Volunteers Are Appreciated

SSPC is privileged to have a great group of core volunteers. Without these volunteers and their support, this association would be severely hampered. Volunteerism begins with the Board of Governors. These 13 people give their free time and use their own resources to meet three times a year. As everyone knows, this group gives our association the strategic guidance needed while being the cornerstone of our entire organization.

Along with the Board, other committees give guidance, suggest changes, and make recommendations to the staff. For example, such committees are those for individual certification, PCCP advisory, government affairs, and education. While the committees are not tasked to direct the staff on what to accomplish, their input is priceless in pushing the organization forward. This association is a technical association. The volunteers who work on the many technical committees that develop the SSPC consensus standards are invaluable.

Approximately five years ago during our strategic planning, we identified our consensus standards as the base or core product for which SSPC is known. Just as important as the committees that develop the standards is the Standards Review Committee (SRC). It provides the capstone for the entire standards development process. The SRC puts a lot of time and effort into reviewing every standard that comes out of a committee and recommending it to the Board for acceptance or rejection.

We can always use additional volunteers. It is tough to get folks to perform the life-blood work of any association due to job and family requirements. We clearly understand the dilemma. It is more difficult right now because many companies have downsized and are working with a lean workforce in these tough economic times. Nevertheless, volunteering has its value, even in this economy. I recently read an article called "The Personal Benefits of Volunteering" in *The Synergist* magazine. Author Al Rickard says that volunteering gives you leadership training. I agree, and I will use our Board of Governors as an example. The Board members are all leaders of their respective organizations. To effectively lead on the Board or in the association, the Board members must use the consensus process to reach an agreement. This approach may differ from what they use in their daily activities.

Mr. Rickard also says that volunteering allows you to make contacts. Volunteering on a committee or a task group allows you to meet people in your profession whom you may consult to obtain technical information and advice when situations arise that you have never faced before. I use current and previous Board members to obtain advice and to float ideas to see if I am heading down the right path.

Volunteering is also a learning laboratory. By listening to the discussion around the table, you may get great ideas. I listen to what folks have to say in meetings and walk away thinking that I would have never thought of doing it that way. The bottom line for me is when I say, "What a great idea!"

Mr. Rickard goes on to say that volunteering builds a knowledge network. By listening to what others say you may find a solution to a situation much quicker than by going out and researching the problem. Many jobs are people-oriented, and the association business is the ultimate profession of dealing with people. A lot can be learned by hearing what others are doing and by observing what is going on in the industry in general. Being a volunteer in an association improves your professional skills and strengthens your résumé. When someone applies for a position at SSPC, I look for what additional things they have done that set them apart from other worthy candidates. Volunteer work makes a difference. Candidates who have participated in something that involves leadership and consensus building have an advantage in the job market. The candidate who does volunteer work is also seen as willing to help when things need to get done. Lastly, they are seen as team players who are familiar with the group-based decision-making process and thus are seen as able to better relate to co-workers.

I want to thank all who volunteer for SSPC. Your contributions are priceless. I only hope that you have been able to use the unique experience you have gained here to further your own career and enhance your contributions to your company. In the long run, I hope your company has benefited from your participation. We can always use additional volunteers. Please contact us, and ask us how you can get involved. It would not only help us, but I hope you can see how it may help you too. Thank you.

Bill Shoup
Executive Director, SSPC

DuPont Names CEO, Coatings Head

DuPont (Wilmington, DE) has named a new CEO and a new head of its coatings business segment.

Ellen J. Kullman became the CEO after holding the position of president and CEO-designate. She is directly responsible for the company's agriculture and safety and protection business segments. Her former executive vice president position will not be filled.

Ellen J. Kullman

Richard R. Goodmanson

The executive vice president and chief operating officer, Richard R. Goodmanson, assumed responsibility for DuPont's coatings and color technologies and performance materials business segments. He will continue to be responsible for operations and engineering, sourcing and logistics, and information technology.

DuPont is a science-based products and services company that operates in more than 70 countries.

NPCA, FSCT Choose Full Merger

The National Paint and Coatings Association (NPCA) and the Federation of Societies for Coatings Technology (FSCT) have announced plans to complete a full merger of the two organizations by March 31, 2009.

Since June 2008, NPCA and FSCT have been operating as two separate organizations working in tandem. Due to current economic conditions and a decrease in short- and long-term FSCT revenues, the organizations have decided to pursue a full merger.

NPCA/FSCT will be governed by one executive committee and one board of directors.

The associations announced that they intend to provide public policy programs for which NPCA is traditionally known, as well as enhance the technical programs provided by FSCT.

Upon completion of the merger, all member services and programs will be provided by one organization, headquartered in Washington, D.C. The Plymouth Meeting, PA, office location will be closed.

Visit www.paint.org for more information.

SSPC Receives ANSI Accreditation for Standards

SSPC has announced that the American National Standards Institute (ANSI) granted accreditation to SSPC's standards development process, effective January 9, 2009.

SSPC standards are used in coatings projects performed worldwide. Coinciding with the global push for standardization and the desire of facility owners to use standards that have been developed in accordance with recognized national or international procedures, SSPC entered into the accreditation process in early 2008.

By adopting ANSI procedures, SSPC expects to attract additional participants in its standards development process. Additional participation in the development process will result in standards that are more useful to a larger number of users around the world, says SSPC.

For details, visit www.sspc.org.

FCA Calls For Economic Stimulus

The Finishing Contractors Association (FCA) has joined other trade associations in calling on lawmakers to use part of the Federal government's proposed 2009 stimulus package to fund construction and infrastructure projects. FCA has gained support of its labor partner, the International Union of Painters and Allied Trades (IUPAT).

Two letters have been sent to the Obama administration and the 111th Congress. The first letter calls on lawmakers to include construction in the infrastructure portion of the stimulus package. The second letter calls for tax incentives, such as a repeal of the 3% tax withholding on many government projects.

According to the FCA, the construction industry normally employs over 7 million people and brings more than $1 trillion in economic activity per year. However, the FCA states that job losses in construction outpaced the general population, and, according to the U.S. Bureau of Labor Statistics, specialty construction trades lost 50,000 jobs in November 2008.

For more information on the FCA's call for economic stimulus support, contact Jay Weaver, the FCA government affairs liaison, at jweaver@finishingcontractors.org.

Missouri S&T Plans Coating Courses

The Missouri Science and Technology Coatings Institute, part of the Missouri University of Science and Technology (formerly UMR), located in Rolla, MO, has announced two spring short coatings courses that will be held on the Rolla campus and one summer short course to be held at Drury Inn St. Louis Airport.

"Basic Composition of Coatings" will take place March 23–27 and is intended for new personnel in the coatings profession. Topics covered include components of coatings, testing and specifications, general formulation, and manufacturing methods. The course is primarily lecture, with several laboratory demonstrations, says the Coatings Institute.

"Introduction to Paint Formula" will be held May 18–22. The course is intended to give attendees a fundamental knowledge of how to approach a starting formulation and troubleshoot it. There will be lecture and laboratory work.

The summer course, "Coatings for People in the General Industry, Sales & Marketing," takes place July 20–22. Less technical than the others, the course will cover types of coatings, basic composition of coatings, and the tests and specifications used by the industry.

For more information, visit http://coatings.mst.edu.

Architectural Coatings Mag Launches New Site

The *Journal of Architectural Coatings (JAC)*, a sister publication of *JPCL*, now has its own gateway web site, www.jacjournal.com. Included on the site are the current issue of *JAC* and the complete archives (all in web-friendly XML format), searchable buying guides, news and events, standards, classifieds, and a community link to *JAC* forums and blogs. The site also links directly to *Painting & Wallcovering Contractor (PWC)*, www.paintsquare.com, the *JPCL* archives, Paintspace.net, and Paint Bid Tracker, all of which are part of the portfolio of Technology Publishing in Pittsburgh, PA.

EMU Announces Spring Short Courses

The Eastern Michigan University Coatings Research Institute (Ypsilanti, MI) has announced its planned short courses for Spring 2009. All courses will be held at the student center on the EMU campus.

"Coatings and Paint Technology: Composition and Application Fundamentals," an introductory course, will be offered March 9–11. It includes two laboratory sessions.

On March 18, "Understanding Coating Raw Materials" will be held to provide a basic understanding of raw materials for coating.

The "Emulsion Polymerization and Waterborne Coatings" course, scheduled for April 7–9, will present an overview of current waterborne resin chemistries, new findings, and synthetic methods. Formulation guidelines will be presented, and there are two laboratory sessions for paint formulation and application.

"Basics of Polyurethane Coatings," planned for April 28–29, is intended to familiarize personnel involved with paints and coatings with the fundamentals of polyurethane (PU) coatings. There will be a focus on emerging PU technologies.

On May 12–13, the "Principles and Practices of Coating Formulations" course will take place. It is designed to familiarize industry personnel with formulation basics. Emerging technologies and underlying concepts will be discussed. There is a half-day laboratory session.

For more information on the courses, visit www.emich.edu.

ASSE Announces Safety Conference

The American Society of Safety Engineers (ASSE), based in Des Plaines, IL, has opened its registration for the Professional Development Conference and Exposition, Safety 2009. The conference will take place June 28 to July 1, 2009, at the Henry B. Gonzalez Convention Center in San Antonio, TX.

Safety 2009 will feature more than 225 educational sessions, safety issue roundtables, key speakers, and an executive summit. Last year's conference hosted more than 4,000 attendees from businesses in 36 countries, according to ASSE.

ASSE also plans to host a pre-conference golf outing at the Hyatt Regency Hill Country Golf Club in San Antonio, TX. Proceeds will go to scholarships for students pursuing degrees in occupational safety and health along with research.

For more information on Safety 2009, or to register, visit www.safety2009.org.

Does Temperature Affect Plural-Component-Applied Coatings?

In our paint shop, we are using an 82% volume solids epoxy mastic, which should be applied with a 1:6 ratio for an average dry film thickness of 300 micrometers (12 mils). We recently observed that as temperatures decrease, application by plural-component equipment results in longer drying and curing times than those resulting from conventional airless spray application. We have also found out that we are applying the coating with a 1:7 ratio. What could cause the delays in drying and curing, and is the 1:7 an off-ratio case or can this deviation be tolerated within the limits of the mix ratio of the coating?

Brent Bergman
Techno Coatings, Inc.

The results from changing mix configuration, mix ratio, and mix temperature can vary from minimal to critical. Mixing in a plural-component pump unit is limited to the in-line static mixer. As component viscosity increases with decreasing temperature, volume ratios can be affected. High viscosity materials don't mix as readily as low viscosity materials. Changes in mix ratio, from 1:6 to 1:7, alter the epoxy chemistry, e.g., by not adding all the amine component. Epoxy chemistry is notorious for slow reaction at low temperatures. Combining three problems—drying delays, curing delays, and coating property variations—makes the result (coating chemistry variations) worse.

Brent Bergman is the EHS Director for Techno Coatings, Inc (Anaheim, CA). He has worked in the coatings industry for more than 30 years in technical sales, production, training support, quality control, safety, and environmental compliance. He can be reached at brent@technocoatings.com.

Earl Bowry
EVB Solutions LLC

The material referred to in the question may be an amine-cured coating that normally requires an induction time when sprayed with conventional airless equipment. Obviously, you cannot have an induction time with plural-component airless spray, and normally, it is not necessary, because the heating of the material helps excite the molecules and gets the reaction started. When you turned the (ambient) heat down you delayed the starting of the reaction.

Based on the solids and mix ratio of the coating mentioned in the question, I can guess what product you are spraying. I know it is very sensitive to temperature during cure and normally requires an induction time of 10 minutes at 73 F (23 C) or longer at lower temperatures. Heating the base to about 90 F (32 C) or even 100 F (38 C) just before spraying should work.

Another potential issue that will affect cure times for plural-component spray is applying the coating off ratio. The applicator must watch that very closely and run a ratio check frequently, at least once every shift or after any work stoppage. Applying coatings off ratio is very easy with 1:6 ratio materials; there is very little margin of error, and a very accurate, correctly operated, and well-maintained plural-component spray machine is needed to do it. But it can be done.

Earl Bowry is the owner of EVB Solutions, LLC, a firm specializing in sales, training, and consulting for marine and industrial coatings. His more than 30 years of experience in the high-performance coatings industry includes work as a sales representative, technical service engineer, and marketing manager for several international coating manufacturers. Mr. Bowry, a NACE-certified Coatings Inspector, an SSPC Protective Coatings Specialist, and an instructor for SSPC and NACE, is a past chairman of the Chesapeake and Hampton Roads SSPC Chapters and the Old Dominion Chapter of NACE International. He was the recipient of SSPC's Education Award in 2004. He can be reached at earl@cox.net.

Continued

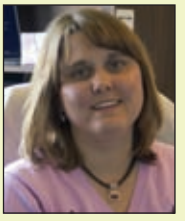
Heather Bayne
SSPC: The Society for Protective Coatings

There are many reasons why you may be seeing a longer cure time than normal. Your ratio could be off. This is something that needs to be monitored very closely when spraying plural-component materials. Epoxies need to remain at their proper "stoich-ratio" to achieve maximum properties.

Also, when mixing recommended ratios, verify if the materials should be mixed per volume or per weight. Each manufacturer reports this information differently. Ratios per volume may be very different than ratios per weight because of the differences that can be seen in the materials' weight per gallon.

Changes in cure time may be related to ambient conditions. Cure time is often affected by temperature fluctuations. If the temperature is above 77 F (25 C), cure time will be shortened. If it is below 77 F, cure time will be lengthened.

The material cure time may also be affected by the status of its shelf life. There should be a date on your material that specifies when it was manufactured. Check the data sheet to make sure it is still in the acceptable shelf life range.



Heather Bayne is a protective coatings professional in SSPC's Product Development Department, where she is responsible for technical writing, responding to scientific inquiries, and acting as a technical resource for SSPC members. She is a member of SSPC, the American Chemical Society, ASTM, and NACE International. Ms. Bayne is a graduate of the University of Pittsburgh. She can be reached at the SSPC offices—tel: 877-281-7772; 412-281-2331, ext. 2224; fax: 412-281-9992; e-mail: bayne@sspc.org; website: www.sspc.org.

Editor's Note: The question and responses above were generated by SSPC's Coatings Talk Listserve. To register for the Listserve, go to www.sspc.org.

Got a question about coatings or an answer to this month's Problem Solving Forum?

Send questions and answers to
Karen Kapsanis, Editor, *JPCL*,
kkapsanis@protectivecoatings.com.

Implementing the IMO PSPC for Ballast Water Tanks

By Thorsten Lohmann, Germanischer Lloyd AG

In December 2006, the International Maritime Organization (IMO) adopted a coating standard for ballast water tanks titled *Performance Standard for Protective Coatings for Dedicated Seawater Ballast Tanks in all Types of Ships and Double-Side Skin Spaces of Bulk Carriers.* This standard, usually abbreviated as IMO PSPC (Performance Standard for Protective Coatings), was introduced after significant ship damages (and even losses of ships) due to corrosion of ballast tanks, and thus is fundamentally intended not only to protect sea vessels but also to enhance the safety of maritime personnel.

The standard, which took several years to develop, has already had a great impact on all parties involved in the coating process—especially shipyards, ship owners, coating manufacturers, applicators, and classification societies.

In this article, we will provide background information on the new standard, amplify three main items of the standard that are newly introduced, explain the implementation dates, identify major consequences for the shipbuilding industry, and report on reference documents that may help with implementation of the standard.

Background on the IMO Coating Standard

The IMO PSPC creates new requirements that both exceed and render more precisely each classification society's own standard as well as the existing "Unified Requirement Z8," issued by The International Association of Classification Societies (IACS) in 1990 and revised 1995. The new standard mandates significant changes from shipyards, ship owners, coating manufacturers, and classification societies.

The specific aim of the IMO PSPC is to achieve a target service life of 15 years for the seawater ballast tank coatings. Up to now, there is no regulation that specifies the intended lifetime of a coating system in seawater ballast tanks. The future will show whether this target can be obtained by following the new standard.

The standard is designed to achieve this service life by defining concrete requirements, limit values, and control mechanisms during the construction phase. Accordingly, the coating standard also gives clearly defined surface preparation limit values for cleanliness, surface profile, salt level, dust grade, and dry film thickness. Precepts are also given for selecting the appropriate coating system, application methods, and appropriate pre-qualification tests of coating systems.

Of course, each coating system is accompanied by the manufacturer's limit values and application requirements. However, they are usually defined by the coating manufacturers with regard to specific characteristics of the coating systems and not by an international unified standard. Moreover, in practice, verification and inspection methods for these requirements and limit values are not currently regulated in a harmonized way and are fulfilled with varying diligence.

Three Key New Requirements of the IMO PSPC

Pre-Qualification and Certification of the Coating System

According to the IMO PSPC, coating systems have to be pre-qualified in a laboratory test before being applied. The laboratory test is clearly described in the standard, including the testing facility, the panels to be tested, the test duration, and the acceptance criteria to be achieved after the testing period. The testing facility simulates the conditions in a seawater ballast tank, including ship movement, adjacent heated tanks, and different levels of filling. In the testing tank, panels coated with different coating systems are positioned. One panel is assembled with a sacrificial anode and two panels have a U-bar welded on, whereas on the other panels, the coating is artificially scribed. The testing period in the tank is 180 days.

One panel will be exposed to dry heat for 180 days to simulate boundary plating between a heated bunker tank and a ballast tank in the double bottom. Furthermore, the coating on two test

Editor's Note: This paper was presented at the PCE Marine Coatings Conference, which took place at the SMM (The Shipbuilding, Machinery, & Marine Technology International Trade Fair), held in Hamburg, Germany, on September 24–25, 2008.

panels is tested in a condensation chamber for 180 days.

With successful testing results, the coating will be certified by a type approval or statement of compliance issued by the administration or recognized organization, which is usually the classification society. The control of this certificate will be part of the coating inspection process.

Coating Inspectors

Another big issue addressed by the IMO PSPC is the implementation of verification, inspection, and documentation items. Those items are intended to ensure that the defined limits for surface preparation, salt and dust, dry film thickness, etc. are achieved. This means that new control persons, i.e., coating inspectors, have to be included in the shipyard's quality control system.

Coating inspectors need a special qualification that must be verified by the class society administration or another recognized organization. The coating inspectors examine and document the complete coating process of the ballast water tanks. The inspection and documentation items of the coating inspectors are clearly defined in the standard.

Currently, there is a shortage of coating inspectors with the special training and qualification. This entails a huge effort for training and certification bodies to provide sufficient personnel in a timely manner.

Coating Technical File

Documentation of each step of the coating process must be filed in a Coating Technical File (CTF), the third major new aspect of the IMO standard. Amongst other documents, the CTF will include the reports of the coating inspector, technical data sheets of the coating system, type approval certificates, and procedures for in-service maintenance and repair of coating systems.

The CTF must remain on board of the vessel and be maintained throughout the life of the vessel. This means that inspection and maintenance of the coating, including location and work specification, must be continuously recorded.

The PSPC offers no format for the CTF that can be delivered all the way from paper version to a sophisticated electronic program. The CTF must contain all relevant information upon the delivery of the vessel to its owners. After the vessel is delivered, the continuous

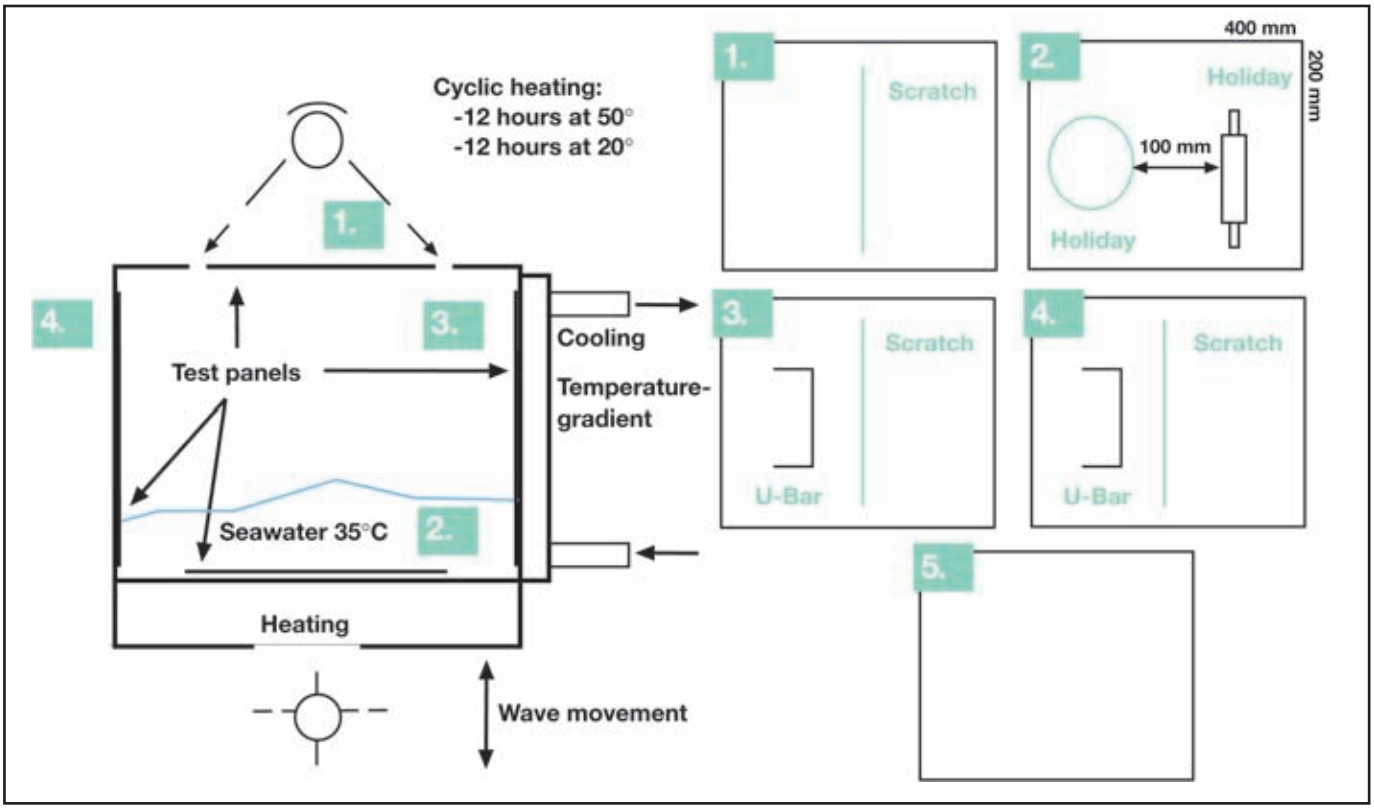


Fig. 1: Wave tank for testing of ballast tank coatings

Stripe coat in ballast tank at newbuild stage
Courtesy of Euronavy

updating of the CTF is the responsibility of the owners. Therefore, the owners should take care to obtain a 'workable' version of the CTF with the delivery of their vessels.

Implementation Procedure and Dates

The IMO PSPC has been made mandatory through an amendment of the SOLAS Convention settled in Resolution MSC.216(82), page 3, and is therefore a statutory requirement. Basically, all commercial vessels are currently built under the SOLAS Convention, which means that, with the amendment, the coating standard will be made internationally mandatory.

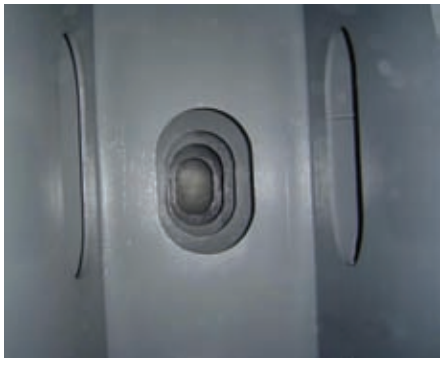
The new coating standard applies to seawater ballast tanks of all types of ships of not less than 500 gross tonnage and double-side skin spaces arranged in bulk carriers of 150 m in length and upwards. The IMO set three different dates to activate the standard, based on the building contract of a ship, the laying of its keels, or its delivery to the owner:

- effective July 1, 2008, for ships for which the building contract was placed on or after July 1, 2008; or
- effective January 1, 2009, in the absence of a building contract, for ships that had their keels laid or that were at a similar stage of construction on or after January 1, 2009; or
- effective July 1, 2012, for ships delivered on or after July 1, 2012.

An exception from the above mentioned dates exists for tankers and bulk carriers built under the Common Structural Rules (CSR) released by IACS. For those types of vessels, the coating standard is already mandatory since its date of adoption, December 8, 2006. This date applies to the contracting date of vessels.

Impacts and Consequences for the Industry

Below is a list of impacts and consequences the new requirements in the IMO PSPC have for each involved party. The qualified coating inspector can be employed either by the party involved in the coating process or be independent and must be agreed upon between the involved parties.



Final coat in ballast tank at newbuild stage
Courtesy of Euronavy

Owners

- Care of the Coating Technical File over the lifetime of the vessel

Shipyards

- Initial issuance of the Coating Technical File
- Responsibility for the provision of the Coating Inspector (the Coating Inspector does not necessarily need to come from the shipyard)
- Compliance with all technical and formal requirements

Administrations and/or Recognized Organizations (usually classification societies)

- Checking and type approving of coating systems
- Checking of Coating Inspector's qualifications
- Monitoring of the Coating Inspector at the shipyard
- Checking and approval of the Coating Technical File

Coating Manufacturer

- Supply of coating systems that are in compliance with the IMO PSPC

Reference Documents for Assistance in Implementation

IACS Unified Interpretation for the SOLAS Convention (UI SC 223)

In June 2008, with a correction in July, 2008, IACS released a "Unified Interpretation" for the implementation of the IMO PSPC.

The Unified Interpretation is to be applied by IACS members and associates for ships subject to the relevant SOLAS Chapter, which makes the IMO PSPC mandatory when acting as a recognized organization, authorized by flag state administrations to act on their behalf, unless otherwise advised, as from July 1, 2008.

IACS UI SC 223 interprets specific points in the IMO PSPC for which involved parties may have different interpretations. Some technical parts of the IMO PSPC have already led to different interpretations of specific points even before the first vessels were built in

accordance with the IMO PSPC.

The following are some major points that required interpretation and on which SC 223 focuses.

- General principles like the content and review of the Coating Technical File
- Design of the coating system, espe-

Typical example of finished ballast tank coating at new building. Courtesy of Euronavy

cially the coating pre-qualification test and the condition for accepting already tested and type-approved systems
- Job specifications, such as measurement of the dry film thickness
- Primary and secondary surface preparation, concerning mainly the measurement of the salt content on the surface
- Procedure for assessing the Coating Inspectors' qualifications, as well as the conditions for the employment of assistant inspectors
- Procedure for verifying the application of the IMO PSPC

IACS Procedural Requirement PR 34

In December 2006, with the adoption of the IMO PSPC, IACS released a 'Procedural Requirement' (PR) on the application of the IMO PSPC under IACS Common Structural Rules (CSR) for bulk carriers and tankers. In the meantime, PR 34 has been revised several times, with the latest revision (number three) in June 2008, and its first correction in July 2008.

The PR 34 was developed to define procedures for specific requirements in the IMO PSPC. The PR 34 is to be used on all vessels built under the CSR by IACS members. The IACS CSRs are unified building rules for tankers and bulk carriers.

PR 34 defines the following procedures.

- Coating system approval
- Assessment of Coating Inspectors' qualifications
- Inspection agreement
- Verification of the application of the PSPC
- Coating Technical File review
- Review of quality control of automated shop primer plants
- Review of coating technical specifications

Several procedures out of PR 34 were taken over to SC 223 and appear the same in both releases.

Summary

The adoption of the coating standard for dedicated seawater ballast tanks in all ship types in December 2006 represents the first great breakthrough for the implementation of an internationally valid standard in the field of corrosion protection in the marine industry. Worldwide, all the engaged parties (shipyards, owners, coating manufacturers, classification societies, etc.) have to prepare extensively to fulfill the new requirements.

Practical experience with the implementation is rare so far, because the IMO PSPC was only recently put into force. The preparation for the new requirements shows, however, the challenges for the coating manufacturers to update their type-approval certificates

and partly retest their coating systems. Furthermore, it shows that the training and certification of the coating inspectors are major tasks because there is still a great lack of qualified personnel. An interesting part is also the provision of the CTF. Some software companies are already working on electronic versions. Fulfilling the technical requirements will require extensive changes in the coating process for some shipyards worldwide. These changes may include the installation of new painting sheds, washing facilities, storage places, and implementation of different painting schedules.

Implementation of a unified minimum coating standard is a good approach to increase a ship's safety. Nevertheless, attention must be paid by all involved parties to practically fulfill the requirements in the standard within a given timeframe to receive the desired benefit of the standard.

Thorsten Lohmann is a naval architect and welding engineer for Germanischer Lloyd AG in Hamburg, Germany. From 2002 to 2005 he was a field engineer at Blohm+Voss Repair GmbH in Hamburg, Germany. A Certified Coating Inspector (FROSIO Level III), he is a member of various IACS and IMO working groups dealing with corrosion and corrosion protection.

JPCL

Applying Single-Coat Systems to

Due to regulatory constraints on the release of VOCs and the time and costs involved with maintenance painting, the use of multi-coat paint systems is decreasing. Two-coat systems, rather than four, are being commonly used for bridge maintenance, and one-coat systems are becoming popular for storage tank lining. The U.S. Navy is not exempt from time and cost constraints, and it has identified the application of one-coat, rapid-cure coating systems to tank internals as a means to significantly reduce coating costs and shorten the duration of painting activities. The Navy has a Preservation Process Instruction (PPI), dated September 2008, for implementing the one-coat systems—"PPI NBR: 63101-001E4 (Rev co) Preservation Process Instruction (PPI) for Ballast Tanks, Floodable and Dry Voids, Collection, Holding, Holding, and Transfer Tanks, and Fuel/Compensating Fuel Tanks Including Coating System Procedures for Heavily Pitted Tanks." According to a November 2008 National Shipbuilding Research Program (NSRP) report, all public yards have used the PPI; in addition, some of the private shipyards and their sub-contractors have conducted pilot "test & evaluate" contracts with this coating system.

To assist the Navy in fast-tracking the use of a single-coat tank preservation process (the PPI) in the private shipyards, NSRP funded a project that involves tools that help the shipyards "define the costs, benefits, and risks" associated with changing from traditional tank coatings to a single-coat system. The project focused on the application of two single-coat systems the Navy has approved for tank internals as of November 2008.

As a result of the NSRP project, two important materials were developed to facilitate a change to a single-coat preservation system: a written guide containing "lessons learned" when fol-

lowing the PPI, along with reference material; and a spreadsheet for comparing initial and on-going costs associated with adopting single-coat, rapid-cure systems and for estimating the time savings possible with one-coat systems. The guidelines are included in an NSRP report titled "Fast Track Single Coat Preservation System."

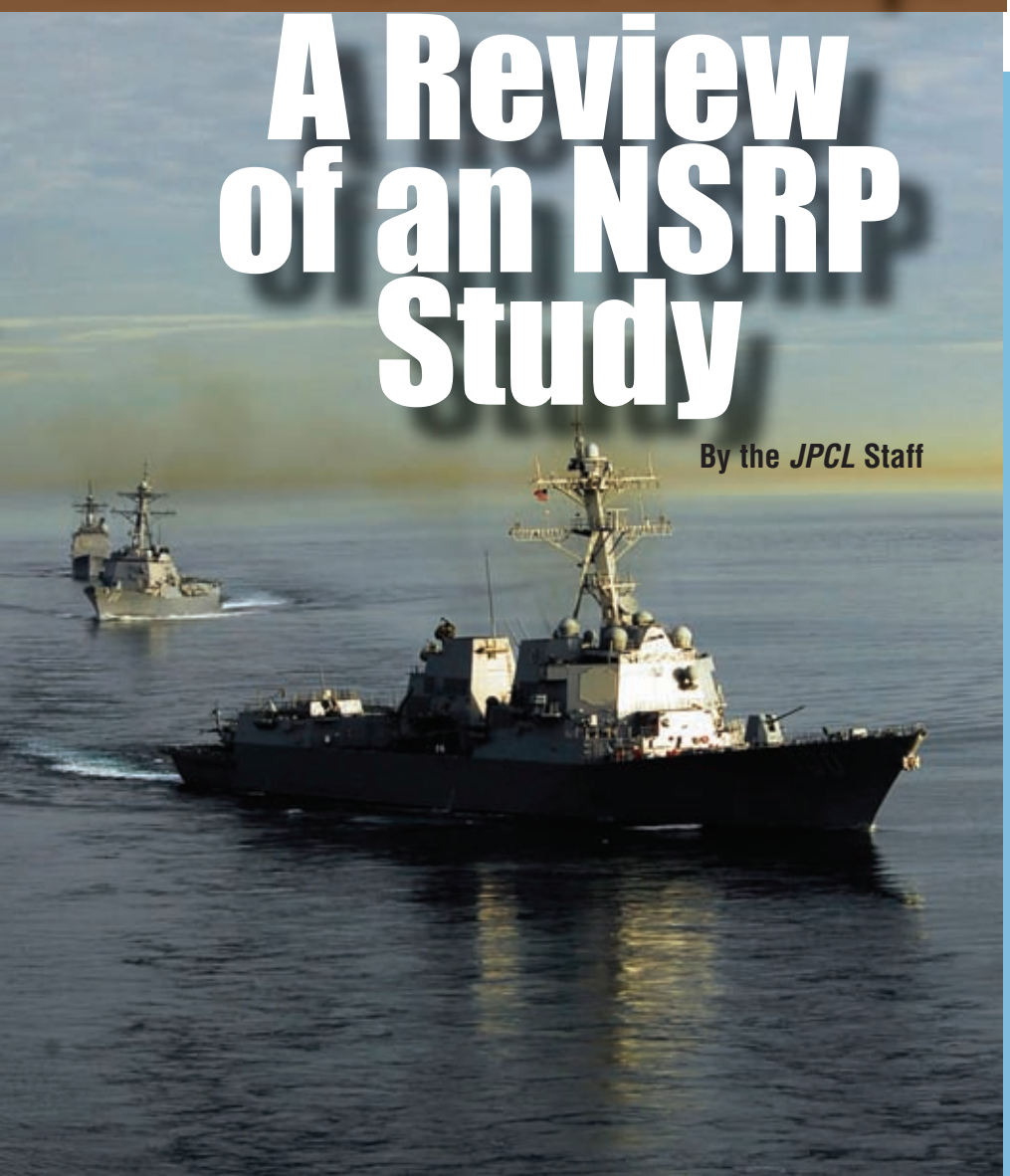
Although the guidelines developed by NSRP directly pertain to coating work done in accordance with the PPI in tanks on Navy vessels, they are also relevant to any contractor applying a one-coat, high-build protective system to any other structure. Among the "lessons learned" in the NSRP guidelines are those involving training, equipment, materials approved as of the time of the study, application, and quality assurance. This article summarizes some of these lessons learned during the application of a single-coat tank coating system in various public and private shipyards.

The PPI, several other appendices, and the spreadsheet for cost comparisons are included in the full NSRP report.

The full report was prepared for NSRP by Elzly Technology Corporation and Atlantic Marine Florida, LLC.

Tank Internals on Ships

A Review of an NSRP Study



By the *JPCL* Staff

Lessons Learned about Training

After a brief background section, the report focuses on the importance of proper and adequate training, especially when applying single-coat protection systems, because they must be applied using plural component airless spray equipment. Training takes on added weight in the case of work performed in accordance with Navy Standard Item 009-32, which requires plural-component pump equipment operators and applicators to be certified in accordance with SSPC C-14 (or NAVSEA 05P23-approved equivalent) certifications, the NSRP report notes.

Training, the report says, includes teaching applicators, helpers, and equipment operators to work as a team to apply single-coat coatings in tanks. The report recommends that a single-coat system be applied initially "to a 'mock-up' structure containing complex geometries" to help the project team develop the skills required to apply these fast setting coatings at the specified thickness. The paint applicators must be able to apply the single-coat

Fig. 1: Mockup for hands-on training of painters before starting the work
Figs. 1-6 courtesy of NSRP "Fast Track" study

system consistently at the specified high-film build (20–30 mils wet film)—compared to the lower films builds more commonly specified for other coatings. The report notes that achieving the correct, thick-film build involves the regular use of wet film thickness gages during the application process.

Fig. 2: Training on a mockup was conducted in the shop

Another training topic identified in the report is the fast cure time of single-coat systems (compared to that of conventional-build coatings). The NSRP report points out that the mixed single-coat system cures within 5–10 minutes. Application teams, therefore, must be taught to keep the coating flowing in the whip line and spray gun, and to not stop moving for more than a few minutes. Nearly constant flow may not be a problem for smaller tanks with simple construction, which can be continuously sprayed by one operator, says the report. However, for larger, complex tanks in which the painter must move around to coat all of the surfaces, the report recommends that the line tender also be trained as a sprayer, thus, "allowing the [tender] flexibility to take over for the sprayer as they reposition themselves or if there is a problem."

How To Use Plural-Component Gear

The report then moves on to a discussion of lessons learned about using plural-component equipment to apply single-coat systems.

For instance, compared to conventional airless spray equipment, plural-component gear needs more paint to prime it for application and more solvent to "change out" the coating system. Therefore, the report suggests, ideally, a plural-component unit should be dedicated to a specific product. When the gear is thus dedicated, individual (un-mixed) components of some products can remain in the feed lines for up to 24 hours without requiring cleaning (although the coating manufacturer should be consulted for specific recommendations).

Fig. 3: The report recommends dedicating a set of spray lines of plural-component equipment to one coating system

In a plural-component system, the coating will catalyse (cure) in the hose within four to seven minutes after its components are mixed, the NSRP report says. If the mixed product does not continue moving through this section, it will quickly harden, blocking the hose, which cannot then be cleaned and becomes useless for spraying. To avoid hose blockage, applicator teams should be taught to keep the length of the whip hose containing catalyzed material to a minimum, usually no more than 50 to 100 feet. However, longer lengths may be needed sometimes, according to the report, "depending on how close the mixing block can reasonably get to the surface being sprayed." (The report recommends consulting the equipment manufacturer about the minimum length of hose.)

Other lessons learned in the NSRP study relate to application temperature, tip sizes, and spray lines. For instance, because they may be temperature sensitive, single-coat systems (such as the ones the Navy has approved for its tanks) may require heated lines for the components. Proper temperature is critical for complete mixing in the mixing block, particularly when ambient temperatures are lower than the recommended

Table 1: Summary of Selected Product Data for Two Navy-Approved Systems

Property	Product A	Product B
Volume solids	98%, ± 2% mixed	95%
VOC (EPA Method 24)	120 g/l mixed	120 g/L as supplied
Dry to touch (77 F)	1 hour	2 hours
Flash point	230 F, mixed	124 F, mixed
Mix ratio	1:1	3:1
Pot life (77 F)	7 minutes	Less than 10 minutes
Recommended tip size	0.021 – 0.025 in. (533 to 635 microns)	0.015 – 0.019 in. (381 to 483 um)
Recommended application temperature	85 F (29 C) to 130 F (55 C) at gun tip	95 F (35 C) output temperature recommended maximum output temperature of 110 F (44 C)
Recommended application pressure	4,000 psi	3,500 psi

application temperature at the spray gun. Temperature and pressure control may also be needed to obtain the required spray fan and flow and levelling. The report notes that as temperature rises, the required pressure will *decrease*, but the chemical reaction (cure rate) will *increase*. According to the report, both one-coat products the Navy has approved are best applied when heated within a range of 90 to 95 F (32 to 35 C).

Due to the complexities of plural-component spraying, says the report, the fan width and material flow rate cannot be adjusted directly, and the proper tip size must be selected for correct coating application. Manufacturers recommend a range of tip sizes to be used and the applicator should have the range available should a tip change be needed to achieve the specified results. For inexperienced operators, the report recommends they practice with different tip sizes on a mock-structure. The choice of tip size may also vary with the temperature and pressure used, as well as with the distance of the gun to the surface.

The report also observes that, although dedicating the application equipment solely for one coating system will cut costs by reducing solvent use and paint waste, "most shipyards will eventually use the equipment for more than one product." The report urges caution when changing to a different product. Residual from a single-coat product in the lines has been reported to contaminate other epoxy chemistries, the NSRP document notes. Thus, it recommends a separate set of spray lines for each coating type applied in a yard.

Lessons Learned about Materials

The NSRP study reports on the only two single-coat systems that the Navy had approved for tank internals at the time of the study. Table 1 on p. 24 summarizes key information about each coating. Appended to the report are data sheets and application guides for both of the products.

Lessons Learned about Application

In its findings on application of the Navy's approved single-coat systems, the NSRP described preparation and setup, spraying, and touchup.

Preparation and Setup

To avoid adding any film thickness to the already coated floor while spraying the top and sides of the tank, the report notes that some applicators put a drop cloth over the floor of a tank before coating the upper part of the tank. The report recommends that, before starting work, the applicator should have available extra tips, tip guards, buckets, rollers, and brushes for quick change out and to fix sags and runs before the coating cures. When spraying the product, says the report, the applicator should be able to quickly change out the tip if the one in use freezes, and, of course, this must be done before the mixed coating in the line begins to cure.

In the section on application, the report repeats the need for painters to have and use wet film thickness (WFT) gages during spray and touch up because WFT measurements are the only way that the painter can confirm proper film build during application.

A waste bucket should also be readily available to spray paint into during stoppages to prevent curing in the whip line.

Spraying

Even if a coating has a pot life of seven minutes or longer, if it remains stationary for more than about three or four minutes, it will begin to cure and cool, according to the report. The combination of curing and cooling will increase the coating viscosity and interfere with further application. Eventually, complete cure may take place in the line, ruining both the coating and the equipment.

The applicator can discharge the spray gun into a waste bucket so the coating flows without disruptions. According to the report, with small tanks of simple geometry, one or two skilled applicators can trigger the gun productively, thereby applying the coating continuously. The percent of time actively spraying is lower for more complex tanks because the sprayer moves to another position. Keeping the coating flowing could involve spraying 5 to 10% of the coating into the waste bucket, the study says. As tanks get more complicated, single coat application can become more difficult and take longer due to the time needed to climb scaffolding in tall tanks (e.g., wing wall tanks) or get into tight spaces (e.g., double bottoms). For such tanks, the report recommends that "two or more applicators may work as a team,

Fig. 4: The report recommends that for use of plural-component equipment, helpers and tenders as well as the operators should be trained in spraying to keep the work moving.

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Fig. 5: Cartridges worked well for touchup, especially with several painters at once doing touchup work

handing the spray gun off as they relocate to access a new work area."

Touchup

Edges, missed spots, and areas of low film thickness should not be touched up until the main application of the single coat has cured for a relatively short time, according to the report. It also suggests application by brush in areas where spraying is not feasible. For one of the approved systems, the report recommends that the regular grade, not the touchup grade, be used for touch up because the regular grade can be applied at high builds and cure quickly. Thus, the report suggests multiple applicators with disposable equipment for touchup work. The report also notes that some users found that cartridges can be difficult to work with and, as an alternative, small quantities of mixed coating can be dispensed using most plural component pumps. However, the report cautions, the touchup material needs to be mixed and the temperature has to be maintained to ensure it is mixed correctly—otherwise it could lead to improper cure.

Less experienced applicators applying a single-coat system may have large areas requiring additional coating thickness, and the report says that it could be helpful to go into the tank and spray additional material onto these areas, rather than applying a simple touchup.

Fig. 6: Excessive millage created an unusual sag on the bulkhead and had to be sanded off

Fig. 7: DFTs on the first tanks were as high as 50 mils on the deck but for all other tanks, dfts were in the specified range of 20-30 mils in all locations.

Lessons learned about QA/Acceptance

According to the study, most of the QA and acceptance issues relating to a single-coat system are similar to those of a conventional multi-coat system. Single-coat systems reduce the number of checkpoints (because there are no intermediate coats to inspect), but the report notes that the Navy does require two complete checkpoints for one-coat systems—surface preparation and final DFTs). If applicators have difficulty in consistently applying the single-coat material at the proper thickness, thin areas must be built up with an additional coat of material. Defining the extent of thin areas may necessitate considerably more than the minimum required number of DFT measurements, according to the report.

Applying a single coat at 20–30 mils DFT can create a non-smooth appearance. Because the coating is applied at high wet film builds, the spray application tends to create a ripple effect in the paint, the report notes. The rippling is related to the thixotropic nature of

the coating and its quick cure time, which prevents the coating from levelling as a slower curing material might. According to the report, rippling does not detract from the coating's protective properties, and a completely smooth finish is not required in Navy tanks.

Single-coat systems do not need a separate stripe coat, but where DFT is low on edges or corners, the Navy's PPI allows for a quasi stripe coat and touchup in a contrasting color. Although the finished coating will not be uniform in color, this condition is acceptable for Navy tank coatings, the report says.

Conclusions

The report concludes that the guidelines it developed in studying the use of the PPI can help applicators, particularly those new to plural-component application, to successfully apply single-coat protection systems. It also concludes that, although single-coat application takes longer than applying one coat of a multi-coat system (e.g., due to thicker film build and the greater attention required), the relatively new process has the benefit of reducing the number of coats that need to be applied. The rapid cure time also significantly reduces the overall duration of the project.

Apart from the cost savings associated with the single-coat system, the NSRP report identifies benefits to other ship repair activities that are often associated with the reduction in coating process time. Examples given in the report include

- shorter overall maintenance timeframe (e.g., shorter drydock time required);
- reduced overhead support costs or "facilities charge" (associated with cranes, dock access, etc.);
- reduced cure time to service—single coat cure time to service is 24 hours, less than the 7 days required for most tank coatings; and
- the ability to do more tanks in scheduled timeframe.

More Information

For a copy of the full report, go to www.nsrp.org. JPCL

Looking for an article from an earlier issue of JPCL? Issues from 1995 through the present can be found on www.paintsquare.com. Click "Publications" on the navigation bar of PaintSquare's homepage.

Courtesy of Shaw Pipe Protection

The external corrosion control system for a buried pipeline consists of two parts: the coating and the cathodic protection (CP). The primary purpose of the coating is to protect the pipe surface from its external environment. The CP system is designed to protect the pipe from corrosion should the coating be damaged or become disbonded from the pipe. The environment for corrosion and stress-corrosion cracking (SCC) can develop when both systems fail.

The performance of the coating depends on the events taking place during the five stages of the coating lifetime: manufacturing, application, transportation, installation, and field operation.

- During manufacturing of a coating, performance can be influenced by changes in raw materials, fillers, coloring agents, wrappers, primers, binders, and adhesives. For each change in the ingredients, the performance is evaluated until a satisfactory combination is reached. The changes are made so that the products meet and surpass standard tests and tests that have been developed in-house. Thus, the available data in the literature are based on products that have been pre-screened by manufacturers. Because of the confidential nature of product development, the relationship between coating chemistry and corrosion protection is not normally available. When the coating product comes onto the market, the applicator and end user do their own tests to validate the products. Once the results of the manufacturer, applicator, and end user agree, the product is applied on the pipeline for further evaluation and use.
- Most modern coatings are applied in the mill, where accurate control of the environment is possible. Coatings at the joints and coating repairs are carried out in the

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Testing Coatings for Pipeline

New Laboratory Methodologies to Simulate Field Operating Conditions of External Pipeline Coatings

field. Even a good coating is bound to fail if applied on a surface that has not been well prepared. In general, surface preparation can be better controlled in the mill than in the field, and mill-applied coatings usually a have longer lifetime than field-applied coatings.

- Line pipes, with mill-applied coatings, are transported carefully to the construction site and stockpiled.
- At the time of installation, care is taken to avoid damage to the mill-applied coating during field welding and application of joint coatings. After the installation of the pipe, the coating is tested for any damage, to which suitable repair coatings are applied.
- During operation, coating performance depends on the chemical, electrochemical (i.e., CP), and physical forces of the underground environment.

Standards developed by various organizations play a vital role in each of the five stages. Standards used to evaluate coatings during these stages have been reviewed recently.[1-4] Based on the performance of the coatings in the field and their failure modes during operation, properties for which there are no laboratory methodologies available at this time include wrinkling, tenting, slipping, and blistering. This article reports on the investigation of the variation of field operating conditions on the performance of coatings and the development or modification of laboratory methodologies to evaluate the resistance of coatings to wrinkling, tenting, slipping, and blistering.

Studying the Influence of the Variation of Field Operating Conditions on Coating Performance

Cathodic disbondment (CD) experiments were carried out over a 14-month period by varying temperature (constant and fluctuating), CP potential (-0.78 and -0.93 V), and holidays (presence and absence). Unless otherwise specified, all potentials presented in the paper were against saturated calomel electrode (SCE). Details of the equipment, online monitoring techniques, experimental procedures, and post-mortem analyses have been presented in previous publications.[5-7]

The salient features of the experiments are below.

The 13 different coatings, applied to steel panels, were asphalt, coal tar (A), coal tar (B), polyethylene tape, FBE (A), FBE (B), liquid epoxy brush, liquid epoxy spray, urethane brush, urethane spray, extruded polyethylene (two-layer), three-layer, and composite. All coatings were applied at the appropriate coating facilities. Characteristics of these coatings are presented in Table 1 (p. 34).

Nine panels per coating, for a total of 117 panels, were exposed to a solution of the composition presented in Table 2 (p. 36). The composition was developed based on the compositions of ground water in Canada. Half of the 117 samples were exposed at constant temperature (65 C [149 F]) and the other half were exposed at fluctuating temperatures, 5—65 C (41 F—149 F). For the constant temperature chamber, 65 C was chosen because most test results using standard tests are obtained at 65 C. The

Table 1: Characteristics of Pipeline Coatings

Coating	Thickness mm	Holiday size, mm	Qualification Standard	Coating Characteristics
Asphalt	8.13-9.00	6.4	Not Known	Asphalt coatings consisted of primer, enamel, binder aggregate, filler, and wrappers. The samples used were prepared from a pipeline that had been in service for over 25 years.
Coal tar	4.66-5.73	6.4	AWWA C203	Two types of coal tar coatings used. Coal tar (A) was a hot-applied enamel coating consisting of liquid coal-tar primer. The coal tar (B) was similar to coal tar (A), except that a liquid epoxy primer was used in coal tar (B).
Polyethylene tape	0.56-0.76	6.4	NACE MR0274	Tape was applied at ambient temperature. Tape consisted of liquid primers (adhesives), prefabricated tape consisting of polyolefin backing and laminated adhesive layers.
FBE	0.24-0.48	3.2	CSA Z245.20	Two types of FBE coatings were used. Both were heat-curable, thermosetting resin powders that utilized heat to melt and adhere to the metal substrate. The FBE (B) coating had a different adhesive than the FBE (A) coating.
Epoxy	0.59-0.76	3.2	CSA-Z245.20	The solvent-containing epoxy resin and curing agents were mixed before application. The same product was either brushed or sprayed onto the panels. The coatings cured at temperatures less than 100 C.
Urethane	0.61-0.87	3.2	CSA-Z245.20	The urethane coatings were fast setting. The same product was applied both by brushing (urethane brush) and by spraying (urethane spray).
2-Layer	1.90-3.23	6.4	CSA-Z245.21	The 2-layer coating was Type A2, specified in CSA Z245.21.A2.
3-Layer	3.59-4.58	6.4	CSA-Z245.21	The 3-layer coating was Type B1, specified in CSA Z245.21.B1.
Composite	0.58-0.75	6.4	CSA-Z245.21	Composite coating was a mixture of primer, binder, and polyolefin sheath and was extruded on the pipe surface (CSA Z245.21.B2).

temperature profile for the fluctuating temperature chamber was obtained from the analysis of temperature profiles of a Canadian oil and gas transmission pipelines.

During the first 12 months of the experiment, temperature was varied at a rate of 10 degrees C (18 degrees F) per month, starting at the temperature 5 C (except from 65—45 C when the temperature was decreased by 20 degrees C in one month). At the end of the cycle, the temperature was increased to 65 C and held for 1 month (month 13), then dropped to 5 C (month 14) and held constant for one month.

The average temperature of the fluctuating chamber over the fourteen months was 31.5 C (approximately 88 F). At the end of fourteenth month, the temperature was again increased to 65 C, and then it was held constant for 2 days before the samples were removed from the chamber. The procedure above ensured the coatings were all at the same temperature (65 C) when the experiment was terminated.

Eight panels with holidays were studied in duplicate under 4 conditions: -0.78 V constant temperature, -0.93 V constant temperature, -0.78 V fluctuating temperature and -0.93 V, fluctuating temperature. During the experiments, temperature of the chambers and CP current demand of each panels were recorded for every 4 hours.

Each cabinet could hold a maximum of 60 panels, so of the 9 sets of coated panels (117 panels in all), 8 sets of coated panels, with holidays (104 panels), were evenly split between cabinets, as described above, but the 9th set of 13 coated panels, without holidays, were split between the two cabinets. Therefore, 6 of the holiday-free coated panels were exposed in the constant temperature cabinet, and the remaining 7 of the holiday-free coated panels were exposed in the fluctuating temperature cabinet. The distribution of the ninth set resulted in the constant temperature cabinet holding 58 panels and the fluctuating temperature cabinet holding 59, nearly the maximum capacity of panels per cabinet. The results of testing the holiday-free coated panels are described later in this article in the section, "Effect of Holidays" on p. 38.

Effect of Temperature

The temperatures of the pipelines vary as a function of distance and of time. The sections of pipelines near compressor

Table 2: Composition of NS_4 Solution

Compound	Concentration (g/L)
$NaHCO_3$	0.483
KCl	0.122
$CaCl_2$	0.137
$MgSO_4 \cdot 7H_2O$	0.131

stations or heaters are higher than those away from these facilities. As a result of operation requirements, e.g., to increase the flow of oil, the operational temperature of pipelines may be increased. Both these temperature variations may be gradual. But during commissioning of the new pipelines or of abandoned pipelines, the temperature of pipelines will be ramped quickly from the ambient temperature to the operational temperature. In order to investigate the effect of temperature variation on the coating performance, two sets of temperature profile were used: constant temperature (at 65 C) and fluctuating temperature (various levels of fluctuation with an average temperature of 31.5 C).

Briefly, the results indicated that coatings exposed to constant higher temperature (65 C) had a larger area of CD than those exposed to fluctuating lower (average) temperatures (31.5 C). The same trend was observed irrespective of the CP potential applied, i.e., -780 mV or 930 mV. Thermal shock caused by increasing the temperature directly from 5 C to 65 C within a few hours caused more damage—as indicated by an increase in CP current demand—than a gradual increase at a rate of 10 degrees C per month. A surge of temperature even for a few hours in the field will have a pronounced effect on the long-term performance of the coatings compared to the effect of a gradual increase in temperature on performance.

Effect of CP Potential and pH

A number of standards describe the application of CP.[8-10] The CP criteria used are given below.

- Negative potential of 850 mV versus saturated copper-copper sulfate (CCS) reference electrode.
- A minimum of 100 mV of cathodic polarization between the structure and a stable reference electrode in contact with the electrolyte.

In this study, experiments were conducted in two CP potentials: -0.78 V and -0.93 V (corresponding to -0.85 and -1.00 V vs. CCS), i.e., CP potential normally applied in the field and 150 mV more negative than normal CP potential applied, respectively. The corrosion potentials recorded were

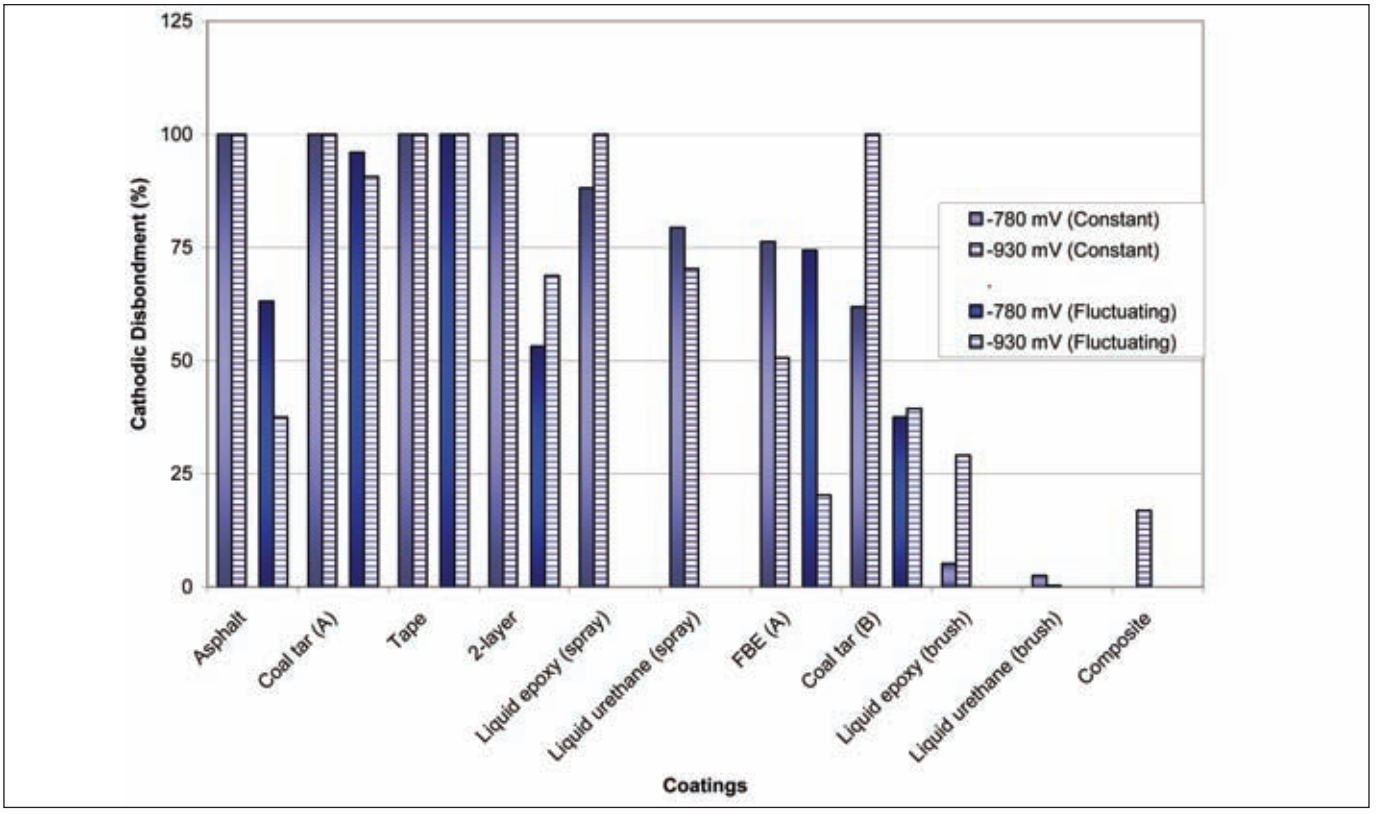


Fig. 1: Effect of variation of CP potential on CD area of coatings. Figures 1-11 courtesy of the authors

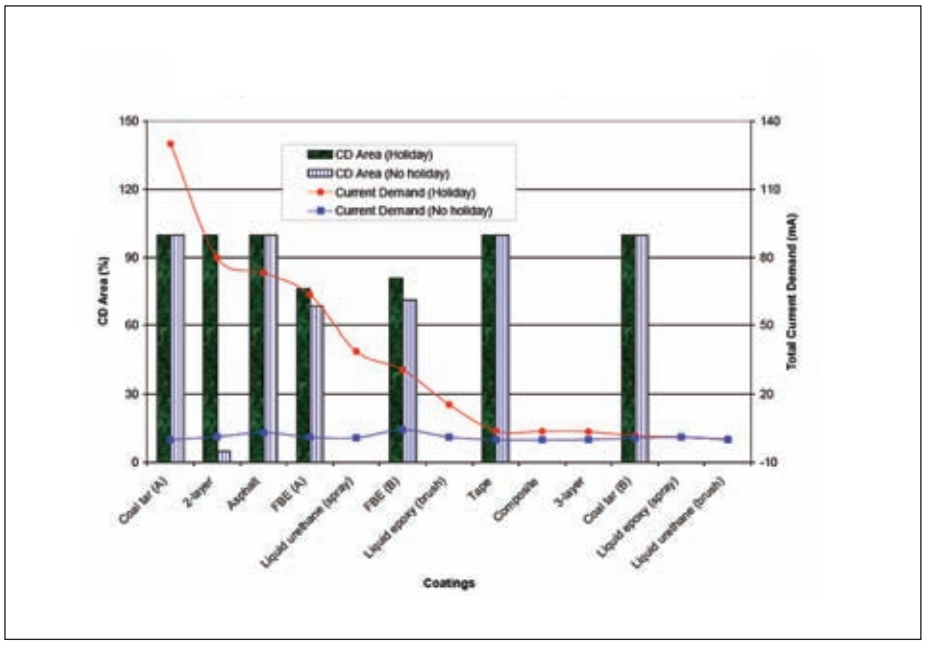


Fig: 2: Cathodic disbondment behavior of coatings with and without holidays

more positive than -0.78 V, indicating that application of -0.78 V would make the panels cathodic.

The effect of variation of CP potential (-0.78 V and -0.93 V) for all types of coating was not significant and was within the range of accuracy of the method (Fig. 1).

During the experiments, as in the field, white precipitates deposited on the holidays of some samples. When the precipitates were deposited, the corrosion potentials exhibited some erratic behavior. Because the investigation focused on simulating field operating conditions in the laboratory, no attempt was made to remove the precipitates during the experiments

In all samples, the pH was approximately 8 for the entire duration of the experiments. In experiments conducted at -1.5 V or -3.5 V vs. copper-copersulfate electrode, pH values of 13–14 have been reported.[10]

It appears that higher values of potentials in accelerated standardized CD tests do not necessarily create environments that are good representations of field conditions.

Effect of Holidays

Even though the coatings are tested for holidays before backfilling, holidays or disbondment develop during operation. Where holidays form, CP should act as backup. Therefore, monitoring of CP current demand should provide some indication of holiday formation. To investigate the influence of holidays, experiments were conducted using panels with and without holidays.

Of the 9 panels per coating type used, one panel per coating type did not have any holidays. Of the 13 holiday-free panels of the different coatings, 6 panels—two-layer, FBE (A), coal tar (A), coal tar (B), asphalt, and tape—were exposed in the constant temperature chamber. The 7 others—FBE (B), three-layer, composite, urethane brush, urethane spray, epoxy brush, epoxy spray—were exposed in the fluctuating-temperature chamber.

Of the 6 panels in the constant temperature chamber, the deterioration in the presence and absence of holidays was the same on 5 of them. In only one instance did a panel with no holiday deteriorate less than the panels with holidays. Invariably, in all cases, the CP current in the absence of holidays was low, regardless of coating type (Fig. 2).

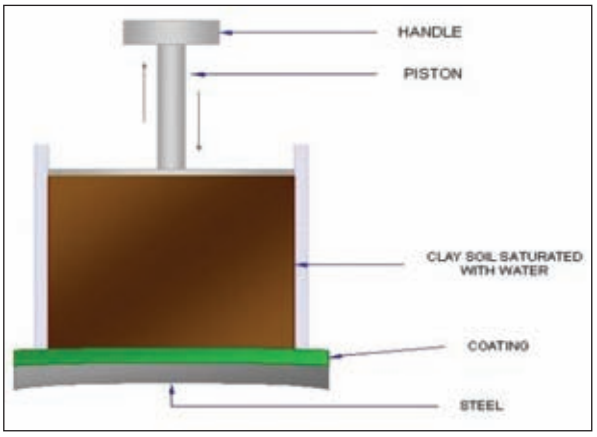


Fig. 3: Schematic diagram of an apparatus to simulate wrinkling

New Laboratory Methodologies

Over the past 60 or more years, several polymeric coatings have been used to protect external pipeline surfaces. However, the procedure to be followed in selecting a protective pipeline coating has remained essentially the same since the 1940s.[11] By 1978, 13 ASTM standard test methods had been produced to determine the properties of non-metallic coatings applied to steel pipe. Since then, several test methodologies and further standard tests have been developed. But there are still a few properties, including wrinkling, slipping, blistering, and tenting, for which no standard tests are currently available. New tests to evaluate these properties are discussed in this section.

Wrinkling

Coatings, particularly tapes, wrinkle when exposed to wet clay sands. Wrinkling occurs when the adhesion of the coating on the surface is not uniformly constant over the entire surface, i.e., attraction at the steel-coating interface is not uniform. If the coating-soil interface has a hydrophilic tendency, the soil wets and adheres to the coating. Due to wet-dry cycles, the soil around the pipe will

Fig. 4: Piston arrangement to simulate soil stress

expand and contract. If the soil adheres to the coating, the coating will then undergo pull and relaxation at localized areas. Pull and relaxation result in the formation of wrinkles if the adhesion at the steel-coating interface is not uniform and is less than that at the coating-soil interface.

The tendency of a coating to wrinkle can be determined in the laboratory in a simple experimental setup (Fig. 3).

To calculate the mass on an underground pipeline in a clay soil in the laboratory the following relationship may be used:

$$m = \pi r^2 \cdot h \cdot \rho \quad \text{(Eqn. 1)}$$

where m is the mass, πr^2 is the area of the base of the piston, r is the radius of the piston, h is the height of the soil, and ρ is the density of clay (2.02 g /cm^3). To prepare the panels, clay is added to fill half of the container. The clay is wetted with water. The clay-water ratio is chosen so that the pressure of the piston will not cause the clay to overflow the container. Using a piston arrangement (Fig. 4), the moist soil is tightly held on the coating for a fixed duration (e.g., 24 h). The piston is removed, without disturbing the soil, and the soil is allowed to dry for certain period (e.g., 24 h). The soil is removed to inspect the status of the coating. The cycle is repeated and the coating is examined after each cycle.

In the field, wrinkles appear, in general, after about 10 years of operation. Therefore, it is necessary that the cycle be repeated for several times (e.g., up to

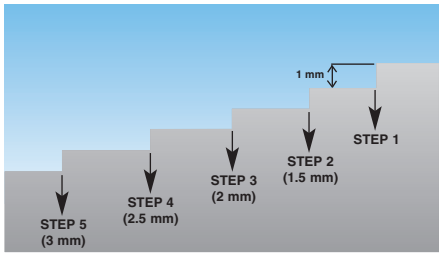


Fig. 5: Step sizes of tenting

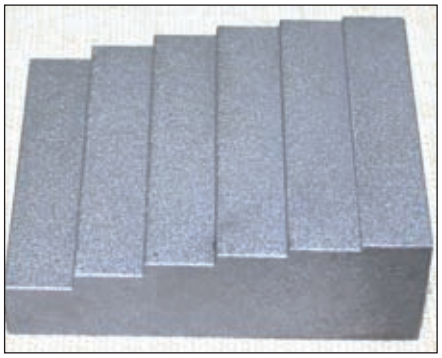


Fig. 6 (above): Steel specimen for evaluating tenting

Fig. 7a-d (below) Samples from tenting experiment

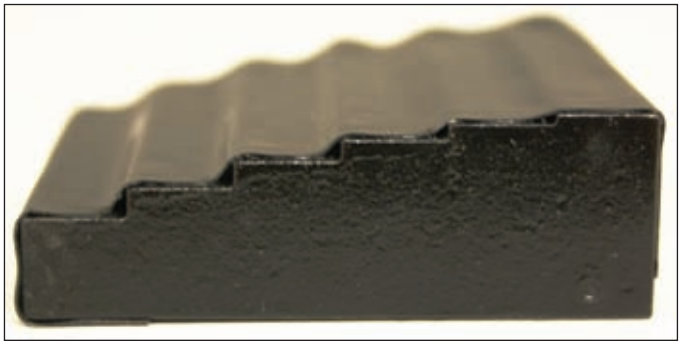


Fig. 7a: Before experiment

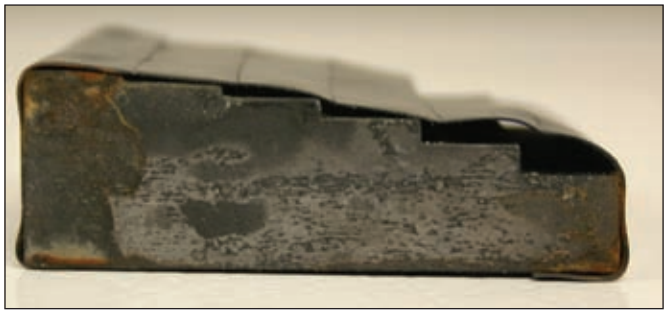


Fig. 7b: After experiment. Sample ranked #3

Fig. 7c: After experiment. Sample ranked #4

Fig. 7d: After experiment. Sample ranked #5

50 cycles). If no wrinkle is found after a fixed number of cycles, it can be concluded that the polyethylene tape has anti-wrinkling properties. Each cycle simulates one year of field conditions—as a first approximation.

Tenting

Failure by tenting occurs on tapes that are spirally wrapped around the pipe with an overlap. These coatings are prone to disbondment because of tenting that occurs between the pipe surface and the tape along the ridge created by the longitudinal weld. A second area of potential tenting is found where the tape is overlapped to achieve a bond between successive wraps of tape. When polyethylene tapes disbond, they allow moisture to penetrate under the coating. Because of the high electrical insulating properties of the polyethylene tape and the long path under the disbonded tape, the cathodic current being applied through the soil cannot reach the pipe surface to prevent corrosion.

A five-step sample surface to evaluate the tenting in the laboratory is presented in Figs. 5 and 6 (p. 41).

After the application of a primer, the PE tape is tightly wrapped on the steel surface. A good primer-coating combination will flow between the steps, filling the gap. As a consequence, the coating adheres tightly to steps. The coated sample is then immersed in a solution and left undisturbed for fixed duration (e.g., seven days at 50 C [122 F]). At the end of the period (as determined by trial and error method during preliminary experiments), the sample is removed, and, with a sharp object (e.g., cutter), the tape is cut at each step. The tenting tendency is ranked between 1 (good) to 5 (poor), where "good" refers to the sample that could not be cut at any of the five steps and "poor" refers to the sample that could be cut in all five steps. Three samples ranked 3, 4, and 5 are presented in Fig. 7 (p. 41).

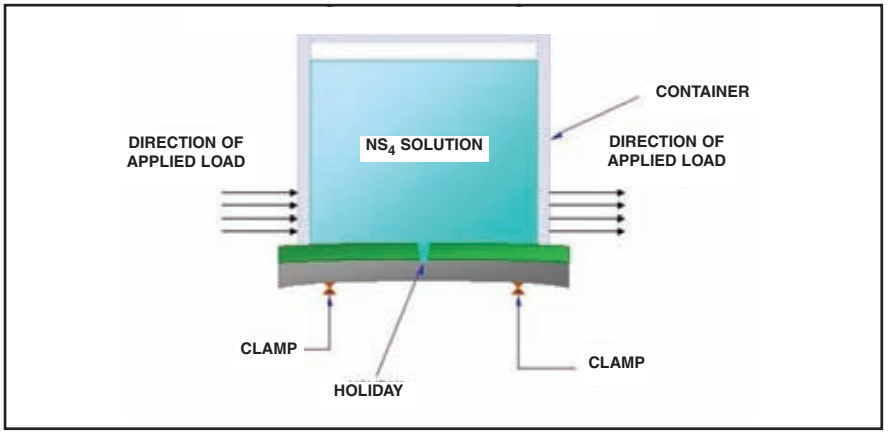


Fig. 8: Experimental setup for evaluating slipping (top steel pulling panel not shown above)

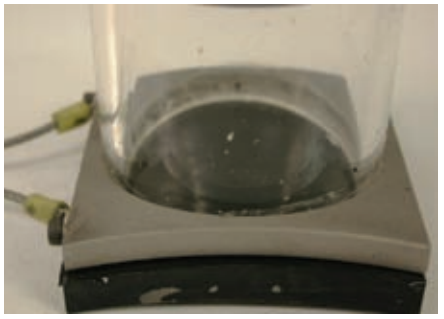


Fig. 9: Slipping experiment (pulling panel is the bare steel panel attached to the coating)

Fig. 10: Application of load in the slipping apparatus

Slipping

Slipping may occur in coatings of two and three layers if the cohesive strength between layers is not sufficiently high. The moisture that penetrates through the outer coating may accelerate the loss of cohesive strength, as may damage to the outer coating that exposes the adhesive layer. Even though the peel and adhesion strength tests measure this property, the peel and adhesion measurements are carried out under dry conditions. A laboratory methodology to evaluate slipping tendency under wet conditions will be more appropriate to simulate the field operating conditions.

An experimental setup to simulate the slipping process in the laboratory is presented in Fig. 8.

To apply the load, an uncoated steel panel (top panel) is machined to create a hole within which the cylindrical container will be placed (Fig. 9). The uncoated panel is secured on top of a coated test panel.

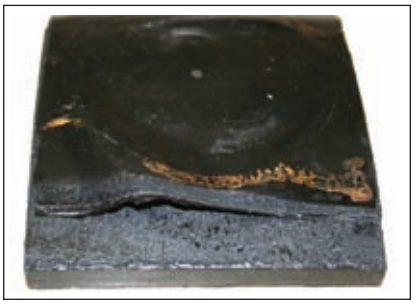
The container is attached to the coating using an adhesive with higher bond strength than the coating on the panel; otherwise, the experiment will be prematurely terminated due to the slippage of the container rather than the coating. The container is filled with the NS_4 solution or wet soil. The assembly is tightened, and a constant load is applied to pull the top panel attached to the coating (Fig. 10).

The slippage of the coating is noted at regular intervals (e.g., every day) for up to a fixed duration (e.g., 30 days) or until complete failure. The slippage rate is calculated using the following formula:

$$\text{Slippage rate} = \frac{d \times w}{t} \quad \text{(Eqn. 2)}$$

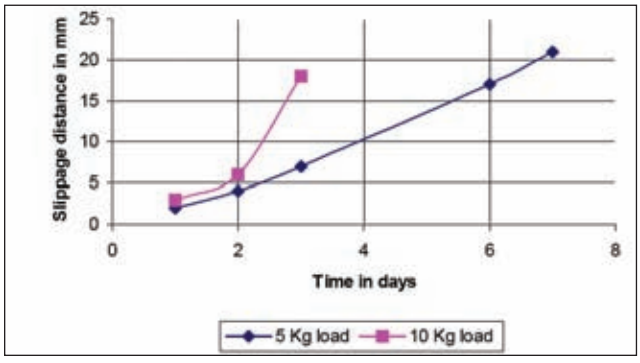
Where d is the distance slipped in mm, w is the load in kg, and t is the time in days.

Some typical results are presented in Fig. 11 (p. 46).



Slippage after 7 days with 5 kg (11 lb) load

Slippage after 3 days with 10 kg (22 lb) load



Plot of slippage distance vs. time

Fig. 11: Typical slippage data

Blistering

Blistering of epoxy coatings in the field is common. Most laboratory investigations have found that the pH under the blistered coating is about 13–14, indicating passage of CP. The same observations have been found in the field. Currently, the hot sock test is used to determine the blister-forming tendency of the coating. Current measurement in CD experiments exhibits characteristic current spikes during the formation of blisters. Therefore, current spike during the CD experiment can be used as a quantitative measure of blister formation.[5]

Most of the standard CD and hot sock tests are carried out only up to 28 days. A minimum of 100 days in the lab is required before any indications of blistered formation can be observed. During the period 1964 through 1977, nearly 200 existing tests for nonmetallic mate-

rials were reviewed for their potential value in the evaluation of pipeline coatings. Throughout this search, test methods were rejected if they could not be adapted for coated pipe as test specimens. Other test methods were not considered because they produced data of marginal value to the corrosion engineer. Test methods retained for critical evaluation were those that would begin to yield definitive performance data within the first 90 days of testing and did not require more than 18 months to complete. Over the years, the duration was reduced to a maximum of 28 days.[12–17] It looks reasonable to conduct laboratory experiments, at least while selecting the coatings, for a minimum of 100 days.

Summary

A modified CD test was used to investigate the influence of the variation of field operating conditions, including operating temperature, cathodic protection potential, and holidays, on the performance of coatings.

- A sudden increase in temperature, which normally occurs during the commissioning of pipelines, has a more pronounced effect on the performance of coatings than the same increase of temperature over a longer duration.
- The rate of cathodic disbondment has been found to be higher at a constant elevated temperature than at lower fluctuating temperatures.
- Application of additional negative potential of 150 mV, rather than the traditional -780 mV (or -850 mV CCS), has a minimal effect on the cathodic disbondment rate.
- Cathodic current demand has been found to be higher for coatings with holidays than without holidays.

However, the influence of holidays has been found to be minimal on the cathodic disbondment area.

New laboratory methodologies have been developed to evaluate the resistance of coatings to wrinkling, tenting, slipping, and blistering.

Acknowledgements

The authors would like to acknowledge the helpful discussions and financial support from the Canadian Federal Government's Program of Energy R&D (PERD) and members (3M Canada, Enbridge Pipelines, AEC Pipelines, Korea Gas [KOGAS], Reilly Industries, Shaw Pipe Protection, Specialty Polymeric Coatings [SPC], and TransCanada PipeLines) of the CANMET/NRC/Industry Consortium on External Pipeline Coatings for Prevention of Corrosion and Stress-Corrosion Cracking.

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JPCL

Ambitious 2009 Schedule of SSPC Courses in Asia

In an effort to expand its overseas footprint, SSPC has scheduled an impressive lineup of dates for its Protective Coatings Inspector (PCI) course for 2009.

The PCI Program is designed to thoroughly train individuals in the proper methods of inspecting surface preparation and installation of industrial and marine protective coatings and lining systems on an array of industrial structures and facilities.

- February 20–March 1, Batam, Indonesia
- March 20–29, Bintan, Indonesia
- April 20–25, Jakarta, Indonesia
- May 11–16, Singapore
- June 1–6, Rayong, Thailand
- June 22–27, Songkla, Thailand
- July 20–25, Ho Chi Minh, Vietnam
- Aug 10–15, Hanoi, Vietnam
- Sep 7–12, Manila, Philippines
- Oct 5–10, Singapore
- Oct 19–24, Batam, Indonesia
- Nov 6–15, Bintan, Indonesia
- Nov 23–28, Jakarta, Indonesia
- Dec 7–12, Johor Bahru, Malaysia

For further information, please contact Jennifer Miller at 877-281-7772 or miller@sspc.org.

SSPC QP Certified Contractors, New and Renewed in 2008

- Bath Iron Works, QP 1, Bath, ME
- Beam, Inc., QP 1 and 2, Poca, WV
- Corporate Painting, QP 1, Charlotte, NC
- Dura-bond Pipe, QP 3, Steelton, PA
- Finishing Systems of Florida, QP 1, Longwood, FL
- General Dynamics Information Technology, QP 3, Chesapeake, VA
- Industrial Coatings Contractor, QP 1 and 2, Prairieville, LA
- J. Mori Painting, QP 1, Hialeah, FL
- Mason Painting, QP 1, Rancho Cordova, CA
- Northwest Pipe Co., QP 3, Washington, WV
- Paragon Construction Services of America, QP 1, Slydale, LA
- Premier Paint, LLC, QP 1, Ogden, UT
- PT McDermott, Indonesia, QP 1 and 3, Batam, Indonesia
- Raydar, QP 3, Odon, IN
- Spartan Contracting LLC, QP 1 and 2, Campbell, OH
- Steed General Contractors, QP 1 and 2, Bronx, NY
- Steel Management, QP 3, Nazareth, PA
- Tarpon Industrial Inc., QP 1 and 2, Tarpon Springs, FL
- Tsuji Heavy Industries, QP 1, Sasebo, Japan
- Turner Industries Group, LLC, QP 3, Port Allen, LA
- Yamahoka Kogyo LLC, QP 1, Sasebo, Japan
- Zachry Industrial Inc., QP 1, Pascagoula, MS
- Ziegler Industries, QP 1 and 2, Nauvoo, IL

Individual Member Update

Below are individuals who joined or renewed their SSPC membership in December 2008. For information about joining, contact Terry McNeill, mcneill@sspc.org.

- Chad Allan, Santa Rosa, CA
- Jayapal Arasu, Singapore
- Louis B, Canton, MA
- Paul Benfield, Cape Girardeau, MO
- Ron Berry, New Plymouth, New Zealand
- David Biggs, Pompano Beach, FL
- Robert D. Branscome, New Castle, PA
- Rayshone Broadnax, Spring Valley, CA
- Paul Brown, Beaumont, TX
- Robert Cebulski, Williamsville, NY
- Emmanuel Chrysakis, Tarpon Springs, FL
- Brian Collins, Greenville, SC
- Barry Couts, Springfield, OH
- Jim Deardorff, Chillicothe, MO
- Thomas F. DeLoughery, Burlington, ND
- David Ditillio, Tampa, FL
- Madeline Douglass, Minneapolis, MN
- Roger Eaton, Pittsburgh, PA
- Andrew Estes, Cape Girardeau, MO
- Steven L. Feuquay, Terre Haute, IN
- Gary Flentge, Chicago, IL
- James Gregg, Greenville, SC
- Thomas Guzek, Hammond, IN
- James Hatch, South Jordan, UT
- Michael Hewins, Wrentham, MA
- Scott Humphreys, Schaumburg, IL
- David J. Johnson, Sapulpa, OK
- Marlana Jordan, Hamilton, ON, Canada
- Bryce Kale, Deerfield, IL
- Jeffrey E. Kelley, Swartz Creek, MI
- Tanant Kittikunakorn, Bangkok, Thailand
- Bill Koppenaal, Newton, NJ
- Steve Lee, Juneau, AK
- Jeffrey Lockwood, Afton, NY
- Frank Lutze, Hanover, MI
- Timothy J. McCahill, Romeoville, IL
- Patrick McCoy, Valrico, FL
- Antony Miller, Crosby, TX
- Emilio Nahum, Santiago, Chile
- Alan Oates, Portland, OR
- Michael O. Onaghinor, Victoria Island, Lagos, Nigeria
- John L. Parr, Kings Mountain, NC
- Elissa Quesenberry, Annapolis Junction, MD
- Dale Ragan, Mount Vernon, WA
- Daniel Reed, Sarasota, FL
- Shane Reynolds, Orange, TX
- Manuel Rodriguez, Fresno, CA
- Ginette Routhier, Beauharnois, QC, Canada
- Jose Ruiz, Villalba, Puerto Rico
- Rick Salgado, Aurora, OH
- Tom Smith, Fulton, MO
- Donald Stewart, West Union, WV
- Paul J. Swanholm, Dover, DE
- Andrew Tsai, Hong Kong
- Phill Allen Tucker, Sulphur, LA
- Bryan Westrick, Bradenton, FL
- Steven R. White Sr., Bohemia, NY
- Todd Whittenburg, Rio Oso, CA
- Cynthia A. Wilk, Trenton, NJ
- John Williams, Arlington, VA
- Arlen Williams, Stockton, CA
- Richard Yauger, Lemont, PA

associations

CORROSION 2009 Goes to Atlanta

CORROSION 2009—The NACE Annual Conference and Exposition will be held in Atlanta, GA, at the Georgia World Congress Center on March 22–26, 2009. Some coatings-related programming will be featured at the event, which is in its 64th year. With more than 5,000 industry professionals expected to attend, the intended audience consists of professionals in coatings and linings; corrosion monitoring and control; marine; military; oil and gas production; pipelines, tanks, and underground systems; transportation; water and utilities; and related industries. More than 350 exhibitors are scheduled to display their goods and services.

Along with familiar programs from past years, such as the Corrosion & Punishment and International Marine Coatings forums, CORROSION 2009 introduces a new exposition feature, the Equipment Pavilion. Here, manufacturers and suppliers of industrial equipment will have the opportunity to display their products in a special area of the exhibit hall.

Photo courtesy of Atlanta Convention and Visitors Bureau

A brief look at sessions related to coatings follows, as does a list of relevant exhibitors (as of press time).

Forums

- Nuclear Coating Inspector, March 23

Presented by Jon R. Cavallo, PE, PCS, Vice President, Corrosion Control Consultants and Labs, Inc., this forum will feature presentations and a follow-up panel discussion with international nuclear power plant coatings experts. The topics of presentations will include coating systems for new plant construction and maintenance of existing nuclear power plants, nuclear coating training programs in South Korea, and an update on the joint EPRI/EdF coating aging project.

- International Marine Coatings, March 23

This forum will include updates by industry leaders; discussion topics will include IMO PSPC regulations for protective coatings on ships; and an update by the National Shipbuilding Research Program (NSRP) on coatings research related to marine environments by Steve Cogswell (Atlantic Marine), chair of the NSRP Surface Preparation and Coatings Panel. A networking reception will be held as well.

- Making Sure the Paint Sticks: How Much Soluble Salt, March 23

Presented by Richard Hays, Naval Surface Warfare Center, this forum will focus on new technologies for determining soluble salts and address the question of the level of soluble salts that should be allowed.

- Corrosion and Punishment, March 24

Presenters John Clayton of Jackson & Walker and Kevin Garrity of CC Technologies (now DNV Columbus) will discuss the legal issues surrounding corrosion-related pipeline failures.

- Bridge Painting—Staying Ahead of the Curve, March 24

This forum consists of several presentations: "Golden Gate Bridge Suspender Coating Equipment," by Noel Stampfi, Project Engineer; "The Effect of Chlorides in the Bridge Re-Painting Process," by Douglas Hedrick, Ohio Turnpike Commission, Construction Manager, and Jim Johnson, Chor*Rid Corp.; "Bridge Painting Issues During the East River Bridge Reconstruction Program," by Ralph Csogi, Senior Vice President, GPI; "Fear, Loathing and Ivory Soap™ in the Bridge Coatings Inspection Industry," by Michael Baase, Transportation Engineer Tech III, Bridge Painting, Kentucky Transportation Cabinet.

- Application of Coatings: How Green Can You Get, March 24

Presenter E.J. Johnson, director of Carboline

Continued

Transportation, will discuss topics that include zero VOC and zero HAP railcar coatings and linings; green coating specifications; and typical waterborne coatings used in the rail industry.

• Front Page Session 2: Bridge Life Extension, March 24

Presenter Mike Baach, NACE Congressional Affairs Subcommittee Chair, will discuss a bill introduced in the U.S. Congress in 2008, the Bridge Life Extension Act of 2008 (HR 6234), which provides a solution to the problem of corroding bridges.

• Pipeline and Hazardous Materials Safety Administration, March 25

Jeff Wiese, Associate Administrator for the Pipeline and Hazardous Materials Safety Administration (PHMSA), Office of Pipeline Safety (OPS), will provide an update on pipeline regulations, including casings, external corrosion direct assessment, internal corrosion, stress corrosion cracking, integrity management, and operator qualification.

• Pipeline and Hazardous Materials Safety Administration Internal Corrosion Public Workshop, March 26

The Pipeline & Hazardous Materials Administration (PHMSA) will hold a public workshop in conjunction with CORROSION 2009 focusing on internal corrosion issues facing the hazardous liquids pipeline industry.

Tutorials

• How to Avoid Premature Coating Failures, March 24

Presenter Mike O'Brien of the MARK 10 Resource Group, Inc. will provide examples and pictures of coating failures on steel and concrete as well as practical knowledge to reduce or avoid premature coating failures.

• Coating Applicator Training and Certification to the NACE/SSPC Standard for Qualification of Applicators—How to Do it Yourself (DIY), Tuesday, March 24

Mike Moss, NACE Education & Training, and industry representatives will discuss a DIY program designed for companies to use when training coating applicators to the national NACE/SSPC Standard on Industrial Coating and Lining Applicator Specialist Qualification and Certification.

Courses

• Basic Corrosion, March 16–20

This course provides a basic but thorough review of causes of corrosion and the methods by which it can be identified, monitored, and controlled. The course includes hands-on experiments and case studies as well as an open discussion.

• Shipboard Corrosion Assessment Training (S-CAT), March 17–21

This course is intended to provide a foundation of coatings, corrosion, and corrosion control knowledge for assessing the condition of tanks and other structures and determining the required actions necessary to effectively maintain fully operational status.

• CIP One Day Bridge Course, March 21

This one-day course is designed to provide participants in CIP or Certified Coating Inspectors with specific training related to coating inspection of bridges. The course concludes with a one-hour written examination.

Committee Meetings, Symposia

• Offshore Coatings: Laboratory Testing Criteria TEG 346X

• Offshore Platform Maintenance Coatings (Nonimmersion): Standard Test Methods; Offshore Ballast Water Tank Coatings: Standard Test Method; Offshore Exterior Submerged Coatings: Standard Test Method; Offshore Platforms: Coatings for Atmospheric and Splash Zone New Construction TG 260, TG 263, TG 264, TG 312

• Offshore Coating Condition Assessment for Maintenance Planning TG 340

Continued

News

- Offshore/Marine Coating Technology—Offshore/Marine Coating Technology Symposium STG 02, STG 03
- Coating Failure Symposium STG 02, STG 03
- Coatings and Linings, Protective: Atmospheric; Coatings and Linings, Protective: Immersion and Buried Service; Coatings and Linings, Protective: Surface Preparation—Joint STG 02, 03, 04 administrative meeting
- Recent Advances in Pipeline Coatings Symposia STG 03
- Pipeline Coating, Plant-Applied Fusion-Bonded Epoxy: Review of NACE Standard RP0394 TG 031,TG 312
- Coating Systems (External) for Pipeline Directional Drill Applications TG 352
- Offshore/Marine Coating Technology Symposia STG 02 STG 03
- Coatings and Linings over Concrete for Chemical Immersion and Containment Service TG 141
- Coating Failure Symposium Symposia STG 02 STG 03
- Surface Preparation of Contaminated Steel Surfaces TG 142
- Nonvisible Contaminants, Identifying Specific Levels: Discussion of Issues TEG 288X
- Pipeline Coating: Aboveground Techniques for the Underground Evaluation of Condition TG 294
- Microbiologically Influenced Internal Corrosion of Pipelines TG 254
- Corrosion Issues & Solutions for Military & Aerospace Systems & Facilities Symposium STG 40
- Waterborne Coatings on Railcars TG 378
- Railcars: Corrosion Protection and Control Program TG 063
- Surface Preparation by Encapsulated Blast Media for Repair of Existing Coatings on Railcars TG 379
- Coating System Application for Interior Surfaces of New and Used Rail Tank Cars TG 333
- Railcars: Coating Application on

Exhibitors

The following is a list of exhibiting companies (and their booth numbers), as of press time, that are involved in protective coatings and linings work.

- AGC Chemicals Americas Inc.....220
- AkzoNobel Powder Coatings.....757
- The Bayou Companies.....341
- Belzona Inc.....1254
- Berry Plastics Corrosion Protection Group.....415
- Blair Rubber Company 1535
- Bodycote Materials Testing Inc. .315
- Bredero Shaw.....707
- Canusa CPS.....806
- Carboline Company 1101
- Central Plastics Co. 409
- CHLOR*RID International Inc....1241
- Clariant.....1049
- Corrosion Control Int'l.....1400
- Corrpro.....1007
- Cortec Corporation 1205
- CRTS, Inc. 640
- Curran International 741
- Cygnus Instruments Inc. 1322
- Dampney Company Inc. 508
- DE Stearns Co. 1112
- DeFelsko Corporation 812
- Denso North America.....1121
- Elcometer Limited 1307
- Elektro-Physik USA Inc. 207
- Enviroline Group Inc. 1052
- Fischer Technology Inc.....314
- Gamry Instruments Inc. 1141
- Greenman-Pedersen Inc.....816
- Hempel Coatings USA Inc. 1340
- Henkel Corporation 306
- Heresite Protective Coatings ..1114
- Hi-Temp Coatings Technology ...210
- HoldTight Solutions Inc.....1523
- Honeywell International.....1115
- Industrial Vacuum Equipment Corp. 560
- KTA-Tator Inc. 1111
- Montipower LLC.....1540
- Monti Tools Incorporated 1449
- Olympus NDT 813
- Oxford Instruments Coating Measurements.....715
- Polyguard Products Inc..1515, 1544
- PolySpec Thiokol.....349
- PPG Industries Inc. 701
- Praxair Services, Inc. 338
- Princeton Applied Research 238
- Radiodetection Corp.....656
- Rema Tip Top North America Inc. 325
- Rohm & Haas Company.....1206
- The Sherwin-Williams Company 1223
- Specialty Polymer Coatings Inc. 1541
- Sponge-Jet Inc. 1335
- SSPC: The Society for Protective Coatings 232
- Tapecoat Company 1301
- 3M Corrosion Protection.....342
- Tinker & Rasor 834
- Tnemec Company Inc. 1622
- Trenton Corp. 712

Exterior Surfaces of Steel Railcars TG 339

• Guidelines for Qualifying Personnel as Abrasive Blasters and Coating and Lining Applicators in the Rail Industry TG 394

• Railcars: Corrosion Under Tank Car Insulation TG 366

• Removal Procedures for Nonvisible Contaminants on Railcar Surfaces TG 271

• Measurement of Soluble Salts on Marine Structures TG 392

• Microbiologically Influenced Corrosion TEG 187X

Association News Continued

ASTM Launches Educational Campaign

ASTM International plans to launch the "Year of the Professor" campaign this year. The academic outreach initiative will be aimed at promoting the value of standards education at colleges and universities worldwide.

In 2007, ASTM launched the "Year of the Student" initiative, which, the organization says, brought a 40% increase in ASTM student membership and increased the number of universities and colleges that access ASTM standards to more than 1,000.

The "Year of the Professor" initiative will reward a university-level educator for exemplary use of ASTM standards in his or her curriculum with a cash award for the educator and his or her university.

For details, visit www.astm.org.

ASSE Chapter Donates to Scholarship Fund

The American Society of Safety Engineers' (ASSE) Permian Basin Chapter in Midland, TX, donated $25,000 to the ASSE Foundation toward the establishment of an annual $1,000 scholarship for college students studying occupational safety, health, and the environment. The scholarship is called the "Permian Basin Chapter Endowment."

According to the Permian Basin Chapter President, Geri Cooley, MS, REM, CSP, the scholarship is available to undergraduate and graduate students enrolled in an environmental, health, and safety program within the ASSE Region III (Arkansas, Oklahoma, and Texas).

For details, visit www.asse.org.

HBS to Hold Steel Bridge Class

Highway Bridge Services will hold a steel bridge design class May 28-30 in Newark, NJ. The class will teach to AASHTO LRFD Bridge Design Specifications.

Topics will include the design of straight or curved girder bridges, gusset plate checks and their relation to rating steel bridges, and construction issues on straight or curved girder bridges.

For more details, visit www.h-b-s.org.

companies

PPG Posts Record Sales

PPG Industries (Pittsburgh, PA) reported record sales for fourth quarter 2008, thanks in part to its high-performance coating sales.

Overall sales surpassed 2007 fourth quarter sales by 3% with $3.2 billion.

Net income was $71 million, or $0.43 per share.

Charles E. Bunch, chairman and CEO of PPG, stated that while the company did experience dramatic volume decline in several of its markets, the acquisition of SigmaKalon earlier in the year was the "major factor" contributing to coating sales.

The performance coatings segment increased its sales by $85 million, or 8%, in the fourth quarter, compared to 2007. Sales grew as a result of acquiring SigmaKalon's protective and marine coatings business and higher pricing in all businesses.

Industrial coatings segment sales decreased by 18%, or $166 million, primarily due to lower volumes in the automotive OEM business. The architectural coatings EMEA (Europe, Middle East, and Asia) segment represented the largest business from the SigmaKalon acquisition and broke even with sales at $414 million.

For all of 2008, sales were $15.8 billion with a net income of $538 million, or $3.25 per share. In 2007, sales were $12.2 billion; however, net income was $834 million, or $5.03 per share. PPG ended 2008 with $1 billion of cash on hand, up roughly $500 million from the end of 2007, according to the company.

PPG Industries is a global supplier of coatings, paints, chemicals, specialty materials, and other products.

Sika Reports Net Sales

Sika Group (Baar, Switzerland) posted net sales for 2008 of just over CHF (Swiss Franc) 4.6 billion, which is 1.1% above the previous year. The growth rate in local currencies was 7.3%, including an acquisition effect of 1.4%. The negative currency exchange effect was -6.2%.

The company reported that growth in the construction division was satisfactory, despite the housing crisis, but the industry division plummeted in the fourth quarter. Sika expects to publish detailed information on the 2008 results at the end of February 2009.

Sika is a global specialty chemicals company with products that include industrial flooring, waterproofing, and roofing systems.

Rapid Prep Opens West Coast Facility

Rapid Prep, LLC (Johnston, RI) opened its west coast facility on January 1, 2009. Tony Cornett of San Diego, CA, was named the head of equipment rental and sales efforts for the new facility. Rapid Prep provides equipment for operations such as surface preparation.

Cornett has 20 years of sales and general management experience specific to equipment rental and marine markets. He previously held positions at Spider and was the general manager for Marine Services Commercial Diving.

All west coast sales inquiries should be directed to Cornett at 619-495-1644.

Burke Industrial Names Chemist

Burke Industrial Coatings (Ridgefield, WA) has named Michael Lee as the company's industrial chemist. He will be responsible for developing high-performance, specialized paints and coatings that are safe and environmentally friendly. Lee will work under the direction of Darrell Badertscher, the vice president and technical director.

Lee has a degree in chemical engineering and has spent several years as a chemist with other paint and coatings companies in the U.S.

Training Offered on Underground Corrosion

The 54th annual Appalachian Underground Corrosion Short Course (AUCSC 2009) will take place May 19-

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21, 2009, at West Virginia University in Morgantown, WV.

AUCSC offers over 100 hours of basic, intermediate, and advanced instruction about the causes and prevention of corrosion on underground structures. Attendees can earn 1.6 CEUs.

For detailed information and on-line registration visit www.aucsc.com.

International Paint, Ceilcote, Devoe Team Up in Canada

International Paint LLC and its subsidiary, Ceilcote USA, Inc., have partnered with Devoe Coatings of Canada to provide fire protection and corrosion control coatings to Western Canada.

Devoe's existing stores in Canada will distribute International Paint's line of Chartek® fire protection and Ceilcote's anti-corrosion coatings, which include products for the Canadian tar sands industry.

With its U.S. headquarters in Houston, TX, International Paint is part of the AkzoNobel family and is a global provider of high performance coatings products. AkzoNobel also purchased Devoe in 2008.

To learn more about the companies, visit www.internationalpaint.com or www.devoecoatings.com.

Thermo Fisher Receives Award

Thermo Fisher Scientific, Inc., headquartered in Waltham, MA, has been recognized with the Good Design™ Award by the Chicago Athenaeum Museum for its handheld line of Niton® XL3t Series XRF analyzers.

According to the company, the Good Design Awards is the world's oldest design competition of its kind. The awards are conferred annually by the Chicago Athenaeum Museum of Architecture and Design and the European Centre for Architecture Art Design and Urban Studies. The 2008 awards were judged in November in New York and Los Angeles by an international jury of design professionals, architects, experts, and cultural leaders. The Chicago Athenaeum will hold the Good Design Show in June 2009.

LyondellBasell Files Chap. 11

LyondellBasell Industries (Rotterdam, Netherlands) has filed to reorganize under Chapter 11 of the U.S. Bankruptcy Code. The filing applies to the company's U.S. operations and one of its European holding companies, Basell Germany Holdings GmbH. All non-U.S. operating entities will continue

to function independent of the Chapter 11 process.

The company also announced that, pending court approval, it has made arrangements for up to $8 billion in debtor-in-possession (DIP) financing to fund continuing operations.

LyondellBasell produces polymers, petrochemicals, and fuels that are used in a broad range of applications, including paints, coatings, and construction materials.

Eastman Taking Cost Reduction Actions

Eastman Chemical Company (Kingsport, TN), which makes chemicals and other materials for coatings and related applications, announced a series of actions the company is taking in response to the current economic conditions. The company plans to reduce its costs in 2009 in excess of $100 million, with $80 million of that coming from labor-related costs.

A few of the actions planned include eliminating 2009 wage and salary increases, permanent change to the U.S. vacation policy on days carried over, eliminating overtime, reduced use of contractors and part-time labor, and reducing management staff.

The reduction in management staff was recently completed and will result in a restructuring charge of $5 million during the fourth quarter. The company's locations outside of the U.S. are taking similar actions to reduce labor costs.

K-Dow Partnership Cancelled

The Dow Chemical Company (Midland, MI) has announced that the Kuwait Petroleum Corporation (KPC) and its subsidiary, Petrochemicals Industries Company (PIC), notified Dow of the Kuwait Supreme Petroleum Council's (SPC) decision to reverse its prior approval of an agreement between the American and Kuwaiti companies. The SPC had initially okayed a Dow-PIC

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joint venture, K-Dow Petrochemicals.

Dow manufactures products for the coatings, pharmaceutical, personal care, and other industries. Headquartered in Kuwait, PIC makes ammonia, polypropylene, and urea for a variety of applications.

IRL Reviews Nanotech Market

Information Research (IRL), located in Ealing, London, has recently published a new review of the nanotechnology sector, titled "Nanotechnology in the European Coatings Industry."

According to IRL, the European coatings industry has been cautious about the use of nanomaterials due to lack of information about formulation, application, and health risks. The report found that the general opinion is that nanomaterials are only lightly used in the European coatings industry, with the most common usage in scratch-resistant additives.

Dr. Andrew Jackson, the senior analyst at IRL and the author of the report, said that a lack of health and safety guidelines and an unclear definition to the term "nanomaterial" is delaying a more accepted use of nanotechnology.

The report is now available for purchase, and more information can be found on www.informationresearch.co.uk.

products

Oxford Launches New Thickness Gauges

Oxford Instruments (High Wycombe, UK) has launched its new coating thickness gauges, CMI153 and CMI250. The gauges combine eddy current and magnetic induction technology to automatically recognize the base material and switch to the correct mode for measurement, according to the company.

The CMI153 is a single-button, precalibrated unit. The CMI250 offers precalibration or user-created calibration,

temperature compensation, data storage, and statistical analysis. The company says that both devices are ideal for industrial coatings, paint and powder coating, appliance finishing, and more.

More information can be found at www.oxford-instruments.com.

Glass Powders for Coatings from Vitro

Vitro Minerals, headquartered in Social Circle, GA, has developed several low alkali recycled glass powders for use in epoxy, urethane, and cementitious protective coatings. The powders are white, inert, have high hardness, low oil absorption, good electrical properties, and are free of crystalline silica, the company says. Products are produced from both post-consumer and post-industrial recycled glass. In cementitious coatings, the powders react with lime to strengthen and promote adhesion of coating to concrete.

For more information on the products, visit www.vitrominerals.com.

New Blastrac Unit Grinds, Polishes

Blastrac, NA (Oklahoma City, OK) has introduced its new Diamatic BMGP-600-R with POD (point of development) technology. The new product is a grinding and polishing machine that offers a 23-inch working path, according to the company.

The POD technology collects dust and debris through the tool while cooling the diamond and polishing heads. The company says this results in a cleaner work path with increased visibility and extended tool life.

More information on the new product

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can be found at www.blastrac.com.

Plugin Integrates Estimating Software

Tech Unlimited, Inc. (Evergreen, CO) has launched an Universal Integration Plugin for its construction estimating and take-off software, PlanSwift. The plugin allows the software to integrate with virtually any other software on the market.

The company developed a "send data" feature that can send designated information, such as measurement totals. According to the company, more than 4,000 industry professionals currently use the software to complete precise and accurate bids on a daily basis.

For more information, visit www.planswift.com.

Victrex Announces New Flame Spray System

Victrex plc. (West Conshohocken, PA) has announced its development of a new flame spray process for applying its Vicote® Coatings. The company says that previously flame spray technology was limited to the application of metal alloys, cermets, and some low-performance polymers. The new technique can spray a polymer-based coating onto a metal substrate. The result is a tough, durable, and high temperature- and chemically-resistant coating, according

to the company.

More information on this product can be found at www.vicote.com.

Rust-Oleum Has New Floor Coatings

Rust-Oleum® (Roosendaal, the Netherlands), part of the American

RPM group, is introducing three new waterborne industrial floor coatings to complement its EpoxyShield® line.

The EpoxyShield® Sealer is intended to combat dust build-up, according to the company. After application, it only takes one hour to reach a stick-free finish. The sealer protects the floor from wetness and chemicals. The transparent finish is glossy, says the company.

The single-component Ultra floor coating dries within two hours. The mat-finished coating resists chemicals and car tire marks, the company says.

The maximum protection available in the new line comes from the Maxx floor coating. It is a dual-component epoxy designed to resist medium to heavy stress, chemicals, solvents, and car tire marks. The permanent glossy finish also has the option of a skid-resistant or decorative finish.

For more information, visit www.rustoleum.com.

Viscosity Software Offered in Seven Languages

Norcross Corporation's (Newton, MA) VISC6000 Viscosity Control System is now offered in several languages. The system can be ordered in Chinese, Portuguese, Spanish, German, Polish, Turkish, and English.

The system, which includes pH and temperature controls, allows adjustment during operation. It can be retrofit to all existing Norcross viscosity equipment.

Applications include coatings, chemicals, adhesives, and lacquers.

More information can be found at

Send news about the protective and marine coatings industry to Karen Kapsanis, Editor, *JPCL*, kkapsanis@protectivecoatings.com

V.H.P. Awarded Caruthersville Bridge Repair Project

By Brian Churray, PaintSquare

V.H.P. Enterprises, Inc. (Tarpon Springs, FL) was awarded a contract of $5,980,169 by the Tennessee Department of Transportation to repair the Caruthersville Bridge, a 7,098-foot-long by 80.5-foot-wide cantilever bridge that spans the Mississippi River between Caruthersville, MO, and Dyersburg, TN.

Photo courtesy of Mid-America Earhquake Center/Jacobs Civil, Inc.

The project includes cleaning and coating approximately 19,706,110 pounds of existing structural steel, for which SSPC-QP 1 and QP 2 certification is required. The steel will be hand-tool cleaned (SSPC-SP 2), pressure-washed, and overcoated with a calcium sulfonate alkyd system. The contract includes the use of containment to prevent the release of the existing lead-bearing coatings.

The project also includes texture finish application on 11,702 square yards of existing concrete surfaces, as well as sealant application on 1,000 square yards of concrete surfaces.

Tarpon Industrial Wins Dam Coating Contract

Photo courtesy of USBR

The United States Bureau of Reclamation, Great Plains Region, let a contract of $517,725 to Tarpon Industrial, Inc. (Tarpon Springs, FL) to perform surface preparation and coatings application on existing metal surfaces at Canyon Ferry Dam, a hydroelectric power-generating concrete gravity dam on the Missouri River in Lewis and Clark County, Montana. The project includes coating a 70-ton gantry crane, gallery access stairway and handrail surfaces, penstock expansion joints, four river outlet gate assemblies and filling valves, fixed wheel gate storage and pedestal surfaces, four gallery entrance doors, elevator shaft ladders, foundation gallery stairs, and a 9.04-foot by 9.04-foot fixed wheel gate.

MacLan Wins Power Plant Liner Project

MacLan Corp. (Lakeland, FL) was awarded a contract by the City of Lakeland to replace the rubber liner on the interior surfaces of a condensate polishing system service vessel at the McIntosh Power Plant. The project includes removing the existing liner and applying a new 0.1875-inch-thick rubber coating to the interior surfaces. The contract, which is valued at $21,582, requires the use of curing equipment to facilitate a five-day project schedule.

New Hampshire DOT Awards Bridge Painting Bids

The New Hampshire Department of Transportation let two contracts to

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Classic Protective Coatings Awarded Tank Repair Project

Content and Photo courtesy of Jack Kollmer, KLM Engineering

Classic Protective Coatings, Inc. (Menominee, WI) won a contract from Owatonna Public Utilities (Owatonna, MN) to repair and recoat the interior and exterior of an existing 500,000-gallon single-pedestal spheroid elevated water tank. The project includes performing miscellaneous structural repairs and modifications. The steel will be abrasive blast-cleaned to a Near-White finish (SSPC-SP 10). The interior surfaces will be coated with a zinc-epoxy system, and the exterior surfaces will be coated with a zinc primer, an epoxy intermediate, and two coats of urethane finish. The contract requires the use of a Class 2 containment structure (SSPC-Guide 6) due to the residential setting. The contract, which is valued at approximately $305,100, is scheduled to commence in the spring of 2009.

Modern Protective Coatings, Inc. (Hudson, NH) to perform maintenance painting on two bridges. The contracts, which require SSPC-QP 1 and QP 2 certification, include erecting Class 1A containment structures (SSPC-Guide 6) to control the emission of the existing lead-bearing coating systems. The steel on both bridges will be abrasive blast-cleaned to a Near-White finish (SSPC-SP 10) and coated with a moisture-cured urethane system. Modern Protective Coatings secured a contract of $249,900 to recoat approximately 12,900 square feet of steel on a 120-foot-long steel bridge over a saltwater creek and a contract of $294,046 to recoat approximately 17,000 square feet of steel on a 210-foot-long steel overpass bridge.

Fix Painting to Recoat Waterpark Slide Structure

The City of Vista, CA, awarded a contract of $131,900 to Fix Painting Company (Woodland Hills, CA) to recoat a 33.5-foot-tall slide tower at the Wave Water Park. The project includes abrasive blast-cleaning and coating steel beams, structural members, handrails, and siderails, as well as concrete decks and stairs. The steel will be coated with a zinc-rich primer and an epoxy finish system. The concrete will be coated with a non-skid system.

Maine DOT Lets Bridge Painting Project

The Maine Department of Transportation let a contract of $968,000 to Royal Bridge, Inc. (Tarpon Springs, FL) to recoat existing structural steel surfaces on three four-span steel bridges. The contract, which requires SSPC-QP 1 and QP 2 certification, includes recoating a total of approximately 696,000 pounds of steel. The steel will be abrasive blast-cleaned to a

Wisconsin DOT Awards Bridge Coating Contract

The Wisconsin Department of Transportation awarded a contract of $687,737.60 to C&L Contracting, Inc. (Gillett, WI) to recoat dual 5-span, 640-foot-long steel plate girder bridges over the Chippewa River. Approximately 87,700 square feet of existing structural steel will be abrasive blast-cleaned to a Near-White finish (SSPC-SP 10) and coated with a zinc primer, an epoxy intermediate, and a urethane finish. The contract includes erecting a negative pressure containment structure to control the emission of the existing lead-bearing coating system.

Tallahassee Awards Tank Coating Contract

The City of Tallahassee, FL, awarded a contract of $129,900 to H2O Towers, LLC (Saline, MI) to clean and recoat an existing 500,000-gallon hydropillar elevated water storage tank. The exterior of the tank will be pressure-washed, spot-cleaned, and overcoated with an epoxy-polyurethane system. The interior wet surfaces will be abrasive blast-cleaned and lined with a zinc-epoxy system. The interior dry surfaces will be pressure-washed, spot-cleaned, and overcoated with an epoxy-acrylic system.

Near-White finish (SSPC-SP 10) and coated with an organic zinc primer, an epoxy intermediate, and an aliphatic urethane finish selected from NEPCOAT List B. The contract includes erecting Class 1A containment, as the existing coatings may contain hazardous materials.

Universal Painting Secures Concrete Repair and Coating Contract

Universal Painting Corporation (Lakeland, FL) won a contract of $143,029.92 from the City of Orlando, FL, to perform concrete repairs and coatings application on two pretreatment channels and two grit chambers at the Water Conserv II water reclamation facility. The project includes repairing spalled concrete, coating exposed reinforcement steel with an anti-corrosive cementitious coating, and lining the concrete structures with a 100%-solids epoxy or polyurethane system. The liner will be applied to approximately 3,200 square feet of pretreatment channel surfaces and approximately 3,300 square feet of grit chamber surfaces.

Worth Contracting Wins Tank Rehabilitation

Worth Contracting, Inc. (Jacksonville, FL) was awarded a contract of $248,850 by Sarasota County, FL, to perform coatings application and cathodic protection installation on a 2 MG steel elevated water storage tank and to perform coatings application on a 135-foot-long, 2-foot-diameter, cast iron pipe aerial crossing. The interior surfaces of the tank will be pressure-washed, spot-cleaned, and spot-coated with a 100%-solids epoxy system. The exterior surfaces of the tank will be pressure-washed, spot-cleaned, and coated with an epoxy spot-primer, a polyurethane intermediate, and a fluoropolymer polyurethane finish. The aerial crossing will be brush-off abrasive blast-cleaned prior to recoating.