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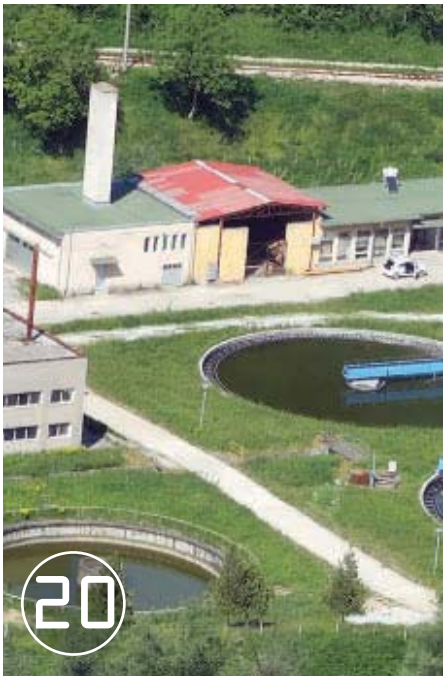
The Voice of SSPC: The Society for Protective Coatings

FEATURES



DEPARTMENTS

On the cover: iStockphoto.com

Also This Month

From the Offices of

SSPC The Society For Protective Coatings

Staff

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April Webinar Scheduled on Conditioning Atmospheres in Tanks

The SSPC/*JPCL* webinar, "Conditioning Atmospheres Inside Tanks for Cleaning and Painting," will be presented by Brian Peroni of Florida Power & Light on April 4, 2012 from 11:00 a.m. to noon, EST.

The locally prevailing air temperature, moisture content of the air (relative humidity), and the temperature at which moisture will condense on the surfaces (dew point) are commonly called atmospheric conditions. If these conditions are not within the ranges required by a coating specification during surface preparation and coating application, problems are likely to occur in creating a protective film with long-term performance properties.

This webinar will focus on atmospheric conditions required in tanks and other enclosed spaces and how they can be readily controlled by heating, cooling, humidification, and dehumidification.

Free registration for the webinar is available online at paintsquare.com/education.

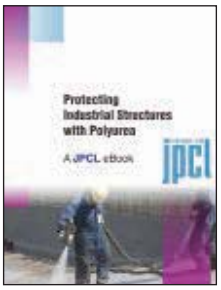
SSPC/*JPCL* Education Series Webinars provide continuing education for SSPC recertifications, as well as technology updates on important topics. While participation in the webinar is free, for those who wish to receive continuing education credits from SSPC, a test is available after the webinar. Cost of the test service is $25. All participants receive a free certificate of completion.

Most of the following stories and more news can be found on *PaintSquare News*, *JPCL*'s sister publication, a free daily e-newsletter. To sign up for the newsletter, go to paintsquare.com.

Free eBook Delivers Polyurea Expertise

Protecting Industrial Structures with Polyureas—an expert-written compilation of articles focusing on this critical protective coating technology—is the focus of a free eBook just published by *JPCL*.

The eBook, available as a free download, is packed with practical, comprehensive articles, case histories, Problem Solving Forum expertise, and maintenance tips on polyurea applications in a variety of applications, from ship decks to dams to tanks to rail lines. The articles are written by leading experts like *JPCL* Top Thinker Dudley Primeaux II, Murphy Mahaffey, and more.



Protecting Industrial Structures with Polyureas features articles previously published in *JPCL* on the use and performance of polyurea coatings and is designed to provide general guidance on selecting and applying polyureas to protect industrial and marine structures.

New *JPCL* Series

Polyureas is the second in a new series by *JPCL*, the "Voice of SSPC" and the leading journal of the protective and marine coatings industry.

The first title in the series, *Ultra-High-Pressure Waterjetting*, was released recently and is also available free.

Future titles in the series will focus on surface preparation, coating inspection, technology and standards,

SSPC Announces 2013 Show and Call for Papers

SSPC: The Society for Protective Coatings has announced that SSPC 2013 featuring GreenCOAT will be held Jan. 14–17, 2013, at the Henry B. Gonzalez Convention Center in San Antonio, TX. It is the only conference and exhibition dedicated 100% to protective, marine, industrial, and commercial coatings.

SSPC is now accepting abstracts for the 2013 show. Presentation topics of interest include, but are not limited to: coating application methods; coating failures; coatings to support emerging green industries (wind power, nuclear coatings); coating inspection equipment; coating types and characteristics; advances in green surface prep (waterjetting, etc.); concrete surfacing; corrosion control; environmental health and safety; estimating for commercial; green application techniques (i.e., plural component technology); flooring; green coatings; marine and military coatings; surface preparation; wind tower coatings; regulations; advances in containment designs; best application practices for high-solids materials; powder coatings; cleaner abrasives; topics for women in the coatings industry; commercial coatings; aerospace; nanotechnology; leadership; and gas and oil pipeline coatings.

The deadline to submit an abstract is May 29. Each abstract is evaluated by the Education Program Advisory Committee (EPAC), which is comprised of SSPC members. The four key areas that abstracts are evaluated on are originality; quality (clearly defines outcomes, flows smoothly); relevance/significance to the industry; and objectives. Notification of acceptance will take place on July 2, and the first draft of the written paper (5–10 page minimum) will be due by Aug. 20.

For more information, contact Christine Estvanik at 412-281-2331 x 2215, or estvanik@sspc.org.

environmental control, new technology, and a collection of award-winning articles in a special "Best of *JPCL*" volume.

The entire series will be downloadable from paintsquare.com.

Coating Selection Series

The new eBook series follows the successful launch of another free series of eBooks developed in conjunction with the *JPCL Coatings & Linings Buying Guide*. That 10-part series featured industry-specific coatings selection and specifying advice.

Hempel Opens First South American Factory

Hempel has opened its first manufacturing facility for marine and protective coatings in South America.

The $17 million factory—Hempel's 24th—will slash production lead times and allow the company to develop and tailor products that meet regional and local

standards and needs, Hempel said.

The new plant is part of a major expansion for Hempel, which is also planning to open new facilities in Russia and Saudi Arabia by the end of 2013.

The 3,000-square-meter (32,291 square feet) plant, which opened Feb. 16, has a production volume of 155 liters (about 41 U.S. gallons) per man-hour at full capacity. Over the next six months, production will gradually increase to supply the entire region with Hempel's complete portfolio of marine and protective products.

New Tech Center for Corrosion Study

A new "market-driven" industrial research center being founded at North Dakota State University will focus on corrosion technology, materials science, engineering, and chemistry.

NDSU Fargo will launch

the Center for Technologically Innovative Products and Processes (CTIPP) with a $320,000 grant from the North Dakota Centers of Excellence Commission and $640,000 in contributions from three founding private-sector parties.

JPCL

On Stripe Coating an Edge-Retentive Primer

When and why would I need to stripe coat if I'm using an edge-retention primer?

From Tom Schwerdt
Texas Department of Transportation

I have seen numerous "edge-retentive" coatings that had an edge thickness half that of nearby flat areas. Some are better; some are worse. Non-edge-retentive coatings may be down at 25% of the thickness of nearby flat areas.

In addition, there is not a good way of verifying edge thickness in the field. (Lab testing requires cutting through the substrate, mounting, and polishing a section.) Magnetic gauges, ultrasonic gauges, and even the Tooke gauge are not good choices. And even if you do have an edge-retentive primer that works at 100% of flat thickness when properly applied, your field inspector cannot verify the thickness of the coating at the edge. Your inspector can visually verify the presence of a stripe coat.

From Richard D. Souza
Stoncor Middle East LLC

Regardless of the type of primer, a proper specification should include stripe coating of each of the subsequent coats to make sure the edges or weld seams receive enough coating film thickness to ensure longevity of the coating system. Primer alone will not protect the surface from failure, and 80% of coating failures occur at these critical areas. Usually, moreover, every coat should be followed by a stripe coat until you reach the finish coat. Before you apply the entire finish coat, you should apply a stripe coat of the finish coat.

If possible, the stripe coat should be tinted a color different than the main coating and must be brush- or roller-applied, depending on the job size and accessibility.

From Brian Chapman
Cadillac Fabrication

Stripe coating serves more than one purpose. Edge retention is just one of many possible reasons for using this technique. On stitch-welded areas, tight corners, or radiuses and irregular surfaces such as welds and flame-cut edges, stripe coating adds protection to ensure adequate coverage.

From Mark Edmonds
Vigor Shipyards Inc.

The use of the word "primer" in the question could imply that an additional coat of paint is to be applied, perhaps for cosmetic purposes or an additional coat of protective coating. In the world of U.S. Navy tank coatings, edge-retentive paints do not use the word "primer." The U.S. Navy does in fact allow single coats of edge-retentive paints without a stripe coat. The caveat is that you have to take additional DFT readings to confirm the edges have the specified millage, usually 20-30 mils dft.

This method of application and checking has many years of research data along with in-service data on board U.S. Navy vessels/tanks to back up not having to apply a stripe coat. For reference, see mil spec MIL-PRF-23236 Type VII and NAVSEA Standard Items 009-32 FY 12 (Chg 1) Notes 23 and 24.

From George Musterer
Hecate Painting & Sandblasting

Wet films tend to back away from edges during curing as the film shrinks, leaving thinner cured material at the edges. That is the main purpose behind developing an edge-retentive primer.

Stripe coating has two main purposes. One purpose is to get coating to areas that cannot be accessed or have limited access for spray application, such as behind bolts, rivets, and threads. Another purpose is to break surface tension. When spray painting, coatings are not always in a hurry to flow into areas such as cracks and crevices because of surface tension. Using a brush will break the surface tension and force the coating into those cracks and crevices, thus sealing up potential points of entry for moisture/water/electrolyte.

Editor's Note: Problem Solving Forum questions are posted on the free daily electronic newsletter, *PaintSquare News,* on behalf of *JPCL*. Responses are selected and edited to conform to *JPCL* style. Send questions and answers to kkapsanis@protective-coatings.com.

SSPC Protective Coatings Specialist


J. Peter Ault

Q&A with J. Peter Ault, By Jodi Temyer, JPCL

This month's SSPC-certified Protective Coatings Specialist, J. Peter Ault, has been involved in corrosion control and materials engineering for nearly 25 years. Since 2006, he has been a principal of Elzly Technology Corporation, an engineering firm that provides a wide range of coatings and corrosion consulting services.

Throughout his career, Mr. Ault has studied coatings and corrosion phenomena on a variety of structures including ships, bridges, pipelines, storage tanks, and historic structures. He has worked extensively with the inspection and evaluation of coatings in the lab and field. Mr. Ault is a registered Professional Engineer in both New York and New Jersey. He is an active member of several technical societies including SSPC, ASTM, ASNE, SNAME, NSPE, and NACE. In addition to holding coatings specialist certifications from SSPC and NACE, Mr. Ault also has a BS in mechanical engineering and an MBA from Drexel University.

JPCL: How did you get involved in protective coatings?

J. Peter Ault: It all started with an internship at Ocean City Research that I accepted primarily because it was close to home. After graduating from college and interviewing with some larger companies, I decided to accept an offer from Ocean City Research because I enjoyed the people and the work.

JPCL: What inspired you to start Elzly?

Ault: After leaving Corrpro in 2006, I really wanted to try something new, so I went back to college to get an MBA. About six months later, Jim Ellor had left Corrpro and founded Elzly. After a year in school and looking at different opportunities, I realized that I really enjoyed the coatings and corrosion industry and missed all the people I had worked with over the years. Over the 20 years we worked together, Jim and I had spoken several times about starting a business so it was natural for us to become partners in Elzly.

JPCL: Your business covers a lot of consulting needs. Is there a particular area (or areas) that you consider yourself to have extra expertise in?

Ault: I don't think I offer any particular "extra" technical expertise that you wouldn't expect from anyone else with 25 years of experience in the field. I strive to look at each new project with an open mind and objective perspective. While it is important to have passion about what you do, I believe data and facts should form the basis for a consultant's recommendation.

JPCL: What is an important lesson that you have learned since starting with your business?

Ault: In the six years I've been part of Elzly, I've recognized that building a successful business is relatively simple–have reasonable expectations, be honest and genuine with your stakeholders (employees, clients, suppliers, and business partners), and keep things as simple as possible. Unsuccessful businesses get sidetracked by unrealistic expectations, overcomplicated business plans, unnecessary risk, and/or lack of stakeholder commitment. Of course "simple" does not imply "easy"…we have to work hard at the basics every day!

JPCL: Since coatings technology is continually advancing, what do you think the future holds for protective coatings that will have a large impact on the industry?

Ault: I see a lot of continuing evolutions, which will eventually have a large impact on the industry. Beyond the continued evolution of protective coating chemistry, I believe that automation of surface preparation and coating application and improved methods for measuring the quality of a coated surface have the potential to radically change the industry.

JPCL: Do you have a mentor in the industry or someone whose work you really admire?

Ault: One of the great things about doing consulting work is that I get to work with a lot of different people in the industry. I value lessons learned from painters and blasters, inspectors, chemists, vendor representatives, and other engineers and consultants. It would be impossible to single out any one individual.

JPCL: Name at least one thing that you still want to accomplish in your career and in your personal life.

Ault: I don't really have "one thing" that I want to accomplish. What I really want to accomplish is to truly help someone everyday (personally or professionally).

JPCL: If you were interviewing another SSPC PCS-certified coatings professional for this column, what type of question would you want to ask them? And how would you respond to the same question?

Ault: I'd ask them if they had to choose a different career, what would it be and why. Personally, I enjoy solving problems and trying to quantify or measure things that are not obvious. I have always been interested in the field of economics.

JPCL

Cases from the F-Files

The Ethics of Coatings Failure Investigations – Are You Getting What You Deserve?

By Raymond S. Tombaugh, Senior Coatings Consultant, KTA-Tator, Inc.
Richard A. Burgess, Series Editor

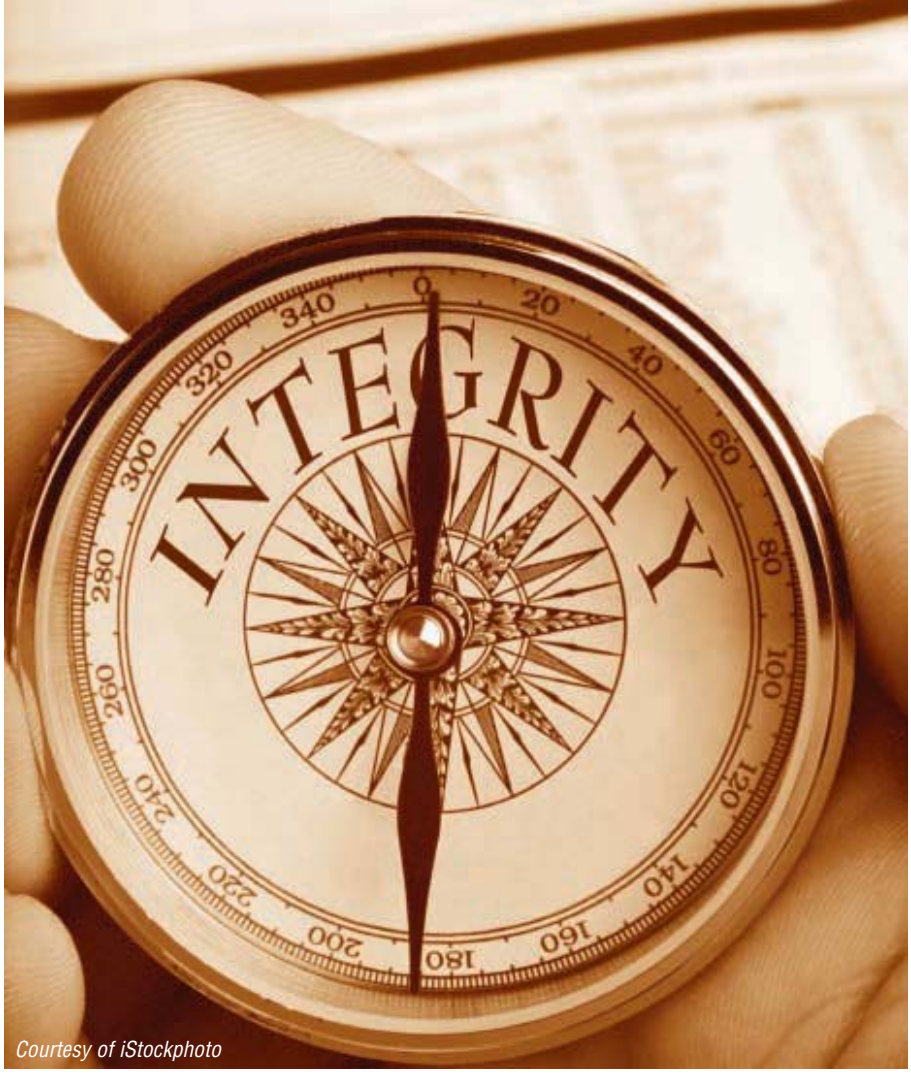
Ray Tombaugh is a Senior Coatings Consultant for KTA-Tator, Inc. He holds a B.S. in chemical engineering from Lehigh University, is a member of SSPC, and is a NACE-Certified Coatings Inspector Level 3 (Peer Review).

"The Case of… Three (Consultants)," a two-part F-Files column published in the November and December 2010 issues of *JPCL*,[1] described observations and conclusions reached by three different consultants, each looking at the same bridge coating system. The article pointed out that clients sometimes retain consultants to perform very specific and limited examinations of the alleged failing coatings. Clients may also request reports that address specific issues, questions, or requirements.

This month's column describes a set of circumstances that forces us further down the path, where a difference of opinion exists "before the sun sets." Sometimes the differences of opinion are legitimate and arise from alternative but reasonable interpretations of data and available information—other times, not so much.

Conducting 200 to 300 investigations over the past ten years has provided me the opportunity to experience situations in which multiple parties investigate the same failures. While many such occasions have been interesting and educational, I have encountered a number of repeat problems in the way that coating failure investigations are performed. When two investigators, knowledgeable in coatings science, perform their respective investigations objectively, there generally should be many aspects of the two investigations that are consistent. There may be minor differences in field data, criticisms in the conduct of certain assessments, or even the identification of some areas that could be expounded upon. Most assuredly, there will be some differences in opinion (often related to the question being answered), but on the whole, the two investigations generally align at least in the actual test results and measurements.

However, there are instances when an opposing technical expert spends little time actually evaluating the condition of the coating and seeking the "root cause" of failure. Rather, his primary responsibility is seeking out [perceived] shortcomings in the work performed by the other investigator(s) to discredit the work product. This "adversarial evaluation" is accomplished primarily by attacking the technical methods/procedures used or not used by others during the collection of information and development of opinions on the cause of failure. These types of adversarial evaluations are all too often performed by inexperienced individuals whose primary knowledge base lies in the industry standards. The individuals may



Courtesy of iStockphoto

or may not be well trained, and may have many years in the field but are unable to grasp the nuances of objective investigation, something quite different from objective inspection. The critical drawback appears to be little understanding of the applied science behind technical properties (chemical and physical) of coatings and reliance instead on consensus standards or subjective requirements.

The adversarial approach is also a hallmark of investigators who serve as hired gun consultants. These individuals may spin or ignore data and exaggerate findings to support the interest of their client. One investigator went so far as to propose one fee for performing the failure investigation and a different, significantly higher fee for "winning the case." I have observed that these practices are reckless and often do not hold up in court. In contrast, an objective, well-reasoned, and clear presentation of facts that support all reported conclusions (i.e., the role of an expert witness) contributes to success in almost every instance. Below are examples in which strict reliance on consensus standards or subjective requirements differs from forensic investigation.

Misuse of a Coating Thickness Standard

One of the most commonly used arguments to discount the technical findings of a failure investigation (when the failure relates to coating thickness) is that the investigator did not perform measurements at the frequencies prescribed by SSPC-PA 2, Measurement of Dry Coating Thickness with Magnetic Gages. The SSPC-PA 2 standard was developed for installation of new or maintenance coatings. It provides frequencies for performing thickness measurements and tolerance of spot and area measurements to help assure that the application is compliant with the coating specification. Its implementation prevents over-inspection of coating thickness.

When a coating or lining system is failing prematurely however, more frequent measurements are warranted in certain areas to identify and isolate problem areas, while no measurements may be needed in other areas. Some investigators attempt to devalue another investigation that included more frequent measurements (in both failing and non-failing areas) by stating that the measurement frequencies identified in SSPC-PA 2 were not followed and the measurements were not random. Other investigators have manipulated the thickness measurement locations to demonstrate compliance with the specified thickness. For example, SSPC-PA 2 requires five separate spot measurements (average of three gage readings) spaced arbitrarily over each 10 m^2 (100 ft^2) area to be measured. (The number of areas depends on the size of the structure being coated.) The standard does not specifically state that the spot measurements must be spaced uniformly across the test area, so some investigators will take the five spot readings within a small area, perhaps where the coating thickness conforms to the specification, rather than acquiring readings across the entire surface. In the end, both of the practices discussed above are usually discounted during mediation or trial, and a logical approach to identifying the problem areas usually wins.

SSPC Committee C.3.2 is revising the dry film thickness standard (PA 2, expected to be published in 2012). Among the proposed revisions are explicit directions that the standard is *not* intended to require how frequently coating thickness measurements must be taken for coating failure investigations nor where such measurements must be taken.

Further, the frequency of measurement acquisition might be removed from the standard practice, ASTM D7091, in its next revision (also expected to be published in 2012). If the proposed revision is accepted, it will then be appropriate to reference the ASTM D7091 standard for coating failure

investigations because it focuses primarily on proper gage use.

Misuse of Adhesion Data

Another approach used to discount sound investigations is the insistence on performing tensile adhesion tests to assess a coating's acceptability. Some investigators have argued that tensile adhesion values are frequently listed on the manufacturer's product data sheet, so the tensile adhesion test is the only adhesion test appropriate to evaluate a coating's acceptability. What must be recognized is that the values listed under "Performance Testing" on a data sheet are typically generated on a coating system applied in a laboratory under ideal conditions and are primarily listed to improve the marketability of the coating itself. The information is not generally listed as an "acceptance criteria" for minimum performance, and it should not be used as the sole means of determining suitability or assessing risk of failure when conducting an investigation. For example, a coating system can withstand significant tensile forces but may be able to be lifted off of the substrate by slight prying with a knife blade (Fig. 1).

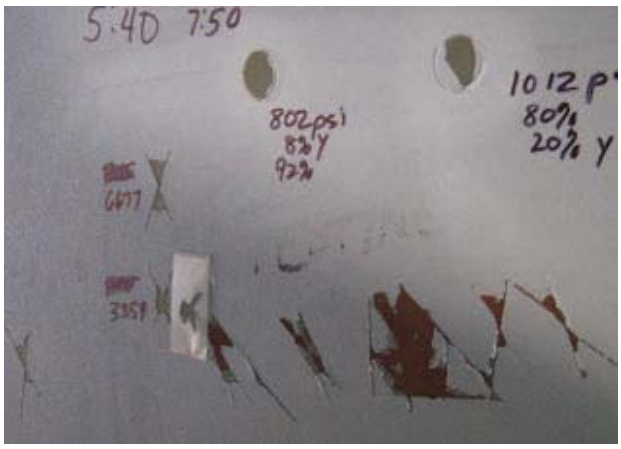


Fig. 1: An example of three adhesion tests conducted in close proximity to one another. Note that the tensile adhesion test resulted in values between 800 and around 1,000 psi—evaluated as acceptable. The knife adhesion test (ASTM D6677) and tape adhesion test (ASTM D3359) resulted in poor adhesion (0 and 2A, respectively). Courtesy of KTA-Tator, Inc.

An experienced investigator can learn more about the integrity of a coating system by probing with the blade of a knife than performing tensile adhesion tests. Further, coatings do not typically fail by separation perpendicular to the substrate surface (tensile forces). To the contrary, most failures are initiated by shear forces—peeling forces that are more parallel to the coated surface. Perhaps the undercutting that extends from the leading edge of a coating defect is the best example of this type of shear failure. When there is a leading edge of coating, moisture can penetrate the edge, initiate corrosion of the substrate, and push the coating off of the surface. There are numerous instances where tensile adhesion testing was performed as part of a coating failure investigation that resulted in pull-off values in excess of 2,000 psi. However, when shear adhesion testing[2] was performed, poor adhesion properties were revealed. In these instances, one investigator concentrated on the tensile adhesion values and ignored the results of the knife adhesion tests. (He also ignored the fact that both the tensile and knife adhesion tests were conducted adjacent to failed coating where continued failure was expected and predicted by the knife adhesion tests.)

Certainly there is a place for tensile adhesion testing; however, when other adhesion tests predict failure at the same location as "good" tensile adhesion results, complete reliance on the tensile adhesion tests should be avoided.

In addition to the misuse of tensile adhesion data, one investigator discounted all of the tape adhesion test data collected by another based on minimal deviations from the ASTM standard (e.g., length of incisions), despite the fact that the tape adhesion testing clearly identified areas that subsequently failed.

Failure Mechanism Identification without Forensic Evidence

The adversarial evaluation also goes beyond misuse of industry standard test methods and procedures. Some investigators will claim to identify the cause of a coating failure without actually performing any forensic analysis (laboratory testing), despite the fact that laboratory testing is necessary and appropriate, in most cases[3], to forming a hypothesis. Can you imagine a crime scene investigator who elects not to use forensic evidence to prove the case? Laboratory forensic analysis is essential for bringing meaning to the investigation by providing (or confirming) facts about the failure. This analysis serves several purposes:

(1) confirms field testing such as coating thickness measurements and number of coating layers,

(2) identifies visible and non-visible contaminants (which may or may not be detected in the field),

(3) verifies the type of coating that was [actually] used,

(4) can identify problems with mixing (if multi-component coatings were applied), and

(5) identifies the presence of additives, intentional or otherwise.

Of course, depending on the type of coating failure, the forensic analysis can reveal a multitude of other evidence, and may even eliminate or disprove initial thoughts on the cause of the failure. The laboratory component of failure investigation confirms or refutes opinions on failure mechanisms and can provide a means to recreate the failure mechanism(s). Without laboratory analyses, many opinions regarding the cause of failure are no more than suppositions. In litigation, the facts and an objective, science-based position should be the foundation of the case presented.

Clairvoyant Failure Investigations

An extremely severe case of reckless investigation exists when an opposing investigator has never observed the failure but discounts the findings of others and claims to identify the exact cause of failure and predict future performance. Under these situations, such an investigator relies almost entirely on discrediting the "opposing" report as a substitute for performing an investigation.

We have all heard that a picture is worth a thousand words. Similarly, witnessing and investigating the actual failure is also very important to having credibility. Reliance on another's data, observations, and reporting requires a very restrained and thoughtful approach. A thorough understanding and unbiased interpretation of the available information is essential, and caution must be taken to assure that the investigator understands all of the facts in the opposing report. If not, significant mis-statements may be made.

While some statements made are a result of a lack of understanding of the coating failure, others may be deliberately deceptive because of a hidden agenda. Here's an example: A failure investigation report discussed both field- and shop-applied epoxy. The first investigator determined that the shop-applied epoxy was performing well, showed excellent adhesion, and therefore required no remediation. The field-applied epoxy, on the other hand, was undergoing significant delamination and adhesion was poor in all locations investigated. Consequently, the investigator recommended replacement of the field-applied epoxy.

The opposing investigator, hired to rebut the report and never having seen the failure, reported that the findings were contradictory, and there was no justification to remove all of the field-applied coating. The "reviewer" simply extrapolated statements from the shop-applied epoxy evaluation (indication of sound coating adhesion) and transposed them next to the results of the field-applied epoxy evaluation (reported as having poor adhesion), thereby creating the impression of a contradiction. The original investigator pointed out the reviewer's "mistake," which ultimately cast doubt on the validity of the entire review.

Casting Doubt Using Unsubstantiated Statements

In some cases, the desire to disprove an investigation has been so strong that exaggerated statements were the only means used to cast doubt on the quality of the original investigation. An extreme example

dealt with the criticism of a commonly used investigative ASTM laboratory test method. Replicate tests were performed on the same samples resulting in similar values. The reviewer proclaimed that performing the ASTM test procedure never results in repeatable findings. What the reviewer failed to note was that the results of the replicate testing fell well within the precision limits established by the standard test method. The reviewer's statement (with no explanation), left it to the reader to conclude whether the unfounded proclamation was an error, a misunderstanding, or an intentional act to steer the reader away from the data generated. Regardless, the "opinion" was dispelled by reviewing the precision and bias section in the industry standard and by the fact that the standard is a common reference in many specifications.

Casting Doubt without Supporting Data

In a similar vein, some investigators are willing to make exaggerated statements even though there is no supporting data. One example involves an investigation in which a painter's insurance policy was terminated 90 days after coating application. At some point after termination of the policy, a coating failure was reported to the insurance company that terminated the policy. Accordingly, it was important to determine if the coating failure occurred before the policy termination date to establish whether there was coverage for the company under the previously held policy. An investigator hired by the insurance company reported that without a doubt, the failure occurred exactly two weeks after the insurance policy termination date. The investigator chose to justify the opinion of the "likely" date of failure by performing accelerated weathering testing in a QUV chamber according to ASTM D4587, Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings. However, accelerated weathering exposure hours cannot be correlated to natural weathering exposure outcomes. The approach to establishing a date of failure and the statement declaring the time at which the failure occurred were totally inaccurate.

Extrapolating Coating Failures to Multiple Structures

Unfounded extrapolation is another pitfall to be aware of. Such was the case in a coating failure investigation on two small bridges assembled and coated in a shop. Heavy snow at the time of the site investigation lim-

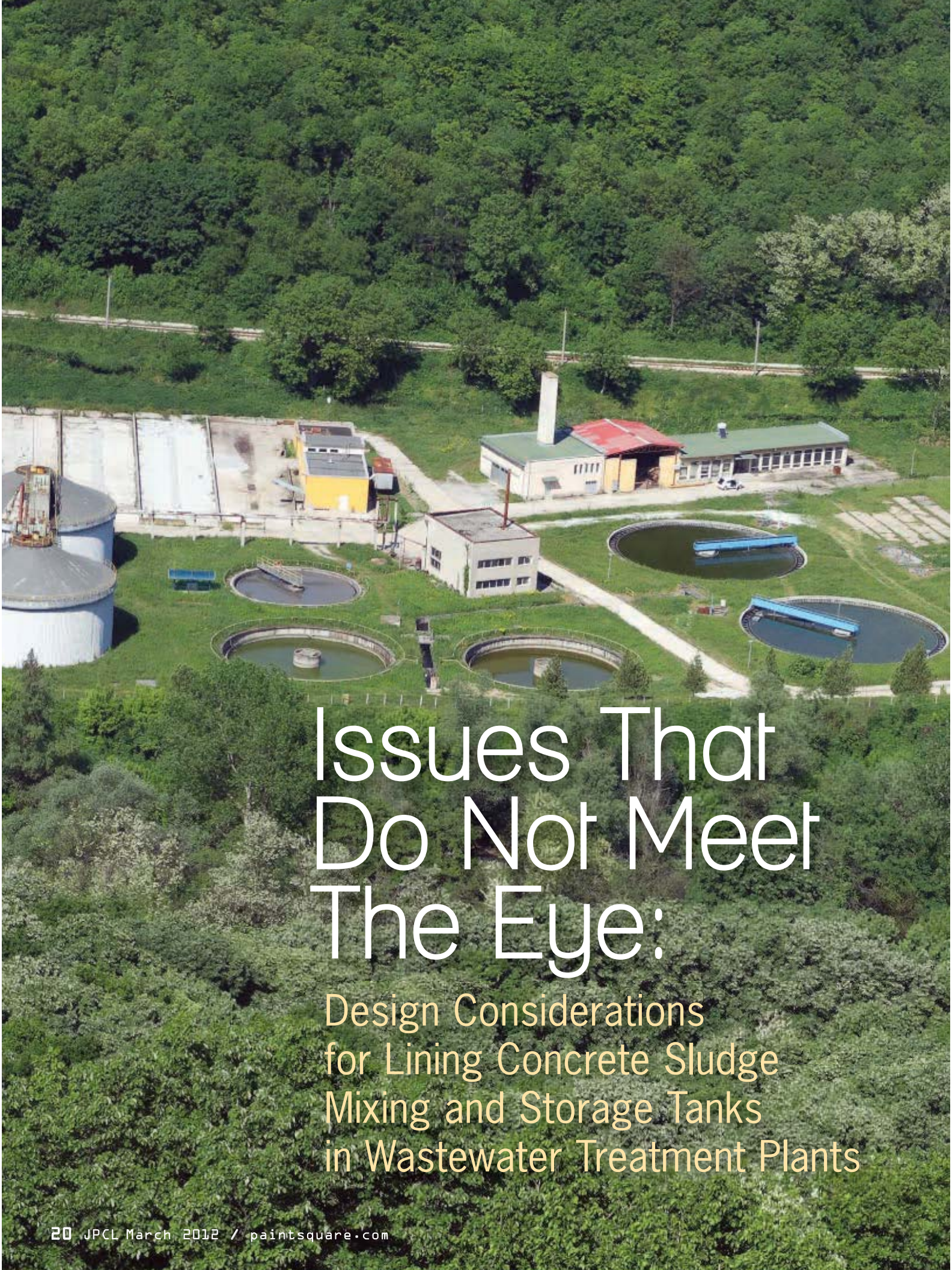
ited access to only one of the two structures. The initial investigator found coating issues within certain isolated areas of the bridge (adjacent to main girder welds). These observations were extrapolated not only to the rest of that structure but to the second bridge, which was never examined because of restrictions on access. His recommendation: both bridges needed to be completely repainted. However, a follow-up and more thorough investigation of both structures by another party established that the coating problems were isolated to small areas (adjacent to the main girder welds) on one bridge. Ultimately, when the case went to mediation, the fabricator was required to repair only the areas around the welds on one bridge, not completely repaint both structures.

Summary

A fair and proper coating failure investigation requires a scientific approach, not one of preconceptions and deceptions. A qualified expert will carefully review all of the existing information and documentation without bias, conduct a thorough site investigation using appropriate tests and industry standards, engage in forensic laboratory analysis, and look at all of the field and laboratory evidence to formulate an opinion about the cause of the failure and the degree to which rework is necessary. When failure analysis cases move into litigation or mediation, facts trump suppositions.

Endnotes

1. *Journal of Protective Coatings & Linings*, Volume 27 Issue No. 11 & 12.
2. ASTM D6677, "Standard Test Method for Evaluating Adhesion by Knife" or Method A of ASTM D3359, "Standard Test Methods for Evaluating Adhesion by Tape." Both tests are conducted by making an X-scribe in the paint film. The X-scribes are to be 1.5" long; cut using a straight edge and the two scribes are to intersect at a smaller angle between 30° and 45°. When using ASTM D3359, adhesive tape is applied to the scribe and rapidly pulled off of the surface upon itself. Adhesion is rated according to the amount of coating removed by the tape. When using ASTM D6677 the coating is lifted with the knife blade at the intersection of the incisions (without the use of tape). Adhesion is rated according to the difficulty of removal and the amount of coating removed by the knife blade.
3. The cause of simple failures related to improper surface preparation or coating dry film thickness can be determined without laboratory testing. However, even in these cases, the laboratory testing can serve as a set of checks and balances on the field work.
4. QUV testing is a cyclic condensation/heat-ultraviolet lightweathering procedure that involves intermittent exposure to UV light/heat and condensation. The test is accelerated and the ASTM standard definitively states that the test results cannot be directly correlated to natural weathering.



Issues That Do Not Meet The Eye:

Design Considerations for Lining Concrete Sludge Mixing and Storage Tanks in Wastewater Treatment Plants

Editor's Note: This article, by Randy Nixon, is part of the series of Top Thinker articles appearing in *JPCL* throughout 2012. Mr. Nixon is one of 24 recipients of *JPCL*'s 2012 Top Thinkers: The Clive Hare Honors, given for significant contributions to the protective coatings industry over the past decade. The award is named for Clive Hare, a 20-year contributor to *JPCL* who shared his encyclopedic knowledge of coatings in many forums. Professional profiles of all of the award winners, as well as an article by Clive Hare, will appear in a special 13th issue of *JPCL*, to be published in August 2012.

By R. A. Nixon, Senior Consultant, Corrosion Probe, Inc.

This article focuses on several condition assessment and design considerations associated with protective linings for corrosion protection in concrete sludge storage and mixing tanks that have been shown to substantially affect performance. Issues include evaluation methods, substrate conditions, surface preparation decisions, tank geometry vis-à-vis reflective cracking of organic linings, and high external ground water conditions around sludge tanks. The lessons discussed result from knowledge gained through failure analyses performed by the author over the past 15 years. The reference projects used to demonstrate the above key points involved existing sludge tanks in municipal wastewater treatment plants.

Sludge tanks in wastewater treatment plants are used for various purposes including, among others, storing primary sludge before thickening and sludge digestion, storing waste-activated sludge before sludge treatment, mixing plant sludge with imported sludge to be incinerated, and storing digested sludge to be conveyed later to dewatering. Many years ago some treatment plants used to mix and jointly thicken primary sludge and waste-activated sludge, but this created significant odor and corrosion problems. The waste-activated sludge provided ample microbes while the primary sludge gave the "bugs" lots of food. This promoted enhanced microbiological activity and hence higher corrosion rates and odor complaints. The practice was therefore discontinued. Depending on the type of sludge stored and the residence time for sludge, sludge storage tanks can have very corrosive head spaces. In addition, because sludge storage tank levels often fluctuate substantially, corrosion can occur at varying headspace elevations. Furthermore, due to rare redundancy in plants, sludge tanks seldom come out of service for inspection and maintenance. Accordingly, damage can frequently be severe before corrective action is taken. In general, undigested sludge can be very corrosive because of the liberation of sewer gases including methane (CH_4), carbon dioxide (CO_2), and hydrogen sulfide (H_2S). In the headspace of these tanks, these acidic gases and oxygen establish perfect conditions for aggressive biogenic sulfide corrosion. The most cost-effective solutions to this degradation mechanism are properly selected and installed lining systems based on industry experience. Several important design considerations when using protective linings to protect sludge tanks are not necessarily obvious without the requisite experience. This article attempts to shorten the learning curve for those who lack the same experience to which this author has been exposed.

CONDITION ASSESSMENT AND DESIGN CONSIDERATIONS THAT DON'T MEET THE EYE

Part 1 – Evaluation Methods and Substrate Conditions

When biogenic sulfide-corrosion occurs in the headspace of sludge tanks, sulfuric acid attack of the highly alkaline Portland cement in the concrete is accompanied by sulfate attack of the cement paste below the reaction zone in the concrete. The acid-base reaction causes dissolution of the cement paste and the formation of calcium sulfate or gypsum from the reaction shown in Fig. 1.

Calcium sulfate further reacts with the tricalcium aluminate in the Portland cement to form calcium sulfoaluminate compounds, much larger compounds than the original calcium hydroxide and calcium silicate hydrates (Fig. 2).[1] This reaction promotes expansive

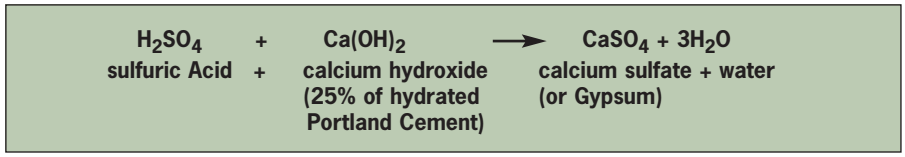


Fig. 1: The acid-base reaction causes dissolution of the cement paste and formation of calcium sulfate or gypsum.

$$3CaSO_4.2H_2O + 3CaO.Al_2O_3 + 26H_2O \rightarrow 3CaO.Al_2O_3.3CaSO_4.32H_2O$$

calcium sulfate di-hydrate + tri-calcium aluminate ⟶ calcium aluminate tri-sulfate hydrate (ettringite)

Fig. 2: Calcium sulfate reacts with tri-calcium aluminate in Portland cement to form calcium sulfoaluminate compounds.

Fig. 3: Large area of lining delamination on ceiling.

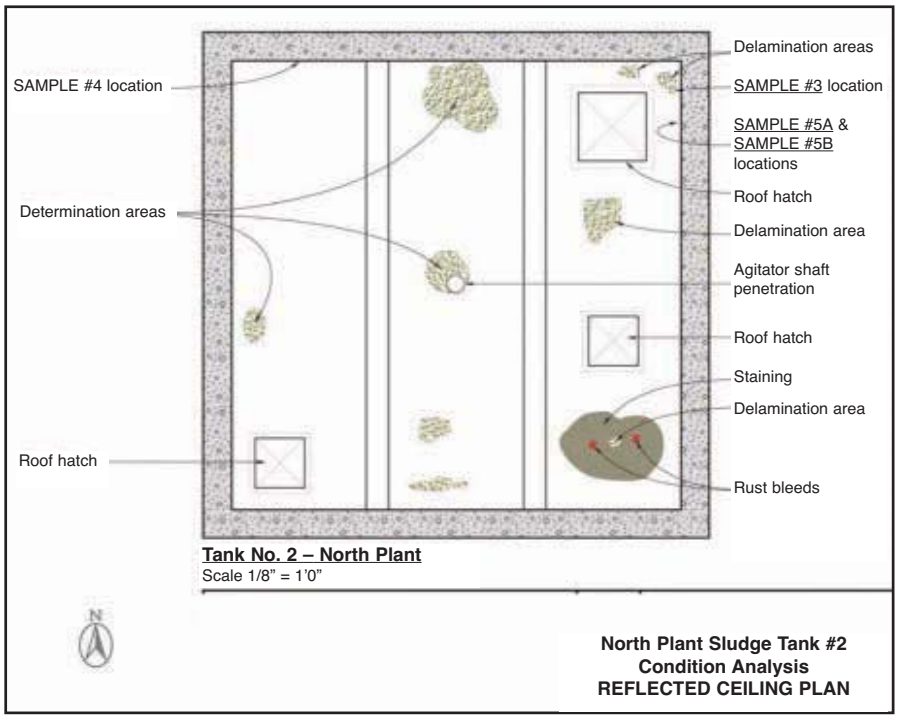


Fig. 4: Typical mapped-out areas of lining delamination in one of the tanks.

deterioration of the concrete manifested by microcracking and disintegration of the paste and aggregate matrix.

Because acidic attack and sulfate reactions associated with biogenic sulfuric acid attack occur in sludge tank concrete, removing contaminated concrete before installing concrete repair materials or linings is crucial to prevent ongoing concrete degradation beneath lining systems. When removal is not adequately performed, premature lining delamination failures can occur.

In 2008, a failure analysis of a trowel-applied epoxy lining system in several sludge storage tanks showed widespread delamination from the concrete (Figs. 3 and 4). The linings had been installed 1½ years earlier in seven sludge tanks in two New York State wastewater treatment plants.

The delaminated lining samples showed no evidence of chemical attack, pinholes, or improper cure. A relatively thin layer of concrete was attached to the back of all delaminated samples (Fig. 5, p. 24). The thickness of concrete varied between ⅛ in. and ½ in. The concrete layer was weak and easily crumbled by hand. On this degraded concrete, pH measurements showed values between 5.0 and 6.0. Further examination of the degraded concrete showed the cement paste to exhibit yellowish discoloration. The concrete under the disbonded lining was chipped back for pH gradient measurements (Table 1).

The pH measurements clearly showed that the concrete had continued to degrade underneath the epoxy lining. The following facts about cement paste pH depression from acidic reactions are especially relevant.

- Newly hydrated concrete—cement paste pH = 12.5 plus
- pH reduction to less than 12.0—loss of potassium and sodium hydroxides
- pH reduction below 10.0—loss of calcium hydroxide
- pH reduction below 8.0—loss of calcium silicate hydrates and possible ongoing acidic reactions in paste

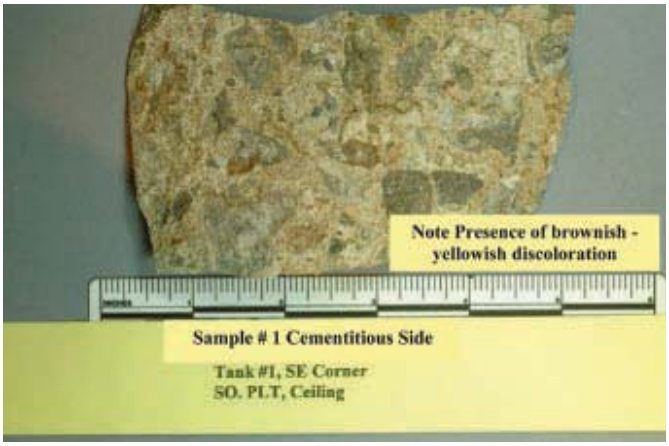


Fig. 5: Back/cementitious side

Based on the author's previous work on sulfuric acid attack of concrete in acid manufacturing plants, he decided that ongoing sulfate reactions were also likely involved in this sludge tank lining failure. Accordingly, sulfate concentration analyses were performed on several samples taken from the degraded concrete and on what appeared to be sound concrete at varying depths into the substrate. The testing, done according to ASTM C114, was performed on drilled concrete powder samples (Table 2, p. 26). Sulfate concentrations are typically low in concrete because the main source of sulfate is the minute percentage of gypsum added to cement for set control. For Portland cement Types I and II, the mean concentration for sulfate as SO_3 is between 2.7 and 3 percent by weight of cement respectively.

The ranges of sulfate concentration in different types of Portland cement are published in ACI 225R in Table 3.2.[2]

Assuming the concrete weighs 140.7 lbs. per cubic foot (CF), the weight per cubic yard (CY) would be 3,800 lbs. Assuming a cement content of 6 bags per CY @ 94 lbs. per bag, the total cement content would be 564 lbs. per CY. Given a 3% by weight of cement maximum sulfate content as SO_3 for Type I Portland cement, the maximum expected sulfate content for the concrete (assuming no outside source) could be calculated as follows.

3,800 lbs. ÷ 564 lbs. = 6.7
3% ÷ 6.7 = 0.45% by weight of sample for sulfate (as SO_3) maximum for the original concrete.

Fig. 6: Flexible polyurethane lining—cohesive failure within cementitious mortar—New Jersey

The test data clearly showed that sulfate reactions were likely to be continuing within the concrete substrate at depths between ½ in. and 1 in. below the exposed substrate. This information was used to select the average depth of concrete removal for the subsequent relining work. Before and during surface preparation, pH measurements and sulfate content testing were performed to ensure adequate depth of concrete removal before resurfacing and relining work. A concrete surface pH range of 8.0 to 10.0 has been shown to avert unseen substrate degradation. Sulfate content of 0.45% (percent weight of concrete sample) or less for the concrete has also avoided ongoing substrate breakdown.

Table 1: pH Gradient Measurements of Concrete Beneath Disbonded Lining

Depth Below Exposed Substrate	pH Measurements
1/8	6.0 to 7.0
1/4 to 1/2	9.0 to 10.0

Part 2—Substrate Integrity and Concrete Repair Mortars

In two failure analyses projects on linings in sludge storage tanks, one in Florida and one in New Jersey, the failure mechanism was cohesive failure of weak cementitious repair mortars: the epoxy and polyurethane lining systems delaminated because the repair mortar was weak. These failures were investigated in 2005 and 2000 respectively. Both linings were installed within 2 to 3 years of the failure analyses. In both cases, the normal lateral curing stresses associated with an epoxy lining and a flexible polyurethane lining exerted sufficient forces to cause the weak cementitious repair mortars beneath the linings to fail cohesively. In both cases, weak cement mortar was found on the backside of lining chips from the delaminated linings (e.g., Fig. 6).

The first lesson learned here was always test the cured repair mortar, whether cementitious, polymer-modified cementitious, or purely resin-based, for substrate adhesion and integrity (ASTM C1583) before applying the lining.[3] Baseline testing of the parent concrete using that same standard is prudent after surface preparation and before applying the repair mortar. A good rule of thumb is 350 to 400 psi for parent concrete substrate pull strengths. Also conduct hammer sounding of the substrate and the repair mortar to identify any areas of concern between adhesion test locations. Listen for the ringing sound or the thud. If parent concrete pull test values are below 300 psi, evaluate substrate integrity more carefully. In addition, calibrate your design expectations for repair mortar adhesion by your parent concrete test results. Similarly, specified lining adhesion values in accordance with ASTM D7234[4] should be based on the

Fig. 7: Typical broom finish on cementitious repair mortar.

Fig. 8: Blast cleaned floated mortar repair.

Fig. 9: Blast cleaned repair mortar that was broom finished.

repair mortar test results per the ASTM C1583[5] test findings. Good lining system adhesion should generally be around 400 psi or higher.

Many manufacturers of cementitious repair mortars (based on calcium aluminate and/or Portland cement) for concrete do not require further preparation of these products before application of organic lining systems. Instead, they permit broom finishing of the mortars to create a surface profile (Fig. 7). This author's experience has shown that broom-finished cementitious mortars create a weak, laitance-rich layer conducive to cohesive adhesion failures. Both lining failures in the Florida and New Jersey tanks fell into this category.

An additional lesson was that floated and troweled finishes of repair mortars provide more uniform surface profiles when properly blast cleaned (Fig. 8). Broom-finished mortars cause more shrinkage cracking and variation in surface profile than necessary (Fig. 9). Uniform concrete surface profiles make lining application more uniform as well.

The relining of two sludge storage tanks in Connecticut added to the lessons learned about repair mortars and linings. A cementitious shotcrete mortar was used for substrate restoration followed by blast cleaning and installation of a 125-mil-thick troweled epoxy lining with subsequently spray-applied epoxy glaze coat. Adhesion testing was performed during the project with the following average results.

- Parent concrete substrate after surface preparation in accordance with ASTM C1583: 400 to 425 psi with failure 100% within concrete
- Repair mortar before abrasive blast cleaning in accordance with ASTM C1583: 150 to 185 psi with failure mostly within upper ⅛ in. of repair mortar

Table 2: Typical Results for the Powder Samples Tested from the New York State Sludge Tanks

Sample Description	Sulfate Content as SO_3 by Percent Wt. of Sample of Concrete
Degraded concrete on back of lining samples	.97
¼" to ½" into substrate below failure	.82
½" to 1" into substrate below failure	.64

• Repair mortar after surface preparation to CSP 5 in accordance with ASTM C1583: 400 psi with failure mostly within concrete (90%).
• Epoxy lining in accordance with ASTM D7234: 400 to 450 psi with failure mostly within the repair mortar

After two years in service, the tanks are in excellent condition.

The main lesson learned here is that after proper cure, cementitious repair mortars should be blast cleaned. A secondary, related lesson is that the adhesion of organic linings to polymer modified (waterborne or resin-based) mortars or filler/surfacers is far better than to cementitious resurfacing materials when not blast cleaned. However, the cost of surface restoration rises dramatically for polymer-modified cementitious or pure polymer-based mortars as restoration depth requirements increase.

Therefore, design decisions need to be based on material and labor costs relative to the depth of restoration required. This ties Parts 1 and 2 of this paper together. Once you can define the depth of concrete removal, you can decide how best to approach restoration and lining material selection. In the author's experience, combined restoration and concrete profile depths of about ½ to ¾ inches or less lend themselves best to the use of polymer-modified cementitious (waterborne or polymer resin-based) or pure polymer mortars for restoration. The lower labor costs realized through no additional surface preparation offset the higher mortar material costs. When combined restoration and surface profile depths exceed ¾ inch, the use of shotcrete applied cementitious repair mortars are preferable, provided they are blast cleaned following proper cure.

Part 3—Sludge Tank Geometry and Reflective Cracking of Linings

The decision to specify polyurethane, polyurea, PVC, or other flexible linings instead of non-flexible epoxy linings mostly rests on the con-

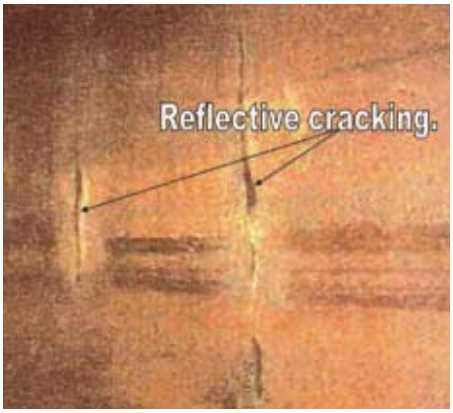


Fig. 10: Typical reflective cracking of an epoxy lining taken in sludge tank in Virginia in 1997. The lining was installed in 1992.

cern over thermally induced movement at existing cracks in the concrete structure. Load-related movement is considered rare in sludge tanks because of the gradual filling and draw down of contents. Flexible lining technologies have provided excellent corrosion resistance and low permeability properties for good sludge tank performance.

However, active structural movement manifested at through-section shrinkage, settlement, or load-related stress cracks in concrete tanks can result in reflective cracking of rigid-cured, brittle resin systems such as epoxy linings. Reflective cracking of linings in sludge tank headspaces exposes the substrate to sulfuric acid attack over time, undermining lining system adhesion (Fig. 10). Flexible linings often can bridge reflective cracking. However, these technologies are far more sensitive to moisture and temperature and more complicated to apply than most epoxy linings.

In the author's experience, active movement manifested at concrete substrate cracks is more frequent and likely in the walls of rectangular tanks than in round tank walls. The inspection of round tank walls typically has indicated that fewer vertical, through-wall, restrained drying shrinkage cracks occur compared to the longer expanses of straight rectangular tank walls, a phenomenon associated with the length of the walls during concrete shrinkage. Much more rigid than straight concrete walls, shell structures such as round tank

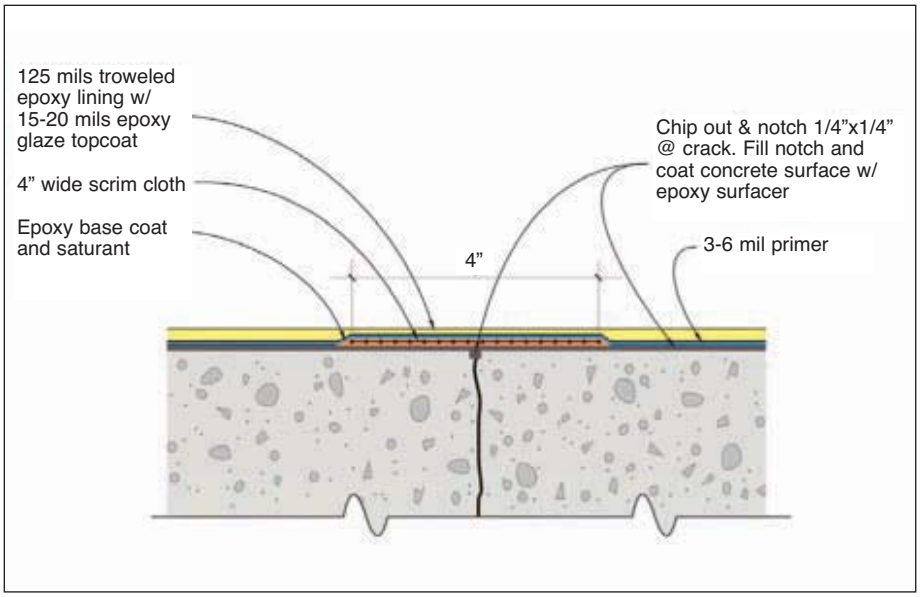


Fig. 11: Typical lining detail at concrete cracks (N.T.S.).

walls, and domes are much more resistant to movement, whether induced by thermal change or hydraulic loading. This geometry difference appears to account for fewer reflective cracking problems when lining round sludge tank walls. Empirically, this appears to be true regardless of similar thermal exposure conditions for square or round tanks.

In contrast to tank walls, reflective cracking in sludge tank covers or roof slabs depends on geometry and thermal exposure. Again, mainly because of the less flexible nature of the structural geometry, domed concrete roofs tend to exhibit less active movement at cracks in the concrete than flat roofs. However, for rectangular and round tanks, the greater the disparity is between internal and external temperatures across the roof section during operation, the greater the likelihood of reflective cracking. For sludge tanks, more original shrinkage cracks are typically found in flat rectangular roofs than in domed roofs. This in large measure explains the higher frequency of reflective cracking of linings in rectangular tanks.

However, the inspection of the domed roof slabs of several sludge tanks exposed to varied outdoor temperatures showed a greater propensity for reflective cracking of rigid, cured linings compared to the walls in the same tanks. This is partly caused by the greater likelihood of through-section shrinkage cracks in roof slabs and the differential temperatures to which roof slabs are often exposed. The internal sludge temperatures remain quite constant, but the outdoor temperatures can vary widely. This differential temperature exposure causes expansion and contraction in the structure conducive to reflective cracking of the tank's lining.

The above notwithstanding, the thermal exposure can affect reflective cracking at tank walls. Sludge tank walls exposed to varied annual outdoor temperatures, whether the tank is round or rectangular, are more likely to experience reflective cracking of linings. Conversely, sludge tanks housed in buildings or insulated exhibit a much lower tendency for active movement at cracks despite the geometry. And sludge tanks built below grade have a much lower likelihood for active movement at cracks because ground temperatures are more constant.

The lessons here are mainly two-fold. First,

the selection of flexible linings versus non-flexible epoxy linings for sludge tanks should be founded on a sound understanding of the presence and frequency of existing through-section cracks. Second, the propensity for active movement at those cracks should be carefully assessed. Some of the lessons above may be helpful in this assessment.

Epoxy linings are easier to apply than polyurethane linings and exhibit fewer adhesion concerns related to rapid set times, lack of wetting properties, and moisture sensitivity. However, flexible polyurethane and polyurea linings can be successfully installed if the propensity for reflective cracking is known or estimated to be significant.

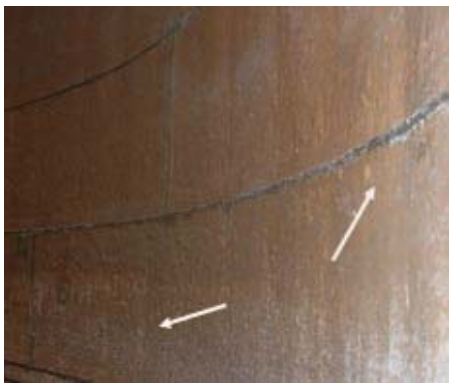


Fig. 12: Blistering and disbondment of lining on lower part of concrete wall of sludge tank with walls built 30% below grade.

Additionally, it is important to recognize that if a small amount of active movement at substrate cracks is expected especially in a roof slab, epoxy and other rigid cured linings can also be reinforced or treated at crack locations in a number of ways to avert localized reflective cracking (Fig. 11, p. 29).

Part 4—Sludge Tank Lining Performance, External Waterproofing, and Ground Water Considerations.

Six years after its application, a fully adhered PVC sheet lining system blistered and disbonded from the lower concrete walls of a sludge tank in New England (Fig. 12). The tank was built with the lower 30% of its walls below grade in a soil condition exposed periodically to a high water table. The tank was originally constructed with one-way relief valves in its sloped concrete floor to deal with the potential for ground water related uplift. The PVC sheet lining was terminated at the bottom of the straight wall leaving the sloped concrete floor (with relief valves) unlined because it is always submerged in sludge unless the tank is emptied. No external concrete waterproofing was installed because of high ground water at the time of construction.

When the lining was installed, moisture testing showed no problem. However, the lining was installed during very dry summer conditions. Two years after installation, the lining was re-inspected and no problems were identified. Four years later, the lining exhibited

Fig. 13: Lining still adhered well in upper part of sludge tank walls after six years of service.

numerous blisters and a few bladder-like, water-filled disbonded areas at the lower wall elevations. The water in the disbonded areas was clear and had a measured pH of about 10.0. Close examination revealed that the source of the water was ground water passing through joints between the tank walls and floor. The pH of the ground water was found to be between 6.0 to 7.0. The rise in pH in the blister liquid resulted from passage through the alkaline concrete. Additionally, the carbon steel relief valves within the sloped tanks floor were almost all frozen in the shut position because they were corroded and plugged with sludge. The tank had been empty for about a year. There was no internal liquid pressure to offset the ground water pressure.

In short, high ground water conditions returned when the tank was empty, but the associated pressure was not relieved by the non-functional relief valves on the tank floor. In contrast, at the upper tank wall elevations not affected by the ground water, the lining was well adhered after six years of service (Fig. 13).

Four lessons were learned in this application. One, if an existing tank was designed with ground water relief valves, address the proper operation of those relief valves during dewatered timeframes when the tank is lined. Second, ensure that the tank's operating level is maintained above the tank's exterior grade elevation during normal operation. Third, before making lining decisions, carefully assess any tank's location relative to above and below grade conditions and annual ground water elevations. Review available geotechnical reports or ground water monitoring well data to determine if ground water pressure can be problematic for lining performance. Fourth, when making lining design decisions, review original tank as-built or design drawings to determine if external waterproofing was applied over the concrete.

The large water-filled blisters and disbonded areas in this tank's lining were repaired. The relief valves were repaired, and the tank's operating level has been maintained at the exterior tank grade elevation since the lining

failure. No recurrence of the lining problem has been observed four years after the lining was repaired.

CONCLUSIONS

Corrosion mechanisms, concrete chemical evaluation methods, substrate integrity testing, repair mortar selection and surface preparation specifications, sludge tank geometry and thermal exposure condition assessments, and ground water and external waterproofing issues substantially affect successful design and the ultimate performance of sludge tank linings. This paper has attempted to demonstrate and share with the coatings and wastewater industries the importance of many of these considerations based on lessons learned from several years of experience.

NOTES

1. ACI 201.2R – 2001, Guide to Durable Concrete, Paragraph 2.2.2 American Concrete Institute, Manual of Practice, Part 1.
2. ACI 225R-99, Guide to the Selection and Use of Hydraulic Cements. Table 3.2 American Concrete Institute, Manual of Practice, Part 2.
3. ASTM C1583-04, Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-Off Method)
4. ASTM D7234-05, Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers
5. ASTM C1583 - 04, Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-Off Method)

Randy Nixon is president and founder of Corrosion Probe, Inc., a consulting engineering firm that has been in business for over 27 years. Mr. Nixon began his career with Georgia Pacific Corp. in 1976 in water/wastewater engineering, construction and utilities management. Between 1979 and 1983, he served in management of specialty contracting services and coatings engineering business for two other firms.

Mr. Nixon has published over 30 technical papers and articles through SSPC, NACE, TAPPI, AWWA, WEF and NEWEA. He is widely recognized in the water/wastewater industry for his expertise and extensive experience in piping corrosion, concrete degradation evaluation, and coatings/linings for concrete substrates. JPCL

Ship Coating Maintenance & Repair:

The Current State of Affairs and the Future with PSPC-Ruled Vessels

By Roy Nedal, Marine Service International AS, Norway

iStockphoto

As a coating contractor with a coating inspection subsidiary, my company is firmly located between a rock and a hard place. The expanse between the vessels' needs and the clients' abilities to repair them has never been more pronounced in our 15 years in this business.

We inspect and maintain or repair several hundred ballast tanks and quite a few decks every year, and we are involved in the hard decisions our clients have to make for these vessels. It is not a scientific or representative sample, as we are normally not called in to evaluate vessels with no issues in the ballast tanks. However, nine out of 10 vessels inspected do have a significant need for maintenance and/or repairs. We have found a good mixture of failed coatings along block joints, fillet welds, and free edges, and this type of breakdown is often associated with rapid and premature steel loss. Since the industry has phased out coal tar epoxy in most countries, we are now repairing vessels coated with modified epoxy paint, so the flat plates are better protected but the welds and edges fail much earlier.

This article gives a contractor's view of the present state of ship coating maintenance and repair as well as predictions about the future of such work with vessels under the IMO Performance Standard for Protective Coatings (PSPC).

COATINGS MANAGEMENT

Today, we recommend repairs on five-year-old vessels that, until a few years ago, would not have been needed until 10 years later. Vessels that are 15 to 18 years old are generally in much better condition than 8- to 10-year-old units. In the current shipping market, most of these repairs are not budgeted and get postponed. For some vessels, only elective maintenance is postponed, which causes future maintenance and repair bills to increase. Many owners also elect to postpone essential repairs, which, in some cases, will have an impact on future Condition Assessment Programme (CAP) ratings; the vessel's longevity; and, in extreme cases, possibly the structural integrity of the vessels. The owners I am referring to are large, well-funded, stock-exchange-listed ship owners and major oil companies. Therefore, knowing how tough the market is in the most professional end of the industry, we are concerned about maintenance in the many shipping companies that are under-funded, or otherwise marginalized in

Editor's Note: This article was published in the October-December 2011 issue of Protective Coatings Europe and was based on a presentation given at the PCE/Safinah Marine Coatings Forum, held Septmber 13, 2011, at Schipol, The Netherlands. It is published here with permission.

If you spend the time and money to get the ballast tank and rest of ship coated properly, then you could get very good service life.

today's difficult market.

It has been pointed out that coating contractors like myself look at ships as being held together by epoxy paint with some bits of steel inside to keep the paint upright. This wry observation has a point, but vessel maintenance is, and should be, a matter of managing coating systems and balancing this against the remaining corrosion margin. When managing structural integrity becomes mainly a matter of steel renewal, the maintenance standards have slipped too far.

When large liquefied natural gas owners (LNG) are forced to change out 3,000 brackets, then cut and install hundreds of other inserts to secure a reasonable CAP rating, the owner spins it as a "life-extension," but in reality it is just catching up on neglected maintenance on a USD 200 million asset. From coating contractors in the major ship repair yards, the message is similar: The "shave and haircut" type of repair yards with average docking times of around 15 days are asked to do a minimal amount of coating maintenance and repairs. The areas are kept to an absolute minimum, and the specified quality is low. A 500-bar, high-pressure wash with no stripe coats is being used where dry blasting or UHP blasting with stripe coats and a proper buildup of DFT should have been specified. The lack of uniform maintenance standards, limited oversight, and the peculiar structure of the industry have always opened the door for substandard operators to ply the shipping markets.

I believe that this practice has to come to an end. It is disruptive for the industry that a surprisingly large number of vessels are allowed to continue trading with serious structural issues, recurring mechanical problems, little maintenance, substandard crews, and no corrosion control. The shipping industry has always been self-governed with limited public involvement. The deal was simple—the classification societies were supposed to ensure that vessels were properly designed

and constructed and maintained a minimum standard until they were recycled. The weak link has always been classification societies' involvement in maintenance, which has been based on their setting some minimum standards such as plate thicknesses. The owner was then supposed to ensure that the ships were maintained to meet these minimum standards.

EXPLOITING THE RULES

I like to compare class rules to Formula 1 Racing rules. Racing fans, for whom winning is everything, already appreciate the ingenuity and effort that goes into dissecting and exploiting rules. Seasoned superintendents and technical managers are equally adept at managing class rules. If the goal of minimizing short-term expenditures is allowed to govern the relationship, there is a sizable body of knowledge to lean on. After a rash of major shipping accidents, the consensus shifted, and "business as usual" was no longer deemed good enough. The costs to the public were becoming too great. The loss of human lives and pollution from oil cargoes and bunker discharges created a demand for private and public regulation, which we are still in the middle of implementing.

Deterioration in a six-year-old tanker. Courtesy of the author

Focusing on the coating issues, it became abundantly clear that standards had been slipping for years. A number of factors were involved. The tough and easy-to-apply coal tar epoxy coatings were outlawed because of health and safety issues; shipbuilding started moving away from European and Japanese yards with decades of experience and skilled workforces; and the market demanded larger, more complicated vessels at a lower price. The end result was vessels that, if built to yard-spec, had ballast tank coatings failing after 5 or possibly 10 years instead of the 15 years normally achieved on older units.

COSTS MINIMIZED

Ship construction is a process in which, after the contract is signed, the yard will push hard to minimize cost and keep to tight production schedules. On the cost side, labor and materials have the most potential to help protect margins. The steel plating is under-rolled, which eats into the corrosion margins; the steel quality is prone to substitution; welding is spotty; and corners are cut when coatings are applied. Nobody likes a small winter storm to delay production or increase build costs, but it is essential for the client to counterbalance these forces with a strong site team who knows the shortcuts and can make sure the yard delivers the quality agreed on in the contract.

In the decade before PSPC was batted about, many ship owners had already reached similar conclusions, and the owners put in place contracts and site teams that ensured that ballast tanks would last 12 to 15 years. We know of many companies that, through such enlightened construction policies, have hardly had to touch the tanks before the third special survey.

Thus, from a vantage point down in the trenches, here come my first predictions: The introduction of PSPC requirements will have only a marginal effect on the ships built for the many already-demanding clients with strong site teams. For yard-spec vessels, the potential for improvement is substantial, and I expect that ships built to PSPC requirements will have improved ballast tanks.

TEMPERED OPTIMISM

My optimism is somewhat tempered by the one-sided strength of the building yards for such vessels. The subcontractors, the rolling mill, the paint manufacturer, and the classification society all work for the yard, and the vessels are being sold with 12-month warranties. The absence of checks and balances will probably ensure that repair contractors will continue to have plenty of work after 2020.

Deterioration on another six-year-old tanker, this one built at a major shipyard. Courtesy of the author

The fact remains that after the contract has been signed, most yards put the schedule first, followed by costs, and then quality at a distant third. Certain problem areas are likely to improve, and the PSPC emphasis on the notorious block joint issue has the potential to have a significant impact on the earliest round of coating maintenance. Over the last few years, early block joint failures have become commonplace. The

(Above and below): Deterioration in a ten-year-old bulk carrier at yet another shipyard. Courtesy of the author

steel adjacent to the manual block welds suffers from poor surface preparation and thus fails prematurely. A proper repair is costly—perhaps USD 50,000 per tank for larger vessels—and, therefore, some owners elect to treat these failures with more power tool cleaning and a new slap of paint. This practice is generally penny-wise and pound-foolish, and it has a detrimental effect on the life-cycle cost of the vessel. The new building yards have known about these problems for years, but because the short 12-month warranty allows for few actual claims being filed, the yards have done little to fix it. Solutions have been known and widely available for many years; however, the cost of few claims was not sufficient enough to alter building schedules, add labor costs, and ultimately reduce the profit margins on these vessels.

The introduction of PSPC and an increased emphasis on coatings during the construction period will probably postpone the need for large block joint repairs.

Here are other aspects of PSPC that we expect will have less of an impact.

- Without the presence of a strong owner, there is a lack of checks and balances.
- The same coatings that failed on three-year-old vessels have, with little or no modification, been type approved for a 15-year minimum service life in ballast tanks.
- The "real life" workings of a shipbuilding yard can quickly reduce coating inspectors to data collectors and bystanders.
- There is a lack of experienced coating inspectors, and there are plenty of flexible people out there with a one-week certificate, a year of experience, and a DFT gauge.

BIG STICK REQUIRED

Call me cynical or call me realistic, but without a big stick in the closet, the goals of PSPC vessels for 15 years of rated "GOOD" ballast tanks will be hard to achieve. When the coating along fillet welds and free

edges fails in 8-, 10-, or 12-year-old vessels, we must question who will bear the cost of repairing the damages. The coating inspectors won't, the yard won't, the product guarantees on the paint will not cover it, and the classifica-

tion society is not going to assume financial responsibility.

In fact, the PSPC regulation will further strengthen the incentives for classification societies to rate all tanks GOOD until the time of the third special survey—especially if the same classification society that was hired by the shipyard to help build the vessel is retained by the owner. This is already a significant problem for the industry, and it causes scores of ships to have necessary maintenance and repair postponed until the age of 15, when little issues have had time to become major headaches. Believing that they have spent extra money to get a PSPC-rule vessel built, owners are likely to be even less inclined to carry out regular coating maintenance over the initial 15 years of trading. This will be partly offset by the PSPC rules that make maintenance a much cheaper option compared to having to repair downrated tanks, which by rule will have to be done using dry grit blasting to SA 2½, whether suitable or not.

Classification societies have historically been focused on steel. The minimal involvement in coating assessment has never been a priority, and most societies are not willing to lose a client over de-rated coatings in water ballast tanks. The result is that substantially all ballast tanks receive a GOOD rating until it is time to issue a CAP assessment for the hull. Eventually, the head-in-the-sand approach to coating condition will have consequences. If we as an industry cannot manage our own problems, then our customers or worse, the public, will do it for us.

Maintenance and repairs compete for company funds like any other department. Without more universally accepted best management practices, and little help from classification societies, the technical departments lose out in the competition for internal funds and are unable to carry out the work needed onboard. The current practice of minimizing operating expenses by postponing recommended maintenance and maintaining only minimum standards, coupled with many companies' policies of disposing of vessels in mid-cycle (often around the third special survey), will prolong the current down-cycle in the main bulk and tanker markets. Current operating expenses are 10 to 15% lower than those at pre-crisis levels. And many ship managers had, at the time, considered the pre-crisis operating expenses to be inadequate.

The typical response from investors and brokers is that spending more on maintenance will cost money. Sure it will; maintenance should cost money, but not maintaining the asset will cost even more. In addition, hundreds of inadequately maintained vessels are forced into the fleets of marginal owners that operate the vessels until the owners can either exit with a capital gain or dispose of the vessels through recycling. Many of these second and third owners are professional, well-run organizations that realize they can pay USD 35 million for a VLCC (a newbuild costs at least $100 million) because there are a maintenance over-hang and high future operating costs that

Breakdown starts at the edges. Courtesy of the author

partly offset the lower capital expenditures. However, many owners and operators are not geared up for running older ships and thus operate these second-hand vessels with an inadequate capital structure, an inability or unwillingness to maintain the vessels, and a lackadaisical attitude about safety.

SUBSTANDARD SHIPS REPREHENSIBLE

These vessels are over-represented in marine accident statistics. A recent study by ABS showed that close to 90% of the bulk carrier casualties happened on vessels 15-years-old or older. In 2011, there were a number of bulk carrier accidents, particularly in the Asian nickel ore trade, which employs a lot of older bulk carriers unable to secure other cargoes. The loss of life and the pollution caused by these accidents are horrible and, because they are mostly avoidable, preventing the use of substandard vessels should be a higher priority. In the long run, allowing a system where hundreds of substandard ships are allowed to continue to operate is morally reprehensible and needs to be stopped. If cargo planes regularly fell out of the sky through a combination of skipped maintenance, inadequate oversight, off-spec and dangerous cargo, and over-zealous cost cutting, the problem would be addressed.

If we want to continue to largely self-regulate our industry, we need to put in stricter maintenance standards and more independent oversight. Also, we need to stop dumping mid-life vessels on sub-standard owners who will trade them in the same market, putting extra downward pressure on our own freight rates. It can also be argued that keeping operating expenses artificially low and disposing of ships halfway through their trading life hides the true cost of owning and operating vessels. In turn, this can cause the ordering of new-buildings during bull markets to be over-extended, which makes the hard times

that always follow even more painful. It would be better if ship owners had a long-term view and based investment decisions on 25 years of trading, followed by a realistic scrap price as the residual value.

FINAL PREDICTION

This takes me to my last prediction: The uniform inspection program and database introduced by the major oil companies in 1993 to identify substandard ships (SIRE) will expand, and, within a few years, ballast tanks will also be inspected by third-party inspectors. This program will rewrite the book and rearrange maintenance priorities. Many owners today are spending good money applying a fresh topcoat on a somewhat faded topcoat just to create a favorable first impression on third-party inspectors. That money is better spent elsewhere.

Oversight and regulation are normally not welcome, but the shipping business may actually benefit from stricter standards and a more level playing field. Competition from older units would become more fair and reasonable by raising operating expense spending across the board and bringing up the lower end to be in line with average spending. If this practice was paired with cargo owners removing arbitrary age limits on vessels chartered in, the owners with first class maintenance practices could justify keeping their vessels in their fleet until they are due for recycling.

Finally, I have a few comments about extending PSPC to cargo tanks in crude oil tankers. For years, nearly every serious tanker owner has already specified that the tops and bottoms of crude oil tanks are supposed to be coated during the construction process. The commercial benefit of this marginal extra investment was so obvious that it has become an industry norm.

PSPC in cargo tanks will probably improve workmanship and standards a bit. We are unaware of any recurring problems with the coating quality in these areas, with the exception of a complete lack of under deck head (under ballast tank roof) coating. But the market has already sorted out this issue.

Roy Nedal is a partner with Marine Service International AS (MSI). MSI, based in Norway, provides voyage ballast tank upgrading and other recoating services to international shipping and the offshore oil industries world-wide. MSI Singapore provides professional coating advice and assists major oil companies and leading shipowners/operators with project coordination and quality control of large scale and/or demanding coating projects at shipyards in Singapore and elsewhere in Asia. JPCL

Field Performance of Polysiloxanes: *An Inspector's View*

By Lee Wilson, Consultant

Technical Editor's Note: Lee Wilson discusses the sensitive subject of the field performance of polysiloxane coating systems, which are often referred to as hybrid protective coatings. To avoid misinterpretation of any particular product, service, or company, the persons whom Wilson interviewed are not named in the article.

When asked to develop an article on an inspector's view from the field on polysiloxanes, I really didn't comprehend how difficult the task that lay ahead would actually be or that the research for this article in general would prove to be rather arduous, to say the least.

During the research for this article, I was approached by, and likewise approached, a great number of protective coating manufacturers who directly offer polysiloxane coatings within their product ranges. I also corresponded with several corrosion control contractors who use these hybrid materials and a great number of coating consultants and paint inspectors—all of whom hold the necessary field experiences with these products from an application and inspection view point and, therefore, in my opinion, the necessary experience to comment for this article. However, nothing appears to be straightforward with the polysiloxane ranges, considering the numerous conflicting reports and experiences with the siloxane brands.

For the record, it has to be said that some protective coating manufacturers were not even willing to release information about their experiences with the field performances of their own ranges of polysiloxane

materials, particularly the second-generation hybrid ranges. As one can gather, this proved to be yet another hurdle that hindered my research and ultimately delayed the release of this article.

For example, the following is a quote from a paint supplier asked for information on the subject: "Until we learn more about the agenda of your article in regards to our polysiloxane range, we will be unable to assist with any research that you are currently undertaking in regards to this technology."

It's a pretty sensible response, I must say, and one that I would also ask before issuing any sensitive information regarding patented technology. With this said, I will tell you exactly what I told our good friends in the manufacturing sectors: "The agenda of the article is to provide the reader with as much information as to the pros and cons of polysiloxanes and to hopefully present the evidence that this technology actually works. Field performance data and information of your experiences with polysiloxane technology would certainly aid in persuading the reader that this is the case."

I subsequently received no further correspondence from the above company.

So why all the melodramatic intrigue? Well, I have to point out that coatings of today are becoming a lot more sophisticated and complex. This is primarily due to the global demand and environmental pressures put on the coating manufacturers to develop environmentally friendly products with longer life spans, i.e., products with low VOC emissions formulated to protect the substrate for extended periods of time before maintenance and refurbishment. With this said, we can clearly see the reasons why protective coating manufacturers are constantly striving to improve and modify their protective coating systems: The financial benefits of successfully bringing to the industry a coating that holds all of the above properties and attributes is clearly a potential goldmine.

This brings us to polysiloxane.

Opposite page and right: Field application of polysiloxanes is often performed under less than the ideal conditions created for lab testing. Photos courtesy of the author

Editor's Note: This article, by Lee Wilson, is part of the series of Top Thinker articles appearing in *JPCL* throughout 2012. Mr. Wilson is one of 24 recipients of *JPCL*'s 2012 Top Thinkers: The Clive Hare Honors, given for significant contributions to the protective coatings industry over the past decade. The award is named for Clive Hare, a 20-year contributor to *JPCL* who shared his encyclopedic knowledge of coatings in many forums. Professional profiles of all of the award winners, as well as an article by Clive Hare, will appear in a special 13th issue of *JPCL*, to be published in August 2012.

THE TECHNOLOGY: INTRODUCTION, EXPECTATIONS, AND PERFORMANCE

Polysiloxane technology was developed and patented in the early 1990s and was widely accepted as the future of the protective coatings industry. The advantages of this new technology were apparent to everyone within the corrosion control industry, with manufacturers of polysiloxane technology offering the industry a low-VOC product with rapid-curing properties and no isocyanates. Furthermore, exhaustive laboratory testing by some of the world's leading manufacturers showed us great performances and key attributes. For example, these products are known to have excellent gloss retention and color properties with good abrasion resistance as well as remarkable resistance to graffiti and to dirt pick-up. Most of all, polysiloxane topcoat systems will apparently last longer than their polyurethane and acrylic counterparts.

The advantages do not stop there, my friends. The polysiloxane technology data supplied from our colleagues within the manufacturing sector also showed us superior corrosion resistance properties at low dry film thicknesses (DFT), especially when used with zinc-rich epoxy primers. This combination was subsequently envisioned by the industry as a replacement for the conventional three-coat systems because initial testing showed truly remarkable performance results in a two-coat system. And the good news continues as further testing data showed excellent compatibility with zinc-rich primers, so we can clearly see how the technology was seen as an economic and cost-effective solution (two coats vs. three or four). The benefits of the above are crystal clear—an environmentally friendly, safer,

and economical solution would be the holy grail of protective coatings.

Writing in the context of extending service life for may coatings, one author suggested that a 25-year service life would be possible for several reasons, including through advances in combining polysilxoane resins and epoxy resins.[1] This is quite a big statement for any coating to live up to.

But I fail to understand why, with this type of prediction coming from any industry expert, contractors, owners, and operators alike, especially in the offshore sectors, still lean toward more traditional, three-coat conventional systems.

As with all coatings, manufacturers are constantly trying to improve application and performance properties of polysiloxanes.

To answer my own question, polysiloxane protective coating systems have certainly had problems. This is well documented and reported. Early versions were considered to be extremely brittle and suffered from internal stresses, which ultimately resulted in numerous field coating failures such as adhesion-related delamination and low flexibility. However, more recent, second generation hybrid polysiloxane materials have shown improved internal stress, flexibility, and hardness properties according to manufacturers' released data, but again these improvements have been under testing conditions. We have to remember that the hybrid versions are still relatively new to the industry, and field performance studies are ongoing, despite some manufacturers' claims that these products are field proven. It is difficult at this stage, in my opinion, to truly determine the real long-term field performances of these products.

Original test data of the first generation of polysiloxane ranges is widely available from our colleagues and friends in the manufacturing sectors and is very impressive when compared to the more traditional acrylic and urethane topcoat products. But, despite the exceptional performances of siloxanes during testing in the laboratory, how are these products really performing and, more importantly, how are they performing where it really counts—out there in the field?

CHEMISTRY, PATENTS, AND FIELD PERFORMANCE

We should remember that the technology is one of competing chemical reactions—one is temperature controlled, the other is humidity controlled. On a cold, wet day, the reaction tends to one direction, and on a hot, dry day, it tends to the other direction. The difference in reactions has huge ramifications on the curing process and, in turn, leads to internal stress of the coating. The problem here is that in real-life applications where it really counts, the weather is not easy to control. The risk then is that we get an unpredictable end product on the steel. In the lab, one can control and simulate the conditions very well and can ultimately achieve some great end results, but this is usually never mirrored in real applications.

We also have to remember that this technology is heavily patented, and there are only a number of limited routes available (chemically) for other manufacturers to go around. The first generation products had a greater issue with this competing reaction technology than what is claimed for the second-generation products; however, many of the second-generation products were designed to get around the patent rather than to try to resolve the issue of competing reaction technology.

My research of available technical data has showed that one leading coating manufacturer has recently developed a second generation product; however, the company is still nervous about the competing reactions and the reproducibility of the end-cured product on the steel. Hence, the company does not wish to bring this type of product to the market at this stage. I believe this is a very sensible decision to make.

Author Anders Braekke summed up the market situation of polysiloxane technology

rather well when he stated: "All major paint companies supplying the offshore sector offer polysiloxane systems, but their compositions have been designed differently. The polysiloxane topcoat market is one where the total patent situation is complicated. Formulating correctly in this area demands both creativity and technological insight."[2]

It is this type of creativity to get around the patent situation that causes me concern.

I asked a fully certified NACE Level III and Frosio 3 coating inspector of a major UK-based, offshore corrosion control company to describe his personal experiences with the siloxane technology. The inspector, I must add, holds significant field experience with polysiloxane application and inspection and has been in a position to monitor the general performance of polysiloxane technology from a number of manufacturers. He describes his field experiences with first-generation technology as "a game of Russian roulette." You just have to look at failures of siloxane systems on several high-profile offshore FPSOs and platforms, as well as a number of onshore facilities in the North Sea UKCS and the Norwegian sectors to understand what he means. The very mention of such failures, in which contractors as well as suppliers might be held liable, strikes fear into the heart of protective coating manufacturers. There have been many recorded catastrophic failures with the real root causes neither identified nor clearly understood.

Several coating inspectors and offshore contractors whom I approached for comments on their field-related experiences with siloxane products stated that they would rather be involved with projects that used more traditional and conventional systems because the potential risk of failure with siloxanes was too great.

Simply put, many contractors and protective coating inspectors are fearful that failure could have huge consequences, jeopardizing not only individual but organizational reputations. On the one hand, I have to agree that this is a big risk to take, so why take it when there are other systems available? Such concerns are, unfortunately, fairly common within the industry, and I believe that polysiloxanes have gained a lot of bad press.

Is this bad press really justified? In my opinion, polysiloxane technology is a truly remarkable concept (that is, in principle and theory), but the real-life experiences of this concept have been mixed with major catastrophic recordable failures and a not-so-perfect reputation, to say the least.

Although it has to be said that some of

While some polysiloxane failures are related to surface preparation and coating application, not all of them are.

these premature failures are preparation and application related, not all of them are. There is considerable evidence that polysiloxanes have not faired well in the field, certainly not as well as their polyurethane and acrylic counterparts, even though the polysiloxanes outperform their counterparts in the vital statistics department.

Regardless of these performance statistics, we have to face the facts. Despite exceptional performances during laboratory testing, polysiloxanes are simply not performing better in the field. Although polyurethanes have received a lot of negativity in regards to the isocyanate reaction and subsequent safety concerns, these protective coating materials have successful performance reputations that have spanned decades across the industry.

ON THE OTHER HAND: A REMARKABLE TECHNOLOGY

I do believe that although siloxane brands receive a great deal of bad press, there are

a number of success stories out there, but these are the stories that you are less likely to hear. I must also add that I do not blame the actual technology or the concept of these protective coating materials. I believe that the blame lies firmly with our colleagues in the manufacturing sectors because of their impatience or eagerness to mass produce and distribute this product. It was, after all, supported by miles of testing statistics that put traditional topcoats such as polyurethane and acrylic to shame, but it was praised as the industry's savior long before it was tried and tested in the field.

However, it is the tail of the tape that really counts. We do have to take into consideration that polysiloxane technology is a truly remarkable achievement and a huge advancement in coating formulation and technology.

Isocyanate-free coatings, such as polysiloxane hybrid coatings, are the future, and I believe that the manufacturers will be trying their utmost to modify and improve their existing products to control the curing process, reduce internal stress and brittleness, and increase flexibility and adhesion of these products. Thankfully, there is published information confirming this belief for me.[2] I just hope that product improvements happen soon because it is a great shame in the sense that a product that offers so many advantages to the industry has developed such a poor reputation.

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Editor's Note: This article was first published in the October-December 2011 issue of Protective Coatings Europe.

Lee Wilson, a senior inspector in the coatings industry, is based in the UK. His March 2011 *JPCL* article, "An Inspector's Views from the Field" on specifying joint SSPC/NACE surface preparation standards more widely, won a *JPCL* Editor's Award. He is also active in industry associations. **JPCL**

SSPC Annual Report

SSPC Delivers Strong Performance in 2011

SSPC President Bob McMurdy begins the Annual Members meeting at SSPC 2012 in Tampa, FL.

Executive Director Bill Shoup delivers SSPC's 2011 Annual Report.

SSPC's 2011 conference, the Society's growing training program throughout last year, and the continued implementation of the strategic marketing plan were among the success stories in another strong year for SSPC: The Society for Protective Coatings, according to Executive Director Bill Shoup. He delivered the "SSPC Annual Report (January 1, 2011 to December 31, 2011)" to the membership at the SSPC's Annual Business Meeting and Awards Luncheon, held during SSPC 2012 in Tampa, FL, January 30–February 2. SSPC President Bob McMurdy presided over the packed event.

The Annual Report is reprinted below. Questions or comments about the report should be directed to Bill Shoup at 412-281-2331, ext. 2230, or shoup@sspc.org.

Part I: Introduction

This annual report gives an overview of the activities, plans, and status of SSPC: The Society for Protective Coatings from January 1, 2011, through December 31, 2011. The information enclosed gives the most current figures for all programs.

SSPC had another successful year. We held our conference in Las Vegas, NV (January/February 2011), increased training program delivery, and continued our progress in implementing the strategic marketing plan.

We continue to look at foreign markets as a way to expand SSPC and continue to reinforce our message that the use of protective coatings is the best solution for corrosion control.

Marketing efforts continue to focus on core SSPC member demographics spread across a broad range of industries: painting contractors, facility owners, consultants, inspectors, engineers, raw material suppliers, equipment manufacturers and suppliers, and coatings suppliers. Targeted industries include marine, defense, chem/petrochem, transportation, and water/wastewater.

Part II: Accomplishments

The acceptance of our Protective Coatings Inspector Course by RINA, the Italian ship classification society, was a major accomplishment in 2011. This is in addition to those who already recognize the course: Lloyds and the American Bureau of Shipping. During 2011, Lloyds did an annual audit of our course and re-accredited it until 2014. We expect to submit our material to Bureau Veritas for its acceptance in 2012. The reason we highlight this is because, to our knowledge, the SSPC inspection course is the only one of the many given that has undergone independent audits by an outside agency. Also during 2011, our training programs and delivery system underwent an audit by IACET, the International Association

of Continuing Education & Training, and we were recertified by that organization. The Florida Board of Professional Engineers approved our entire program for the 2012 conference for Professional Education Units, representing an improvement over the 2011 conference where it only accepted four courses.

Training remains the hallmark of our association. Ten years ago the conference and membership cost centers accounted for 48% of the revenue for SSPC. It is now 31%. During the same time frame, training and certification have increased in revenues by 21% as SSPC adapted to the needs of its members and the industry in general. New training courses for 2011 were: Navigating Standard Item 009-32, Using SSPC PA 2 Effectively, Basics of Estimating Industrial Coating Projects, and Coating Applicator Specialist Level 1 Qualification Preparation Course. We have also continued to conduct training for all our armed forces, the U.S. Coast Guard, and NASA under the auspices of the University of Akron's contract with the Department of Defense Office of Corrosion Policy and Oversight.

In 2011, SSPC began issuing certifications for the new Aerospace Coating Application (ACAS) Program. SSPC, Embry-Riddle Aeronautical University, and Honda Aircraft worked together to create the first industry certification for Aerospace Coatings Applicator professionals. Four candidates completed the initial program.

At the request of members and facility owners, SSPC developed an additional level of certification for the Protective Coatings Inspector (PCI) program. We now have three levels. Candidates for the PCI Level 3 must have additional inspection experience over Level 2 and take a comprehensive written exam. The first exams were given in November 2011.

SSPC began providing PCI training online in December 2011. This program is a great way to prepare candidates for the PCI Level 1, PCI Level 2, and PCI Level 3 Certification Exams. SSPC offers an in-person, one-day PCI Instrument Workshop for those who complete the online training.

In 2011, SSPC signed an agreement of cooperation with the Australasian Corrosion Association so that the organization can teach our applicator programs. We also signed an agreement with the Institute of Materials Malaysia (IMM) that states SSPC and IMM would begin a dialogue for future cooperation.

In the area of Chapters, the SSPC Board of Governors approved a Chapter in India in January 2011 and Nigeria in September 2011.

In the area of Public Policy Advocacy, SSPC submitted comments to EPA on the Bisphenol A Epoxy Resin (BPA) action plan in September. In November, SSPC also submitted comments to the U.S. Department of Agriculture referencing a proposed rule to redefine the abrasive category for federal procurement.

SSPC also posted headlines on our website relating to government activities that may affect the coatings industry.

In the area of providing information, we had 1,113 technical information inquiries in 2011. This was up from 1,039 in 2010, or 6.9%. We are now finding that many of the coatings technical conversations are taking place on social media outlets such as LinkedIn or Facebook, not on SSPC's Coatings Talk. By participating in these interactions, you make use of the outstanding knowledge and expertise of the SSPC membership. Heather Stiner, a chemist and a member of the SSPC staff, is also a superb resource of information for our members, and we invite you to make use of her capabilities.

Two other items need to be mentioned. Last year, SSPC awarded three scholarships to deserving students who were studying in the coatings field. Also, in June 2011, SSPC and its members donated $16,750 to the SSPC Japan Chapter for the relief efforts in that country after the terrible tsunami.

Part III: Member Programs

SSPC is a member-based organization. We are evaluated on how well our programs and services meet the needs of our members and the protective coatings industry.

Standards and Publications

Our core product is our standards. There were no new standards issued or existing standards revised in 2011. In early 2012, five new standards and five revised standards are scheduled to be released. New or updated publications are listed in Table 1.

Certifications

The past year saw an increase in the total number of certified contractors. Three hundred and thirteen (313) contractors, many holding multiple certifications, have achieved certification, an increase of 7.6% over 2010. The past year also saw an increase in the total number of certified coating and lining inspection entities. Eight companies have achieved Coating and Lining Inspection Company certification, an increase of 14% over 2010. In the Protective Coatings Specialist Certification (PCS) program, we have 273 participants

Table 1: Standards and Publications Completed in Year Ending December 2011

SSPC Protective Coatings Glossary (June) – Major Update
Preparing and Using Protective Coating Specifications (August) - New
SSPC Concrete Coating Condition Assessment: An Illustrated Guide (December) - New

certified, an increase of 8.3% from last year. A breakdown of the certification programs is shown in Figure 1.

Training

**In brackets is the percentage increase or decrease from last year.*

The SSPC C-1, Fundamentals of Protective Coatings, and the C-2, Planning and Specifying Industrial Coatings Projects courses have continued with 161 [-11%] students trained this past year. The number of students taking advantage of our online offering of these courses has increased to 176 [+9%] this year. For Lead Supervisor Competent Person training and refresher courses (C-3 and C-5), 1,884 [+13.4%] students received training. Another 34 [-60%] students participated in our Lead Worker training program. The C-7 Abrasive Blasting course had 378 [-15%] personnel trained. Airless Spray (C-12) had 114 [-41%] students trained; WaterJetting (C-13) had 113 [+232%]; and Marine Plural Component (C-14) had 110 [-11%]. The Applicator Train-the-Trainer course had 29, just one more than last year. The Quality Control Supervisor course (QCS) had 77 [-28%] students trained, with another 166 [-21%] taking the course online. Four students attended the Evaluating Common Contract Clauses; five trained in the Navigating 009-32; and 23 in the Basics of Estimating Industrial Coatings Projects, a new 2011 offering.

The Coating Applicator Specialist (CAS) program made great strides this year with 273 achieving CAS Level 1 and 30 achieving CAS Level 2 Interim Status.

SSPC's Concrete Coating Inspector Certification (CCI) Program had 44 [+340%] students. There were 420 [+1%] in the NAVSEA Basic Paint Inspector (NBPI) program, 117 [+102%] in the Bridge Coating Inspector (BCI) Program, and 295 [+9%] students completed the Protective Coating Inspector (PCI) Program.

Webinars

SSPC continued the free webinar program that began in 2010. Twelve webinars were given from February to December 2011. This year's attendance was off slightly with 1,379 [-8%] attendees. SSPC continues to offer a short online exam that provides Recertification Units toward the Protective Coating Specialist (PCS) exam. Sixty-four individuals took the online webinar exam in 2011 and 98 in 2010. All of the webinars in the 2011 series are archived and can be viewed at the PaintSquare.com website.

International Training

SSPC continues to expand its reach internationally with our training and certification programs. Through our Chapters and licensees, 354 students attended SSPC training and certification programs. Again this year, the Protective Coating Inspector program continues to be extremely popular internationally.

Asia and Southeast Asia continue to be areas of strong growth. Our volunteers in Singapore and Indonesia have helped us hold seven PCI classes in Singapore and Batam, Indonesia, where 104 individuals have taken the PCI Level 1 and 2 programs. Our chapter in the Philippine Islands hosted a small class of five for the PCI program.

The SSPC China Chapter and our licensee in China have combined to hold a C-2, Specifying and Managing Protective Coatings course with 18 students and five Protective Coating Inspector courses with 44 students. Moody International has been a licensed provider of SSPC's Protective Coating Inspector (PCI) course in China since January 2009. They translated the course into Chinese and are the only SSPC licensee to deliver the course in a language other than English.

Our licensee who works out of the United

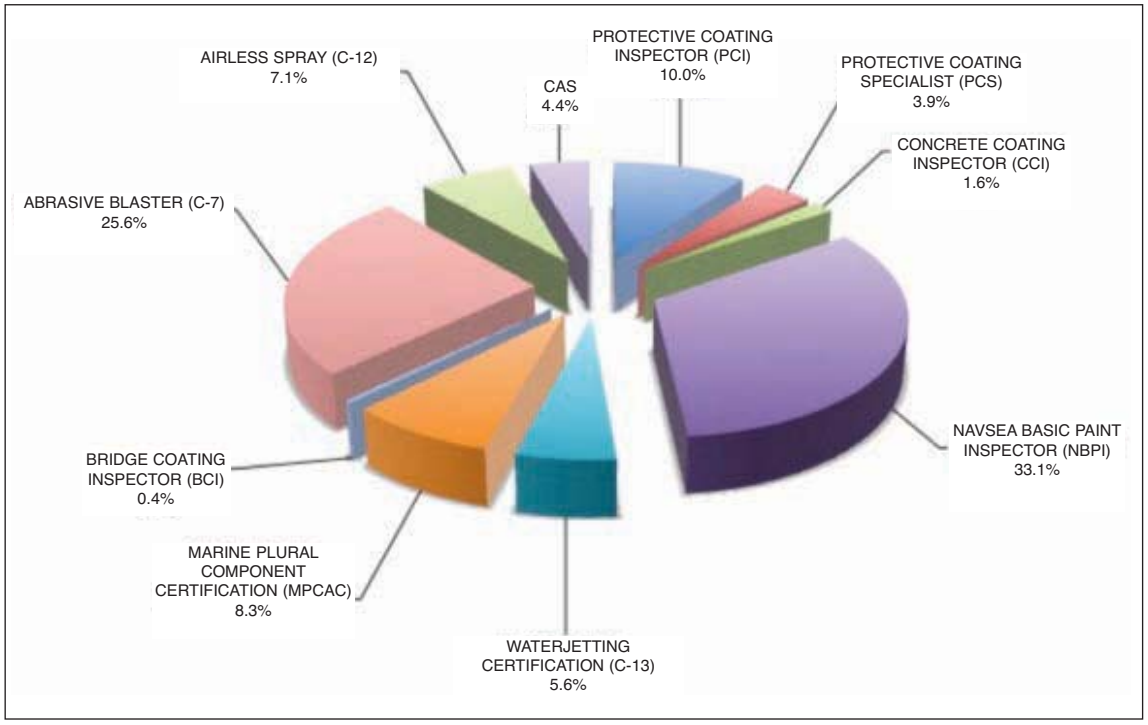


Fig. 1: Breakdown of Certification Programs in 2011

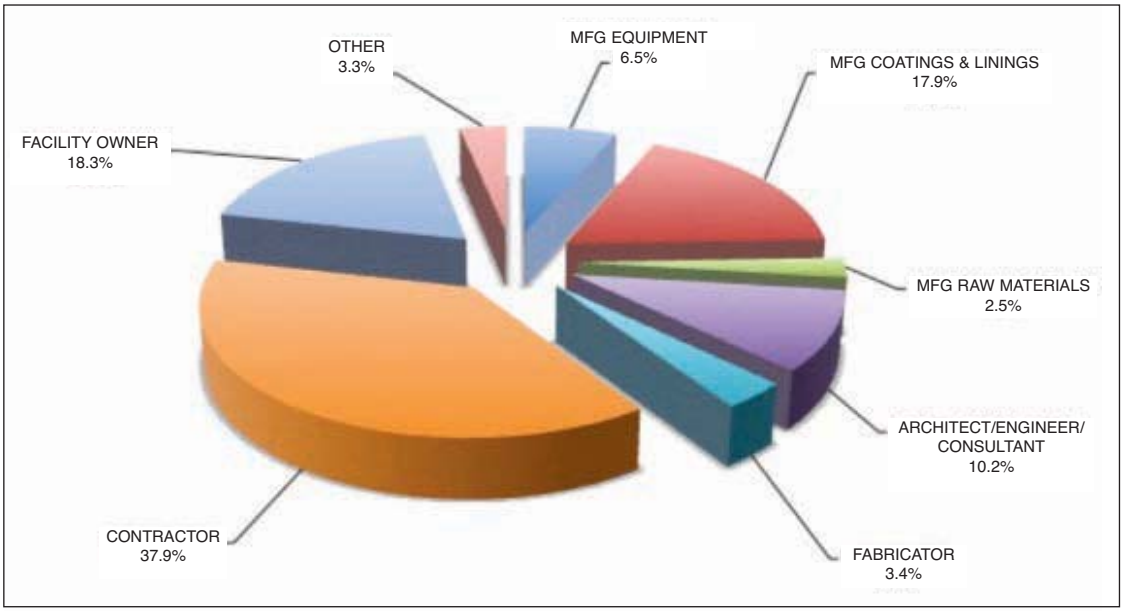


Fig. 2: SSPC Membership Demographics in 2011

Arab Emirates chapter had another successful year. There have been six PCI courses in Dubai with a total of 49 students. Ten candidates successfully completed the Protective Coatings Specialist (PCS) exam after taking the C-1 course exam and the complete C-2 course. An Applicator Train-the-Trainer course had nine students complete the training in Dubai. In addition, there were also two PCI classes in Nigeria with 22 students, one course in Cairo with four, and one PCI in India with 11 students. The PCI program was also given in Belgium for 11 students under a different licensee.

SSPC also made some progress south of the border in Mexico where we held a C-10, Floor Coating Basics, for 10 people; a Quality Control Supervisor (QCS) course for 12; and gave the Abrasive Blasting (C-7) program for eight people.

Website

On April 1, 2011, SSPC launched its redesigned and database-driven website focusing on enhancing the customer and member experience. It features a customized content management system (CMS) for updating and maintaining both our site content and our products and services for sale. Customers can now search for training courses and other products, place those items in their Marketplace "shopping cart" and pay for them using a single sign-on account. Members now have easier and unlimited access to standards and other member only downloads through the use of their single sign-on.

The CMS features have also been extended to SSPC Chapter administrators who can now list their events and other items of interest.

We also offer direct links to popular social media tools and/or SSPC branded and controlled social media homepages through LinkedIn, Twitter, Facebook, the SSPC Blog, and RSS feeds for SSPC news. Also, we placed any and all searches for individuals' and/or companies' qualifications right on the homepage.

The system has been automated to reset a lost or forgotten password. When a member logs into their account, they access a dashboard listing their purchase history. It also notifies them when their membership is about to expire. We also added links to the video proceedings so members and customers can view the prior year's conference videos online. Many of the online forms, including the QP contractors' Notification Form, have been revised for better information flow.

We also enhanced the onsite training request form that enables individuals to bring SSPC training courses to their own facilities. New forms for PCS, NBPI, and PCCP have been added. We've also updated the online tools and links section and email groups targeting specific market segments.

Although not a part of the website redesign project, but very much a part of the "NEW SSPC," we launched SSPC's technical committee activities onto a "cloud" workspace to improve member access and communication within and between committees. The process started in October 2011 and is currently serving SSPC committee members involved in the development of consensus documents.

The average number of unique visitors to our site is 15,305 per month, a slight decrease attributed to site redesign and the increased use of website traffic that is not traceable to a unique host.

Part IV: Membership and Administration

Membership

During the reporting period, SSPC organizational membership (OM) increased to 822, or 3.8%. Individual membership grew from 8,768 in December 2010 to 9,157 in December 2011, an increase of 4.4%. A breakdown of individual members' demographics is shown in Figure 2; however, it remains nearly the same as the previous year.

We are pleased with the progress in increased organizational and individual mem-

Table 2: Board of Governors

Name	Company	Representing
Robert McMurdy *President*	**Mohawk Garnet, Inc. Ontario, Canada**	**Other Product Suppliers**
Stephen Collins *President-Elect*	**Air Products and Chemicals, Inc. Thomaston, GA**	**Coating Material Suppliers**
Benjamin S. Fultz *Vice-President*	**Bechtel Corporation Houston, TX**	**Facility Owners**
Russ Brown *Immediate Past-President*	**Polygon Indianapolis, IN**	**Other Product Suppliers**
Gunnar Ackx	SCICON Worldwide bvba Brugge, Belgium	Other Service Providers
Derrick Castle	Kentucky Transportation Cabinet Frankfort, KY	Facility Owners
Steven Hagman	CanAm Minerals/Kleen Blast Abrasives Danville, CA	Other Product Suppliers
James R. King, Jr.	John B. Conomos, Inc. Bridgeville, PA	Coating Contractors
Garry D. Manous	Atsalis Brothers Painting Warren, MI	Coating Contractors
Brian Skerry	The Sherwin-Williams Company Cleveland, OH	Coating Material Suppliers
Marty Stamey	The Brock Group Beaumont, TX	Coating Contractors
L. Skip Vernon	CLT, Inc. Tijeras, NM	Other Service Providers
Gail A. Warner	Huntington Ingalls Industries – Newport News Shipbuilding, Newport News, VA	Facility Owners
Carl Angeloff, P.E.	Bayer MaterialScience LLC Pittsburgh, PA	Ex-Officio
Robert J. Ziegler	BBZ Consulting Nauvoo, IL	Ex-Officio

Officers in bold

Table 3: Revenue Versus Expense (Unaudited and before final adjustments)

Revenue	FY 11	FY 10
Memberships	$997,000	$995,000
Standards and publications	$583,000	$575,000
Conferences	$855,000	$499,000
Certification & training	$3,591,000	$3,312,000
Other *	$84,000	$705,000
Total Revenue	**$6,110,000**	**$6,086,000**
Expense	**FY 11**	**FY 10**
Memberships	$759,000	$736,000
Standards and publications	$558,000	$472,000
Conferences	$651,000	$448,000
Certification & training	$2,436,000	$2,363,000
Other **	$760,000	$780,000
Total Revenue	**$5,164,000**	**$4,799,000**
Net Surplus (Loss)	**$946,000**	**$1,287,000**

Notes to Table 3

** Includes revenue from royalties, interest, and external projects.*

*** Includes expenses for SSPC chapters, governance, regulatory advocacy, knowledge center, external projects, general administration, and strategic plan implementation.*

bership in these uncertain economic times. However, we cannot remain satisfied with the status quo.

Governance

The Board of Governors changed in 2011. The Board welcomed Garry Manous from Atsalis Brothers Painting and Marty Stamey from The Brock Group, both coating contractors. The Board also welcomed Dr. Brian Skerry from The Sherwin-Williams Company to represent the coating material supplier demographic. The present Board is shown in Table 2.

Administration

Key staff members remained the same. They are: Bill Shoup, Executive Director; Michael Damiano, Director of Product Development; Barbara Fisher, Controller; Mike Kline, Director of Marketing; and Terry Sowers, Director of Member Services.

Part V: Finances

We are pleased to report that SSPC again met its financial goals for the FY that ended December 31, 2011. The reserve fund now stands at $3,872,000, which represents about 63.4% of the average annual operating revenue. SSPC has met its financial goals by increasing operating revenue by $688,000 while only increasing expenses by $151,000. The financial details for the last fiscal year and the prior fiscal year are presented in Tables 3 through 5. Those charts demonstrate that SSPC continues to be a financially sound organization, and all of our financial indicators and ratios are healthy.

Respectfully Submitted:
William L. Shoup, Executive Director

Table 4: Statement of Financial Position as of 12/31/11 (Unaudited)

	Total All Funds	General Operating Fund	Reserve Fund
Assets - Current Assets			
Cash	$1,809,000	$1,809,000	
Investments	$6,548,000	$2,676,000	$3,872,000
Accounts receivable	$173,000	$173,000	
Inventory	$148,000	$148,000	
Total	**$8,678,000**	**$4,806,000**	**$3,872,000**
Furniture, Fixtures, and Equipment			
Equipment, Leasehold improvements at cost less accumulated depreciation	$403,000 <$328,000>	$403,000 <$328,000>	
Total	**$75,000**	**$75,000**	**-0-**
Other Assets			
Prepaid expenses	$274,000	$274,000	-0-
Total Assets	**$9,027,000**	**$5,155,000**	**$3,872,000**
Current Liabilities			
Accounts payable	$118,000	$118,000	
Accrued expenses	$343,000	$343,000	
Deferred revenue	$1,399,000	$1,399,000	
Total Liabilities	**$1,860,000**	**$1,860,000**	**-0-**
Net Assets - Unrestricted	**$7,167,000**	**$3,295,000**	**$3,872,000**
Total Liabilities and Net Assets	**$9,027,000**	**$5,155,000**	**$3,872,000**

Table 5: Changes in Net Assets (Unaudited)

	Total All Funds	General Operating Fund	Reserve Fund
Unrestricted net assets - December 31, 2010	$6,221,000	$3,059,000	$3,162,000
Change in net assets as a result of current operation	$946,000	$986,000	<$40,000>
Transfer from general operating fund to reserve fund		<$750,000>	$750,000
Unrestricted net assets - December 31, 2011	$7,167,000	$3,295,000	$3,872,000

American Legion Mall. Photo courtesy of the Indianapolis Convention & Visitors Association, www.visitindy.com.

Biennial American Coatings Show Heads to Indy

The American Coatings Association, partnered with Vincentz Network, will hold the American Coatings Show and Conference 2012 in Indianapolis, IN, at the Indiana Convention Center. The show, which is held every other year, takes place May 8–10, 2012, with the conference portion being held May 7–9, 2012.

The following preview provides information about the show that may be of interest to industrial coating professionals. All information is current as of press time. For more information, visit www.american-coatings-show.com.

Pre-Conference Tutorials

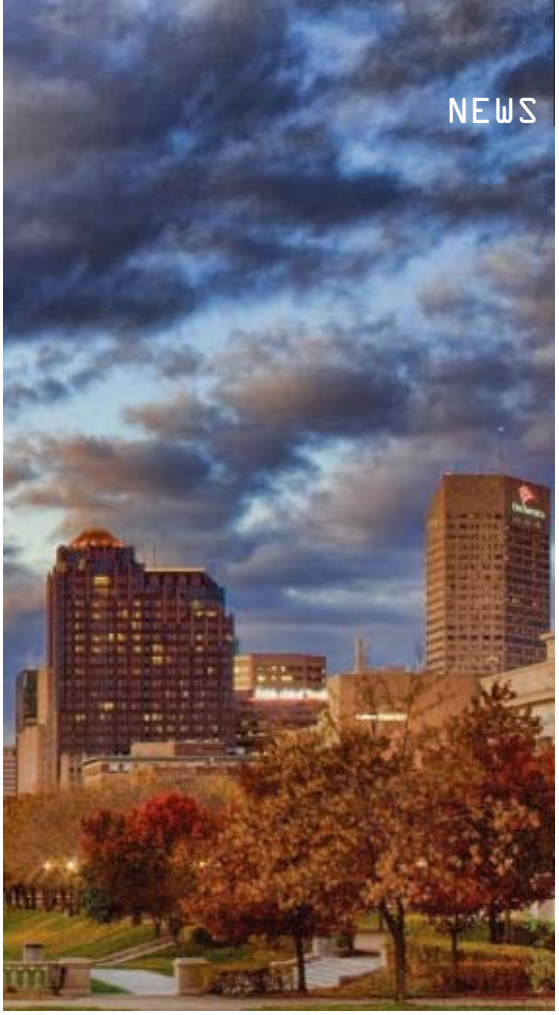
Nine pre-conference tutorials will take place between 8:30 a.m. and noon on Monday, May 7, before the conference sessions begin. Tutorials 1–5 will be held from 8:30 to 10:00 a.m. on the topics of antimicrobial surfaces, easy-to-clean coatings, radiation curing, waterborne high-performance coatings, and smart coatings. Tutorials 6–9 are scheduled from 10:30 a.m. to noon and include topics on polyurethanes, titanium dioxide, antifouling coatings, and anticorrosive coatings.

Conference Sessions

Sixteen conference sessions will be offered at the conference; those that focus on protective coatings are discussed in more detail below. Other conference sessions include: Science Today—Coatings Tomorrow, Measuring & Testing, Radiation Curing, Pigments, Architectural Coatings I & II, Biobased Coatings I & II, Modeling & Measuring, Polyurethanes, Epoxy Coatings, Waterborne Systems, Smart & Functional Coatings, and Novel Materials.

Sessions 6 & 10: Protective Coatings I & II

On Tuesday, May 8, two sessions focused on protective coatings will take place. Each session includes six papers. Jeff Lackey of Vogel Paint will chair the Protective Coatings I morning session. Anthony



Gichuhi of Halox is the chair for the Protective Coatings II afternoon session.

Papers, presenters, and times for both sessions are:

- "Novel WB Epoxies and Curing Agents for Protective Coatings," by Tim Miller, Dow Coating Materials, 9–9:30 a.m.
- "Use of Fluoro Silane Monomers to Improve the Performance of Epoxy Polymers," by Safak Oturakli, Kanat Paints and Coatings, Turkey, 9:30–10 a.m.
- "Anticorrosive Concepts for Modern High Performance Protective Coatings," by Lars Ludwig Kirmaier, Heubach GmbH, Germany, 10–10:30 a.m.
- "Cr (VI) Free, Water-Based Sol-Gel Systems for Metal Corrosion Protection," by Helmut Mack, Evonik Industries, Germany, 11–11:30 a.m.
- "Silicone Foul-Release Coatings for Vessels and Marine Structures," by Rob Thomaier, NuSil Technology, 11:30 a.m.–Noon
- "Novel Multiphase Acrylics for High Performance Coatings," by Ivan Tyre,

Alberdingk Boley, Inc., Noon–12:30 p.m.
- "Smart Coatings for Self-Healing Corrosion Protection," by W. Marshall Ming, Georgia Southern University, 2–2:30 p.m.
- "Nano-Structures Particle Solutions to Improve Primer Performance," by Maria Nargiello, Evonik Degussa Corporation, 2:30–3 p.m.
- "Performance of Epoxy-Siloxane Binders," by Daniel Calimente, Wacker Chemical Corporation, 3–3:30 p.m.
- "Durable Multi-Purpose Protective Coatings," by William Schaeffer, Sartomer USA, LLC, 4–4:30 p.m.
- "Low VOC SB Epoxy for Corrosion Resistant Primers with Improved Flexibility," by Daniel Haile, Dow Coating Materials, 4:30–5 p.m.
- "Positive Influence of Dispersed Nanoparticles on Corrosion and UV Protection," by Robert McMulin, BYK USA Inc., 5–5:30 p.m.

Mega Rust Takes Annual Event to San Diego

The American Society of Naval Engineers (ASNE) will hold Mega Rust 2012: Naval Corrosion Conference in San Diego, CA, June 12–14. The annual event will take place at the Town and Country Resort & Convention Center.

The conference brings together government, military, owners, operators, shipyards, research facilities, and coatings man-

Exhibitors at ACS 2012

The previous two American Coatings Shows saw approximately 330 exhibitors at each show. *JPCL* has provided a list of exhibiting companies and their booth numbers registered at press time that may be of interest of professionals in the industrial and maintenance coatings industry. A full list is available on the show's web site.

- 3M Energy + Advanced Materials....1610
- ACT Test Panels LLC....1319
- AGC Chemicals Americas, Inc. ...2122
- Air Products Chemicals Inc. 1911
- AkzoNobel Functional Chemicals LLC....1523
- Alberdingk Boley Inc....611
- American Coatings Association 1661
- Arizona Instrument LLC....1229
- Arkema Inc. 500
- Ashland Specialty Ingredients....823
- BASF—The Chemical Company 1401
- Bayer MaterialScience LLC....301
- Brenntag North America & Brenntag Specialties, Inc. 1717
- BYK USA Inc. & BYK-Gardner USA 1000
- Cardolite....1828
- Cargill....1622
- Celanese Emulsion Polymers 1200
- Clariant....1820
- COATEX....500
- Croda....1344
- Cytec Industries....1600
- DeFelsko Corporation....1211
- The Dow Chemical Company ...1800
- DSM Coating Resins....523
- DuPont....1944
- Eastman Chemical Company....1917
- ECKART GmbH....1100
- Elementis Specialties 1611
- Emerald Performance Materials ..722
- European Coatings Vincentz Network GmbH & Co. KG....1761
- Evonik Degussa Corp. 2000
- Fischer Technology, Inc. 1515
- Paul N. Gardner Co., Inc. 1426
- Grace Davison....1339
- HALOX....1711
- Heucotech, Ltd./ Heubach GmbH 1433
- Hoffman Mineral GmbH....1755
- Huber Engineered Materials 1033
- Huntsman 511
- Hybrid Coating Technologies 428
- Incorez Corporation....1730
- Kärntner Montanindustrie GmbH 623
- King Industries, Inc. 416
- Konica Minolta Sensing Americas 1219
- LANXESS Corporation 1538
- Lonza Microbial Control....1239
- Lubrizol Advanced Materials 2101
- Michelman Inc. 2123
- Momentive 923
- Nubiola USA 1739
- NürnbergMesse China Co., Ltd. ..439
- Nuplex Resins 2017
- Omnova Solutions....933
- Perstorp Coating Additives 1939
- Pittsburgh Society for Coatings Technology 330
- Q-Lab Corporation 917
- Reichhold Inc. 1300
- Rhodia 111
- Rockwood Holdings 2117
- Sartomer Company, Inc. 500
- Schlenk Metallic Pigments GmbH 717
- The Shepherd Color Company....723
- TQC b.v. 1116
- Troy Corporation....410
- Tyco 1933
- U.S. Polymers-Accurez, LLC 1546
- Wacker Chemical Corporation....201
- X-Rite, Inc. 1017

ufacturers and suppliers. The conference will include over 30 technical papers, more than 75 exhibits, and SSPC and NACE accreditation courses.

More information will be available closer to the conference and can be found at www.navalengineers.org/megarust2012.

SSPC Courses at Mega Rust

The following SSPC courses will be offered: June 11–15, NAVSEA Basic Paint Inspector (NBPI); June 12, Navigating Standard Item 009-32; June 13, Using SSPC PA 2 Effectively; June 14–15, Quality Control Supervisor (QCS).

Under the DoD program, approved personnel can register for SSPC coatings training courses and have the cost of the course covered by the funding. All of the SSPC courses being offered at Mega Rust 2012 are eligible. Contact Jennifer Merck at merck@sspc.org for more information.

Courtesy of the San Diego Convention & Visitors Bureau, sandiego.org.

Exhibitors

Companies planning to exhibit at Mega Rust (current at press time) include: 3M Defense; Av-DEC; Ceram-Kote Coatings Inc.; Cocoon, Inc.; DeFelsko Corporation; DESCO Manufacturing Co., Inc.; Dex-O-Tex by Crossfield Products Corp.; Fischer Technology, Inc.; International Paint LLC; Munters Corporation; Novetas Solutions, LLC; SAIC; The Sherwin-Williams Company; Spencer Industries & ArmorGalv®; Sponge-Jet, Inc.; Sulzer Mixpac USA, Inc.; Superior

Products International, II, Inc.; and Western Technology, Inc.

Updates on exhibiting companies can also be found at the Mega Rust web site.

PDA Holds Conference in Orlando

The Polyurea Development Association (PDA) will hold its 2012 Annual Conference in Orlando, FL, on March 26–29. The conference takes place at the Doubletree by Hilton Orlando at Seaworld Hotel.

During the conference, PDA will offer courses for applicators, live demonstrations of spray techniques, a keynote speaker, and breakout sessions. PDA session topics will include the state of the industry, innovative coatings projects, and new spray techniques and processes.

For information: pda-online.org.

UT Researcher Wins Tess Coating Award

A University of Texas researcher in membrane materials science and technology will receive the American Chemical Society's prestigious Roy W. Tess Award in Coatings for 2012.

Dr. Benny D. Freeman, of UT Austin's Department of Chemical Engineering, will receive the award from the society's Division of Polymeric Materials: Science and Engineering (PMSE). The honor "recognizes the significant fundamental and practical contributions that Dr. Benny Freeman has made over the last 23 years in the area of polymer and coatings material science and technology applied to membranes," said Dr. Theodore Provder, who heads the award committee.

Dr. Benny Freeman

Freeman has authored more than 300 papers and publications; has presented more than 500 lectures at institutions and conferences worldwide; has co-edited five books; and has been named inventor on 14 patents or patent applications.

Funded by a grant from Dr. and Mrs. Roy W. Tess, the Tess Award is presented annually in recognition of outstanding contributions to coatings science and technology. Dr. David Schiraldi, 2012 Chair of the PMSE Division, will present the Tess Award to Freeman on Aug. 20 at the 244th National Meeting of the ACS in Philadelphia, PA.

Companies

RPM Shuffles Top Finance Team

RPM International's board of directors has elected Russell L. Gordon, VP of corporate planning, as VP and CFO of the company, effective April 10. Gordon will replace Robert L. Matejka, who plans to retire May 31, at the end of the company's fiscal year.

Russell Gordon

Keith Smiley

Matthew Ratajczak

Gordon will oversee all of RPM's finance functions, including corporate accounting, financial reporting, global tax administration, and investor relations.

RPM also announced these other changes within its finance department, effective April 10.

• Keith R. Smiley, current VP, treasurer, and assistant secretary, will become VP of finance and controller.

Barry Slifstein

• Matthew T. Ratajczak, VP of global taxes, will assume additional treasury responsibilities as VP of global taxes and treasurer.

• Barry M. Slifstein, VP and controller, will become VP of investor relations and planning.

International Paint Names Protective Coatings Manager

International Paint LLC, an AkzoNobel company, has promoted Chris McMillan to protective coatings marketing manager for North America.

Chris McMillan

McMillan will be responsible for all marketing and marketing communications activities for the company's International Paint, Devoe, Environline, and Ceilcote brands serving the oil and gas, industrial, water/wastewater, infrastructure, and other markets throughout the U.S., Canada, and Latin America.

McMillan has been with International Paint since 1999 and has a BS in marine science from Texas A&M University. He is certified as a NACE Level 3 Coatings Inspector and is an active member of SSPC.

Safway Announces New President

Safway Services LLC has announced the appointment of Bill Hayes as president.

Bill Hayes

Hayes, also named COO and a company director, was most recently president of Honeywell Safety Products. Hayes graduated from Northwestern University's Kellogg School of Business.

Industrial Scientific Names Sales Chief

Industrial safety veteran Larry Kilian has joined Industrial Scientific Corp. as senior director of sales for the Americas, Australia, and New Zealand.

Larry Kilian

Kilian will have overall responsibility for sales functions in these regions for the company.

He most recently served as the vice president of sales at Dräger Safety, where he was responsible for sales and customer service teams in the U.S.

Vigor to Acquire ASD

Alaska Ship & Drydock Inc. (ASD) will become part of Vigor Industrial under an acquisition plan announced this week by both companies.

The deal would strengthen shipbuilding, ship repair, and maritime jobs in Alaska, the joint announcement said.

The sale requires approval by the Alaska Industrial Development and Export Authority (AIDEA), which owns the Ketchikan Shipyard (KSY), where ASD is based. ASD performs painting, cleaning, repairs, inspections, and other services at the shipyard. Vigor Industrial currently owns and operates a wide range of maritime services in the Pacific Northwest.

Most of the news this month is based on stories from *PaintSquare News*, *JPCL*'s sister publication, a free daily e-newsletter. To get even more news, sign up for the newsletter at paintsquare.com.

Project Preview

By Charles Lange, Paint BidTracker

Tarpon Industrial To Coat IA-IL Memorial Bridge

The Iowa Department of Transportation and Tarpon Industrial, Inc. (Tarpon Springs, FL), SSPC-QP 1- and QP 2-certified, have agreed on a $10,091,600 contract to clean and recoat structural steel surfaces on the Iowa-Illinois Memorial Bridge, a pair of 3,370-foot-long x 27-foot-wide suspension bridges that connect Bettendorf, IA, and Moline, IL, over the Mississippi River. Also known as the I-74 Bridge, the northbound span was dedicated in 1935 and the southbound span in 1960, with both spans upgraded in 1975. The twin suspension spans run 66 feet over the river. A separate contract of $4,997,472 was awarded in February 2011 to Civil Constructors, Inc. (Freeport, IL) for structural rehabilitation of the bridges; work for that project is currently under way.

This contract requires abrasive blast cleaning approximately 960,000 square feet of structural steel to a Near-White finish (SSPC-SP 10). The existing coatings contain lead and chromium and will require containment and paint waste transport and disposal. The steel will then be coated with a zinc-rich epoxy primer, an aluminum epoxy-mastic intermediate, and an aliphatic polyurethane finish. The contract also includes pressure washing existing bridge surfaces for maintenance cleaning purposes. The project is expected to begin in late April, at which point the contractor will have a 120-day window for completion.

Cushman Penstock Contract Goes to Certified Coatings

Certified Coatings (Concord, CA), SSPC-QP 1- and QP 2-certified, won a $2,685,522.73 contract from the City of Tacoma (WA) to clean and reline the interior surfaces of two existing 1,300-foot-long penstocks (diameter ranges from 10 feet to 8 feet), two 120-foot-long x 3.5-foot-diameter vent stacks, scroll cases, and pressure relief valves at the Cushman Dam #2. The project will be completed in two phases, with one penstock being coated in 2012, and the other in 2013. The metal piping and appurtenances are lined with a coal tar system that was applied in the 1930s; the vent stacks may have a lead primer, and the scroll cases and relief valves do have a lead primer that will require containment and removal. The steel, including approximately 40,000 square feet in each penstock and 1,320 square feet in each vent stack, will be abrasive blast cleaned to a Near-White finish (SSPC-SP 10) and lined with an elastomeric polyurethane system.

Blastco Locks Up Annual Crane Coating Contract

The Port of Houston Authority awarded a year-long contract to Blastco, Inc. (Houston, TX) to clean and repair failed coatings on the exterior connections, framing, and machinery housings of 9 wharf cranes and 20 rubber tire gantry cranes at one terminal and 6 wharf cranes and 18 rubber tire gantry cranes at a second terminal. The $649,500 contract, which requires SSPC-QP 1 and QP 2 certification, involves vacuum-shrouded power-tool cleaning crane surfaces to SSPC-SP 11 (Bare Metal) and coating them with a rust-penetrating sealer, epoxy mastic intermediate, and urethane finish or a zinc primer, epoxy intermediate, and urethane finish. Some of the existing coatings contain lead; containment is required. The contract also includes option items for furnishing ultra-high-pressure water jetting and dehumidification equipment, shop coatings application, difficult containment erection, and heat-resistant coating application.

Crossword

by Andy Folmer, PaintSquare

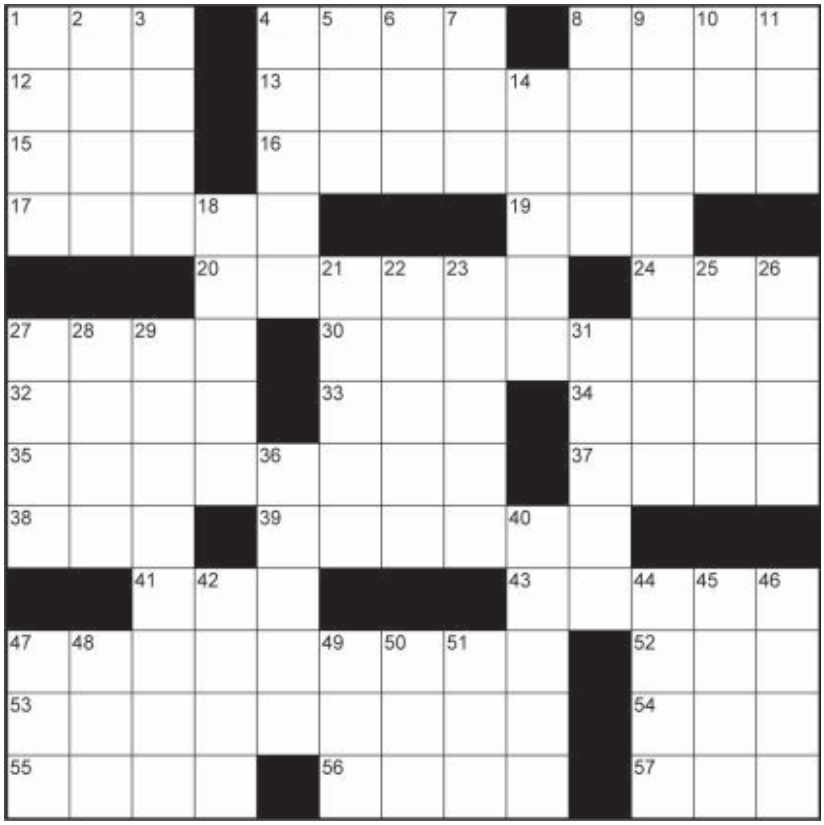
Lots of Layers

ACROSS

1 Coating layer, or the word missing from the answers to 4- and 8-Across
4 Bravo cooking competition (also see 1-Across)
8 Main headlines (also see 1-Across)
12 Ending for lemon or lime
13 Tribal ritual, of a sort
15 It's HQ'd in Langley, VA
16 Synopses
17 Frequency unit
19 A highly potent mutagen
20 Paper in Boston or Miami
24 They attend stags
27 Kind of advice
30 Like loose soil on a hillside
32 Important exam (also see 33-Across)
33 Coating layer, or the word missing from the answers to 32- and 34-Across
34 Big Ten country (also see 33-Across)
35 Translate from English to Greek
37 Angers
38 Common word in a family business name
39 Some Bikini happenings in the 1950s
41 Indian stew of dried lentils
43 Chicago hub
47 Like some marriages
52 He-man's asset
53 Words before "of one's own" or "by oneself"
54 She was tempted in 46-Down
55 Coating layer, or the word missing from the answers to 56- and 57-Across
56 America's pastime (also see 55-Across)
57 Decimal numeral system (also see 55-Across)

DOWN

1 Gage on the dash
2 Jon Arbuckle's dog
3 Bosc or anjou
4 Mania
5 Nickname for a Montreal Canadien
6 It's frozen in Berlin
7 Extension for Times, on a PC
8 South Asian flatbread
9 Hinder
10 Weath. Svc. calculation
11 A village in Romania
14 Judge of sci-fi comics
18 Message
21 Make payment
22 Crop up
23 Deposits of ore
25 Otherwise
26 Takes home, as money
27 Phases: Abbr.
28 Prefix for "dynamic"
29 "___ Feather Bed": John Denver song
31 Words often spoken to a genie
36 Actress Sevigny
40 Item needed at a pool or in a gym
42 Org. of Jr. Highs
44 Drive the getaway car, for example
45 Republican strategist Karl
46 Garden in Genesis
47 US Army recognition for veterans of active ground combat: Abbr.
48 Words with "tear" or "roll"
49 Catch
50 Abbr. on some luggage in NYC
51 Fortified village



(Answer next month)

Answers to last month's puzzle

H	E	P	A	T	I	T	I	S	■	S	T	R
A	M	U	S	E	M	E	N	T	■	H	R	E
C	E	N	T	I	P	E	D	E	■	I	A	N
■	■	■	E	R	A	T	E	■	M	P	N	■
■	■	A	P	A	C	H	E	P	A	S	S	■
D	D	E	■	■	T	E	D	D	Y	B	O	Y
V	I	S	I	T	■	■	■	A	R	O	M	A
R	E	T	R	A	C	E	D	■	■	A	S	K
■	T	H	E	P	A	T	R	I	O	T	■	■
■	R	E	S	■	S	H	I	N	N	■	■	■
M	I	T	■	O	B	A	M	A	C	A	R	E
I	C	E	■	M	A	N	A	B	O	Z	H	O
O	H	S	■	T	H	E	P	A	L	A	C	E

The Takeaway

By Karen Kapsanis
JPCL

Just Paint?

When I meet people who don't work in the coatings industry and they ask me what I do, they typically laugh when I say I edit a journal about high-performance coatings for corrosion protection. Then, if I try to explain the industry, they remark with a smile, "Isn't that just paint? There's a whole industry for it?"

Usually I change the topic, mostly to football. (Hey, we're in Pittsburgh, and the Steelers let Hines Ward go!)

"Just paint?" The articles this month remind me of how many types of professionals are involved with high-performance coatings for corrosion protection, how global and complex the industry is, how regulated it is, and how important corrosion prevention is.

We have, of course, contractors in the industry, and, this month, contractor Roy Nedal gives a candid perspective on the present state of ship coating maintenance and repair, along with his predictions about the future of the work, including the impact of global regulations for it and the value of spending the time and money to correctly coat ships. Protecting ships from corrosion is a matter of life and death, of keeping ships from sinking and keeping crews alive in the world's most common mode of transportation of goods (like the computers, smart phones, and cars that many of my laughing acquaintances have). "Just paint?"

There are consultants with their own expertise, like Randy Nixon. Based on his 15 years of field experience, he shares his knowledge about coating failures at wastewater facilities and ways to avoid the failures. (How long will my acquaintances manage without indoor plumbing when part of their local waste treatment system breaks down?) "Just paint?"

Also writing this month is consultant Lee Wilson, who is always willing to question the industry in the name of improving it. His survey of contractors, consultants, and coating manufacturers shows how much time, R&D expertise, and field experience it takes to develop a coating that is consistently easy to apply, effective for a reasonable service life, affordable, and compliant with health and environmental regulations. "Just paint?"

And all you have to do is read the SSPC 2011 Annual Report (pp. 64-69) to see the rest of the kinds of professionals who make up our industry—facility owners, of course; fabricators; architects and engineers; and manufacturers of coatings, equipment, and raw materials. Again, "just paint?"

So here's my answer to the people I meet who cannot believe there is a whole industry about coatings for corrosion protection: There is just such an industry, and it's about way more than "just paint."