TRENCHLESSTECHNOLOGY.COM

Trenchless TECHNOLOGY

SEPTEMBER 2024

MAINSTAY IN THE TRENCHLESS INDUSTRY

MADEWELL PRODUCTS CELEBRATES ITS 50TH YEAR

ALSO INSIDE:

NEED A LIFT?

The new **electric remote lift for T66** allows operators to adjust the height of their inspection camera directly from the control unit! You can even pair the remote lift with the T66 Height Attachment (Pictured below) to go from small diameter to large diameter with one system! Available in both SD and HD.

RapidView®
IBAK North America

Sourcewell
Awarded Contract
Contract # 120721-RVL

Push | High Def | Mainline | Lateral Launch | 3D Mapping | PANO 4K Scanner | Rehabilitation | Software

(800)-656-4225 | www.rapidview.com | Quality Makes the Difference

IBAK Inspection Equipment Manufacturing is Certified ISO 9001:2015 and ISO 14001:2015

LEADER IN SLIPLINING SOLUTIONS

AKKERMAN®

SAFE | EFFICIENT | EFFECTIVE

Discover why Akkerman is the leader in sliplining solutions. Our advanced pipe rehabilitation technique seamlessly inserts a new liner pipe inside your existing, deteriorated pipeline. Best of all, we perform this without disrupting service or requiring bypass pumping. Trust Akkerman for innovative, reliable sliplining that keeps your infrastructure running smoothly.

SALES AND LEASING OPTIONS AVAILABLE!

AKKERMAN.COM

IN THIS ISSUE

SEPTEMBER 2024
VOLUME 33 · NUMBER 08

ON THE COVER

Natalie Steele and Craig Closser are ready to shepherd Madewell Products into its next phase.

16 MADEWELL PRODUCTS: A MAINSTAY IN THE TRENCHLESS INDUSTRY

Now amid its year-long 50th anniversary celebration, Alpharetta, Georgia-based Madewell Products Corp. is setting its sights and leadership up for another 50 years of success.

By Mike Kezdi

FEATURES

FEATURES (cont.)

Trenchless TECHNOLOGY

PROMOTING TECHNOLOGY IN THE UTILITY CONSTRUCTION INDUSTRY

AGRIWEB

VISIT US ON

@TrenchlessTech
@TrenchlessTech
linkedin.com/showcase/trenchless-technology-magazine
youtube.com/@TrenchlessTechnology

BENJAMIN MEDIA

Founder: Bernard P. Krzys
bkrzys@benjaminmedia.com

President/CEO: Robert Krzys
robk@benjaminmedia.com

Controller: Marianne Saykes
msaykes@benjaminmedia.com

3554 Brecksville Road, Suite 200
Richfield, OH 44286 USA
(330) 467-7588
www.benjaminmedia.com
e-mail: info@benjaminmedia.com

FROM THE PUBLISHER

SEPTEMBER AND OUR *PIPE RELINING GUIDE*

By Kelly VanNatten

Welcome to an exciting issue of *Trenchless Technology*! We're thrilled to bring you a collection of articles that highlight the incredible innovation and progress driving our industry forward. From pioneering methods in sewer system maintenance to groundbreaking advances in power grid resilience to our annual *Pipe Relining Guide*, this issue is packed with the latest developments that are shaping the future of trenchless technology.

We're especially proud to feature Madewell Products in our cover story as the company celebrates its golden anniversary. Since 1974, this family-owned business has been a beacon of innovation and excellence, particularly with its Mainstay Composite Liner. Madewell's journey from a small operation to a respected industry leader is a testament to its unwavering dedication, cutting-edge innovation, and commitment to quality. Under the visionary leadership of the Steele family, Madewell has not only developed industry-leading products but also built strong, lasting relationships with contractors across the country. Madewell's hands-on training and support have fostered a loyal network of certified applicators, ensuring its continued success and growth for many years to come.

Pipe Relining Guide

This issue also includes our annual *Pipe Relining Guide*, an indispensable resource for all rehabilitation project stakeholders. Inside you'll find in-depth articles on the latest techniques, best practices, and industry innovations, as well as manufacturer product directories. We cover everything from sliplining procedures and their crucial quality control measures to the vital role of cleaning and surface preparation for ensuring long-term durability. Plus, our feature on large diameter lateral rehabilitation dives into the unique challenges and solutions for these niche projects, providing valuable insights from real-world case studies. We also update you on NASSCO-funded research into styrene safety, reflecting our industry's unwavering commitment to worker and community safety.

As you delve into these articles, we hope you find the knowledge and inspiration you need to tackle your next project with confidence.

World Trenchless Day - Celebrate with Us!

If you're reading this before Sept. 26, be sure to register for our World Trenchless Day Municipal Roundtable webcast, which features perspective on the benefits of trenchless technology, as well as the announcement of the winners our prestigious *Trenchless Technology* Projects of the Year for New Installation and Rehabilitation awards! If you can't join us live, the webcast will be available on-demand.

For more details and registration, visit *trenchlesstechnology.com/webinars*.

We also invite everyone in our industry to become trenchless technology ambassadors on World Trenchless Day! Whether through social media, company gatherings, or educational events, let's create a buzz and raise awareness about the transformative benefits of trenchless technology. Let's unite on World Trenchless Day to celebrate and share this game-changing technology with the world!

As always, we are here to serve you, our readers. If you have any suggestions or comments, please email me at *kvannatten@benjaminmedia.com*.

Until next month!

Kelly VanNatten
Publisher,
Trenchless Technology

Renew Your Subscription or Subscribe

If you haven't renewed your subscription in the last year, you'll want to do so now so you continue to stay connected to the industry! Here's the easiest way to renew your subscription or become a new subscriber to *Trenchless Technology* ...

Go to *trenchlesstechnology.com/subscribe* and complete the online subscription form, or scan the appropriate QR code below to complete your subscription.

Renew

Subscribe

FLXX™ MIDSIZE VACUUM EXCAVATOR

FLEX YOUR HUSTLE

Flexible. Productive. Profitable.

Take your operation's get-it-done attitude, then add **TRUVAC FLXX**'s versatility. It's a powerful one-two punch for profitability — and the smaller profile doesn't compromise on payload or performance.

Maximum legal payload with excellent maneuverability	Super-safe, precise digging with DigRight® one-touch flow control	Quick, one-switch setup and teardown with Park-N-Dig™	Choice of air or hydro excavation for all conditions	Flexible build configurations to meet specific needs

TRUVAC® FLXX™

TO SEE THE FULL LINE OR REQUEST A DEMO, VISIT TRUVAC.COM

Trenchless Pioneers

By Mike Kezdi

Trenchless Pioneers: Marc Anctil

Trenchless Pioneers is a special monthly series sharing with readers the trailblazers who grew and expanded the trenchless industry.

For his entire trenchless career Marc Anctil spent his time focused on rehabilitation-related technologies working for Logiball Inc. And many of the things he helped bring to the forefront while at Logiball make Anctil a trenchless pioneer.

Born and raised in Quebec, Anctil studied economics at Sherbrooke University and earned a degree in business administration with a minor in marketing. He had no experience in trenchless before starting his job at Logiball Inc. And to say he had to learn on the fly would be an understatement.

"I started to work for Roger Bissonnette on Wednesday, June 8, 1994, without any experience and very little understanding of the industry. After two days in the shop, Roger tells me I have to head out to Pennsylvania on Monday," Anctil recalls.

At that point Anctil began questioning what exactly he got himself into at Logiball and confers with his new boss about the situation.

"I said, 'Roger, I've never opened a manhole cover in my life.' He then brings me out on the street, pops open the cover and tells me, '[Waste] is coming this way and going that way. That's all you need to know for now.' On Monday, I was headed over to McCandless Township Sanitary Authority in Pennsylvania to install our cured-in-place sectional liner (Combo-Liner)," Anctil says.

Something must have clicked on that trip because, after 30 years in the trenchless industry, Anctil retired from Logiball in July 2024. When looking back at the early years of his career, and from the perspective of a trenchless manufacturer, Anctil says it was a little

sleep and a lot of prototypes.

"For a couple of years, I am not sure if we built two packers the same way. We had ideas and added features to make our equipment a little better than the last one," he says. "Finally, in 2001, we started standardizing our production. Customers would come to us with new problems, and we would go back and design new solutions."

Working for one company his entire career, Anctil often intertwines his contributions to the industry and the work being done by Logiball as a whole. And so much of it is focused on the customer. "I think our ability to listen and understand the issues brought us to innovate our manufacturing of pipe plugs and grouting packers, which has brought us into a leading position in the industry," Anctil says. "We did not sell equipment, but a way to get the jobs done right the first time. You needed something special, out of the ordinary and we would come up with solutions and refined them through the years."

Because of the technologies that Logiball designed and perfected serve multiple sectors of the trenchless rehabilitation space, Anctil has had a unique view of some of the game changing methodologies that have come along.

"The game changer was cured-in-place pipe (CIPP). In the mid- to late-90s, we saw a boom with contractors getting into the trenchless rehab market. They needed auxiliary and specialized equipment and [new] solutions to complete their work," Anctil says. "This created a snowball effect of new CCTV equipment, cleaning equipment, sealing equipment, cutters, etc. As time went by, the acceptance of trenchless technologies continued to grow, and new solutions continued to pop up."

He adds that the industry needs to continue to evolve, especially in light of recent workforce situations. "We must search for alternative delivery methods that will increase a contractor's productivity and ease their installation, but still maintain the same quality controls," he says.

Where does the industry go from here? While Anctil is looking forward to some well-deserved rest and relaxation from his time spent on the road at shows and training sessions, he doesn't see the industry slowing down.

"The need is there, and we, as a society and taxpayers, cannot afford to dig and replace these aging and expanding assets. We need new blood and devoted individuals who are willing to grab the bull by the horns and make a difference while making a dollar at the end of the day," Anctil says. "This industry has been 'recession resilient' and I encourage the upcoming generation of laborers, technicians, entrepreneurs and engineers to have a serious look at this great and growing industry."

Mike Kezdi is the managing editor of *Trenchless Technology*.

UNITED FELTS LAUNCHES NEW UV CIPP LINER PORTFOLIO

United Felts (formerly Applied Felts Ltd. & FerraTex Solutions) recently announced the launch of its new ultraviolet cured-in-place pipe (UV CIPP) portfolio manufactured in the United States.

This new portfolio combines the strengths of United GRP and EnviroCure UV, offering comprehensive solutions for varied sewer rehabilitation needs with the unmatched benefits of UV-cured technology.

The latest addition to the portfolio, United GRP, is engineered for gravity sewers and extensive infrastructure projects. Designed with continuous fiberglass, United GRP liners are notable for their exceptional strength and durability, making them perfect for projects requiring long lengths and large diameters.

"Our United GRP product defines standards in a structurally strong UV option – with features, including a multi-layer, overlapping construction that allows for a thinner wall, optimizing flow capacity. Furthermore, we're delivering liners in as little as two weeks, giving contractors the longest in hands shelf life so that they can plan properly for projects to meet the needs of their customers," said Vortex Companies president and CEO Mike Vellano.

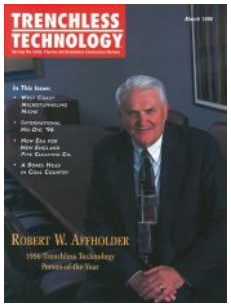
The liners are delivered pre-impregnated from any of the Vortex Companies' wet-out facilities to anywhere in the U.S. and Canada, ensuring rapid, reliable installation and reducing environmental impact.

EnviroCure UV, an established choice in the market, is optimized for sections containing multiple laterals. Its unique construction allows the liner to 'dimple' at lateral connections, simplifying the reinstatement process. EnviroCure UV is ideal for environmentally focused and high-profile projects, delivering high strength with a thinner wall that leads to improved flow and reduced abrasion.

"The excitement of EnviroCure UV is that it provides the perfect amount of flexibility to allow for dimpling at laterals, while delivering the strength to be a 50-year solution," said United Felts technical director Mark Chandler.

"With the introduction of the 'United Felts UV CIPP Portfolio,' we are not just launching products; we are delivering the most robust suite of options in the market, giving asset owners and contractors the power to choose the best solution for their project," added United Felts president Matt Timberlake.

OBITUARY: TUNNELING, CIPP PIONEER ROBERT 'BOB' AFFHOLDER



Robert "Bob" Affholder, a towering figure in the trenchless construction and technology industry, passed away on July 26, at the age 88. He passed away peacefully, leaving behind a legacy of innovation and mentorship that significantly shaped the trenchless industry and inspired the careers of countless professionals.

Affholder's journey in underground construction began in 1958 at Armco Steel Co., where he was first introduced to tunneling and boring systems. In 1968, his entrepreneurial spirit led him to establish his namesake company, Affholder Inc., which quickly made its mark with an (at the time) landmark $500,000 tunneling project. Over the next two decades, Affholder Inc. expanded nationwide, completing numerous groundbreaking projects, helping to innovate tunneling technology, and setting new standards in the industry.

A pivotal moment in his career came in 1982 when a chance meeting on an airplane introduced him to the novel cured-in-place pipe (CIPP) technology. Recognizing its revolutionary potential for pipeline rehabilitation, Affholder partnered with Insituform North America to become its licensee for Kansas and Missouri, incorporating under the Insituform Mid-America name.

With his partner, Jerry Kalishman, Affholder eventually grew Insituform Mid-America into the largest licensor and ultimately took the company public. Despite initial challenges, his determination and innovative approach transformed CIPP from an expensive, risky alternative into a cost-effective, widely accepted solution for repairing failing infrastructure.

His leadership and vision culminated in the 1996 merger of Insituform North America and Insituform Mid-America, forming Insituform Technologies, Inc. As vice-chairman, Affholder guided the company to new heights, driving continued acceptance and growth of CIPP technology and undertaking increasingly complex projects. His relentless pursuit of excellence became

the benchmark for all in the trenchless technology industry.

In 2004, he left Insituform and later reunited with former protégés Jerry Shaw and Tom Kalishman to form SAK Construction in 2006. SAK quickly became a leader in pipeline rehabilitation, embodying Bob's principles of hiring the best talent, fostering respect and trust, and delivering world-class services. In 2023, the SAK Tunneling division rebranded as Affholder LLC, marking the return of the iconic name and continuing Affholder's legacy of excellence and innovation.

Throughout his illustrious career, he received numerous accolades reflecting his pioneering contributions to the trenchless technology industry:

- *Trenchless Technology* Magazine – 1996 Person of the Year
- Underground Construction Technology Association (UCTA) – 2000 MVP
- North American Society for Trenchless Technology (NASTT) Hall of Fame – 2014 Inductee/ Honoree
- Underground Construction Technology – 50th Anniversary Award Recipient
- *Trenchless Technology* Magazine – Trenchless Pioneer

His career was built on the principles of hard work, trust, and respect. Growing up as one of 11 siblings on a Kansas farm, he learned from his father that hard work could be enjoyable, especially when shared with people you care about and respect. This ethos shaped his approach to business and the culture at SAK Construction.

Beyond his professional achievements, Affholder's legacy lives on in the countless professionals he mentored and the industry he helped pioneer.

VACUUM TRUCK RENTALS CONVERTS FLEET TO VACALL UNITS

Vacuum Truck Rentals has converted its entire fleet of vacuum and jetting rental units to Vacall brand AllJetVac, AllExcavate, AllJet and AllVac machines. Vacall machines are designed, manufactured, sold and supported by Gradall Industries Inc., in New Philadelphia, Ohio. Gradall is wholly owned by the Alamo Group.

Vacuum Truck Rentals has one of the largest fleets of specialty equipment in the United States including trailers, tankers, roll-offs, dump trucks and jetters. About one-third of its 900 rental machines are vacuum and jetting machines, which formerly were products from a major competitor, but now have been replaced by Vacall machines.

"Vacall represents high-efficiency, simplistic operation and unmatched reliability," said B.T. Steadman, co-founder and co-managing partner of Vacuum Truck Rentals. "They are a really good

partner, helping us to facilitate our growth. They treat us like a customer."

Vacuum Truck Rentals is a key supplier for contractors serving governments, as well as private industry. Founded in 2001, the company grew out of an environmental service contractor business, Vacuum Truck Services, which was founded in 1998. As the business continued to grow, a sister company, Vacuum Truck Sales & Service, was founded in 2006 and now sells new and used Vacalls and other machines in six states.

"In the fast-moving world of vac trucks, our customers need a partner that's committed to delivering the highest quality products, parts and service," continued Steadman. "Our field experience and dedication make us a leader in the industry with the best product lines, including Vacall."

"Vacuum Truck Rentals became one of the nation's top rental companies by focusing on customer needs and meeting those needs with top-flight equipment, as well as responsive parts and service support," said Tod Ebetino, director of Vacall products for Gradall Industries.

"We are proud to have our products in the Vacuum Truck Rentals fleet," said Mike Popovich, president of Gradall. "They make sure our Vacall machines are available and operating profitably for contractors in many, many states. We appreciate VTR's loyalty, and we are pleased to be a part of their continuing growth plan.

MCELROY RECEIVES OSHA SHARP CERTIFICATION

Oklahoma-based Manufacturer Again Recognized by OSHA for its Commitment to Workplace Safety

On July 15, McElroy was recognized for its commitment to workplace safety and its participation in the Occupational Safety and Health Administration (OSHA) Safety and Health Achievement Recognition Program (SHARP).

Oklahoma Labor Commissioner Leslie Osborn presented the company with a proclamation commending leadership and employees at two McElroy campuses, located at 833 N Fulton Ave. and 5305 E. Admiral Place in Tulsa. She and OSHA Consultation Director Jason Hudson also presented company leadership with a flag commemorating McElroy's SHARP-certified status.

SHARP is an onsite consultation program that offers confidential occupational safety and health services to small- and medium-sized businesses in the United States, free of charge.

Consultants from local agencies or universities work with employers to identify workplace hazards, provide advice for compliance with OSHA standards, and assist in establishing and improving safety and health programs.

"We all can use another set of eyes to help make sure we're doing the right thing here at McElroy and providing a safe workplace for our team," said Tony Little, McElroy Environmental Health and Safety Manager.

While addressing the crowd during the presentation, Osborn commended McElroy 's continued emphasis on employee safety. McElroy, she said, has a long history of ensuring safe working conditions for the hundreds of team members who come to work each day.

"In my six years as labor commissioner, I have discovered that McElroy

Pictured, from left, are McElroy vice president and chief technology officer Jim Johnston, Oklahoma Labor Commissioner Leslie Osborn, McElroy environmental health and safety manager Tony Little, and OSHA consultation division director Jason Hudson.

is like our flagship," Osborn said. "Its three sites are consistently trying to do everything they can to keep their employees safe and to meet the qualifications to be a SHARP company. Often, we use McElroy as an example across the state of why companies should want to be involved in this program."

To become SHARP certified, companies must first reach out to their local OSHA representatives for a consultation visit. During the visit, representatives study the company's entire workplace, doing walk-throughs of facilities, examining existing safety programs, interviewing employees, and going through the company's training records. The process is time and labor-intensive, and once completed OSHA representatives provide a report of their findings.

The company has a long history of dedication to workplace safety. In 1964, McElroy founder Art McElroy asked for OSHA to visit and help assure compliance with OSHA standards. This predated federal OSHA requirements and is a testament to McElroy's culture of safety.

"Even back in those days, Art knew that it would be good to have someone come in and help make the workplace safer for his team," Little said.

McElroy has been SHARP certified since 1999 and its three campuses are part of 14 SHARP-certified workplaces in Oklahoma. This certification extends from 2024 to 2026.

THE NEXT GENERATION OF VERMEER DRILLS IS COMING.

Imagine taking everything that made the Vermeer HDD lineup the go-to drilling equipment solution — and then incorporating new technology and machine refinements that help maximize uptime and performance. It's this kind of thinking that will change the HDD industry and enable your crew to bore more and do it better than ever before.

Stay tuned for the latest Vermeer HDD updates at: ***vermeer.com/nextgendrills***

Vermeer

THE NEXT GENERATION OF VACUUM EXCAVATION IS HERE.

THE FUTURE OF THE UTILITY AND SOFT DIG-INDUSTRIES.

The next generation of solutions from the Vermeer vacuum excavation experts will open the industry's eyes to what comes next. And it starts with the VXT600 vacuum excavator.

See the next generation of vacuum excavation at: ***vermeer.com/vxt600***

MADEWELL PRODUCTS: A MAINSTAY IN THE TRENCHLESS INDUSTRY

Georgia-based manufacturer celebrates 50 years and looks forward to future growth

By Mike Kezdi

There was a lot going on in 1974. A Chinese farmer discovered the Terracotta Army, Happy Days made its TV debut, President Richard Nixon resigned, Hank Aaron broke Babe Ruth's homerun record — and the world of composite liners changed forever with the formation of Madewell Products Corp.

Now amid its year-long, 50th anniversary celebration, the Alpharetta, Georgia-based manufacturer is setting its sights and leadership up for another 50 years of success. Since its inception, captaining the Madewell Products ship has been the Steele family. Incorporating the business in 1974 was Jay Steele, and, later, during the early 1980s, Jonathan "Jon" Steele gained operational control of the business.

As of July 8, Natalie Steele is now the president of Madewell Products. As with most family-owned businesses, she helped around the company in her teenage years, but she officially joined Madewell Products in 2012 following her graduation from the Terry College of Business at the University of Georgia. In the ensuing years, she's worked in several facets of the family-owned business and was most recently vice president of operations.

Joining her at the leadership table is Craig Closser, vice president of business development. Although no longer involved in day-to-day operations, Jon Steele remains an integral part of Madewell as majority owner.

Establishing its Niche

The cornerstone of Madewell Products is its Mainstay Composite Liner. Its lineage can be traced to the United States Steel Corp., which originally developed the process for lining uncured reinforced concrete pipe with coal tar epoxy coating. The first successful application of the product was in 1962.

Jay Steele owned Steele & Sons, a licensed applicator of the U.S. Steel product, and when U.S. Steel decided to divest itself of its coating interests, Steele & Sons became the exclusive licensee of the Mainstay liner. Madewell Products was established in 1974 to manufacture Mainstay products.

After Jon Steele graduated high school in 1973, he worked on the biggest Mainstay project Steele & Sons had performed at the time, and he then spent the next few years applying the Mainstay product alongside his dad and brother Jeff Steele.

When Jay Steele became more involved in the development of the NACE (now AMPP) Coating Inspector Program, Jon Steele came into control of Madewell Products to grow and advance the Mainstay product line. It's worth noting that Jay, Jeff and Jon have NACE Inspector Certification Program (now the AMPP Coatings Inspector Program) certificates #001, #016 and #018, respectively.

"My grandfather and my uncle were more involved on the contracting side. It was my dad who took on the role of growing the manufacturing business and making the product," says Natalie Steele. "[He] made it what it is today: A two-component system that encompasses a mortar and epoxy coating."

"At that time, Mainstay consisted of one product, a coal tar epoxy coating," says Jon Steele. "In the early 1990s, I began developing other coatings, as well as mortar products, and by the late 1990s, the Mainstay Composite Liner [as we know it today] was created to rehabilitate manholes and other underground infrastructure affected by corrosion."

As Jon Steele began to develop the product, it became clear that it had uses outside of Madewell's core markets. This was early in the time of trenchless, as system owners across North America began taking a hard look at their underground assets and EPA Consent Decrees started becoming more prevalent.

Jonathan "Jon" Steele

Turning to Manholes

"We started exhibiting at the Pumper Show [now the WWETT Show] in the early 2000s, when we first discovered the potential for restoring manholes with the Mainstay Composite Liner, and trenchless technology was still a new industry," says Jon Steele. "From there, we attracted contractors who were interested in adding manhole rehabilitation to their list of offerings."

It's the discovery of this niche industry that has helped propel Madewell Products' growth. Closser notes that in addition to showcasing the Mainstay Composite Liner, the addition of Art Wilson in Florida as the first manhole rehabilitation contractor helped propel the company forward. "It snowballed from there," Closser says. "He still has some of our original equipment and is still lining manholes today."

"Most of our growth has happened in the last 20 years. The development of the Mainstay Composite Liner is our most significant milestone. Developing the equipment to apply it is probably our second biggest milestone," says Jon Steele.

To help understand Madewell Product's growth in this sector, it's important to understand what made its Mainstay Composite Liner unique and standout in a crowded space. Jon Steele understood that mortar and epoxy coating served different purposes when it came to concrete restoration and corrosion protection, however both were necessary to the process.

Part one of the Mainstay Composite Liner process is the application of the high-strength, high-build mortar on the surface. Once the desired thickness is achieved, the applicator adds the epoxy coating over the uncured mortar. This, Jon Steele says, was not widely accepted at first. Like any good business looking to grow in a new space, Madewell Products overcame that by offering free demonstrations of its materials and equipment.

"Once we got involved in the manhole rehab space, our growth took off from there. We created a sales team and brought on certified applicators to promote the Mainstay Composite Liner," says Natalie Steele. "We've mostly grown organically through our network of applicators and their relationship with our sales team."

While numbering only about 20 employees at its Georgia headquarters and its equipment manufacturing and service center in Indiana, the entire Madewell Products team takes great pride in the hands-on approach to making sure their applicators are properly

trained and equipped.

"This helps promote a lot of faith in our products from municipalities and engineers that come out to see this work. We are big on [the idea] that execution is everything," says Natalie Steele.

Focusing on Contractors

To help further that growth, Madewell Products brought Closser on board in 2016. Closser, a seasoned trenchless contractor, had years of experience on the manhole rehabilitation side, first working for his in-laws and then with Winchester, Indiana-based Culy Contracting. Culy Contracting is Madewell Products' biggest customer.

Closser started working for Culy Contracting in 2006 to help start up their new manhole program. He knew what they needed to start the program and picked up the phone and started calling the various manufacturers and suppliers in the space to gather the necessary equipment and products.

"I called everybody and Madewell was the only that would agree to come to Indiana and complete two free demos — one with mortar and one with mortar and epoxy — at no cost to us," Closser says.

Madewell Products brought the Mainstay Composite Liner and one of its trailers to Indiana for the demonstration. Closser, who had experience with a variety of manhole rehab products, was sold when he saw the product and the sprayer casting it. He told his boss that Madewell wasn't leaving with that trailer.

Since joining Madewell Products, Closser makes sure to maintain that same level of service and support he received from the company when he was building and maintaining Culy Contracting's manhole rehab crews.

"When a contractor signs up with us, the first thing we do is get out there with them to teach them the products and the equipment," says Closser. "They really become like family."

He says that it's up to the contractors how big they want to go. There are some contractors who Madewell sells to that complete a few projects a year and there are others that have robust programs like Culy Contracting.

If the contractor has the desire to go big Madewell will help them along the way. Madewell will attend conferences with them, set them up with promotional materials, help with live demonstrations, and more. Closser notes that Madewell's two technical services workers are on the road more than they are not.

Regardless of size, all customers are treated the same when it comes to training and service. This commitment to customers, and Closser's focus on relationship building, has help Madewell Products grow by leaps and bounds.

"We've been growing significantly especially since we brought on Craig, so keeping up with demand was a little bit of a challenge for a little while," Natalie Steele says. "[We went] from making a certain number of truckloads to making three times that."

Future Growth

Prompted by this growth in sales, and a need for more production space, Madewell opened its dedicated equipment manufacturing facility in Indiana, close to Closser, as well as Culy Contracting. "We moved our equipment manufacturing up to Indiana in 2019 and in that first year we sold 18 trailers," says Closser. "We've taken a lot of time and effort to build high quality robust equipment that our contractors find easy to use and maintain."

And that growth trend continues as Madewell looks to expand its underground infrastructure offerings into the world of horizontal assets with products like ML-72HP for sanitary and storm sewers. It's also growing in the world of aquarium linings, an area that Natalie Steele has been heavily involved in. To help keep up with demand, there are also plans in the works for a new manufacturing and storage facility in Georgia.

"We have plans to keep growing and getting more people out there selling our product and increasing our certified applicator base," says Natalie Steele. "We've got plans in the works for new programs and educational opportunities and I am pretty excited about that."

Closser adds, "There are big things happening and I look forward to it and I'm excited about it. Both Natalie and I want to grow even more and we're looking forward to the future of Madewell."

Editor's Note: As we were closing this issue of* Trenchless Technology*, we received word from Madewell Products that Jonathan Steele passed away on Aug. 22.

Mike Kezdi is the managing editor of *Trenchless Technology*.

Get Maximum Performance with **AquaMax™ C909 IB PVCO Pipe**

For your next municipal water project, choose PVCO from Westlake Pipe & Fittings. Our AquaMax™ C909 IB PVCO pipe achieves the same pressure rating as traditional PVC, it is stronger, lighter and more flexible facilitating ease of assembly while maintaining high performance.

For more information, visit **westlakepipe.com/trenchless**

Westlake
Pipe & Fittings

MINIMIZING ENVIRONMENTAL IMPACT DURING CREEK CULVERT REHABILITATION

Wildlife and Water Quality Safeguarded

The City of Orinda, California, sits within the Diablo Mountain Range just nine miles east of Oakland. Local roads wind through the rolling hills next to many main streams that run through the mountain range. These tributaries empty into the Pablo Reservoir and the Upper San Leandro Reservoir.

These seasonal streams are environmentally sensitive for local aquatic life and drinking water derived from the reservoirs. Many large culverts were installed in the 1940s and 1950s to take these streams under the roads, which are now showing signs of fatigue and some with their inverts completely corroded.

The City recognized the corrosion as an issue and called on Walnut Creek-based HDR Inc. to evaluate which trenchless technology would be a feasible repair option. HDR considered sliplining, cured-in-place pipe and spray-applied geopolymer mortar.

Geopolymer mortar was selected based on its ability to minimize environmental impact. It was identified as having the least impact to surrounding area, as well as delivering the ability to reinstate flow through the culvert immediately after installation. It also maintained the hydraulic capacity of the rehabilitated culverts and had a lower overall cost of installation.

The City required a permit from the California Regional Water Board for the project and the work could occur only during the non-rainy season. The permit required ecotoxicity data on the selected material, to determine the time required before the stream could start flowing through the culvert after rehabilitation.

The contractor chosen to complete the rehabilitation was National Plant Service, a Carylon Company, with the chosen material being GeoSpray 61 by GeoTree Solutions. The decision was made based on the material holding 'Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, 5th Edition'. This indicated that flow could be reinstated after only two to four hours of curing. GeoSpray 61 is also NSF 61 certified for drinking water standards and has a high flexure strength, which meant the installed thickness of the material could be reduced, compared to other materials and systems on the market.

In preparation for the rehabilitation work, a diversion was put in place that would run the summer creek flow through a gravity flow bypass pipe without the use of a pumping system, which could negatively affect aquatic life. The bypass did not change the flow of the creek up and down stream during the rehabilitation, did not increase turbidity or increase erosion from the discharge of the bypass pipe. The bypass was installed directly through the pipe being rehabilitated which allowed for the gravity flow to occur.

The city hired LSA from Point Rich-

mond, California, to have a wildlife biologist on site to verify that the bypass and the installation of the GeoSpray 61 was not affecting wildlife.

National Plant Service manager Danial Solano said, “A temporary dam was installed using gravel filled geotextile bags and plastic. This directed the water from the upstream side of the culvert into the bypass pipe. The bypass pipe exited the culvert and drained into the creek downstream.”

The project consisted of three culverts at different locations within City of Orinda that each sat on different tributaries. One was a 72-in. by 110-in. acm arch culvert, the other two were cmp culverts measuring 66 in. and 60 in. All mixing and pumping operations were carried out on a spill control pad within a tarp tent to minimize dust release. A disposal container sat next to the mixing area for the cleaning of hoses that conveyed the material into the culvert to the spray head applying the material.

GeoTree Solutions engineers calculated the thickness required to adequately line the culverts. The thickness applied was 1.5 in. for the 60-in. and 66-in. diameter pipe and 1.75 in. for the 72-in. x 110-in. arch culvert. The invert was partial deteriorated in two of the culverts. These required filling

with GeoSpray 61 to eliminate water movement under the pipe which could cause issues later. Again, GeoSpray 61 was used to eliminate any ecotoxicity issues with stream. All the geopolymer was hand sprayed with the finial ½ inch thickness of the structural rehabilitation spin casted.

The construction equipment, which measured 10 ft by 75 ft, was stagged along the street to ensure it did not affect traffic flow. For the arch culvert the equipment was along the side of a residence driveway but access was still possible. Work could be carried out between 8 a.m. and 4 p.m. to eliminate disruption to the residences. Each culvert from mobilization to completion took just five days.

This article was provided by GeoTree Solutions.

TRENCHLESS IN CLEARWATER

Life and vacation time in Clearwater is about the full beach town experience.

By Forrest Parham

Clearwater, Florida is one of those places in life where, if you have been there and experienced even a fraction of what it has to offer, it will forever be etched into your memory as one of the most fantastic places to go. And, if you've only been there once, you'll feel compelled to return to experience it all over again.

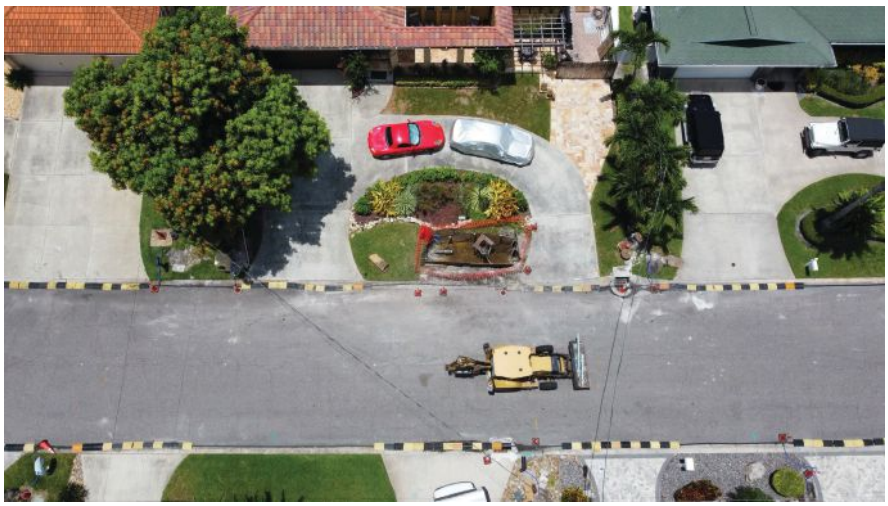
The manicured, white sand with the consistency of fine sugar, the sparkling aqua blue water, and some of the best bars, hotels, and restaurants Florida has to offer, make Clearwater one of the few places on Earth where you can encounter the full spectrum of life and fun in the sun.

The Clearwater experience is truly about enjoying coastal beach life, not tied up in construction caused traffic jams or the eyesore of gouged earth to stain the image one brings back home to everyday life once one leaves the beach. That latter image is best left to open-cut utility installation.

Like most towns in the United States that have been around for more than 100 years, Clearwater has pipeline infrastructure that is starting to show its age. The inherently corrosive nature of the salt water and sand of its beaches are particularly hard on the materials used in the past, such as cast and ductile iron. The City of Clearwater took the lead in upgrading the failing infrastructure to keep the city beautiful and functional for centuries to come, and one of those upgrade technologies it decided to deploy is the trusted combination of pre-chlorinated pipe bursting with high density polyethylene (HDPE) pipe replacement. Murphy Pipeline Contractors (MPC) won the bid for the project, and work began soon after.

To anyone familiar with Clearwater, it seems obvious that traditional open-cut water main replacement just doesn't fit well into the pristine landscape of the beach town, the geographically restricted roads leading to its most beautiful destinations, nor the immaculately groomed residential neighborhoods that are nestled within its borders. Open-cut pipeline replacement requires excavations along the entire length of the pipes being replaced, leaving often deep and ugly trenches that mar up large swaths of the environment around such projects and make navigating around them difficult; sometimes even dangerous. At the very least, the necessarily expansive excavations, open-cut projects are visually jarring to longtime residents or tourists expecting to see the unblemished, natural beauty Clearwater has come to be known for.

Pipe bursting, however; —the "minimally invasive surgery" of the pipeline replacement world — reduces all of those impacts down to the smallest elemental sizes and ensures daily life and tourism go on with little interrup-



tion. By excavating only an insertion pit and exit pit, and even smaller surgical excavations for water service meters, trenchless pipe bursting for water main replacements turns a typically disruptive project into a barely noticeable construction operation.

The City of Clearwater Water Utilities services around 8,000 residents and thousands of businesses that are not just limited to its fantastic hotels, resorts and restaurants. Marinas, shopping centers, and even the famed Clearwater Marine Aquarium are sustained by the water infrastructure provided by the city. Add to that, the nearly 15 million visitors to this magnificent town per year and it's easy to see why the city decided to go the less-intrusive construction route that trenchless offers. Narrow roads and walkways are the arteries that serve the barrier islands and coastal cities of Florida, which tend to be restricted by slender land masses and natural bodies of water; it doesn't take too much to clog them up. Open-cut projects, by their nature, are expansive in scope and cause traffic delays that can be much more profound in such tight spaces.

Thus far, more than 6,000 lf of 4-in.6-in. and 8-in. water mains have been replaced in the Clearwater residential community of Island Estates, using trenchless technology.

Weston Haggen, of CHA Consulting, is the lead design engineer for the water main replacement project at Island Estates. With trenchless pipe bursting being brought into play for this extensive pipeline replacement, he explains what his experience has been using this technique vs. open-cut. "Trenchless has been quicker and cleaner. Residents have been happier, overall, with the reduced physical scope of the project compared to the larger areas needed for open-cut," he said.

Having overseen multiple open-cut projects, Weston offered, "It's more economical, as well." The reduced footprint of these more surgical projects reduces the size and scope of road, concrete, and green restoration, which is often a large portion of a project's total cost.

This project is the first large-scale water main project utilizing HDPE for the City of Clearwater. The original host pipe materials encountered, so far, have been cast iron and ductile iron, with a few short stretches of C900 PVC throughout the islands.

Haggen describes how the transition for the City in using the newer material has gone. "There was a bit of a learning curve with using the pre-chlorination process, but transition to the new materials and techniques were mostly seamless," he said.

Haggen adds about future maintenance or repairs of the new pipeline, "The HDPE is more durable and less prone to leaks over time because it has fewer joints and has complete fusion when joining lengths of pipe together. Future maintenance or repairs by municipalities should be completed in the same manner as the cast iron, ductile iron, or PVC they're already used to because the components used with the new material are the same standard items used with other materials."

One of the first phases of the project took place on Palm Island Northeast and Palm Island Southeast; two "finger islands" located within the Island Estates community. Residential homes were placed on a water bypass system by Murphy Pipelines to ensure that interruption in water service was kept to a minimum. Once the bypass line was activated, water services were transferred from the old water main to the temporary bypass. The process for each service typically took a few minutes to transfer.

Although the residents were notified that they would be briefly without water, few even noticed the transition due to the extremely short duration each service transfer took. The same process was repeated in reverse once the new main was installed and activated via the trenchless method, and residents were able to continue with their day-to-day with barely any disruption.

With the trenchless construction technology used by Murphy Pipelines, thousands of linear feet of failing water infrastructure were replaced with the durability of HDPE. The island community went about their normal routines and way of life without having to deal with the challenges typically associated with the intrusive nature of open-cut water main replacement. The bumper-to-bumper traffic, the sounds of concrete and asphalt being cut over large stretches of road and walkways, and the visual and environmental impact long trenches make were virtually eliminated by the community-friendly pre-chlorinated pipe bursting method used by MPC.

Traffic flowed almost completely uninterrupted through the tight neighborhood roads that would have come to a near standstill had the roads been cleaved and split apart by an open-cut operation.

More than 6,000 lf of failing water main infrastructure was replaced in a handful of months that would have taken exceedingly longer had the labor-intensive excavation of open-cut been the rule of the day.

All of these tangible and quantifiable obstacles were eliminated by using the latest trenchless construction techniques employed by MPC.

Though both tangible and quantifiable, some of the most important aspects of life enjoyed by residents of and visitors to Clearwater can be expressed much more simply:

Sunsets over the aqua and turquoise blue water washing up on the white, powdery fine sands were enjoyed without the jarring visuals of open trenches carved into the earth to sully the landscape of this most famous beach town.

Forrest Parham is project manager with Murphy Pipelines.

SINGLE-LEG SOLUTION — MOBILE MANHOLE REHAB IN THE BLUEGRASS STATE

Restoring far-flung manholes proves to be no problem for agile crews using high-build coatings

By Brian Huffman, Ben Fouch, Chris Gross and Jesse Skinner

Like many cities with centuries of history, Frankfort, Kentucky, has manholes both off the beaten path and right in the heart of the action. These manholes, found in backyards, remote wooded areas, and near farmers' fields, reflect both the municipality's legacy of infrastructure and its growth as a capital city.

After serving the community for a range of decades, around 175 bare concrete manholes in the Frankfort Sewer Department (FSD) required rehabilitation. The FSD, responsible for managing water and wastewater, treats nearly 10 million gallons daily, making this upkeep essential.

Many manholes in the sewer system were at critical stages in their lifespan due to the absence of protective linings. The concrete structures faced corrosion from high concentrations of hydrogen sulfide (H2S), a toxic gas produced by microbial decomposition of organic material in sewers. There were manholes compromised by laminar sanitary flow, a slow-moving, consistent stream of wastewater in areas with high water tables that leads to the buildup of sewer gases.

As the team went on, it found additional deterioration from inflow and infiltration (I&I) issues, where rain or groundwater can breach the concrete and directly enter the wastewater stream.

Figure 1. A manhole showing signs of corrosion and degradation (left) is restored with Dura-Plate 6000 (right) using a single-leg sprayer.

All of these destructive forces can lead to accelerated concrete corrosion and significantly shorter life expectancies for concrete than originally designed.

To seal the compromised manholes — and extend their service lives — the FSD designed a manhole rehabilitation project. Structured Solutions LLC, a Union City, Indiana, firm that specializes in restoring infrastructure assets, was awarded the project and was excited to put the company's expertise into repairing Frankfort's sewer system.

"We found some with just a couple of leaks, while others had substrate damage or bench walls that were falling apart," said Structured Solutions president Ben Price. "This was the first time any type of rehabilitation or sealing work had been done on them."

An Ease-of-Use Epoxy

Manhole accessibility varied widely across the project, with many of the assets requiring the crew to manually transport equipment.

Drawn to using a single-leg sprayer, Structured Solutions decided to reline each manhole using Dura-Plate 6000 (Figure 1), a high-strength, reinforced epoxy that offers the choice of spraying with either single-leg or plural-component equipment and can also be hand-applied. The lining was also chosen for its high build characteristics, low permeability and fast return to service.

"It really makes doing easement structures easier because of the single-leg capability," said Structured Solutions vice president Jon Moore. "We were all too happy to eliminate the need to haul bulky plural-component equipment to difficult-to-access locations."

The two-component, high-build, high-strength, reinforced epoxy lining with 100 percent solids has become part of Structured Solutions' regular manhole repair treatment arsenal for severe service assets.

Concrete Challenge

Across the United States, aging sewer infrastructure and rising waste levels are causing more frequent and severe chemical reactions that damage these systems. Built-up concentrations of H2S leads to microbial-induced corrosion (MIC), where bacteria transform H2S into sulfuric acid, which then erodes the concrete,

Figure 2. Corroded steps (left) are removed during restoration, which prevents workers from entering the confined space without safety equipment.

making it more prone to degradation and spalling.

Concrete has a significant vulnerability – its alkaline nature leaves it highly susceptible to acid attacks. This weakness is particularly problematic in sewer systems where biogenic sulfide corrosion is prevalent.

Increased waste loads and prolonged exposure to harmful substances can accelerate the deterioration of critical structures. Plus, manholes that aren't watertight allow stormwater and abrasive surface materials like soil and gravel into sewers. That can ultimately accelerate wear on sewer infrastructure — and raise the cost of treating sewer contents — in both rural and urban areas.

In Frankfort, the expansive project — which began in 2021 and will continue through 2025 — requires crews to pre-plan staging and make on-site adjustments based on the specific conditions of each manhole.

"Each manhole we encounter is unique," said Moore. "But we want to restore them all to the same level of excellence."

Teamwork in Tight Spaces

In many cases, the routing of the sewer system in Frankfort happened before homes were built, hence the seemingly random siting of many manholes.

Using hand-pulled carts or all-terrain vehicles, the Structured Solutions team transported a single-leg pump to each job site. "Instead of trying to back up a box truck in somebody's backyard," said Price, "we wheel single-leg pumps to the structure and still have the same application as you would with a plural-component pump that would be operated from a trailer."

For the manhole rehabilitations, the crew first removed rusting manhole steps (Figure 2) and degraded concrete. They then cleaned the existing cement with a high-pressure washer at 5,000 PSI to remove any laitance or contaminants from the substrate.

The application team then manually applied new layers of a microsilica mortar material in stages to rebuild the manhole structure, ensuring it had the necessary tensile strength. Where infiltration was present, they used a combination of hydraulic cement and injection grout to seal leaks and allow the coating system to be applied. Then, microsilica mortar was applied at thicknesses up to 1 inch to bring the concrete back to its original plane (Figure 3).

"Once the surface is prepped and we begin the application of the epoxy, it's a pretty fluid process," said Moore. "It looks a lot like how you would picture somebody who's painting a car."

Crewmembers applied Dura-Plate 6000 to ensure complete coverage and strong adhesion. Applicators were able to build the lining to a 125-mil dry film thickness (DFT) or higher in one coat.

"It makes our jobs easier to have a high-build coating with great chemical resistance that can work in remote areas – without the need for a plural-component pump," said Price.

Without their single-leg approach, applicators would have to hand-apply materials, including hand-mixing cement and manually applying coatings, due to the inaccessibility of the manholes.

The team was also drawn to the lining's durability, as it contains reinforcing glass flakes that stack on top of each other and prevent moisture from reaching the substrate.

Newly lined assets are returned to service quickly, enhancing efficiency — in about 10 hours after application, while "the average product return-to-service can be up to 48 hours," said Price.

Invisible Touch

Post-application inspections include visual checks, measuring thicknesses with a wet mil gauge and performing holiday detections to spot and treat defects.

Figure 3. Steps can also be a weak point in the structure when dealing with I&I issues; removing the steps ensures a monolithic liner, eliminating weak points.

With most manholes, the team is able to restore an impressive 40 to 50 vertical feet a day for easements, even those in the most corroded condition. This efficiency can be attributed, in part, to the applicator's familiarity with products from Sherwin-Williams Protective & Marine.

Structured Solutions is a member of the coating manufacturer's Certified Applicator Program, which requires extensive qualified training and means the restoration specialist "can be trusted to meet high-quality standards," said Price.

The certification program reassures municipalities and engineers of the applicators' qualifications and allows for additional warranties to be offered on their work.

The team anticipates the manholes in Frankfort may not need additional service until much beyond the work's 10-year warranty — especially given the coating's design life of 50 years. It may also be fair to assume many in the town were hardly aware of the application crew's presence in the first place.

"We pride ourselves on creating as little disruption as possible – in being quiet and stealthy," said Moore. "Using the single-leg sprayer has been a great advantage. We can just focus on getting the job done right."

Brian Huffman is business development manager water infrastructure, Ben Fouch is a protective and marine coatings sales representative; Chris Gross is a protective coatings specialist; and Jesse Skinner is a coatings specialist – water infrastructure, from Sherwin-Williams Protective & Marine.

BLOWING SMOKE

HOW TO GET STRAIGHT ANSWERS ON WHY YOUR SEWER SYSTEM IS LOSING CAPACITY

What's the problem that drives smoke testing?

By Mike Ping, P.E.

Sewer collection systems consist of a network of pipes that connect residential and commercial buildings to a local wastewater treatment plant. In a perfect world, this pipe network would be watertight – meaning no extra rainwater would be able to enter the system.

However, this is rarely, if ever, the case.

The real question is how much extraneous water — rain derived inflow and infiltration (RDII) — from rain events will enter the collection system. This additional volume creates substantial demands on the downstream wastewater treatment system (WWTP). Additionally, sewer pump stations out in the collection system have to be sized accordingly. Bigger pumps cost more to operate than smaller pumps.

Since the wastewater treatment system is required by regulatory agencies to be able to treat all wastewater, the size of the plant must increase if sewer flows are increasing because of RDII. Efforts to locate and eliminate this extra rainwater entering the system can eliminate and/or delay wastewater treatment upgrades and is a very cost-effective approach for utilities.

How Smoke Testing Works

Smoke testing is one of the simplest and most cost-effective ways to locate where rainwater, RDII, is entering the system and is an underutilized method used to detect leaks and defects in sewer collection systems. This process involves blowing non-toxic smoke into the sewer lines and observing where the smoke emerges. The presence of smoke in areas other than designated outlets indicates potential breaches, such as cracks, leaks, or illegal connections.

The primary goal of smoke testing is to locate and identify potential locations of inflow and infiltration sources.

Communication Is Key to a Successful Project

Having an effective community communication plan is essential to conducting a successful smoke testing

Examples of proper documentation and integration of location and test results.

project. Advance scouting and documentation of points-of-contact for sensitive areas can be the difference in a smooth project, versus upset residents and alerting media. Areas containing schools, medical facilities, retirement homes and other highly sensitive facilities should be identified and planned for in your communications plan. Simple and practical steps such as avoiding major medical centers or coordinating with the school maintenance staff to conduct the smoke testing after school hours can make all the difference.

Project Data Collection

After a smoke test project is completed, the data should be presented in a way to quickly understand key results such as:

- Are there any major defects?
- How many defects?
- The location of the defects

Providing maps and corresponding data reports is a key requirement for a successful job. If the project specifications are not defined, it is possible to end up with a hard drive with thousands of randomly named photos, in no particular order. A web-based dynamic platform or electronic map-driven deliverable can help to quickly understand the results and implement follow up action steps.

Why Blow Smoke?

Smoke testing is a powerful and cost-effective tool for utilities aiming to enhance infrastructure efficiency and reduce costs. By identifying sources of inflow and infiltration, utilities can reduce stress on downstream treatment capacity, delay system upgrades, and save energy costs as energy consumption is directly proportional to wastewater volume. The cost-effectiveness, ease of data integration (when properly collected), and potential for in-house repairs make smoke testing an invaluable practice for utilities managing inflow and infiltration.

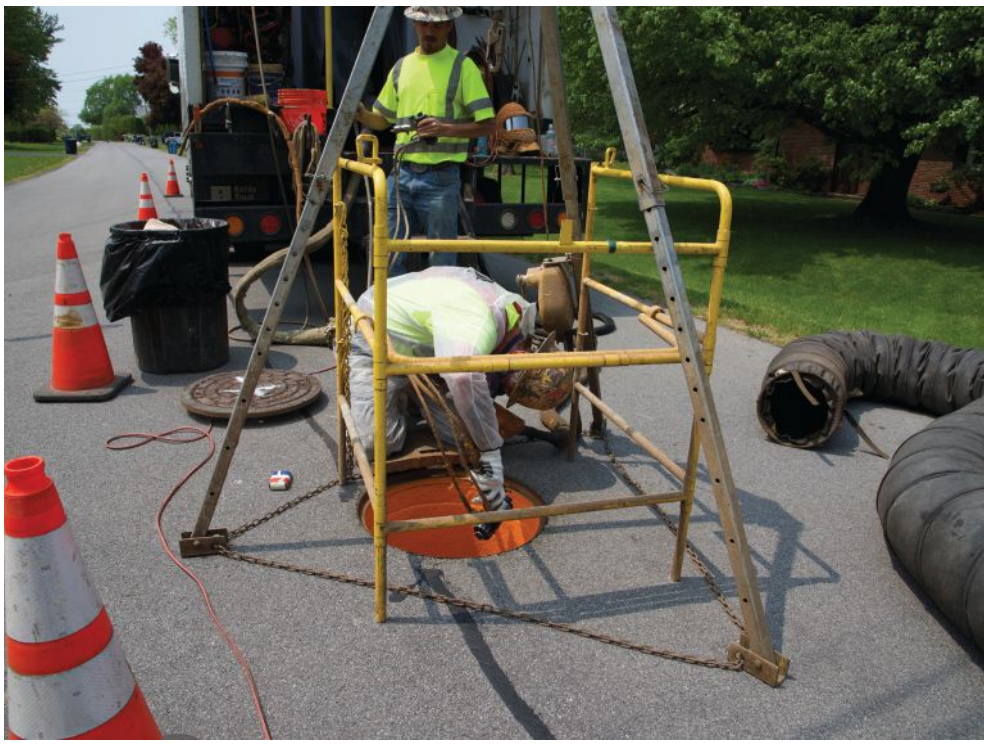
Mike Ping, P.E. is technical manager with Duke's.

OUTSIDE THE STREETS OF PHILADELPHIA:

FINDING AN EFFECTIVE SOLUTION

By Mike Hoffmaster

A town located just 14 miles north of Philadelphia may not be as rich in history as its neighbor, but it has made its own mark in history. Warminster Township, Pennsylvania was originally settled by English and Scotch-Irish colonists after William Penn received a grant of land in the area from King Charles, Illinois.



During World War II, the U.S. Navy acquired an industrial site here and opened a Naval base in Warminster. It served as a weapons development and airplane testing facility. The military base remained in operation until it closed in 1996. In the 1960s the naval site became adapted as a training center for the Mercury, Gemini and Apollo space programs. The facility also developed a prototype "black box," best known as the indestructible flight recorder of cockpit conversations and information in the event of a crash.

Today, Warminster has a population of approximately 34,000 residents covering an area of 13 square miles. The township manages its own water, sewer and storm drainage systems. There are 15 pump stations throughout the system, according to Bob Wilson, collections mechanic and Warminster's sole NASCCO certified Pipe Assessment Certification Program (PACP), Lateral Assessment Certification Program (LACP) and Manhole Assessment Certification Program (MACP) certified employee.

Warminster has a longstanding program to address the aging infrastructure and Inflow and Infiltration (I&I) issues. They have had an I&I program in place for approximately 20 years. In the early stages of the program, they used a triage type of approach to prioritize the severe cases and repair them first. In more recent years they have used more of a grid approach focusing on specific neighborhoods and performing a complete rehabilitation program including pipe, lateral and manhole lining.

The Challenge

Challenges persist due to the township's proximity to Philadelphia,

notably in managing traffic control. Additionally, the age and historical development of the infrastructure, which expanded significantly during World War II presents more complexity with the various materials that were used in construction since metals and other products were not available as they were being diverted to support war efforts. They even had concrete lids in lieu of frame and covers on many of their manholes. Manhole materials consist of concrete, brick and precast.

Solution

"Over the years we investigated and tried other technologies but could not find one that worked well for us. We did not like something that was simply spincasted from a device lower into the manhole because it did not provide consistent coverage in our structures," Wilson stated. "We wanted something requiring a person down inside the structure so they could visually see what they were doing and where they were spraying."

Years ago, they learned about a multi-layer lining system using polyurea. They contracted Advanced Rehabilitation Technology (ART), who is a certified installer of OBIC with offices located in Ohio, Maryland and Texas. OBIC Armor is a multi-layer liner consisting of three layers. The first layer is the adhesion layer (a 50 mils thick layer of polyurea) sprayed to the host structure, the second layer is the surfacing layer (a 400 mils thick layer of 6- to 7-lb. foam), then finished with the barrier layer (a final coating of 50 mils of polyurea).

"We are very pleased with the product and workmanship of the ART crews. Additionally, the 10-year warranty on the material and workmanship is an added bonus," Wilson said. The foam surfacing layer not only adds some structural enhancement to the system, but it works well filling in voids and smoothing out offsets in brick manholes.

OBIC Armor lining system provides a complete monolithic coating. Due to the excellent elongation properties of the OBIC 1000 (the two polyurea layers of OBIC Armor). It is sprayed from the invert channel up to the manhole casting, where it is bonded to the frame itself. Utilizing the OBIC Armor system eliminates the need for the installation of chimney seals, resulting in savings of an additional $800 to $1,000.

Path Forward

Following the successful pilot project, Warminster Township has maintained a steady pace of rehabilitating approximately 80 to 90 manholes each year. They favor working with ART due to their satisfaction with the OBIC product and the professionalism of ART's crews and company. Should any issues arise, ART consistently honors its warranty and stands behind its workmanship. PJ Rohrbaugh, a project manager at ART, spoke highly of Warminster Township as a customer, stating, "I really enjoy working with the employees of Warminster. They are a good customer to work for."

Wilson shared an anecdote he particularly enjoys: when faced with a major challenge at a severely leaking manhole on the former Naval base inherited after its closure, they turned to ART. This particular manhole was leaking 73,000 gallons of water per day — an extraordinary situation. ART was tasked with grouting the leaks and applying OBIC Armor coating, a solution that continues to perform effectively. Given that wastewater treatment costs in the Philadelphia region range from $8 to $14 per 1,000 gallons, with a median cost of $11, the repair resulted in significant savings. Specifically, the lining of the manhole saved $803 per day in wastewater treat cost, amounting to $293,095 annually.

Conclusion

Wilson emphasized, unlike some other municipalities, once they discover a product that meets their needs effectively, they remain loyal to it. During discussions involving alternative materials and technologies, they consistently pose a critical question: whether these options are backed by a 10-year warranty on material and workmanship. The response they invariably receive is a straightforward, "No."

Mike Hoffmaster is vice president at OBIC LLC and also provided the photos.

TRANSFORMING MANHOLE REHABILITATION:

A CASE STUDY ON ADVANCED SOLUTIONS FOR CORROSION RESISTANCE

By John Bluntach

Aging infrastructure poses significant challenges for municipalities across the United States, particularly in urban areas where sewer systems have been in place for decades. Many of these systems were constructed using materials that are susceptible to corrosion and degradation over time.

Manholes, which are critical components of sewer systems, often suffer from corrosion and structural degradation due to harsh environmental conditions, especially where hydrogen sulfide (H2S) is prevalent. The presence of H2S exacerbates these issues. H2S, a byproduct of anaerobic bacterial activity, is highly corrosive and can significantly accelerate the deterioration of concrete and metal structures within manholes.

Corrosion in manholes is not just a structural concern; it also poses environmental and public health risks. When manholes deteriorate, they can allow infiltration and inflow (I&I), leading to excess water entering the sewer system. This not only increases the treatment burden on wastewater facilities but also raises the risk of untreated sewage overflows, which can contaminate local water bodies and pose serious health hazards.

Traditional rehabilitation methods, such as spray-on epoxy and cementitious liners, frequently fail under these conditions, leading to further deterioration and the potential for catastrophic structural collapse. Additionally, traditional dig-and-replace methods are often not feasible due to their high cost, extensive disruption, and the risk they pose to surrounding structures. However, an innovative method exists that avoids excavation, results in a brand-new manhole within the existing structure, and offers 100 percent structural integrity and corrosion resistance, setting a new standard in manhole rehabilitation.

Problem Identification

In a recent project in a small municipality in South Dakota, the challenges of aging infrastructure were vividly illustrated. The municipality was grappling with a deteriorating manhole more than 40 ft deep that had been previously rehabilitated using spray-on epoxy coatings.

Unfortunately, due to the improper application that caused pinhole leaks, these epoxy coatings were unable to provide adequate protection against corrosive elements. The coating, because it was improperly applied, began to peel off of the manhole walls allowing gases, particularly H2S, to penetrate behind and seep between the liner and the manhole walls.

Over time, this seepage led to a gradual degradation of the manhole's structural integrity — exacerbating the corrosion of the underlying concrete and exposing the wire mesh within the structure. The threat of structural failure and collapse was imminent, emphasizing the limitations of traditional rehabilitation methods in environments with high levels of H2S.

Project Challenges

The rehabilitation of this manhole, exceeding 40 ft in depth, posed unique challenges that rendered traditional methods impractical. Located immediately adjacent to a large car dealership building and its parking lot, excavation would have necessitated digging up the entire corner of the building. This presented a significant risk of structural damage or collapse to the dealership itself and nearby buildings. The potential for a sinkhole was also a concern due to groundwater seepage bringing soil into the manhole over time.

The financial implications were substantial, with estimates running into multiple hundreds of thousands of dollars, solely for excavation and associated repairs. Given these risks and costs, traditional dig-and-replace methods were not feasible, highlighting the necessity for trenchless rehabilitation methods as the only viable solution.

Another challenge was stabilizing the air quality before beginning the rehabilitation work. This involved deploying an air-moving fan positioned upstream of the work area to mitigate high concentrations of H2S. Powered by a large air compressor, the fan effectively reduced H2S levels to safe limits, ensuring a secure working environment. Maintaining continuous operation of the fan was critical to sustaining safe conditions, as any interruption could quickly reintroduce hazardous gases.

To manage the high flow rates from

the large interceptor line, an internal bypass was employed using a pneumatic plug with a flow-through pipe. This approach allowed the redirection of flow away from the work area, enabling safe working conditions without direct exposure to the flow. This method was essential for repairing the bench and invert as required before initiating the Monoform PLUS process on the manhole. Traditional bypass methods would have been excessively costly for the municipality, particularly given the interceptor line's critical role in the town's infrastructure. Potential shutdowns would have necessitated extensive bypassing efforts, risking environmental impact if flow redirection was mishandled.

The Solution: Innovative Manhole Rehabilitation

Addressing the challenges of deteriorating manholes requires a method that goes beyond traditional solutions. The approach employed here involves creating a fully structural, independent lining system. Custom ABS plastic forms establish an annular space within the existing structure, which is then filled with a high-strength concrete mixture reinforced with fiber mesh.

This system integrates a corrosion-resistant HDPE liner, offering robust protection against hydrogen sulfide. Once the concrete sets and the forms are removed, the resulting lining system stands alone, meeting rigorous load specifications and ensuring long-term durability.

This method streamlines surface preparation and performs well under various environmental conditions, significantly reducing project timelines and disruptions. For example, in a recent project near a commercial building, this approach was applied effectively without extensive excavation, thereby minimizing impact on the surrounding area.

A representative from the municipality noted, "The solution provided was efficient and high-quality, avoiding costly and disruptive excavation. The team's work was impressive, meeting our needs and ensuring minimal impact on nearby infrastructure."

Long-Term Impact & Conclusion

In addressing the challenges posed by deteriorating manhole infrastructure in a small municipality, traditional manhole rehab methods, such as spray-on coatings and dig-and-replace, proved impractical due to environmental risks, structural constraints, and escalating costs. These challenges were compounded by the high levels of corrosive hydrogen sulfide (H2S), which accelerated structural degradation and posed significant public health risks.

John Bluntach is structure rehabilitation business development director with HK Solutions Group.

Finding the Next Great Undergrounding Technologies

ARPA-E GOPHURRS Program Under Way

By Mike Kezdi

Across North America, communities are being hit with extreme weather events that test the boundaries of what the current power grid can handle.

Following each weather event come the cries that the electric lines should be taken underground to safeguard them and ensure the continued delivery of power to homes and buildings. And the cries are getting louder as we move toward a more electrified world.

Though there are utilities that have robust undergrounding and grid hardening programs in place, many still don't pursue undergrounding because of costs, which the utilities will say are high compared to repairing lines when they are damaged. Any increased costs of installation will be passed on to the rate payers.

To help address this challenge

GOPHURRS PROJECT DESCRIPTIONS

GE Vernova Advanced Research – Niskayuna, New York - SPEEDWORM: Swift, Portable, and Efficient Electrical undergrounDing using a Waterfree, cOmpact, and Reliable Machine

GE Vernova Advanced Research is developing a robotic worm tunneling construction tool that would dig and install conduit and cables for underground distribution powerlines in a single step. GE's SPEEDWORM would mimic the natural movement of earthworms and tree roots to install 1,000 ft of cable and conduit in two hours with unmatched flexibility. The tool could deploy from a standard pickup truck and would eliminate the cost, complexity, and surface disruption compared with conventional approaches.

RTX Technology Research Center – East Hartford, Connecticut - UNderground Imaging with QUantum sEnsors (UnIQue)

RTX Technology Research Center (RTRC) is developing a mobile sensing platform using radar approaches based on quantum radio frequency sensing together with artificial intelligence to locate existing utility lines prior to installing underground power distribution lines. RTRC's quantum radio frequency atom vapor sensors offer unparalleled superior performance to that of traditional ground penetrating radar, and its artificial intelligence-assisted data processing method could boost the accuracy of 3D reconstructions of subsurface infrastructure by at least 95 percent compared with traditional data processing techniques.

Prysmian Cables & Systems USA – Highland Heights, Kentucky - Error-Free Splicing Machine for Underground Power Cables

Prysmian Cables & Systems USA is developing a hands-free power cable splicing machine operating in underground vaults to reduce the share of splicing-caused medium-voltage network failures from 60 to 80 percent to less than 5 percent and dramatically improve the workforce safety by reducing the time the underground cable splicing crews spend in underground vaults. The proposed machine—which fits down a utility hole and is operated from above ground—would implement laser cutting and layer preparation, abrade cable layers, and complete the splice while a vision system augmented with machine learning would aid operators in maintaining quality control.

Pacific Northwest National Laboratory – Richland, Washington - Subsurface Intelligence for Undergrounding Operations: Rapid AI-Based Geophysical Imaging and Advanced Visualization

Pacific Northwest National Laboratory is developing an artificial intelligence system for processing geophysical survey data into digital twin and augmented reality in order to identify existing utilities and other subsurface obstacles before installing underground power distribution lines. The system would autonomously process data from multiple types of geophysical sensors to detect and classify anomalies underground and create a digital representation of the subsurface for geographic information systems. Analysis, visualization, and reporting typically takes weeks or months after data acquisition, but the proposed system could produce results within minutes, providing near real-time subsurface mapping and utility identification which will lead to

of getting more electrical utilities underground by developing new technologies is the U.S. Department of Energy's (DOE) Grid Overhaul with Proactive, High-speed Undergrounding for Reliability, Resilience, and Security (GOPHURRS) program administered through the Advanced Research Projects Agency-Energy (ARPA-E).

ARPA-E – which launched on Earth Day 15 years ago and modeled after the Defense Advanced Research Projects Agency (DARPA) – advances high-potential, high-impact energy technologies that are too early for private-sector investment.

Leading the GOPHURRS program is Philseok Kim, PhD, an ARPA-E Program Director who has helped bring this latest idea to the program phase.

"ARPA-E is sort of a moonshot technology idea incubator under the DOE. We are funding future technologies that are extremely difficult to realize. Therefore, the risk is relatively high," says Kim. "But these moonshot ideas, if we can realize them, could bring a huge impact [to the sector]. That's the type of energy technologies we want to advance, and we [ARPA-E] are created to fund these specific efforts in the energy sector."

Simply put, ARPA-E program de-risks technologies to help further innovation in the United States, increase our energy independence and resilience and benefit the taxpayers.

"The GOPHURRS program's mission is improving our energy infrastructure's reliability, resilience and security by undergrounding power lines," Kim says.

Kim notes that this ARPA-E program was created to address the question of, "Why are we not burying the power lines?" He investigated it further and discovered that people know that burying the lines is better for power grid reliability and resiliency but trenching in the lines – the leading method for undergrounding – was too cost prohibitive and disruptive.

"So, the golden key to make that happen is [finding out] how do we dramatically cut the cost of burying the powerlines to prevent these disasters," Kim says. "The main idea behind the GOPHURRS program is [answering the question], 'Can we underground powerlines without digging the ground?' And trenchless technologies are the main focus."

"Modernizing our nation's power grid is essential to building a clean energy future that lowers energy costs for working Americans and strengthens our national security," said U.S. Secretary of

cost savings and speed up the task of burying power lines.

Virginia Polytechnic Institute and State University – Blacksburg, Virginia - Multi-Physics, Intelligent Sensing System (MISS) For Real-Time, Look-Ahead While Drilling

Virginia Polytechnic Institute and State University (Virginia Tech) will develop a look-ahead sensing system based on integrated electromagnetic and seismic sensors to guide and assist drilling to lower the cost and safety concerns of undergrounding power lines. The system's sensors, in the form of radar and accelerometers, would be mounted on and behind the drill head, with complimentary distributed acoustic sensing at the surface to detect obstructions within at least 10 feet of drilling operations. Artificial intelligence capabilities would interpret the geophysical data from the sensors and provide a real-time prediction of obstacles to operators within seconds.

Sandia National Laboratories – Albuquerque, New Mexico - Advancing Horizontal Directional Drilling for Rapid Undergrounding of Electrical Utilities

Sandia National Laboratories is developing a real-time, drill-mounted, cross-bore detector using ground penetrating radar to reduce the risk of damaging existing utilities while installing new underground power lines. Unlike other drill-mounted ground penetrating radar sensors that measure broad frequency bands and produce large quantities of data that make real-time communication with surface systems difficult, the proposed sensor uses a narrow band frequency domain. The result is a system capable of detecting cross-bore events with high resolution within one foot, using directional drill rod integrated sensors and advanced communication channels to avoid collisions.

Melni Technologies – Twin Falls, Idaho - Enhancing Reliability and Resilience of Underground Distribution Systems Using Innovative Splicing

Melni Technologies is redesigning and developing novel medium-voltage power cable splice kits that require fewer steps and streamline connections to greatly reduce human errors and boost the reliability of underground electrical power distribution systems. The splice kits feature Melni's proprietary Dual Helix Spiral Technology, which expands and contracts as electrical currents and temperatures vary. The kit also contains an integrated housing system with medium-voltage insulation and components that require only basic hand tools for installation. Melni's proposed kits could be installed in 10 to 15 minutes, which is three to four times faster than conventional kits, and would reduce failures and mistakes up to 90 percent by eliminating installation steps and potential human errors.

Arizona State University – Tempe, Arizona - High Speed Installation of Buried Medium Voltage Electrical Distribution Lines Using a Single Pass System

Arizona State University is developing a water-jet underground construction tool that would deploy medium-voltage electrical cables and conduits simultaneously underground with a lower risk to existing utilities by eliminating the need for a hard drill bit. The proposed tool creates a borehole by passing high-pressure water through a steering drill head and then vacuuming the slurry back out of the borehole to clear a path for excavation. At the same time, the system installs conduit to reduce cost and schedule impacts from

Energy Jennifer M. Granholm in a press release announcing the GOPHURRS funding. "With today's announcement, DOE is supporting teams across the country as they develop innovative approaches to burying power infrastructure underground — increasing our resilience and bringing our aging grid into the 21st century."

Announced in January was an allotment of $34 million for 12 project teams across 11 states. The awardees are looking into one of three components of the undergrounding process.

The first is burying powerlines without open trenching. While this can be done with horizontal directional drilling (HDD), Kim envisions more autonomous installation methods that can navigate already tight utility corridors.

This brings Kim to the next category of research and funding. Enhancing underground mapping capabilities to precisely locate and map existing infrastructure and other underground obstacles in real time, as well as the ability to look ahead and avoid those obstructions.

The third phase is splicing the cables together, an area that is manually completed and open to human error slowing the installation process. Kim says the program asks its researchers to redesign the splicing process.

"The ARPA-E projects typically run for three years, and we anticipate that at the end of the three years, successful teams will have a validated technology at lab scale," Kim says. "For this kind of technology, that lab scale means small outdoor experiment."

Kim notes that the $34 million to the project teams is a portion of the funding needed for research and development activities. The awardees are also responsible for securing additional matching funds for the project.

"After successful validation, the team can take multiple paths. They are eligible to apply for ARPA-E's new SCALEUP funding vehicle to further de-risk technologies to go to market. Or they can secure follow up funding from the private sector so they can do more testing, larger scale outdoor field testing and maybe pilot scale demonstrations," Kim says. "Eventually we really want to see these technologies being adopted and deployed and when that happens at massive scale that's when our technologies truly become transformative and that's ARPA-E's ultimate goal."

Mike Kezdi is managing editor of *Trenchless Technology.*

reaming and duct pulling tasks.

Case Western Reserve University – Cleveland, Ohio - Peristaltic Conduit with Stiff Structure and Compliant Skin

Case Western Reserve University is developing a worm-inspired construction tool that could cheaply and quickly install underground distribution powerlines in busy urban and suburban environments. The proposed robotic tool consists of a sleeve of expanding and contracting materials that digs underground like an earthworm while laying conduit as it goes. The goal for the peristaltic conduit is to be able to avoid existing infrastructure obstacles by turning more nimbly (with potential turning radius of about 5 ft compared with conventional methods with turning radiuses larger than 1,000 ft). If successful tunneling would be possible in environments which are currently too risky for trenchless methods.

Cornell University – Ithaca, New York - Mini-Mole: Combustion Powered Tip Fracturing and Undulatory Locomotion Robot

Cornell University is developing a worm-inspired digging tool with a combustion-powered soil fracturing head to minimize environmental disruption, enhance efficiency, and reduce costs of undergrounding power cables. The Mini-Mole leverages soft robotics to allow for improved steering and movement compared with conventional approaches and would be capable of tunneling, laying conduit, and installing cables without damaging the surface. The Mini-Mole would be capable of digging as fast as 12 ft per hour, have a reach up to 1,000 ft, and lower costs of cable and conduit installation by over 50 percent.

Oceanit – Honolulu, Hawaii - Artificial Intelligence and Unmanned Aerial Vehicle Real-Time Advanced Look-Ahead Subsurface Sensor (AURALSS)

Oceanit is developing a look-ahead subsurface sensor system that would take advantage of unmanned aerial vehicles (UAV) and electromagnetic (EM) resistivity techniques to avoid damaging existing utilities when undergrounding powerlines. The proposed system pairs an EM sensor on an underground drill string and an antenna mounted to a UAV flying overhead to expand the distance and sensitivity of object identification underground. The system would use machine learning interpretation and high-resolution imaging capabilities to provide real-time guidance for the drill path.

Phoenix Boring Inc. - San Francisco, California - PyroHDD

Phoenix Boring Inc. is developing a small-diameter multi-modal drilling head for ultrafast trenchless deployments in heterogeneous and changing ground conditions, especially where challenging hard rock exists. Building on 12- to 72-in. diameter multi-mode Phoenix Boring machines in the market, PyroHDD aims to simplify and accelerate deployments by seamlessly switching to the most efficient boring method for the ground conditions encountered. PyroHDD will use a combustion-based thermal spallation drilling (TSD) to efficiently flame-weaken and remove hard materials. Combining conventional HDD head with TSD technology in a hybrid thermal-mechanical head will allow switching modes without tool removal from the borehole, a smaller surface footprint, and lower power/thrust requirements than conventional HDD methods. PyroHDD is intended to tackle both typical and conventionally impossible small diameter undergrounding jobs with the same dynamism, efficiency, and decreased downtime.

TRENCHLESS AT THE FALLS

NIAGARA FALLS, ONTARIO

OCTOBER 28-30 | NIAGARA FALLS, ON

NASTT NO-DIG NORTH 2024

OCT. 28-30, 2024

Niagara Falls Convention Centre

REGISTRATION OPEN - nodignorth.ca

Platinum Sponsors:

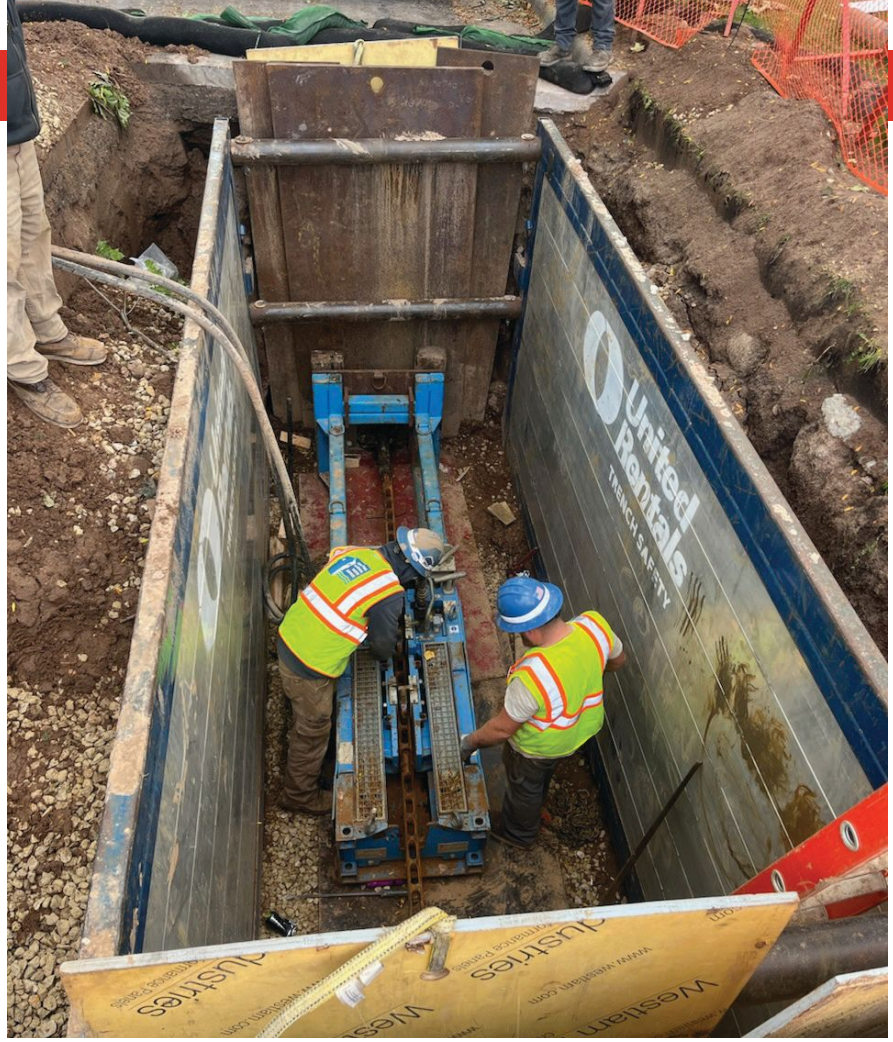
CAPITAL INFRASTRUCTURE GROUP INC. | IMC | NUKOTE COATING SYSTEMS CANADA | Insituform | MICHELS CANADA | TRELLEBORG

For Sponsor info please contact Kelly VanNatten at KVanNatten@benjaminmedia.com or Dan Sisko at Dsisko@benjaminmedia.com

No-Dig North is owned by the North American Society of Trenchless Technology (NASTT). For more information about NASTT or other NASTT events, please visit nastt.org.

St. Paul Regional Water Services Pipe Bursting Program: FINDING EFFICIENCY IN-HOUSE

By Jim Schill



Crews utilized 10-ft trench boxes to accommodate the Grundoburst static bursting equipment.

Much can be said about the evolution of trenchless technology and the level of accessibility it has achieved. That's credit to an industry that has pushed, promoted and supported the development and refinement of trenchless equipment, methods and applications.

Does that mean that someday we might see a directional drill or tunnel boring machine parked in every suburban driveway? Not exactly. But in-house trenchless programs being initiated at utilities around the country are becoming much more common.

St. Paul Regional Water Services is the water utility for the city of St. Paul, Minnesota, and several surrounding suburbs. The utility maintains several construction crews that perform water distribution work for both water services and water main maintenance, including installation and replacement. But, until recently, the utility has subcontracted out water main replacement via pipe bursting.

Distribution division manager Todd Blomstrom said, "A few years ago we became quite interested in developing a self-performing the pipe bursting program," said distribution division manager Todd Blomstrom. "We had field construction crews available and felt that by developing that type of program would achieve a higher level of efficiency with our water main replacement. We had a good pipe bursting contractor but wanted to be more in control of the process because of the amount of coordination it takes for projects like this,' he said.

St. Paul Regional Water Services worked with trenchless equipment manufacturer TT Technologies, Aurora, Illinois, to develop a pipe bursting plan, as well as prepare and train crews in the trenchless pipe bursting method. "Todd [Blomstrom] and the St. Paul Regional Water Services crew have really developed a strong in-house program. In many cases they're achieving high production with their static bursting equipment that are comparable to any contractor," said TT Technologies product specialist Mark Dorn.

Keeping it In-house

St. Paul Regional Water Services facilitates a robust in-house construction program. However, until 2022, pipe bursting work was contracted out to third-party providers. Utility crews would excavate launch and exit pips, set the trench boxes, and cut open the main. Then the contractor would fuse the HDPE pipe and perform the pipe bursting. St. Paul Regional crews would then reassemble the main, test it, reconnect the services and put it back in service.

And while the utility had a positive working relationship with a pipe bursting contractor, it was determined that performing the work in-house could be more efficient when considering coordination and prep time and contractor availability. So, in 2022, St. Paul Regional Water Services launched its in-house pipe bursting program. Initial projects consisted of existing 6- and 8-in. cast iron replaced it with 6- and 8-in. HDPE.

The Pipe Bursting Plan of Attack

With approximately 1,200 miles of water main in its system, spanning seven cities, developing a plan to address failing lines is a key component to the water utility's in-house program. Much of its system is made up of cast iron pipe with some of the oldest pipes dating back to the late 1800s. To help prioritize projects, St. Paul Regional Water Services has a model of its system that shows main break history, as well as the consequence of main breaks.

"The model does not put equal emphasis on each break, as higher risk facilities, such as area hospitals, medical facilities, schools, daycares, rank higher in importance within the model," Blomstrom said. "It then identifies a risk score for a specific location. The main break count is also an element of that score and replacement projects are prioritized based on those results. It's a great tool for helping map out our program."

According to Blomstrom, once the pipe segments are identified, further evaluation takes place to determine whether the project will be an open cut excavation, pipe bursting project or a clean inline project. One factor that is taken into consideration is the density of service connections.

For the in-house program at St. Paul Regional Water Services bursting projects range between 300 and 500 ft in length.

Basic temporary services are used for residential customers and established as needed from project to project.

"Pipe bursting is most efficient with a manageable number of service connections. Smaller residential lots with a high density of service connections are often best served through an open cut application," Blomstrom said. "The other consideration is host pipe material, as the utility has not attempted pipe bursting on ductile iron pipe."

St. Paul Pipe Bursting

Pipe bursting runs average between 350 and 500 ft for residential applications. The presence of ductile iron repair sleeves can impact the length of bursting runs. Host pipe diameters range between 6 and 8 in. for the cast iron mains. Several 12-in. segments are scheduled and represent the largest diameter pipe assigned to the pipe bursting program.

"The St. Paul crews have really taken to pipe bursting. Existing mains have been successfully upsized from 6 to 8 in. where capacity is a consideration," Dorn said. "High Density Polyethylene Pipe (HDPE) is being used to replace the existing cast iron mains. Water mains are generally 8 ft deep with 10-ft trench boxes providing a secure workspace. They're really working on efficiency and doing a great job."

Traffic control and access are also significant parts of the utility's pipe bursting efforts. Projects are planned and laid out to provide for optimum traffic flow. Hard and soft road closures are situational. Often, a street will be shut down with a soft closure allowing residents to access their properties while diverting through traffic to alternative route options. Crews will provide temporary service as needed per the specific project.

Staging pipe is done in the most effective way to reduce the amount of disruption. Care is taken to ensure the new HDPE stays as clean as possible while being transported to the job site, during fusion and when it is staged. Upon successful application of the pipe bursting process, the new pipe goes through a chlorination process, as well as pressure testing.

Pipe Bursting on Target

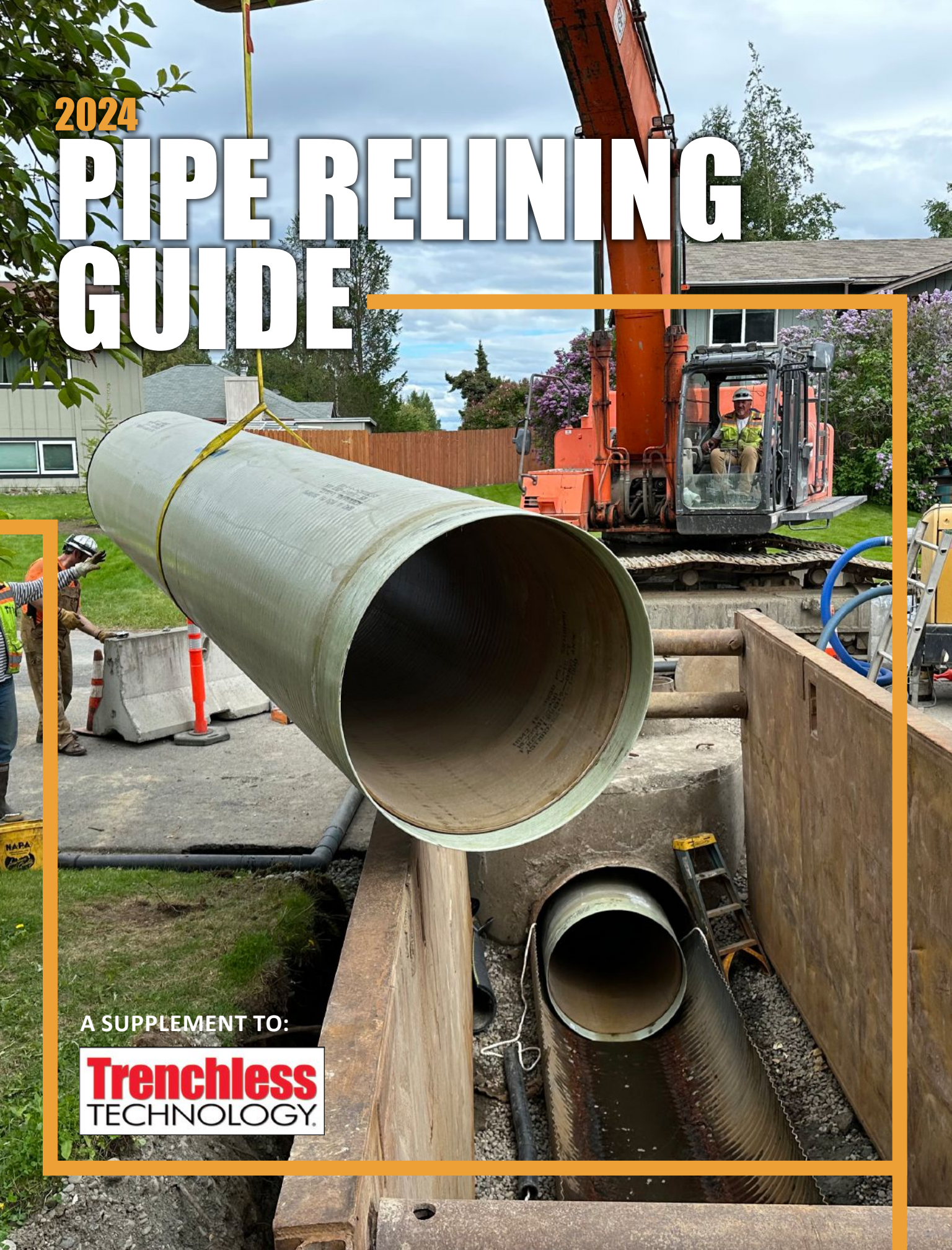
According to Blomstrom, focusing on performance measures, benchmarking has been a large part of the utility's success in development of its pipe bursting program.

"By creating dashboards for data has allowed us to evaluate of the process and see where we're succeeding and where we need to improve," he said. "We've been able to determine that the program has been cost effective in terms of lower cost per foot, replacing mains with less disruption, reduced street restoration and traffic closures. That also is a reflection of our pre-project evaluation process and its effectiveness. If the criteria and conditions are correct, pipe bursting will work effectively in those situations."

Blomstrom says that investing the time to develop a five-year plan, and understanding what the highest priorities are, has also been part of the success of St. Paul Regional Water Services in-house program.

"Once priorities are defined, it is possible to zero in on identifying the most efficient method for sections within the system," he said. "That knowledge has helped us refine the pipe bursting program. Since starting the program, our crews have completed an average of 5,000 feet of main pipe bursting a year."

Jim Schill is a technical writer in Mankato, Minnesota.



2024

PIPE RELINING GUIDE

A SUPPLEMENT TO:

Trenchless TECHNOLOGY

CONTENTS

PIPE RELINING DIRECTORIES

HOW TO COMPLETE A PROPER CIPP INSTALL

A Responsible Proper Order of Operations for SAFE High Quality CIPP

By Larry Kiest Jr.

Since 1971, cured-in-place pipe (CIPP) has steadily become the method of choice to rehabilitate old, crumbling and leaking sewer pipes. Lower cost, speed of execution, minimal disruption and long-term effectiveness of trenchless rehabilitation eroded support for the old dig-and-replace approach.

With improved materials and better installation methods, more pipes per day are being renewed by CIPP than ever before. In fact, most CIPP projects now include lining the mains, the service laterals (to the property line), and the associated manholes. It is now more of a system rehabilitation approach; after years of chasing water, we know you can't plug a leak here and expect it not to leak over there.

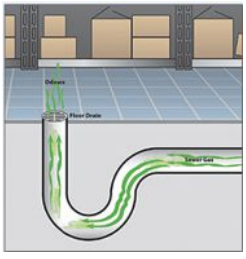
With miles of sewer pipes now being renovated annually, there are far too many instances where a dry fixture trap has caused a lot of grief for residents, business owners, contractors and municipal utilities. Cases of CIPP emissions entering a home or business including a medical facility where workers and patients were overcome by CIPP emissions (styrene gas) has led to a complete evacuation of the facility for the remainder of the day allowing crews to ventilate the building.

CIPP has proven to be a great product, one that has revolutionized how we maintain our wastewater infrastructure and avoid mass disruption to our fast-paced lives. So, what is really going on and why do we not have an answer to the occasional resident being exposed to CIPP emissions in their home? It seems the best we can do is to tell people, "It's OK, it won't hurt you, just pour water down your drain and open the windows." That's not much of a solution, but that is how our industry has addressed it.

A number of issues can arise from the sequencing of events dictated by current installation practices. The cleanouts are installed by the lateral lining contractor and are generally not in place when the mainline liner is installed. If the service cleanouts are not in place, the contractor is unable to plug the service pipe and manage unintentional flow. Unintentional flow may consist of facility use by the homeowner; footing tile/sump-pump connected to the sewer, roof leaders and infiltration from the private side sewer lateral. This creates an opportunity for discharge of sewage from multiple buildings during inversion and curing of the mainline liner. Sewage mixed with the resin saturated liner can impair CIPP quality.

Most municipal specifications require the contractor to have an on-site, redundant robotic cutter and a redundant bypass pumping system. Yet, the specifications fail to require any protective measures for homeowners during CIPP processing. Concern for VOCs from CIPP (main and lateral) is really limited to migration into residential and commercial buildings. The exhaust from mainline CIPP at the discharge manhole is typically not an issue for a variety of reasons. NASSCO offers good practices for CIPP and with those practices in-place, the area around a discharge manhole typically does not pose a health concern. Styrene dissipates quickly, and therefore the exhaust at the discharge manhole is quickly diluted. Think about it like this: People are walking down the sidewalk and cars are passing by and no one is getting sick from vehicle emissions. That's because "dilution is the solution" but take just one of those cars and pipe the exhaust into someone's home and quickly you'll have a completely different situation. This situation can be like a dry trap during the curing process.

As an industry of engineers, entrepreneurs and hard-working driven contractors, we can do a better job, and it starts with the engineers' technical specifications. That's because contractors are expected to do the best job at the lowest price. In turn, contractors are typically driven to meet only the minimum requirements of a contract. This is why the technical specifications are so important. It's the engineer's technical specifications that should require contractor submittals for an installation design that improves CIPP quality and protects homeowners and the public from CIPP emissions.



Dry P-Trap

Here is a brief explanation of an engineered solution that will improve CIPP quality, protect homeowners, and the public from CIPP emission exposure:

Mainline CIPP ASTM F1216

Step 1 - Survey (CCTV) main pipe and launch each service pipe. Take pipe I.D. and length measurements and perform critical locating (with GPS coordinates) for cleanout placement.

Step 2 - Install two-way cleanouts in the public right-of-way. Most communities require a minimally invasive cleanout as described in ASTM F3097 with same day restoration.

Step 3 - Providing informational door

hangers and making personal contact with the homeowner prior to mainline CIPP, requesting no water usage during pipe renovation.

Step 4 - Plug the main pipe and pump system flow.

Step 5 - Plug each service pipe connected to the main pipe segment by inserting the plug on the upstream side of the cleanout. Take appropriate steps to address unintentional discharge from a building by use of a sensor and a portable pumping system. The cleanout plug is outfitted with a bypass pipe and connected to a suitable pumping system. This is necessary, because even though the contractor provides informational door hangers and makes personal contact asking the homeowner not to use any water, there is a risk of unintentional discharge. A flooded basement can cause significant damage and contamination that can lead to potential health issues, including mold.

Step 6 - A continuous temperature monitoring cable is used to identify cold spots in the liner and confirm a proper cure. This prevents lifts, costly cutting, and patches in a new CIPP.

Step 7 - Rehabilitate the main pipe according to ASTM F1216.

A pre-liner is another solution that can be used to shield resin from contamination while reducing styrene exposure.

CIPP liners are available with a special coating that significantly reduces styrene leaching into the path of high velocity steam that is exhausted at the discharge manhole.

Systems are also available for filtering mainline CIPP emissions at the discharge manhole.

Step 8 - The mainline CIPP is cured, and the service connections are robotically reinstated.

Sometimes, a contractor has difficulty finding the dimple. That is why the cleanout must be in place before lining the main pipe, providing the contractor access to insert a camera into the lateral and illuminate the main liner at the connection. This prevents contractors from making "swiss cheese" out of the new CIPP.

The service connection can also be remotely reinstated from the cleanout.

Step 9 - A Hurco Ripcord fan is used to purge the system (main and laterals).

Step 10 - Plugs (main and laterals) are removed and flow is restored to normal operations.

Lateral CIPP ASTM F2561

Step 1 - Prepare the lateral pipe (descale, remove debris, roots and grease) and take final measurements (diameter/length) of the lined main pipe and the lateral pipes.

Step 2 - Providing informational door hangers and making personal contact with the homeowner prior to Lateral CIPP, requesting no water usage during pipe renovation.

Step 3 - Plug the main pipe and pump the flow around the main pipe segment.

Step 4 - Plug each service pipe on the upstream side of the cleanout and take appropriate steps to manage unintentional discharge from the building (typically a sensor and a pump system).

Step 5 - Flush each service pipe, then perform a final flush of the lined main pipe.

Step 6 - Rehabilitate the service pipes according to ASTM F2561 in a sequential order starting at the upstream manhole.

Step 7 - Attach a carbon charcoal filter to the cleanout to separate water and CIPP emissions as the pressurized steam (exhaust) is discharged through the filter.

Step 8 - A ventilation fan is used to purge the system (main and laterals) for at least 20 minutes.

Step 9 - Plugs (main and lateral) are removed, and flow is restored to normal operations.

Rather than sitting idle and allowing CIPP to be portrayed as a dangerous product, we advance the technology by providing engineered solutions. Cleanouts must be installed before any CIPP (main or lateral). Contractors must plug all system flows and manage unintentional discharge. Though the changes described in this article require additional steps, the impact is huge. They yield an improved system rehabilitation, capture, and put to good use, advancements in the CIPP technology.

Larry Kiest Jr. is owner of Confluence Trenchless Solutions LLC.

PIPE RELINING: CIPP

CIPP MATERIALS MANUFACTURERS & SUPPLIERS

APEX CIPP SOLUTIONS
941-300-0441
Sarasota, FL
apexcipp.com

BRANDENBURGER LINER GMBH & CO.KG
Landau Pfalz RP, DE
brandenburger-liner.com

BRAWO SYSTEMS
240-796-5007
Olney, MD
brawosystems-usa.com

E2 TECHNICAL TEXTILES
908- 249-4376
Hillside, NJ
e2techtextiles.com/industries/cured-in-place-pipe

FLOW-LINER SYSTEMS
800-348 -0020
Zanesville, OH
flow-liner.com

FORMADRAIN
514- 352-6911
Montréal, QC
formadrain.com/

GLOBAL MATERIALS CO.
888-797-3736
Riviera Beach, FL
globalmaterialscompany.com/

GO TRENCHLESS ZONE (CANADA)
519- 222-0432
Cambridge, ON
gotrenchlesszone.com

HAARTZ CORP.
978-264-2654
Acton, MA
haartz.com/products/cipp

INNERCURE TECHNOLOGIES INC.
844-748-5200
Orlando, FL
innercuretechnologies.com

MANUFACTURED TECHNOLOGIES CO. LLC
636- 530-3330
Chesterfield, MO
azuria.com/mtc

MAXLINER USA
919- 349-1969
Martinsville, VA
maxlinerusa.com

NATIONAL LINER LLC
800-547-1235
Pewaukee, WI
nationalliner.com

NEOPOXY LLC
510-782-1290
Hayward, CA
neopoxy.com

NORDITUBE TECHNOLOGIES SE
Liège WLG, Belgium
norditube.com/

NUFLOW TECHNOLOGIES
866-452-4754
San Diego, CA
nuflow.com

OMEGA LINER COMPANY INC.
605-558-1020
Canton, SD
omegauvpipe.com/

PARAMOUNT PIPE LINING PRODUCTS
833-663-2477
Clearwater, FL
paramountcipp.com/

PICOTE SOLUTIONS INC.
864-940-0088
Sammamish, WA
picotegroup.com

PIPELINE RENEWAL TECHNOLOGIES
973- 252-6700
Randolph, NJ
pipelinert.com

PROKASRO USA
Centennial, CO
prokasrousa.com

REEF INDUSTRIES INC.
713- 507-4214
Houston, TX
reefindustries.com

RELINE AMERICA
866- 998-0808
Saltville, VA
relineamerica.com

R-TEXTILES LLC
770- 274-2426
Tucker, GA
r-textiles.com

SAERTEX MULTICOM LP
704-584-4059
Huntersville, NC
saertex-multicom.com

SHONAN PLASTICS MFG. CO. LTD.
81-(0)463-22-0307
Hiratsuka Kanagawa, JP
shonan-gousei.co.jp/en

TENOWO INC.
704- 476-9548
Lincolnton, NC

TRELLEBORG ANCASTER INC.
226- 505-4659
Ancaster, ON
ist-web.com/en

TRELLEBORG ENGINEERED COATED FABRICS
828-289-2724
Rutherfordton, NC
trelleborg.com/en/engineered-coated-fabrics/industries/manufacturing-and-general-industry/pipecure

TRELLEBORG PIPE SEALS MILFORD INC.
603-801-0976
Milford, NH
trelleborg.com/en/pipe-repair

TRENCHLESS PRODUCTS LLC
212-419-0069
Closter, NJ
trenchlessproducts.us

UNITED FELTS
276-656-1904
Martinsville, VA
appliedfelts.com

UPSTATE TRENCHLESS LLC
518-307-1760
Hudson Falls, NY
ustliner.com

UV WIZARDS
855- 702-7251
Tumwater, WA
uvwizards.com

VECTORPLY CORP.
334- 291-7704
Phenix City, AL
vectorply.com/

WARRIOR USA LLC
716- 601-7760
Clarence, NY
thermoformliner.com/

WATERLINE RENEWAL TECHNOLOGIES
847-457-1810
Elk Grove Village, IL
waterlinerenewal.com/

CIPP RESIN MANUFACTURERS & SUPPLIERS

AOC
866-319-8827
Collierville, TN
aocresins.com/en-amr/home/

APEX CIPP SOLUTIONS
941-300-0441
Sarasota, FL
apexcipp.com

CHAMPION FIBERGLASS
832.698.8952
Spring, TX
championfiberglass.com/

FLOW-LINER SYSTEMS
800-348 - 0020
Zanesville, OH
flow-liner.com

GLOBAL MATERIALS CO.
888-797-3736
Riviera Beach, FL
globalmaterialscompany.com/

INNERCURE TECHNOLOGIES INC.
844-748-5200
Orlando, FL
innercuretechnologies.com

INNOVATIONS AMPLIFIED
888-595-1780
Avon, IN
innovationsam.com

INTERPLASTIC CORP.
651-481-6860
St. Paul, MN
interplastic.com

MC-BAUCHEMIE
289-763-4443
Aurora, ON
mc-bauchemie.ca

NORDITUBE TECHNOLOGIES SE
Liège WLG, Belgium
norditube.com/

NUFLOW TECHNOLOGIES
866-452-4754
San Diego, CA
nuflow.com

POLYNT REICHHOLD
847- 551-4448
Carpentersville, IL
polynt.com/en

PRIME RESINS
770- 388-0626
Conyers, GA
primeresins.com

PROTECTIVE LINER SYSTEMS, INC.
770-482-5201
Lithonia, GA
protectivelinersystems.com

SHERWIN-WILLIAMS
800-524-5979
Cleveland, OH
sherwin-williams.com/protective

SPRAYROQ INC.
205-957-0020
Birmingham, AL
sprayroq.com

TRELLEBORG ANCASTER INC.
226- 505-4659
Ancaster, ON
ist-web.com/en

TRELLEBORG ENGINEERED COATED FABRICS
828-289-2724
Rutherfordton, NC
trelleborg.com/en/engineered-coated-fabrics/industries/manufacturing-and-general-industry/pipecure

CIPP SPOT REPAIR MANUFACTURERS & SUPPLIERS

APEX CIPP SOLUTIONS
941-300-0441
Sarasota, FL
apexcipp.com

FERNCO CONNECTORS / SOURCE ONE ENVIRONMENTAL
519-466-1053
Sarnia, ON
s1eonline.com

FORMADRAIN
514-352-6911
Montréal, QC
formadrain.com

GLOBAL MATERIALS CO.
888-797-3736
Riviera Beach, FL
globalmaterialscompany.com

HAMMERHEAD TRENCHLESS
800-331-6653
Lake Mills, WI
hammerheadtrenchless.com

HAMMERHEAD TRENCHLESS - CANADA
416-659-5141
Mississauga , ON
hammerheadtrenchless.com

INFRASTRUCTURE REPAIR SYSTEMS, INC.
727-327-4216
St. Petersburg, FL
irsi.net

INNERCURE TECHNOLOGIES INC.
844-748-5200
Orlando, FL
innercuretechnologies.com

MAXLINER USA
919-349-1969
Martinsville, VA
maxlinerusa.com

PIPELINE RENEWAL TECHNOLOGIES
973-252-6700
Randolph, NJ
pipelinert.com

PROTECTIVE LINER SYSTEMS, INC.
770-482-5201
Lithonia, GA
protectivelinersystems.com

TRELLEBORG ANCASTER INC.
226-505-4659
Ancaster, ON
trelleborg.com/en/pipe-repair

SLIPLINING: QUALITY CONTROL PROCEDURES AND RISK MITIGATION

By Brian Gastrock, P.E.

Trenchless sliplining is a time-tested and effective technique for rehabilitating existing pipelines without the need for extensive excavation. This method allows for the reinforcement and repair of aging or damaged pipes, reducing the environmental impact and minimizing disruption to local communities. Sliplining rehabilitates pipelines by inserting a new pipe within the existing (host) pipe alignment. This technique is widely used for the rehabilitation of sanitary sewers, water, and storm water mains due to its cost-effectiveness.

Despite its advantages, there are risks associated with slipline design and construction implementation. Sliplining projects should implement quality control procedures and effective risk mitigation strategies to reduce risk and increase the chance of success.

The Sliplining Procedure

The sliplining design and construction involves several key steps:

1. Assessment and Inspection: An assessment of the existing pipeline should be completed. Techniques such as CCTV inspection, sonar, and other non-destructive testing methods identify the extent of damage, structural integrity, and dimensions of the host pipe.

2.Pipe Selection: Based on the conditions found in the assessment, an appropriate liner pipe material is chosen. Common materials used for sliplining include High-Density Polyethylene (HDPE), Fiberglass Reinforced Polymer (FRP), or other suitable pipes. The selection depends on factors such as site constraints, load-bearing capabilities, and flow capacity.

3.Preparation of Host Pipe: Prior to inserting the new liner pipe, the host pipe must be prepared. This may involve cleaning out debris, ensuring the interior surface is smooth, and performing repairs if certain

sections of the pipe are damaged.

4.Insertion of Liner: The new liner is inserted into the host pipe. This is typically performed using winches, excavators with slings, or a combination of both. Using segmented pipe allows for installation in "live flow" conditions in sewer and storm pipe.

5.Sealing and Grouting: Once the liner is in place, the annular space between the host and liner pipe should be grouted for structural integrity and to create a watertight seal. This step helps prevent movement of the liner and provides additional stability.

6.Final Inspection: After the installation is complete, a final inspection is recommended to verify the installation meets the project specifications.

Quality Control Procedures

1.Pre-Installation Inspection and Measurements

The success of sliplining projects begins with an inspection of the existing pipeline. This step involves inspections and measurements. The inspections are commonly completed using closed-circuit television (CCTV) to identify defects, blockages, and the overall condition of the pipeline. This step can be challenging for pressurized water mains. Accurate measurement of the internal diameter and length of the host is required to confirm new liner pipe will fit.

2.Material Quality Control

Selecting the proper pipe and testing is essential for project success. Selecting the appropriate material (e.g., HDPE, PVC, or fiberglass) is based on the pipeline's function, fluid type, and environmental conditions. During construction, the specifications should outline the appropriate tests required for the liner material to verify its compliance with industry standards and project specifications. Verifying the joints and connections for defects that could potentially compromise the integrity of the liner should be included in the final inspection.

3.Installation Procedures

Proper installation techniques are vital to the success of a sliplining project. Key methods include the insertion technique, annular space grouting, and end seals. The insertion technique typically uses a winch or other pulling device to insert the liner smoothly and evenly, avoiding damage to both the liner and the host pipe. Filling the annular space between the host pipe and the new liner with the correct grout is necessary to provide structural support and prevent future infiltration or exfiltration. The ends of the liner should be sealed correctly to prevent leaks and secure the liner in place.

4.Post-Installation Testing

After installation, testing is necessary to confirm the success of the sliplining process. The design should include specifications to conduct hydrostatic or air pressure tests to verify the new liner is leak-free and structurally sound. It's also recommended to perform a post-installation CCTV inspection of the liner's position, integrity, and absence of defects. Measuring the flow rate to ensure the rehabilitated pipeline meets

the required capacity and performance standards is also recommended, depending on project specifics.

Risk Mitigation Strategies

1.Comprehensive Planning and Design

Effective risk mitigation starts with detailed planning and design, including site assessment, specifications, and contingency plans. The engineer should be responsible for conducting thorough site assessments to address ground conditions, access points, and potential challenges. The design should also include detailed specifications to consider the host pipe's condition, environmental factors, and project requirements. Additionally, the design should include contingency plans for issues such as blockages, structural failures, or adverse weather conditions.

2.Stakeholder Engagement

Engaging with key stakeholders, including owners, operators, citizens, and contractors, helps with communication and coordination. Including a plan for stakeholder engagement confirms clear and continuous communication to address concerns and project progress.

3.Selecting Experienced Contractors

The choice of contractors plays a significant role in mitigating risks. Often, low-price selection is required, but the specifications should include contractor qualifications language, requiring experience in sliplining projects.

4.Monitoring and Supervision

Inspections during critical phases of the project help to identify and address issues promptly. It is recommended to have qualified supervisors on-site to oversee the installation process and ensure adherence to quality control procedures. Having regular scheduled meetings with the contractor helps to understand the construction schedule and critical phases.

Conclusion

Sliplining should be a method considered for pipeline rehabilitation, offering numerous benefits such as cost savings, reduced environmental impact, and extended pipeline life. However, the success of sliplining projects hinges on quality control procedures and proper risk mitigation strategies. Conducting pre-installation inspections, verifying material quality, requiring proper installation techniques testing, project managers can reduce risks and increase project success. This can be completed with proper planning and design, stakeholder engagement, obtaining qualified contractors, and performing inspections throughout the sliplining project.

Brian Gastrock, P.E. is a senior discipline civil engineer at Coffman Engineers.

PIPE RELINING: SLIPLINING, CLOSE-FIT LINING AND SPIRAL WOUND MANUFACTURERS & SUPPLIERS

AGRU AMERICA INC.
800-373-2478
Georgetown, SC
agruamerica.com

ARMTEC
519-620-6129
Cambridge, ON
armtec.com

CHANNELINE INTERNATIONAL
514-242-4495
Montreal, QC
channeline-internation-al.com

CONTECH ENGINEERED SOLUTIONS
513-645-7455
West Chester, OH
conteches.com

CPM PIPELINES
480- 206-2309
Phoenix, AZ
cpmpipelines.com

DYNALINER
970-948-7401
Birmingham, AL
dynalinerllc.com

FACTION FUSION
877-387-4669
San Clemente, CA
factionfusion.com

INFRASTEEL BY PRECISION PIPE AND PRODUCTS
205-613-0072
Birmingham, AL
infrasteel.com

INNERCURE TECHNOLOGIES INC.
844-748-5200
Orlando, FL
innercuretechnologies.com

IPEX INC.
800-463-9572
Pineville, NC
ipexna.com

MANUFACTURED TECHNOLOGIES CO. LLC
636-530-3330
Chesterfield, MO
azuria.com/mtc

PERMALOK CORP. - A NORTHWEST PIPE CO.
314-888-6805
Ferguson, MO
nwpipe.com/products

PICOTE SOLUTIONS INC.
864-940-0088
Sammamish, WA
picotegroup.com

PIPELINE HANDLING LTD
770-881-0754
Holmes Chapel, TX
pipelinehandling.com

PRIMUS LINE INC.
704-569-4460
Charlotte, NC
primusline.com

SEKISUI SPR AMERICAS LLC
678-510-1820
Austell, GA
sekisuispra.com

SHONAN PLASTICS MFG. CO. LTD.
81-(0)463-22-0307
Hiratsuka, Japan
shonan-gousei.co.jp/en

STRUCTURAL TECHNOLOGIES
714-869-8824
Columbia, MD
structuraltechnologies.com

UNITED PIPELINE SYSTEMS
970-799-0167
Durango, CO
unitedpipeline.com

VYLON PIPE
800-382-0862 Ext. 1
Bowling Green, OH
vylonpipe.com

PROPER CLEANING & SURFACE PREP: FUELS SUCCESSFUL SPRAY APPLICATIONS FOR INFRASTRUCTURE REHAB

By Brocklyn Stone

In any rehabilitation project that involves the use of a spray-applied cementitious repair material or a polymeric protective coating, the cleaning and surface preparation stages play a critical role. The age and composition of the host structure, as well as the type of material being used for rehabilitation, are key factors that determine the necessary steps and considerations for cleaning and surface preparation.

Regardless the host material composition, or whether a cementitious or polymeric material is being applied, the cleaning process serves as the initial step to promote proper adhesion or positive interface between the repair material or protective coating and the host infrastructure substrate. To achieve this, it is generally recommended and necessary to remove surface contaminants such as loose debris and FOG (Fats, Oils, and Grease). This can typically be accomplished by employing high-pressure water blasting techniques, where the surface is subjected to water at a pressure ranging from 3000 to 5000 pounds per square inch (psi).

Once the surface has been meticulously cleaned, the next step involves assessing the condition of the substrate. This entails inspecting for cracks, spalls, or any other surface defects that may require repair before the spray-applied material can be applied. It is crucial to address these issues before proceeding with the rehabilitation project, as they have the potential to compromise the integrity of the final coating or repair.

Determining the right surface prep level:

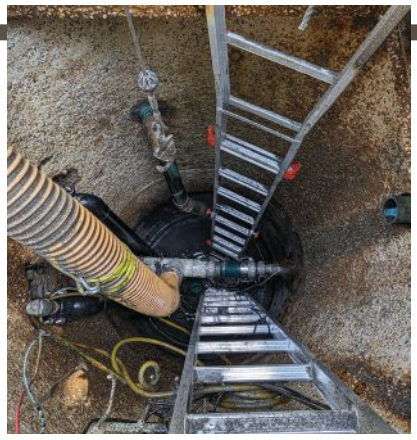
Since each product is unique, both in

makeup and in function, it is important to know what the individual surface condition requirements are prior to application. Proper concrete surface preparation will save time, money and greatly reduce the chance for coating failure. The International Concrete Repair Institute (ICRI) classified and developed ten concrete surface profiles (CSP 1-10). Each profile is classified by the average distance from the peaks of the concrete surface to the valleys. The higher the classification number, the coarser the surface. CSP 1 is nearly flat, while CSP 10 is rough and ridged. The ten CSP classifications are accepted industry standards designed to help an installer achieve proper surface texture to successfully bond the existing surface to the rehabilitation material.

Surface preparation steps for cementitious material application

When specifically dealing with the installation of cementitious repair materials onto existing or aged concrete or brick masonry infrastructure, it is advisable to rinse the substrate surface with potable water after removing unsound concrete, dirt, dust, FOG, and other debris through high-pressure water blasting. This rinsing process effectively eliminates any remaining dirt, sand, and loose debris, thereby providing a clean and damp surface that facilitates bonding between the host structure and the cementitious repair material during and after the spray application process. It is important to note that the specific cleaning and surface preparation methods employed will depend on the nature of the surface and the extent of contamination. For heavily soiled surfaces contaminated with dirt or grease, more aggressive techniques such as higher psi pressure washing, water jetting, abrasive blasting, grinding, or scarifying may be necessary for effective debris removal. In some cases, the use of chemical cleaning agents might be required to dissolve stubborn contaminants. It is crucial to follow the manufacturer's instructions when utilizing these cleaning agents, as they

Before Prep



After high-pressure washing and sand blasting to bring surface to CSP 5.

may have specific dilution ratios and safety precautions.

When applying a polymeric material application, proper surface prep is even more critical

When using a polymeric product as a repair material in existing or aged infrastructure, or as a protective coating in a new structure, additional steps and considerations must be taken to ensure proper application and bonding between the substrate and the polymeric material. These steps go beyond what is necessary for cementitious repair materials. Similar to cementitious materials, polymeric materials also require a clean surface free from loose debris and FOG (Fats, Oils, and Grease). However, unlike cementitious materials, achieving a specific surface profile becomes crucial for polymeric materials to achieve the desired level of adhesion. This may necessitate the use of more aggressive means of surface preparation, such as ultra-high pressure water blasting, sandblasting, abrasive blasting, wet abrasive blasting, mechanical grinding, or acid etching.

For instance, when preparing a new concrete structure for the application of a polymeric material, a more aggressive surface preparation method is required to achieve the recommended surface profile. Merely using high-pressure water blasting may not create the necessary profile, thus necessitating the use of sandblasting or abrasive blasting techniques. In contrast, for existing or aged infrastructure, a surface profile of CSP 5 can be achieved more easily with high-pressure water blasting at 5000 psi. When in doubt, always follow the manufacturer's recommended surface prep level.

In particular to polymerics, surface preparation does not end with cleaning and profiling. It is crucial to monitor the work environment and surface moisture to prevent any contamination that could interfere with the proper installation of the polymeric material. After ensuring proper cleaning and achieving the desired surface profile, a quality control standard must be implemented to ensure that the polymeric material interfaces correctly with the substrate. This includes monitoring the moisture in the atmosphere and on the host structure. Most manufacturers recommend refraining from installing polymeric materials when the dew point and surface temperature of the structure are within 5 F of each other.

In conclusion, proper cleaning, surface preparation, and adherence to quality control standards are paramount in any spray-applied rehabilitation project. By thoroughly removing dirt, debris, and contaminants from the surface, addressing necessary repairs, and monitoring surface and environmental conditions, successful installation and optimal performance of the spray-applied material can be achieved. It is imperative to meticulously follow the manufacturer's instructions and guidelines throughout the entire process to achieve the best possible results.

Brocklyn Stone, AMPP Level II certified inspector, is vice president of product development at Vortex Companies.

PIPE RELINING: SPRAY-APPLIED MANUFACTURERS & SUPPLIERS

AMERICAN POLYWATER CORP.
651-430-2270
Stillwater, MN
polywater.com

APEX CIPP SOLUTIONS
941-300-0441
Sarasota, FL
apexcipp.com

AVANTI INTERNATIONAL
281-486-5600
Webster, TX
avantigrout.com

CHAMPION FIBERGLASS
832-698-8952
Spring, TX
championfiberglass.com

DENSO INC.
281- 821-3355
Houston, TX
densona.com

EPOXYTEC INT'L INC.
954-961-4656
Hollywood, FL
epoxytec.com

FLOW-LINER SYSTEMS
800-348-0020
Zanesville, OH
flow-liner.com

GEOTREE SOLUTIONS
855-655-6750
Lafayette, CO
geotreesolutions.com

GLOBAL MATERIALS CO.
888-797-3736
Riviera Beach, FL
globalmaterialscompany.com

INNERCURE TECHNOLOGIES INC.
1844-748-5200
Orlando, FL
innercuretechnologies.com

MADEWELL PRODUCTS CORP.
770-558-7330
Alpharetta, GA
madewell.net

MASTER BUILDERS SOLUTIONS
404-386-9263
Beachwood, OH
master-builders-solutions.com/en-us

MC-BAUCHEMIE
289-763-4443
Aurora, ON
mc-bauchemie.ca

NEOPOXY LLC
510-782-1290
Hayward, CA
neopoxy.com

NUFLOW TECHNOLOGIES
866-452-4754
San Diego, CA
nuflow.com

OBIC PRODUCTS
240-818-3639
Bryan, OH
obicproducts.com

PARAMOUNT PIPE LINING PRODUCTS
833-663-2477
Clearwater, FL
paramountcipp.com

PICOTE SOLUTIONS INC.
864-940-0088
Sammamish, WA
picotegroup.com

PIPELINE RENEWAL TECHNOLOGIES
973- 252-6700
Randolph, NJ
pipelinert.com

PIPE LINING SUPPLY
605-690-3382
Anaheim, CA
pipeliningsupply.com

PROTECTIVE LINER SYSTEMS INC.
770-482-5201
Lithonia, GA
protectivelinersystems.com

QUIKSPRAY INC.
419-732-2611
Port Clinton, OH
quikspray.com

RAINSTOPPER
318-687-4330
Shreveport, LA
rainstopper.us

REEF INDUSTRIES INC.
713-507-4214
Houston, TX
reefindustries.com

REMOTE ORBITAL INSTALLATIONS LLC
608-845-0360
Verona, WI
roi360.com

RESILINE
+44 1845 577498
Thirsk, England
resiline.co.uk

R-TEXTILES LLC
770-274-2426
Tucker, GA
r-textiles.com

SAUEREISEN INC.
412-963-0303
Pittsburgh, PA
sauereisen.com

SEALING SYSTEMS INC.
763-478-2057
Loretto, MN
ssisealingsystems.com

SEWPERCOAT BY IMERYS
757-284-3278
Chesapeake, VA
imerys.com

SHERWIN-WILLIAMS
800-524-5979
Cleveland, OH
sherwin-williams.com/protective

SPECTRASHIELD
904-419-4889
Jacksonville, FL
spectrashield.com

SPRAYROQ INC.
205-957-0020
Birmingham, AL
sprayroq.com

TENOWO INC.
704-476-9548
Lincolnton, NC

THE STRONG CO. INC.
870-535-7617
Pine Bluff, AR
strongseal.com

TRELLEBORG ANCASTER (CANADA)
226-505-4659
Ancaster, ON
trelleborg.com/en/pipe-repair

TRELLEBORG ENGINEERED COATED FABRICS
828-289-2724
Rutherfordton, NC
trelleborg.com/en/engineered-coated-fabrics/industries/manufacturing-and-general-industry/pipecure

VORTEX COMPANIES
713-750-9081
Houston, TX
vortexcompanies.com

WARREN ENVIRONMENTAL
508-947-8539
Middleborough, MA
warrenenviro.com

LEVERAGING CONDITION ASSESSMENT FOR EFFECTIVE PIPELINE REHABILITATION

By Jeff Griffiths

According to the American Society of Civil Engineers (ASCE) Report Card for America's Infrastructure, there are as many as 75,000 sanitary sewer overflows (SSOs) annually in the United States. The management and assessment of our wastewater infrastructure is a critical component in the preservation of the environment, economy, and overall public health. Drinking water and wastewater infrastructure is the lifeblood of our society and runs throughout our communities, near our homes, schools, and businesses.

Manholes are critical access points for sanitary sewer systems.

Managing this critical infrastructure requires effective asset management, which is a systematic approach to ensure optimal service delivery while minimizing costs over the asset's entire lifecycle. It involves several key components and practices aimed at maintaining, rehabilitating, and replacing sewer system assets such as pipes, manholes, and pump stations. Due to the age of our infrastructure, most utilities need to conduct extensive condition assessment and rehabilitation in support of asset management; however, many utilities lack the experience and capabilities to perform such work. In addition, local budgets are often insufficient to fully address these comprehensive assessment needs.

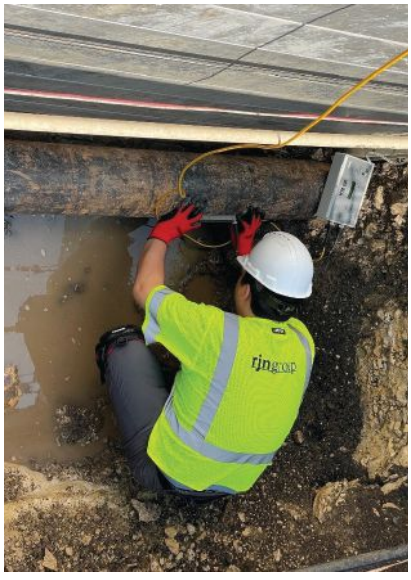
There are several primary reasons why we perform sewer condition assessments:

1.Identify Sources of Inflow and Infiltration (I/I): The Holy Grail for any system owner, especially those under Consent Order, is to completely eliminate SSOs. While this is not often practical, moving closer to zero from 75,000 is one of the primary drivers of performing condition assessments of our wastewater collection systems. The framework of Sanitary Sewer Evaluation Surveys (SSES) was born out of the Clean Water Act and the US Environmental Protection Agency (EPA) in the early 1970s. SSES methodologies have been continuously refined by Engineers and Municipalities for decades, so now we have an industry-wide, best-practices playbook to identify and address I/I. This often starts with sewer flow monitoring, smoke testing, dye testing, and manhole inspections before progressively moving into more invasive and expensive activities like Closed-Circuit Television Inspection (CCTV) and private property wet-weather simulations.

2.Preventative Maintenance: Regular assessments help identify potential issues before they become major problems, allowing for proactive maintenance and repairs. Ultimately, this extends the remaining useful life of buried assets and reduces the likelihood of costly emergency situations.

3.Prioritize Repairs and Rehabilitation: Condition data allows utilities to identify and prioritize which pipes and sections need immediate attention versus those that can be addressed later. This enables more efficient use of limited funding. According to ASCE, there is an $81 billion annual gap representing the difference between current infrastructure spending and the estimated required annual investment to maintain sustainable, reliable water and sewer systems. ASCE projects this could increase to as much as $434 billion by 2029, if unaddressed.

4.Evaluate Rehabilitation Options: Detailed condition assessment helps determine the most appropriate and cost-effective rehabilitation methods for different pipe segments. In most cases, cost-effective, trenchless rehabilitation methods are preferred, but good condition assessment data is needed to support these designs to



Broadband electromagnetic (BEM) inspection can determine relative pipe wall thickness.

avoid more costly, open cut, dig-and-replace methods.

According to the Environmental Protection Agency (EPA), condition assessment is defined as the process whereby data and information are gathered through observation, direct inspection, investigation, and monitoring. An analysis of the data and information helps determine the structural, operational, and performance status of capital infrastructure assets. Once structural and operational conditions are known, the most appropriate maintenance, repair, and rehabilitation decisions can be made, thus ensuring the longevity and reliability of aging infrastructure.

In asset management and condition assessment, "data" is the linchpin. Without accurate data, sound engineering analysis and design becomes a gamble. Cost-effective repair and rehabilitation hinge on reliable condition assessment data, which is crucial for determining the best rehabilitation methods for gravity sewer pipes, force mains, and manholes. Here is how data is typically used:

1.Structural Integrity Assessment: Data on pipe wall thickness, cracks and deformations helps determine if a fully structural or semi-structural rehabilitation solution is needed. For example, pipes with significant structural damage may require sliplining, or pipe bursting, while those with less-severe or minor issues might only need cured-in-place pipe (CIPP) lining or point-repair liners. Manholes with significant wall loss may need to be rebuilt or replaced with a total structural rehabilitation solution depending on costs (often related to surface restoration).

In asset management and condition assessment, "data" is the linchpin. Without accurate data, sound engineering analysis and design becomes a gamble.

2.Corrosion Evaluation: Information on corrosion guides the choice of rehabilitation materials. Pipes with severe corrosion may require cathodic protection (metallic pipes) or corrosion-resistant liners or complete replacement, while those with minor corrosion could be treated with protective coatings. One progressive approach to dealing with severe corrosion would be to CIPP line, slip-line, spray apply, or replace the deteriorated pipe segments. Minor corrosion in large diameter lines could be added to a watch-list to be rehabilitated later due to cost considerations. Minor corrosion in small-diameter lines is monitored over a period of three to five years and often added to a rehabilitation list. Force mains and water pipes with minor corrosion are often flagged for rehabilitation sooner because the deteriorated internal pipe condition can affect the flow capacity and pump operations more so than with gravity pipes.

3.Operational Performance: Data on flow capacity and restrictions helps determine if a rehabilitation method that reduces pipe diameter (e.g., sliplining) is feasible or if methods that maintain or increase capacity (e.g., pipe bursting) are necessary. Information on pressure requirements for force mains or flow characteristics for gravity sewers influences the selection of rehabilitation methods that can withstand these operational conditions.

4.Material-Specific Considerations: The pipe material (e.g., ductile iron, PVC, concrete, brick) influences rehabilitation choices. For instance, Prestressed Concrete Cylinder Pipe (PCCP) force mains with wire breaks may require different approaches than corroded metallic pipes or large diameter gravity concrete sewers.

5.Access Points and Site Conditions: Information on available system access points and pipe lengths help determine if methods like CIPP (which can cover long distances) or segmental lining are more appropriate. Also, the construction footprint needed for rehabilitation activities may drive certain technologies. Data on surrounding topography, soil conditions and groundwater levels may impact the choice between trenchless rehabilitation methods and open-cut replacement.

6.Risk Assessment: Data on the consequence of failure (COF) helps prioritize rehabilitation efforts and may justify more robust, and potentially costly, rehabilitation methods for critical assets. Condition assessment data can indicate the likelihood of failure (LOF) of a particular asset, but it should be evaluated against COF to determine the actual risk of failure.

By analyzing comprehensive condition assessment data, utility owners and engineers can make better informed decisions about the most appropriate and cost-effective rehabilitation methods for their specific pipe conditions. This is often referred to as “actionable data.” This approach ensures that the chosen rehabilitation technique not only addresses current issues but also provides long-term reliability and performance for rehabilitated wastewater infrastructure.

Jeff Griffiths is manager of infrastructure assessment at RJN Group, Norfolk, Virginia.

PIPE RELINING: CONDITION ASSESSMENT, SOFTWARE, LEAK DETECTION AND INSPECTION

AMERICAN POLYWATER CORP.
651-430-2270
Stillwater, MN
polywater.com

ARIES INDUSTRIES INC.
800-234-7205
Waukesha, WI
ariesindustries.com

CAN-EX TECHNOLOGIES
Quebec City, QC
canex.tech

CHERNE INDUSTRIES
800-843-7584
Shakopee, MN
cherneind.com

CPM PIPELINES
480- 206-2309
Phoenix, AZ
cpmpipelines.com

CUES
800- 327-7791
Orlando, FL
cuesinc.com

ENVIROSIGHT
973-252-6700
Randolph, NJ
envirosight.com

FIBERSCOPE.NET BY STRAHL LLC
877-613-2210
Woburn, MA
fiberscope.net

FLOWPOINT ENVIRONMENTAL SYSTEMS
877-655-5585 Ext. 1001
Morinville, AB
flowpointsystems.com

GROEBNER
Rogers, MN
groebner.com

H2O MANAGEMENT
619- 715-9841
San Diego, CA
h2omanagement.com

HATHORN USA
866-428-4676
Columbus, OH
hathorncorp.com

INNERCURE TECHNOLOGIES INC.
844-748-5200
Orlando, FL
innercuretechnologies.com

L.M.E. CONSULTANTS LLC
561-306-0777
Edgewater, FL
simply-wicked.com

MOBILE POWER
972-864-1015
Garland, TX
meps.com/

MUELLER WATER PRODUCTS
352- 512-8409
Seminole, FL

PIPE RELINE SOLUTIONS
208-459-7999
Caldwell, ID
piperelinesolutions.com

PIPELINE RENEWAL TECHNOLOGIES
973- 252-6700
Randolph, NJ
pipelinert.com

PIPETRONICS GMBH & CO. KG
49 (0) 7244 94 993 - 0
Stutensee, Germany
en.pipetronics.com

PROKASRO USA
Centennial, CO
prokasrousa.com

RAPIDVIEW IBAK NORTH AMERICA
800-656-4225
Rochester, IN
rapidview.com

RATECH ELECTRONICS LTD.
905-660-7072
Concord, ON
ratech-electronics.com

RAUSCH ELECTRONICS USA
717-709-1005
Chambersburg, PA
rauschusa.com

SEWER ROBOTICS
Poeldijk, Netherlands
sewerrobotics.com

TRELLEBORG ANCASTER (CANADA) INC.
226- 505-4659
Ancaster, ON
ist-web.com/en

TRELLEBORG PIPE SEALS MILFORD INC.
16038010976
Milford, New Hampshire
trelleborg.com/en/pipe-repair

TRENCHLESS PRODUCTS LLC
212-419-0069
Closter, NJ
trenchlessproducts.us

TRY TEK MACHINE WORKS INC.
717-428-1477
Jacobus, PA
trytek.com/

VIVAX-METROTECH CORP.
201-562-7056
Santa Clara, CA
vivax-metrotech.com

WINCAN LLC
Pittsburgh, PA
wincan.com

USE OF PRIMUS LINE® REHAB RESTORES LAWRENCE'S VERMONT STREET BRIDGE WATER MAIN

Rehabilitation of the 20-inch water line running under the Vermont Street bridge over the Kansas River.

In February of 2021, the 20-inch potable water transmission main under the Vermont Street bridge over the Kansas River was immediately taken out of service due to significant breaks in the line during a freeze-thaw cycle. The City of Lawrence, KS, quickly investigated the extent of the damage and the cause of the 1,110-foot steel pipeline to determine the feasibility and cost-effectiveness of restoring the pipeline to service and to identify one or more solutions. The city's consultants evaluated a wide range of trenchless solutions and recommended the flexible fabric-reinforced pipe (FFRP) technology "Primus Line® Rehab" as the best rehabilitation option.

With the 20-inch water main running under a bridge spanning the Kansas River, city engineers were faced with a difficult and potentially expensive conventional replacement. As a result, the decision was made to look for a "pipe lining" option to rehabilitate the pipeline instead of conventional replacement.

Engineers contacted Primus Line whose representatives presented the low-pressure Primus Liner to the city engineers, and after several meetings, the city decided to add Primus Line® Rehab to its specifications as the method for rehabilitating the pipeline.

Due to the location of the water main under a bridge, access to deploy the liner at each end of the main was extremely limited. The contractor developed a system of rollers and pulleys to "reverse deploy" the Primus liner from the material spool, up the embankment under the bridge, and then back into the water main. To do so, a 10-ton capstan winch to pull the liner into the pipeline from the opposite side of the river was used.

Despite the difficult installation, the liner was successfully installed, pressure tested and approved by city inspectors.

Contact for press enquiries:

Rädlinger primus line GmbH

Andrea Wohlfarth
Marketing Manager

Kammerdorfer Straße 16
93413 Cham, Germany

Phone: +49 (0)9971 8088-1504
presse@raedlinger.de
www.primusline.com

REHABBING LATERALS IN LARGE DIAMETER PIPE

Niche Projects Require Tailored Approach

By Mike Kezdi

When discussing the relining of service laterals, it boils down to this: It's typically a small diameter (4- or 6-in.) line that is relatively shallow and a short run, however, depending on the geographic location (if there is a basement or no basement) of these small diameter lines, they can reach depths up to 10 ft or great and extend out past 100 ft. The work takes place on the private side from the property line or cleanout to the building or on the system owner's side from the mainline to property line or a cleanout.

These relining projects are done every day across North America and are part of a growing and critical segment of the trenchless industry — either as property owners look for less intrusive ways to repair their sewers, or as system owners look at areas where they can reduce inflow and infiltration (I&I) into to their systems. The latter is often done in conjunction with mainline sewer repair work.

Lateral connections to larger diameter sewers is an area of lateral rehabilitation that is growing — but still a niche market making up a small percentage of the overall work. These connections were either ignored or were repaired using a more traditional open-cut replacement because of access issues in the past.

BLD Services of Kenner, Louisiana is one of the contractors working in this type of arena. BLD crews have completed projects over the last several years involving the rehabilitation of service laterals in larger diameter sewers in multiple states, including Florida, Kentucky, Ohio and Tennessee.

"We reline about 18,000 laterals in a year," says Jacob Trapani, vice president of BLD Services. "Of those, probably 500 are connected to large diameter pipes. It's out of the ordinary for sure."

Trapani reiterates that this is a small segment of the market, noting it's typically found involving older sewer systems and in areas that had combined sewer systems. The location of a property on a gravity fed system is one scenario that leads to this occurrence.

He explains that the laterals connect to a more typical section in an 8- to 10-in. pipe, which is typically in the upstream portion of the system. The depth and diameter increase to address capacity as the sewer moves downstream. The contractor would install the service lateral directly to the larger diameter pipe when these older systems were installed. In a newer system, the owner would typically have the contractor install a feeder sewer line as an intermediary between the service lateral and the mainline sewer.

BLD Services works from the mainline towards the property, therefore, most of its projects are completed via access from manholes. Access via manholes made repairing these laterals via trenchless a challenge.

"From an installation perspective, it's the same as any other lateral just on a bigger scale," says Trapani. "We just didn't have the tools or the mechanisms to do the repairs. Now we do."

Without getting into details about its proprietary installation methods, Trapani says that BLD's lateral train – the system the crew uses to invert and install the lateral liner from the mainline – had to be adjusted to accommodate installation in a larger diameter sewer. Considerations had to be made to install the liner in live flow situations where bypass was not available. In addition, the manhole opening which are typically 22-in. in diameter, needed to be altered to accommodate the large installation train. Trapani refers to these larger diameter lateral trains as being the same as the ones used on typical sewers, just on steroids.

Case Studies in Lateral Rehab in Larger Diameter Pipe

Project - City of Nashville, Tennessee - Shelby 6 Sewer Rehab

BLD's scope of work included lining the laterals in sewer mains ranging from 8- to 42-in. in diameter. For this project BLD completed four lateral rehabilitations in 30-in. diameter pipe, 39 rehabilitations in 36-in. diameter pipe and three inside a 42-in. diameter pipe. BLD built new frames for the lateral train to accommodate the larger diameter pipes. This required an intensive study of the site, specifically the manhole configuration, to make sure the opening was large enough to accommodate the train to the mainline. This also marked the first time that BLD Services successfully installed a full-wrap lateral in 36-in. and 42-in. sewers.

Project – City of Pinellas Park, Florida

For this project, BLD lined 30 service laterals along a 25-ft stretch of a 30-in. mainline sewer. BLD had to use brims instead of a full wrap because the client could not fully clean or bypass the mainline. There were many things that the crews learned

on this project that helped pave the way for other lining projects to come. Working in a line with debris caused the rotation motor on the lateral installation train to burnout. Additionally, the connection at the mainline was 8 in. but the lateral transition to 6 in. in diameter was about 6 in. up from the mainline. This caused some issues with alignment and liner inversion. The crew improved by trying different processes for each installation.

Project – City of Columbus, Ohio – Blueprint Columbus

This project consisted of connection seals and lateral liners on 450 properties with the sewer mains ranging in sizes of 8 to 24 in. and 37 installations on the 24-in. section of the mainline. The average length of the installations was approximately 85 ft. This work marked the longest length that a lateral liner had been installed in large diameter sewers.

Project – Louisville Kentucky Municipal Sewer District

This project saw BLD crews working in a 24-in. egg-shaped brick combination sewer. The crews relined 8- through 15-in. laterals without cleanouts. A new frame had to be built to accommodate the pipe size and the shape of the sewer to complete the work. It was also determined that they needed less PSI to invert the liner in the lateral because of the size and shape of the pipe.

Trapani notes that getting to this point in the rehabilitation laterals connected to large diameter sewers has been a lot of trial and error by the crews in the field to determine what worked and what didn't. However, through this effort there are now processes and procedures in place for this niche market giving system owners a trenchless option.

The biggest obstacle is that every field situation is different, thus every solution will need to be tailored to the specific conditions of that particular install. Nonetheless, according to Trapani, a traditional open-cut repair would be roughly three times the cost, so a trenchless solution provides a viable and cost-effective alternative.

Mike Kezdi is managing editor of *Trenchless Technology*.

PIPE RELINING: LATERAL REHAB

APEX CIPP SOLUTIONS
941-300-0441
Sarasota, FL
apexipp.com

ARIES INDUSTRIES INC.
800-234-7205
Waukesha, WI
ariesindustries.com

BRAWO SYSTEMS
240- 796-5007
Olney, MD
brawosystems-usa.com/

CUES
800- 327-7791
Orlando, FL
cuesinc.com

FERNCO CONNECTORS / SOURCE ONE ENVIRONMENTAL
519-466-1053
Sarnia, ON
s1eonline.com

FLOW-LINER SYSTEMS
800-348 - 0020
Zanesville, OH
flow-liner.com

GLOBAL MATERIALS CO.
888-797-3736
Riviera Beach, FL
globalmaterialscompany.com

GO TRENCHLESS ZONE (CANADA)
519-222-0432
Cambridge, ON
gotrenchlesszone.com

HAMMERHEAD TRENCHLESS
800-331-6653
Lake Mills, WI
hammerheadtrenchless.com

HAMMERHEAD TRENCHLESS - CANADA
416-659-5141
Mississauga, ON
hammerheadtrenchless.com

INFRASTRUCTURE REPAIR SYSTEMS INC.
727-327-4216
St. Petersburg, FL
irsi.net

INNERCURE TECHNOLOGIES INC.
844-748-5200
Orlando, FL
innercuretechnologies.com

LOGIBALL INC.
418- 656-9767
Quebec, QC
logiball.com

MAXLINER USA
919- 349-1969
Martinsville, VA
maxlinerusa.com

NUFLOW TECHNOLOGIES
866-452-4754
San Diego, CA
nuflow.com

PICOTE SOLUTIONS INC.
864-940-0088
Sammamish, WA
picotegroup.com

PIPELINE RENEWAL TECHNOLOGIES
973- 252-6700
Randolph, NJ
pipelinert.com

PIPETRONICS GMBH & CO. KG
+ 49 (0) 7244 94 993 - 0
Stutensee, Germany
en.pipetronics.com

PRIME RESINS
770- 388-0626
Conyers, GA
primeresins.com

PROKASRO USA
Centennial, CO
prokasrousa.com

RAPIDVIEW IBAK NORTH AMERICA
800-656-4225
Rochester, IN US
rapidview.com

REMOTE ORBITAL INSTALLATIONS LLC
608- 845-0360
Verona, WI
roi360.com

R-TEXTILES LLC
770-274-2426
Tucker, GA US
r-textiles.com

SEWER ROBOTICS
Poeldijk, ZH NL
sewerrobotics.com

TRELLEBORG ANCASTER INC.
226- 505-4659
Ancaster, ON
ist-web.com/en

TRELLEBORG ENGINEERED COATED FABRICS
828-289-2724
Rutherfordton, NC
trelleborg.com/en/engineered-coated-fabrics/industries/manufacturing-and-general-industry/pipecure

TRELLEBORG PIPE SEALS MILFORD INC.
603- 801-0976
Milford, NH
trelleborg.com/en/pipe-repair

TRENCHLESS PRODUCTS LLC
212-419-0069
Closter, NJ
trenchlessproducts.us

TRY TEK MACHINE WORKS INC.
717-428-1477
Jacobus, PA
trytek.com

VORTEX COMPANIES
713-750-9081
Houston, TX
vortexcompanies.com

WARRIOR USA LLC
716- 601-7760
Clarence, NY
thermoformliner.com

WATERLINE RENEWAL TECHNOLOGIES
847-457-1810
Elk Grove Village, IL
waterlinerenewal.com

UPDATE: NASSCO-FUNDED STUDIES ON STYRENE SAFETY

By Sheila Joy

Since the question of styrene safety first came to NASSCO's attention nearly 10 years ago, the Association has been at the forefront of learning everything possible to keep workers and communities safe. Since that time, NASSCO has funded four phases of independent study, with the results and recommendations of each opening the door for more knowledge.

Phase 1, conducted by the Center for Underground Infrastructure Research and Education (CUIRE) at the University of Texas, Arlington, focused on a thorough publication review of 21 articles and papers on the topic of styrene used in the CIPP emissions process.

Dr. Mo Najafi was the lead investigator. Completed in April 2018, this study resulted in a report from CUIRE stating that previously published reports were non-conclusive. The report also suggested field research to further explore the subject.

Phase 2 then commenced. A request for proposals was submitted to various universities and testing labs, and The Trenchless Technology Center (TTC) at Louisiana Tech University was awarded the contract.

Lead by Dr. Elizabeth Matthews with the support of the US Army Corps of Engineers – Engineer Research and Development Center (ERDC), the research objective was to quantify worker and public exposure to steam-cured CIPP emissions. The methodology included field studies to evaluate air emissions from polyester resin CIPP with steam cure, testing varying pipe diameters, lengths, weather conditions and geographic locations, modeling air dispersion of emissions and evaluating potential health risks to workers and the public.

The final report was delivered to NASSCO in February 2020. Based on the data collected, TTC made several recommendations including wearing PPE at the time of the initial opening of the liner transport truck; performing active air monitoring when entering manholes (which is already an industry practice); and maintaining a 15-ft perimeter around the exhaust manholes, with emission stacks being a minimum of 6 ft in height.

Phase 3 continued the investigation with a study by TTC titled "Evaluation of Styrene Emissions Associated with Various CIPP Coatings in Refrigerated Storage."

Lead by Dr. John Matthews, the goals of this study were to:

- Measure dispersion of styrene from the liner transport truck
- Correlate site-specific liner information with styrene concentrations via the following methods:
  - Styrene breakthrough studies through common thermoplastic coatings
  - Lab scale simulations and modeling
  - Field testing with loaded refrigerated trucks

- Measure dispersion of styrene
- Better Understand the Styrene breakthrough times for the various coatings:
  - Nylon – Longest break-through
  - Polyethylene – Medium break-through
  - Polyurethane – Fastest break-through
  - Understand ways to improve coating technologies and provide styrene containment understanding

The report, delivered in April 2023, included TTC recommendations to safely enter a refrigerated truck with minimal PPC only after doors are opened and styrene thresholds decline to below regulatory agencies' limits for the planned exposure of workers. Specifically:

1. Once storage unit doors are opened and styrene thresholds reduce below regulatory agencies' limits, storage

unit can be entered with minimal PPE.
2. If limits are exceeded, consider thicker coatings, more impermeable coatings, wrapping the liners with impermeable materials, additional PPE, etc.

NASSCO expanded the list of recommendations to include:

1. For job site air monitoring, installation companies should use different tube coatings, have various amounts of liner, and follow various installation procedures.
2. Testing should be done for styrene levels in the refrigerated storage unit when workers must enter. Typical testing instruments are photoionization detectors (PIDs) and detector tubes.
3. If using a PID, if styrene levels > ACGIH TLV STEL* of 20 ppm, PID should alarm, and worker should exit storage unit.
4. Be aware that impervious coatings and ventilation reduce styrene levels.

Phase 4 research shifts the focus from air emissions to cure water. For this study, currently under way, NASSCO partnered with the Buried Asset Management Institute – International (BAMI-I).

Dr. Tom Iseley is the lead investigator; Dr. Hanouf M. Alhumaidi serves as Lead Research Engineer. This research initiative focuses on establishing the styrene discharge concentration in cure water that may create bio-inhibition at publicly owned treatment plants. With a goal of completing this by the end of 2024, the study began with Dr. Iseley and his team conducting Task 1, a thorough literature review of peer reviewed research. This Task, now concluded, did not reveal any previous studies on the subject. Task 2 is a survey amongst POTWs to determine current perceptions on the subject, and Task 3 will include laboratory testing and development of a White paper on the findings.

The goal of the study is to establish laboratory inhibition standards and refine recommendations included in NASSCO's Specification Guideline titled "The Safe Use and Handling of Styrenated Resins in the CIPP Process."

NASSCO continues to put safety above all we do. With the recent hiring of Dennis Pivin, CSP, as NASSCO's director of health, safety and environmental, our goal is to support our industry in keeping our most valued assets — the workers we employ — safe.

To read the full reports and recommendations from Phases 1, 2 and 3, and learn more about styrene and other safety topics including PFAS and so much more, visit *nassco.org/safety*.

*American Conference of Governmental Industrial Hygienists (ACGIH)

Sheila Joy is executive director of NASSCO.

CROSSING THE COOSA RIVER: PROVIDING A TRENCHLESS SOLUTION FOR LONG-SOUGHT PIPELINE CROSSING

By Tucker Toelke and Jace Lovell

Williams Companies Inc.'s 10,000-mile Transco Pipeline system is the nation's largest and most reliable interstate natural gas pipeline system, delivering natural gas from south Texas to New York City.

At a location in the system approximately 50-miles south of Birmingham, Alabama, Transco's system had, until recently, experienced a bottleneck due to the inability to install an additional fifth pipeline crossing the Coosa River. Historically, due to the subsurface geology and drastic topography in the region, the Coosa River had proven to be a challenge for pipeline crossings, regardless of the installation methodology.

In 2021, Williams reached out to Michels Trenchless Inc. to provide feasible solutions for crossing the challenging river. Michels, along with Williams, conducted site visits at the Coosa River to explore multiple pipeline installation methodologies including horizontal directional drilling, direct steerable pipe thrusting, microtunneling, and open trench construction. Through a detailed survey and geotechnical investigation, the Michels and Williams team, with support from trenchless consultant J.D. Hair & Associates Inc., determined that a preliminary design supported a plan that crossing the Coosa River would be feasible through horizontal directional drilling (HDD).

During the detailed design phase, supplemental geotechnical borings were completed on land as well as on a barge within the river. Subsequently, additional geotechnical investigation was completed, and the challenging features of the design were evaluated. The identified geology indicated that the trenchless installation would be carried out in very hard and abrasive gniess bedrock. GeoEngineers Inc. completed the final design report for the portion of the pipeline crossing the Coosa River.

It was decided by Williams that the

REGISTER TODAY

17TH ANNUAL BREAKTHROUGHS IN TUNNELING SHORT COURSE™

at the University of Denver Denver, CO

Sept. 9-11, 2024

Course Directors:

Levent Ozdemir
Ozdemir & Associates

Timothy Coss
Microtunneling, Inc.

Jim Rush
Benjamin Media, Inc.

TUNNELINGSHORTCOURSE.COM

Main Event Sponsor: SCHAUENBURG Maschinen- und Anlagen-Bau GmbH

Sponsors: BRIERLEY ASSOCIATES, Schnabel Engineering, DELVE underground, GEI Consultants, Kiewit, HNTB, Stantec, KELLER, ALDEA, GZ Gall Zeidler Consultants, ROETZEL, KILDUFF Underground Engineering, Inc., AECOM

Organized by:

Ozdemir & Associates

MICRO tunneling inc.

TBM TUNNEL BUSINESS MAGAZINE

For sponsorship information contact: Maura Bourquin: mbourquin@benjaminmedia.com

HDD methodology would be implemented to install approximately 3,407 ft of 42-in. diameter steel carrier pipe. Ultimately Williams awarded the mainline portion of the approximately 1.9-mile-long, 42-in. diameter loop (Southeast Energy Connector Project) to U.S. Pipeline Inc. and the HDD portion of the scope to Michels.

Prior to Michels crews mobilizing in March 2024, Michels and U.S. Pipeline developed extensive plans that would allow both contractors to navigate the steep and challenging terrain to and from the entry and exit side pads. U.S. Pipeline played a large role in the support of accessing the difficult terrain on both sides of the river, while assisting 24/7 operations. Due to the length and complexity of the installation, the horizontal directional drill was executed via the pilot hole intersect method. Therefore, Michels mobilized

custom-built maxi horizontal directional drilling rigs on both sides of the Coosa River. After roughly two weeks of safely navigating the Coosa River terrain for setup operations, pilot hole operations commenced.

Like that of the preliminary plans used for mobilization, the Michels team had to come up with innovative solutions for the removal of spoils generated during the horizontal directional drilling process with the winching support of U.S. Pipeline's HDD support crews. Given that the final pipeline had a diameter of 42-in., three ream passes were utilized following the pilot hole intersect. A 30-, 42-, and ultimately a 54-in. ream pass were required to execute this project with a large enough borehole diameter to safely install the Williams' product pipe. Each ream pass brought with it substantial volumes of excavated borehole cuttings that were transported back up the complex hills surrounding the Coosa River. Rain events made transportation of any equipment to and from the drill locations nearly impossible, adding an additional level of complexity to ensure that HDD operations could continue without delay.

Once the final ream pass was complete, Michels crews rigged down the exit site HDD rig to prepare for pipeline pullback. A total of five pullback sections were carefully fabricated within the narrow right-of-way, as longer sections were deemed unfeasible due to the complex terrain. Once pullback operations commenced, Michels and U.S. Pipeline Crews worked relentlessly to pull the pipeline into place via 24/7 operations. On July 6, after working through the July 4th holiday, Michels received the final 42-in. diameter pipeline into the entry pit, completing the installation. Following the successful installation of the 42-in. diameter steel pipe, U.S. Pipeline Inc. would complete the adjacent open-cut and tie-in construction.

Ultimately, through collaboration, early contractor involvement and execution, the Coosa River horizontal directional drilling installation was a success.

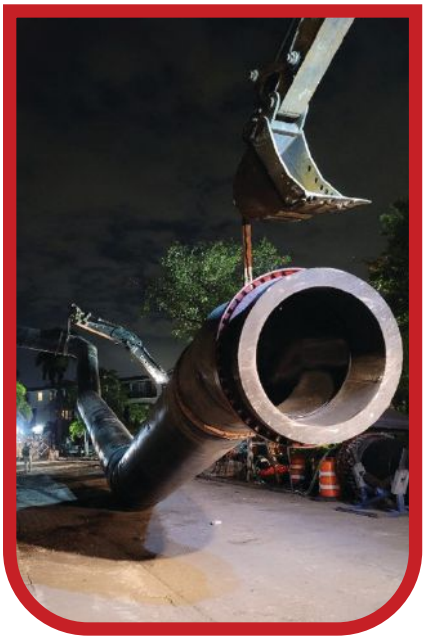
The installation of this new pipeline will ultimately solve the Transco system's bottleneck and through the implementation of trenchless technologies, a solution was provided to overcome a historical challenge impacting one of the United States largest energy infrastructure systems.

Tucker Toelke is an alternative delivery manager for the Michels Micon Group. Jace Lovell is a senior project manager for Michels Trenchless.

FORT LAUDERDALE'S SUCCESSFUL SEWER PIPE FIGHT

By Steve Cooper

Reminiscent of linking the first transcontinental railroad lines in 1869, two underground runs of HDPE pipe by two different contractors were joined to complete a 7.5-mile redundant force main sewer in Fort Lauderdale.



Each string of high-density polyethylene (HDPE) pipe was installed using mostly horizontal directional drilling (HDD) through the congested downtown and picturesque residential areas of the city. Approximately six miles — nearly 85 percent of the total length — of HDPE pipe was installed using 17 horizontal directional drills that included going under three rivers. The project is part of the city's program to replace all of its decaying cast iron and ductile iron sewer pipes which have become weakened by the area's corrosive high saltwater table.

Murphy Pipeline Contractors Inc., Jacksonville, Florida, put in 3,400 ft of 48-in. diameter HDPE PE 4710 pipe from the north that included 1,500 ft drilled 60 ft deep across the intracoastal waterway. At the same time, David Mancini & Sons Inc., Pompano Beach, Florida, installed 3,100 ft of 54-in. diameter HDPE PE 4710 pipe from the south, which is one of the biggest HDD installations of large diameter HDPE pipe to date. Other sections that were installed using HDD ranged from 1,100 to 1,300 ft. The city worked with consulting engineering firm Hazen and Sawyer which served as owner's representative on the project and provided technical advice.

This $65 million wastewater transmission line from the George T. Lohmeyer (GTL) Wastewater Treatment Plant on SE 18 Street to a wastewater lift station located near Bayview Drive and NE 37 Street was completed in April 2021, months before it was expected. The project will enable the city to repair its existing 50-year-old force main that was experiencing frequent breaks during the past several years. Because of the complexity and scope, it was named Project of the Year for the Municipal & Industrial Division of the Plastics Pipe Institute Inc. (PPI), the North American trade association representing the plastics pipe industry. The award was presented to PPI member companies JM Eagle (Los Angeles), and AGRU America Inc. (Georgetown, South Carolina). Both Murphy and Mancini are contractor members of the Municipal Advisory Board, an independent, non-commercial adviser to the Municipal & Industrial Division of the PPI.

"This is an unprecedented feat of engineering and use of HDPE pipe," stated PPI president David M. Fink. "Not only did it encompass thousands of feet of pipe, it solved a pressing problem for City of Fort Lauderdale and its citizens. The City is to be congratulated for its innovative use of design-build, engineering, construction and HDPE, the number one piping system for HDD. This enormous project created only minimal disturbance for vehicles and the daily living of the people because of the use of trenchless technology and the expertise of engineers and contractors. Also, the trenchless technology provided the way to expedite approvals from the regulatory agencies and permits from federal, state, and county agencies including the United States Army Corps of Engineers, Florida Department of Environmental Protection, and the Florida Department of Transportation. Using trenchless technology, the City of Fort Lauderdale was able to complete this project significantly ahead of schedule to add a reliable force main to supplement its existing infrastructure."

In December 2019, the City of Fort Lauderdale experienced numerous breaks to its aging seven-mile major sewer transmission main resulting in more than 200 million gallons of raw sewage spilling into streets and waterways. This led to the city declaring an emergency and awarding two design-build contracts. Using this delivery method, the project was split into multiple phases to design, permit,

and construct each phase concurrently. The majority of the city's sewer system is six decades old and consists of ductile and cast-iron pipe. According to a South Florida Sun Sentinel newspaper article, "Rio Vista, the first neighborhood hit by a tidal wave of sewage on December 10 (2020) when a giant 54-in. pipe made of ductile iron gave way to years of neglect. In two months alone, Fort Lauderdale's crumbling sewer pipes have spewed 211.6 million gallons of raw sewage into waterways and streets."

"Mancini and Murphy came into an emergency situation facing our city in which one of the main sewer lines was repeatedly rupturing because of its age and deteriorating condition," said Fort Lauderdale mayor Dean J. Trantalis. "They moved at unparalleled speed to build an entire new line so our residents could continue to receive service without the threat of more and more breaks. The methodology they used with directional boring was a solution that minimized the interruption to the lives of surrounding homeowners. Their tremendous work illustrates the city's commitment to thoroughly address our infrastructure needs and have a system that serves our growing city for decades to come."

Part of the problem Fort Lauderdale was having was due to the many weak points in the sewer line that would keep breaking because of the pipe's fatigue. "Patching just meant putting more stress on other areas in the pipeline, which would then burst," stated Camille George Rubeiz, P.E., F. ASCE, senior director of engineering for the Municipal and Industrial Division of PPI and is also the co-chair of the HDPE Municipal Advisory Board. "Plus, these voids in the pipeline would allow infiltration of predominantly sandy soil into the pipeline which would reduce the inside diameter thus increasing the pressure inside the pipe, leading to more stress on the fragile sections of the cast iron pipe.

"HDPE pipe has been used in municipal water applications for more than 50 years. HDPE's heat-fused joints create a leak free, self-restraint, monolithic piping system that can be pulled from one area to another with minimum disruption to traffic or the surrounding communities. The fused joint also eliminates infiltration into the pipe and exfiltration into the environment. HDPE pipe has

other benefits which include resistance to water hammer, fatigue, ground movements, freezing temperatures, earthquakes, corrosion and tuberculation."

The 48-in. diameter HDPE PE 4710 pipe was manufactured by JM Eagle. It has a pressure rating of 160 psig at 80 F and can handle total pressure during recurring surge of 240 psig and total pressure during an occasional surge of 320 psig. The working pressure on average was approximately 37 psi with a flow rate of 20,700 gpm. AGRU America made the 54-in. pipe that carries a pressure rating of 200 psi at 80 F used by Murphy.

According to Krishan Kandial, P.E., the project manager for the City of Fort Lauderdale, "This project afforded me a unique professional opportunity to work alongside two contractors and an owner's representative to deliver a much-needed redundant force main for our residents and visitors. Throughout construction, we had unmatched support from city leadership and residents in each of the neighborhoods we worked in. The scale of this project and the technology that was used impressed residents and field staff alike who had never seen a project of this type be completed so efficiently."

Four of the HDD segments required unique compound curves on 48-in. HDPE pipe due to roadway geometry and field conditions, and three of the area's rivers also had to be addressed. Reaching depths under the riverbed of up to 60 ft, 1,800 ft of pipe was drilled under the Tarpon River, which was next to a bridge and had only eight feet of available right of way between the bridge and adjacent properties. A precise compound curve was utilized in the design to achieve the constrained alignment. The crew pulled 2,500 ft of pipe under the New River and 1,600 ft under the Middle River. Due to the depth and soil conditions, 48-in. pipe was used in the Middle River crossing, making it one of the first projects in the country to utilize this pipe size.

The project also had four HDDs with tight-radius compound curves using 48-in. HDPE pipe, which included a 2,600 ft and a 1,400-ft S-curve. Other compound curves were required due to roadway geometry and field conditions.

Kandial described another situation, "Due to space limitations, a 60-in. borehole at the lift station was drilled only a few feet away from professional-grade clay tennis courts at the Coral Ridge Country Club that have a unique subsurface irrigation system and were at risk of being undermined by the trenchless installation. In response, the team developed a soil stabilization treatment plan, which required the injection of rigid structural geotechnical polymers at 68 locations that prevented soil movement or collapse."

Fort Lauderdale has geotechnical conditions common for a coastal city. Geotechnical investigations found loose material - sand and limestone — in the first 30 ft below land surface (BLS) and very dense cemented sand below that. The crew had to carefully adjust the HDD alignment to address the change in ground conditions, particularly where the HDD was deeper than 30 ft.

"It's not only Fort Lauderdale facing this problem. Pressure from groundwater and also the corrosive nature of saltwater found in sandy soil will continue to destroy the old piping infrastructure," stated Rubeiz. "This project shows how Fort Lauderdale has taken steps to not only correct the problem but to also give its citizens a high-integrity solution that will serve the city for a hundred years. The Venice of America can now say good-bye to raw sewage flowing in its streets."

Steve Cooper is the managing director of SCA Communications.

SPACE CONSTRAINTS:
DRILLING IN PLANO, TEXAS

By John C. Wood

Recently, Lovelady Directional Drilling LLC undertook a project for the City of Plano, Texas, installing approximately 1,450 ft of 24-in. HDPE SDR 11 piping. This involved developing engineered plans tailored to the project's needs, ensuring the use of an appropriately sized drilling rig, and implementing meticulous safeguards for fluid handling, noise reduction, and bore accuracy

Founded in 2008 in Lufkin, Texas, Lovelady Directional Drilling has become a trusted provider of precision drilling solutions, serving industries ranging from oil and gas to utilities, renewables, and telecommunications. With a fleet of drills ranging from 40,000 to 100,000 lbs, the company delivers expert trenchless installation services across the continental U.S., adapting to all soil types.

General contractor Wilson Contracting awarded the project bid to Lovelady and then they collectively met with the City of Plano to address the aforementioned concerns. CCI Inc., located in Houston, Texas, was contacted to provide a bore specific plan that would put everyone's mind at ease regarding rig size and capability. Lovelady worked closely with CCI's Justin Taylor, P.E., to engineer a plan that would not only succeed but also give a margin of error that would satisfy everyone. For noise cancelation we encircled all equipment with fencing and ECHO-BARRIER noise reduction matting to maintain the requested decibel level or below at all times. To provide adequate drilling mud management, a Tulsa Rig Iron MCS-355 reclaimer was utilized, as well as in-house 130BBL vacuum trailers for disposal.

Once all questions had been answered, the Lovelady crew mobilized and set up drilling operations. Because drilling space was key concern, Lovelady chose a Vermeer 100x140 for drilling. The product pipe would weight in at over 106,000 lbs, but if done exactly to plan this wouldn't be an issue. After reviewing the geotech reports, we knew we would need to run a mud motor and called Aaron Potter at Horizonal Technology Inc., located

in Hockley, Texas, which provided a proprietary "sonde" motor that allows utilization of a Digital Control Inc. DigiTrak sonde. Lovelady used a DigiTrak Falcon F5+ with 19-in. long range sonde because of depth and interference, due to being installed under a concrete road that included rebar for the entire length of the bore. The mud motor was fitted with a 6.25-in. PDC bit that cut through the shale like butter.

Lovelady piloted the drill string and waiting anxiously for the bit to breach the wall of the exit pit. After measuring and painting a bullseye on the exit pit wall, the crew watched as the bit emerged 2 in. above it, while the drill sat 1,450 ft away. This answered the city's concern regarding the accuracy of the "walk over" method. The city inspector was more than pleased, not only was it dead on but had saved them a tremendous amount compared to others who had suggested it could only be accomplished via wire line. Now that the pilot bore was complete, we removed the motor and changed tooling to a fly cutter style reamer. Before beginning to ream, we had to move our reclaimer to the exit pit. Once it was set into place, we rolled out 1,500 ft of 4-in. fire hose to pump from the reclaimer back to the water truck with a 3,000-gallon holding tank to supply the drill. This set up worked great as we never had to shut down during reaming.

The crew stepped up ream passes from 12, 18, 24, 30, and finally 36 in. This process took two weeks to complete and drilling mud was hauled off once it exceeded 10 lbs. and fresh mud would be introduced. All drilling fluids for this job were provided by DCS Fluid Solutions out of Graham, Texas. Don White with DCS has worked with Lovelady for many years, providing drilling mud and additives. After all ream passes were complete, two swab passes were made with a 34-in. swab to guarantee a clean bore, free of all cuttings.

As a result of the previously noted space constraints, we weren't able to pull the product pipe from the position we had drilled from but needed to move to the exit pit and pull from the entry side to the exit side. The space constraints further complicated pullback as there was only room to lay out 500-ft sections of pipe. This made for two long breaks during pullback while the pipe was fused together. Once the equipment had all been put in place and rigged up for pullback, Lovelady hooked up to the product pipe and began installing it. The first 500-ft section pulled into place with ease and the crew proceeded to fill the pipe with water, as per the engineered plan. After flooding the pipe with water, we sat and waited as the pipe was fused to the next section.

Now for the moment of truth.

As the driller eased back on what was now 1,000 ft of 24 in., the pipe didn't hesitate and slid toward the rig with zero resistance. Another 500 ft of pipe was installed with no issues. Lovelady repeated this process again, with flooding the entire pipe and fusion, and eased back on what was now 1,450 ft of 24-in. HDPE. With water weight and pipe weight combined it was in the neighborhood of 260,000 lbs. The bore hole was flawless, the driller was flawless, and the average pullback pressure during installation was 34,000 lbs. As the swab pulled into the exit pit, it was quickly followed by the pullhead and 24-in. HDPE.

Success!

Results

The Lovelady team couldn't have been happier with the results, and that opinion was shared by the City of Plano, as well as the general contractor. This job demonstrated many things we as a contractor already knew but are often overlooked. First, do not try to cowboy it — Have a great plan and stick to it, having no plan is a recipe for disaster. Second, there are a lot of very experienced people with specific tooling that want you to succeed, do not be too proud to ask for help. And third, great crews make it look way too easy, and we have great crews. Once installed, I could tell the onlookers were thinking "dang, we could have done that."

Special thanks go to CCI Inc. (engineering) – Justin Taylor, P.E.; 215 Consulting (survey) – Micheal Delaney, P.E.; Horizontal Technology (drilling motor and bit) – Aaron Potter; DCS Fluid Solutions (drilling fluids and additives) – Don White; and Wilson Contracting (general contractor) – Weldon Wilson.

John C. Wood is president of Lovelady Directional Drilling.

nassco report

HEALTH & SAFETY COMMITTEE

By Dennis Pivin, CSP, CHST, CIT

DELIVERING THE BEST WORKPLACE SAFETY TRAINING

Have you ever attended a safety training class that puts you to sleep? In most cases, it's probably not that the instructor didn't know the material but more likely the information wasn't presented in an interesting and effective manner. This article will cover some basic concepts that can boost your safety training program.

Workplace safety training is a process whereby employers educate employees on safe work practices. This usually includes topics like work hazards, work safe behaviors, reporting unsafe acts and, of course, regulatory safety compliance. Understanding that while the Occupational Safety and Health Administration (OSHA) is a federal agency that issues laws and regulations that employees must abide by and thus require training, it does not mean that the training should be boring.

Typically, as safety and health professionals, we learn the technical aspects of our craft but are usually not given training on how to effectively train others. One of the key starting points for safety trainers is to understand the adult learning process. It is critical to remember that as adults we learn differently than children. Here are a few points to help instructors better understand adult safety education:

- Adults have many years of experiences that affect their learning ability.
- Adults learn more effectively when they realize that the information being taught is specific to their job.
- Adult learners attend training with established habits and ideas.
- Workers have different experiences over their careers that could change their attitude about learning and should be considered when training.
- Adult attention spans vary by audience.
- Adults want to share their own personal safety experiences on a given topic.

In addition to understanding these basic concepts of educating adults, one of the more critical first steps to designing and implementing a solid safety training program is to complete a needs assessment. Simply put, a needs assessment helps the trainer and the company understand what causes a need for training. Without a complete needs assessment, it is impossible for the trainer to be properly prepared.

A well-built safety training needs assessment should answer the following questions:

1. Who requested the training?
2. Who needs the training, and why?
3. What kind of training do they need?
4. What training have they received to date?
5. What is the educational level of the students?
6. What are the key learning objectives?
7. Will management reinforce training best practices?

Now that the needs assessment is complete, the trainer can move forward to establish the goals and objectives of the safety training. In other words, if the training is successful, what will the student walk away knowing?

Organization is also very important. As safety trainers, make sure that you organize your training so that students feel confident in your ability. Being organized also helps the instructor cover all the necessary safety information. Here are a few key concepts to consider when organizing your training:

- Start with simple general concepts and then transition to more complex ones, if needed.
- Create a training outline from the needs assessment and the objectives. This outline ensures you are focused and stay on topic.
- Choose a presentation format that makes sense for your audience and keeps things interesting.
- Engage the students as much as possible.

Lastly, how you as a trainer appear and sound is critical. Do not forget to bring energy and enthusiasm to the course as this can make a huge difference to your adult learners and their ability to absorb the subject matter.

In summary, in order the put together a great safety training course the instructor needs to have a solid understanding of how adults learn, conduct a complete safety training needs assessment, identify goals and key learning objectives, use a solid safety training organizational format, and arrive with an instructional presence that instills confidence in your ability to present the material. By using these key components, the result will be an effective safety training course where students will learn and, most importantly, use their knowledge to stay safe.

Dennis Pivin, CSP, CHST, CIT, is director of health, safety and environmental at NASSCO, as well as chair of the NASSCO Health and Safety Committee.

product spotlight

TT TECHNOLOGIES

TT Technologies' Grundomudd portable bentonite mixing/delivery systems use a Venturi mixer/filtration system to quickly mix bentonite and water into slurry. An in-tank re-circulating valve prevents the mixture from settling. The Grundomudd is available in 225-, twin 225-, 500-, 1,000-gallon capacity models. All models are designed for use with pneumatic trenchless tools including pipe ramming tools, pneumatic pipe bursting systems and directional boring units. Each self-contained unit comes complete and ready to use. A tank isolation valve allows pump lines to be cleaned without draining the tank(s). All models incorporate easy to clean round poly tanks.

For more information, visit ttechnologies.com.

SPONSORED CONTENT

RapidWorks: The All-in-One Software Solution for Managing Hydrovac Jobs

Running a hydrovac service means facing uncertainty daily. But with RapidWorks, you get the tools to manage your trucks, crew, and jobs, all in one place — so you're always ready to answer the call.

RapidWorks makes getting the right equipment and crew out to each job easier than ever. No more double-booking trucks. No more misunderstandings about who goes where. No more lost job tickets.

With RapidWorks:

- See live truck locations and job status with the map view.
- Find trucks and crews quickly with the dispatching dashboard.
- Book jobs on the go with mobile scheduling.
- Submit DVIRs, JSAs, and timecards digitally and on time.
- Submit job tickets right from the job site.
- Instantly turn job tickets into PDF invoices with automated invoicing.
- Keep personnel certifications up to date with certification tracking.
- Track pay rates and hours automatically.

Best of all, simply using RapidWorks generates automated utilization reporting, giving you the insights you need to grow your business.

Rapid Works takes the hassle out of hydrovac management, letting you focus on getting the job done and growing your business. It's hydrovac job management, simplified.

For more information, visit www.rapidworks.com.

SPONSORED CONTENT

SprayWall®: Reinforcing Underground Infrastructure with Unmatched Strength

In the trenchless technology industry, finding a rehabilitation solution that offers ease of installation and exceptional structural integrity is paramount. For three decades, Sprayroq's SprayWall structural lining system has stood out as the industry-leading choice for rehabilitating underground assets such as manholes, large-diameter pipes, and other critical water and wastewater infrastructure.

Our spray-applied polyurethane coating is engineered to provide both structural enhancement and corrosion resistance. Its remarkable mechanical properties set it apart in terms of strength and durability, surpassing traditional Class A concrete.

With a compressive strength exceeding 18,000 psi, SprayWall outperforms standard concrete by more than fourfold. This exceptional strength enables it to withstand enormous hydrostatic, soil, and traffic loads, which is crucial for underground applications where pressure is constant.

Additionally, SprayWall boasts a tensile strength greater than 7,450 psi, significantly surpassing concrete's capabilities. This superior strength minimizes the risk of cracks and structural failure, ensuring a longer service life and fewer maintenance needs.

Third-party D-Load testing further validates SprayWall's load-bearing performance, reinforcing the host structure and enabling it to handle increased service loads without compromising integrity.

SprayWall's exceptional resistance to the effects of typical municipal raw sewage flows, rapid cure time, and seamless application make it ideal for underground environments prone to wear and corrosion.

SprayWall offers an advanced, reliable, and cost-effective solution for maintaining and enhancing the integrity of underground infrastructure. For infrastructure managers seeking to invest in the future of their assets, choosing SprayWall means opting for unmatched structural capabilities in trenchless rehabilitation. https://sprayroq.com/ | 205.957.0020 | info@sprayroq.com

SPONSORED CONTENT

WICKED PRODUCT SUITE

LMEC has been in the underground inspection industry for over 15 years. We have had the pleasure to have certified several inspection systems with NASSCO over the years. With over 30 years of experience in Software development and Process Improvement we have helped hundreds of customers simplify their operation to provide more streamlined and accurate deliveries.

WICKED was developed with the mindset of simplicity of use and augmented productivity. We offer a variety of products that will help your business grow, be more productive and provide a professional deliverable, assist you with your Inspection Needs, Operation and Maintenance programs as well as your reporting requirements and workflow management. Some KEY FEATURES include: Pipeline, Lateral and Sewer Structure Inspection system, out of the box comprehensive report package, Integration with AI for both PIPELINES and MANHOLES, ESRI GIS integration included with basic license. Our office product assists you with asset review and recommendation without the need to review reports or videos individually as well as perform Quality Control tasks to evaluate your operators and contractors. WICKED Analyzer uses historic inspection data to review and recommend asset rehab, repair, and cleaning, manage your future workflow, and assist with budget preparation. Visit our site for additional information or to schedule a demonstration: simply-wicked.com.

business cards

last word

By Andrew Ginter

NEW PERSPECTIVES ON CYBERSECURITY

In 2023, 68 cyber attacks took down more than 500 sites worldwide, some of them water utilities. All modern automation includes computers, and so for the last 40 years we have been deploying more and more targets for cyber attacks.

Compounding the problem, data in motion is the lifeblood of modern automation, but every connection that lets data flow, also lets cyber attacks flow. Thus, for 40 years we have been deploying not only more targets, but more and more opportunities to attack those targets. Neither of these trends is reversing any time soon. Cybersecurity is expensive and becoming more so every year. We need a new approach.

CYBER-INFORMED ENGINEERING

If ransomware cripples water treatment automation, how long can a city continue without a boil water advisory? Well, that depends on the size and fill-level of finished water reservoirs, doesn't it? And on whether we can still operate treatment systems manually. How long will it take to erase all the affected computers and industrial devices and restore them from backups? Do we even have backups stored where ransomware cannot reach them?

These questions are increasingly asked by engineers, in addition to enterprise cybersecurity teams. After all, in most jurisdictions, it is the engineering profession that is responsible for protecting public safety, environmental safety and national security, at least to the extent that critical industrial infrastructures impact the society and the nation.

When engineers design a bridge for example, the public expects that bridge to carry a specified load, in a specified operating environment, for a specified number of decades, with a large margin for error. Increasingly, the public also expects that our water utility automation will bear a specified threat load, until at least the next opportunity to upgrade our security posture with a large margin for error.

The new Cyber-Informed Engineering (CIE) initiative at Idaho National Laboratory (INL) is exploring these expectations and the tools that engineers have to manage cyber threats to physical operations. For example, some large water treatment systems are designed so that they can be operated manually in an emergency. For example, at one utility this author is familiar with, on the last day of every month, no matter if that day falls on a weekend or a holiday, the employees power off every computer and device in the automation system and operate the entire system manually. If a cyber attack impacts operations, the utility can declare an emergency, cancel all vacations, and operate manually for the weeks that it takes to restore automation.

But where is manual operations in the ISO 27001 standard? Manual ops is not in the standard. Where is a large, finished water reservoir in the NIST Cybersecurity Framework (NIST CSF)? Not there. What about the industrial IEC 62443 security standard? Again, neither is there. These are cybersecurity standards. Manual operations, finished water reservoirs and other fail-safes are engineering tools, not cybersecurity tools. CIE is defined as both cybersecurity and engineering, but it is engineering that has been neglected these last 20 years as a way to addressing cyber risk.

A WAY FORWARD

The CIE initiative points out that we need to be more pragmatic in our planning for cybersecurity. If a two-week boil water advisory when ransomware hits our automation is acceptable, then say so, and have our teams design to that goal. If such an outcome is unacceptable, again we must say so, and task our cybersecurity and engineering teams with designing to what is acceptable.

At a very high level, the new CIE perspective includes:

- Understanding what the worst possible consequences of cyber compromise are, potentially including long-term equipment damage, burst pressure vessels and threats to public safety;
- Deciding and documenting which of these consequences are acceptable vs. unacceptable;
- Understanding what kinds of cyber attacks or situations pose credible threats of bringing about unacceptable consequences; and
- Designing physical and cyber mitigations to prevent those attacks causing the consequences, again with a large margin for error.

The tool set for addressing threats includes:

- For the smallest utilities, limiting some automation initiatives when the cost-saving benefits of automation do not pay for the cybersecurity and engineering protective measures needed to assure public safety;
- Deploying network engineering, such as unidirectional gateways or analog signaling, to enjoy the benefits of business automation accessing OT data without the risk of Internet-based attacks leaking back into OT systems; and
- Deploying cybersecurity measures in OT systems to address residual risks of deceived, disgruntled or compromised insiders.

There is no simple formula for this decision process, but neither is it insoluble. The profession has both the skills and responsibility to look at water utilities in light of today's attack environment, understand how that environment is expected to change in the decades ahead, and put together recommendations for acceptable designs, again with large margins for error.

Andrew Ginter is vice president of industrial security for Waterfall Security Solutions, co-host and Chief Security Officer of the Industrial Security Podcast and the author of three books on OT security.

TRENCHLESS EVENTS CALENDAR 2024

****RED BOX DENOTES NOTABLE EVENTS****

***All events are current as of July 25. Please check the event's website for updates.**

SEPTEMBER

8-11 2024 Public Works Expo (PWX2024)
Atlanta, Georgia
Web: apwa.org/events/pwx-conference

9-11 2024 Tunneling Short Course
Denver, Colorado
Web: tunnelingshortcourse.com

25-27 HDD Rodeo
Independence, Missouri
Web: hddrodeo.com

26 World Trenchless Day
Global Trenchless Celebration
Web: worldtrenchlessday.org

OCTOBER

5-9 WEFTEC 2024
New Orleans, Louisiana
Web: weftec.org

7-10 PHCC Connect 2024
Birmingham, Alabama
Web: phccweb.org/connect

15-16 WESTT No-Dig Conference
Pomona, California
Web: westt.org/education-and-events

23-25 DCA 2024 Fall Meeting
Boston, Massachusetts
Web: dcaweb.org/page/fallmeeting

28-30 2024 No-Dig North
Niagara Falls, Ontario
Web: nodignorth.ca

NOVEMBER

4-6 2024 CCGA Symposium
Regina, Saskatchewan
Web: canadiancga.com

6-7 3 Rivers Wet Weather Sewer Conference
Monroeville, Pennsylvania
Web: 3riverswetweather.org

14-16 Global Buried Asset Management Congress
Indianapolis, Indiana
Web: bami-i.com/congress

LOOKING AHEAD TO 2025

FEBRUARY

17-20 2025 WWETT Show
Indianapolis, Indiana
Web: wwettshow.com

MARCH

30-April 3 NASTT 2025 No-Dig Show
Denver, Colorado
Web: nodigshow.com

APRIL

7-13 bauma
Munich, Germany
Web: bauma.de/en

AUGUST

9-13 UESI Pipelines 2025 Conference
Tampa, Florida
Web: pipelinesconference.org

Ad Index

UNITED FELTS
A VORTEX COMPANY

EnviroCure®-Felt*

FINALLY A CIPP LINER THAT MITIGATES ONSITE STYRENE EMISSIONS WITHOUT LOSING STRENGTH.

THE ONLY LINER OF ITS KIND.

Developed by United Felts, the most trusted CIPP manufacturer in the industry, EnviroCure-Felt, is a game-changer! Featuring a proprietary styrene barrier coating, EnviroCure-Felt liner odor and emissions are significantly lower than traditional CIPP Liners.

- Styrene emissions are less than 1 ppm on job site.**
- Less expensive than styrene-free resin liners.
- Liner strength is not compromised.
- Installs like traditional CIPP.

MADE IN AMERICA

** Patent Pending. ** Independent 3rd party tests of Styrene Emission for EnviroCure with/without Pre-Liners During CIPP Process, 2021-11-23.*

LEARN MORE
276-656-1904