TRENCHLESS

FOR GAS INFRASTRUCTURE

NASTT NORTHEAST REGIONAL CHAPTER

2023

New Installation in Cobbles and Boulders

Texas Ingenuity Combining Trenchless Applications

Raising the Bar for HDD

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New Installation in Cobbles and Boulders below Sensitive Wetland

Choosing methods with minimal disturbance is a paramount consideration when crossing below sensitive wetlands. Two existing natural gas pipelines required interconnection with a new 1.5 mile 6-inch, high pressure line, including under a river crossing at a fen wetland. The Horizontal Hammer Boring (HHB) method selected presented the best opportunity for success.

Texas Trenchless Ingenuity Combining Trenchless Applications

Energy companies are working diligently to update or install new infrastructure at every level, and trenchless technology has often been a driving force behind these efforts. Even with the various trenchless applications available, sometimes a little creativity is necessary to get the job done. Details on the installation of a new carrier pipe for a field storage facility.

Turnkey Alliance Manages Leak-Prone Infrastructure

CIPL is an advanced leak repair technology which enables gas utilities to comply with the PHMSA PIPES ACT regulations for reducing methane emissions. A turnkey alliance between contractors Progressive Pipeline Management and Hallen Construction is delivering solutions integral to National Grid's long-term strategy to manage leaking infrastructure.

Raising the Bar for Horizontal Directional Drilling

For high risk and complex HDD projects, asset owners need to raise the bar and have higher expectations for deliverables and ensure best practices from their engineering service providers and construction contractors. Higher expectations and contractual requirements by all utility owners will encourage all HDD contractors to embrace change, and continue to move the HDD industry forward.

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Printed 04/23 in Canada.

WELCOME MESSAGE FROM NASTT-NE CHAIR

Eric G. Schuler, P.E. NASTT-NE Chair

Welcome to the 5th annual edition of the NASTT Northeast Regional Chapter's Trenchless for Gas Infrastructure Journal! I hope that you find the content in this publication to be forward-thinking and practical. The NASTT-NE Chapter thanks the continued support of sponsor's for this crucial publication highlighting the gas industry.

In 2023, the NASTT-NE Board remains unchanged at the Executive Committee level, has lost a couple Directors going into the start of the year. **We have a need for volunteers**, especially from the **gas industry** as we look to expand educational offerings for that sector of the market going forward. This Regional Chapter is always evolving, growing, and learning from our past experiences relating to both Journal content and annual conference results. We are a volunteer-run organization and it takes a strong commitment from a select group within this industry to keep things moving forward as we strive to provide sound educational and networking experiences for our 7-state region. As you read this magazine, I encourage you to get involved with our close-knit group if you are located within our region as we are always looking for individuals from the gas industry to get involved with our conferences and Journal content development.

2022 NASTT-NE Conference Recap

- Our annual conference was deemed a success; again. It definitely was a risk to hold our annual conference on a chilly November day up in Portland, Maine. Maine is at the outer reach of our Chapter's footprint and we were not too sure if we could generate enough attendance/interest to minimize financial risk, but we hit our attendance metrics and enjoyed a great event.
- We did not have a large representation from New Hampshire or Maine in attendance, as attendees from Massachusetts and New York carried our numbers. Our technical agenda consisted of our two typical tracks, with the biggest hit seeming to be a Roundtable titled "Trenchless 101: Experiences and Lessons Learned". There were a couple gas industry-specific presentations built into our agenda, and we hope to expand gas-related offerings at future conferences. We are always looking for good content! So please keep your eyes out for our "Call for Papers" for our 2023 Conference that will be held in Albany, NY. I would say that our Call for Papers notification will probably hit the streets in July; right after our Conference Registration page goes live. For information regarding our NASTT-NE Conference, November 13-14, in Albany NY please keep checking: www.nenastt.org
- The tradition of Live Outdoor Demonstrations continued as well with Vortex Companies conducting a CIPP presentation in the venue parking lot. Vortex was well-represented at this Conference, partially due to Matt Timberlake having the role of Keynote Speaker during the Lunch Hour. Matt is from Maine, and brought a great personal touch to the Conference.
- Our Social Event also was a big hit, as we had Chapter-sponsored food and drinks on a floating restaurant. We had the pleasure of 3 individuals from National (NASTT) attend and partake in our event. As always, we appreciate the support of National and continue to use our events to learn and grow our experience for attendees.

As you take a read through this publication, please try to take note of the messaging portrayed throughout the articles and the criticality of these topics. This magazine does a great job at portraying the positive role that the various trenchless technologies can play in the gas industry's mission to reduce methane leaks and greenhouse gas emissions. Both very popular and much-debated topics in this age. There is also good consistency with NASTT "Green Above, Green Below" messaging, along with coverage of the AGA-NASTT TT Workshop that occurred in Atlanta Feb 28-Mar 2. The committee that pulled this product together has shown how passionate they are about this industry and how committed they are to moving the messaging in a positive manner consistent with industry goals.

Thank you for the opportunity to write another Welcome Message for you. This will be my last one as I will be completing my term as Chair at the conclusion of 2023. I look forward to the continued Northeast Chapter support of this publication and for the continued evolution of this publication. I hope to see some of you at No-Dig 2023 or NASTT-NE Albany 2023! Enjoy the day!

Eric Schuler

Eric G. Schuler, P.E.
Chair, NASTT-NE

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REGISTRATION IS OPEN! The 2023 American Gas Association (AGA) Operations Conference and Biennial Exhibition is being held May 2–4, 2023, in Grapevine, TX. This event will gather the natural gas industry leaders from across North America to network and share technical knowledge and leading practices to promote the safe, reliable, and cost-effective delivery of natural gas.

Exhibition: The Conference will feature the renowned biennial exhibition, May 2–3, which attracts approximately 250 domestic/international vendors with exhibit space exceeding 90,000 sq. ft.

In conjunction with the 2023 AGA Operations Conference and Biennial Exhibition, AGA's spring technical committee meetings will be held May 1–2. More information on these events and how to register can be found **here**.

This event is AGA's largest forum with regularly more than 1,000 operations management in attendance, including 100 speakers, and over 120 technical presentations that focus on a variety of topics, including:

- Hydrogen
- Gas Control
- Engineering
- Piping Materials
- Renewable Natural Gas
- Worker Health & Safety
- Workforce Development
- Gas Utility Management
- Underground Gas Storage
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WELCOME MESSAGE FROM NASTT CHAIR

Matthew Wallin P.E, NASTT Chair

As more utilities and resources move underground, trenchless technology becomes the obvious choice for underground infrastructure management. With smaller easements and congested or inaccessible areas, trenchless technologies offer minimal to no excavation and surface disruption. NASTT is focused on the sharing of advancements in new technology. This then affects the way both contractors and utilities evaluate trenchless methods. Safety is a top priority for the gas industry, and the use of trenchless techniques has been demonstrated to be safer than conventional construction techniques. Utilizing trenchless methods allows for outside-the-box thinking in solving today's construction issues and challenges. When you consider that 50 percent or more of a utility budget is spent on construction, the use of trenchless technologies results in more reliability at lower costs. Knowledge of when and how to apply its use is the key to successful implementation. This is achieved through education and training.

As we know, North America relies heavily on dependable sources of energy, yet much of the infrastructure that supports these utilities is at the end of its lifecycle. While natural gas and electrical utilities continue to provide a safe and reliable solution, they must continuously work to keep the energy flowing, regardless of any rehab, replacement, or new installation taking place. The need to provide resilient energy grids is driving the increased undergrounding of energy transmission and distribution systems.

NASTT is an important organization comprised of engineers, contractors, municipalities, utilities, and others with strong beliefs in the practical, social and environmental benefits of trenchless technology. By partnering with American Gas Association (AGA) & Distribution Contractors Association (DCA), NASTT can bring the infrastructure community together to provide appropriate designs and constructible projects. Our mission to advance trenchless technology is achieved through technical information dissemination, research and development, education, and training. NASTT strives to provide a voice for all sectors of the trenchless technology industry. For nearly 35 years, the all-volunteer members of NASTT have presented seminars and training on these "green alternative" engineering methods to North American communities.

Climate change is one of the most urgent issues for the United States with utilities focused on clean energy and a reduction in GHG emissions. As NASTT continues to share new technologies, the gas industry will benefit from enhanced safety, reduced excavations and emissions, reductions in 3rd party damages, and reductions of the risk to human life from entering excavations. We regularly review and update our training materials and virtual/ in-person courses. We are excited to roll out updated gas educational resources this year. For the latest information on upcoming events, visit our website at www.nastt.org/training/events.

We look forward to the events in the coming months to bring the underground

infrastructure community together. Please join us in Edmonton, AB for the 2023 No-Dig North conference, October 23-25. No-Dig North is hosted by the Canadian Chapters of NASTT and offers three full days of training, education and networking. This is a must-attend event for anyone doing business in Canada. Visit www.nodignorth.ca for details!

Be sure to mark your calendars and save the date for the NASTT 2024 No-Dig Show in Providence, RI, April 14-18. The city of Providence is a perfect location, right here in our Northeastern backyard, for our industry to come together to celebrate and educate with the theme, *Green Above, Green Below*. It is important that our industry is a steward of our natural resources, and we welcome the opportunity to provide a forum to learn about the latest in innovative trenchless products and services. Learn more at www.nastt.org/no-dig-show.

We welcome your feedback and questions! Please reach out to us at any time at info@nastt.org.

Matthew Wallin,

Matthew Wallin, P.E.
Chair, NASTT Board of Directors

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TRENCHLESS TECHNOLOGY PERSPECTIVE

Going Trenchless is the Linchpin for a Brighter Greener Future

George Ragula, RagulaTech Inc.

Welcome to the fifth edition of ***Trenchless for Gas Infrastructure 2023***, the annual NASTT-NE publication focused on the benefits and applications of trenchless technologies for gas industry construction, renewal and rehabilitation work. As shown in these pages, trenchless technology continues to provide a comprehensive set of alternative construction and rehabilitation techniques for all gas distribution infrastructure. Trenchless technology offers numerous economic, social and environmental benefits, and in particular harbors excellent potential for significantly reducing the GHG emissions associated with the gas industry.

All gas industry sectors are making concerted collective efforts to reduce GHG emissions by whatever means possible. Climate change is one of the most urgent issues facing the industry with utilities focused on clean energy and curtailing GHG emissions. Towards this end, replacement and rehabilitation of an aging pipeline inventory is a major focus for local distribution companies. Vast reductions of emissions related to construction activity and sealing up the gas distribution system to drastically reduce methane leaks are two important avenues for minimizing GHGs through the effective utilization of trenchless methods.

Smaller construction site footprints, limited excavations, minimal use of resources such as asphalt and/or concrete, sand and stone, less need for waste disposal, decreased transportation of materials and overall greatly reduced energy and surface restoration costs, all significantly decrease the CO2 equivalent impact of underground construction projects. Projects are completed in less time with less equipment, thereby alleviating traffic idling and delays, and other social and environmental costs associated with open cut excavation. Importantly, the impacts of necessary gas system repairs and infrastructure upgrades on nearby residents, businesses and communities are also greatly mitigated by using trenchless technology applications. In fact, a number of studies have shown that GHG emissions can be reduced by 40 – 90 percent during construction by using trenchless technologies instead of conventional trenching.

Massive gains in methane leak reduction are being achieved system-wide through the progressive replacement and rehabilitation of the aging pipeline inventory. Distribution company replacement programs have already repaired or replaced the most accessible portions of their networks, leaving pipelines in remote or difficult-to-access regions like bridges, under highways and major thoroughfares, railroads, golf courses, and waterways, etc. Repairing leaks in these areas is also considerably more difficult. These most inaccessible and challenging projects are where trenchless can really shine, reaping the greatest benefits in GHG reduction. Pipeline renewal using CIPL for rehabilitation on pipelines in these outlying areas is demonstrably the best approach, yet ironically lining of cast iron and steel pipe remains the least understood trenchless method, despite being successfully utilized on pipeline repair projects for more than 30 years.

In that regard, as part of the overall effort to raise awareness of the numerous social, environmental and economic benefits of utilizing trenchless methods for gas industry construction, the AGA and the North American Society for Trenchless Technology jointly hosted a two and a half day Trenchless Technology Workshop in Atlanta February 28 – March 2 (pages 10-11). I chaired the AGA organizing team that worked relentlessly, meeting biweekly since last summer to pull together a highly informative program covering the range of trenchless applications available to the gas industry. NASTT supported this endeavor by providing core course materials, which were then modified by the AGA team for the workshop. Special thanks to the AGA organizing team, exhibitors and sponsors. It was an excellent, well-attended learning opportunity and the first of many to come!

The 2023 NASTT slogan is "Green Above - Green Below", which aptly encapsulates the huge promise various trenchless technology applications harbor for enabling the gas industry to achieve its aggressive GHG reduction objectives, meeting every legislative and regulatory challenge head on. Trenchless methods improve the ecological footprint significantly, and are a linchpin of efforts for the gas industry to meet its climate change targets. Enjoy these pages and the valuable information found within!

George Ragula

George Ragula, RagulaTech Inc.
NASTT Hall of Fame Member

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AGA Trenchless Technology Workshop a Success!

First-ever AGA Event Focused Exclusively on Trenchless Technology!

The first-ever AGA hosted workshop focused exclusively on trenchless technology was held at the stylish Loews Hotel Atlanta February 28 – March 2. It was the culmination of over 3 years of careful planning effort by AGA and NASTT, spearheaded by George Ragula former Chair of the AGA Construction Operations Committee and past Chair of NASTT. Course materials were provided by NASTT and modified by the AGA specifically for the gas industry. Over 75 attendees took in 15 presentations and case studies covering trenchless applications used in new construction and rehabilitation of gas distribution systems. Networking events and close access to industry expertise were highlights of the workshop.

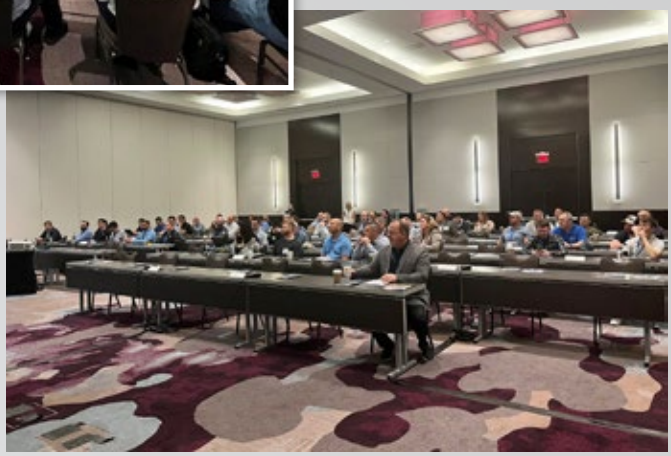
Open to AGA members and non-members, the two and half day workshop was a unique opportunity to learn more about trenchless technology's useful toolbox of alternative construction and rehabilitation methods, such as HDD, CIPL, Pipe Bursting, Pipe Splitting. Utilizing trenchless applications has numerous social, environmental and economic benefits, and offers significant reductions in GHG emissions.

The Loews Hotel in Atlanta hosted the first-ever AGA Trenchless Technology workshop

Several AGA Trenchless Workshop Speakers and Presenters: (from l-r): George Ragula, RagulaTech; Javen Moore, Ditch Witch; Melissa Lisher, AGA; Alan Goodman, Hammerhead Trenchless; Paul Bearden, HDR Inc.

Networking and close personal access to industry expertise was an important aspect of the workshop

Attendees had close personal access to industry experts and trenchless technology exhibits featuring innovative new technologies



Attendees enjoyed two and a half days of 15 technical presentations and case studies on various trenchless technology applications for the gas industry

The final half-day of presentations featured utility case studies on trenchless projects for gas distribution systems, highlighting a wide range of applications including HDD, CIPL and pipe splitting along with an in-depth discussion of cross bore risks and impacts.

As the success of the Atlanta workshop demonstrates, there is a strong desire for in-depth information on trenchless methods for the gas industry, and hopefully the first of many more to come.

Special thanks to the workshop organizers, exhibitors, sponsors, presenters and attendees!

Workshop organizer George Ragula, RagulaTech, delivers a presentation on the "NASTT New Installations Methods Best Practices Course"

Javen Moore, Ditch Witch delivers presentation on HDD Good Practices

New Installation in Cobbles and Boulders below Sensitive Wetland

New Trenchless Method Overcomes Project Hurdles in Record Time

By: Richard Revolinsky, Geonex Inc, (GEO)

To meet the needs of rapidly growing resort communities in Colorado, two existing natural gas pipelines required interconnection with a new 1.5 mile 6-inch, high pressure line. In July 2021, Blackeagle Energy Services of Berthoud CO was contacted by their client to construct the interconnection, which needed to be complete by winter 2021. "Residential construction growth in Colorado is occurring at breakneck speed, faster that most gas companies can keep up." Said Erik Hepker, Field Services Manager for Blackeagle. "This would normally be a 2 - 3 year project for design and construction. In July 2021 design was not finalized. It would be design as you go and were up to the task." In addition to only having 4 months to complete the project, several other challenges made this new installation even more complex. Traversing hiking and biking trails, a 600-foot elevation change in the 1.5 miles, survey, clearing, material procurement, soil investigations, and coordination with Army Corps of Engineers, the installation, testing and putting the line into service by October 2021. Adding further difficulty, the proposed path included crossing the Fraser River at a Fen Wetland, a crossing which saw 9 design reiterations before being finalized.

A Fen Wetland is a peat-forming wetland that relies on groundwater input and requires thousands of years to develop. The ecological functions of fen wetlands cannot be easily restored once disturbed, thus, selecting techniques with minimal disturbance was paramount consideration when choosing the methods for crossing the fen. Installation of conductor casings is a common technique in directional drilling when encountering gravel and cobbles at the entry pit. Conductor casing provides a mechanism to mitigate inadvertent returns and maintain good flushing of the bore hole. Setting drilling operations back from the fen wetland prevented surface damage, but to prevent subsurface damage the need to protect the wetland from inadvertent returns from below also had to be considered.

Geonex allowed the contractor to install the conductor casing twice as long as traditional hammer boring methods

Soil borings along the proposed path revealed a cobble layer about 50 feet deep before hitting bedrock. Drilling would need to go 240 feet at a 12-degree entry angle before hitting bedrock at a 12-degree entry angle. Utilizing the GEONEX™ downhole hammer boring system allowed trenchless contractor NewTech Drilling of Nebraska City NE to install the conductor casing twice as long as traditional hammer boring methods would allow. Installing 300 feet of conductor casing provided NewTech with the ability to get through the cobbles and boulders and established into bedrock. This approach provided significant benefits to the 2,200 LF HDD installation by mitigating inadvertent returns as well as being able to avoid having to steer the HDD through the cobbles and boulders. Once into the bedrock NewTech would drill another 50 feet in elevation before beginning to steer

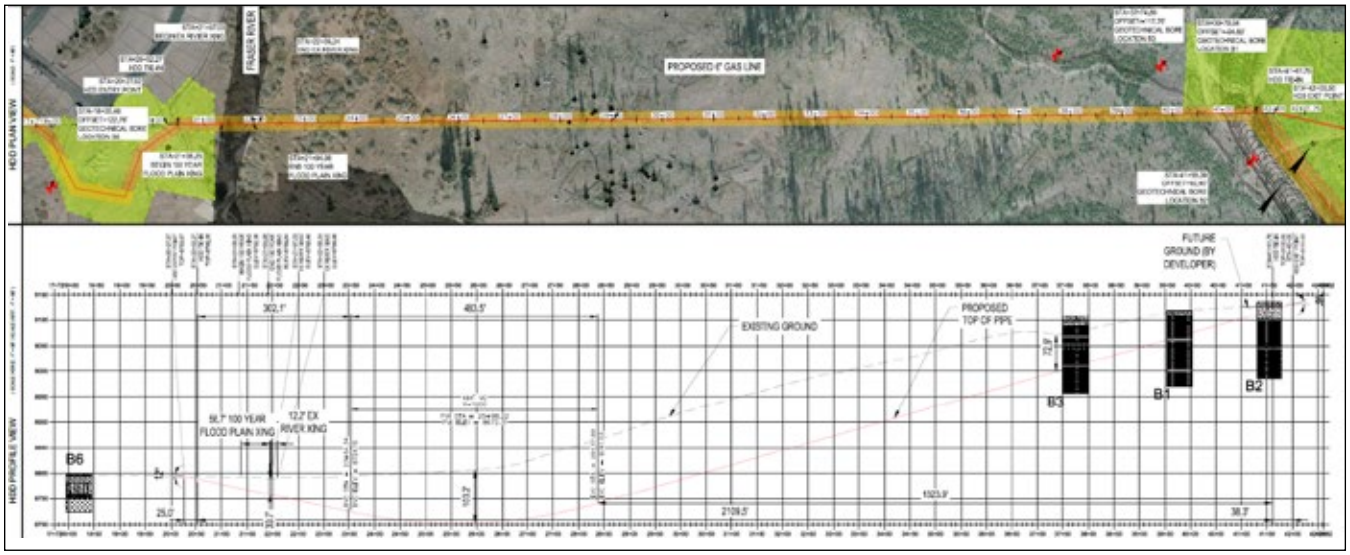
Down the Hole (DTH) Horizontal Hammer Boring was selected as the best method to install the 300 feet of 24-inch conductor casing

> *"The need to protect the wetland from inadvertent returns had to be considered."*

Drilling needed to go 240 feet through cobbles before hitting bedrock

upward to hit an exit angle of 16 degrees at El. 9,131, nearly 2,200 LF away.

Blackeagle selected NewTech Drilling of Nebraska City, NE to perform the trenchless works. "We have done a lot of work for Blackeagle, in some really challenging conditions." said NewTech's president Brandon Olson, they trusted our expertise and opinion in selecting the best approach." Olson had been researching GEONEX™ for a while. "We really struggled on a project in Steamboat Springs a few years ago, and I knew there had to be a better way to deal with cobbles and boulders. I found GEONEX™ online, spoke



Proposed 2,200 LF HDD path included crossing the Fraser River at a Fen Wetland

System does not require the use of drilling fluids

Desired 12 degree entry angle was met by adjusting independent hydraulic legs

with them and believed their technology was the answer."

NewTech met with Blackeagle and the pipeline owner to discuss using GEONEX™. "The project schedule was too tight to wait for a new Geonex system to arrive from Finland where GEONEX™ manufactures their equipment, but they were great to work with. They (GEONEX™) helped coordinate a rental and technician with one of their clients in Minnesota." said Olson. To install the 300 feet of 24-inch conductor casing, the GEONEX down-the-hole (DTH) Horizontal Hammer Boring (HHB) solution presented the best opportunity for success.

The GEONEX™ system is an umbilical system consisting of 3 main components, a drill machine, hydraulic power pack, and air compressors. The drill machine which provides rotation for auger and the means of conveying air to the downhole hammer at the face of the steel casing is placed in the launch pit. The Hydraulic power pack sits on grade and provides power to the rotary system and other hydraulic components, air flow regulation, and the brains for wireless remote control. Air compressors to meet the air requirements of the downhole hammer were placed

System consists of 3 main components, a drill machine, hydraulic power pack, and air compressors

on site and connected via hosing to the powerpack. The GEONEX™ Down-The-Hole horizontal boring system does not require the use of drilling fluids, which further served as benefit to mitigate impacts to the fen wetland.

"While coordinating and planning for the drill, we were installing the 6-inch gas main on either side of the bore path," said Hepker, "so we were really counting on the crossing going well. There was no margin for error." The GEONEX™ HZR610 was adjusted via independent hydraulic legs to meet the desired 12 degree entry angle. Because the downhole hammer and auger string would be removed to accommodate the HDD drilling components, the lead section of casing was fitted with an integrated ring bit to prevent the ring bit from becoming an obstruction once the hammer is removed. The process of installing 300 LF of 24-inch casing through the 50-foot thick layer of cobbles and boulders and terminating in bedrock took approximately 2 days to complete.

Upon completion of installing the conductor casing and retraction of the auger and hammer, air and hydraulic hoses between the GEONEX drilling unit and the powerpack were removed and the drill machine pulled from the launch pit. Next, a 16-inch steel casing with centralizing legs was slid inside the conductor casing to aid in centering the HDD tooling. NewTech utilized their Vermeer D330x500 accompanied by a 14-inch bit with centralized mud-motor for the 2,200 LF pilot drill. "We used a wireline for steering." said Olson. "You can't get a reading until you're out of the casing because of magnetics. The 24-inch casing was within ½ degree vertically and 2 inches horizontally from target, so we were very pleased with how the GEONEX™ system performed, and it gave us a great start to our drill."

NewTech completed their 2200 LF pilot drill in 6 days, on target and keeping the project moving at the pace it needed to achieve schedule. After pulling back the 6-inch steel gas main, Blackeagle quickly wrapped up the tie-ins, completing testing and putting the line into service before the first snow falls.

"We were really proud of the work" said Hepker referring to the project team. "We have a few more projects coming up which we plan on utilizing the GEONEX system." After the project, NewTech, purchased the first of now three GEONEX™ systems in their fleet. "I was really impressed by how the GEONEX™ system performed. We now have the capabilities to go from 5-1/2-inch casings up to 32 inches with our equipment. We have both power packs, the HZR 610, HZR400 and our HZR220 should be here soon. I don't expect to see these machines in our yard too often."

ABOUT THE AUTHOR:

Richard Revolinsky *is the North American Operations Manager for Geonex Inc. He has served the trenchless industry for the past 10 years in various roles as Project Manager for Auger Boring and HDD projects and material sales. He is committed to furthering the Trenchless Construction industry with viable innovative solutions.*

Texas Trenchless Ingenuity Combining Trenchless Applications Puts Pipe in the Ground

By: TT Technologies

The replacement and upgrading of a wide range of infrastructure by the oil and gas industry is a process that is happening all the time. In areas throughout the United States, energy utilities are working diligently to update or install new infrastructure at every level. To facilitate new services, mains, transmission pipelines and storage facilities, the industry aligned itself early on with trenchless applications and contractors, and, in many cases, has been a driving force in the growth of that technology as well. But even with the vast number of trenchless resources available, sometimes a little creativity is needed to get the job done.

That was the case for trenchless contractor MAXX HDD, Navasota, Texas on a recent pipeline corridor project in Baytown, TX. The multifaceted trenchless contractor was selected to install a new carrier pipe for a storage field facility. However, because of the difficult jobsite layout, how that would be accomplished was not immediately evident.

According to MAXX HDD Chief Operating Officer TJ Strickland the project presented several significant challenges. He said, "It was on a pipeline corridor. It's a very congested corridor that runs through Houston, down to the Baytown area. There are facilities and pipelines everywhere. The project was part of the development of a new storage facility. We were subcontracted to install the 450-foot, 8-inch diameter steel pipeline that would get the product into or out of the new facility. Typically, this would have been a directional drilling project. However, the tight work area and job requirements did not allow us to pullback the product pipe in a traditional manner."

MAXX HDD used a 20-ton Grundowinch from TT Technologies to pullback a carrier pipe in a tight location where a traditional directional drilling pullback wasn't feasible

The 450 feet of 8-inch diameter steel carrier pipe was installed as part of storage facility development

MAXX HDD crews drilled out to a 26-foot-deep pit, then used the winch to pull in the new pipe. The versatile "trenchless" winch provided the pulling power and the constant-tension needed to install the pipe without any issues

Without the ability to use the drill to pull in the new pipe, TJ Strickland and his team needed to find another option for installing the pipe. The jobsite layout had the MAXX HDD crew drilling into a 26-foot-deep pit where the new carrier pipe would be connected to the rest of the system. The problem was there was no room to stage the pipe for pullback near the pit or even reposition the drill in that area.

TJ Strickland said, "Thinking out of the box, we had to come up with something to facilitate getting the pipe in the ground. We met with the project owner, the engineers and other partners trying to just come up with different ways to do it. Rick Melvin [TT Technologies, Aurora, Ill.] mentioned the possibility of using a trenchless winch, stationed at the pit to pull in the pipe. So, I said, 'Let's get some paperwork on it.' And we did and I sent it over for review and everyone thought it looked like that could work!"

Melvin a Trenchless Specialist with trenchless equipment manufacturer TT Technologies is no stranger to pairing trenchless technologies to make difficult projects happen. He said, "Like TJ said, this was thinking about things differently to find a solution. The drill rig would do part of the job and the winch would finish it off. The Grundowinch we used on the job is typically paired with a pneumatic pipe bursting tool but has many other applications as well. It can pull pipe, conduit, swage line any number of things. It's called the 'trenchless winch' and that's accurate. Having a highly skilled contractor like MAXX HDD, however, is what made this project work."

MAXX HDD- MAX SKILL, MAX SAFETY, MAX RESULTS

Founded in 2015, MAXX HDD is a respected leader in the trenchless construction industry. The privately owned company is led by an ownership group and management team comprised of second and third generation industry experts.

Strickland said, "So we started the company in 2015. My other two business partners come from pipeline background as well. We just wanted to build something that

With adjustable boom length and extension legs, the winch has the ability to adapt to a variety of different configurations and structures

Soil conditions and a high water table meant crews needed to keep the dewatering pump in the pit running constantly to handle the ground water

we could stand behind, that was privately owned, and make it really special for a small group of folks and it took off. We've got a really good core group of guys. One of or supervisors has got over a million feet of pipe installed in his career. He is absolutely a plethora of knowledge."

According to Strickland, safety is a key part of the culture at MAXX HDD. He continued, "The safety of our employees is really at the top of the list and it's part of everything we do. From extensive training to identifying hazards on the job site before they happen and allowing employees to voice safety concerns, it becomes part of everything we do. It's not taken lightly."

DRILLING OUT

MAXX HDD was subcontracted to install approximately 450 feet of an 8-inch diameter steel pipe. Without the ability to pullback the new pipe, crews had to drill out to the pit and create a hole so the new pipe could be pulled with the 20-ton winch. That began with a 5-inch pilot bore and transitioned to backreaming.

Strickland said, "With this one we had to drill, prepare the hole, move the rig out of the way. We used a 100,000-lb. HDD rig for the bore path. We piloted it out, opened the hole and punched out in the bottom of the box. There were pipelines everywhere some that were very close to us. Several of them we exposed in that pit structure itself. The plan was to get the pipe in place and the general contractor would take it from there."

Soil conditions were wet "Baytown clay" and crews needed to keep the submersible dewatering pump in the pit running constantly to keep the ground water under control. The seven-man crew spent two days completing the pilot bore and another two days backreaming.

Strickland said, "With all that other pipeline out there the pilot had to be dead on the money and it came in perfectly. After the pilot bore, we went straight to a 16-inch fly cutter backreamer. We cut a 16-inch hole to make sure we had plenty of room. We left our steering tool in the system down hole so we could make sure that the reamer wasn't cutting too far out of the hole. And then we pushed the reamer back across to keep that hole open. On the last pass

The variable speed Grundowinch makes adjustments for conditions that impact line speed during operation, providing constant and consistent pulling force

we made through there, we pulled back the Grundowinch cable and moved our drilling rig out of the way."

PIPE PULLING POWER & PRECISION

With the Grundowinch positioned above the target pit and the winch cable pulled through the bore hole, crews began preparing the product for pullback. Melvin said, "Constant-tension winches are built to handle ever-changing conditions in below-grade work. You hear about constant-tension and variable speed. And that is one thing that sets this winch apart from others. That design feature means any cable slack is sensed by the winch and taken up quickly and automatically. This makes for an ideal winch for sensitive operations such as swage lining. Obviously, the adjustable boom came into play here. It needed to be extended almost 25 feet in order to make this pull work."

Again, the tight working area forced the crew to pull back the new pipe in sections, rather than staging the entire 450 feet and pulling it back all at once. Strickland said, "There was a lot of new construction going on right there and we were kind of pinned up against a parking lot. So, we started with 150 feet of pipe and welded one of our regular pulling heads on the first section of pipe. We had 14-degree entry angle and used pipe rollers to make the pullback as easy as possible. We pulled the first 150-foot section in about 45 minutes and then we welded on the next segment, approximately 170 feet. Then we pulled that out and made the second weld to the final section of pipe."

All welds were x-rayed, and special monitoring was done to ensure that there was no damage to the pipe coating during installation. To everyone's satisfaction, pulling in the carrier using the 20-ton constant-tension winch proved to be very successful.

Strickland said, "Once we got our winch unhooked from it, we cleaned up our mess, got our stuff loaded up and get out of there. After the general contractor made the tie in, they cut off our pull head and shipped it back to us a week or two later. I think we had about nine days total on the job. That's from the time we hit the ground, until the time we completely demobilized and got out of there."

ABOUT TT TECHNOLOGIES:

TT TECHNOLOGIES

For more than 45 years, TT Technologies has been the worldwide leader in trenchless technology. Each year, more trenchless sewer, water, gas and electric rehabilitation and replacement projects are successfully completed with trenchless equipment from TT Technologies than any other. TT Technologies is the leader in trenchless!

Turnkey Alliance Manages Leak-Prone Infrastructure

Complex Lining Meets (almost every) Challenge in Queens NY

By: Mario Carbone, Progressive Pipeline Management

Specs:
Project: 24-inch Cast Iron Main Rehabilitation with Starline ® 2000 Cured-in-Place-Lining
Location: New York City, Queens, 134th Street
Length of Project: 6,960 feet, 1.3 miles
Client: National Grid NY (NGNY)
Contractors: Progressive Pipeline Management (PPM) and Hallen Construction

After a big lining project, I often go back to the site and think about what went well and any lessons learned that we could apply to future projects. I was standing on the corner of 134th Street and 97th Ave. in Queens, New York City. Cars were parked on both sides of the one-way street. There was a constant hum from cars and vroom from the trucks two blocks north along the Van Wyck Expressway. Overhead was the intermittent high-pitched whir of plane engines as they fly in and out of JFK airport 2 miles to the South. PPM was tasked with remediating an underground gas main that traversed over 1 mile in this densely populated, heavily trafficked urban area.

The 24-inch cast iron National Grid gas main pipeline underneath 134th Street was lined using the Starline® Cured-in-Place-Lining (CIPL) technology. The 1.3-mile project extended along 134th Street from 97th Ave. and the Van Wyck Expressway all the way to 116th Avenue. PPM's advanced leak repair technology is a trusted strategy enabling gas utilities to comply with the PHMSA PIPES ACT regulations for reducing methane emissions. CIPL technology is integral to National Grid's long-term strategy to manage leaking infrastructure.

TACKLING LEAK PRONE PIPE WITH A TURNKEY SOLUTION

This section of cast iron gas main in Queens is part of National Grid's strategic mandate to rehabilitate over 100 miles of leak prone pipe throughout New York and New England. Taking advantage of the 100+ years of additional life that the Starline CIPL restores back into their aging infrastructure, National Grid's Leak Prone Pipe is being lined and rehabilitated. PPM and Hallen Construction, National Grid's primary contractor, deliver a turnkey solution that has been a cost-effective and critical alliance for National Grid's Leak Reduction Program.

The Starline ® Cured-in-Place-Lining Inversion Drum on 134th Street

"Our alliance with Hallen Construction and the Turn-Key CIPL program for National Grid is an industry first."

-David Wickersham, CEO, PPM

PPM crew with ARIES LETS CCTV camera used to inspect the pipeline prior to lining

The dense, urban neighborhood in Queens has modest single-family homes, apartments, and tree-lined sidewalks. Along the sixteen-block stretch is a Sikh temple, a used car lot, a 24-hour grocery store and a few local bars and restaurants.

This was a complex project. 1.3 miles is quite long for a CIPL project. The 24-inch main under 134th Street changes direction multiple times with zigs and zags. Every joint where a length of the cast iron pipe connected to the next length of pipe was leaking. PPM needed ten pits for the lining and two additional pits for the gas shut off, an essential step in the CIPL process.

When we talk about lining projects, engineers often ask, 'how long did it take?' On paper, the planning, excavation, cleaning, pipe preparation, lining and completion took approximately four months. But that is not completely accurate. It really took five decades, which is as long I have been in the gas pipeline business. The relationships with Hallen, National Grid and PPM were built on trust and competence across several decades. We execute complex lining projects

> *"We speak the same language."*
>
> *-Shep Poole, President, Hallen Construction*

successfully, safely, and cost-effectively, because we have an alliance that is focused on a single goal, successfully eliminating leaks from existing gas mains.

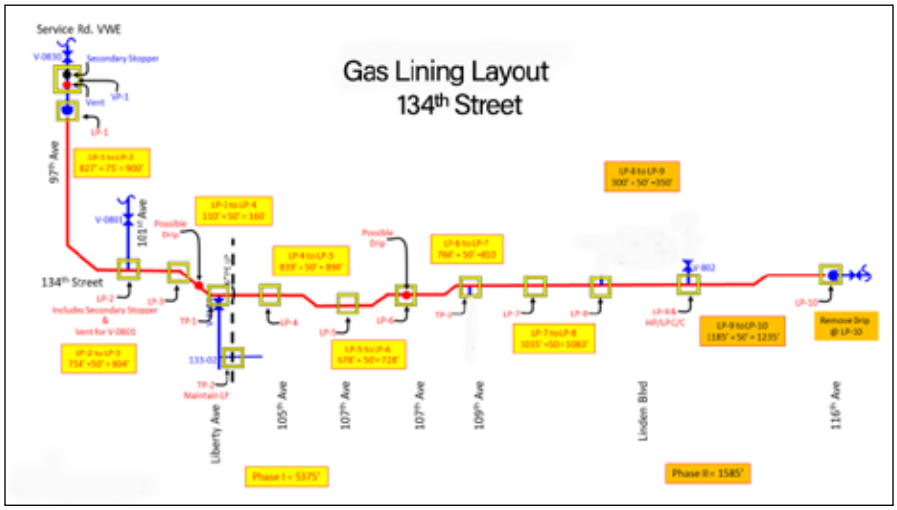
AN EXTRAORDINARY ALLIANCE

I have had the privilege to know and work with Hallen and National Grid almost the entire 52 years I've been in the gas industry. The combined expertise encompasses the best of rehabilitation technology, pipeline construction, gas engineering and distribution practices. Our training took place on these streets of New York, and the northeast.

Hallen has been in business for ninety-five years. Hallen and National Grid, formerly Brooklyn Union Gas, have been working together since the early 1970s. I've known Hallen since I started out at Brooklyn Union Gas. As PPM's construction management arm of the turnkey operation, Hallen handles the excavation, the pipe work, paving and putting it all back together. The crews support PPM with manpower, traffic control and offer invaluable input at every stage.

"We speak the same language." explained Shep Poole, President of Hallen Construction. *"Whatever PPM or National Grid needs for the project, it will get done. Our partnership operates from a deep level of trust while at the same time being open to new ideas and solutions."*

Most of PPM's engineering team was at one time part of the National Grid ecosystem. We learned the gas industry the old-fashioned way, starting at the "Brooklyn Union Gas School of Hard Knocks." They gave us shovels and put us to work in a ditch. I loved



The Gas Lining Layout (GLL) maps the lining project with locations and details of the pits for lining and gas shutdown

PPM crew prepare the transfer hose for lining the 24" cast iron natural gas pipeline on 134th Street

> *"CIPL eliminates leaks, reduces emissions and extends the life of the pipelines by another 100 years, supporting our net zero vision and NY CLCPA mandate.*
>
> *-Saadat Khan, Director Gas Distribution Asset & Engr., NYS at National Grid*

every minute of it. Brooklyn Union Gas (BUG) ultimately became National Grid. I worked my way through National Grid and "retired" after 35 years. I "unretired" twenty years ago to join David Wickersham at PPM.

David Wickersham, PPM's CEO said about the alliance, *"Our alliance with Hallen Construction and the Turn-Key CIPL program for National Grid is an industry first. It demonstrates proven value and showcases our companies' mutual commitment to excellence. We offer CENTURIES of experience in gas system engineering, gas construction, excavation, safety and pipeline rehabilitation in a single offering." He continued, "This experience and partnership enables PPM, with Hallen, to synchronize all aspects of pipeline rehabilitation seamlessly from initial project design to final restoration."*

STEP ONE – PLANNING

Once National Grid had identified that this pipe would need to be rehabilitated, their engineers provided drawings and specified the sections that we were to line. We studied every detail, collaborated with our internal teams, and designed the Gas Lining Layout (GLL). The GLL maps the entire project laid out from the gas perspective and the lining perspective. The location and details of the lining pits and gas shutdown pits were identified along 134th Street and 97th Street. Our operations team led by Tom Nestoras weighed in on the execution and safety protocols.

When we presented the Gas Lining Layout to National Grid, we talked through the geographic location of the ten pits that were required to support the lining. National Grid has a gas feed system that regulates gas services in the neighborhood. By redirecting the service to an alternate main, they ensured that service to their customers was never interrupted during the project. Gas shutdown procedures and pits were also reviewed.

The GLL worked perfectly.....on paper. However, when we walked the site with National Grid and Hallen to see the exact sites for excavation, we realized that we

Concrete Median in Williamsburg, Brooklyn and site of the Chair Challenge

had not fully considered the impact that one of the pits would have on traffic at a key intersection. Hallen recommended we move that specific pit about 25 feet to minimize the traffic impact.

LINING COMPARED TO TRADITIONAL TRENCH AND REPLACE

National Grid could have opted not to install a CIPL in this 1.3-mile-long section of gas main. Upon closer analysis, however, this would have been a more daunting challenge. To 'trench and replace' would have meant excavating over every connecting joint within the scope of the project. That would have required 580 individual pit openings. Each pit requires a road permit. The pits are large and sheeted because the pipe is large in diameter. There would have been a pit every twelve feet along the 1.3-mile section of pipe. Not only would the hard costs have been astronomical, the carbon footprint and environmental impact of pulling all that soil out of the ground and then having to replace it all again is unthinkable. Furthermore, the entire project would have taken about two years to complete. Rehabilitating the pipeline with 12 pits total was the most sensible option.

"PPM and Hallen are crucial to National Grid's Leak Reduction Program." Saadat Khan, Director Gas Distribution Asset & Engr. NYS at National Grid explained. *"CIPL rehabilitates large diameter leak-prone pipes permanently. The technology eliminates leaks, reduces emissions and extends the life of the pipelines by another 100 years. They support the Company's net zero vision and NY CLCPA mandate."*

PREPARATION & LINING

After the gas was shut down, the pipeline was excavated, purged and cut up for PPM's crews to lead the lining portion of the scope. Using a CCTV Aries LETS camera, PPM examined the pipe internally looking for anomalies before cleaning, while also confirming that the pipeline was dry. After the first camera inspection, the pipe was sandblasted and cleaned. The next CCTV inspection showed that it was clean without any obstructions.

Lining was executed section by section, pit to pit. As soon as the first pit was ready and prepared, the crews lined, cured and moved to the next section. It was seamlessly orchestrated by the field and lining teams. After lining, the pipeline was inspected for the third time using CCTV. It looked exactly like it should.

The pipeline was put back together with compression couplings. Pressure tests were executed per National Grid's test procedures and oversight. Once the team verified there were not any leaks, the pipe was blown down. Cathodic protection was applied to the couplings, then the pits were backfilled and paved. The main was put back online.

THE CHAIR CHALLENGE

Challenges come from different directions, and this project was no exception. The large diameter services and major connection points at some intersections required special attention. National Grid has a pressure control device that allows the high-pressure gas to be regulated into the low-pressure system. A unique shut-down procedure added some complexity that required the lining project to be divided into two phases.

Sometimes the challenges come from the neighborhood, unrelated to the pipeline itself. The team executed a project for National Grid in Williamsburg, Brooklyn with an unforeseen challenge. The pipeline to be remediated was in the middle of the highway, under a concrete median. Across the street was a synagogue. The team was prepping for a few days on the street and in the median. When we showed up early Saturday morning to line the pipe, on the median were about 300 wooden folding chairs, stacked about 6 high. 'What in the heck are all these chairs doing here?' I cried. The name of the synagogue was stamped on the chairs. I knocked on the door at the synagogue. No answer. A police car drove up. He said the chairs belong to the Rabbi. I walked back towards the synagogue. The policeman asked, "Where are you going?"

'I'm going to tell him to get the chairs out of here!' I exclaimed. The policeman laughed.

'Rabbi, are those your chairs?' I asked. "Yeah," he replied. He said he had seen our crews working on the pipeline.

I asked, 'Why are your chairs in the middle of the street? Our guys will put them back for you.' I offered.

"No. I have to put them somewhere." The Rabbi answered. "We have services on Saturday, and I need the space in our auditorium." He explained that he stacks his wooden chairs on the median in the middle of the street every Friday afternoon for the services Friday night and Saturday. "This is where I've been putting them for years. You can have the space back Monday." Then he closed the door.

Those chairs never moved until Monday morning. The team had to call National Grid and explain. We laugh about it now. We were able to adjust the project schedule without any adverse impact. I have 100 percent certainty that whatever complications or challenges come up, we can always find a workable solution.

The effectiveness of the PPM-Hallen Construction turnkey alliance boils down to three things. Our collective expertise across disciplines minimizes our blind spots; our decades of experience and connections in the region allow us to lessen the impact that unforeseen obstacles throw at us; and the extraordinary trust we have in each other enables us to put the client's issues front and center. As lining becomes integral to operator's strategy for leak elimination, we encourage more operators to consider the turnkey model for infrastructure management.

Progressive Pipeline Management (PPM) is a NJ-based, full-service contractor that has been committed to improving the safety and longevity of pipeline infrastructure for more than 20 years. PPM offers the latest trenchless robotics and technologies to perform condition assessments and renew aging, damaged or leaking underground infrastructure, including pipelines of all types and sizes. The Starline® Cured-In-Place-Lining (CIPL) technology is the only approved liner for natural gas pipelines and adds 100 years of new service life to the existing pipe while eliminating methane leaks and emissions. This innovative and green solution has been installed in over 1 million feet of gas mains in 20 states.

ABOUT THE AUTHOR:

***Mario Carbone**, Chief Operating Officer leads PPM's key projects and spearheads the testing of new technologies and robotics. He spent thirty-two years in design, maintenance and construction with Brooklyn Union Gas/KeySpan Energy and ten years as the senior manager for gas research and development with KeySpan Energy. Mario holds three gas pipeline industry patents for new technologies in gas pipeline purging, live gas polychlorinated biphenyls (PCBs) pipeline sampling, and live service pipeline transfer without interruption. In addition to his expertise in Starline® CIPL, engineering and managing field operations, Mario is versed in current regulations for corrosion and pipeline environmental procedures. His inventiveness to overcome challenges led PPM to win the Trenchless Technology Project of the Year multiple times.*

Raising the Bar for HDDs

By: Pete Daniels, Kleinfelder

Asset Owners find themselves facing the challenges of implementing new technologies, standards, specifications and best practices vs the "this is how we've always done it" mentality for each new horizontal directional drilling (HDD) project. This can be an internal mentality or driven by push back from contractors not willing to embrace change. For high risk and complex HDDs, asset owners need to raise the bar and have higher expectations for deliverables and ensure best practices from their engineering service providers and construction contractors. Higher expectations and contractual requirements by all utility owners will encourage all HDD contractors to embrace change, invest in new technologies to provide a better product and continue to move the HDD industry forward.

Over the last 15 years, advancements in drilling and steering technology, best practices for preconstruction engineering and inspection have been developed. Unfortunately, the expectations for contractors, utilization of HDD best practices and pre and post construction deliverable requirements vary drastically from owner to owner across the country. It is understandable that owners are often tentative when imposing requirements that may dictate the contractor's means and methods; but not doing so can often put them at risk for change orders, damaged or overstressed carrier pipe and inaccurate as-builts leading to future claims or 3rd party strikes.

Before raising the bar for the contractors, owners must first look inward at their own engineering practices and HDD specifications. This begins with a realistic project schedule and budget that allows for proper due diligence during the planning and design phase. Some small additional upfront costs may be incurred from the contractor creating additional documentation, but it will reduce construction costs and risk during the duration of the project. Recent studies have shown that for every dollar spent on preconstruction engineering, the owner saves approximately $15 in construction costs.[1] At a minimum, preconstruction planning and engineering should include:

- A site visit to identify construction issues and potential permitting constraints
- Topographic survey with utility locating (Subsurface Utility Engineering – Level A)
- An appropriate number of geotechnical exploratory bores based on the length of the HDD and previously mapped subsurface conditions
- Geotechnical lab work issued for Construction drawings with drill geometry clearly specified
- An Inadvertent Return (IR) analysis
- Specifications appropriate to the complexity of the HDD and project site

Kleinfelder has piloted this process for multiple utility owners on a variety of gas transmission pipeline replacement projects. It has been shown that owners have a higher success rate of satisfactorily completing HDDs by adopting a collaborative planning and design process with the internal or external design engineer, a geotechnical engineer and preferred drilling contractor. Having open communication and collaboration between all four groups/individuals during the design and drawing development for each milestone stage (30 percent, 60 percent, 90 percent and IFC) and permitting process will reduce project costs by mitigating design changes in the field, schedule delays, unplanned environmental impacts and produce a realistic project schedule and cost.

In implementing this collaborative process, each group/individual is responsible for providing project specific information and deliverables. The asset owner is responsible for providing internal design standards, material preferences (standard purchase or stock on hand), project objectives and constraints, pipeline operating pressures (including maximum and minimum test pressures), future operation and inspection, existing system interconnections and integrity management input if applicable. The design engineer is responsible for the design and appropriate pipe stress and pullback force calculations, developing or modifying existing HDD specifications, pilot hole as-built verification/approval, mitigating potential risks (e.g. settlement or voids in the annular space after pullback), and pick plan verification. The geotechnical engineer is responsible for determining the number and depth of exploratory bores to adequately characterize the soil and lab testing, making design recommendations, inadvertent return (IR) analysis, settlement calculations (if required) and identifying potential risks (e.g. hole stability). Lastly, the HDD contractor is responsible for means and methods recommendations, space requirements, confirming drill geometry feasibility and providing a comprehensive drilling plan. During the collaborative process, the asset owner's project manager can start managing project expectations for each member of the project team.

As the owners paying for the project, they should embrace requiring more from their contractors and the best fit for purpose deliverable. During the submittal process, owners should require a comprehensive drill plan as mentioned above that includes: project personnel, identifies all planned equipment (i.e. rod and drill head diameter, reamer diameters, drill rig size, and equipment available for the pullback) and steering system to be used, project schedule, IR clean-up plan, engineered drilling mud plan, pumping rates, drill mud and proposed additive

Contractor did not follow the approved pick plan and created a "stair stepped" caternary bend that nearly overstressed the pipe

material safety data sheets (MSDS), a proposed drilling profile that aligns with the IFC drawings, and a proposed pick plan for the pipe string.

Time and time again, contractors and owners are seen neglecting the importance of having an approved pick plan that can be easily followed by field personnel. Lifting the pipe string into position to match the exit angle and meet the minimum catenary bend radius and appropriate height at the breakover

Having a safety factor of two for sling spacing can mitigate overstressing of the pipe during lifting into place by accounting for field conditions and human error

point is the likeliest time to over stress or damage the pipe. Owners' inspection representatives often lack proper training or adequate experience for overseeing HDD drilling operations, especially as relates to the pullback to ensure the pipe is not over stressed. Most pipeline inspectors are familiar with open trench construction and not the nuances of HDD construction.

There are several solutions; the owner can provide the contractor with the maximum spacing requirements between the pipe cradles (sling rollers) and pipe rollers or the contractor can provide calculations in the drilling plan justifying the proposed spacing. The design engineer should provide the minimum catenary bend radius, the maximum height at the breakover and distance from the exit point for the breakover point. A recommended best practice is to cut the maximum allowable unsupported span in half for the pipe cradles to account for field conditions and human error.

Design engineers without field experience rarely allow for human error that may occur when lifting the pipe string into place for example. Having all cradles remain in contact with pipe string while lifting is nearly impossible due to human reaction time or different lifting speeds of equipment. The pipe rollers should be placed no more than 80 percent of the maximum allowable unsupported span but may need to be even closer based on project topography or if the pipe is being hydrostatically tested while on the rollers.

Having an approved pick plan prior to drilling commencing ensures the contractor has the minimum number of pipe rollers/cradles required and equipment on site to meet the lifting heights necessary for the catenary bend. An approved pick plan holds the contractor accountable as it is their pick plan which reduces the owner's risk for placing an overstressed section of pipe into service. Owner oversite is still required as field personnel still embrace "this is how we've always done it" or "we've never needed a pick plan before" and as a result, may not follow the project approved pick plan.

A proper pick plan avoids over stressing the pipe when being pulled in, but that is not the only risk for over stressing the pipe string. Owners should standardize their requirements in regard to as-built accuracy for the pilot hole profile to evaluate and potentially mitigate before it is too late, the other primary risk for over stressing the pipe. From our experience, owners' expectations and requirements could not vary more across the nation. Steering systems (such as "walk-over" or "wire-line") and proprietary software vary greatly with accuracy and data outputs. In addition, owners need to accurately know the location of their facilities to meet permit conditions and/or avoid conflicts with existing and future infrastructure, especially in urban areas.

Not all HDDs require exceptional accuracy due to low/no environmental risks or no existing/future infrastructure conflicts, but high risk or challenging geometry HDDs do. Requiring the contractors to provide the raw data and a plotted plan and profile tied to project stationing for approval should be the minimum requirement. As government regulations increase, owners are often required to have traceable, verifiable and complete documentation of their pipelines. Contractors rarely provide calculated compound radii in as-builts unless the designed drill geometry contains a compound curve. Owners should be verifying the vertical, horizontal and compound radii of drills with the raw data prior to approving the pilot hole for reaming to ensure the pilot hole is within compliance of the project specifications.

As owner and industry expectations and requirements rise, a natural balance will be established between improved best practices and project deliverables without assuming unnecessary liability by imposing on the contractor's means and methods. As owners the raise bar of what is expected to complete work for them, the contractors that embrace these new expectations will thrive. The contractors that continue to work the way it was always done will be left in the past.

[1] North American Society for Trenchless Technology, Good Practices Course. 2023

ABOUT THE AUTHOR:

***Pete Daniels** has 15 years in the natural gas industry and is the Trenchless Construction Community of Practice lead and Pipeline Construction SME at Kleinfelder.*

Questions about Plastic Pipe?

Do you want to know how, why and when to use high-density polyethylene (HDPE), medium-density polyethelene (MDPE), polyamides (PA-11 and PA-12), high temperature (PE-RT), and composite piping systems? All of which are being used more and more in the energy field including salt water disposal facilities. It's important to understand the different trenchless ways to install the different types of pipe as well as the various joining methods such as mechanical and fusion. And what are the latest and expected PHMSA rules?

The Plastics Pipe Institute, Inc., the major, non-profit North American trade association, has technical information, field reports plus a full staff of professional engineers to answer all your questions.

Call Randy Knapp, Ph.D., Director of Engineering, Energy Piping Systems Division **469-499-1054** or rknapp@plasticpipe.org or go to the PPI website: www.plasticpipe.org and click on Divisions then Energy Piping Systems: https://plasticpipe.org/EnergyPipingSystems.

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ENERGY PIPING SYSTEMS

Best Practices for Electrofusion on HDD Pipe

By: Frank Simini III, ISCO Industries Inc.

If you are reading this article, you already know that Horizontal Directional Drill (HDD) is a great way to install HDPE Gas Pipe with minimal surface soil disruption. HDD allows pipe to travel under streams, roads, and other environmentally sensitive areas where open trenches would be extremely damaging, costly, or downright impossible. At the same time, HDD inherently involves fluctuating temperatures, tensile load, and ground contaminants. These environmental hazards pose potential threats to electrofusion joints. Our qualified operators must have the patience and training to work around and mitigate all these threats. Even on sunny, clear, and calm days, Qualified Operators must take special care in preparing HDD pipe for electrofusion. As Natural Gas Professionals, we must identify, target, and resolve these additional challenges.

HDD Machine starting bore hole

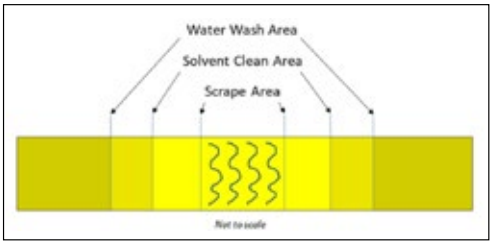
BENTONITE CONTAMINATION

When a directional drill is passing through the earth, a slurry of water and a naturally occurring clay powder, called bentonite is added to the bore. Bentonite provides lubrication, reduces heat, and helps keep the structure of the bore hole open throughout the boring and pulling process. Inevitably, pulling the pipe through the bore completely coats it in this slurry. When bentonite becomes a contaminant to a fusion joint, it acts as a barrier to the polyethylene bond and can greatly weaken the joint. Bentonite is often measured in microns and may not be visible to the naked eye. Still, even unseen bentonite can negatively affect an electrofusion joint.

It is extremely important to make sure qualified fusers are aware of potential bentonite contamination. In preparing for electrofusion, many manufacturers and utilities have adopted new procedures to minimize bentonite contamination, including three easy steps:

1. A general wash zone far outside the footprint of the fitting
2. Peeling the pipe approximately 1 inch beyond the fitting footprint
3. Using 96 percent or greater isopropyl alcohol wipes to clean the peeled area

NOTE: It is extremely important that isopropyl alcohol wipes stay within the peeled area of the pipe. Trace amounts of Bentonite may remain on the un-peeled wash zone, which then transfer into the freshly peeled fusion area.



Schematic of Cleaned Pipe Areas (Plastic Pipe Institute TR-49 2020)

GOUGES IN HDPE

After the bore hole is complete, operators change the directional drill head, and pull the HDPE back through the bore hole. After the pull is complete, we inspect the exposed HDPE for gouges and other potential damage. It is rare for a piece of pipe to come out of a bore hole looking perfect. In cases of gouging and HDD, we can pull more pipe through to see if the gouge is isolated or continuous. In most cases, any gouge less than 10 percent of the pipe wall thickness is acceptable for service. If the gouge is 10 percent or greater, we must remove that section of pipe completely. Most electrofusion manufacturer's instructions state that the fusion zone must be free of all gouges and scratches. So, what are the dangers of

gouges in the electrofusion zone? A gouge can hold contamination like small pebbles, sand, or bentonite that can contaminate the fusion. Let's assume you have a fusion zone that has a few small (well under 10 percent wall thickness) gouges, and those gouges are meticulously cleaned by the qualified person. Then the person runs alcohol wipes and a small flat head screw driver through the gouges. And after peeling the pipe there are still very clean gouges visible. Those gouges are voids that we must fill with material from somewhere. That "somewhere" becomes material from the melt pool created by the electrofusion coupling. Is there enough molten plastic created by the heat from the coupling to fill these voids? How does a person in the field measure the volume of the gouge (depth, width, length) to ensure there is enough material to make up these voids? The current answer is that most manufacturers and OQ programs do not have a process to allow for any size acceptable gouges in the fusion zone.

EF Fitting with suspected Bentonite contamination and severe gouge

PIPE RELAXATION

The pipe pulling process can put tremendous strain on the entire length of pipe. To protect against this tensile strain, a mechanical or manufactured weak link is used to protect the pipe. The weak link is designed to break before the pipe reaches a point where it could be permanently damaged. Gas companies have different procedures for pipe relaxation after a pull. Waiting overnight is common as is waiting 30 minutes per 100 feet of pipe pulled. The most important thing you can do is follow your company's Standard Operating Procedure for pipe relaxation. Not following a relaxation practice can put a great deal of strain on an electrofusion joint. Pulling pipe can result in elongation, a slight reduction in Outside Diameter (OD), and ovality. If an operator installs an electrofusion coupling before the pipe can relax there are two major potential failures. First, as the pipe tries to relax the electrofusion coupling will impede the pipe's ability to do so. This creates an incredible amount of tensile strain directly on the fusion zone, even though nothing is pulling on the pipe. Second, with the slight reduction in OD, the EF Coupling will struggle to transfer heat and achieve the proper melt penetration. It is important to remind installation crews of the proper relaxation time before tying in pulled pipe.

PIPE ALIGNMENT/ DIG BACKS

During an HDD operation the pipe generally enters and exits the ground on an angle through pre-dug pits. These intersections are where one pull ends

EF failure with suspected Bentonite contamination and severe gouge

A properly prepared EF Coupling with Clamp

another one begins. After installation, installers must dig back the pipe to lay down at the level of the installation to connect an electrofusion coupling. Depending on the depth and angle of the pipe, it may be necessary to excavate a great deal of earth around the exit point to allow the pipes to come together without stress. It is a tempting mistake to bend the pipe with shale bars or even an excavator to achieve proper alignment. When using an electrofusion alignment clamp, the pipe joint should not be under any stress. EF alignment clamps should be used as restraints only. Despite the name "alignment clamp", installers should achieve alignment by digging back enough soil and/or blocking under the pipe so the two ends come together with no stress. This can be frustrating when the pipe is at a steep angle but it is necessary for the integrity of the electrofusion joint.

CONCLUSION

When properly prepared, an HDPE electrofusion joint remains one of the strongest methods of pipe joining. In hydrostatic quick burst tests, properly prepared electrofusion joints have exceeded 800 psi, with the pipe yielding before the actual fitting. With most Natural Gas Distribution systems operating at or below 100 psi, this is just one small example of our Industry's dedication to safety and longevity. Construction sites are not controlled, laboratory environments, but with the help of the above considerations, electrofusion can help you solve your challenges in gas distribution and beyond.

NOTE: For those interested, a more thorough explanation of how bentonite negatively effects an electrofusion joint can be found in "Bentonite Contamination in Plastic Pipe Installed by HDD" by Mike Kerans Manager, Distribution Integrity Management PG&E and Richard Klopp Principal Engineer, Exponent Failure Analysis Associates.

ABOUT THE AUTHOR:

***Frank Simini III** has 15 years of combined Utility, Contractor, and Distributor experience in the Natural Gas Industry. Currently he works for ISCO Industries Inc Natural Gas Division. He is passionate about proper training and getting the next generation of Gas Men and Women ready for the future of our evolving industry.*

Delivering Tools to Avoid Pipe Damage During Installation

GTI ENERGY
solutions that transform

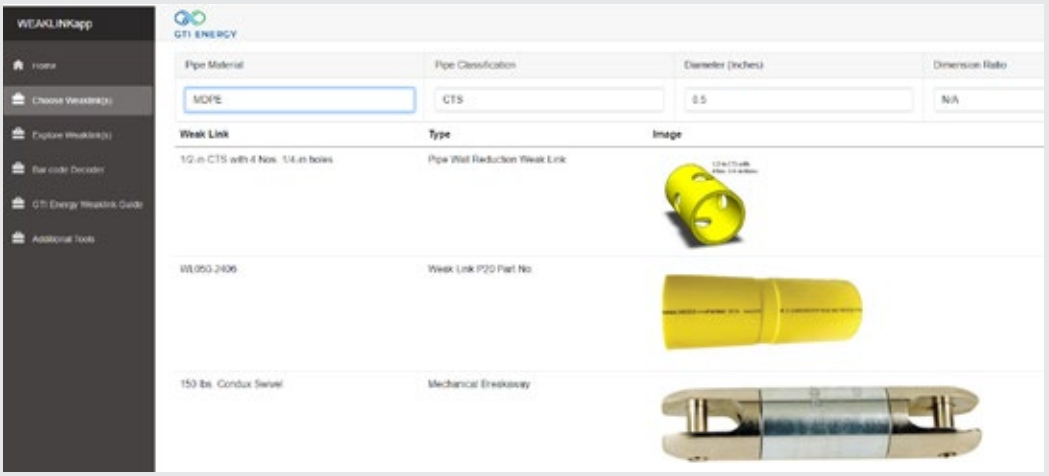
OTD
Operations Technology Development

With sponsorship from Operations Technology Development (OTD), GTI Energy researchers have developed an easy-to-use and accessible web-based tool – www.WEAKLINKapp.com – that assists industry professionals in the selection and application of weak links for trenchless installations.

The tool incorporates recommendations from the Weak Link Break-away Good Practice Guide that was developed for OTD. The guidance document is based on a survey of OTD members and contractors to evaluate the current state of the industry. They provided insight on procedures, commercially available and "homemade" weak links for the safe trenchless installation of plastic pipe, and industry best practices.

How does the WEAKLINK app work?

The WEAKLINK app user enters the pipeline characteristics into a web-based form and the output of the app will be a list of suitable weak links that can be used with the pipeline. Another option is to scan the 16-character barcode on the pipeline with a smart phone app to obtain the numbers and then pasting those pipeline numbers into the WEAKLINK app. This is identified as the "Bar Code Decoder" in the app.



For trenchless pipeline installation projects, the use of weak links is important to ensure that a plastic gas pipe's allowable tensile stress is not exceeded during the process of pulling the pipe through the ground. All weak link methods or devices should be designed to fail at or before the plastic pipe allowable tensile stress. Providing utilities with information about acceptable types of weak links and good practices will ensure that they are utilizing the appropriate method or device on the Allowable Tensile Load (ATL) for each standard size of plastic pipe or tubing. Although weak links are used to avoid pipe damage during installation, there is still concern that human error or manufacturer defect in the weak link may result in overstressing the pipe. To address this and add another layer of safety, GTI Energy is developing a load measurement device and data logging system to monitor the pull load during the pipeline installation. The device will record the tensile load on the pipe during the process and alert the gas operator of any pulling force that exceeds the ATL for the pipe.

For more information contact:
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MFL Robotic Inspection of a Water Heating 24-inch Pipeline

By: Rod Lee, Intero Integrity Services

In Seoul, South Korea, the asset owner operates a network of water heating pipes constructed in the early 1990s that transports steam to the surrounding area. This robotic inline inspection was the first comprehensive assessment of this segment. Winter temperatures in South Korea can be harsh, commonly dipping down to -12°C, thus the integrity of this pipe network is critical for both commercial and residential end users to receive much-needed heating during cold winter months.

The pipe segment of interest was 24 inches in diameter with a nominal wall thickness of 8.7 mm, typically transports steam at 120°C, and has a Maximum Allowable Operating Pressure (MAOP) of 16 bar.

THE CHALLENGE

After internal discussions, the network operator decided to perform a comprehensive inline inspection on a section of the pipeline network to understand integrity conditions and identify potential threats that might jeopardize its safe operation.
Other assessment methods such as Direct Current Voltage Gradient (DCVG) surveys, hydro-testing, or direct examination, did not meet their data requirements or would have been cost-prohibitive.

Operators use DCVG surveys to detect stray currents in surrounding soil propagated through compromised pipeline coating (e.g. cracks, disbondment, general degradation). This method effectively screens coating degradation but does not provide substantial information regarding carbon steel pipeline integrity. Best practices involve excavating detected stray current areas and directly assessing the pipeline and coating.

Hydro-testing can indicate immediate pipeline integrity concerns. The process involves isolating the pipeline segment and pumping in water, then the testing company increases and monitors the water pressure above the pipeline MAOP for several hours. If the pressure remains constant for a prescribed duration, the pipeline passes the hydro test. However, if the pipeline pressure descends below the threshold, the pipeline fails the hydro test. This process subjects the pipe to a stress level that exceeds the typical operating condition of the pipe.

Direct examination of pipes in heavily urban and built-up environments typically involves excavating through concrete and/or asphalt roads. This can be complicated by permitting/road moratoriums, active 24-hour traffic control, and finally, remediation of the urban infrastructure. As a result, the costs and environmental impact of evaluating the pipes with direct examination are notably higher than inline inspection. With inline inspection, a limited number of excavations allow the inspection of long stretches of pipe, significantly reducing the associated challenges.

The operator ultimately decided that DCVG surveys and hydro-testing did not provide adequate integrity information to assess the potential impact of high-temperature steam on the pipes. The possible option to excavate

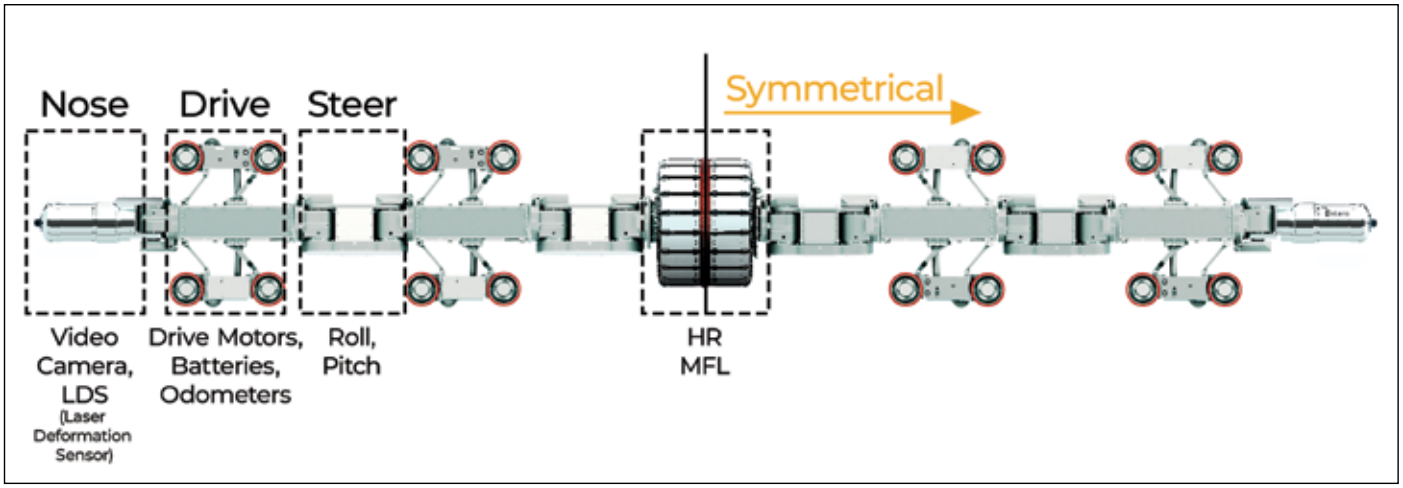


Figure 1: The anatomy of a Pipe Explorer robot

several thousand feet of pipe for direct examination could yield adequate data, but this method was not economically feasible and would have been burdensome to the environment.

In-Line-Inspection (ILI) allows for collecting comprehensive integrity data to monitor potential integrity effects imposed by steam and water. The construction features of this pipe were unsuitable for free-swimming or tethered ILI solutions, as the 24-inch pipe segment includes mitered and short radius elbows/bends and multiple elevation changes. Intero's Pipe Explorer robotic ILI crawler fit the operational constraints as the robots are wireless and therefore not subject to cumulative bend angle limitations; they are highly articulate and can navigate short radius elbows and up to 90° miter bends which can prove challenging or impossible for most smart pigs; and they are self-propelled which eliminates data degrading speed excursions. Additionally, no costly permanent modifications were required that would have been necessary for free swimming ILI.

THE TECHNOLOGY: PIPE EXPLORER INLINE INSPECTION ROBOT

Intero's Magnetic Flux Leakage (MFL) inspection division (formerly Pipetel) has operated the fleet of Pipe Explorer robotic crawlers since 2011. These robots operate tetherlessly, are self-propelled and bidirectional, and can launch and receive from a single size-on-size hot tap fitting.

Pipe Explorer robots retain similar anatomy across the fleet and can inspect pipelines from 6 through 36 inches in diameter. The center of the robot carries the high-resolution MFL sensors. This sensor body collapses and de-magnetizes to negotiate challenging bends and mechanical features, including 90° miter bends and unbarred tees. The noses, located on the front and rear of the robot, transmit real-time video to the operator and capture deformation data with the Laser Deformation System (LDS). The drive modules expand and contract to push against the pipe wall to create traction for the robot to drive upstream or downstream in the pipe. The steer modules also actively roll and pitch to accommodate challenging bend groups and mechanical features.

Rechargeable batteries power the Pipe Explorer robots, which can inspect to a range of 475 to 600 meters before returning to the launch location. When inspecting from point-to-point (for example, hot-tap fitting to hot-tap fitting), the robot inspection range is increased to 800 meters.

The robots use wireless technology for data transmission and are self-propelled, allowing them to methodically navigate almost any bend angles and mechanical features while inspecting pipelines. The sampling frequency of the Pipe Explorer results in a data measurement every 2 mm.

USE CASES AND LIMITATIONS OF PIPE EXPLORER

The robotic Pipe Explorer makes inline inspection practical in established urban environments where pipeline conditions are most challenging. For example, urban

> *"Robots operate tetherlessly, are self-propelled and bidirectional."*

pipelines typically include various bend groups to avoid other underground infrastructure.

The robots wirelessly transmit a live video stream of the pipeline during the inspection, allowing the discovery of unknown pipeline features.

Pipe Explorer robots can enter and exit the pipe from a single location and, for gas pipes up to 52 bar, under live pressure and flow conditions. This allows for minimally invasive inspections of critical infrastructure.

Although very capable, these robots have some limitations, including inspection range. The inspection distances are battery and wireless communication limited. This is mitigated through inline charging (ILC) technology available for Pipe Explorer, which can be used if necessary. To use ILC additional small excavations and 2-inch fitting installations are required to extend the inspection range.

The robots are also not liquid-proof, meaning liquid pipes must be displaced of the product and dried before inspection, as was necessary for this project.

Pipe Explorer robots house an axial MFL sensor which must saturate the pipe wall to achieve desired sizing specifications (general corrosion at ±10% with 80% confidence). The maximum wall thickness varies by diameter, with NPS20 through NPS36 capable of saturating a wall thickness up to 19.1mm.

Lastly, the robots are self-propelled at a speed of 0.1m/s, allowing for ideal data collection but extending run time, particularly in longer projects.

PROJECT PREPARATION

The pipeline operator decided to inspect a continuous 220 meters of 24-inch diameter pipe that was considered a critical network segment. The pipe segment was first isolated with existing valves, and the water was drained. Next, a foam pig (see Figure 2) was run through the segment to remove residual liquid. This was completed using a foam pig-rated temporary launcher and a receiver installed at both ends of the pipe segment. Compressed air was used to propel the foam pig through the pipe.

The robotic inline inspection only required one excavation for entry and exit as shown in Figure 3. This allowed for the immediate remediation of the second excavation used for the foam pig passage. Before the inspection, local authorities approved a permit for the excavations as the pipeline traversed the core of a major city.

Figure 2: Foam pigs used for displacing liquid

THE PROJECT

Intero completed this Pipe Explorer inspection for the pipeline operator in the summer of 2021. The operator chose to remove a section of pipe to facilitate the alignment of the Pipe Explorer with the pipe for entry and exit. Figure 4 shows the entry and exit site with Pipe Explorer aligned with the pipe's opening. Figure 5 is a schematic illustrating such a setup.

Once the pipeline operator removed the pipe cap from the opening, the lifting crew aligned the robot and tray with the pipe so the robot could drive into the pipe. Once inside, the robot drove through the initial pipe segment, including elbows and a vertical segment, before reaching the desired start of the inspection. The MFL sensor was then deployed and magnetized to collect MFL, LDS, and video data. An Intero operator controlled the Pipe Explorer robot with real-time access to the robot systems, including data acquisition, odometry, robot health, battery life, and a live video stream. Once the robot reached the inspection limit (based on odometry and feature identification), the MFL sensor was rotated to collect an optional redundant data set. Finally, the Pipe Explorer robot returned to the insertion location and was retrieved from the opening.

REPORTING

Intero submitted the MFL and LDS data coverage reports to the pipeline operator within several hours of completing the inspection. Data sets were 100 percent and 98 percent for MFL and LDS through the

Figure 3: Inspection schematic for a 220-meter robotic inspection

220 meters of pipe. Intero subsequently provided preliminary and final reports depicting the integrity conditions of this pipe. Metal loss indications and dents with varying severity were identified, and the pipeline geometry and installations were visually confirmed and correlated to existing records for the pipeline.

With the information gathered, the pipeline operator can plan and structure a repair program by prioritizing the most severe findings. Following this first inspection, the pipeline operator can also conduct future assessments on the rest of the water heating pipe network according to its network of pipes risk profile.

ABOUT THE AUTHOR:

Intero

Rod Lee *is the Global Business Development Manager for MFL robotics at Intero Integrity Services. He is a licensed professional engineer of Ontario. He lives in Toronto, Canada.*

Figure 4: The Pipe Explorer being aligned to the 24-inch pipe

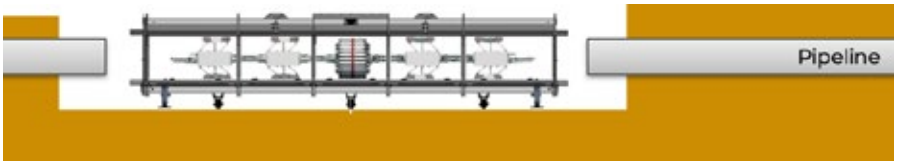


Figure 5: The Pipe Explorer being aligned to the 24-inch pipe

4 Proven Steps to Elevate Your Field Operations Performance and Culture

By: Dan Lorenz, P.E., Joe Knows Energy

There is a famous Peter Drucker quote that says that "culture eats strategy for breakfast". This implies that the culture of your company always determines success - regardless of how effective your strategy might be. He points out the importance of the human factor in any company.

The workplace is changing. It's been a whirlwind since the pandemic. We've been tackling remote work, generational differences, the "Great Resignation", DEI initiatives, and more. As a leader, how do you decide where to start and where to focus to build better teams and get the performance you want?

The truth is, we can't change the market, fix the economy, or control when our employees choose to retire. What we can do is create a culture that can weather outside changes, build supportive teams that nurture high-performers, and select employees that help elevate our culture.

When we build workplace cultures that are good for employees, everyone benefits. Employees are happier and more fulfilled. Leaders see less turnover and better performance against key indicators.

Through a combination of our own culture journey and the staffing services we provide at Joe Knows Energy, we've defined key steps that have been proven to elevate our own culture and our clients' cultures.

Step 1: Define Your Desired Workplace Culture with an Emphasis on High Performance People First

What is culture? Webster defines it as "the set of shared attitudes, values, goals and practices that characterize an institution or organization."

Whether you build a culture intentionally or unintentionally, you have a workplace culture today. The first step to improving it is deciding how healthy that culture is today. Start with a simple exercise of asking questions. Ask yourself the following questions:

- Do you and your team members feel free to share your thoughts and ideas?
- Do your team members feel supported and encouraged?
- Is everyone aligned with a mutual vision, set of values, and strategy?
- Do you rarely hear excuses for performance issues or missed goals?
- Do your leaders express gratitude and appreciation often?
- Does your team embrace change rather than resist it?
- Do your leaders show vulnerability, ask for help, and accept feedback?

The more you can answer "yes:" to these questions, the healthier your current workplace culture is. A healthy workplace culture is often one where collaboration and shared ideas, open and effective communication, trust, respect, and cross-team support are consistent.

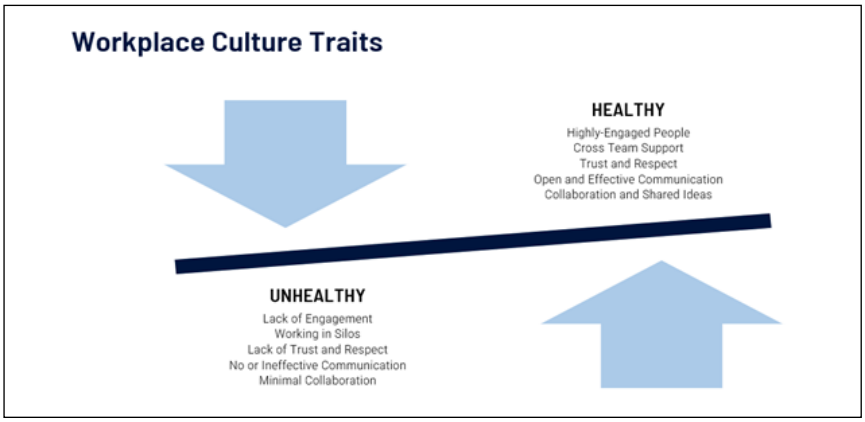
If your culture isn't there yet, define what you want your culture to be including the desired (high performance) results. Commit to aligning with team members to create a shared vision of where you want to take your culture. Group workshops, one-on-one discussions, and best practice research go a long way in this process.

Step 2: Implement Your Culture Vision with a Collaborative Model

In many situations, the human resource department leads the charge to define culture and implement culture change initiatives. Organizations often start with culture surveys, then conduct leadership workshops to define a vision, and roll out the new culture plan to the staff.

The survey employees complete doesn't necessarily align with the end vision. This can lead to culture plans that don't produce results and make employees feel unheard. All the while, the underlying issues that caused culture challenges aren't always addressed.

For culture improvement plans to work, leaders at all levels should be involved



in the process. At Joe Knows Energy, we've implemented a model based on IG Compass' proven research. The model starts with leaders at all levels in collaboration with executives and human resources working together to create a shared vision, purpose, and values. To do this well, leaders must connect with team members and each other to align these shared goals.

Then, the changes and improvements can be piloted in real environments. As pilots are happening, real-time feedback and input helps to improve the result. When leaders go first, they can better demonstrate vulnerability and connect in a more meaningful way to employees at all levels.

As pilots are completed, practical impact can be evaluated and feedback reviewed. Leaders can then embrace rapid learning and implement strategies more broadly, candidly discussing challenges, constraints, results, and adjustments along the way.

Step 3: Finding and Nurturing Internal Culture Leaders to Drive Change

A leader is someone who can take people where they want to go but wouldn't go without you.

Frontline culture leaders are key to implementing any culture change. They reinforce behaviors in the field and help to attract, develop, and retain talent that is aligned to organizational goals.

You can identify internal personnel or recruit external personnel that are a fit for your culture goals. To begin, you need to identify what makes your best frontline culture leaders unique. Ask yourself the following:

- Which team members are potential culture leaders that exemplify our culture?
- What experience or skills do these people have?
- What makes these people stand out?
- What behaviors, characteristics, and values do these people demonstrate?

When you can identify what makes your prospective frontline culture leaders unique, you can begin to define who would be a good fit moving forward and create programs, processes, and screening to identify culture leaders in the future.

Step 4: Modeling a High-Performance Program to Create Your Own

At Joe Knows Energy, we've spent a decade developing our High-Performance Program that helps us recruit, screen, and retain high performers. Our program is designed to help us identify the right people and place them in roles where they can exceed expectations – the right role for their skill, personality, values, and goals.

There are four major elements that make our program effective in elevating culture – performance-driven processes and tools, deep understanding of teams and individuals, consistent strategic reviews, and frontline leader ratios to support hands-on guidance.

1. Performance-Driven Processes and Tools

Culture development is a continual process. As we work to identify culture leaders and recruit new talent into the organization, having the right processes and tools is a critical factor in long-term improvement.

> *"Culture of your company always determines success."*

As you create your own processes, it's important to create simplified tools for each step of the process to ensure your managers can focus on what matters most. Some considerations include:

- Benchmarking how your top performers think and what makes them unique,
- Ensuring a diverse audience and broad reach beyond friends and family recruiting,
- Testing and optimizing the process as you go to ensure it works consistently and under pressure,
- Listening to feedback from managers and hiring teams to handle gaps or issues in the process,
- Scaling up the process as needed to ensure you can handle capacity as needed, and
- Committing to continual improvement process to make the program better over time.

2. Deep Understanding of Teams and Individuals

Your team and culture are unique. Once you've defined what makes it unique, you can seek to identify people that are aligned with that culture.

When you're benchmarking your frontline culture leaders and top-performing employees, you can start to understand what makes them unique. Identify what is different about how they think and behave, what skills they have, and what preferences they have around workplace culture.

Define what it is you're looking for in any role, promotion, or recruiting initiative. Focus on leveraging what you've learned from benchmarking to make better decisions. As you define your criteria for a role, consider how different factors might affect who is the best fit.

"While culture change is not easy, it is worth it!"

- What is unique about your team and culture?
- What is the scope of work required of an individual in this position?
- What support, training, or resources are provided? Is this position isolated or surrounded by supportive team members?
- How do you measure success for this role or this team? What would failure be?

When you have clarity around what performance looks like and what you want your culture to be, it becomes easier to spot the top performers who can improve your overall culture and performance.

3. Consistent Strategic Reviews

Make feedback a consistent part of your improvement process to engage leaders in various roles or across stakeholder organizations.

Here at Joe Knows Energy, we conduct regular strategic reviews with clients. In your organization, you may want to schedule regular strategic review meetings with hiring managers or department leaders.

Encourage feedback across the organization. Great performance comes from listening to frontline leaders' opinions, about what actions are needed to advance the culture. This empowers the leaders to take action toward positive change, leading others on the team to contribute their heads and hearts to the vision and mission of the team.

This process encourages collaborating on best practices, solutions, and pilot performance. Strategic reviews are an opportunity to identify what is working in isolation with pilots and sharing it with others with similar challenges, leading to a broader culture change.

Culture change is hard and occurs over a long period of time. There will be many challenges that the team needs to be committed to working through over time. During strategic review conversations, establish and reestablish the commitment to working together over time to reach long-term goals.

The adage, "if it is not broken, don't fix it" is not appropriate in a fast-changing, competitive environment. Strategic review processes are designed to proactively anticipate needed changes and lead the team (and program) in the best direction before the process is broken.

4. Frontline Culture Leaders Ratios Support Hands-On Guidance

When an organization is truly committed to culture change, funding the resources and leadership to make it happen is important.

Culture shifts don't occur without the frontline culture leaders to support and champion the shift in the field. Ideally, for every ten employees, there should be one leader capable of coaching, guiding, and supporting those employees.

This creates an infrastructure where leaders are consistently driving improved performance by:

- Modeling the organization's values daily, under pressure, in context of the daily grind, provides the encouragement that the team needs to reach its potential.
- Being involved with Interviews, management, and the complete employment lifecycle to provide a more effective leadership relationship and the consistency needed to overcome the challenges that may occur.
- Maintaining in-depth knowledge of the organization, teams, and projects to act as an interpreter and connector so that all parties understand and appreciate the challenges that everyone is faced with.
- Coaching and managing soft skills, technical skills, and compliance allows the individual and the team to achieve their potential and reach their individual and collective goals.

It's Not Easy – It Is Worth It!

Culture change can be a long and difficult process. Start with a proven plan and apply it to your company by leveraging smaller pilots, focusing on improving your culture one team at a time. Don't forget, your frontline culture leaders are vital to your success in this initiative.

While culture change is not easy, it is worth it. Many organizations see improvement in safety, quality, retention, and reduction of costs - **all because we remember the importance of the human factors**.

ABOUT THE AUTHOR:

***Dan Lorenz P.E.**, Founder and President of Joe Knows Energy, has over 35 years leading construction, training, and inspection services companies. He is passionate about elevating safety and quality cultures with frontline professionals. Joe Knows Energy provides staffing, recruiting, and consulting services to the utility and energy industries. To find out more, visit their website: www.joeknowsenergy.com or contact Dan at 614-989-2228 or dan@joeknowsenergy.com.*

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Discover Advanced Mobile Leak Detection (AMLD)

Residential Methane Detectors

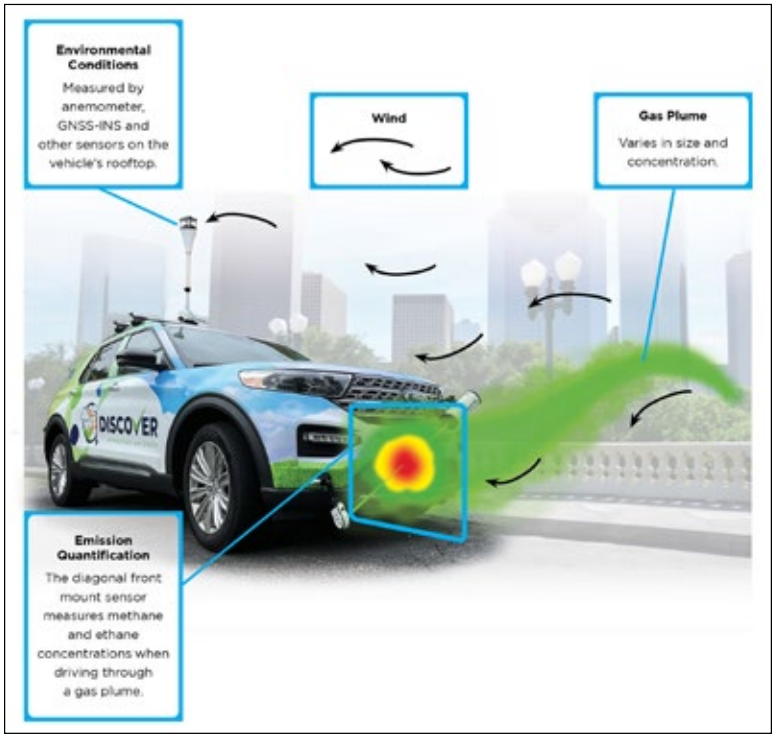
By: Paul Wehnert, Heath Consultants

Pressure continues throughout the World against fossil fuels; in the case of natural gas, it is the fear of methane emissions, a major component in natural gas and a greenhouse gas (GHG) as a contributor to climate change. Natural gas companies are under constant scrutiny to reduce methane emissions from the wellhead through gas gathering, processing, transmission, distribution and up through and including the customer burner tip. The issue is two-fold, as methane emissions through leaks and other operational processes create concerns for public safety in addition to lost and unaccounted-for revenue losses.

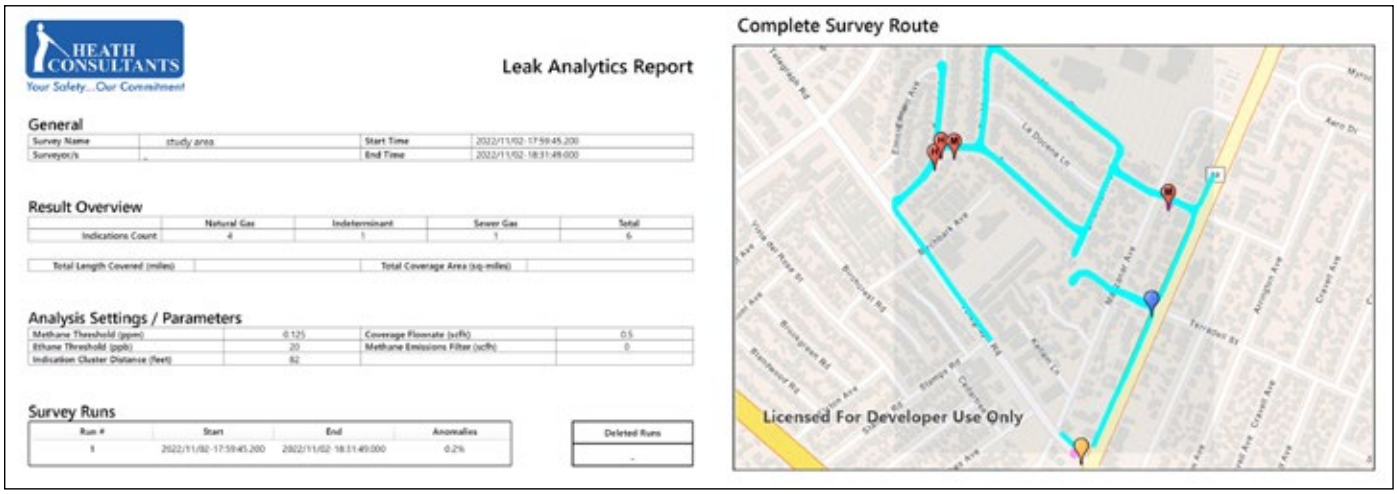
Gas companies have always conducted natural gas leak detection surveys primarily using portable technologies with sensitivity requirements in the parts per million (ppm) detection range and carried by the person as they walk the pipeline assets. Surveys are generally done on a time requirement, whether it be annual, 3-year or a 5-year inspection, based on State and Federal regulations. Natural gas is also odorized with a distinct odor. In the event of a gas release, the public can smell it and notify the appropriate authorities. Thus, between scheduled compliance leakage surveys and customer leak and odor calls has been a proven approach to reducing leaks within a pipeline network.

New requirements in Federal Regulations – Pipes Act has now required Advanced Leak Detection Technologies, which generally can detect leaks in the parts per billion (ppb) range and are much more sensitive than previous technology. These systems, including the Discover Advanced Mobile Leak Detection (AMLD), allow a Utility to patrol their pipeline assets with a street or offroad vehicle and provide a much larger coverage area than conventional walking or legacy mobile

Discover AMLD



Gas plume detection



Leak survey documentation

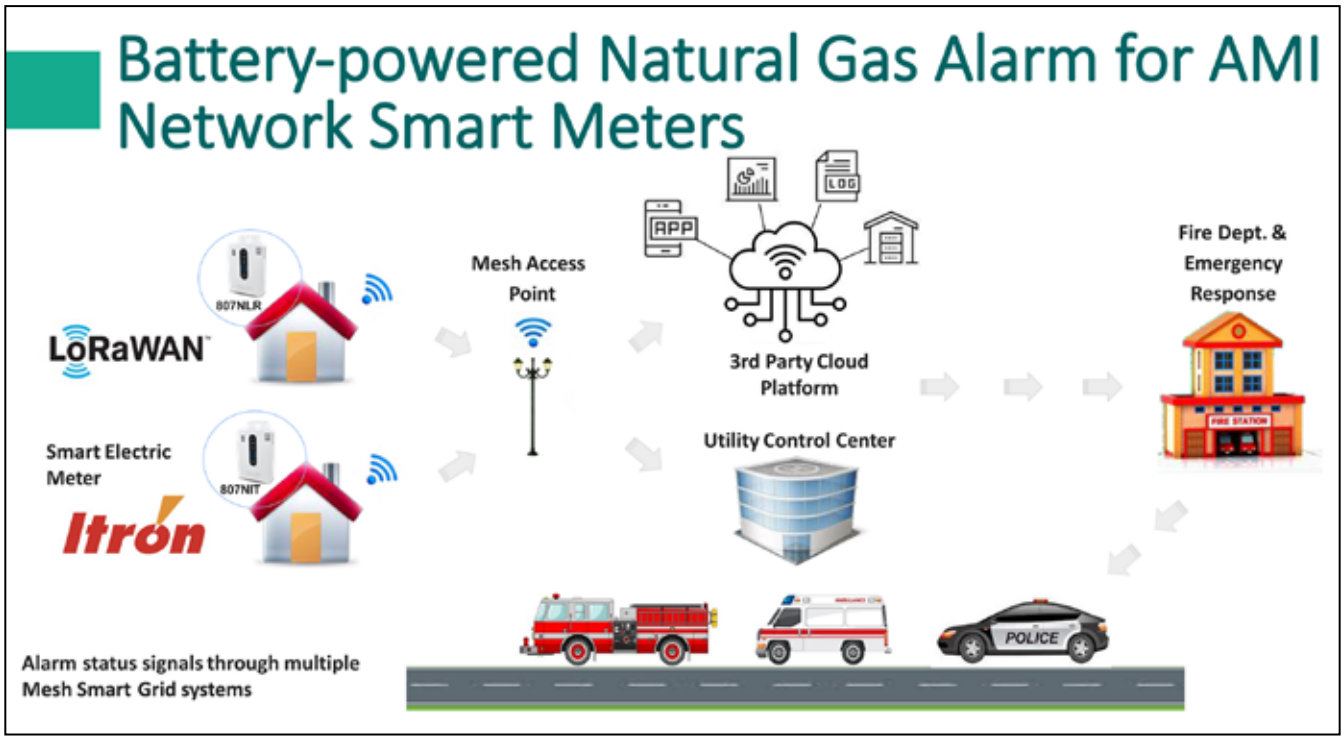
patrols. Sophisticated software with Geographical Information System (GIS) now provides a utility with coverage maps, heat maps, indications, etc. and can be performed at much faster speeds allowing more frequent inspection as part of Distribution and Transmission Integrity Management (DIMP/TIMP) programs. This system can also differentiate pipeline gas from naturally occurring methane such as marsh, swamp, landfill, and sewer gas by also detecting ethane found in pipeline gas – thermogenic gas but not in short-term decomposition gas.

The technology in the Discover AMLD operates with Tunable Diode Laser Adsorption Spectroscopy (TDLAS) and deploys two (2) lasers mounted on the front of a vehicle for both methane and ethane. This allows for instantaneous response and analytics done with cloud computing for analysis and record keeping. Under integrity management programs, utilities need to understand the risk associated with their assets by pipe age, pipe material, pipe construction, pipe pressure, and pipe location and allows a process to survey those assets more frequently. This also happens with activities outside of a utility's control, such as construction activities, open excavation and directional boring, and environmental effects like earthquakes, floods, fires, heavy snow, and hurricanes on pipeline assets. Legacy assets are being replaced at a tremendous rate as part of aging infrastructure replacement programs for public safety and the prevention of methane emissions to the atmosphere.

Residential Methane Detectors are another vital opportunity to be installed indoors at residences and commercial buildings to detect leaks on inside piping and gas migration into a structure from outside leaks. The detector will alarm if the indoor atmosphere is at 10% LEL. As mentioned previously, not all the public will call when they smell the odorant added to natural gas as some have issues with their sense of smell or believe someone else will make the call, then come to find that nobody makes the call. These detectors are an added layer of protection. If a homeowner does or doesn't smell the leak, the alarm will sound and let them know of the potential danger. Another added feature is the ability have the devices connected to an automated meter infrastructure (AMI), the communication protocol that currently reads gas, water, and electric meters. If the alarm sounds, the customer is notified immediately, the gas utility receives a signal directly and can dispatch a service technician to the property for further investigation.

Most catastrophic leaks are caused by third-party damages by contractors/

Survey route (turquoise), coverage area (green) leak indications (purple)



Communication depiction of gas alarm to the gas utility

excavators and the general public digging around natural gas utilities without calling the National 811 number to have utilities come out and mark their assets before excavation. Calling 811 is extremely important and the law which is designed to eliminate potential loss of life and property. The fact is, we can now patrol piping networks with more frequency using the Discover AMLD and have connected natural gas leak detectors inside residential and commercial properties to provide several more layers of protection for public safety and the reduction of natural gas/methane as a greenhouse gas (GHG) emission.

Residential methane detector installed in basement at gas meter location

ABOUT THE AUTHOR:

***Paul Wehnert** is the Executive Vice President/Chief Marketing Officer at Heath Consultants with more than 40 years of natural gas industry experience. He has been instrumental in the development of technical advances in the fields of leak detection, odorization and underground locating technologies. Paul frequently presents papers and provides instruction for private, municipal and investor-owned utilities, numerous government and regulatory agencies and state and regional gas associations around the World. He represents Heath as a member of state, regional, national and world gas associations and committees.*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8. Constructability Reviews
9. Value Engineering

Operations

1. Reviews & Audits
2, Leak detection practices & equipment
3. Restoration/Backfill/Flowable Fill expertise
4. Project Management
5. Equipment/Process evaluations
6. Municipal Coordination
7. Manpower Assessment
8. Safety
9. Negotiations, Labor Agreements and Work Rules

R&D

1. Project Management
2. Technology Transfer/ Deployment/Implementation
3. Technical reviews & input

Construction

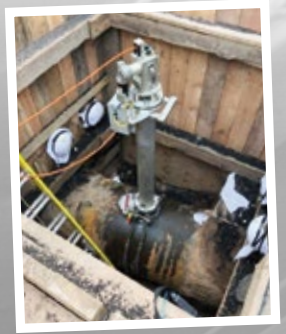
1. Project Management
2. Inspection
3. Means & methods
4. Contract reviews

Training

1. Corrosion
2. Trenchless
3. Leak survey, investigation and pinpointing
4. Emergingtechnologies

Trenchless Construction

1. Project Management & inspection
2. Applications and solutions
3. HDD design
4. Risk management
5. Vacuum equipment
6. Cured-in-place liner and pipe bursting expertise



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