degree in mechanical engineering from the Rose-Hulman Institute of Technology with a concentration in structural and material analysis. ***JPCL***

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TECH PROGRAM PLANNED FOR SSPC 2016

SSPC 2016 featuring GreenCOAT, SSPC's annual conference and exhibition and the only conference dedicated 100 percent to protective, marine, industrial and commercial coatings, will return to the Henry B. Gonzalez Convention Center in San Antonio, Texas, from January 18 to 21, 2016.

A full range of training courses, workshops, technical presentations, committee meetings, panel discussions, peer forums, exhibitors, special events and networking opportunities will be available to SSPC 2016 attendees. An awards ceremony and the second-annual Poster Session, which highlights research projects done by students or young professionals, are also scheduled for the conference.

Upcoming issues of the *JPCL* will preview the SSPC 2016 conference and exhibition. This month's preview offers a list of the presentations and workshops scheduled in the SSPC 2016 technical program. Information is subject to change; for updates, visit sspc2016.com.

MONDAY, JANUARY 18

Afternoon — 1:30 to 4:30 p.m.

Session 1: Working in the Coatings Industry — What You Need to Know!

• "SSPC Programs: Learn About What SSPC Has to Offer," by Jennifer Merck, Terry Sowers, Aimee Beggs, Jim Kunkle and Michael Kline, SSPC.

• "Coatings Industry Standards: Are You Current?" by William D. Corbett, PCS, KTA-Tator, Inc.

• "Developing an Effective Coating Specification," by Breck A. Vernon, Coating & Lining Technologies Inc.

• "Corrosion Control Training for Ground Combat and Tactical Equipment," by James Ellor, P.E., Elzly Technology Corporation

• "Surface Preparation and Paint Application Training for Shipboard Organizational Level Corrosion Control," by Michael Damiano, PCS, SSPC.

Session 2: Workshop

• "Coating Failure Investigations in Action," by Cynthia O'Malley, PCS, and Chrissy Stewart, PCS, KTA-Tator, Inc.

Session 3: Environmental, Health and Safety Regulations

• "Regulatory Update: Confined Space in Construction and More," by Alison B. Kaelin, CQA, ABKaelin, LLC

• "The Principles of Working at Heights," by Mino Muhanad Alkhawam, Tractel

• "Green Coatings from a Global Perspective," by Don Futch, Jotun Paints, Inc.

• "Integrated Loss Prevention and Control: A Three-Pronged Approach," by Steven Grego, CSP, KTA-Tator, Inc.

• "29 CFR 1926.1200 — The New OSHA Confined Spaces in Construction Standard: What's Different," by Charles Brown, PCS, Greenman-Pedersen, Inc.

Session 4: Workshop

• "Overview of Health, Safety and Stewardship Programs for Polyurethane Coatings," by Scott Ecoff, Lisa Marie Nespoli and Ahren Olson, Covestro LLC

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TUESDAY, JANUARY 19

Morning — 8:30 to 10:00 a.m.

Session 1: Adhesion

• "Superhydrophobic Versus Freezing Point Depression — Exploring Different Chemistry and Test Methodology of Ice Adhesion to Coatings," by Andrew Recker, BASF Construction Chemicals
• "Improving Performance — Increasing Adhesion of Solvent-Borne and Waterborne Epoxy Primers," by Ronald Brashear, BYK Additives Inc.
• "It's All About Adhesion," by Guerman Vainblat, P.E., and Timur Kolchinskiy, E.I.T., Greenman-Pedersen, Inc.

Session 2: Commercial Painting Programs — Challenges, Solutions, and Opportunities, Part I

• "Case Study: Decorative Yet Functional Floor Coating at the Energy Innovation Center," by Steven Reinstadtler, Covestro LLC
• "Beating the Odds for Successful Flooring Installations," by Fred Goodwin, BASF Construction Chemicals
• "Using Lead Abatement Contractors for Surface Preparation on Commercial Properties — The Consequences of Sacrificing Quality for Safety," by Raymond S. Tombaugh, KTA-Tator, Inc.

Session 3: Wastewater Coating Challenges and Solutions

• "Standards, Training, and Certification in the Wastewater Industry," by Robert Murphy, PCS, The Sherwin-Williams Co.
• "Pull-Off Adhesion Strength Testing of Lining Systems on Concrete: A Review of the Various Direct Tensile Test Methods Used for Severe Service Exposures," by Vaughn O'Dea, PCS, and Cory Brown, Tnemec Company, Inc.
• "Applying Common Sense to Moisture Vapor Emissions and Moisture Content Requirements When Coating Concrete Substrates in Wastewater Applications," by Randy Nixon, Corrosion Probe, Inc.

Session 4: Coating Types

• "20-Year Color Lifetimes of Protective Coatings — Theory and Reality," by Charles Weidner, Arkema Inc.
• "Secrets to Success — Examining the History and Chemistry Behind the Performance of Vinyl Resin Coatings," by David Tordonato, Ph.D., PCS, U.S. Bureau of Reclamation
• "Selecting the Proper Coating Over Hot-Dip Galvanized Steel Using SSPC-Guide 19," by Kevin Irving, AZZ Galvanizing Services

Mid Morning — 10:30 a.m. to 12:30 p.m.

Session 1: Workshop

• "SSPC 2016 Coating Inspectors' Forum," by Earl Bowry, PCS; and J. Peter Ault, P.E., PCS, Elzly Technology Corporation

Session 2: Commercial Painting Programs — Challenges, Solutions and Opportunities, Part 2

• "Case Study: Setting Up a Commercial Coatings Inspection Program," by Davis Kyle, Master Painters Institute; and Richard Bright, Bright Concepts, Inc.

• "Commercial Building Cleaning, Painting and QC Requirements — Differences Between 'High Performance' and 'Conventional' Commercial Coatings," by Jeff Theo, PCS, and Doug Pigue, Vulcan Painters

Session 3: Oil & Gas, Part 1

• "Standards, Training, and Certification in the Oil & Gas Industry," by Ernst Toussaint, E.I.T., PCS, TransCanada

• "Piping's Kryptonite: Understanding Repair Options for Piping with Section Loss," by David Hunter, PCS, NRI

• "Test Methodology to Reflect Changes Within the Oil and Gas Linings Market," by Michael Harrison, Hempel A/S

• "Tungsten Powder Thermal Spraying in the Oil & Gas Industry," by Herman E. Amaya, OneSubsea

• "Use of Induction Heating for the Pre-Heating and Post-Curing of Liquid Epoxy Coatings on Gas Pipelines," by Bruce Wiskel, Pacific Gas & Electric; and J. Peter Ault, P.E., PCS, Elzly Technology Corporation

Session 4: Concrete Protection Solutions

• "Update to SSPC-PA 9 Paint Application Specification," by David Beamish, DeFelsko Corporation

• "Moisture Testing and Inspecting for Concrete Floors to Receive Coatings," by Brian O'Farrell, PCS, MCI, DP Coatings Ltd.

• "Leak Mitigation of Dynamic Cracks in Concrete," by Charlie Lerman, Avanti International

• "Application Concerns and Practices for Applying Conductive and Static Dissipative Coating to Concrete," by Steve Schroeder, Dex-O-Tex division of Crossfield Products Corp.

Afternoon — 1:30 to 4:30 p.m.

Session 1: Bridge Painting and Protection

• "Shop Painting vs. Field Painting of Steel Bridges: Pros and Cons," by Charles Brown, PCS, Greenman-Pedersen, Inc.

• "The Use of a Duplex Protective Coating System for a KYTC Rapid Reconstruction Bridge Project," by Bobby Meade, Greenman-Pedersen, Inc.

• "Two-Coat Polyaspartic Urethane Coatings Protect Virginia Steel Bridge Structures for Over a Decade," by Ahren Olson, Covestro LLC; Mark Hudson, The Sherwin-Williams Company

• "New Developments in Fluorourethane Coatings for Bridges," by Robert Parker and Kristen Blankenship, AGC Chemicals Americas, Inc.

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• "Assessment of CBPC Coating in Wet Exposure by Electro-Chemical Testing," by Md Ahsan Sabbir, Florida International University

Session 2: Commercial Painting Programs — Challenges, Solutions and Opportunities, Part 3
• "Case Study: Coating Failure or Building Failure," by Kevin Brown and Ken Trimber, PCS, KTA-Tator, Inc.
• "Are You Ready to Pursue Today's Greatest Market Opportunity in the Coatings Industry? Millions of Square Feet of Commercial Walls Need Air Barriers. What Do You Need to Know to be a Part of this Emerging Market?" by Kevin Knight, Edifice Tutorial; and David de Sola, 3iVE
• "Traffic Bearing Coating Systems in the Parking Structure Market," by Lawrence W. Mosby IV, NEOGARD Construction Coatings

Session 3: Defending Against Corrosion in the Military
• "Translational Corrosion Science in Action," by Daniel Dunmire, Department of Defense/LMI
• "Department of Navy Corrosion Control and Prevention Executive (DON CCPE) Overview," by Matthew Koch, DON CCPE, ASN RD&A — DASN RDT&E
• "The Greatest Challenge in Corrosion Prevention and Control is Apathy," by Dr. Roger D. Hamerlinck, U.S. Army Office of the Army CCPE
• "Impact and Abrasive Resistant Coatings and Overlays for Immersion Structures in Severe Environments," by Jeffrey Ryan, U.S. Army Corps of Engineers
• "Institutionalizing Corrosion Prevention and Control in the USAF," by Jeffrey Nusser, U.S. Air Force

Session 4: Cultural Issues in the Workplace
• "Creating a Culture of Leadership; Strategic Planning Workshop by Women in Coatings," by Cynthia O'Malley, PCS, KTA-Tator, Inc.
• "Recruiting Young Adults into the Coatings Business," by Chris Hooter, PCS, Prairie Finishing Trades Institute (PFTI)

WEDNESDAY, JANUARY 20

Morning — 8:30 to 10:00 a.m.
Session 1: Mini Session
• "Green Tank Linings — Are They Better?" by Don Futch, Jotun Paints, Inc.
• "CO_2 and The Partial Pressure Bandit," by James McDonald, Hempel

Session 2: Mini Session
• "The Manufacturer's Standard Coating System — What It Can mean to the Stakeholders in the Equipment Purchasing Processes," by Steve L. (Harry) Harrison, WorleyParsons; and Kristin Leonard, Bechtel Corp.

Session 3: Mini Session:
• "Radar Absorbing Materials for Defense Applications," by Dr. Andrew Amiet, Defense Science and Technology Organisation (Australia)
• "Chemical Agent Resistant Coating (CARC) System for Military Vehicles," by Alex Piazza, Elzly Technology Corporation

Session 4: Mini Session
• "Formulators in the Field: The Effect of Overcure or Undercure of Polyclamine Cured Epoxy Linings," by Michael O'Donoghue, Ph.D., and Vijay Datta, M.S., International Paint LLC

Session 5: International Spotlight Session
• "An Overview and Comparison of Surface Cleanliness Standards for the Protective Coatings Industry," by Nico Frankhuizen, TQC B.V.

Mid-Morning — 10:00 a.m. to 12:00 noon
Session 1: Power
• "Coating Modern Wind Turbines — How Hard Can It Be?" by Benedicte R. Sorensen, Jotun AS
• "The Nuclear Renaissance, Painting Vogtle 3 & 4," by Richard L. Smith, II, PCS, Williams Specialty Services, LLC
• "Unique Application of Epoxy Gel to Eliminate Penstock Cavitation and Potentially Improve Turbine Power Generation Efficiency," by Norm Klapper, Process Equipment Corporation
• "Styrene-Free Coatings for Flue Gas Desulfurization Applications," by Mike Durbin, The Sherwin-Williams Company

Session 2: Panel Discussion — Agree to Disagree
• "Exploring Differing Views on Causes of Coating Failures," moderated by Dwight Weldon, PCS, Weldon Laboratories, Inc.; with panelists Michael O'Brien, MARK 10 Resource Group, Inc.; Charles Harvilicz, PCS, Newport News Shipbuilding; and Dudley Primeaux, PCS, VersaFlex, Inc.

Session 3: Surface Preparation — The Foundation of Every Coating Project
• "Measuring Sodium Chloride and Soluble Contaminants," by Nico Frankhuizen, TQC B.V.
• "Myth or Fact? Higher Surface Profile Increases Coating Adhesion," by Brad Gooden, Blast-One International
• "Effect of Surface Preparation on Coating Performance," by Patrick Cassidy, Elzly Technology Corporation
• "Improving Surface Preparation Productivity Using Rectangular Blasting Nozzles," by Chang-Hun Lee, Hyundai Heavy Industries Co. Ltd.

Session 4: Workshop
• "Waterborne Coatings for Commercial Architecture," by Dr. Leo Procopio and Laura Vielhauer, The Dow Chemical Company

Afternoon — 3:00 to 5:00 p.m.
Session 1: Protecting Ships and Marine Structures, Part I
• "Standards, Training, and Certification in the Marine Industry," by Earl Bowry, PCS
• "Development of Materials and Process Metrics for High Performance Abrasive Blast Surface Preparation," by Robert Kogler, PCS, and Laura Erickson, Rampart, LLC
• "Surface Preparation & Coatings Panel 2016 Update," by Arcino Quiero, Jr., Newport News Shipbuilding
• "Using the Latest Digital Inspection Tools — NSRP Panel Project Final Report," by Joseph Walker, Elcometer

Session 2: Women's Program

Session 3: Inspection — Assuring Performance and Quality
• "Corrosion: Domesticated and in the Wild," by Carl Reed, AkzoNobel
• "Small Expense, Big Reward — The Impact and Value of Quality Assurance Testing of Coatings for Steel Structures," by Brooke Divan, M.Sc., and Rebekah Wilson, Ph.D., USACE Paint Technology Center
• "Inspecting Hot-Dip Galvanized Steel," by Bernardo Duran, AZZ Galvanizing Services

Session 4: Workshop
• "An In-Depth Look at Standards Most Frequently Used by Industrial Painters," by L. Skip Vernon, PCS, MCI, Coating & Lining Technologies, Inc.; and Michael Damiano, PCS, SSPC

THURSDAY, JANUARY 21

Morning — 8:30 to 10:00 a.m.
Session 1: Mini Session
• "Novel Acrylic Epoxy Hybrid Coatings," by Zhenwen Fu, Ph.D., The Dow Chemical Company

Session 2: Mini Session
• "Case Study: Telecom Meets Water Tower," by Chris Wolfgram and Dan Zienty, PCS, Short Elliott Hendrickson, Inc.

Session 3: Mini Session
• "Modern Corrosion Testing," by Sean Fowler, Q-Lab Corporation

Session 4: Mini Session
• "The Impact: Traveling Faster than the Speed of Sound, Protective Coatings at Work," by Dudley J. Primeaux II, PCS, and Todd Gomez, PCS, VersaFlex Incorporated

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Mid-Morning — 10:00 a.m. to 12:00 noon

Session 1: Protecting Ships and Marine Structures, Part 2

• "New Advances in Epoxy Protective Coatings," by James McCarthy, PPG Protective & Marine Coatings

• "Improvement of Weatherability for Epoxy Coatings on Marine Structures," by SangMoon Shin, Hyundai Heavy Industries Co. Ltd.

Session 2: Specification Issues

• "Inconsistent Coatings Specification Language Between Divisions," by Laura Blechl, DECO Coatings

• "Equifinality: Specifying Performance," by Troy Fraebel, PCS, The Sherwin-Williams Company

• "Standards Used for 'Partial' Abrasive Blasting During Maintenance Painting," by J. Peter Ault, P.E., PCS, Elzly Technology Corporation

Session 3: Green Evolution

• "Waterborne Functional Coatings: Combating Noise, Heat and Air Pollution," by Dr. Leo Procopio, The Dow Chemical Co.

• "Green Solvents — Replacing Dirty & Toxic with Clean & Green," by Dave A. Pasin, TBF Environmental Technology, Inc.

• "Ultra-Low VOC Waterborne Alkyd Coatings with Exceptional Corrosion Resistance," by Erin Vogel, Ph.D., The Dow Chemical Company

• "Novel 2K Epoxy-Hardener System with Superior Performance and Minimum Impact on Health and Environment," by Ramon Sanchez-Morillo, Ph.D., Allnex USA Inc.

Session 4: Oil & Gas, Part 2

• "Coatings for the Prevention of Corrosion Under Insulation," by Michael MeLampy, PPG Industries

• "The Good, The Bad and The Smugly: The Importance of Monitoring OEM Coating Selection and Application by Sub-Tier Vendors," by Richard A. Burgess, PCS, KTA-Tator, Inc.

Afternoon — 3:00 to 5:00 p.m.

Session 1: Business

• "Five Business Development Moves to Make Now," by Jon Goldman, Brand Launcher

• "Work Packages: Development and Use," by Doug Sawyer, PCS, CDS Custom, LLC

Session 2: Workshop

• "Failure Analysis of Paints and Coatings," by Dwight G. Weldon, PCS, Weldon Laboratories, Inc.

Session 3: Workshop

• "Thermal Spray Coatings," Grant Blohm, Structural Technologies

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WEFTEC 2015 Returns to Chicago

McCormick Place in Chicago, Ill., will host the 88th annual Water Environment Federation Technical Exhibition and Conference (WEFTEC) from September 26 to 30. The largest water quality event in the world, according to the Water Environment Federation (WEF), this yearly conference will feature workshops, technical sessions, water and wastewater treatment facility tours, an exhibition hall with over 1,000 exhibitors and more.

Focus areas for WEFTEC 2015 technical program include: Research and Innovation; Industrial Issues and Treatment Technologies; Municipal Wastewater Treatment Process and Design; Facility Operations and Maintenance; Residuals and Biosolids Management; Disinfection and Public Health; Collection Systems and Distribution; Stormwater Management; Watershed Resources Management and Sustainability; Utility Management and Leadership; Water Reclamation and Reuse; and Future Insights and Global Issues.

The following technical sessions may be of interest to protective coatings professionals. For more information, visit www.weftec.org.

- Workshop: "Combatting Hydrogen Sulfide Corrosion in Wastewater Systems: Infrastructure at Risk!" Sat., Sept. 26, 8:30 a.m. to 5:00 p.m.
- "Collection System Odors and Corrosion," Wed., Sept. 30, 8:30 a.m. to 12:00 noon
- Workshop: "Confined Space Entry Training," Wed., Sept. 30, 9:00 a.m. to 3:00 p.m.
- "Corrosion Protection of Wastewater Infrastructure Using High-Performance Protective Coatings: Innovating Technologies That Meet Demanding Sustainability Requirements," Wed., Sept. 30, 1:30 to 5:00 p.m.

Exhibitors at WEFTEC 2015

The following is a list of exhibitors at WEFTEC that may be of interest to protective coatings professionals. For a complete exhibitor list, visit the WEFTEC website.

3M	358j
A.W. Chesterton Company	2074
American Water Works Association (AWWA)	5138
AP/M Permaform/ConShield Technologies	514
Arizona Instrument	528
Ashland	5535
Atlas Copco Compressors LLC	634
C.I.M. Industries Inc.	4389
Carboline Company	4203
CCI Pipeline Systems	2703
Containment Solutions	406
Contech Engineered Solutions	320, 4505
Denso	5431
Draeger Safety, Inc.	503
Gardner Denver, Inc.	1843
Graco, Inc.	4986
Induron Coatings Inc.	2667
Jack Doheny Companies Inc.	4352
KCH Engineered Systems	5631
Kerneos Inc.	5131
MSA, The Safety Company	1953
NACE International	976
NETZSCH Pumps North America, LLC	1461
Pittsburg Tank & Tower Maintenance Co.	5172
PPG Protective & Marine Coatings	5271
Quadex/Interfit	1023
Raven Lining Systems	916
ResinTech, Inc.	5315
Sauereisen, Inc.	2701
The Sherwin-Williams Co.	4420
Solvay Chemicals, Inc.	3514
Specialty Products, Inc.	5644
SpectraShield Liner Systems	452
Sprayroq Inc.	3656
SSPC: The Society for Protective Coatings	524
Sulzer Pump Solutions Inc.	1448
Sunbelt Rentals	4249
Terre Hill Composites	5616
Tnemec Company, Inc.	1248
United Rentals	5054
U.S. Environmental Protection Agency	4467
Vactor Manufacturing	2442

Photo courtesy of the New Orleans Ernest N. Morial Convention Center.

New Orleans Welcomes WJTA-IMCA Conference

The WaterJet Technology Association (WJTA) and the Industrial Municipal Cleaning Association (IMCA) will bring the annual WJTA-IMCA Conference and Expo back to the Ernest N. Morial Convention Center in New Orleans, La., from November 2 to 4. This show is dedicated to high-pressure waterjet/hydroblast tools, equipment and services; industrial vacuum trucks and hydro-excavators; and related industrial cleaning and safety equipment.

The conference will be composed of educational "Boot Camp" sessions, a day-long "Waterjet Technology Basics & Beyond" short course, technical research papers and case studies, live outdoor demonstrations, an exhibit hall, networking receptions and more. Major themes for this year's conference include the application and development of mechanized/automated hydroblasting systems, safety in manual and robotic industrial cleaning and technical innovation in fluid-jet applications, according to the WJTA-IMCA.

A panel discussion between facility/end user representatives, equipment manufacturers and contractors on the topic of automation in waterblast cleaning is also scheduled for Tues., Nov. 3, from 2:00 to 3:15 p.m. Panelists include representatives from BASF; DuPont; HydroChem, LLC; Pienemann Equipment, B.V.; StoneAge, Inc.; and The Dow Chemical Company.

Educational "Boot Camp" sessions of interest include the following. For more information, visit www.wjtaimcaexpo.com.

- "Pressure Loss in Waterjet Systems," by Bill Shires, StoneAge, Inc.; Tues., Nov. 3, 10:30 to 11:15 a.m.
- "Hands-Free Hydro-Excavation," by Mike Tepatti, Jack Doheny Companies; Tues., Nov. 3, 12:15 to 12:45 p.m.
- "Hydroblast Training and Certification," by Tommy Nipp, Houston Area Safety Council; Tues., Nov. 3, 1:15 to 1:45 p.m.
- "Waterblast Nozzle Selection," by Bill Shires, StoneAge, Inc.; Wed., Nov. 4, 10:30 to 11:15 a.m.
- "Robotics in Hydrodemolition," by Patrik Andersson, Aquajet Systems, AB; Wed., Nov. 4, 12:15 to 1:00 p.m.

Exhibitors at WJTA-IMCA

The following is a list of exhibitors at the 2015 WJTA-IMCA Expo that may be of interest to protective coatings professionals, current as of press time. A complete list is available at the conference website.

24 Hr Safety	109
Advanced Pressure Systems	701
BIC Alliance	218
Blasters, Inc.	619
CAT Pumps	420
D&S Professional Services	918

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