Replacement for Failed Bridge Is on Fast Track

Photo by Tim Davis, courtesy of FIGG, designer of the bridge

Minnesota Department of Transportation (Mn/DOT) officials expect the replacement for the collapsed I35W Bridge in Minneapolis to be finished ahead of schedule, according to a June 19, 2008 statement from Mn/DOT. The I35W Bridge collapsed August 1, 2007.

"I am pleased to announce that the I35W Bridge project will be complete sometime between mid-September and mid-October, more than two months ahead of schedule," said Tom Sorel, transportation commissioner. "The project is more than 70 percent complete."

Sorel said crews have worked around the clock since the project began last fall and were able to continue work through the winter because there was little snow.

Bridge and roadway construction as well as some painting are all underway. Crews are installing precast concrete segments that will make up the main spans crossing the river; other crews are rebuilding the north and south roadways to the bridge. Portions of the bridge were blast cleaned the week of June 9 so that coating application to the approach span on the south side could begin the week of June 16, according to Mn/DOT.

An Mn/DOT study concluded that road-user costs incurred because of the unavailability of the I35W bridge are approximately $400,000 per day. The early opening may save the public as much as $40 million in travel costs, said Sorel.

Thirteen people died and 145 were injured when the I35W collapsed, according to the May 2008 third party Investigative Report on the collapse. Corrosion, leaking joints, section loss, and failure of fracture critical components were among the factors in the failure, the Report concluded.

Manufacturers Sought for Coatings Study

The U. S. Army Corps of Engineers is seeking manufacturers of moisture cure urethane coatings interested in participating in an evaluation program. The program will subject supplied coatings to the laboratory testing requirements of SSPC Paint 38, SSPC Paint 40, and SSPC Paint 41.

Manufacturers wishing to participate should contact Al Beitelman—tel: 217-373-7237; email: alfred.beitelman@us.army.mil.

AISI Selects New President, CEO

The American Iron and Steel Institute (AISI) has announced the selection of Thomas J. Gibson as the association's president and CEO. Currently senior vice president of advocacy for the American Chemistry Council (ACC), Gibson will assume his new responsibilities on September 1. Gibson will succeed AISI president and CEO Andrew G. Sharkey, III, who has announced his retirement after leading the Institute over the past 15 years.

Keith E. Busse, chairman, AISI Board of Directors and chairman and CEO, Steel Dynamics, Inc., and Ward J. Timken, Jr., chairman of the search committee and chairman, The Timken Company, together issued the announcement of Gibson's appointment.

Thomas J. Gibson

Busse said in a letter to AISI's Board of Directors, "With his leadership experience at ACC and as the top government affairs officer for the Portland Cement Association, Tom will effectively spearhead AISI's advocacy efforts on critical policy issues, such as access to affordable energy, climate change, trade and pro-manufacturing policies."

Timken praised Gibson's work at the

Dow Chemical to Acquire Rohm and Haas

The Dow Chemical Company announced a definitive agreement to acquire Rohm and Haas Company, a major manufacturer of acrylic resins and other key raw materials for coatings, for $78 per share in cash in a deal valued at $18.8 billion.

Dow said the acquisition of Rohm and Haas will make it the world's biggest manufacturer of specialty chemicals and advanced materials, combining the two organizations' "best-in-class technologies, broad geographic reach, and strong industry channels to create an outstanding business portfolio with significant growth opportunities." Dow added that Rohm and Haas provides "an excellent position in a number of industry segments that are poised for significant growth given long-term market megatrends, most notably in the electronic-materials and coatings segments."

Rohm and Haas also has a strong presence in a number of other attractive areas such as water solutions, adhesives, personal care, biocides, and building and packaging materials, Dow said. Rohm and Haas, based in Philadelphia, reported sales of approximately $8.9 billion in 2007.

The transaction, which has been unanimously approved by the boards of directors of both companies, remains subject to approval by Rohm and Haas shareholders and regulatory authorities. The companies are targeting completion of the transaction by early 2009.

Dow said financing for the acquisition includes an equity investment by Berkshire Hathaway and the Kuwait Investment Authority in the form of convertible preferred securities for $3 billion and $1 billion, respectively.

Rohm and Haas's product portfolio includes powder coatings; acrylic resins; biocides; adhesives materials; caulks and sealants; cement/concrete additives; materials for exterior insulation and finish systems (EIFS); coatings additives; and others.

Dow Chemical is a major manufacturer of basic and specialty chemical products, including coatings raw materials such as acrylic monomers; solvents; vinyl acetate monomers; acrylic, vinyl-acrylic and styrene-acrylic latexes; biocides; surfactants; epoxy resins; and other specialty materials.

RPM Names New VP

RPM International, a holding company that owns many manufacturers of coatings and other products, has named Barry Slifstein Vice President and controller, effective July 1.


Barry Slifstein

Slifstein is currently vice president of finance, CFO, and treasurer of RPM's DAP Products Inc. He succeeds Robert L. Matejka, who has been a consultant to RPM since January.

Based in Medina, OH, RPM owns subsidiaries that make roofing systems, sealants, corrosion control coatings, floor coatings, caulks, sealants, and other products for the industrial and consumer markets.

Environmental Protection Agency (EPA), where he served as Chief of Staff to Administrators Christine Todd Whitman and Michael Leavitt, and with the U.S. Senate Committee on Environment and Public Works.

At ACC, he led the chemical industry's global, federal, and state advocacy efforts and has represented the Association before government and media. At PCA, he led efforts to increase the cement industry's visibility and influence in Washington, including spearheading industry efforts on climate change and successfully advocating for the cement industry's inclusion in the Asia Pacific Partnership.

Gibson is a U.S. Naval Academy graduate with a master's degree from the University of Rhode Island and a juris doctor degree from Georgetown University Law Center.

AISI serves as the voice of the North American steel industry in the public policy arena and advances the case for steel in the marketplace as the material of choice.

Coating 2008 Returns to Indianapolis

With a technical conference featuring more than 45 presentations and an exhibit hall floor filled with more than 150 exhibitors, COATING 2008, an event for professionals involved in industrial finishing processes, will be held September 23–25, 2008 at the Indiana Convention Center in downtown Indianapolis, IN. The show is sponsored by the Powder Coating Institute and managed by Goyer Management International, Inc. The focus of the conference is on powder coating, electrocoating, and porcelain enamel coating, and includes case histories and presentations on emerging technologies.

To register online, visit www.thecoatingshow.com/registration.htm; for all other inquiries, contact Goyer Management—tel: 513-624-9988; fax: 513-624-0601; email: lmuck@one.net.

Continued

JPCL-PCE Marine Coatings Conference Takes Shape

The 2008 *JPCL-PCE* Marine Coatings Conference will take place September 24–25 in Hamburg, Germany. The two-day international event will run concurrently with SMM: The Shipbuilding, Machinery & Marine Technology International Trade Fair, which is scheduled for September 23–26.

Themed "Marine Coatings Under the Regulatory Spotlight," the Marine Coatings Conference will feature more than 15 presentations from experts representing marine paint suppliers, owners, and shipyards, says Brian Goldie, conference organizer. Representatives from various regulatory agencies will discuss their experiences with the upcoming implementation of the IMO's Performance Standard for Protective Coatings (PSPC). Other topics to be discussed, according to Goldie, include the use of alternative coating systems, proposed coating specifications for critical areas of vessels, and the effect of various tin-free and foulant-release coatings in reducing fouling in ship bunkers.

The following is a preliminary list of paper titles and authors slated for the Marine Coatings Conference, as of press time.

Session One: Plenary (Trevor Parry, Chairman)

- "The Evolution and Benefits of Ultra High Solid Coatings," Michael Bentkjaer, The Sherwin-Williams Co.
- "Improving Coatings through Fibre Reinforcement," presenter TBA, Hempel
- "Is Sa 2½ Really Necessary," Owen Jones, Royal Coatings Inc.

Session Two: PSPC (Till Braun, Chairman)

- "PSPC: The Coating Technical File," Raouf Kattan, Safinah Ltd.
- "PSPC Challenge—Why an Innovative Coating Technology Is Needed," Joao Azevedo, Euronavy
- "Impact of the PSPC on Contractors," Andreas Momber, Muehlhan GmbH
- "Experiences on Implementing PSPC for Ballast Tank Coatings," presenter TBA, Germanischer Lloyd

Photo courtesy of Hamburg Messe und Congress

Session Three: Anti-fouling

- "Applying Silicone Foul Release to Newbuildings—An Owner's Perspective," John Drew, Carnival Shipbuilding
- "Ecospeed A/F," Martin Weightman, Subsea Ltd.
- "Maintenance of Silicone Antifoulings," presenter TBA, Tecor
- "Monitoring Hull Performance," Daniel Kane, Propulsion Dynamics

Session Four

- "Dry Ice Blasting for Surface Preparation," Lars Eric Etzold, Meyerwerft
- "Lifecycle Costs of Coating Failures on Weld Seams and Methods to Mitigate," Walentin Mirgorod, Sponge-Jet

Further Details

The final program and registration information can be found at www.marinecoatingsconference.com. For additional information, contact Brian Goldie—email: brianpce@aol.com.

Color and Contamination after Abrasive Blasting

I have heard that the type of abrasive used during surface preparation can impart a color to the cleaned surface. What field tests can be performed to rule out interpreting the coloring as contamination?

Hugh Roper

A newly blasted steel surface that is bright and shiny may or may not be free of dust contamination, but a newly blasted steel surface that shows any discoloration is significantly contaminated. The discoloration is a result of diffraction of light by the micronic dust particles driven into the valleys of the profile—called backside contamination.

When all aspects of the blast system are not operating at optimum cleanliness conditions, it is possible for dust to be driven into the profile by following abrasive particles. Not only must all facets of the blast equipment be operated to remove dust, but also the newly produced blasting residues must be quickly removed from the blast area by appropriate air movement techniques. The micronic dust is probably statically charged, and may not be dislodged by brushing or blowing-down. Appropriate testing should therefore be done to ensure that the surface is free of micronic dust before applying a coating.

Much has been written about backside contamination and its adverse effects on coating adhesion. Recently, A.W. Momber of Muhlhan Equipment Services GmbH, Hamburg, Germany presented findings, including micrographs, of surfaces showing this type of micro contamination on prepared substrates (Momber, A.W., et al., *JPCL/PCE* November 2004, p. 44). Coatings with poor wetting ability show very poor performance on surfaces with high levels of backside contamination. Backside contamination may also provide an easier pathway for corrosive electrolytes to move or flow freely under a coating.

The proof of surface cleanliness is shown in the results of coating adhesion. There is significant data to indicate that when a uniform, 2-3 mil, high-peak-count profile shows little or no contamination on the 3M Tape Test (described at right), most fusion bond epoxies (FBE) and liquid industrial epoxies (applied to this surface) should fail only cohesively, and only when applying a pull-off strength of greater than 5,000 psi using a hydraulic tester (H.J. Roper, R.E.F. Weaver, and J.H. Brandon, *JPCL*, June 2005, pp. 52–64).

Backside contamination can be identified on prepared surfaces with a tape test. There is an international standard for performing a tape test, ISO 8502-3, but in the author's experience, this test does not always identify micronic dust contamination to the extent required to achieve optimum coating adhesion.

Tape used to identify backside contamination should have a soft, pliable surface and a soft adhesive that can be pressed deeply into the profile. One such tape is Scotch® Magic™ Tape 810 by 3M. Any alternative tape can be checked against this tape by using a 30 power or higher microscope to determine if the tape removes all of the contamination from the profile (Roper, Hugh J., "Cost Effective Surface Preparation for Coating Performance, Corrosion Protection and Long Service Life," PACE 2007).

The procedure for the 3M tape test is as follows.

1. Select the tape brand described above or its equivalent.
2. Remove at least two complete turns from a new roll, or when using any roll for the first time after storage.
3. Cut a 6-inch strip of tape from the roll and turn under approximately ¼ in. at one end to make a tab for removing the tape from the tested surface.
4. Apply the tape to the surface to be tested, and rub the surface with a hard rounded object to press the tape into the profile until the tape turns totally clear (until you can see the steel as if the tape were not on it). Satisfactory results can typically be achieved by rubbing vigorously with a fingernail.
5. Remove the tape from the tested surface using the pull tab, and apply it to a bright, white surface, such as a sheet of paper or plastic.

There is no consensus cleanliness standard for the results of the 5-step tape test above; therefore, a job standard for cleaned steel or other such evaluation tool will be required. Because the contamination will appear dark on a white background, a Go/No Go gage can be developed as a job standard by mounting tapes with various levels of contamination on a white plastic sheet.

The non-standard tape test is not appropriate for determining contract conformity, unless specified, but it is usable wherever the intent is to present knowledge of surface cleanliness.

Hugh J. Roper is retired from Wheelabrator Abrasives, where he was responsible for technical services for all of North America and special assignments in South and Central America. He is a certified SSPC Coating Specialist and a NACE Level 3 Coating Inspector technician and is active in ASTM International, SSPC, and the National Association of Pipe Coaters.

John Fletcher, Elcometer

Sometimes abrasives impart color to a surface. This is acknowledged in BS 7079 Part A1. The British standard was the same as ISO 8501-1 (SIS 055900, "Swedish Standard") but with a supplementary section showing the same level of cleaning (Sa3) with different color shades, depending on the abrasive used. The picture after blasting with copper slag was the darkest. The supplementary section of BS 7079 Part A1 has now been incorporated into the current edition of ISO 8501-1:2007 as Annex A (informative).

A practical way to set the required level of cleanliness and appearance of the steel on site would be to blast a panel with the abrasive specified for the job and keep re-blasting until there is no visual change. This job site standard would be representative of Sa3, and a lower level (Sa2 ½) could be agreed to, also. The challenge is keeping such a panel in good condition over time.

Using a 10X magnifier to examine the valleys of the profile can also be useful as a test for contamination. There should be little rust remaining at the bottom of the valleys.

Dust still on the surface after blasting can also affect the color of the surface. The ISO 8502-3 Dust Tape Test will determine the quantity and size of the dust particles left after blasting and will allow an assessment of the color of the dust, although this is not described in ISO 8502-3.

John Fletcher is the technical support manager at Elcometer. He is responsible for product support, including product training, new product planning, and the management of the quality and environmental management systems, including certification to ISO 9001 and ISO 14001. He is currently chairman of the North West Branch of the Institute of Corrosion.

Role of FBE Primers in Pipeline Adhesion Studied

Three-layer polyolefin coatings have become the industry standard for the external protection of oil and gas transmission pipelines against corrosion. However, over the past few years, loss of adhesion has been observed in some three-layer polyolefin (3LPO) pipeline coatings. The results of a research study of this problem on behalf of Paris, France-based Total, a multinational oil company, have been published recently and were presented at BHR's 17th International Conference on Pipeline Protection, held October 17–19, 2007. In "Three-Layer Polyolefin Coatings: How the FBE Properties Govern Long-term Adhesion," authors V. Sauvant-Moynot et al. compared the wet properties (water up-take, T_g, and adhesion) of commercial FBE primers with the long-term adhesion of related commercially-applied 3LPO coatings. Their work and conclusions are summarized below.

Background

Polymeric external coatings are used with cathodic protection (CP) to give long-term protection to pipelines. The use of good organic barrier coatings, such as 3LPO, results in a lower CP demand. 3LPO systems feature an epoxy primer layer (fusion-bonded epoxy, FBE) for adhesion and corrosion protection; an adhesive tie-layer; and a polyolefin (polyethylene or polypropylene) outer layer, which provides protection against mechanical damage during manufacture and installation.

The quality of the surface preparation of the pipeline and the subsequent coating application are key to obtaining the best barrier properties. For good adhesion, the steel surface must have an adequate profile and be free of surface contamination; moreover, the coating must be applied without defects and cure fully. Other factors related to maximum performance are resistance to mechanical damage; permeability to corrosive species (water, oxygen, other ions); differential swelling of coating and pipe, which can be affected by water permeability; and the chemical resistance of the outer layer to the environment, which can affect the permeability of corrosive species to the internal layers.

The research focused on adhesion loss on pipeline coatings that show no signs of defects until it's too late.

Unexpected Adhesion Problems Lead to Research

Multi-layer pipeline coatings should provide corrosion protection for over 20 years, but the authors note that recently, loss of adhesion of 3LPO-coated pipelines showing no defects has been observed. Since polyethylene has a very large electric resistance, this adhesion loss can lead to shielding of the CP current at areas of disbondment, thus preventing the CP current from reaching the defect and affording protection to the area. These areas are not obvious from a visual examination of the external coating. The adhesion loss, disbonding, and shielding result in rapid, unseen corrosion that can lead to pipeline failure.

The authors also report on previous studies in which researchers identified defect-free polyethylene topcoats that nevertheless allowed water to permeate the inner layers over time, compromising adhesion to the steel. The previous studies were carried out on one grade of FBE and thus did not address the effects of different FBEs and their properties on adhesion.

The object of the Total research summarized below was to correlate long-term performance of 3LPO systems with the wet properties of various commercial FBE primers.

Preparation of Samples for Study

Five commercial FBE grades were selected from those most commonly used in the past 20 years, together with a sixth grade that can be used as primer for 2LPO or as a single-layer anticorrosion coating. FBE-coated panels were prepared by spray application to freshly grit-blasted steel panels to Sa 2½ (SSPC-SP 10) and cured according to the manufacturers' recommendations. Free-standing films (500 microns' dft) were prepared by their respective manufacturers.

Cross hatch adhesion testing of the FBE-coated panels was carried out at room temperature before and after aging them in water at 60 C (140 F) for 7 and 90 days. Differential Scanning Calorimetry (DSC) was conducted on the dry free-standing films and on the films aged in water to analyze T_g. The lowering of the T_g, obtained from the difference of the dry and wet results was then calculated. The amount of water up-take by the different FBEs

Continued

was determined by Gravimetry after immersion in deionized water at 20 and 60 C (68 and 140 F) for 3 months.

Pipe sections were coated in-plant with various combinations of FBE and topcoats in accordance with Total specifications GSGRCOR 220 and NFA49-710. Some samples were prepared without the final polyolefin layer to provide information in a shorter timescale. The 3LPO ring sections were cut from the coated pipe, aged at 20 and 60 C (68 and 140 F) in 1% NaCl, and subjected to cathodic protection by potentiostatic polarization (1.5 V vs Ag/AgCl). Undamaged coatings and those with artificial defects were tested.

Testing and Analysis

The 2LPO coated sections were aged at 20 and 60 C (68 and 140 F) by immersion in deionized water. The purpose of immersion was to simulate the electrolyte beneath a thick polyethylene topcoat acting as a selectively permeable membrane (i.e., water molecules diffuse through the membrane faster than ionic species diffuse). The peel strength of the coated ring sections was measured at room temperature, and the average peeling force was calculated. The nature of the failure, either adhesive or cohesive, was noted.

The authors found that all FBE primers adhered well when dry, with no adhesive rupture. However, after 7 days of wet aging, two primers showed significant adhesion loss. After 90 days of wet aging, the same two primers failed adhesively, whereas two other FBEs still showed no adhesion loss and another two showed a mixed rupture mode, failing both cohesively and adhesively.

The T_g values on coatings as received were all very similar, with a slight increase between the first and second run in the DSC machine. The increase in the T_g value on the second run showed that the full cure had not been achieved. The heat input from the first run caused more curing. T_g values after 7 days (plasticized state) and after 90 days (aged state) were all lower than corresponding dry values, whatever the FBE. This observation underscored the need to define the upper operating temperature limit of the system by the wet T_g, to ensure that the materials remain in the glassy state. The results indicated that the degree of plasticization of the FBE by immersion in water can be correlated with the level of adhesive failure. However, the wet T_g value and the degree of plasticization alone cannot

Continued

explain the long-term adhesion behavior; therefore, one or more other FBE properties must be examined.

From the gravimetric study, two types of behavior of the primer were found. In one, the water content reaches a saturation level after one week's immersion and does not increase with immersion time. In the other, water content steadily increases with immersion time.

The authors analyzed the water uptake results with aging time according to several physical laws of diffusion and permeation. They confirmed that the relationship of physical and chemical properties with respect to temperature allows researchers to identify formulations that are sensitive to hydrolysis in hot water. When the relationship among physical and chemical properties is combined with a detailed analysis of the change in T_g, and optical microscopy of dry and aged films, evidence can be found for osmotic degradation, or what the authors call "three-dimensional hydrolysis," which can affect long-term adhesion to the steel substrate.

The authors identified two FBEs with completely different behaviors in the first phase of their research: one very hydrophobic material sensitive to osmotic blistering, and one with little water uptake and a stable behavior after three months' exposure. These two FBEs were used for the second phase of the study, which involved peel testing on the 3LPO and 2LPO formulations. The authors observed major differences in peel strength and the nature of adhesion loss, both of which could be related to the intrinsic properties of the FBE powder. The powder that was highly hydrophilic and sensitive to hydrolysis in hot water showed numerous corrosion sites due to blisters, which developed after 3 months' aging at 60 C (140 F).

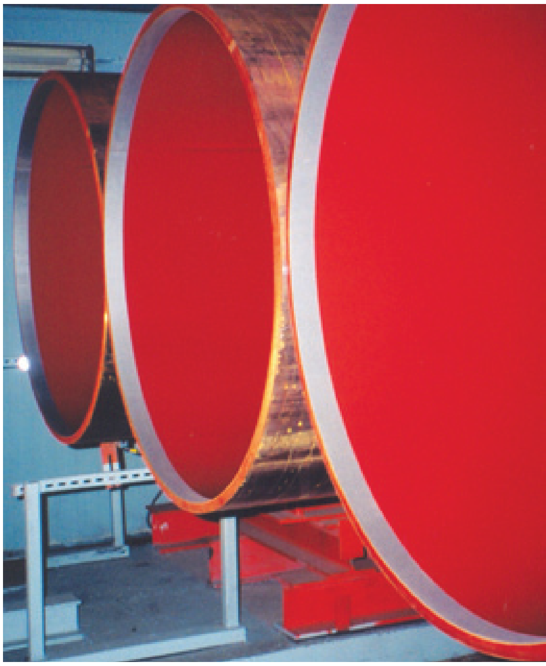
Conclusions

The authors concluded that for proper selection of FBE powders for a given maximum operating temperature, two criteria need to be filled for long-term adhesion in service conditions.

• The wet T_g must be higher than the maximum operating temperature to ensure proper mechanical (adhesion) and electrical (barrier) properties, and it should be noted that the wet T_g is always lower than the dry T_g, in some cases by as much as 50 degrees C.

• The durability in water at the maximum operating temperature must be good. Poor resistance to hydrolysis will affect the mechanical bonding (adhesion) and may lead to osmotic blistering, which acts as a corrosion initiator.

Editor's Note: For a copy of the conference proceedings, contact the BHR Group Ltd, Cranfield, UK, at 44 1234 750422.



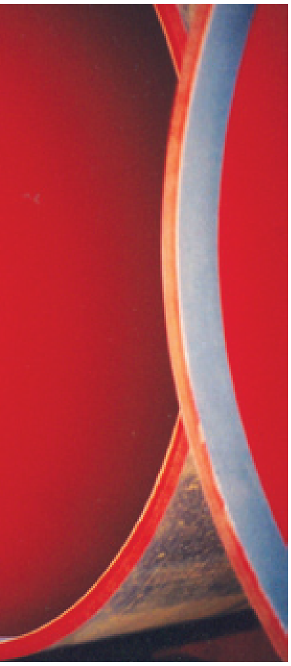
Advances in High-Solids Coatings for Efficient Flow in Pipeline

By I. Robinson, 3M E. Wood Ltd, UK

In addition to coating natural gas pipeline for corrosion protection during storage and transport of the coated pipe, operators coat pipeline internally to reduce friction and improve flow efficiency when conveying non-corrosive natural gas. Internal pipeline coatings reduce the surface roughness, thus reducing the friction factor of the pipe wall. The use of thin-film (<100 microns [<4 mils]) epoxy resin-based coatings for this purpose is well known and has an extensive track record with many pipeline operators. By convention, such coatings have typically been formulated with solid Bisphenol A epoxy resins (molecular weight approx. 1000) and either polyamine adduct or polyamide curing agents. The solid/semi-solid nature of the epoxy resin and curing agent calls for substantial levels of organic solvents to provide a suitable liquid coating. A typical commercial coating would, therefore, contain 40–45% solvent by weight, equating to a volatile organic compound (VOC) content of 400-450 g/L.

This article describes the performance requirements for internal coatings (flow coatings) for pipeline; gives the broad formulation parameters for a new generation of high-solids internal coatings; compares the environmental impacts of several flow coatings; and reports briefly on a study of the surface roughness parameters of internally coated pipe as a function of flow coating volume solids.

Editor's Note: This article is based on a paper given at BHR's 17th International Conference on Pipeline Protection, held October 17–19, 2007, in Edinburgh, and is published here with permission.



Opposite page, clockwise from lower right: Applying the internal efficiency coating; checking the applied coating; internal coating of pipes completed
Photos courtesy of the author

Performance Requirements

General Requirements

The performance attributes required for an internal flow efficiency coating are detailed in a number of internationally recognized specifications and standards—API RP 5L2 (“API”), TRANSCO CM2 (“British Gas”), and, more recently, ISO 15741. While the documents differ in some of requirements, the standards and specifications have many common requirements for properties, such as

- good adhesion,
- hardness,
- flexibility,
- corrosion resistance,
- water resistance,
- chemical resistance, and
- resistance to gas pressure variations.

Formulation Considerations for Optimized Performance

The overall package of properties required from the cured flow coating presents a number of challenges to the formulator seeking to reduce VOC content.

The use of liquid epoxy resin, rather than solid Bisphenol A resins, allows solvent content to be reduced. However, the lower molecular weight of liquid resin forms polymer networks with an increased crosslink density, yielding coatings of limited flexibility. Flexibilizing agents generally reduce resistance to corrosion, water, and/or chemicals. Non-reactive diluents or plasticizers must be avoided to prevent outgassing from the coating because of in-service temperature/pressure fluctuations.

Despite the above constraints, coatings appropriately formulated for flow efficiency can now be produced with VOC contents ranging from 0 to 225 g/L.

Comparison of VOC Emissions for Different Flow Coating Technologies

Solvent emissions and associated carbon emissions for a range of coating technologies are illustrated below, calculated on a basis of a nominal 200-km/36-inch internal diameter (ID) pipeline to be coated. The reduced environmental impact of high-solids/solvent-free formulations is clearly demonstrated in the box below.

Effect of Internal Flow Coating on Surface Roughness

General

A number of roughness/profile parameters can be used to characterize pipeline surfaces,[1] including:

- average roughness (Ra)
- maximum height of profile (Rt)
- average maximum height of profile (Rz)

Study of Impact of Flow Coating Volume Solids

It might be assumed that dry film thickness is the principal driver in reducing the surface roughness of a blast cleaned surface. However, examining the roughness parameters obtained from a range of flow coating compositions, at equivalent dry film thicknesses, reveals the volume solids of the liquid coating to be highly significant in reducing surface roughness. This effect can be seen in Table 1, which shows the roughness para-

Comparing the Environmental Impact of Pipeline Coatings

a) Conventional solvent-borne flow coating

VOC content = 440 g/L (0.44 kg/L)
For 200-km, 36-in. ID pipe:
Practical applied coating film thickness (wet) = 200 microns (8 mils)
Coating consumption = 120,000 liters based on equations 1 and 2 below.
1. Area coated = π x ID x length of pipe
2. Volume of paint required = area to be coated x wet film thickness

VOC emissions = 120,000 x 0.44 kg = 52.8 tons (UK)
Carbon emissions = 45.0 tons, based on the following:
Assuming a typical solvent mixture of 4 parts aromatic hydrocarbon (xylene) to 1 part alcohol (n-butanol)
by weight, which is then broken down on the basis of atomic mass, approximately 85% is carbon; the remaining 15% is hydrogen and oxygen. Therefore: 85% of 52.8 tons = 45 tons

b) High-solids solvenated flow coating

VOC content = 225 g/L (0.225 kg/L)
For 200 km, 36 in. ID pipe:
Practical applied coating film thickness (wet) = 125 microns (5 mils)
Coating consumption = 75,000 liters (per equations 1 and 2 above)
VOC emissions = 75,000 x 0.225 kg = 16.9 tons
Assuming typical aromatic hydrocarbon/alcohol solvent blend carbon emissions = 15.0 tons

c) 100% solids, solvent free flow coating

VOC content = 0 g/L
For 200 km, 36 in. ID pipe:
Practical applied coating film thickness (wet) = 75–100 microns (3–4 mils)
Coating consumption = 45–60,000 liters
VOC emissions = nil
Carbon emissions = nil

Table 1: Roughness parameters for a range of flow coatings @ 75 microns dft

Flow Coating Composition	Volume Solids (%)	VOC Content (g/litre)	Roughness Parameters (microns)	
			Ra	Rz
Conventional solvent-borne	45	440	1.38	5.90
High-solids solvented	75	225	0.65	3.88
Solvent-free	100	0	0.16	0.83

meter figures for three flow coating variants applied to blast-cleaned steel line-pipe (Rz = 40 microns) at a dry film thickness of 75 microns.

Conclusions

Solvented, thin-film epoxy coatings formulated for flow efficiency have served pipeline operators well for many years. However, their high solvent (VOC) content may be considered environmentally undesirable and ultimately unsustainable. A new generation of reduced-solvent-content (high-solids) and solvent-free (100% solids) flow coatings minimizes the environmental impact of internal coating processes without compromising coating performance. Furthermore, the new coating technologies yield hitherto unexpected benefits in that they reduce the surface roughness of internally coated pipe without any increase in applied coating thickness.

References

1. Koebsh, et al, "Measuring Roughness of Blasted Steel Pipe Surfaces: A Case Study," 16th International Conference on Pipeline Protection, 2005.

Ian Robinson graduated from the University of Nottingham in 1980 with a BSc Honours degree in chemistry. He joined E. Wood Ltd. in 1987 and held the position of technical director from 1998 up to the acquisition of E. Wood in 2007 by 3M. He is now the laboratory manager for 3M Corrosion Protection Products Division. Mr. Robinson is a specialist in the field of liquid-applied coatings and linings for pipeline protection/rehabilitation; he holds numerous international patents in this area.

Photos courtesy of the authors

Protecting Concrete for Chemical Service: A Guide to Applying Polyurea Geomembranes

By Robert M. Loomis, Willamette Valley Company, and Sean D. Boeger, Poly-Pro Industrial Coatings, LLC

Design engineers and applicators are often faced with challenging liner or coatings installations for concrete tanks or related structures in chemical or other aggressive service. Often, the challenge starts with the existing structural surface, which might be contaminated or require significant repair, resurfacing, or extensive surface preparation. When such surface conditions are not remediated completely, traditional liquid-applied linings often fail because their performance depends directly on the surface to which they are applied. Coating systems may be also susceptible to chemical attack and may delaminate or blister, compromising their performance and the tank itself.

Specifiers have required thermoplastic sheet liners in some instances as an alternative to liquid-applied coatings. The liners are seamless and don't rely on surface preparation. In some cases, however, they become ineffective because of damage during installation or service.

Over the past ten years, the use of another alternative, polyurea geomembranes, for lining concrete tanks and other structures in aggressive service, has been increasing. The systems are formed with an appropriate combination of polyurea and geotextile. Installed correctly, the polyurea geomembranes can be an alternative to traditional liquid-applied materials and thermoplastic liners, sometimes providing higher performance and better economics.

Specifiers and contractors are often more familiar with coatings than with the variety of geotextiles available to create a polyurea geomembrane. This article, therefore, first describes the types of geotextiles available and suitable; it then briefly addresses the selection of polyurea systems. The remain-

Editor's Note: This article is based on a paper presented at PACE 2008, held Jan. 28-31, 2008, in Los Angeles, CA. The paper appears in the PACE Proceedings. PACE is the joint conference of SSPC and PDCA.

der of the article details the steps for installing a polyurea geomembrane in concrete tanks for chemical service.

Selection of Materials

Geotextiles: What's Available, and What's Suitable?

Polyurea geomembranes have been in use for several years. However, case studies of the interaction and performance of combined polyurea systems and various geotextiles to create a polyurea geomembrane have not been readily available until recently.[1]

The first steps in the successful application of a polyurea geomembrane are creating a proper design and then choosing the materials that best meet the established criteria for the application. To meet the criteria for a given application, the product must have specific chemical, thermal, and mechanical stress-resistance properties. Polyurea geomembranes have low permeability rates to chemicals typically found in leachate, and they can withstand large swings in ambient temperatures without cracking or becoming brittle over time. Depending on the combination of polyurea and geotextile chosen, polyurea geomembranes can resist moderate concentrations of acids, more concentrated alkalis, some fuels, wastewater, and other liquid chemical products or byproducts.

The type of geotextile selected to create the polyurea geomembranes is critical to the design of the system. One reason the geotextile is critical is that it, rather than the concrete tank, becomes the substrate to which the polyurea must adhere.

The predominant configurations of geotextile commonly used for polyurea geomembranes are woven, non-woven, and spunlaid made of polypropylene or polyester. In general, most polyurea systems undergo loss of physical properties (elongation and tensile strength) when combined with geotextile. However, data[2] have shown that woven polypropylene consisting of a single monofilament strand running in one direction and fibrillated strands running perpendicular to the monofilament strand (Fig. 1) may offer increased tensile strength to the complete system (approximately 40%) and the least amount of elongation loss (approximately 17%).

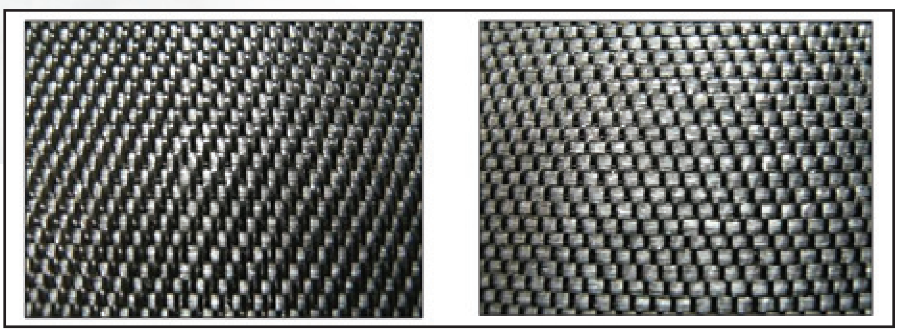


Fig. 1: Woven polypropylene configuration: On the left is monofilament side, the correct side for application. On the right is the fibrillated side, the wrong side for application.

Adhesion of polyurea systems to woven geotextile is usually less than adhesion to non-woven. However, the monofilament/fibrillated woven configuration typically offers two to six times the level of adhesion seen with other woven geotextile. The increase in adhesion is due mainly to the specific construction of the geotextile: the monofilament strand arches up on one side, allowing liquid polyurea to envelop the strand and creating good mechanical adhesion. The applicator must be careful to spray the proper side of the geotextile. The monofilament arches up on only one side of the geotextile. (Spraying the wrong side will produce very poor adhesion of the polyurea to the geotextile.)

Overall, combined with the monofilament/fibrillated woven geotextile, the polyurea system offers superior tensile strength and puncture resistance over that of the non-woven systems. Furthermore, with the woven, there is less initial absorption of polyurea before it solidifies, in contrast to the non-woven (typically 80% less). If less polyurea is absorbed, the coverage rate increases. Also, the workability of the woven is easier, or rather more pliable, than most geotextile, which facilitates application.

Polyurea Systems: What Basic Requirements Are Needed?

With regard to owner's requirements in the selection of the polyurea system, careful consideration should be given to mechanical stress, thermal differentials, and chemical exposure. The term "polyurea" refers to a type of coatings technology, not a specific coating. Therefore, there are many different formulations of polyurea systems in the industry. Some exhibit excellent chemical resistance, mechanical properties, or a combination thereof. Not all polyurea systems will work for every situation.

One characteristic that polyurea systems should have for this particular application is a gel time of 15 to 20 seconds, which has been found to be beneficial, ensuring enough time for workability, yet keeping the polyurea's advantage of rapid application. (Gel time is the time a coating takes for the system to go from liquid to solid.) The 15 to 20-second window allows enough time to physically set seams and work the geotextile, but keeps the gel time short enough to move ahead with installation at a reasonable pace and to minimize absorption into the geotextile.

As for other properties of the polyurea system, the intended use of the system will determine what is necessary. It is, however, not uncommon to see formulations that have tensile strengths at a minimum of 2,000 psi (138 bar) and a minimum elongation of 500%. That is not to say that given a specific situation, these property values cannot be lower; these values just offer sound protection against general mechanical stresses that may occur.

Another common characteristic among these polyurea systems is that they are typically spray-applied with a plural-component, high-pressure, and high-temperature proportioner. These proportioners are typically sprayed at 2,000 psi or higher to allow for adequate coverage of the geotextile with good production rates. Furthermore, the plural-component spray equipment is equipped with either mechanical purge or air purge impingement mixing spray guns that deliver material by simply triggering the gun. The impingement spray gun's design allows the applicator to start and stop spraying without having to purge into a waste container (unlike low-pressure proportioners with a static mixer). Other polyurea systems include brush-grade or roll-applied systems, which would not be suitable for these applications.

The Fundamentals of Application

The process for applying polyurea geomembranes over concrete is basic but requires attention to detail.

The concrete tank in question should be dry and free of loose debris. Generally, no other preparation, such as filling bugholes, is necessary.

It is helpful to precut the necessary sections of geotextile, roll them up, and stage them in an area that is quickly accessible and within reasonable distance of the exact area where the particular section is to be installed. The approximate length and width of each section depends on the size of the tank.

The sidewalls will be done first, and then the floor will be finished, with the same affixing and overlapping of segments as the walls (Fig. 2).

Start with One Section at a Time

Each section of geotextile can be applied to a vertical surface by a method similar to wallpapering. Due to the rapid gel time of most spray-applied, high-pressure polyurea systems, the

Fig. 2: A complete job. The floor is done after the walls are done.

polyurea can be used to temporarily adhere the geotextile to the concrete surface. A light tack coat of polyurea can be sprayed on the top edge of an area where the geotextile section is going to be applied.

After spraying the tack coat where the top edge of the geotextile will be adhered, the applicator must press the top edge into the tack coat, taking care to make sure the geotextile is properly aligned and smoothed out by hand to avoid wrinkles and fishmouths (unadhered raised edges) in the geotextile. Applicators should therefore take care to wear protective gloves and coveralls to avoid getting liquid polyurea on their hands and arms. In addition, applicators should use other personal protection equipment as specified by the polyurea system manufacturer (e.g., respirators).

The degree of adhesion should be such that the section of geotextile is able to hang free on the vertical surface to which it is being applied. The section of geotextile not yet adhered to the wall can then be rolled up to the affixed top edge and held in place by hand. (It is helpful but not required to have another worker hold the geotextile in place.) Another tack coat of polyurea can then be sprayed to the remaining surfaces of the section the geotextile is to cover (Fig. 3). For particularly long sections of geotextile, it is advisable to tack down the geotextile in horizontal segments that are reasonable in size to work with, given the gel time of the polyurea system specified.

Once the additional tack coats are sprayed, the rest of the section of geotextile can be rolled down over the vertical surface of the concrete. Again, the applicator must be careful to smooth the surface of the geotextile, ensuring that there are no wrinkles or large areas of geotextile protruding from the surface.

It is common to have multiple small areas of geotextile that don't completely adhere to the surface. These areas should be no more than a couple of inches in diameter. In some instances, the small areas that do not adhere may bulge to the point that they give the appearance of a blister. Generally, the bulging areas do not compromise the integrity of the containment system, because the polyurea geomembrane does not depend on adhesion to the concrete to function properly, unlike conventional liquid-applied coating systems.

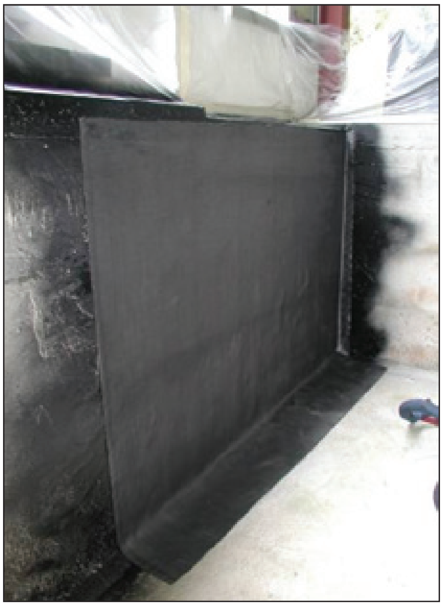


Fig. 3: The geotextile is cut to the necessary shape and tacked to a section of the surface using polyurea.

Applying Polyurea over the Adherent Geotextile Section

Once an entire section of geotextile is adhered to the vertical surface of the concrete tank, the section can be sprayed with polyurea at the specified dry film thickness. Adhered sections of geotextile should initially be sprayed from the bottom to top. This spray technique helps keep the polyurea coating free of runs, which can lead to voids or uncoated areas of the geotextile.

Subsequent coats should be applied in a crosshatching method to minimize the effects of any shrinkage, but all horizontal passes should always, as previously stated, start from bottom to top. Advances in the engineering of polyurea systems have greatly reduced their shrinkage factor compared to earlier formulations. Shrinkage of the polyurea, thus, does not generally become a significant factor in the application. For extremely large jobs, however, specifiers and applicators should be aware of possible shrinkage factors that could cause the polyurea geomembrane to pull itself too taut, placing undue tension on the system.

While spraying the various sections of geotextile, it is critical to use the proper spray technique. The applicator should align the spray gun so that it is perpendicular to the geotextile surface being coated. Movement of the spray gun should remain parallel to the substrate, and care should be taken to avoid any arcing movement of the gun. Improper spray technique may result in poor coverage of the geotextile. Inadequate coverage of the geotextile may result in voids in the lining system. Accordingly, any fishmouths or bulges in any geotextile sections need to be sprayed at all appropriate angles to avoid the effects of shadowing, which can cause inadequate coverage and voids in these areas as well.

Installing the Rest of the Sections

Subsequent sections should overlap by a minimum of three inches (7.5 cm) to ensure sound continuity of the lining system and should be installed within the recoat window of the polyurea (Fig. 4). When spraying the tack coat of polyurea for subsequent sections, it is beneficial to spray slightly on the coated geotextile to help hold the geotextile in place. The additional polyurea will help ensure that the edge of the overlapping geotextile is completely adhered to the section. When spraying subsequent sections of geotextile, the applicator should take care to spray against the direction of the overlapping edge to ensure it is properly sealed. This may require the applicator to spray at an angle that may deviate as much as 45 degrees to the substrate.

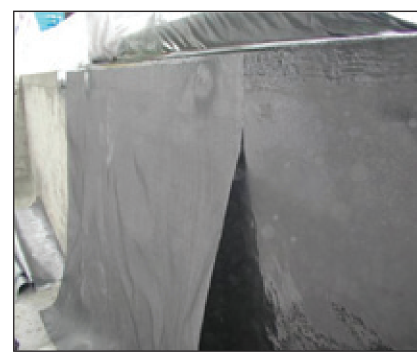


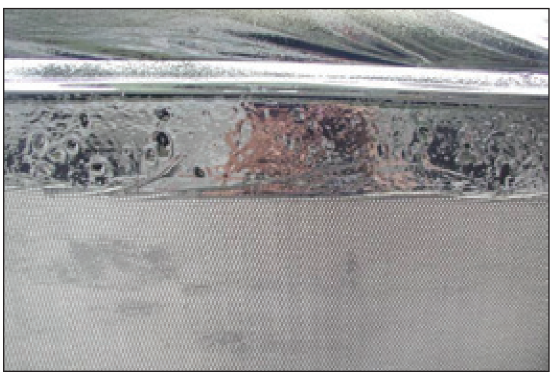
Fig. 4: Seams are overlapped for subsequent sections on walls and on floors.

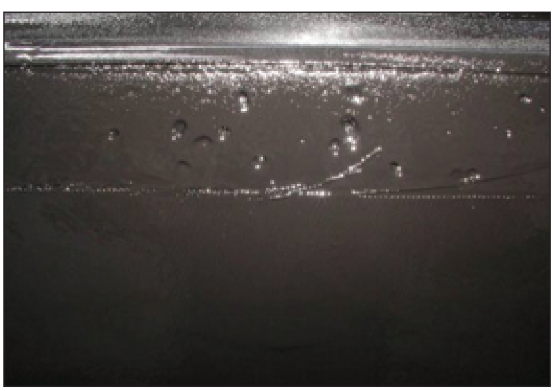
To further ensure the integrity of all seams, an architectural-grade urethane caulk may be applied over the seam. (High-quality architectural-grade urethane caulks contain minimal amounts of solvent, which does not cause blistering under the polyurea.) It is suggested that the color of the caulk should contrast with the color of the polyurea system to visually aid the applicator by indicating proper coverage. A bead of caulk can be applied to the seam and then brushed smooth with a small bristle paint brush. Application of the caulk helps ensure that any possible voids or hard-to-seal areas of a seam will be filled.

Once the caulk is brushed smooth, it can immediately be sprayed over with polyurea, encasing the caulk into the lining system. This practice creates a situation where all seams are triple sealed.

Handling Terminations

Terminations of the lining system along the top edge can be handled in several ways. One technique is to adhere the top edge of the geotextile sections a few inches below the top edge of the concrete tank, thereby leaving an area of concrete exposed. Adhesion at the top edge will therefore be between the concrete and the polyurea system (Figs. 5 and 6).





Figs. 5 and 6: Termination with exposed concrete above geotextile (top) and subsequently coated concrete (bottom)

The degree of adhesion should exceed the tensile strength of the concrete, and some surface preparation along with applying a primer is typically required to achieve this level of adhesion. In some applications, minimal surface preparation is performed, and primer is not used on the bare section of concrete that is sprayed with polyurea. As expected, outgassing does occur, and these sprayed sections of concrete cause pinholing in the polyurea coating. There are often bugholes that are not filled, as well. To rectify the situation, the same architectural-grade urethane caulk as described above can be applied and brushed over the entire area, filling pinholes and bugholes and smoothing over the transitions from the geotextile to bare concrete. The area is then coated with polyurea a second time.

For transitions requiring a more secure method of termination, saw-cuts into the top edge of the tank can be utilized to anchor the polyurea system in addition to its adhering to the concrete. Mechanical fastening with sheet-metal strips can be used as well. After the polyurea geomembrane is applied, strips of one- to two-inch-wide (2.5- to 5-cm) sheet metal can be fastened approximately one inch below the top edge of the tank, over the polyurea. The strips can be fastened with concrete nails or anchoring bolts. Once the strips are in place, they can be encapsulated with polyurea. Voids or exposed edges, bolts, and nail heads can be sealed with urethane caulk and recoated with polyurea.

What To Do with Penetrations

Incorporating piping and other penetrations into polyurea geomembranes is often easier than with conventional systems, with regard to achieving proper performance. Due to the versatility of polyurea systems, penetrations can be handled through various methods. Because of the uniqueness of each project, some methods may function better than others. For common penetrations such as piping, one method used in applications is mechanical clamping. The base of the piping, where it enters into the containment system, should be clean and free from contaminants and other impediments such as weld spatter and burrs. Polyurea should be sprayed around the entire circumference of the pipe near the base, taking care to build up an appropriate thickness without runs or drips.

After the polyurea coating has gelled, mechanical clamps, such as stainless steel hose clamps, can be placed over the pipe, clamping the polyurea coating to the pipe. This technique works well for pipes constructed of polyvinyl chloride or polyethylene, to which polyurea will not generally adhere. It should be noted that, depending on the polyurea system's formulation, adequate time should pass between spraying the pipe and placing the clamp. Placing the clamp over the pipe too early can damage the polyurea coating.

The integrity of the seal is based on the polyurea being clamped to the pipe. However, further assurances can be taken by spraying over the clamp once it is installed. Applying the polyurea coating over the clamp will protect it against loosening and corrosive attack. Urethane caulk, as used previously, can be built up around the sprayed clamp and beveled out from the pipe toward the wall of the structure. The caulk is again sprayed over, as with its use in any seams or terminations. Pipes can extend wherever the design requires, or they can be cut off just before the clamp.

Other types of transitions found in these situations are sometimes handled by using compressive flanges or faceplates, and a free film of polyurea. Free films can be created by spraying polyurea to a surface it will not adhere to, such as polyethylene panels. The film can then be peeled off of the panel and used as a gasket between flanges or faceplates. There has to be enough free film extending beyond the exterior perimeter of the flange or faceplate, so that it may join up and bond to the rest of the polyurea geomembrane.

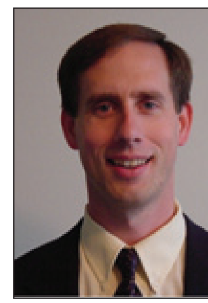
Other methods of handling penetrations may also be used, and are up to the imagination of the applicator or design engineer. The versatility of polyurea coatings and polyurea geomembranes allows for customized methods that would not normally be possible with simple liquid applied coatings or precast materials.

Summary

When considering the maintenance and/or repair costs associated with conventional methods, the durability and reduced application time of polyurea geomembranes often outweigh their higher material costs, in contrast to traditional liquid-applied linings or sheet liners. Surface preparation, which is arguably the most time-consuming process of a conventional coatings project for concrete tanks (and other structures), is almost completely eliminated by the use of geotextile, which becomes a suitable substrate for application. Also, the rapid cure of polyurea systems allows for quicker return-to-service, often a major concern for facility owners. Depending on the exposure service, polyurea geomembranes are capable of offering excellent physical properties and chemical resistance based on the polyurea coating and geotextile chosen for the application. Polyurea geomembranes provide facility owners with a completely seamless liner that is very durable and requires minimal surface preparation compared to traditional liquid-applied coatings or thermoplastic liners.

Reference

1. Reddy, D.V., and B. Butul, "A Comprehensive Literature Review of Liner Failures and Longevity," Gainesville, Florida: Florida Center for Solid and Hazardous Waste Management, July 12, 1999.
2. Loomis, R.M, "Polyurea Geomembranes: High Performance Seamless Liners," Polyurea Development Association Annual Meeting: Engaging the Global Community, March 20-23, 2007.



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Lining Concrete Secondary Containment

Here are the steps for protecting secondary containment with fluid-applied linings and mat reinforcement.

All photos courtesy of Tnemec

Various local and federal governmental regulations require secondary containment structures for chemical storage areas. Typically, secondary containment structures are made of concrete. They require protective linings to prevent chemicals from attacking the porous concrete or penetrating existing cracks and joints, thus breeching the structure. The linings are intended to serve two purposes: to protect the concrete substrate from chemical attack and physical abuse, and to help retain chemicals that leak from their primary containment or are spilled during transfer, preventing them from leaching through cracks or joints in the concrete and into the ground soil below. Typically, the linings are pre-fabricated liners, or they are fluid-applied polymeric coatings and linings, often with mat reinforcement, installed on site.

This article will describe the application of a mat-reinforced polymeric system at approximately 125 mils' dry film thickness (dft). The discussion

Interior wall of secondary containment shows the progression of the wet-on-wet lining process. From right to left: the dark area is primed, the light gray area is basecoated, the first panel of fiberglass is laid into the wet basecoat, and the last four panels are saturated.

By Chris Ard, Tnemec Company, Inc.

will range from preparing the surface to applying the lining and mat reinforcement. Although a variety of polymeric coatings and linings can be used, the article is limited to polyamine and novolac epoxies and vinyl esters.

New vs. Existing Concrete

Both new and existing concrete structures have their challenges. While erosion from chemical attack and physical abuse are more of a concern for existing concrete, new concrete has its own issues. Although new concrete is typically given the proper time to cure as required per ACI 318-05, this does not mean that the residual water in the concrete has completely evaporated or that the concrete has finished settling into its permanent space. Continued settling and shrinkage of the concrete may cause further development of cracks even after the required 28-day cure time.

It is also impossible to gauge whether the concrete could have a continuous and high moisture vapor transmission (MVT) rate, because the concrete may still hold residual water that has yet to react or be released through evaporation, thus skewing the results of MVT testing. Assurance that a vapor barrier was properly installed before the pour can greatly alleviate this concern.

Even with new concrete, there could still be areas with imperfections in need of repair before coating application. Fins, splatters, and other protrusions should be ground smooth. Abrasive blasting will expose depressions such as bug holes and honey combs, and, depending upon the size of the area affected, either spot patching or resurfacing will be required.

In existing concrete, both cracking and MVT can be readily identified. Cracks may be visible once abrasive blasting is completed, and MVT can be detected through testing by either ASTM F-1869-04, "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Sub-floor Using Anhydrous Calcium Chloride," or ASTM F-2170, "Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes."

Concrete eroded or destroyed from physical abuse and corroded from chemical exposure will also be detectable. These areas will require further investigation to determine the scope of damage and the necessary extent of the repair.

Small defects such as spalls, bug holes, and hairline cracks will be exposed during the surface preparation of the concrete substrate. These areas can then be filled through the use of engineered cements or polymer patching materials. The same patching materials can also be used to repair larger damaged areas; however, further preparation of these areas may be necessary before patching, such as removal of contaminated concrete or the repair of rusted or damaged rebar and the surrounding concrete. Repouring of curbs and shoulders as well as areas in the floor may be necessary in extreme circumstances.

Surface Preparation

Several viable options are available when it comes to the surface prepara-

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tion of concrete. Water jetting, water blasting, wet abrasive blasting, dry abrasive blasting, shot blasting, and diamond grinding are the most common methods used. Abrasive blasting, shot blasting, and diamond grinding will be discussed here.

Per ICRI Guideline 03732 from the International Concrete Repair Institute (ICRI), a surface profile of CSP 4 or greater will achieve a roughness suitable for the application of the specific linings to be discussed in this paper. Although ICRI references several different preparation techniques, it does not require a specific method. The project engineer, coatings manufacturer, or the contractor performing the work chooses the method.

Abrasive Blasting

Abrasive blasting is commonly used to clean and profile the surface of both concrete and steel. Concrete can be profiled at pressures around 80 psi (5.5 bar). Proximity of the blasting nozzle to the substrate, the blasting media being used, the condition of the concrete, and how quickly the contractor moves or "sweeps" the blast nozzle across the surface can all affect how quickly the surface is blasted and how much profile is achieved. Based on ICRI Guideline 03732, the profile should be determined by an agreement among the project engineer, the material supplier, and the contractor.

Open abrasive blasting creates a significant amount of dust and debris; therefore, the applicator and any personnel in the immediate area should wear proper protection.

Shot Blasting

While most contractors will abrasive blast walls and floors, some may choose another method for the horizontal surfaces, due to the excessive amount of spent media created by open abrasive blasting. Shot blasting is the most commonly used method for abrasive blasting horizontal concrete. The dust is self-contained through the use of a vacuum system, and the abrasive is a steel shot that is reclaimed and reused throughout the blasting process. A simple magnetic sweep of the floor removes any unclaimed shot, making the method much cleaner than open abrasive blasting.

Diamond Grinding

Small or hard to reach areas, such as the floor/wall transition, inside corners, or floors beneath existing equipment, can be abraded with a hand-held diamond grinding tool. Attaining a surface profile by this method equal to or greater than a CSP2 should be required per ICRI guideline 03732.

Once the concrete has been thoroughly abraded, the contractor will need to address various conditions in the concrete substrate. All cracks, spalls, and general defects must be addressed, as well as any control joints saw cut into the floor during its placement. Terminations will also need to be addressed in the exposed perimeters of the containment area.

Active and Non-Moving Cracks and Joints

Many times, it is nearly impossible to ascertain if a crack is static (non-moving) or active. Some cracks develop during the placement and curing of the concrete, and after time will no longer move, becoming static. Others develop due to thermal cycling, tortional or seismic movement, compressive forces from applied loads, or vibration from traffic or machinery. These cracks will continue to move throughout the life of the floor and must be addressed accordingly.

Active Joints and Cracks
Active joints, called expansion joints, account for any movement caused by the aforementioned physical dynamics, and they isolate two structural elements from one another. Active joints should not be overcoated. Instead, the contractor should terminate the lining on either side of the joint, or coat over the joint and then re-saw it, which will cut back through the lining and into the floor, thus reopening the joint. Either way, the joints should then be filled with the appropriate joint filler. In the case of secondary containment, the joints should be filled with an elastomeric, chemically-resistant joint compound such as a polysulfide caulk. Toolable or self-leveling grades of caulking may be used, depending on the contractor's preferences.

Active cracks develop when the expansion joints are not adequate to handle the movement in the floor. Many times, these cracks will develop diagonally to a footing's outside corner. These cracks may be addressed in two different ways, depending on how wide the crack is and how much it moves.

Minimum or hairline movement of the crack may be addressed by routing out the crack and then filling it with the appropriate flexible caulk. This repair should be performed after the lining has been applied. If the owner wishes to not see the crack, a slip sheet method may be employed. This method involves applying a non-adhering or bond breaking material over the crack. The crack should first be cleaned out and filled with a mixture of epoxy and fumed silica, forming a non-shrinking paste or mortar. The filler should be allowed to cure to ensure the bond breaking material does not adhere to the wet filler. Typical bond breakers include polyethylene tape or simple duct tape. Once the filler has cured hard, the tape may be applied over the entire crack, followed by the lining application. The theory behind this method is that the crack underneath the lining will be able to move independently of the lining because the crack and the lining are not directly bonded together in that particular area.

Non-Moving Joints and Cracks
Non-moving joints are referred to as contraction or control joints. The joints are created by saw cutting the concrete to a depth of at least ¼ the thickness of the concrete slab and a ¼-inch width. The joints create weak points in the concrete, allowing any cracking due to shrinkage or settling to be controlled within these joints. Once the concrete has fully cured, the control joints are no longer necessary.

Non-moving cracks are typically developed outside of the control joints during cure. This happens from time to time when there are not enough control joints cut into the floor or when the concrete has shrunk excessively from overwatering or rapid curing in hot weather.

Both of these non-moving openings may be routed out, patched in with non-elastomeric material such as 100% epoxy mixed with fumed silica, and reinforced with fiberglass tape. The paste should be similar in consistency to thick peanut butter. Once mixed, the material can be pushed into the opening with a putty knife and struck flush to remove protruding, excess material. Fiberglass tape may then be applied over the crack and into the wet filler, reinforcing the crack against movement. Excessive movement of the crack may tear the fiberglass and allow the crack to travel through the lining.

Termination Details

Various termination details should be used, depending on the design of the concrete structure. Termination of the lining into trenches and exposed perimeters should be detailed using key ways. Key ways are created by saw cutting a line in the concrete where the lining will terminate and chipping the concrete back approximately one inch, or, in the case of a drain, chipping back from where the flange of the drain is set flush into the concrete. Both of these details produce a deep notch in the concrete and anchor the lining into it, thus preventing the lining from chipping or peeling at the exposed termination.

Inside and Outside Corner Details

When fiberglass mats will be used to reinforce a lining, detailing the inside and outside corners will be necessary if the intent is to wrap the glass around them. Both inside and outside corners are typically sharp 90-degree angles, making it difficult to wrap the fiberglass around or into these transitions.

Wrapping the fiberglass through a 90-degree angled inside corner will cause gapping behind the mat because the glass is somewhat rigid and will not lay completely into the corner. Such hollow spots should be cut out and repatched before the application of the next coat.

Wrapping the fiberglass over a 90-degree-angled outside corner will often cause fiberglass hairs to pop up out of the mat, leaving strains of the fiberglass sticking out of the coating. The frayed glass will have to be addressed after the lining dries through, either by sanding or grinding before the next coat is applied.

Obviously, cutting the glass at these inside and outside corners is an option; however, many secondary containment designs require the mat to be overlapped at the seams to eliminate unreinforced areas in the lining.

To detail the inside corners, a one- to two-inch (2.5- to 5-centimeter) cant (or 45-degree angle) cove should be installed. A cant cove can be created by mixing a small amount of the mortar that will be used in the lining system. The material should be applied in a bead along the inside corner and tooled into the shape of a cant with a margin trowel. This technique will leave a 45-degree angle that the mat can then be wrapped over without leaving gaps behind the glass. The detailing can take place where the wall or vertical face of the concrete meets the floor, or at the inside corner of two walls.

Outside corners are more difficult because they must be ground down to eliminate the 90-degree angle. Addressing these edges in the design phase is recommended: require the outside corners of the concrete to be bull nosed while being poured and placed.

> *“It is important to understand the chemistry of polymeric linings and how it affects their workability.”*

The Lining Material and Its Application

While the following discussion considers epoxies and vinyl esters, other polymeric linings may be suitable for a project, and it is the responsibility of the owner, engineer, and material supplier to determine what system is suitable for a project, based on the anticipated exposure conditions.

It is important to understand the chemistry of polymeric linings and how it affects their workability. Both epoxies and vinyl esters are highly cross linking materials and are supplied as two-part, chemically reactive liquids. Once mixed, the liquids immediately begin to react and crosslink. This chemical reaction causes the material to have a relatively short pot life. Combined with the inherent thickness of these types of resins, these materials can be much more difficult to apply than a solvent-borne epoxy or a single-part acrylic, both of which are normally sprayed or dipped from a bucket and then rolled.

Because the materials are chemically reacting with one another, energy is being produced. This energy creates heat, and heat speeds up the reaction of the two. This reaction becomes exponential in mass, making the pot life even shorter when the materials are worked out of the containers in which they’ve been mixed. To alleviate the problem of short pot life on horizontal applications, the mixed material is typically dumped immediately onto the area where it is to be installed and then quickly spread uniformly with a trowel or squeegee. These tools are either flat or notched, depending on the specified thickness of the coating.

When applying material vertically, it is impossible to pour the material onto the substrate. Instead, small amounts are mixed at a time or several applicators share a large mix, thereby shortening the amount of time the material is in the container.

Lastly, these types of materials develop their hardness rather quickly, thus shortening their recoat window to around 24 hours. If the recoat window is missed, a thorough abrading of the surface is required before applying another layer.

Close attention should also be paid to the temperature of the material, the surface to be coated, and the surrounding air. Material temperature is the most critical and should be between 65 and 80 F (18 and 27 C) at the time of installation. Colder material becomes thick and sticky, making it hard to apply, while warm material will drastically reduce pot life and can decrease working time.

Because of its porosity, concrete will contain air. This air will expand or "outgas" in rising temperatures and can cause pinholing or blisters in the lining system. When applying coatings in outside applications or when interior spaces are not climate controlled, air temperatures should be stable or descending during application. Also, if possible, the material should be applied in shaded areas and not in direct sunlight during outside applications.

Installation of the Lining

The installation of the lining system is a five-step process involving the primer, base coat, fiberglass mat, saturant coat, and finish coat. The first four steps should be performed as a wet-on-wet application, which means that all four steps should take place on the same day. Again, with a multi-component material, all parties involved in the installation must be ready to proceed once the material is mixed. That means all rollers are set up, spike shoes are already on, and areas to be protected are already masked. A mixing area should also be set up, and the material to be used should be stacked accordingly. Cutting the glass to the appropriate lengths and opening the aggregate container should also be done ahead of time. Most important, all workers should be aware of their roles in each of the first four steps of applying the system.

Since both walls and floors in secondary containment structures will be lined, the lining system should first be applied to the vertical portion of the containment area. Addressing the walls first allows for installation of the lining system while working on uncoated concrete. If the flooring were to be done first, the wall application could expose the flooring system to potential damage by the applicator. Floors could be protected by covering them with plastic or felt, but this is unnecessary if the walls are addressed first.

• Step One: The application process begins with mixing and applying primer. The material should be mixed per the manufacturer's instructions, either in small amounts at a time or split among a number of applicators. The material should be dipped and rolled onto the

Fig. 1: Foreground: Fiberglass sheet is laid onto the wet basecoat (light gray area). Background: The basecoat has been applied over the wet primer (dark gray).

wall at approximately 160 to 200 sq ft per gallon. This rate can vary, depending upon the aggressiveness of the profile. At a typical temperature of 75 F (24 C), the material should be used within 15 to 20 minutes of mixing.

• Step Two: As the wet primer begins to tack up, the base coat can be mixed and applied at a dry film thickness of 60 mils (1.5 mm). Per the manufacturer's recommendation, the part A and B liquids should be mixed, and while they are under agitation, the part C filler should slowly be sifted into the mixed liquids and blended until thoroughly combined. The material should then be scooped out

Fig. 2: Applicators smooth the fiberglass sheet into the wet basecoat.

onto a mortar hawk (mortar tray) or directly onto the floor in front of the wall to be coated. With the use of a flat trowel, the material can be pulled up the wall and spread at a uniform thickness of approximately 60 mils.

• Step Three: Once the base coat is evenly applied, the glass should be laid into the wet base coat (Fig. 1). It is important to remember that there is a cant at the bottom of the wall and the glass mat may be applied over it as well. The glass mat should then be smoothed into place with a metal ribbed roller or a wide drywall knife, the purpose of which is to smooth out imperfections and ensure full contact of the glass with the base coat, making sure no voids are left between the two (Fig. 2).

• Step Four: The same resin used to build the basecoat can then be used to fully saturate the front surface of the fiberglass (Fig. 3). To do this, the appro-

Fig. 3: Fiberglass sheet before the application of the saturant coat

priate amount of liquids should be mixed, leaving out the filler component of the three-component basecoat. With the material split among multiple applicators, the saturant coat should then be applied with napped rollers. The glass should appear thoroughly and evenly wetted out; however, overbuilding the saturant coat can result in sags and runs on the surface of the saturated glass, so there should be a minimal amount of film build of the saturant coat.

All four applications should be properly terminated into any keyways that have been cut into the substrate for termination purposes.

The system should be allowed to cure overnight. The next day, the surface of the system should be dry and hard with random glass fibers sticking out of the coating. The fibers should be sanded down before applying the topcoat.

- Step Five: There are two ways to proceed after the first four steps have been completed. The wall can be lightly sanded to knock down any fiberglass and then finished with a topcoat, or the four-step process may be repeated and applied to the horizontal surface. The latter allows for the topcoat to be applied at the same time to both the floors and walls, providing a more uniform finish. This process, however, would typically cause the 24-hour recoat window to be missed, thus requiring a thorough sanding of the entire vertical surface.

Once the applicator is ready to apply the topcoat, the material should be mixed and applied vertically as was done with the primer and saturant coat. However, once the lining has cured hard on the floor and can be walked on, the topcoat may be ribboned out of the container it was mixed in and spread uniformly across the floor with a flat or notched squeegee. Wearing spiked shoes, the applicator can then walk on the wet topcoat and backroll the material. Backrolling will prevent squeegee lines in the coating and will ensure that the topcoat is consistent in thickness and coverage.

Conclusion

Following these preparation, repair, detail, and application guidelines will ensure a properly placed, well-adhered lining that provides years of protection for the secondary containment concrete structure. To insure these guidelines are met, constant communication among all aforementioned parties is of the utmost importance. If the project is driven through the specification process, many of these details can be addressed early in the design phase of the project and included in the execution portion of the architect's or engineer's specification.

Chris Ard has over 17 years of experience in the installation, project management, technical service, and sales of fluid-applied protective flooring systems and reinforced epoxy wall coatings as well as secondary containment linings for chemical containment areas. He currently is a technical service representative for the Tnemec Co. in Kansas City. He is a member of the Construction Specifications Institute (CSI), the International Concrete Repair Institute (ICRI), and The Society for Protective Coatings (SSPC). He is C1 and C10 certified.

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How Surface Preparation Methods Affect Delamination in Ballast Tanks

By A.W. Momber, Muehlhan AG, Hamburg, Germany; and S. Koller, Germanischer Lloyd AG, Hamburg, Germany

Delamination is an infamous phenomenon frequently observed on coated steel substrates. Delamination at an artificial scribe is usually used as a corrosion-resistance evaluation parameter in conjunction with a salt spray test per ISO 7253. Major reasons for the delamination of organic coatings include the following.[1]

- Penetration of a liquid between substrate and coating, caused by mechanical damage
- Osmotic processes
- Contamination of substrate surfaces
- Insufficient adhesion between substrate and coating
- Too much swelling of the binder
- Large temperature differences between substrate and environment
- Solvent retention

Some of these processes, namely contamination and adhesion, depend solely on the method used to prepare the substrate before coating application, if all other parameters of the coating system and environment are kept constant. There are a number of studies that evaluate the effects of surface preparation methods—basically dry abrasive blast cleaning (AB) and waterjetting (UHP)—on coating performance. These studies also include investigations of the long-term behavior of the coating systems.[2,3] These authors, however, were concerned with adhesion assessment procedures (falling ball impact, pull-off testing, pen knife disbondment) only, and they did not consider delamination on an artificial scribe after salt spray exposure as a parameter characterizing the corrosion protection performance of coatings.

The laboratory research described in the present article focuses on delamination at the scribe for coatings primarily suitable for ballast tanks.

Objective of the Investigation

The combination of AB and UHP is an innovative approach in the surface protection industry. Although this method—denoted UHPAB throughout this study—is already introduced into ship repair practice, there is limited information available to evaluate quality aspects associated with UHPAB.

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Previous studies have shown that UHPAB removes soluble salts and ground abrasive debris from steel substrates, and that the method can guarantee an excellent adhesion between organic coatings and steel substrates.[4,5] It is the objective of this study to investigate the delamination of various coating systems applied to substrates prepared with three surface preparation methods—AB, UHP, and UHPAB. The investigation focuses on ship repair and steel structure repair applications. The selected coating systems are mainly suitable for ballast tank applications. However, one additional coating, originally designed for steel-water constructions, was also included to check the ability of the investigated methods to prepare surfaces of steel-water construction, such as weirs and flood barrages.

Table 1: Test Procedures for Paint Systems Applied to Steel (ISO 12944-6)

Corrosivity Category	Durability Range	Tests: ISO 2812-2 (water immersion)	ISO 6270 (water condensation)	ISO 7253 (neutral salt spray)
C5-M	medium	-	480 h	720 h
Im2	medium	2000 h	-	720 h

Table 2: Surface Preparation Method Parameters

Parameter	Method: AB	UHP	UHPAB
Operating pressure in MPa	0.85 (air)	200 (water)	150 (water) 0.8 (air)
Nozzle diameter in mm	10	6 x 0.3	19
Water consumption in l/min	0	10	10
Abrasive consumption in kg/min	12	0	12

The environment for evaluating coating performance was selected according to the classifications listed in ISO 12944-2. In detail, the following categories were considered.

- Atmospheric-corrosivity: C5-M (marine)—This category covers coastal and offshore environments with high salinity as well as areas with almost permanent condensation
- Categories for water and soil: Im2—This category covers sea or brackish water; structures considered include sluice gates, locks, and offshore structures

These two categories determined the type and intensity of the laboratory tests to be performed according to ISO 12944-6. These tests are listed in Table 1. The results of the neutral salt spray tests are of particular concern because they were evaluated in terms of delamination.

Surface Preparation and Coating Procedures

The following three methods were used for surface preparation in our study.

- AB (dry abrasive blast cleaning)
- UHP (waterjetting)
- UHPAB (ultra-high-pressure abrasive blasting; μ®*jet*)

The performance parameters of these methods are listed in Table 2. The abrasive material applied for dry abrasive cleaning and UHPAB was a commercial copper slag (NAstra®), according to ISO 11126-3, with the following properties: hardness: > 7 (Mohs); density: 3600 kg/m^3; particle size range: 0.4-1.2 mm; particle shape: irregular. For the UHP and UHPAB applications, tap water was used with a specific electrical conductivity of 650 μS/cm.

Test panel size was 3 m in length and 0.5 m in width. The area of each panel was separated into three parts: one for AB, one for UHP, and one for UHPAB. All test panels were originally coated with an organic coating system with an average DFT between 400 and 800 μm. After coating removal, the surfaces were allowed to dry. Thereafter, the new coatings were applied to the entire panel surface. Thus, any individual coating application was performed identically to the three types of prepared surfaces.

Five commercial organic coating systems were used for coating; their major properties are listed in Table 3. The coatings were applied with an airless spray device in a spraying booth with a controlled climate. The hardening period was 50 days. After that period, specimens for the laboratory tests were manufactured. Their size was 15 x 10 cm, per the requirements of ISO 12944-6. The specimens were cut with plate shears. Edge protection was manually applied to each sample with a commercial protective coating system. Debonding was evaluated on the samples after the salt spray test per ISO 7253. The coating was then artificially injured with a knife before the salt spray testing. The length of the artificial cut was 130 mm, and the cut

Table 3: Properties of Applied Coating Systems

Property	Coating System: 1a	1b	2	3	4	5
Binder	EP 1)	EP 1)	EP 2)	EP 3)	EP 4)	EP 5)
Primer	Zn	-	-	-	-	-
Density in kg/l	2.8	1.5	-	-	1.3	-
Solid content in vol.-%	67	100	96	83	60	80
DFT in μm	70	490	346	253	273	374
VOC in g/l	-	-	free	-	385	170

1) two-pack; 2) two-pack epoxy-mastic; 3) two-pack modified; 4) two-pack, polyamide-hardened; 5) high-build polyamide epoxy

Continued

Table 4: Results of Delamination Tests

Coating System	Surface Preparation	Delamination[1] Values in mm		
		Average	Standard Deviation	Variance
1	AB	0	-	-
1	UHP	0	-	
1	UHPAB	0	-	-
2	AB	11.2	2.09	4.35
2	UHP	7.6	0.45	0.20
2	UHPAB	7.6	0.70	0.49
3	AB	13.9	0.76	0.62
3	UHP	9.1	0.54	0.29
3	UHPAB	6.8	0.21	0.04
4	AB	12.8	0.85	0.72
4	UHP	12.5	1.47	2.17
4	UHPAB	10.7	0.85	0.72
5	AB	12.2	0.29	0.08
5	UHP	13.0	1.22	1.50
5	UHPAB	8.7	0.88	0.78

[1] Six measurements

pentrated through the coating system to the substrate. Delamination was evaluated by removing all loose coating sections very carefully with a small chisel and then assessed by measuring the absolute width of the disbonded coating sections along the cut. The delamination of each sample was given as the average of the widths of the delaminated areas at both sides of the artificial scribes.

Results of Delamination Tests

The results of the tests are summarized in Table 4 and in Figs. 1 to 5. There were notable differences in the degree of

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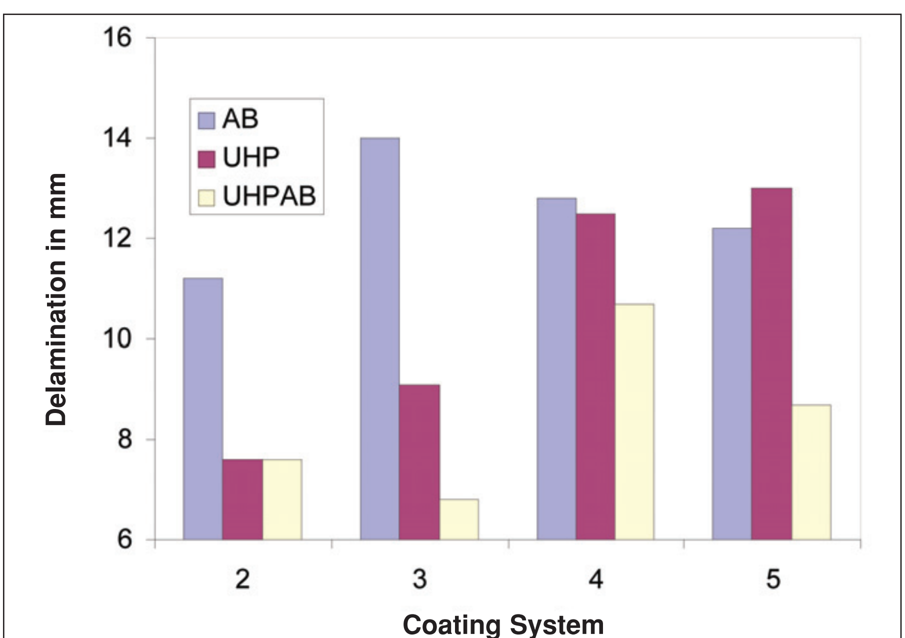

Fig. 1: Effects of coating systems and preparation methods on delamination (Coating System 1 did not show any delamination at all.)

delamination. First, Coating System 1 showed excellent performance compared to the other coating systems. This result agrees with results of delamination and underrusting tests performed by other authors.[6-8] Pietsch and Kaiser[9,10] found that, at dry blast cleaned substrates (Sa 2½), replacing a zinc phosphate primer with a zinc-dust-based primer reduced delamination. However, if the substrates were prepared with hand-held tools (St 2, surfaces partly rusty) or needle guns (surfaces partly rusty), the primer type did not notably affect undercreeping. Thus, corrosion and delamination at defects depended on the condition of the substrate before coating and on the pigmentation of the coating systems. Coating systems with inert pigments tended to exhibit cathodic delamination on dry blast cleaned substrates, and this process occurred at comparatively high rates.[9]

With respect to the surface preparation method, a notable trend can be seen in Fig. 1. UHPAB always showed the lowest delamination values for any of the coating systems being tested. However, the beneficial effect of UHPAB depended on the coating system. It was highest for Coating System 3 and lowest for Coating System 4. AB generated high delamination values in most cases. The only exception was Coating System 5, where UHP had higher values than AB. These results confirmed results obtained by Pietsch and Kaiser,[8] who found that delamination was more intense on dry blast cleaned surfaces than on surfaces prepared with hand-held tools.

The differences in delamination for the surfaces prepared by various methods depended upon the coating systems. If Coating System 1 was applied, the surface preparation methods investigated

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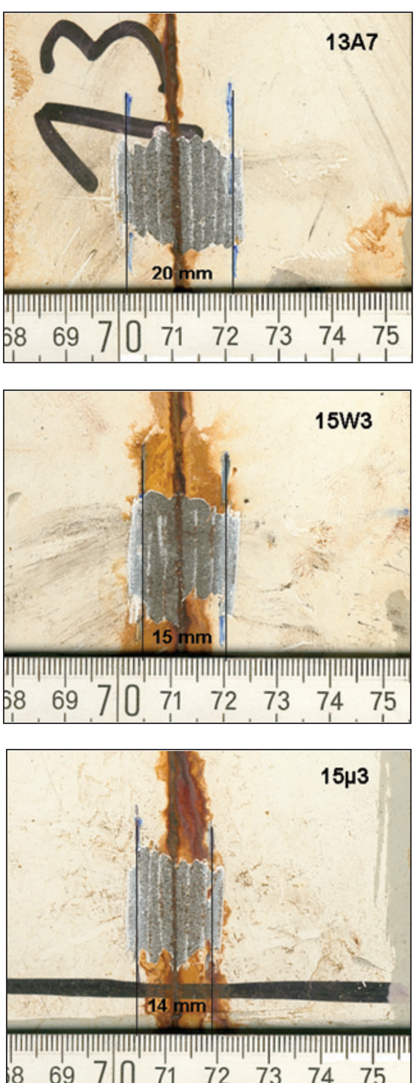

Fig. 2: Results of delamination tests on Coating System 2 (A=AB; W=UHP; µ=UHPAB)

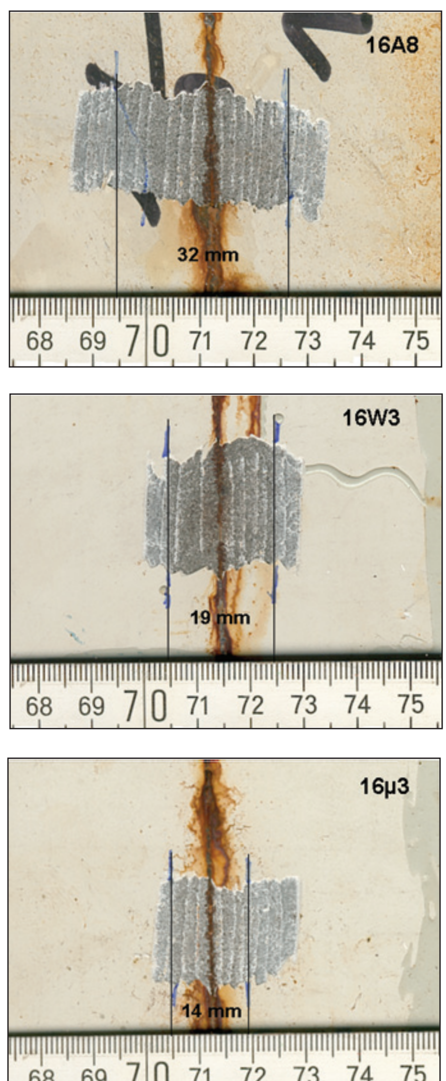

Fig. 3: Results of delamination tests on Coating System 3 (A=AB; W=UHP; µ=UHPAB)

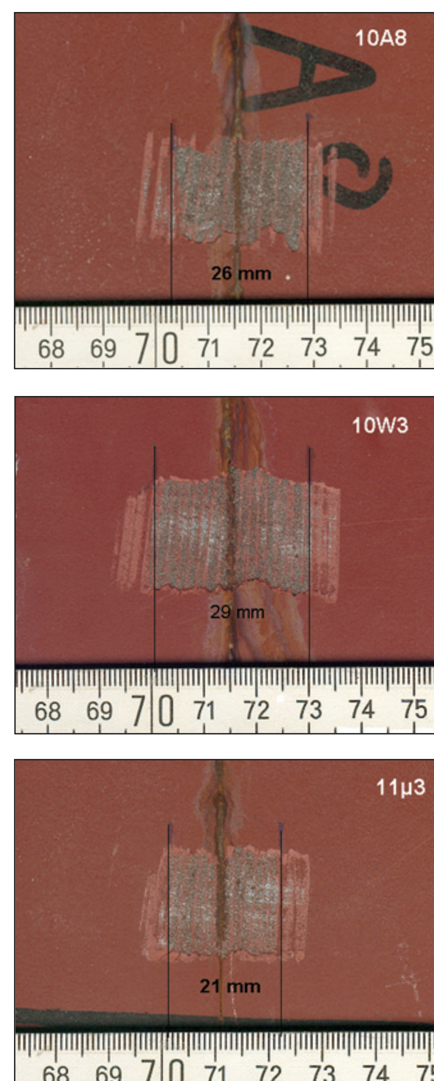

Fig. 4: Results of delamination tests on Coating System 4 (A=AB; W=UHP; µ=UHPAB)

in this study did not seem to affect the delamination process. No delamination occurred in that case at all. (Therefore, Coating System 1 is not displayed in Fig. 1.) The high resistance to delamination of Coating System 1 could be explained partly by the protective action of dissolved zinc particles that penetrated the artificial scribe. The hydrogen ions generated during zinc dissolution neutralized hydroxyl ions from oxygen reduction. Thus, highly alkaline pH-values, responsible for delamination, were prevented.[8] If, however, Coating System 3 was applied, delamination was a very strong function of the surface treatment

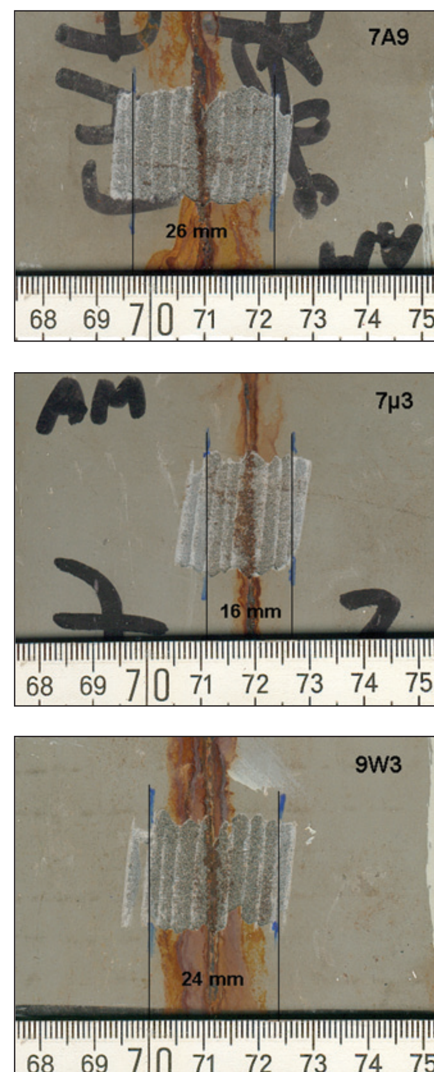

Fig. 5: Results of delamination tests on Coating System 5 (A=AB; W=UHP; μ=UHPAB)

method. This is illustrated in Fig. 3. Further examples are shown in Figs. 2, 4, and 5.

Delamination on dry blast cleaned substrates seemed to be less sensitive to changes in the coating type. The heights of the columns for AB in Fig. 1 show the lowest fluctuations over the coating type range (26%), whereas the values for UHPAB (57%) and especially UHP (71%) exhibited much higher deviations. For the latter two methods, a careful adjustment of coating type and surface preparation method can help to minimize delamination.

It is not clear yet what mechanisms may be responsible for the effects observed in this study. The difference in delamination between UHP and UHPAB can partly be explained by differences in profile roughness and coating adhesion, which, according to the list on page 43, affect delamination. Concerning surface profile and roughness, the areas cleaned with UHP exhibited a lower profile. The steel plates had already been prepared before the application of the original coating. Because this coating was then removed by UHP water jetting to prepare the surface for applying the new paint, the original profile was deteriorated. The rather insufficient performance of the AB-samples could be due to the presence of abrasive debris that were detected and described in a previous study.[5] Thus, fine cleaning after AB may be an additional parameter that influences the delamination process. However, other effects, namely the ability of UHP and UHPAB to remove dissolved salts, may also contribute to the superior performance of the coatings applied to the substrates prepared with UHP and UHPAB.[4] The effects of the coating types on delamination can not easily be explained. All coatings, except System 1, were based on epoxy with inert pigments. This particular problem will be addressed in a subsequent study.

Summary

In our study, delamination of organic coatings applied to metal substrates depended upon the surface preparation method and coating properties. In most cases, substrates prepared with AB showed the highest delamination values, whereas substrates prepared with UHPAB exhibited the lowest delamination values. Zinc dust containing primers prevented delamination during the testing period.

References

1. STG-Richtlinie Nr. 2221: Korrosionsschutz für Schiffe und Seebauwerke, Teil III: Instand-

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haltung von Korrosionsschutz-systemen, Schiffbautechnische Gesellschaft e.V., Hamburg, 1992.
2. Allen, B, 1997, "Evaluating UHP waterjetting for ballast tank coating systems," *PCE*, Vol. 2, No. 10, 38-92.
3. Morris, M., 2000, "Update: evaluating UHP waterjetting as preparation for ballast tank coating," *PCE*, Vol. 5, No. 9, 54-59.
4. Momber, A.W., 2006, "Aspects of salt concentration of prepared steel substrates," *JPCL*, Vol. 23, No. 2, M2-M8.
5. Momber, A.W., Koller, J., Dittmers, H.-J., 2004, "Effects of surface preparation methods on adhesion of organic coatings to steel substrates," *JPCL*, Vol. 21, No. 2, 44-50.
6. Baumann, M., 2003, Korrosions- und Beschichtungsschäden an Stahlwasserbauten. 2. Tagung Korrosionsschutz in der maritimen Technik, Hamburg, 124-142.
7. Binder, G., 2001, Korrosionsschutz an Kainanlagen, Schifffahrtswegen und Seebauwerken. 1. Tagung Korrosionsschutz in der maritimen Technik, Hamburg, 84-102.
8. Binder, G., 2003, "Examination of accelerated laboratory tests for corrosion protection," *PCE*, Vol. 8, No. 11, 8-16.
9. Pietsch, S., Kaiser, W.-D., 1997, Defect-induced undermining of anti-corrosive paints – influence of zinc dust and rust. Proc. Eurocorr '97, Trondheim, Norway, Vol. II, 367-371.
10. Pietsch, S., Kaiser, W.-D., 2001, Unterrostung am Defekt – Korrosion von beschichtetem Stahl an mechanischen Verletzungen. Farbe & Lack, Vol. 107, 141-145

Dr. Andreas Momber is head of research & development at Muehlhan Surface Protection International GmbH and a lecturer at Aachen University, Germany, in the Development of Mining, Metallurgy and Earth Sciences. He was given the 2007 *JPCL* Editors' Award for a paper he co-wrote with Sven Koller.

Sven Koller has worked for Germanische Lloyd AG, Department MCM, Hamburg, since 1996. His areas of expertise include materials technique, non-ferrous metals, corrosion, and corrosion protection. He was given the 2007 *JPCL* Editors' Award for a paper he co-wrote with A.W. Momber.

New President, Board Members Welcomed at SSPC

SSPC has welcomed J. Bruce Henley, Vice President, Program Services of The Brock Group (Beaumont, TX), as the new President of the SSPC Board of Governors. Mr. Henley takes over for Doni Riddle of The Sherwin-Williams Co., whose term as President ended on June 30, 2008. Mr. Henley's term as President will end June 30, 2009.

Mr. Henley, a 30-year veteran of the coatings industry, was first elected to the Board in 2003. At Brock, he is responsible for the development and maintenance of painting, insulation, and corrosion-under-insulation (CUI) programs for petrochemical, pulp and paper, power, and offshore industry projects, SSPC says. He is an SSPC-certified Protective Coatings Specialist (PCS), a Certified Energy Appraiser, and a member of the National Insulation Association (NIA) and NACE International.

Other changes among the SSPC Board officers, effective July 1, include Doni Riddle becoming Immediate Past President; Steven P. Roetter, P.E., of Tank Industry Consultants, Inc. becoming President-Elect, and Russ Brown of Munters Corporation becoming Vice President.

In other SSPC Board news, Gail A. Warner of Northrop Grumman Shipbuilding—Newport News was elected by SSPC members to fill the vacant facility owner Board position created by the expiring term of Danny McDowell. Ms. Warner has been a project engineer for Northrop since 1982. She is responsible for developing ship specifications and drawings and providing technical support for the engineering, construction, and cost estimating departments for the aircraft carrier *USS Gerald R. Ford* (CVN 78) project. She also is the technical lead for protective coatings, cathodic protection, and markings for the CVN 78 project. Ms. Warner is a certified NAVSEA Basic Paint Inspector (NBPI).

J. Bruce Henley

Benjamin S. Fultz of Bechtel Corporation, who was appointed by the Board in February to complete the unexpired term of L. Brian Castler, was elected by SSPC members to a new four-year term, according to SSPC. Mr. Fultz, a Bechtel Fellow, is the Chief of Materials Engineering Technology. He has 42 years of experience in both technical and production management of protective coatings uses and applications. Much of his experience is in marine, refinery, chemical processing, and nuclear applications.

Mr. Fultz is a member of ASTM, ASM, and NACE International. He is also a past chairman of the NACE Southeast Region as well as a former contributing editor for *JPCL*. Mr. Fultz has received numerous awards from the coatings industry, including several *JPCL* awards and the 2007 SSPC Technical Achievement Award, SSPC reports. He has authored more than 40 articles for several industry publications, and he has presented papers at conferences and seminars throughout the U.S., Europe, and Asia.

Steven P. Roetter

Russ Brown

Gail A. Warner

Benjamin S. Fultz

Shoup To Make Presentation at Indocoating Conference

SSPC Executive Director Bill Shoup will make a presentation at the Indocoating & Corrosion Summit 2008 International Conference & Exhibition, to be held at the Jakarta Convention Center in Jakarta, Indonesia, August 12–14. The conference is co-sponsored by the SSPC Indonesia Chapter and the NACE International Indonesia Jakarta Section.

According to SSPC, Shoup's presentation is entitled "Inspire and be Inspired—Resolving Issues in the Coating Industry."

The purpose of the conference is to give attendees a well-rounded knowledge of protective coatings, material selection, chemical inhibitors, and cathodic protection; update participants on the latest technologies and their many issues and requirements; and provide a forum for discussion and for sharing expertise, best practices, and case studies in managing various aspects of corrosion mitigation, the sponsors say.

In addition to the technical program, the event will include a workshop, a NACE International Corrosion Technician certification exam, a panel discussion, and an exhibition.

For additional information, visit the Indocoating & Corrosion Summit 2008 website at www.iee-c.com/indocoating2008/.

SSPC Ontario Chapter To Hold 5th Annual Golf Tournament

The Ontario Chapter of SSPC will hold its 5th Annual Golf Tournament on September 18 at the Willow Valley Golf Course in Mount Hope, Ontario, Canada.

According to Chair Bob Tucker, the chapter also will present its annual G.L. Stone Memorial Award during the tournament. The award, created by members of the Ontario chapter, honors the

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late George L. Stone, the impetus behind the formation of the Ontario chapter. The award is presented to a suitable candidate who has demonstrated outstanding contributions to the protective coatings industry, Mr. Tucker says.

RSVPs for the golf tournament as well as nominations for the award should be sent on or before September 4, 2008, to Mary Beth Tucker at info@stone-tucker.com. For more information, contact Bob Tucker—tel: 905-892-6142; rtucker@stone-tucker.com.

SSPC Individual Member Update

Below is the list of 76 new individual members who joined SSPC in May 2008.

If you have questions about joining, contact Terri McNeill at 877-281-7772 (U.S. and Canada) or 412-281-2331, ext. 2233.

- Kenny G. Adams, Norman, OK
- Larry Adkins, Anderson, IN
- Michael Babb, Wildeys, St. Michael, Barbados
- Thomas L. Bailey, Suffolk, VA
- Norazriyana Bte Bazuri, Singapore
- Richard Bear, Tenino, WA
- Vincent Yeo Eng Beng, Singapore
- Carl Berg, Avon, MA
- Richard Berghuis, Hoquiam, WA
- Butch C. Bliss, San Diego, CA
- Bill Boardman, Pleasanton, CA
- Thomas Bockman, Hixson, TN
- Pau Boou Leong, Selangor, Malaysia
- Jeffrey Bordeaux, Hampton, VA
- Greg Brakefield, Lakeland, FL
- Richard A. Brown, Hampton, VA
- Donald Burghardt, Sheridan, NY
- Regina Burton, Clarks Summit, PA
- Graham Carlisle, Johannesburg, South Africa
- Joel Chaidez, San Diego, CA
- Paul J. Crews, Long Island City, NY
- Harold Daly, Las Vegas, NV
- Frank Daniels, Stuart, FL
- D. Devaraj, Singapore
- Michael DeVlieger, Ocean City, NH
- Rick W. Dickinson, Platteville, CO
- Michael Farley, San Diego, CA
- Chad Fazzio, Ocean Springs, MS
- Henry P. Flanagan, New Orleans, LA
- Steve Fountaine, Washington, DC
- Allen Fuller, Winter Park, FL
- Antonio Garcia, Randleman, NC
- Ryan Graves, Pittsfield, ME
- Earl Hamlin, South Point, OH
- Jim Hammond, Peninsula, OH
- Minh Ho, Calgary, AB, Canada
- Karen Hou, Huntsville, AL
- David B. Hudak, Red Deer, AB, Canada
- Brian Huffman, Ronda, NC
- J. Richard Leader, Lancaster, PA
- Donghoon Lee, Gyeonggi-do, Republic of Korea
- Miok Lee, Busan, Republic of Korea
- Peter Lignos, Torrance, CA
- Jesse Lindemann, Fargo, ND
- Val Manzanedo, Tucson, AZ
- Caroline Marceau, Sept-îles, QC, Canada
- Chris Marvel, Easton, MD
- George McGee, Charlotte, NC
- Thomas Mirabile, East Setauket, NY
- Jennifer Morse, Houston, TX
- David Muth, South Point, OH
- Ravishankar Nagarajan, Dubai, UAE
- Brian O'Neal, Elkins, AR
- Lorenzo Ortiz, National City, CA
- Rene L. Oubre, Baton Rouge, LA
- Paul M. Powers, Edwardsville, IL
- Andrew J. Provost, Orlando, FL
- Abdul Quim, Singapore
- Ali Rezvanjah, Port Moody, BC, Canada
- Oscar Salazar, Edmonton, AB, Canada
- Doug Sandercock, Sarnia, ON, Canada
- Ron Shaw, Elmhurst, IL
- Richard Simons, Miami, FL
- Endi Siswanto, Bintan, Indonesia
- Dennis Stacey, Victoria, BC, Canada
- Joe Swann, Houston, TX
- Mitch Thibodaux, Bourg, LA
- Nicholas Paul Vincent, Johor Darul Tak'zim, Malaysia
- George Vorel, Butler, PA
- Nathan Ward, Columbia, SC
- Philip Waser, York, PA
- Julie Weber, San Antonio, TX
- Arlen Williams, Stockton, CA
- Gail Winterbottom, Shakopee, MN
- Noor Azman Yusoff, Singapore

Mega Rust 2008 Returns to Louisville

Mega Rust 2008, the U.S. Navy Corrosion Conference, will be held August 18–21 at the Galt House Hotel & Suites in Louisville, KY. The annual event began in June 2005 and rotates among Louisville, KY; Norfolk, VA; and San Diego, CA. The conference brings together government and military personnel, sea vessel and facility owners and operators, shipyard and research facility personnel, and coatings manufacturers and suppliers to discuss issues pertinent to the corrosion protection of the U.S. Navy's fleet. The event combines the following five annual conferences/meetings.

- U.S. Navy and Industry Corrosion Technology Exchange, known as the "Rust" Conference
- Commander, Fleet Forces Commands Fleet Corrosion Control Forum
- NAVSEA Submarine Preservation Conference
- Navy Shipyards and Intermediate Maintenance Facilities Coatings Group Meeting
- U.S.C.G. Coatings & Corrosion Control Tiger Team Meeting

The keynote luncheon speaker this year is Vice Admiral (Sel) Kevin M. McCoy, USN, Prospective Commander, Naval Sea Systems Command. The keynote speaker for the Fleet Corrosion Symposium is Rear Admiral John Clarke Orzalli, USN, Commander, Regional Maintenance Centers. The keynote speaker for the Joint Services session is Mr. Dan Dunmire, Director, DOD Corrosion Policy and Oversight.

To register online for the event, visit www.nstcenter.com/currentMegaRust.aspx, or contact the National Surface Treatment Center, host of the event, at 401 Industry Road, Suite 500, Louisville, KY 40208—tel: 502-638-4400; fax: 502-638-4300; email: contact@nstcenter.com.

Photo courtesy of Greater Louisville Convention & Visitors Bureau

Training Courses

Several training courses of interest to professionals in the industrial and marine coatings field will be held at Mega Rust.

- SSPC's Marine Coatings Program is a new, five-day fundamental coatings training course covering the selection, specification, and use of coatings in a safe, effective, and economical manner to protect structures in harsh marine environments. Related topics discussed will include coating failures, assessing marine corrosion, safety and environmental issues, and the use of international standards in the marine industry. Structures covered include ocean vessels (blue/deep water), inland vessels (coastal, brown water, shallow draft), offshore platforms, and coastal marine structures.
- SSPC's NAVSEA Basic Paint Instructor (NBPI) course is a five-day QA course that was developed by Naval Sea Systems Command (NAVSEA) to train coatings inspectors to inspect critical coated areas as defined by U.S. Navy policy documents. These areas include, but are not limited to, cofferdams, decks for aviation and UNREP, chain lockers, underwater hulls, bilges, tanks, voids, and well deck over-

Continued

heads. The content of the course is similar to the NACE CIP Session I, but with a particular focus on ship painting issues. This course also provides both the technical and practical fundamentals for coating inspection work for any steel structure projects other than ships.

Both the Marine Coatings and NBPI courses will be offered on August 13-17, before the rest of Mega Rust begins. To register, call SSPC—877-281-7772, ext. 2202; email: boyle@sspc.org; or visit: www.sspc.org/training.

• Surface Preparation by Water Jet Methods

Led by Lydia Frenzel, this four-hour interactive workshop will feature the pilot run and training protocol of a new NSRP (National Shipbuilding Research Program SP-3) manual focused on "how to inspect flash rust," and a thirty-year perspective on what happens to a surface when water jetted or hydroblasted to strip paint or corrosion. The objective of the training manual is to reduce uncertainty between inspectors and production personnel, and to reduce costs by eliminating time that is spent in additional paperwork "approval" for a variance. Dr. Frenzel will also discuss "How the Surface Is Affected during High Pressure or Ultra-High Pressure Waterjet Cleaning." The date of the workshop is August 18.

To register for the workshop, visit www.nstcenter.com.

Exhibitors

Exhibitors at Mega Rust 2008 will have the opportunity to make technical presentations, exhibit their products or technology, and network with individuals from all branches of the U.S. military, as well as personnel at shipyards, research facilities, and private industry. Below is a list of exhibitors that may be of interest to readers of *JPCL*, as of press time.

- Advanced Resin Coatings LLC
- Chlor*Rid International, Inc.

- Cortec Corporation
- Desco Mfg. Co., Inc.
- Duromar
- DUX Area, Inc.
- Dynabrade Inc.
- Elcometer Inc.
- Elektrophysik
- Greenman-Pedersen, Inc./ Instrument Sales Inc., a GPI Company
- Hold Tight Solutions
- Industrial Vacuum Equip Corp.
- International Paint, LLC
- ITW American Safety Technologies
- 3M
- Monarflex by Siplast
- Munters Corporation
- NACE International
- NST Center
- Office of Secretary Defense OSD
- Rapid Deployable Systems Services
- Rapid Prep, LLC
- Sherwin-Williams
- Specialty Polymer Coatings Inc.
- Sponge-Jet, Inc.
- SSPC: The Society for Protective Coatings
- Thermion
- Tinker & Rasor
- U.S. Army Corrosion Office
- Western Technology Inc.

Associations

PDCA Elects New Board

The Painting and Decorating Contractors of America has announced the election of a 13-member Board of Directors, as the organization transitions to a new governance structure.

In accordance with PDCA's newly adopted bylaws, the organization has elected four candidates each from its west, central, and east regions, as well as one past-president candidate. The board will consist of those 13 directors beginning in August 2008.

Through a transitional period, the current executive committee will serve the board. PDCA will also have two non-voting directors: one from the associate members and the PDCA chief executive officer.

At the swearing-in ceremony, each director will be randomly assigned to a one- or two-year term, in order to provide stability and stagger election cycles. For each region, two directors' terms will be for one year, and two will be for two years. Six director positions (two from each region) will be open in the fall of 2009 for terms beginning in 2010. Terms from 2010 forward will be two years. The past-president director shall begin with a two-year term.

The 2008 regional directors are:

- West: Dave Ayala, Monty Cates, Darylene Dennon, and Steve Nagelmann
- Central: Dave Ryker, Bob Siebenaler, L.E. Travis III, and Pete Wirtz
- East: Carol Adkins, Ken Sisco, Mike Walker, and a tie between Mark Adams and Joe Lombardo. The tie will be resolved per Robert's Rules of Order at the August director meeting.

The new past-president director is Paul Corey. The associate director is John Lanzilotti.

Radtech 2008 Honors Researchers

(left to right): Petra L'Abbe, PPG, president of RadTech; Molly Hladik, HP, Technical Conference chair; and John Garnett, head of RadTech Australia

Papers on flame-retardant coatings, recycling, and other innovations took top honors this year at RadTech 2008. The conference and exhibition featured presentations on electron beam (EB) and

Continued

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- Desco Mfg. Co., Inc.
- Duromar
- DUX Area, Inc.
- Dynabrade Inc.
- Elcometer Inc.
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- Hold Tight Solutions
- Industrial Vacuum Equip Corp.
- International Paint, LLC
- ITW American Safety Technologies
- 3M
- Monarflex by Siplast
- Munters Corporation
- NACE International
- NST Center
- Office of Secretary Defense OSD
- Rapid Deployable Systems Services
- Rapid Prep, LLC
- Sherwin-Williams
- Specialty Polymer Coatings Inc.
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Continued

ultraviolet (UV) industrial technologies.

Best Paper honors went to John Garnett, head of RadTech Australia, for his presentation on "Novel UV/EB-Curable Flame Retardant Coatings Using Unique Water Compatible Oligomers; Applications of the Coatings Particularly for Recycling Waste Products Such as Banana Tree Trunks."

"Dr. Garnett's paper lent itself to green chemistry by turning waste into usable product, using renewable resources that advance sustainability, applying the chemistry such that it could benefit humanitarian interests and applications, and using the unique properties of the raw material to their advantage," commented Molly Hladik, the RadTech 2008 Technical Committee Chair.

The best university paper award went to Sun Yat-Sen of the University in China for "Photodecarboxylation in UV-Curable Waterborne Coatings."

"This paper describes how water-compatible monomers may become water-resistant polymers by photodecarboxylation," said Hladik.

RadTech UV/EB 2008 is the world's largest UV & EB event. The conference and exhibition, held May 4–7 in Chicago, is dedicated to fostering educational, technical, and scientific advancement in the manufacture and use of UV- and EB-curable products.

Companies

PPG Buys Illinois Coating Manufacturer

PPG Industries (Pittsburgh, PA) has announced its acquisition of Vanex, Inc., Mount Vernon, IL. Terms were not disclosed.

Founded in 1964, privately-held Vanex is a supplier of Plascron® and Breakthrough® brand waterborne industrial coatings for use on metal, plastic, and wood in the structural steel, building systems, construction, and fabricated metals industries. Vanex operates one manufacturing facility in Mount Vernon and employs approximately 20 people.

"The Vanex waterborne coatings are a strong complement to the PPG TrueFinish product offering," said William Wulfsohn, PPG senior vice president of coatings. "What's more, this acquisition will enhance our ability to provide fast turnaround and leading-edge technologies to our customers."

Pittsburgh, PA-based PPG is a global supplier of paints, coatings, chemicals, optical products, specialty materials, glass, and fiberglass. The company has more than 150 manufacturing facilities and equity affiliates, and it operates in more than 60 countries.

Appointments At Tnemec

Tnemec Company Inc. (Kansas City, MO) has announced the appointments of two employees—Joe Davis as vice president of technical service and Mark Thomas as vice president of marketing.


Joe Davis

Joe Davis is active in several industry organizations, including SSPC, NACE International, the Construction Specifications Institute (CSI), and the Association of Facility Engineers (AFE). In addition, Davis is a NACE-certified coating inspector and instructor, and an SSPC-certified C1, C2, and Protective Coating Specialist and Instructor. He holds a KTA Level II Certificate for failure and coating analysis, as well. "Joe has extensive expertise in industrial high-performance coatings application, failure analysis and facility coating evaluation," according to Chase Bean, the company's executive vice president.


Mark Thomas

Regarding the company's new vice president of marketing, Mark Thomas, Bean said, "Along with a significant role in the development of Tnemec's StrataShield floor and wall coating systems, Mark has sculpted our company's contemporary market image and guided the implementation of our market strategies." In his new position, Thomas will continue to manage Tnemec Company's marketing department. "His expertise includes a wide range of coating technology issues, such as VOC regulations and new product technology."

Thomas has authored technical articles for trade publications, including *The Construction Specifier.*

Tnemec manufactures industrial coatings for steel, concrete, and other substrates for new construction and maintenance.

Michelman Acquires Hydrosize® Technologies

Michelman (Cincinnati, OH) has announced the acquisition of Raleigh, NC-based Hydrosize® Technologies, Inc. Hydrosize is a manufacturer of state-of-the-art coatings, including sizings, film formers, fixatives, binders, and resins for the coating and composite industries.

According to Michelman, a key to the acquisition is that Hydrosize gives

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Michelman a waterborne polyurethane sizing technology designed specifically for the fibers and composites market. The polyurethane dispersion technology will complement Michelman's existing line of polyolefin-based solutions, and will be developed for applications in other markets, including coatings and packaging, the company says.


Andy Brink

Hydrosize was co-owned by husband and wife, Andy and Heather Brink. Dr. Andy Brink has joined the staff of Michelman to ensure a successful transition, and has been named business development manager, Fibers & Composites. He will work with the combined customer groups.

Michelman is a global manufacturer of additives and modifiers for many industries, including fibers and composites, coatings, inks, and construction products.

International Paint LLC Hires Sales Manager

International Paint LLC (Houston, TX), a division of Akzo Nobel, has hired Doug Kirkner to serve as High Value Infrastructure/Fire Protection Engineering sales manager throughout the Northeastern U.S.


Doug Kirkner

Kirkner was recruited by International Paint to help direct the company's long-term efforts for developing brand awareness and growth of International's high-performance protective and fire protection coatings within the commercial building markets in that region.

Before joining International Paint, Kirkner served as senior architectural fireproofing salesman at W.R. Grace for 20 years. He is a Certified Construction Product Representative of the Construction Specification Institute (CSI) and is a member of the Structural Engineers Society of CSI.

International Paint LLC is a global provider of high-performance coatings and fire protection products, offering an extensive range of high-performance coatings for the oil, gas, chemical processing, power, paper and pulp, rail, steel structure, mining, and marine industries.

Nilfisk CFM Names New Director of Sales

Nilfisk CFM (Malvern, PA) has announced Joe Wintsch as its new director of sales for North America. Wintsch will be responsible for driving sales efforts in the U.S., Canada, and Mexico, which includes overseeing the company's 20-member direct sales force and a range of distributors and dealers throughout North America.


Joe Wintsch

Wintsch brings over 20 years of industrial sales management experience to the organization. Before working at Nilfisk, he served as vice president of sales at Houghton International Inc., a specialty chemical company. In addition to his sales management expertise, Wintsch offers first-hand knowledge of the various other aspects of industrial manufacturing and distribution. He spent 9 years with The Tilley Chemical Company as a product manager and 5 years with Bausch & Lomb Inc., Diecraft Division.

Nilfisk CFM, part of Nilfisk-Advance A/S and a member of the Danish NKT group, is a global provider of industrial vacuums. Based in Malvern, PA, and in Zocca, Italy, the Nilfisk CFM division specializes in HEPA/ULPA-filtered industrial vacuums.

Novetas Solutions Moves to New Headquarters

Philadelphia, PA-based Novetas Solutions, LLC (formerly New Age Solutions) was to have moved its company headquarters and staff from Sewell, NJ, to the Philadelphia Naval Shipyards as of June 16, 2008.

With operating plants in New Jersey and the Midwest, Novetas manufactures and sells its trademarked New Age Blast Media®, 100% recycled bottle glass that is used as a blast abrasive for cleaning surfaces such as building exteriors, bridges, and naval ships. The recycled media also benefits the environment by increasing valuable landfill space, Novetas says.

BASF Subsidiary, Kanoo Group Form Joint Venture

Elastogran—a subsidiary of BASF—and the Kanoo Group have created a joint venture under the operational lead of Elastogran. The joint venture company (Kanoo 51%, BASF/Elastogran 49%) was to acquire the polyurethane business of Multi Chemical Est. in Abu Dhabi from the Al Hamid Group by the end of May 2008, BASF reports. Financial details were not disclosed.

The partners say that they plan to construct a new polyurethane plant in Dubai Industrial City in mid-2008. The production of polyurethane systems by the joint venture will be concentrated there as of 2010.

Multi Chemical Est. is a Mid-East regional supplier of rigid polyurethane systems to various industries, including construction and oil and gas.

Headquartered in Bahrain, the Kanoo Group is a family-run diversified business with various interests in the industrial, specialty chemical, shipping, trav-

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el, and other industries. Kanoo also forms joint ventures with companies that support the service and industrial sectors.

BASF is a chemical company. Its products and industry affiliations include oil and gas, plastics, performance products, agricultural products, and fine chemicals.

Euclid Chemical Announces Appointments

Euclid Chemical Company promoted Jennifer Crisman to technical marketing manager and Jesse Osborne to market analyst, and announced that Dale Mizer has joined the company as a product manager.

Dale Mizer

Crisman is responsible for synthesizing and disseminating technical product information for the Construction Products Division and management of marketing activities associated with new product development. She retains her duties as technical support group manager. Crisman has worked for the past 12 years in new-product development and product marketing in the construction industry.

Jennifer Crisman

Osborne is responsible for comprehensive sales and industry analyses for the Admixture and Construction Products Divisions. Osborne has worked in the construction-products industry as a product development specialist, technical marketing specialist, and product manager. He joined Euclid in 2004.

Jesse Osborne

Mizer has joined the company as product manager, concrete rehabilitation products, in the Construction Products strategic business unit. Mizer is responsible for developing and managing horizontal and vertical marketing programs for the repair product lines, epoxy adhesive products, overlayments/underlayments, and the coatings product lines. Mizer has more than 15 years of construction-industry experience, including positions in sales, contracting, and application training.

Products

Floor Coating Protects Battery Storage Areas

International Coatings Inc. (Franklin Park, IL) has announced the release of ICO Floor 51 for battery storage areas.

Battery manufacturers and facilities that use a large number of battery-operated vehicles have problems with the battery acid attacking their concrete floors. A seamless, acid-resistant coating is required to contain spills and prevent the corrosion of the concrete from acid, and must be durable enough to withstand the heavy traffic in the area. International Coating's ICO Floor 51 system is designed for these tough areas, the company says.

The product is three-part, low odor, 100% solids, trowelled epoxy flooring system. It is a durable coating system with outstanding toughness, as indicated by impact strengths greater than

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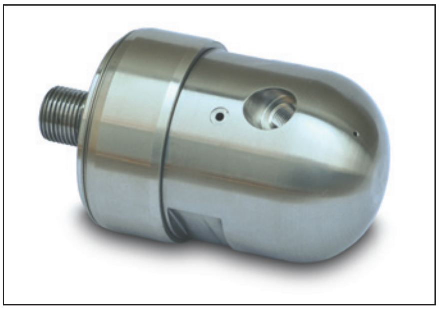
160 inch pounds. It resists impact far better than conventional, more brittle epoxies, says the company. Of particular importance in battery charging or storage areas is the system's resistance to sulfuric acid. The product also resists oils, greases, lubricants, caustic cleaners and some solvents.

For more information, contact International Coatings—tel: 800-624-8919; website: www.InternationalCoatings.com.

Rotating Nozzle Removes Pipe Build-Up in One Pass

According to the NLB Corp. (Wixom, MI), large blocked pipes (up to 12 inches in diameter, or 30.5 cm) can typically be



cleared in a single pass with the RPN2420, a new rotating water jet nozzle from the company. The self-propelling nozzle is designed to make pipe cleaning more productive while clearing blockages horizontally, vertically, and in tight elbows.

The RPN2420 is field-repairable with a simple kit. Rotation is variable from 50 rpm to 500 rpm, with full speed control. The new nozzle operates at pressures up to 20,000 psi (1,400 bar) with flow up to 20 gpm (76 lpm). It features five sapphire nozzles positioned for peak efficiency, one in front and four on the sides. The body is made of stainless steel for long life, and weighs 3 lbs. (1.35 kg).

For more information, contact the company—tel: 248-624-5555; fax: 248-624-0908; website: www.nlbcorp.com.

Multi-Gas Portable Detector Is Compact

New from ENMET Corporation (Ann Arbor, MI) is the RECON/4, a compact portable gas detector with a color LCD that can monitor for CO, H_2S, O_2 and combustible gas simultaneously. The instrument features STEL; TWA; two instant alarms with audio/visual and vibratory indicators; a rechargeable battery; and one-button operation for simple use. The small belt-clip-style instrument weighs about 200 grams.

For more information, contact the company—tel: 734-761-1270; website http://enmet.thomasnet.com; e-mail: info@enmet.com.

New Technology for Low-VOC Polyurethanes

Bayer MaterialScience LLC (BMS), has developed technology for the design of waterborne two-component (2K) polyurethane coating formulations that the company describes as providing low emissions, fast curing speeds, and high protection levels comparable to their solvent-borne counterparts. A good balance of resistance properties, film appearance, and mechanical strength also characterizes these waterborne 2K polyurethane coatings, the company says.

The fast drying times open the door for potential new markets, including site-applied, industrial, and fast running roll-to-roll applications, according to the company.

Bayer MaterialScience LLC is a producer of polymers and high-performance plastics in North America. Bayer Corporation, headquartered in Pittsburgh, PA, is a subsidiary of Bayer AG, an international health care, nutrition and innovative materials group based in Leverkusen, Germany.

For more information about the product—tel: 800-662-2927; e-mail: naftainfo@bayerbms.com; website: www.bayermaterialsciencenafta.com.

VOC-Free PVC Coating Available for Ships

BioCoatings LLC (Fort Lauderdale, FL) has introduced a new VOC-free polyvinyl chloride coating system for the marine industry. Featuring the proprietary One Plus Green 0 g/L VOC solvent and Marine Vinyl Coat (MVC) developed by Tarksol Inc., the high-performance system meets all current and proposed environmental and health safety requirements and regulations, the company says.

A one-component system, the product is formulated especially for marine applications above and below the waterline. It offers superior toughness and hardness compared to films prepared from other esters or resins, the company says. The system is designed to dry in minutes to a flexible film that can be applied to ships, refineries, docks, locks, dams, barges, and other surfaces that require an excellent oxygen barrier and superior resistance to water. It also offers excellent resistance to chemicals, oils, greases and salt, the company adds. The product meets military specs and is available in a clear coat or custom colors to match customers' requirements.

For more information, contact BioCoatings, the product's exclusive distributor—tel: 866-201-2877.

RML Construction Wins Newark Bay Bridge Painting Project

By Brian Churray, PaintSquare

RML Construction, Inc. (Hasbrouck, NJ) was awarded a contract of $1,433,200 by the New Jersey Turnpike Authority to perform zone-painting services on the Vincent R. Casciano Memorial Newark Bay Bridge. The 9,500-foot-long by 115-foot-wide cantilever steel bridge, which was constructed in 1956 and includes a 1,270-foot-long main arch span, connects Newark and Bayonne. The contract includes cleaning and coating approximately 100,000 square feet of structural steel surfaces, including 27,000 square feet of truss surfaces and 9,700 linear feet of steel safety-walk and parapet surfaces. The steel will be cleaned with hand tools and power tools and recoated with an epoxy ester spot-primer, an epoxy ester intermediate, and a silicone alkyd finish. The existing coatings contain lead, which will be controlled with localized containment.

Universal Coatings Secures Roof Coating Contract

Universal Coatings, Inc. (Fresno, CA) has secured a contract of $37,300 from the City of Fresno, CA, to install a new roof system on an existing 6,377-square-foot water yard meter shop roof. The system consists of spray-applied, zero-ozone-depleting polyurethane foam insulation and an Energy Star acrylic roof coating that conforms to ASTM D-6083. The project also includes painting new flashing.

Quick Hits

Preferred Tank & Tower (Henderson, KY) was awarded a contract of $32,500 by Oakland County, MI, to recoat a 400-foot-tall radio tower according to FAA Regulations.

The Nevada Department of Administration awarded a contract of $61,120 to Belzona Mountain States Division, Inc. (Las Vegas, NV) for the supply of “fish-safe” protective coating kits and repair composites that will be used by the Department of Wildlife.

Arrowhead Painting (White Bear Lake, MN) has won a contract of $23,923.88 from the City of Duluth, MN, to hand-tool clean and epoxy coat approximately 2,207 sets of gas meter piping.

Restruction Corp. (West Valley City, UT) was awarded a contract of $120,730 by the Utah Department of Administrative Services to apply a fiber-reinforced structural repair mortar system to three 310-foot-long by 18-foot-wide concrete raceways at the Eagan Fish Hatchery.

Kane to Coat Bridge and Canopy

Photo courtesy of Alaska Railroad Corp.

The Alaska Railroad Corporation (Anchorage, AK) let a contract of $645,150 to Kane, Inc. (Anchorage, AK), to recoat 9,086 square feet of steel on a 128-foot-long girder bridge, 4,278 square feet of steel on a 74-foot-long girder bridge, and 11,474 square feet of steel on a 386-foot-long by 23-foot-wide platform canopy frame. The structural steel bridge surfaces will be abrasive blast-cleaned to a Near-White finish (SSPC-SP 10) and coated with a zinc-epoxy-urethane system. The steel canopy frame surfaces will be abrasive blast-cleaned to a Commercial finish (SSPC-SP 6), primed, and coated with a urethane finish.

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Yuba County Water Awards Dam Gate Rehabilitation Work

Photo courtesy of Yuba County Water Agency

The Yuba County Water Agency (Marysville, CA) let a contract of $1,197,000 to California Engineering Contractors, Inc. (Pleasanton, CA), to strengthen and rehabilitate three steel radial spillway gates at the New Bullards Bar Dam. The project includes cleaning and coating new and existing steel gate surfaces, including the downstream faces of each gate. The steel will be abrasive blast-cleaned to a Near-White finish (SSPC-SP 10) and coated with a moisture-cured urethane system. The existing coating system includes a red lead primer.

Chelan PUD Awards Spillway Gate Reinforcement Project

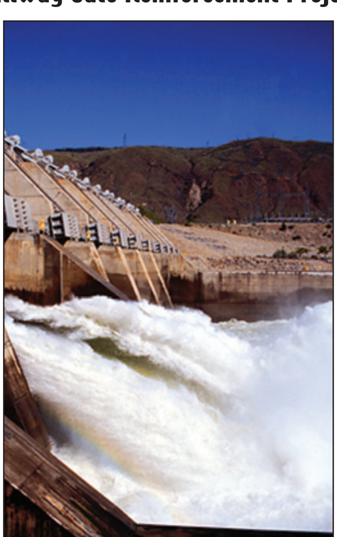

Photo courtesy of Chelan County PUD

Chelan County Public Utility District No. 1 (Wenatchee, WA) awarded a contract of $638,404 to Triad Mechanical, Inc. (Portland, OR) to reinforce two spillway gates at the Rocky Reach Hydro Project on the Columbia River. The project includes applying a moisture-cured urethane system to new structural reinforcement and existing gate surfaces impacted by the retrofit. The contract includes containment of the existing coatings, which contain lead and other hazardous materials.

Washington State Ferries Lets Drydocking Job

Washington State Ferries awarded a contract to Foss Maritime Co. (Seattle, WA) for drydocking and repairing a 149-foot-long by 39-foot-beam ferry vessel. The project includes cleaning and recoating various vessel surfaces. The below-waterline hull will be coated with an epoxy-antifouling system; the above-waterline hull will be coated with an epoxy-urethane system; and the inlet tunnel will be coated with a glass flake-reinforced epoxy system. The contract is valued at $87,235.

Nunez Painting Wins Clarifier Coating Contract

Nunez Painting (San Jose, CA) was awarded a contract of $634,636 by the City of San Jose, CA, to perform coating rehabilitation work on five clarifier tanks. The contract, which required SSPC-QP 1 certification or 5 years of equivalent experience, involves abrasive blast-cleaning and recoating metal surfaces associated with four 100-foot-diameter tanks and one 110-foot-diameter tank. The project includes applying a high-solids epoxy system to submerged metal surfaces, an epoxy-urethane system to exposed metal surfaces, and a non-skid epoxy system to catwalk deck surfaces.