FUSIBLE PVC® PIPE INTRODUCED IN THE PERMIAN BASIN
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Innovation takes the forefront at Aegion in 2018
Chief Technical Officer David Kroon discusses our values and how they impact safety, quality and innovation

Certified Applicator Program
Fyfe kicks off its new Certified Applicator Program

NEW at Aegion
Aegion introduces prelined pipe spools and UV Cure technology to the market

Safety and quality
Aegion makes updates to fleet system; Quality implements a new customer survey experience

Focus on project management results in cost savings
Corrpro provides complete cathodic protection on a natural gas liquids pipeline that results in cost savings for the customer

Fusible PVC® pipe introduced in the Permian Basin
Fusible PVC® Pipe is used to convey raw water in the oil fields of the Permian Basin

Raising the bar for CIPP lining in water mains
Insituform and ULC engineer a new solution for mechanical service reinstatement

Solving the stray current problem
Corrpro helps a client mitigate stray current on its public transit system

Novel deepwater field joints
Aegion Coating Services completes the first project of its kind on a high-temperature deepwater pipeline project

Seismic retrofit of a historic hotel
Fyfe’s Tyfo® system is used to rehabilitate the historic Century Plaza Hotel

Advanced data collection
Aegion expands its Asset Integrity Management offerings with a new data collection system
Aegion Technology 2018

Within our strong corporate culture, our values define who we are.

OUR VALUES

Aegion Values

Inherent to our values are safety, quality and innovation. 2018 brought increased focus on these three areas in addition to industry recognition of our achievements.

Safety

In 2018, each Aegion platform received industry awards for our safety program.

Energy Services received the American Fuel & Petrochemical Manufacturers (AFPM) Contractor Safety Award at 9 of 14 facilities where we provide maintenance, construction and turnaround services. This award recognizes maintenance contractors working a minimum of 20,000 hours per calendar year at a member facility.

The Insituform manufacturing facility in Batesville, Mississippi achieved Star Status recognition after completing a VPP/OSHA safety audit. Batesville employs approximately 150 people and achieved Star Status recognition after completing a VPP/OSHA safety audit. Batesville employs approximately 150 people and achieved Star Status recognition after completing a VPP/OSHA safety audit.

Aegion Coating Services was recognized for its outstanding safety performance by the Industrial Safety Training Council. Awards included the Safety Sustainability Award for working five years without a lost time incident and the Safety Achievement Award for zero recordables over the last three years. Our teams in Tulsa and the Middle East surpassed 1.4 million man-hours without a lost time incident.

Quality

Aegion is proud of the ISO 9001:2015 certification that several business units hold for our Quality Management System covering the areas of design, applications engineering, manufacturing, assembly and installation. Customer feedback continued to be key to our improved product and service offerings (more on page 9).

Environmental Techniques was Achilles certified for its performance in the areas of health and safety, quality, environment and corporate social responsibility. This is one of the toughest and most coveted accreditations in the United Kingdom, requiring a comprehensive annual audit to demonstrate exemplary performance in all areas.

Innovation

Innovation drives our ability to BE BETTER. All of our business units have been busy developing new technologies and methods of application. In 2018, we had 18 patents issued with 53 additional new pending applications.

Our Northwest Arm Trunk Sewer (NATS) project in Halifax, Nova Scotia, was recognized as Project of the Year runner-up for pipeline rehabilitation by Trenchless Technology magazine. The project was challenging in part to the weight restrictions of Canadian National Railway bridges, and required onsite fabrication of the 13 CIPP liner segments with over one million pounds of resin. The project represents the longest CIPP installation of an arch-shaped pipe in Canadian history at 2,235 linear feet.

The Insituform engineering and R&D groups were busy throughout 2018 developing innovative technologies for CIPP renovation for both water and sewer applications. New and improved fabrics and resins were identified, tested and NSF certified. Better installation practices were developed, and safer, more efficient equipment was designed and built. Great progress was made in the development of an internal service line reinstatement process (more on page 13) to provide leak-free connections in CIPP-lined potable water mains.

One of the biggest accomplishments at Fyfe Company was the successful implementation of our certified applicator training program (more on page 6). Another important achievement was the development of our new, double-thickness glass fiber-reinforced polymer system called Tyfo SEH-81A, which optimizes pipe designs and reduces costs for pipeline owners. New laws in California require owners to retrofit their non-ductile concrete buildings. Our engineers completed new structural testing and prepared a building code criterion that will help owners satisfy the requirements for seismic retrofits. Fyfe also advanced the technology for internal repair and reinforcement of large-diameter water line segments.

Aegion is proud of the ISO 9001:2015 certification that several manufacturing facilities have received for their quality management systems. This certification demonstrates exemplary performance in the areas of health and safety, quality, environment and corporate social responsibility.

Aegion continues to be key to our improved product and service offerings (more on page 9). Another important achievement in 2018 was the successful implementation of our certified applicator training program (more on page 6). Another important achievement was the development of our new, double-thickness glass fiber-reinforced polymer system called Tyfo SEH-81A, which optimizes pipe designs and reduces costs for pipeline owners. New laws in California require owners to retrofit their non-ductile concrete buildings. Our engineers completed new structural testing and prepared a building code criterion that will help owners satisfy the requirements for seismic retrofits. Fyfe also advanced the technology for internal repair and reinforcement of large-diameter water line segments.
Aegion Coating Services continues to advance the robotic tools and system used to inspect and coat internal pipeline girth welds. A new wireless data communication system is being integrated into our equipment fleet which gives us the ability to travel at least one kilometer into the pipe while maintaining data rates of 865 Mbps—many times more data than was previously possible. Using this new technology, we are able to equip our current fleet with the tools and sensors needed to ensure the highest quality. The plug and play design of the platform will facilitate quick development of future tools, such as a laser cleaning head and spot weld repair system.

Aegion Coating Services has also greatly advanced external field joint coating and insulation for both deepwater offshore and underground applications. A complete system was built and successfully deployed on a high temperature, deepwater project in the Gulf of Mexico (more on page 17).

During 2018, Corrpro focused on innovative advanced data collection (ADC), asset integrity management (AIM) and cathodic protection power supplies and controllers. Low-cost remote monitoring and control systems were developed and installed at hundreds of locations. A solar power system, which uses super capacitor technology for energy storage, was invented and deployed. The Corrpro ADC system was developed and put to use in the field for collection of cathodic protection data on customer facilities, and 2019 will see further advancement of ADC for pipeline integrity applications (more on page 21). Great steps were taken in further development of AIM with new applications for delivering data, data analytics and managing assets.

2018 was a great year, and we are working for the same in 2019.

Wishing the best for all of you,

David Kroon, P.E.
Chief Technical Officer
Aegion Corporation

Fyfe Company officially commenced the development of its new Certified Applicator Training Program in August 2017 to create a network of certified applicators who are properly trained on the use of the Tyfo® system for aboveground civil structures. This shift in direction from previously self-performed installations through FibreWrap Construction holds many benefits for Fyfe Co., including the expansion of the Tyfo® brand to established contractors, continuation of Fyfe’s status as an industry leader for strengthening solutions and access to Fyfe engineers, who provide the highest standard of quality across the nation.

Fyfe’s training program was implemented with support from our engineering, sales, research and development (R&D) and operations departments. The program is currently managed by a two-person team with over 40 years of experience within Fyfe Co. Fyfe’s Senior Training and Inspection Officer, Mark Postin, has been with Fyfe and FibreWrap Construction since 1988 and has held senior operational roles within FibreWrap as well as critical technical roles in Fyfe’s early R&D that helped establish the technology in the structural rehabilitation market. Fyfe’s Quality Assurance Engineer, Reymundo Ortiz, has been with Fyfe since 2009 and has focused on materials engineering, R&D and materials testing to develop new and existing products. Together, their combined operational and engineering experience has been vital to training contractors on successful product implementation.

The inaugural certified applicator training class was held in October 2017 in Rancho Cucamonga, California. As of December 2018, there were more than 60 contractors recognized as certified applicators (totaling over 250 individuals). Fyfe has also expanded its training program to include special inspectors and structural engineers. Participants take part in a two-day program that combines classroom and hands-on training. The program covers industry terminology, environmental factors, field quality control, installation methods and inspection procedures of the Tyfo® system.

Applicators agree on the advantages of being part of Fyfe’s certified applicator network:

- The Tyfo® system is very user-friendly and preferred by experienced contractors.
- The Tyfo® system is the most tested, approved and widely recognized in the industry.
- Fyfe’s engineering and application experience is greater than any other.
- Fyfe provides the most comprehensive training and support to ensure contractors have the answers they need to succeed.

The feedback from applicators has been overwhelmingly positive. Both new and experienced contractors have praised the program and remarked on how informative it has been.

- “Quality control and correct application is key to performance of FRP.”
- “Temperature and surface preparation are very important.”
- “Ratios, temperature and education on the system matter for producing the best results.”
- “Very well-done class and very informative… maybe increase training to 3 days.”
- “Hands-on is a must!”
- “Entire class was extremely valuable not having prior field experience.”
- “I can’t tell you how much the Certified Applicator Program has done for us. I’ll be honest, my attitude was probably not the best going in… but I was totally wrong. I walked out of there super charged and loaded with more ideas and processes for our company and how I can make us better.”

United Pipeline Systems continually innovates to provide solutions to customer needs in a constantly maturing liner market and to expand the use of liners into previously untargeted markets. Our WeldTite® welded connection consistently gains traction as the preferred connection methodology in environmentally and safety-sensitive areas while we continue to improve the design to reduce the overall installed cost. 2019 will see United offering pre-lined spoons that owners and operators can install with their own personnel (more on page 8).
NEW AT AEGION

IPLUS INFUSION® UV
Abu Abraham

Cured-in-place pipe (CIPP) is the most commonly known trenchless pipeline rehabilitation method. Consisting of a felt liner material infused with a polymeric resin, the soft CIPP tube is installed into the original host pipeline via an inversion or pull-in method. The resin is then polymerized to form a hard liner that extends the life of the pipeline.

A vast majority of CIPP rehabilitation projects occur in the wastewater pipeline market. Since its introduction in 1971, the product has seen incremental changes in the product materials as well as in the equipment used to install. Traditionally, the polymeric resin reaction is initiated thermally using a heat source like water or steam, but it can also be accomplished using ultraviolet (UV) light. The typical CIPP tube uses a non-woven felt made of polyester fibers and a thermally cured polymeric resin. Traditionally the use of UV light cure technology has necessitated the use of a fiberglass reinforcement to allow light penetration. Insituform has introduced iPlus infusion UV, a technological breakthrough that combines non-woven felt fibers with a UV light cure system.

NEW PREFIT™ TITE LINER® PRE-LINED PIPE SYSTEM
John Demore

United Pipeline Systems is pleased to announce the new PreFIT™ Tite Liner® pre-lined pipe system with a range of supporting end connectors. The system uses a thermoplastic lining inside a steel pipe, effectively combining the strength of steel with the corrosion, chemical and abrasion resistance of thermoplastics.

Some of the valued benefits of pre-lined pipes include overall project cost savings, excellent flow capabilities, high corrosion/chemical/abrasion resistance and quick and easy installations that can be performed by local contractors.

After the steel pipe is factory-lined with thermoplastic, the pre-lined pipes are shipped and ready to be connected in the field. United is initially offering end connections similar to the offerings for our Tite Liner® system, such as flanged spools with pressure ratings up to ANSI 2500#. In addition, we are also offering coupled spools with operating pressure ratings up to 3,000 psi.

United Pipeline Systems has been a global leader in providing thermoplastic lining systems for internal pipeline protection for more than 30 years. United has constructed and internally lined more than 20,000 miles (32,000 kilometers) of pipelines on six continents since 1985. With locations in the United States, Canada, Mexico, Chile, Brazil, Malaysia, South Africa and Oman, United can respond quickly with the specialized personnel, equipment and material resources necessary to complete turnkey projects anywhere in the world.

Example of UV curing equipment

The iPlus Infusion® UV system combines the strengths of polyester tube with that of the UV cure resin.

PreFIT™ Tite Liner™ pre-lined pipe spools
CUSTOMER FEEDBACK IS KEY TO CONTINUOUS IMPROVEMENT AT AEGION
Jennifer Bean

Aegion continues to use customer feedback to improve our product and service offerings. We implemented a consistent customer feedback process across North America in 2016. This process helps ensure our customers have an opportunity to provide feedback on every project. This process was improved even further in 2018 when a new software system to obtain the feedback was implemented. Users may now take the survey from any mobile device, the management team can monitor feedback through a dashboard and a corrective action tracking system allows for better follow-up when feedback received is not desirable.

The survey questions are separated into several categories:
- The sales experience
- Executing the work
- Project closeout
- Overall satisfaction

Dashboards are set up to track performance in each of these categories along with the net promoter score, which measures that all customers are satisfied with our products and services. Our Aegion Energy Services DOT compliance group, led by Jenna Baker and John Redo, implemented the successful transition from Truescreen to DISA, a third-party database that tracks drug results and driver files.

Another achievement for 2018 was the cross-company event to implement a strong focus on driver vehicle inspections and vehicle maintenance. The year culminated in the successful completion of Aegion’s Commercial Safe Driving Day and Driver Vehicle Inspection Train the Trainer programs for both our Corrosion Protection and Infrastructure Solution platforms, in addition to individual pre-trip inspection videos. As a result, there has been an improvement in compliance scores and awareness is up across all business units as we continue to see improvements.

Other 2018 accomplishments by Aegion’s fleet team included updating U.S. Fleet and Drug & Alcohol Policies and the Canadian Drug & Alcohol Policy to reflect the legalization of cannabis in Canada. We also created a DOT inspection tracking database. Our Aegion Energy Services DOT compliance group, led by Jenna Baker and John Redo, implemented the successful transition from Truescreen to DISA, a third-party database that tracks drug results and driver files.

AEGION FLEET TEAM KEEPS DRIVERS SAFE
Jennifer Hudgens

Aegion Corporation employs over 400 commercial motor vehicle drivers in North America who follow strict regulations set by regulatory agencies established by the United States Federal Motor Carrier Safety Administration (FMCSA) and Transport Canada. 2018 was a year of challenges and successes. In December 2017, the FMCSA released a mandate that all motor carriers begin tracking hours of service – both working and driving hours – on an electronic log device. Our U.S. companies were already tracking their hours and Canadian companies began the process in December 2018. Drivers adapted to this new requirement and ended the year on a strong note.

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AEGION CORPORATION

FOCUS ON PROJECT MANAGEMENT RESULTS IN COST SAVINGS

Plans for a new 1,400-mile natural gas liquids (NGL) pipeline were announced in May 2017. This NGL pipeline will transport product from the Permian Basin and Central Oklahoma to a fractionation and storage complex in Mont Belvieu, Texas with an estimated capacity of 300,000 barrels a day.

The pipeline owner contracted two engineering firms to design the pipeline system, and the work was divided between them. It is common in the industry for an owner to place cathodic protection and AC mitigation scope as a responsibility of its design firms. The head of NGPL operations for the owner was concerned that the two firms would select different cathodic protection contractors and cause complications for operations due to lack of consistency. To complicate matters, the owner had assigned multiple project managers to different sections of the pipeline.

Due to the length of the pipeline and complexity of the project, the owner had many concerns for critical items such as design and construction schedules, logistics of materials, coordination of resources and overall cost. Multiple stakeholders would need to be consulted or informed throughout the project including the owner, project managers and engineers, engineering firms, pipeline contractors and multiple Corrpro departments across multiple offices.

In response to the concerns of the customer and to ensure successful execution of the project, Corrpro developed a project management approach based on the engineering, procurement and construction (EPC) model.

AEGION TECHNOLOGY REVIEW
OVERVIEW

The Permian Basin, located in West Texas and southeast New Mexico, is a part of the western portion of the United States Mid-continent Oil Field. It has become the largest petroleum-producing basin in the United States, currently producing more than 3 million barrels of oil per day. With production rates increasing, Permian Basin drillers could soon be pumping enough crude oil to outmatch every nation in the world except Russia and Saudi Arabia.

Solaris Midstream of Midland, Texas develops raw and produced water lines used in oil & gas production in the Permian Basin. Currently, development is specifically focused on an area south of Malaga, New Mexico along the Texas/New Mexico border and in the heart of the Permian Basin. Solaris operates a 42-million-gallon raw water pond. Solaris is in the business of efficiently moving the fluids upon which the oil development work in the Permian Basin functions and had been using trucks as a means of transportation to deliver water to fracking rigs in the region. Trucking raw or fresh water can be very challenging due to the area’s remoteness and questionable road quality. In the case of this specific application, building a new distribution pipeline and pump rig would reduce the operating costs and improve oilfield water logistics. These pipelines would run from the fresh water pond and pump station constructed in Texas just south of the Texas/New Mexico border and head north through Lea and Eddy counties in New Mexico to fracking rigs. This pipeline system would provide a steady supply of water to and from various rigs in the region and reduce the need to truck water along primary routes.

Solaris Midstream would normally complete this raw water pipeline with high-density polyethylene (HDPE) pipe. For this project, they evaluated the use of Fusible PVC® pipe, an alternate thermally butt-fused thermoplastic pipe material, for this project. Fusible PVC® pipe provided some unique advantages compared to HDPE, even though HDPE pipe is more commonly used in the oil & gas industry. First, Fusible PVC® pipe was more readily available in terms of production and lead time, allowing Solaris to meet its strict project deadline. In addition, PVC thermoplastic material has a higher tensile strength than HDPE thermoplastic. Practically, this means that for the same pressure carrying capacity and required flow area, smaller diameter pipe and thinner walls are required for PVC, saving material and significant pipe cost. Solaris was also able to reduce material cost by utilizing four different pressure-rated pipe sections. Based on forecasted water demand, hydraulic modeling showed that a range of PVC pressure class pipe sections, from 305 psi down to 165 psi ratings could be utilized. By doing so, the engineer reduced cost by using thinner-walled pipe where pressure in the line was lower.

The project alignment spanned over nine miles through arid, undeveloped land. The open terrain simplified layout and installation but complicated crew and equipment mobilization to the project site. The closest towns where construction crews could stay were over an hour drive from the project site, and the site itself was far from any paved roads. The design was completed and pipe ordered by late March 2018. Construction started in May 2018, and the project needed to be installed and operational by July 1, 2018. This schedule required intense coordination between owner and project manager Solaris Midstream, installing contractor Blackline Energy Services and Underground Solutions, who provided the Fusible PVC® pipe and assembled it using thermal butt-fusion joints onsite.

Despite the challenges presented, including the tight schedule, all parties involved worked together throughout the design, procurement and construction to meet the ambitious deadline. Nine miles of 16-inch fresh water line and 12-inch produced water line were installed and operational in less than four months. This project marks Fusible PVC® pipe’s first major step into the oil & gas development market in the Permian Basin, a market which has yet to reach its full potential. The continued growth of oil production in the Permian Basin will open opportunities to move water necessary for fracking in the future. The success of this project demonstrates Fusible PVC® pipe’s efficacy for water transfer applications and raw water distribution in West Texas and other oilfield locations.
RAISING THE BAR FOR CIPP LINING IN WATER MAINS

The process of using cured-in-place pipe (CIPP) to line water mains has been used selectively in North America for over 15 years. Several issues have become more important to owners and engineers as the industry has evolved and grown. Concerns regarding the design and confirmation of installed liners’ structural capacity has led to AWWA-sponsored guidelines that move from the existing qualitative design requirements to quantitative means of designing, producing and verifying the structural capability of CIPP water main liners.

CIPP pressure pipe liners are continuous pipes and designed to be watertight at specified operating conditions. The two locations that require a seal are at the liner end terminations and at service connections. Insituform has developed a proprietary system to ensure a solid, long-term seal at the end terminations of pipes. Current industry practice typically involves simply cutting the line flush with the host pipe and applying a coating of epoxy over the cut liner face and host pipe. This is intended to prevent any migration of water between the host pipe and liner. An upgrade to this method involves installation of an expanded internal end seal that steps up from the host pipe over the liner. These are often installed in the existing host pipe and expanded in-place to provide a seal. In this process, expanding the seal against the host pipe can result in significant loads on a deteriorated conduit in its present or future condition.

Insituform’s process of termination of the liner includes a new FRP spool piece, which provides a significant improvement in bond or seal, as well as solid, long-lasting restraint against the forces required to expand an internal seal.

Perhaps the most contentious consideration in a CIPP water main lining product, after establishing the structural rating of liners, is the ability to produce a reliable seal at internally reinstated service connections. There is no concise standard or guideline that establishes the required bond strength. Current practice is to simply clean the host pipe by moderate pressure flushing (2000 to 3000 psi), pulling scrapers through the water main or using some form of rotating mechanical system to remove hard encrustations or deposits in water mains. Post cleaning, the liner is installed and cured to form a new pipe within the host pipe. The vast majority of internal service connection reinstatements involve simply drilling through the liner material that covers the opening on the host pipe.

Many options available to provide a prepared internal surface for CIPP water main liners range from the simple medium pressure flushing, which produces adhesive bonds in the range of 0 to 200 psi, hand-applied FRP liners which generate bonds of over 1000 psi with man-entry abrasive blasting of metallic pipes and fusion-bonded epoxy systems that require bond strengths of over 3000 psi. Operating in small-diameter water mains makes some of these processes impractical. A mechanical style seal eliminates the need for reliance on bond or adhesion between the liner and host pipe.

Insituform developed a process over a decade ago known as the iTAP® system which eliminated the need for bond or adhesion at service connections. The process involved plugging the service connection prior to lining then drilling out the plug, similar to current industry practice. The iTAP® system increased the capability to provide a seal by inserting a hollow T-nut into the corporation stop to provide a mechanical seal. While the process was a technical success, the system required additional time for installation. This prompted the desire for a cost-effective, reliable plug and fitting system that provides a reliable and long-term mechanical system.

Insituform has worked with ULC Robotics, a specialty robotics firm with experience in pipe rehabilitation and inspection, over the past year to improve the design of the mechanical internal service connection. Key design considerations for the improved mechanical internal service connection focused on simplified installation of the plug and fitting and improved efficiency in installation—both of which must lead to a more cost-effective solution and have the ability to address direct tapped and saddled services. As the project evolved, it became obvious that a method for location of the plugged and lined over service was also essential. The system provides autonomous location of the center of the plug to within 0.1 inches. Both the plug and fitting installation processes use the same robotic train, which carries up to eight units, accommodating service connections ranging from ½-inch to 1-inch.
A major electric distribution company in a large metropolitan area had been maintaining and monitoring an effective cathodic protection system on its high-pressure, fluid-filled pipe-type cables, bringing high-voltage AC into downtown substations. The city has direct current (DC) transit systems for both internal public transportation and commuter rail. Although stray currents had been a persistent problem in this congested scenario, much progress had been made in identifying and mitigating the effects. A major supply component consisting of two 18-inch pipe-type cables with 5-inch oil circulation lines was being protected with regularly spaced rectifiers. Unexpectedly, routine cathodic protection monitoring uncovered a severe increase in detrimental stray current interference, with structure-to-electrolyte (S/E) potentials shifting several volts positive with swings of 1,800 millivolts observed over short periods of time.

After the utility had tried several unsuccessful remedies, such as the addition of supplemental cathodic protection and installation of a bond that regularly returned a time-weighted average of 5 amps with a maximum of 56 amps to the nearest transit substation, Corrpro was called in to identify, locate and resolve the source of stray currents.

SOLVING THE ISSUE

Corrpro began a systematic identification of the location and extents of the affected area. Dataloggers deployed along the pipe-type cables’ route revealed a severely affected area approximately 1,000 feet long. Corrpro measured sample line currents on each pipe-type cable averaging 30 – 45 amps, with spikes of over 200 amps.

Possible sources were sought by comparing simultaneous S/E potential recordings on the pipe-type cables and on transit substation negative busbars in the area where access could be obtained, and on large grounded structures where it could not. A nearby commuter rail service yard showed the strongest correlation. This source had nearly been discounted because the pipe-type cables crossed the railroad tracks approximately one mile north of the area most affected by stray current. The discharge section was remote from the crossing. The railroad company agreed to additional testing and requested that Corrpro establish a temporary bond as part of the investigation process. A 1,000-foot bond was installed that returned an average of 82 amps and up to 99 amps.

Two transit power substation cables were included in the evaluation, with the bond returning to the negative busbar on the northern one, which was closest to the pipe-type cables. A small service power rectifier in a maintenance facility was also tested. Synchronized dataloggers were placed to simultaneously record structure-to-electrolyte potential and bond current on the railroad electrical facilities and on strategic locations along the pipe-type cables.

While the temporary bond had a measurable effect of making pipe-type cable S/E potentials more negative, it was clearly not the complete solution. The pattern of interference in the measured S/E potentials in the most affected area of the pipe-type cables bore a stronger similarity to potentials measured on the negative busbar at the southernmost railroad substation and the power service rectifier nearby. No new facility construction or major change in electrical operations had occurred that coincided with the sudden increase in stray current. The answer was elusive until a Corrpro field engineer investigating the service facility found a small connection to building grounds that, when tested, was found to be returning an average of 128 amps and up to 156 amps to the small rectifier busbar.

The service power rectifier was in a maintenance facility where car inspections and repairs were conducted. Railroad cars were pushed into the facility because there was no third rail, and the tracks were intended to be electrically isolated from negative return running tracks. The service power rectifier provided power through a direct connection, enough to operate car components, but not enough to drive a locomotive. Because workers in the facility had reported shocks coming from touching car components, the system was grounded by adding a connection between the rectifier negative and through it to the rails and the building grounds. Of the two sets of rails going in and out – a total of eight isolation joints – one had failed completely and most of the rest had lost some degree of electrical resistance. The connection to the building grounds at the maintenance facility created a large, low-resistance contact that resulted in a path for traction current that originated in the southern substation, jumped off the rail system somewhere to the south, flowed onto and along the pipe-type cables, to where it discharged into the soil at the closest approach of the pipe-type cables to the rectifier in the maintenance facility.

SOLVING THE STRAY CURRENT PROBLEM

The railroad replaced all of the rail isolation joints to address the issue. An immediate improvement was found on the pipe-type cables, with cathodic protection levels returning to the status quo ante. Variations in structure-to-electrolyte potential were still observed but were much smaller and mitigated by the cathodic protection. Transitory spikes were observed as railroad cars were pushed into the maintenance facility and bridged the rail isolation, but these tended to be only a minute or two in duration and only a few times a day. No permanent bond was required.

A typical rail system
Aegion Coating Services designed a field joint system for a deepwater project in the Gulf of Mexico. The insulation process was qualified in November 2017, following years of working with the client and Materia, the insulation manufacturer. Aegion Coating Services leveraged technology it developed for insulating the deepwater equipment of the project, which also won Aegion Corporation’s 2017 Chairman’s Award for Innovation. During 2018, Coating Services completed an improved design for a containerized skid, validated the design and executed a multimillion-dollar project using the new technology.

NEW MATERIALS

This was the first time polynorbornene insulation had ever been used on pipeline field joints. This game-changing polymer allows lines from hotter wells to have an insulation that is on par with mainline insulation on their field joints. While silicone is an alternative approach that comes close, its maximum temperature still measures below the client’s required operating conditions.

In addition to managing extreme operating conditions, Coating Services had to work closely with Heerema Marine Contractors (HMC) to ensure that the application process met safety and productivity requirements. The deepwater construction vessel, Balder, required field joint application in both horizontal and vertical orientations. This unusual configuration essentially required two separate field joint systems be developed, tested and executed. Additionally, all equipment was required to interact with shipboard safety systems.

PROJECT EXECUTION

All equipment was tested and ready to install ahead of schedule. By containerizing the material skid and minimizing interconnection points, installation time was kept to a minimum. Aegion engineers worked closely with HMC’s engineers, designing around the space constraints of the vessel and configuring the equipment for ease of maintenance. The Balder crew was pleased with the simplicity of the installation, which was executed according to plan.

Aegion Coating Services planned all steps of the process in conjunction with HMC, Shell and other third parties. By ensuring all were aware of their role in the process, communication problems were minimized. The crew was able to be reduced to just 12 Coating Services personnel, and the cycle time dropped by 35 percent. This was a direct result of the extensive planning and training Aegion Coating Services performed during the design and validation portions of the project.

HMC was able to finish the installation of the lines six weeks ahead of schedule due to the hard work of the Coating Services crew. Only two joints were rejected during the production phase of the job – one due to operator error and another due to a customer emergency stop elsewhere in the work area. The project reject rate of 0.08 percent represents world-class quality, far superior to the current industry average. In addition, the equipment uptime was greater than 99 percent over the course of the project.

ZERO INCIDENTS ARE POSSIBLE.

Safety was designed into the process from the beginning, through hours of engineering analysis and validation of safety systems. The reduction in the number of technicians also helped minimize risk to project personnel. Aegion Coating Services worked with all parties in the work area to improve hazard awareness, including daily safety talks. These actions resulted in zero on-duty injuries during the entire job.

PROJECT RESULTS

This deepwater Gulf project is an example of how customer engagement early on in a project can have positive effects throughout execution. We were able to present several options and backup plans to the customer, work through possible failure modes and verify changes in scope. Having cemented such a close relationship with all parties, we achieved more effective communication with HMC and the client throughout the project.

Advances in product development with Materia opened up offshore projects like this to field joint coating as a solution. At this time, there is no other known solution for this temperature and depth. Aegion Coating Services will continue to improve this technology to SOLVE PROBLEMS such as reel-ability, vessel headcount reduction and reduced cycle times for the offshore industry.
The Century Plaza Hotel has been marketed as “the World’s Most Beautiful Hotel” since it opened in 1966 in Los Angeles. The iconic building became the setting for numerous high-profile events and has hosted numerous presidents, even serving as President Reagan’s “Western White House” in the 1980s. In 2008, new owners announced plans to demolish the hotel. But the hotel was added to the National Trust for Historic Preservation’s list of the eleven most endangered historic places in America in April 2009. This prompted the developer to announce in 2010 that it would renovate the building, including a seismic retrofit. This retrofit of the main building coincides with the construction of two new 46-story towers for the historic hotel.

The Tyfo® system was a major part of the retrofit of the main building. The project, consisting of column, beam and slab strengthening, started in October 2017 and is due to be completed in spring 2019. As with most seismic retrofits, the Tyfo® system was only part of the solution. Additional conventional steel was added along with buckling restrained braced frames. Fyfe worked closely with Englekirk Consulting Engineers, the engineer of record, to design and specify the advanced composite solutions. The material cost of the Tyfo® system exceeded $2.5 million dollars. This is one of the largest building retrofit projects the company has worked on to date.

The work was performed by Penhall Company, one of Fyfe’s trained and certified applicators in Southern California. Penhall sent multiple teams to a two-day training course at our Rancho Cucamonga office. One of the biggest challenges was the need to train multiple crews to be able to handle the scope of the project.

The project consists of many phases with multiple mobilizations. Because several trades were working at each level, a need for enhanced communication and coordination between the various contractors was required. The scope of work included over 170 columns, 15 beams and over 32,000 square feet of slab strengthening.

In addition to the specified scope, there were many slab openings identified during the project that required additional strengthening. These change orders added another 2,400 square feet of strengthening spread out over 17 floors.

Tyfo® SCH-41 was the main product used on all the structural elements. Tyfo® RR finish coating was applied to achieve the required fire-resistant protection for interior locations that were strengthened for seismic loads (Class A flame and smoke rating). Tyfo® 4HFL coating was applied where elements were strengthened for gravity load and required a two-hour minimum UL assembly.

The thin profile and light weight of the Tyfo® system was critical to achieve the design goal given that it was essential to minimize the added mass to the building. Adding mass creates larger inertia forces during a seismic event and can cause undesirable failure modes in a structure. The detailing, including number of layers, development lengths and splices for the beams, slabs and columns, was unique for each element depending on the required performance enhancement and location. This unique and innovative approach allowed the owners to achieve their vision while strengthening and preserving this historic site.
Aegion set out to improve its asset integrity management (AIM) process in 2016 for the benefit of its customers and to improve internal quality and efficiency. Customers require complete, traceable and verifiable data to meet government regulations. This data also helps them make the best use of their maintenance and repair budgets. The Aegion AIM framework consists of a central geospatial repository and client data delivery tools.

Applications since then for information storage, recall and decision-making have been released on the Aegion Asset Integrity Portal. In 2018, a strong focus was placed on improving our data collection tools, resulting in the creation of our new advanced data collection system. Although some off-the-shelf data collection systems are available, only Aegion’s has all the features and flexibility needed to meet customer demand.

NEW AND IMPROVED DATA COLLECTION SYSTEM

Data was previously collected in the field and imported to the AIM data repository in a variety of formats. With our new state-of-the-art data collection system, Aegion now has a consolidated platform for engineering surveys and will tackle pipeline surveys over the next several months.

The platform consists of the following:

- Integrated survey manager application to configure jobs and intake existing survey data
- Instrumentation consisting of a tablet device, sub-meter GPS and Bluetooth voltmeter
- Mobile software to collect field measurements, locations and asset attributes

PRE-SURVEY SET-UP

The pre-survey step is the area of focus that provides the greatest productivity gains. Survey preparations are completed with a user-friendly setup tool. Project managers simply choose the options they want from a menu of selectable items (see Figure 1).

FIELD DATA COLLECTION

After items are saved into the job-specific survey, it is downloaded to the tablet with just one click. If changes are requested later, they can be made and quickly updated to the tablet. If GPS locations are available, they are imported along with other information to save time in the field. Technicians can see a display on the tablet with color-coded test points and a map with their location. Technicians can also sort by distance to take the most efficient route to the test point (Figure 2).

HARDWARE

The hardware for field data collection consists of a tablet, multimeter and sub-meter accuracy GPS (Figure 3).

POST PROCESSING/DISPLAY

Project managers can pull up the data in a viewer once surveys are in progress to track progress and verify the required information has been collected. After verification, all information is passed to the AssetView™ application for structured viewing and/or report completion as shown in Figure 4.

BE BETTER.

Aegion continues to deliver improvements in the way we deliver information to our customers, and these recent enhancements to our advanced data collection system are successfully improving data quality while simplifying the process.