



TEXAS & OKLAHOMA

TRENCHLESS REPORT 2019

OFFICIAL PUBLICATION OF THE NASTT SOUTH CENTRAL CHAPTER (NASTT-SC)



- Pipe Pullback Design**
- Pipe Surgeons Houston**
- Guided Auger Boring at DFW**
- HDD Buoyancy Control**

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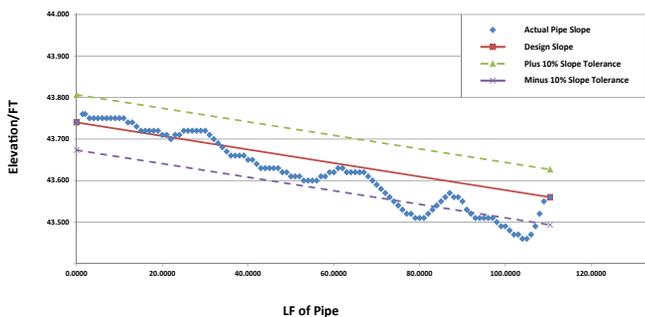
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HDD – The Importance of Pullback Support Design & Planning

One of the most overlooked aspects of Horizontal Directional Drilling (HDD) design is product pipe pullback support. Above ground pipe support design is crucial to the goal of ensuring safe, efficient and cost-effective HDD installations.



Pipe Surgeons: Houston Contractor Pulls off Complex Sewer Upsize

One of the most complex challenging pipe bursting jobs ever encountered involved a 370-foot run of 10-inch sewer line being upsized to 12-inch HDPE. The pipe was 10 feet below 125 year old oak trees valued at millions of dollars apiece.



Guided Auger Boring Supports DFW Runway Upgrades

The Dallas-Fort Worth (DFW) International Airport is in the midst of a comprehensive runway improvement program. Upgrades to runway electrical systems are critical enhancements being installed by guided auger boring to minimize runway closures & disruptions to airport operations.



Buoyancy Control for HDD Installations

Long used to reduce pull load friction, pipe buoyancy control effectively reduces tensile loads on pipe during installation, and decreases pipe stress and coating abrasion. Buoyancy control methods, implementation, challenges and risks are explored in this article using four project examples.

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MESSAGE FROM THE NASTT SOUTH CENTRAL CHAIR

Alan Goodman, NASTT South Central Chair

Welcome back to the 2nd publication of the *Texas and Oklahoma Trenchless Report*. Having been established just three years ago, the South-Central Chapter of the North American Society for Trenchless Technology (NASTT) is proud to present this 2nd publication as a result of our growth and the impressive level of support of professionals within our industry.

The South-Central regional chapter of NASTT represents Texas and Oklahoma, two states comprising a geographic area experiencing significant growth in population. As population grows, so does the need to expand, upgrade and replace existing infrastructure. Now more than ever, the benefits of trenchless technologies are critical to addressing our infrastructure challenges. The *Texas & Oklahoma Trenchless Report* is focused on providing a better understanding of trenchless methods and best practices on a regional level.

The South-Central chapter (NASTT-SC) was formed in January of 2016, and has since hosted 3 chapter events in the summers of 2016 and 2017 at The University

of Texas at Arlington and September of 2018 at Oklahoma State University. The first 2 events at UTA brought in roughly 150 attendees that ranged from utility owners to engineering firms to municipalities. At these events, attendees learned about the trenchless projects that were taking place in their local areas and enjoyed the professional networking opportunity to learn from their peers. The board decided that we would like to reach out to a new location for our 3rd annual event and OSU was chosen in an effort to bring NASTT to the state of Oklahoma. I continue to remind myself that our outreach is what will grow this industry and trenchless market. Remember, we can only expect what we put in. Most importantly, I am proud to share that both UTA & OSU are two of the largest and strongest student chapters within NASTT. The South Central Chapter will continue to support the student members through scholarships, education, and future employment within our industry.

At NASTT's 2019 No-Dig Show Chicago in March, the board decided to support 3 young professionals in our industry. A

We truly appreciate your continued support.

total of 3 student scholarships at \$2500 each will be awarded at the 4th Annual Chapter Conference on May 21st, 2019 at UTA. For more information about this event see page 13 for registration details.

I challenge each of you reading this publication to consider joining the South-Central Chapter of NASTT and get involved with our organization. We hope you find this publication to be a valuable resource for all things trenchless and we truly appreciate your continued support.

Sincerely,

Alan Goodman

Alan Goodman
NASTT South Central Chair



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MESSAGE FROM THE NASTT CHAIR

Craig Vandaele, NASTT Chair

It is the grass roots effort of our Regional Chapters that is the foundation of our Society. Our volunteers are the reason for our growth and success. Thank you for being a part of our organization and dedicating your careers to the trenchless industry.

We recently wrapped up NASTT's 2019 No-Dig Show in Chicago and by all accounts it was a resounding success. We hosted a record breaking 200+ exhibitors and over 2,200 attendees.

We're already working on next year's show to be held in Denver. The call for abstracts is currently open until June 30. We'd love for you to submit an abstract and join us as a presenter in Denver in 2020. Visit nastt.org/no-dig-show for details.

NASTT exists because of the dedication and support of our volunteers and our 11 regional chapters. The South Central Chapter Members that serve on our No-Dig Show Program Committee are an important part of our success. Thank you to these committee members that ensure that the technical presentations are up to the standards we are known for: Mohammad Najafi, Justin Taylor and Jim Williams. I'd also

Thank you again for your support of our society and the trenchless technology industry. Hello South Central Chapter Members

like to extend a special thank you to Dr. Mohammad Najafi who also serves as a Track Leader. Track Leaders are Program Committee members that have the added responsibility of managing a track of the technical program and working with the authors and presenters to facilitate excellent presentations.

I would like to congratulate South Central Chapter Member, Alan Goodman of HammerHead Trenchless, for his appointment as Vice Chair of the NASTT Board of Directors. Alan is a true trenchless champion and his leadership helps direct the affairs of the Society as well as helps grow our industry. Thank you Alan!

The North American Society for Trenchless Technology is a society for trenchless professionals. Our goal is to represent our industry and provide valuable initiatives. To do that, we need

the involvement and feedback from our members. We are always seeking volunteers for our various committees and programs. If you are interested in more information, please visit our website at nastt.org/membership/volunteer. There you can view the committees and learn more about the ways to stay involved with the trenchless community and to have your voice heard. Please consider becoming a volunteer – we would love to tap into your expertise.

Thank you again for your support of our society and the trenchless technology industry. I hope to see you in Denver next year!

Craig Vandaele

NASTT Chair





MEMBERSHIP IN NASTT

Carolyn Hook, NASTT Membership Outreach & Database Manager

MEMBERS TALK NASTT MEMBERSHIP

As the Membership Outreach and Database Manager at the North American Society for Trenchless Technology (NASTT), it's my job to be able to speak about the value of NASTT membership and all it offers beyond professional credibility and information. NASTT is a community of peers where members are connected to go-to people in the trenchless industry – innovators, experts and a network of students and future trenchless professionals.

At every stage of their career, NASTT members have access to a comprehensive set of tools ensuring success.

- **Engage in learning.** NASTT member-only pricing for top-notch training courses, conferences and webinars.
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- **Propel your career.** Career resources, including NASTT's Job Board.
- **Empower your position.** NASTT's No-Dig Show - North America's premier Trenchless Technology Conference and Trade Show.
- **Connect locally.** Regional educational and networking events.
- **Find answers at your fingertips.** Subscriptions to NASTT's *Trenchless Today*, NASTT's *Regional Chapter magazines*, *ISTT's Trenchless International* and *Trenchless Technology*.

NASTT is the largest community of trenchless professionals in USA and Canada committed to promoting better

and more responsible ways to manage underground infrastructure and advance trenchless technology for the benefit of the public and the natural environment.

That's what I would say. But what about NASTT members, do they agree? It's also my job to know what NASTT members think about membership. So, I asked a few to share their insights. Here's what I found out.

NASTT Transforms Careers

"Having come from an entirely different industry focusing on natural gas, the common link of construction bonds the two industries closely together. Membership has made me a well-known nationally recognized expert in the use of trenchless and its applications in two industries. When I do not know the answer, I can call on an established network of key contacts and access a library of technical papers. Membership allows me to maintain a current and state-of-the-art awareness of trenchless methods and potential improvement areas that I address through my R&D activities." – *George Ragula, Distribution Technology Manager, PSE&G*

NASTT Provides Leverage for Corporations, Municipalities, Educational Institutions and More

"NASTT is far and away the leading educator and networking pool in the trenchless industry. If your company plays a part in the trenchless industry, you will benefit from NASTT membership much more than you realize." – *Joe Lane, Vice President, International Operations, Infrastructure, Aegion Corporation*

"We advertise that our staff are



members of NASTT for RFPs and on Trenchless resumes." – *David Crowder, C.E.T., C.D., Senior Associate, Trenchless Practice Leader, R.V. Anderson Associates Limited*

"I get to network and share ideas with other like-minded professionals. I've learned about new technologies that make us work more efficiently." – *Tayo Olatunji, PE, PMP, CCM, Supervisor Construction Projects, DC Water*

"The bottom line is that active membership benefits me professionally and, in turn, my company can provide unique and cost-effective solutions to challenging projects." – *George Ragula*

Regional Chapters Bring NASTT to Your Backyard

"The quality and dedication of local volunteers makes working in the industry much easier, more fun and extremely fulfilling." – *Joe Lane*

"Regional chapters make it easy to meet locally with engineering consultants and municipal staff who share the same passion for trenchless technology, learn new ideas and discuss other trenchless topics."

– *David Crowder*

"Seeing the impact that trenchless technology has on our communities and the country makes chapter participation worthwhile." – *Alan Goodman, Strategic Accounts Sales Manager, HammerHead Trenchless Equipment*

What about you? How has NASTT membership made a difference in your career? Email me at chook@nastt.org and let me know. You Belong in NASTT!

NASTT SOUTH CENTRAL REGIONAL CHAPTER

ELECTED OFFICERS



**ALAN GOODMAN -
CHAIR**

agoodman@HHTrenchless.com

Alan Goodman has more than nineteen years of experience in the underground construction industry. Alan began his career in the auger boring industry as a sales representative and is currently employed with HammerHead Trenchless as Strategic Account Sales Manager in the United States and Canada. After learning Japanese in high school, Alan studied abroad in Japan and served as an Ambassador for the Rotary International exchange program. For several years at HammerHead Trenchless he had the opportunity to manage the Asia/Australia business and utilize his Japanese. Alan completed his education with a B.A. in International Business from the Stephen F. Austin State University in East Texas. During his tenure at HammerHead Trenchless, he has worked closely with municipalities, engineering firms, and contractors around the world providing customer training, technical support, pre-project planning, project specifications, and installations for pipe ramming, pipe bursting, cured-in-place pipe (CIPP) and other trenchless projects. Alan currently serves on NASTT's board as well as the Program Committee. He is also Chair of NASTT's (North American Society for Trenchless Technology) South Central chapter which includes Oklahoma & Texas.

Alan is also an active member of the following industry associations: DCA (Distribution Contractors Association), AGA (American Gas Association), PLCA (Pipe Line Contractors Association) and PLCAC (Pipe Line Contractors Association of Canada), NUCA (National Utility Contractor's Association).



**JONGHOON "JOHN" KIM,
PH.D. - VICE CHAIR**

jongkim@okstate.edu

Dr. Kim is currently working in the Department of Construction Engineering Technology at Oklahoma State University (OSU) as an Assistant Professor. He has a B.S. in Civil Engineering from Colorado State University, a M.S. in Civil Engineering from the University of Louisville, KY and he received a Ph.D. in Civil

Engineering with emphasis on Construction Engineering at Arizona State University. He has over ten years of professional industry experiences in construction and heavy/civil engineering areas in the United States and South Korea. He was involved in the areas of various civil projects, which include utility design (e.g., water and wastewater), roadway and bridge. His research interests are sustainable infrastructure development, Civil Integrated Management (CIM), underground pipe evaluation and construction using 3D modeling.



**JOSH KERCHO, P.E. -
TREASURER**

josh.kercho@kimley-horn.com

Josh has over ten years of experience in water and wastewater infrastructure design. His experience includes water distribution and transmission design; wastewater collection and interceptor design; lift station design; force main design; ground storage tank and yard piping design; construction administration for water, wastewater, drainage, and roadway projects; and infrastructure condition assessment. Prior to joining Kimley-Horn in 2011, Josh spent three years on staff with the City of Bryan, TX, and is very experienced with the construction of water and wastewater infrastructure for municipalities.



**LUIS CUELLAR -
SECRETARY**

Luis.Cuellar@rpsgroup.com

Luis currently serves as Vice President for RPS Infrastructure, Inc., and is located in the San Antonio, Texas office. His primary responsibilities include the overall business operations and client management in the Central and South Texas area. Luis strives to provide excellent, responsive, high quality service to our clients and build a team that shares the same vision and optimism. His 22 years of engineering experience cover wide gamut of infrastructure planning and design, with focus on transportation and water projects.

BOARD OF DIRECTORS 2019



SETH MATTHESEN
- DIRECTOR,
MEMBERSHIP

Smatthes@ditchwitch.com

For 29 years, Seth Matthesen has worked in the HDD industry. His first five years as an HDD Contractor, and the past 20+ years with Ditch Witch® holding positions such as business manager, dealer sales representative, global account sales manager, and product manager. Currently as the HDD category manager, Seth has become familiar with different job requirements by visiting customers and jobsites all over the world. He works to identify the needs of customers involved in the underground construction business and provide solutions.



JUSTIN TAYLOR -
MARKETING CHAIR

justin.taylor@cciandassociates.com

Justin Taylor, P.E. is the VP of Engineering for CCI & Associates, an engineering, design, and inspection firm specializing in trenchless technology. Justin holds a B.Sc. in Mechanical Engineering from the University of Alberta. After almost 10 years of various engineering and management roles in the Western Canadian CCI offices, Justin moved to Houston, Texas to head the engineering team in CCI's first stateside offices. Justin is a licensed P.Eng. in Alberta, among other provinces, as well as a licensed P.E. in multiple states including Texas. In his time with CCI, Justin has worked on trenchless crossings for various high profile projects such as Keystone/Keystone XL, Enbridge Line 3, and Kinder Morgan TMEP Pipelines, and has been involved in the development of tools for real-time measurement of strain and stress on steel pipe during Horizontal Directional Drill installations. Justin is an active member of NASTT, having authored and co-authored several papers for the organization, and being a member of the NASTT Program Committee.

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2019 UPCOMING TRENCHLESS EVENTS

May 21, 2019

2019 NASTT South Central Trenchless Technology And Pipe Conference (TTP)

University of Texas at Arlington (UTA)
Arlington, Texas
Information: www.uta.edu/engineering/conferences/ttp/index.php

May 22, 2019

SESTT Trenchless Technology, SSES & Buried Asset Management Seminar

Charleston, South Carolina
(Date may change)

Information: Leonard Ingram,
sestt@engconco.com

June 6, 2019

9 AM - 12 Noon (double session)

NASTT Gas Distribution Good Practices Course

Bryant University
Smithfield, Rhode Island

Information: www.nastt.org/events

June 26, 2019

MSTT Trenchless Technology, SSES & Buried Asset Management Seminar

Indianapolis, Indiana
(Date may change)

Information: Leonard Ingram,
mstt@engconco.com

August 21, 2019

MASTT Trenchless Technology, SSES & Buried Asset Management Seminar

Arlington, Virginia
(Date may change)

Information: Leonard Ingram,
mastt@engconco.com

September 25, 2019

SESTT Trenchless Technology, SSES & Buried Asset Management Seminar

Charlotte, North Carolina
(Date may change)

Information: Leonard Ingram,
sestt@engconco.com

October 23 - 24, 2019

RM-NASTT 9th Annual Regional Conference: Trenchless Elevated!

Location TBD
Denver, Colorado
Information: www.nastt.org/events

October 28 - 30, 2019

NO-DIG NORTH

Telus Convention Centre
Calgary, Alberta
Information: www.nodignorth.ca

November 11 - 12, 2019

2019 NASTT Northeast Trenchless Conference

Embassy Suites by
Hilton Syracuse Destiny USA

Syracuse, New York
Information:
www.nastt-ne.org/seminar-2019.html

November 20 - 21, 2019

15th Annual Western Regional No-Dig Show

Location TBD
Honolulu, Hawaii
Information: www.westt.org

December 4, 2019

MSTT Trenchless Technology, SSES & Buried Asset Management Seminar

Council Bluffs, Iowa
(Date may change)
Information: Leonard Ingram,
mstt@engconco.com

April 5 - 9, 2020

NASTT 2020 No-Dig Show

Colorado Convention Center
Denver, Colorado
Information: www.nodigshow.com





ANNOUNCEMENT



2019 NASTT SOUTH CENTRAL TRENCHLESS TECHNOLOGY & PIPE CONFERENCE (TTP)

The NASTT South Central Chapter is hosting the 4th Annual TTP
May 21, 2019, 8:00 am: University of Texas at Arlington (UTA)



The NASTT South Central Chapter is pleased to announce the 4th Annual 2019 Texas/Oklahoma Trenchless Technology and Pipe Conference (TTP) May 21 at University of Texas at Arlington.

Join us for one full day of trenchless presentations and networking along with breakfast, lunch and refreshment breaks! Registration includes a useful and informative technical seminar program and mini trade-show product exhibit area. The 2019 Texas/Oklahoma Trenchless Technology and Pipe Conference (TTP), co-hosted with Center for Underground Infrastructure Research & Education (CUIRE), offers all the benefits of a national conference at the local level.

The NASTT South Central Chapter provides opportunities to advance the science and practice of Trenchless Technology in Texas and Oklahoma by promoting and conducting training and education through seminars, short courses and field demonstrations.



The 2019 Texas/Oklahoma Trenchless Technology and Pipe Conference (TTP) is a valuable educational networking opportunity for those involved in underground infrastructure work including public works officials, utility company personnel, oil/gas companies, engineers, underground contractors, industry suppliers and students.

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Event Cost

	Before April 30th	After April 30th	On Site
Student (With Active Student ID and Advanced Registration)	\$0	\$0	\$0
Municipalities and Government Agencies	\$25	\$50	\$50
Engineering Firms, Contractors, Others	\$149	\$199	\$225
Exhibitors- Includes 1 Pass to Event	\$500	\$500	\$500



DEADLINE for submission of abstracts/presentations is Friday May 3rd, 2019. Sponsorships available!
Email Dr. Mo Najafi: cuire@uta.edu



For updates on the Conference location, Hotel Accommodations and Registration, visit:
www.uta.edu/engineering/conferences/ttp/index.php or phone: 817-272-9177

Horizontal Directional Drilling – The Importance of Pullback Support Design and Planning



By: Justin Taylor, PE, CCI & Associates Inc. | Ashkan Faghieh, M.Sc., P.Eng., CCI Inc.

Perhaps the most commonly overlooked part of any Horizontal Directional Drill (HDD) design is the product pipe pullback support. Although there is commonly significant engineering evaluation put into the development of the below-ground geometry (such as Annular Pressure / Hydrofracture and Inadvertent Return risk calculations, design radius and minimum allowable radius calculations, pull-force evaluations, buoyancy control calculations, etc.), in general much less thought is put towards how the product pipe is handled above ground, before it

enters the designed bore-path. However, as will be discussed here, the design of this portion of the HDD process can be just as important (or more so) than the downhole design in ensuring a safe and successful installation.

Fifteen years ago, pullback (or lift-plan) designs were almost non-existent. It was up to the general pipeline contractor to provide equipment to lift the pipe such that it entered the borehole at the specified angle. As long as the side-booms could lift the pipe to align with the hole, there was not much additional analysis or thought put into the process.

With the increasing capabilities of HDD equipment and planning, larger and longer pipe crossings started to become more common, and with some large pipe and challenging geometry in HDD designs, site-specific lift-plans started to become a project requirement. Although not always the case, within the United States lift plans are predominantly prepared by the general pipeline contractor or their subcontractors who are responsible for the lifting of the pipe, well after the design of the HDD drillpath itself has been finalized. HDD designers may draft up plans to show required pullback alignment for temporary

The goal of the design is to ensure safe, efficient, and cost effective HDD installations

workspace consideration, but in many cases, the design of the pullback support does not go beyond this preliminary stage during the detailed HDD design. For a multitude of reasons that are discussed below, this really should not be the case if the ultimate goal of the design is to ensure safe, efficient, and cost-effective HDD installations.

WHY ARE LIFT PLANS UNCOMMON IN HDD DESIGN?

Before we can talk about why things could be done better, first we need to know why they are being done the way they are. So, why are lift plans not included within all HDD designs? There could be many logical reasons. Among them: It is outside of the HDD designer's skillset. Or, it is preferred to leave scoping of equipment and liability for the pipe lift in the pipeline contractor's hands rather than the Owner's or Designer's. Or, sometimes, it may just be the old way of thinking: that the lift above ground is a minor concern in relation to the HDD installation overall.

An important related consideration to keep in mind is that the Contractor's goals and the pipeline Owner's goals, although the same in the big picture, can be coming from different perspectives. The Owner's goal is likely the efficient, safe installation of their utility in a way that ensures it is not compromised and can successfully operate. They are concerned with the stresses on their pipe during installation and operation, essentially the protection of their assets. Things such as weld and coating quality, steering specifications, and minimizing coating damage may be primary concerns in what they consider



Proper alignment with the drilled hole is critical for safe installation

the successful installation of the pipe. On the other hand, the Contractor will be coming from a similar "protection of their assets" frame of mind. Therefore, Contractors will generally be more focused on the loads and forces on their equipment to ensure the product can be installed successfully without failure of their tooling, drill stem, rig anchors, and/or pipe support equipment. It is this inherent understanding of these differences in priority that lead to the creation of specific steering tolerances within the below-ground HDD design that

the Contractor must adhere to, along with other prescriptive requirements around tooling and processes that the Contractors must follow in order to be allowed to complete the installation. So why does this not extend to the pipe when it is above ground?

WHY ABOVE-GROUND PIPE SUPPORT DESIGN IS IMPORTANT

Ensuring pullback pipe support design has been included within the HDD design



Pullback plans should minimize public impact where possible

has many benefits. One of the most basic benefits is the determination of the amount of additional temporary workspace that may be required for the preparation of the pipe section. A full support design would include evaluation of horizontal curves (or “roping”) along the pullback section to confirm if the pipe section can fit within the constraints of existing right of way (ROW) and temporary workspace inflections. This evaluation at the design stage can allow for additional temporary workspace to be obtained that would allow for the line pull to be completed in one continuous section and which would otherwise not be obtained prior to construction. If ROW and workspace cannot achieve layout in a single section due to other impediments such as elevation differences, roads or rails, alternatives such as culverts or temporary supports above roadways can be evaluated at the design stage to assess construction challenges and impacts to the public. The avoidance of unnecessary additional intermediate welds during HDD pullback due to lack of sufficient workspace can eliminate risks to the successful installation of the pipe in most cases. In addition, the confirmation of whether or not intermediate welds would be required and where could be a significant factor in determining the overall feasibility of the HDD installation, and may necessitate

design modifications in order to mitigate these risks.

Another reason the pipe lifting design could directly play a significant role in the HDD design geometry is for consideration of pullback pipe support equipment requirements. A designer may be able to optimize an HDD drillpath with slightly higher entry and exit angles, reducing overall length and therefore schedule and cost of the HDD. However, if this higher exit angle significantly increases

equipment requirements to support the pipe adequately without over-stressing it, the relative savings in drilling costs may be irrelevant to the overall cost of the crossing. In many cases, optimal downhole HDD geometry will be at odds with optimal above-ground support requirements and costs. Having a design that considers BOTH, and finds an optimal middle ground, is a necessity in ensuring overall cost and schedule efficiency with HDD designs, in addition to minimizing safety concerns that may be present with extremely large-scale pipe lifts that require long lengths of very high suspended loads.

Another benefit of completing a design that balances the HDD drillpath considerations with the above-ground support requirements is that there will be a clear understanding of the pipe support requirements at the design stage, and therefore at the bidding stage. Without detailed pipe support designs, pipeline contractors may severely underestimate or overestimate the support equipment requirements. This can lead to significant unexpected costs at the time of construction and contractual disagreements that may be passed to the pipeline owners. A clear understanding of the equipment requirements will allow for the Contractor to be more accurate in their pricing, and ensure less price variance for the Owner.

Perhaps most importantly, having an engineered design for the pipe support



Both vertical and horizontal loads on pipe must be evaluated

ensures that the product pipe will not be overstressed during handling above-ground and therefore safety issues that may develop from overstressed pipe in operation are avoided. Previous studies have shown that the stress on product pipe above ground during pullback can far exceed the stress on the pipe once it is within the HDD borehole (see technical paper: Goerz, B., Taylor, J., & Martens, M. "Longitudinal & Circumferential Pipe Stress in Horizontal Directional Drills", NASTT No-Dig Show, 2014). With a lift plan in place that is designed to ensure there is sufficient support equipment at suitable spacing and heights so as to not over-stress the product pipe (with suitable safety factors to account for actual in-field variations), excessive loads and stresses on the pipe prior to entry into the HDD borehole can be avoided.

PULLBACK DESIGN CONSIDERATIONS

There are many things that need to be taken into account when developing

a pullback lift plan. The means and methods for how the plans are developed (hand calculations and/or finite element analysis, etc.) are effective as long as they are done competently and take into consideration several important factors. These include, but are not limited to: the break-over radius, the effects of combined horizontal and vertical bending stress, the length of unsupported pipe at the leading and trailing end of the pullback section, the local stresses at the supports, the buoyancy control measures being implemented, the frictional forces from the pipe section on cradles/rollers; etc.

THE GOAL: SAFETY AND EFFICIENCY

The goals of the Owners, the designing engineers, and the Contractors completing the work are all the same at the end of the day. All parties want to ensure that the pipe is installed successfully, as efficiently and cost effectively as possible while maintaining the required level of safety within the design and the installation processes. Having ALL aspects of the HDD designed accordingly allows for the achievement of these goals. †

ABOUT THE AUTHORS:



Justin Taylor is the VP of Engineering for CCI & Associates Inc., based out of Houston, TX, and has over 12 years of trenchless experience,

focussing on HDD and Direct Pipe installations.



Ashkan Faghih is a project manager for CCI Inc., based out of Alberta, Canada, and has over 7 years of experience in design and

planning of trenchless construction projects.



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Pipe Surgeons:

Houston Contractor Pulls Off Complex Sewer Upsize

By: HammerHead Trenchless

Highly valued, 125-year-old oak trees immediately ruled out open cut replacement for a 370-foot run of 10-inch sewer line being upsized to 12-inch HDPE for a new apartment complex in Texas. Valued at millions of dollars apiece, a city arborist was called in to get approval for a static pipe-slitting operation on the pipe lying 10 feet below them. It was just one of many complications on this job, which was performed by Houston-based T Construction LLC (T-Con).

Owner Ramon Torres established T-Con in 2008 after 30 years' experience in the industry working with Troy Construction and Kinsel Industries. He attributes T-Con's success to the expertise of its field operations personnel – Gerardo Negrete and Yonin Villares.

“The closest thing I can compare this job to is surgery,” said Villares, managing director for T Construction LLC. “I’ve never seen a pipe bursting job with so many challenges.”

It’s a significant assessment coming from Villares, who has 30 years of pipe-bursting experience. T Construction (T-Con) is general contractor capable of full project management of civil construction projects for its public and private-sector customers throughout the state of Texas. Services include project engineering and specification, with 95 full-time personnel employed in its five divisions. These include a cement concrete and asphalt department for paving streets, sidewalks and parking



Expander increases the required pipe path by approximately 20 percent of the new pipe diameter, reducing drag for a smoother installation

“The closest thing I can compare this job to is surgery,”

- YONIN VILLARES, MANAGING DIRECTOR, T CONSTRUCTION LLC

lots, in-house. Another department performs storm-related debris cleanup, ditch clearing and grubbing services.

T-Con also specializes in trenchless pipe installation, replacement and repair, providing its customers with the most reliable, permanent and cost-effective alternatives for their underground utility, sanitary sewer, storm sewer and water main projects. Its expertise in non-invasive methods like pipe bursting helps T-Con get any job done safely and on time – even jobs as complicated as this one.

SLITTING BACKWARD

Traffic on the nearby, busy city street could not be interrupted. Alongside this job, a second apartment complex was under construction, requiring coordination all crews working in the crowded space. The pipe path was crowded with other utilities, including a 30-inch water main.

The congestion forced the T-Con pipe slitting crew to put its 10-foot-deep, 15-foot-long machine pit at the “wrong end” of the run. One end of the existing line was 10-inch-diameter truss pipe, which switched over to 10-inch ductile iron (DI) pipe at a manhole halfway through the run. DI pipe can be successfully split using custom-made DI pipe-slitting tools but is one of the most challenging types of pipe to replace, especially compared to truss pipe made of dual-wall PVC and Mearlcrete filler.

The most desirable place for the pulling machine would be at the DI pipe end on the south side of the run, with the slitting tool and product pipe entering the truss pipe side on the north. It was not an option, due to a school to the north and a north/south street adjacent to the apartment building already blocked off due to construction. Further limitations to traffic flow or to the parking north of the jobsite fence was not permitted, leaving

no place to string out fused-up pipe on the surface there.

T-Con’s only choice was to pull from the truss pipe end, hoping it would stand up throughout the DI pipe slitting operation.

Pulling from that end of the run also meant pulling the slitting tools through the DI pipe sections from bell end to spigot end. Pipe slitting contractors generally prefer to slit DI pipe spigot to bell. The spigot end is thinner and easier to split, reducing the chance the pipe will travel. Beginning a slitting process at the thicker, bell end of the pipe increases odds of “stacking,” when a moving, un-slit pipe section is driven inside the section ahead of it, increasing the thickness of material that the pipe slitting tool must cut through next.

EQUIPMENT AND VENDOR COLLABORATION

Although T-Con owns its own pipe bursting equipment, for this job they contacted longtime consultant Kent Westendorf. Westendorf is a Rehab and Replacement Applications Specialist for HammerHead Trenchless of Lake Mills, Wisconsin, T-Con’s bursting equipment vendor.

HammerHead determined the correct equipment for this job was its HydroBurst 100XT rod-pulling machine with 100-ton rated pulling capacity, a slitting head for 10-inch ductile pipe and an expander suitable for the replacement 12-inch HDPE. Westendorf traveled to the jobsite for the operation to provide on-site technical support.

The T-Con crew dug its 30-foot-long, 4-foot-wide entry pit at the DI pipe end of the run and a 15-foot by 6-foot-wide machine pit at the other. Both pits were excavated carefully to avoid damaging buried utilities, a difficult job in the crowded urban site. Once the machine



The HammerHead 100XT requires a relatively small machine pit yet has a 100-ton pulling capacity. This pull required 40 to 50 tons psi of pressure through ductile iron



Highly valued trees prevented open cut pipe replacement

was ready in the pit, the crew paid out the pulling rods. The slitting head, expander and product pipe were attached to pipe at the opposite end.

HammerHead Trenchless pipe slitting tools are part of its Same Path technology product lines. The slitting head designed for DI pipe features three slitting wheels set in line at incrementally larger diameters to make progressively deeper cuts in the pipe. The first wheel scores the ductile iron. The second slices through it. The third ensures separation of the pipe through connections and such hardware as repair bands and fixtures.

The run began well, with the slitting head disappeared into the pipe, product trailing behind it, with the sound of it rending the metal pipe growing quieter. Shortly after they started, Westendorf at the other end of the run saw the pressure gauge suddenly jump from 40 tons to 85 tons and quickly halted the operation.

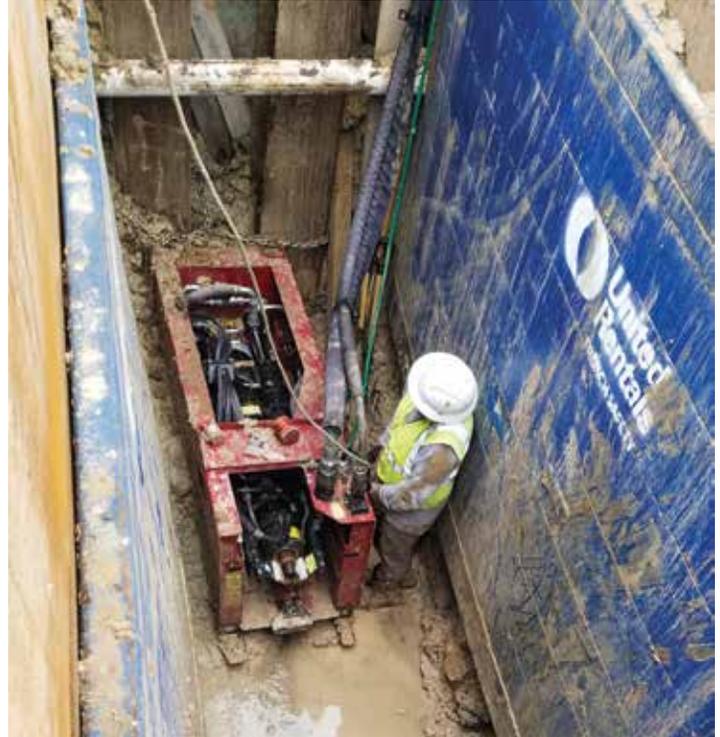
When pressure spikes on a 100XT, continued pulling is risky. The pressure could fall back as the tooling overcomes whatever it was that made it spike. Or, unable to move the tooling further, the machine might deadhead itself against the pit wall, potentially damaging the machine, tooling, product pipe or all three.



Congested work area permits only one location to lay out fused-up pipe on the surface. It meant pulling through 150 feet of 10-inch ductile iron pipe first from the truss pipe side of a 370-foot run



The pipe-slitting operation commences in the entry pit. The string consists of pulling rod, slitting tool and expander connected through flexible linkage, and the new, 12-inch-diameter, HPDE product pipe



A pressure spike to 85 tons caused the crew to immediately cease operations and troubleshoot the cause

Westendorf suspected stacking. The pipe section had likely moved, ramming itself into the next pipe. The slitter might still be able to slit through the pipe, however, if the pipe stops moving. Pipe slitting further in this case posed another risk – that the tooling and product pipe could get irretrievably stuck in the ground beneath the trees, where excavation was forbidden.

“We needed to see the pipe,” Westendorf said. Although two manholes in the run allowed some visual inspection of the pipe, the crew needed access closer to the tooling. Between the trees ahead of the tooling was just enough room for a small access pit, 10 feet deep but less than 6 by 6 feet in size.

When the crew resumed the pipe slitting operation, the pipe stayed in place. The pressure gauge did not rise above 50 tons from that point on. The tooling slit through the pipe without any further problem until just before encountering the truss pipe. “Our slitting head actually didn’t burst the truss pipe,” Westendorf said. “The last bit of ductile did.”

Ground friction at that point was not sufficient to keep the final 10 feet of DI

pipe from moving. The DI pipe simply began bursting through the truss pipe on just 5 tons of pulling pressure until it was stopped by the 100XT pulling machine. At that point the head finished slitting the DI pipe to the end.

COMPLETION

Like surgeons around an operating table after a touch-and-go procedure, the crew could now step back, wipe their brows and breathe normally again. The trees had not been damaged. The perfectly undamaged product pipe was in place. The crew had completed the job in a work space crowded by other construction trades nearby with tight access to their job and under challenging worksite restrictions. It was a successful size upgrade despite having to “pull backward” through the bell and spigot pipe, and do it from the weaker, truss-pipe side of a pipe run 23 yards longer than a football field.

From start of the project to final cleanup, the T-Con crews were on the site for 8 days. Of that total time, the pipe-slitting pull itself took just 2 ½ hours.

Villares attributed T-Con’s success to expertise of the project team. “It just shows when you have good people like we had, a team of experts, with a good plan, and give them quality equipment, you can come through on a project even as difficult as this.”

ABOUT HAMMERHEAD TRENCHLESS:



Founded in 1989, HammerHead Trenchless provides the industry with the most comprehensive suite of precision-manufactured trenchless equipment and consumables for the installation, repair and replacement of pipes used in fiber, communication, water, sewer and gas underground infrastructure. HammerHead is part of The Charles Machine Works’ Family of Companies, the Underground Authority. Each CMW company shares in its overall commitment to solving today’s infrastructure challenges, offering solutions in all areas of underground construction.

Guided Auger Boring Supports DFW Runway Rehabilitation Upgrades

By: Laura Anderson, Akkerman Inc.

The Dallas Fort Worth (DFW) International Airport, has embarked on a rehabilitation program to improve its runways, the first comprehensive effort of its kind to upgrade its runway systems since airport construction in 1974. While most of the runway enhancements are evident from the surface, upgrades to the electrical systems by way of trenchless guided auger boring methods are equally critical to the improvements yet not so apparent to travelers.

Runway 17C-35C is DFW's primary runway out of seven, handling an average of 40 percent of arrival traffic. Since the 17C-35C runway sees the most traffic, it was the most deteriorated therefore deemed priority on the docket of three phases.

The DFW Runway 17C-35C Rehabilitation project replaced 6,000 feet of runway, including resurfacing and a weather-resistant asphalt overlay, shoulder reconstruction, the addition of a new parallel high-speed taxiway, and upgraded runway status lighting and electrical as the primary objectives.

Minimization of closures and disruption was pertinent to all construction goals for the project owner. The DFW enacted a plan to first conduct a partial shutdown of the runway from May through October 2018, limiting traffic to daytime hours on days with good visibility. During this time, construction took place during the night shift. A full closure was scheduled for August 2018 through November 2018 but was later extended through February 2019 because of unexpected site conditions and severe weather.

BorTunCo, of Houston, TX has been



BorTunCo crew mobilized onsite to complete their work as dictated by the DFW AOA

servicing the needs of project owners for underground construction since 1948. Many of Houston's underground pedestrian tunnels, infrastructure for downtown landmarks and crossings have

been installed by trenchless methods performed by BorTunCo.

In seventy years, BorTunCo has learned a thing or two about how to do things properly. In fact, as a standard course of



The primary objective for the project was to minimize closures and disruptions for travelers

action, they choose to first guide any steel casing installation with their pilot tube system before enlisting their auger boring machine fleet.

The means to determine auger boring alignment are limited and nearly unfeasible on bores exceeding 200-linear feet. Nowadays, steel casing installations take place in tight corridors, where unforeseen obstructions are commonplace.

BorTunCo's general manager David Womack states, "Initially, we began using the pilot tube system to maintain control of grade when installing auger bores. With gravity lines, this is critical. We soon realized that the alignment of both line and grade with the pilot tube system prevented errors and allowed us to ensure that our bores were always right on."

Womack furthered, "Shooting the pilot ahead of the casing serves as a probing tool to confirm that the path of the bore is viable. The pilot bore also helps identify differing ground conditions or obstructions, preventing costly delays or rework when a bore path must be altered."

"While the initial setup of the pilot adds a little time and cost, it eliminates virtually all of the risk associated with

"Whenever possible, we will always use the pilot tube system for auger boring steel casing."

- DAVID WOMACK, GENERAL MANAGER, BOR TUNCO

control of line and grade. In the end, the cost associated with establishing a pilot more than offset the costs associated with controlling or correcting line and grade during the bore. Whenever possible, we will always use the pilot tube system for auger boring steel casing."

BorTunCo's contract included the installation of 3,945-linear feet of 24-, 28- and 32-inch outside diameter steel casing pipes which were filled with 10-way to 20-way two-inch electrical conduits under the taxiways connecting to runway 17C/35C. The casing sizes were dictated by the number of electrical communications lines required for the lighting and signaling at the various taxiways.

Sometimes called pilot tube guided boring, pilot tube micro-tunneling or guided auger boring, the method is the same. An accurate pilot tube bore installation is always the first step in the process.

After the launch and reception shafts are excavated and shored, the launch pit

floor is installed to the alignment's line and grade. The guided boring jacking frame is positioned on the centerline of the bore path close to the bore entrance point and clamps onto the track with a universal adapter. Following this, auger boring machine is placed on the track behind it to serve as a backstop during the pilot tube installation process.

The next step is to set-up the guidance system. The guidance system's theodolite and camera are placed between the guided boring jacking frame's hydraulic thrust cylinders on a mounting stand to protect them from movement. The theodolite and camera transfer a digital video feed of the target to the monitor.

Akkerman pilot tubes are hollow, with a dual inner wall. The center ring is kept dry and free from contaminants to maintain a clear target sight path over the full length of the bore. The narrower outer ring allows for lubrication flow to the steering head ports to reduce jacking forces.

A steering head containing the target is

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BorTunCo advances steel casing which houses electrical conduit under DFW taxiways that connect to the newly renovated 17C-35C runway



The crew sets up their guided boring and guidance systems to install pilot tubes on line and grade to establish an accurate path for the steel casing

affixed to the lead pilot tube and advanced as pilot tubes are added to the pilot tube string. The steering head rotates and displaces the ground. Concurrently, the operator views the target on the monitor, mounted to the jacking frame. The operator assesses the target's position and makes steering corrections as necessary to establish an accurate bore path. The operator also controls the hydraulic values on the gearbox for jacking, rotation, and advancement of pilot tubes.

When the steering head reaches the reception shaft, steel casing installation commences with the auger boring machine using a sequence of tooling. A pilot tube adapter connects to a guide rod, attached to a reaming head which attaches to the lead casing with enclosed augers. As pipe segments are added, pilot tubes are removed in the reception shaft, and the augers transport the excavated spoil to the launch shaft.

The 16 bores on this project took place under runway 17C-35C's connecting

taxiways with an average of five foot of cover above the top of the casing pipe. In addition to limited cover and windows of opportunity for installing the casing, airport security clearances were required for the crew and were limited daily to specific, allowable work zones. The DFW AOA also dictated construction sequences and schedules.

The entire installation comprised 3,945-linear feet in 16 runs. The shortest run was 160-linear feet, and the longest was 429-linear feet. The project had a constricted schedule between the months of May through October 2018. DFW encountered worse than typical weather impacts throughout this duration. By running multiple crews and efficient utilization of the pilot tube process, BorTunCo was able to complete their portion of the work in 93 days, well within the original project schedule and without extensions.

Womack details, "The ground conditions at DFW would have allowed

for the traditional, unguided auger bore methodology to be successful. However, the accuracy and reliability we count on from the Akkerman pilot tube system guaranteed this success and facilitated completion of the work program within a very tight project schedule."

The DFW is now experiencing the full benefit of their investment, and the first arrival touched down on the new asphalt on March 10, 2019. 🇺🇸

ABOUT THE AUTHOR:



Laura Anderson is
Director of Marketing
and Communications

with trenchless underground construction manufacturer Akkerman in Brownsdale, MN. Akkerman wishes to thank David Womack and Bryan Swanson of BorTunCo for sharing the details of their project for this project article.



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Buoyancy Control for HDD Installations – Purpose, Methods and Results

By: Jim Williams, Brierley Associates

Buoyancy control is not a new concept, it has been used since the early days of horizontal directional drilling to improve the success of pipe installation. Initially, it was only used to free pipe that became stuck or reduce pull loads but as the industry grew other benefits were discovered. As plastic pipe became more and more common, buoyancy control greatly expanded the range of applications for which it could be considered by effectively reducing tensile loads on the pipe. Secondary benefits include reduced pipe stress and potentially, less coating abrasion.

PHYSICS

Adding weight to the pipe by filling it with water to reduce the pull load may be counterintuitive. But when you consider the physics behind this it makes perfect sense. The relationship between Archimedes Principle and frictional drag force is the basis for the physics behind this mechanism. Friction, in this case, is the force resisting movement between the pipe and another surface. The frictional force (F_f) is directly proportional to the normal force (F_N), which acts perpendicular to the direction of travel, and a friction coefficient (μ) which relates the magnitude of the friction of the two materials in contact ($F_f = \mu F_N$). For example, when a pipe is being pulled horizontally, the normal force equals the weight of the pipe ($F_N = W$) but acts in the opposite (upward) direction. The important concept here is that the frictional force increases with an increase in the normal force, whether down, as when a pipe is very buoyant, or up such as a very heavy steel pipe. Archimedes Principle is directly related to the normal force and explains the buoyant force on the pipe. This principle states that



42-Inch Steel Pipe with 24-inch HDPE Ballast Pipe and 6-inch HDPE Fill Line

the buoyant force is equal to the weight of the displaced fluid. For example, if one cubic foot of water weighing 62.4 lbs. is displaced by an object, then there will be a buoyant force of 62.4 lbs. acting upward on the object. To tie this all together, if the buoyant force is minimized, the normal force is likewise reduced, resulting in a lower friction force and lower pull loads.

BUOYANCY CONTROL METHODS

The most well-known method of buoyancy control is filling the product pipe with water as it is pulled into the ground. The intent is to completely fill the pipe, adding as much weight as possible

to counteract the buoyant force on the pipe. This complete fill strategy is most often used with plastic pipe which has a relatively low unit weight. Other methods include partial water fill, increased pipe wall thickness, ballast pipe, and self-ballasting. These methods have varying degrees of complexity and effectiveness, but all can improve the conditions under which the pipe is installed.

Partial filling of the pipe is effective where an empty or completely filled pipe results in a high normal force (the magnitude of the net pipe weight is high). This method can be used with large diameter (>30 inches) steel pipe with the best results realized on HDD crossings with long flat bottom tangents. Since the water

fills the pipe from the lowest elevation, a partial fill can only be used in the bottom tangent.

Probably the simplest method of buoyancy control is achieved by increasing the wall thickness, although this is only feasible for a narrow range of steel pipe. Although an additional cost is expected with increased wall thickness, no other effort is needed to realize the benefits of the lower net pipe weight. In cases where conventional water-filling methods are logistically challenging such as shore crossings, this may be a feasible alternative.

The ballast pipe method is one of the more complex methods but with planning, can be readily achieved. This method uses a pipe (ballast pipe) pulled into the product pipe to add weight by either filling the annular space or the interior of the ballast pipe. Careful calculations are required to determine the pipe sizes, wall thicknesses, and which space to fill with water. The benefit of this method is precise control over the buoyancy for the full length of the crossing.

In rare cases it may be advantageous to allow the product pipe to self-ballast. This method requires a port in the pull head, or similar opening near the leading edge of the pipe, to admit fluid into the pipe. This fluid may be bentonite slurry in the case of a pullback through a drilled hole or water if the pipe is pulled through a casing. This is a very effective method for slip-line applications where the casing or host pipe is filled with water. In some cases where the product pipe is pulled directly into the drilled hole, drilling fluid flows into the pipe, usually with very good buoyancy control results, however cleaning the pipe afterwards may require a significant effort.

IMPLEMENTATION

Implementing an effective buoyancy control plan starts with a detailed procedure identifying the specific tasks, equipment and materials needed. Depending on the method, this can include fill lines, pumps, water meter, water storage, water source, valves, motorized equipment, and personnel. Under sizing the fill line(s) is a common mistake, so it is important to calculate the required flow rate to keep up with the pipe installation



36-Inch Steel Water Main with 6-inch HDPE Fill Line

plus an additional amount in the event the water filling falls behind. After the desired flow rate is determined, the pump and fill line can be sized. Another condition to check is the fill line's tensile capacity if it will be pulled into the product pipe. A 2-inch diameter pipe is probably the smallest fill line that should be used, and many projects will need 3-, 4- or even 6-inch diameter lines to properly fill the product pipe at the required rate and stay within safe pressure limits.

Another important factor is an available water source, probably the same as that used for drilling, with adequate volume or flow rate. If a hydrant connection is used, the line losses should be calculated to verify that the required flow rate can be delivered. If storage is needed, the volume required is equal to the internal volume of the product pipe plus a margin for contingency.

For projects that require water storage, a pump will be required to convey the ballast water to the product pipe. The pump should be selected with the specific components and project characteristics in mind. Self-priming centrifugal pumps are well suited and commonly used for this purpose whether electric or engine-driven. As with all of the other components in the system, it is important to understand

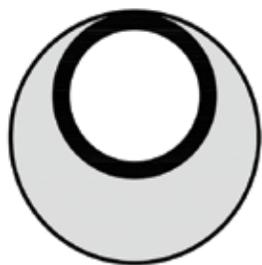
the requirements of the pump and its rated discharge and pressure which are dependent on the size, characteristics and elevations of the downstream piping.

Finally, a meter is needed to measure and monitor the water that is pumped into the product pipe as it is installed. Two important reasons for this are to verify that the correct amount of water is delivered and to avoid an unsafe condition where the water is filling the pipe above the ground elevation and adding significant weight to the pipe. The equipment used to support the pipe; cranes, excavators, or rollers; may not have the capacity to safely support this additional weight. Metering the water will help ensure that this situation does not occur.

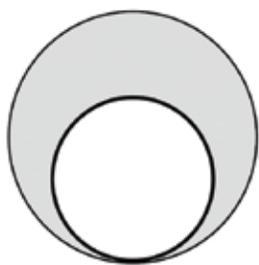
CHALLENGES AND RISKS

As with most aspects of HDD projects, buoyancy control also involves risks but with proper planning and execution, they can be minimized to a manageable level. The overall intent of buoyancy control is to reduce risk, so it only makes sense to plan accordingly. Avoid last minute planning and making do with what is on hand at the work site. A well-developed plan and proper execution are essential.

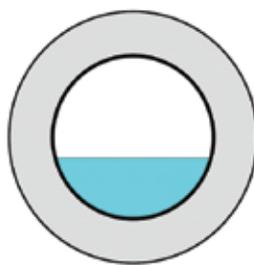
Some of the challenges associated with



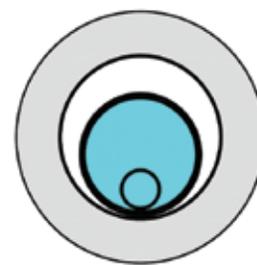
Empty pipe floating in HDD borehole.



Empty pipe heavier than displaced drilling mud, resting on bottom of HDD borehole.



Partially-filled pipe, neutrally buoyant in HDD borehole.



Filled ballast pipe inside product pipe, neutrally buoyant in HDD borehole.

Pipe Buoyancy Model

implementing a buoyancy control plan include increased project complexity, additional coordination during pullback, additional cost, and various technical concerns. Buoyancy control usually involves additional equipment, materials, and labor which all increase the complexity by placing an additional burden on project management and the budget. Projects that have multiple pipe strings and require intermediate welds or fusion joints may each have individual fill lines which have to be removed before the two pipe strings can be connected. This adds an extra step and additional time, increasing the risk of high pull loads to initiate pipe movement as the pullback resumes. Pipe bundle installations are also

challenging due to the need to fill multiple pipes simultaneously and in cases where there are different pipe sizes it is difficult to fill each equally. Another situation that is challenging is the use of a ballast pipe. Determining the optimal pipe size for the ballast pipe and developing an installation procedure should be carefully developed.

PROJECT EXAMPLES

Four project examples are provided to demonstrate the beneficial results of effective buoyancy control. Each example employed a different buoyancy control method based on the project characteristics of pipe material, diameter, crossing length, and other factors.

Example 1 – Complete Fill

In this project example a 4-inch PVC communication conduit was installed 5,400 feet across a bay by HDD. This was the longest known crossing of a plastic pipe of this diameter at the time, raising concerns about the tensile loading of the pipe. Pull load calculations confirmed these concerns with a predicted pull load of over 25,000 lbs. when installing the pipe empty. Under a scenario where the pipe is filled with water during installation, the pull load is reduced to around 12,500 lbs. which is less than the safe pull load of 13,400 lbs. for this pipe. This crossing was successfully completed using buoyancy control which otherwise would not have been feasible.

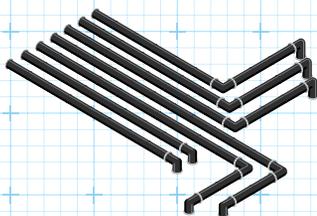
Example 2 – Partial Fill

In this partial fill example, the installation of 4,750 feet of 36-inch steel water main was planned for a HDD river crossing. Three buoyancy control options were evaluated for this project; empty, filled and partially filled. The estimated pull loads for these options were 670,000 lbs. for an empty pipe, 480,000 lbs. for a filled pipe, and 340,000 lbs. for a partially filled pipe. Although the steel pipe's allowable pull load was over 1,000,000 lbs., reducing the pull load by nearly 50 percent by partially filling the pipe was considered a prudent risk mitigation strategy. Not only was there less force applied to the pipe, but the forces and stresses on all other components such as drill pipe, swivel, and the HDD rig itself were reduced.

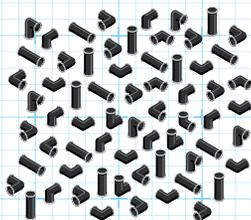
Example 3 – Pipe Bundle

A recent utility replacement project included a pipe bundle HDD crossing

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consisting of three 6-inch and two 8-inch HDPE conduits. The length of the crossing was 2,750 feet and it was determined that buoyancy control was needed to safely install the pipe bundle. The estimated pull load with empty conduits was 104,000 lbs., very close to the 109,000 lbs. safe pull load. By filling the five conduits, the estimated pull load was reduced to 57,000 lbs. Two intermediate fusions were needed during the pullback of the three sections of the pipe bundle. To fill the pipe with water, each bundle section was pulled then a manifold was inserted into the back end of each conduit to fill them with water. In this case, because the water was pumped in just before the sections were fused, the conduits were only 2/3 filled at the end of the pullback. A continuous fill that was matched to the installation rate would have been a better method of filling the pipe, however a successful installation was accomplished.

Example 4 – Self-Ballasting

In this example a 20-inch DR9 IPS HDPE pipe was planned for a ±7,000 ft.

HDD crossing in which it would be pulled through a 24-inch steel casing. Due to project constraints, the steel pipe was installed first then the HDPE was pulled through. To minimize the required pull load, a pull head was designed with a 4-inch diameter port that allowed water to enter into the HDPE pipe at the rate that it was pulled into the water-filled steel casing. This method resulted in a very simple installation with the pull load ranging from 20,000 lbs. to less than 10,000 lbs. at completion. The greatest contributor to the pull load in this example was the section above ground on rollers.

CONCLUSION

As the HDD industry undertakes increasingly challenging projects it is crucial that risk mitigating measures, such as buoyancy control, be implemented to avoid delays, failures, and unintended results. Buoyancy control is one of many procedures and methods to improve the overall success of HDD crossings. In most

cases, the pull load can be reduced by approximately 50 per cent compared to pulling empty pipe. As described in this article, there are several methods used to control buoyancy and there will likely be others developed in the future to meet the unique project characteristics of this industry. †

ABOUT THE AUTHOR:



Jim Williams received his bachelor's degree in Engineering from the University of Florida and is a licensed civil engineer in 15 states. He has 25 years of experience in a wide range of projects primarily in HDD and other trenchless methods by conventional and design build delivery methods. Jim previously served as engineering manager for a leading HDD contractor then joined Brierley Associates in 2017 as a senior consultant.

HDD Pipe Bursting - Success in San Antonio



The San Antonio Water System - SAWS - has used pipe bursting for years as a cost-effective and less disruptive way to replace old sewer mains. Recently, crews put their sewer pipe bursting experience to use on the water side of the business for the first time. They replaced a 1932-era, 6-inch cast iron water main on the city's South Side with 8-inch diameter PE 4710 high-density polyethylene (HDPE) pipe.

"It's not only a faster way to replace water mains, but it's also longer lasting and it significantly reduces costs, plus it reduced the amount of surface restoration" said Lance Rothe, manager, distribution & collection – operations at SAWS. The project took just nine days to replace 674 feet of pipe, which included careful excavation around three gas mains.

In the past, a SAWS waterline crew would cut deep trenches to replace a pipeline, ripping up roads and terrain. Pipe bursting, with just a small excavation pit at each end, avoids the need to remove and replace hundreds of feet of topsoil, concrete or asphalt.



"HDPE pipe is the number one material for trenchless construction," stated Camille George Rubeiz, P.E., F. ASCE, senior director of engineering, Municipal and Industrial Division for the Plastics Pipe Institute, Inc. (PPI). "Its high flexibility, tight bending radius, high impact resistance, high ductility and longest fatigue life makes HDPE the preferred material for the major trenchless installation such as sliplining, horizontal directional drilling (HDD), Swagelining" and pipe bursting. A trenchless HDPE pipe installation can typically provide initial cost savings up to 50 percent over open cut. And because the long continuous segments of HDPE pipe are fused together, the community will have a leak-free pipeline. Congratulations to SAWS for expanding its use of trenchless technology and HDPE pipe."

Additional information can be found at https://plasticpipe.org/municipal_pipe/



A Modern Solution for an Old Problem: Utilizing both CIPP and CFRP for Aerial Pipeline Rehabilitation

By: Amber Wagner, Ph.D., PE, and Timothy Peterie, Insituform Technologies, LLC

ABSTRACT

What happens when you determine one rehabilitation technology isn't sufficient enough? The internal or external rehabilitation of aerial piping can be a tricky concept when utilized as an "either/or" repair option, but when combined, these technologies can prove to complement one another, providing a fully structural repair solution not previously considered in our industry. A City in North Texas, was no stranger to this internal/external design challenge, yet had never previously considered combining these two technologies until it was presented as one design solution procured under one contract.

This paper will focus on two aerial pipes, 12-inch and 18-inch steel pipes, which were showing signs of severe deterioration. The design team determined that the pipes would be internally rehabilitated with cured-in-place pipe (CIPP) to eliminate internal corrosion; then, to provide additional protection due to environmental exposure and provide additional longitudinal strength, the use of carbon fiber reinforced polymer (CFRP) systems was designed to be applied to the exterior. This paper will discuss the City's struggle with this issue and the process that led to this unique repair option. By consulting with its partners, the City realized this problem could be overcome by implementing both an internal and external repair solution. Design procedures and construction details will also be discussed and illustrated.

INTRODUCTION

During project development phases, there are typically in-depth discussions of the pros and cons of different approaches to project design, construction and installation. This was no different for the team of engineers trying to determine the best rehabilitation option for the City's aerial pipes, see Figure 1. Several different options were discussed:

1. **Reinforced CIPP Liner** – This would protect the inside of the pipe from further corrosion, and also withstand internal and external loading conditions.
2. **CFRP System** – Due to the 12 and 18 inch size of the aerial pipe, the CFRP system would need to be applied as an external repair. This option would protect the pipe from external corrosion and be designed to withstand internal and external loading conditions.
3. **Replacement of Aerial Piping Section** – One way to ensure the piping system could last another 50 years, was by replacing it with a brand-new section. This selection, however, would result in significant costs and longer than allowed shut down times.

4. Combined Non-Reinforced CIPP Liner and CFRP System

– This would protect the inside and outside of the pipe, and also withstand all internal and external loadings. Additionally, the use of the internal CIPP application would address the immediate concerns for leaks, so that the external CFRP could be planned and scheduled later.

After reviewing all options, the City decided to use Option 4 for a variety of reasons:

- Allow for a minimized downtime of the pipe. The installation process for a reinforced CIPP liner is longer than for a non-reinforced standard felt CIPP system.
- The pipe would be protected both internally and externally.
- The rehabilitated pipeline would have an extended life of up to 50 years.



Figure 1. Example of Aerial Pipe to be Rehabbed

- Due to access limitations and obstacles around the pipeline, replacement with a new pipe would have logistical challenges, adding time and money to the project.

This paper will further discuss the design and installation practices for the combined CIPP and CFRP systems used to rehabilitate several aerial piping systems in Texas.

DESIGN PHILOSOPHY - CIPP

For the internal lining of this project, the standard felt and resin CIPP tube configuration (see Figure 2) was utilized. The design requirements for the CIPP portion were to provide internal corrosion protection and handle all the gravity loads of the host pipe. Since this is an aerial pipe, and there is no external (soil, water) loading to the pipe, the only real design requirement was based on the gravity head created by the change in elevation. Nevertheless, the industry standard for the design and installation of CIPP systems is the ASTM F1216 – Standard Practice for the Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube. By utilizing the Appendix X equations, the following design checks were required for the CIPP System:

1. Equation X1.1 – Hydraulic loading
2. Equation X1.2 – Withstanding ovality of the host pipe
3. Equation X1.3 – Buckling limitations
4. Equation X1.4 – Minimum Stiffness Requirements

For each of the equations mentioned above, the minimum thickness requirement can be attained and correlated to the installed CIPP thickness.

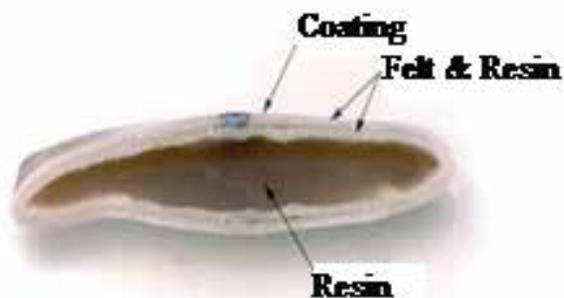


Figure 2: Sample Tube Construction for CIPP Liner

DESIGN PHILOSOPHY - CFRP

In contrast to the typical internal CFRP project, the design requirements for the CFRP system for aerial piping systems was only required to provide strength going the length of the pipe, i.e. the longitudinal direction. All internal loads were to be taken by the CIPP system, as discussed in the previous section. Additionally, the CFRP system would help provide additional protection to the existing host pipe by eliminating any new corrosion.

Since there is not a design standard that exactly addresses this design requirement, it was determined to design the CFRP system utilizing similar design methodologies described in the American Water Works Association (AWWA) design standard C305

[AWWA C305]. This design standard was developed specifically for strengthening Prestressed Concrete Cylinder Pipe (PCCP) using CFRP. Thoroughly reviewing and understanding the design methodology within the document strongly influenced the primary design considerations for this project. In the end, three different design checks were required for the CFRP System:

1. Deflection limitations due to moments spanning between supports,
2. Buckling of the CFRP liner due to temperature change, and
3. Debonding of the CFRP system due to shear demands at the termination locations.

Not only was it important to understand and identify the proper design requirements for the CFRP system, but it was also important to provide proper detailing for several components of the project: (1) saddle supports and (2) the exterior clamp used to stop previous leaking of the host pipe. Due to the height of the saddle supports (and project cost limitations), it was determined that the saddle supports could not be removed. This meant a special trim detailing was required at the saddle support locations to ensure the longitudinal forces were developed properly over the length of the pipe (see Figure 3). Even though the CIPP had already been installed and the risk of leak was non-existent, for ease of installation and keeping to the work schedule the clamp remained in place. The detail, shown in Figure 4, requires a ramp to be created with epoxy mortar to create a smooth transition for the CFRP system.

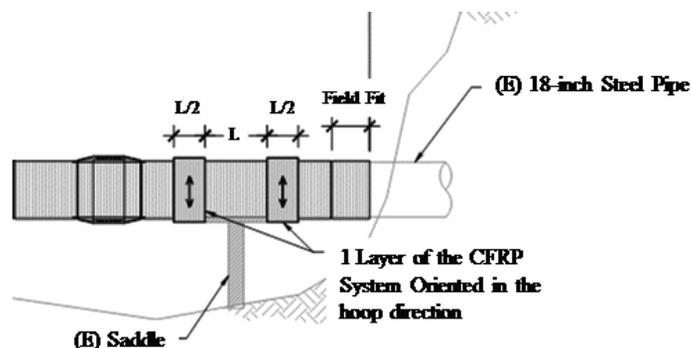


Figure 3: Special Detailing at Saddle Locations

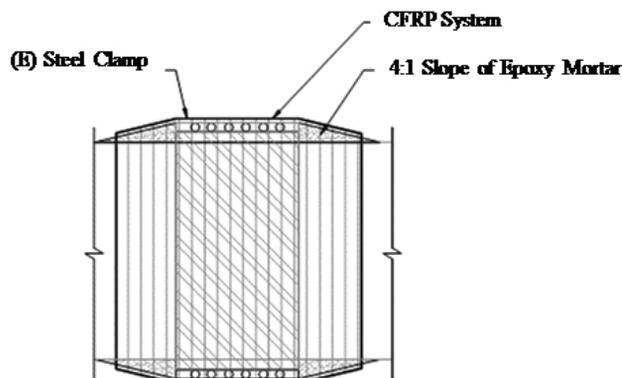


Figure 4: Special Detailing at Clamp Locations

PROJECT CONSTRUCTION – PHASE 1

For the construction of the CIPP liner, the following installation process was utilized:

1. Pipe is de-watered and cleaned in preparation for lining.
2. A pre-manufactured felt and resin tube was delivered to site. The tube is wet-out prior to delivery at a dedicated wet-out facility. This helps to ensure consistency in the wet-out process, as well as compliance with environmental methods.
3. The tube is then inverted using water pressure, see Figure 5a. The water pressure inverts the tube like a sock and propels it through the length of the pipe being rehabilitated.
4. The inversion water is then heated and used to cure the resin. This helps the product to “form in place” and creates a tight-fitting, jointless, and corrosion-resistant replacement pipe.
5. Finally, the rehabilitated pipe is inspected by closed-circuit TV, see Figure 5b.

In the end, the installation of the CIPP system took 1 day and was an overnight install.

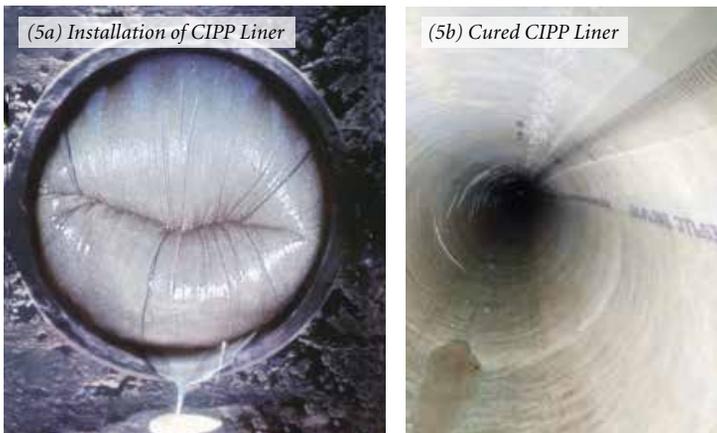


Figure 5. Installation of the CIPP Liner

PROJECT CONSTRUCTION – PHASE 2

Once the CIPP system was installed and properly cured, the next phase of construction was to install the CFRP system. Since this was an external repair over a creek, the installation was a bit different than standard internal repairs:

1. The need for additional safety measures was reduced, only scaffolding was required.
2. Special scaffolding was required for the extent of the pipe being repaired, see Figure 6.
3. Since the repair occurred in a sensitive nature preserve, dust confinement and additional environmental measures were required.
4. The crew size required to complete the repair was less.
5. Installation time was quicker.
6. Difficult to increase cure time through heat unless confinement tents are utilized. For this project, ambient cure was enough.

For the actual installation of the CFRP system, the following installation procedure was utilized:



Figure 6: Surface Preparation of Host Pipe



Figure 7: Installation of CFRP System

1. Exposed steel was prepared to SSPC SP-10 or near white metal finish.
2. A single layer of the GFRP system was applied to act as a dielectric barrier between the steel and CFRP system.
3. Apply a primer layer of thickened epoxy.
4. Apply the longitudinal layer and hoop layers as required, see Figure 7.
5. Allow system to cure for 72 hours before pipeline is put back into service.
6. Apply a top coat of acrylic paint for protection to the CFRP system.

In the end, the installation of the CFRP system took 5 days and the pipe was never out of service during the installation.

CONCLUSION

For the City in North Texas, the use of CIPP and CFRP to rehabilitate its aerial pipeline was a suitable choice for three reasons. First, the installation sequence allowed the pipeline to remain out of service for the least amount of time necessary. Second, use of CIPP strengthened the pipe for the head gravity loads and provided internal corrosion protection to the host pipe. Finally, the CFRP system provided additional longitudinal strength and external corrosion protection, which a standard felt CIPP system cannot sustain. In the end, the City was able to rehabilitate and protect its aerial pipe without significant bypass costs and reduced downtime of their system - necessary items for the project to be deemed a success. †

REFERENCES

AWWA (American Waste Water Association). (2017) *CFRP Renewal and Strengthening of PCCP*, ANSI/AWWA C305. First Edition. AWWA, New York, NY.

ASTM (American Society for Testing and Materials). (2016) *Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube*, ASTM F1216-16. Tenth Edition. ASTM International, West Conshohocken, PA.

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The group held their second meeting at the No-Dig Show in Chicago, Illinois on Sunday, March 17, 2019, for a growing group of interested participants. This technical group consists of engineering firms, municipalities, & contractors throughout North America. As we see the continuing growth in both water and sewer pipe bursting, please make sure that you are up to date on the most advanced pipe bursting skills to tackle your next project. The Center of Excellence recently released its first educational effort, NASTT's 3rd Edition of the Pipe Bursting Good Practices Guidelines.

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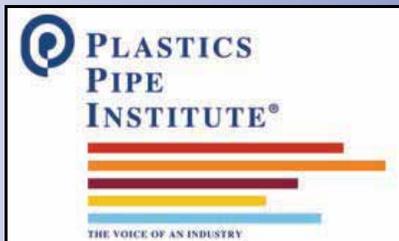
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PE4710 Pipe: The Best Solution for Water Systems

Gain Efficiency, Extend Drill-Pipe Life with Proper Drilling Techniques



For most HDD units, recommended torque is the maximum rig torque in low speed

By: Jeff Davis, Ditch Witch

Efficiency is king. When on a job, operators are highly focused on efficiency and productivity above all else. After all, the ROI of a horizontal directional drilling (HDD) project can hinge on the speed of deployment, especially when turnaround is tight. But sometimes moving quickly can distract operators from getting the most out of equipment.

One of the more expensive pieces on the job is HDD tooling, specifically the drill pipe. Replacement costs vary, but contractors can reduce overall costs by extending the life of their investment. For instance, high-quality steel and rigorous manufacturing standards help protect against fatigue, which can lead to a broken drill string downhole.

High-quality drill pipe is the first step to getting the most out of equipment.

Even the best equipment, however, cannot withstand mistreatment. Proper use and maintenance helps operators confidently and efficiently complete a job on time and on budget. To increase drill pipe longevity and effectively complete job after job, operators should know the recommended bend radius, how to maintain correct torque, and the proper use of drilling fluid.

DEPTH MATTERS

The underground conditions ultimately determine the proper depth of a bore. And getting to that depth starts at the entrance point above ground. From the entrance point, HDD operators need to steer drill pipe down before leveling off at the correct depth. The space between the entrance point and deployment depth is

often thought of as lost time and space, as operators prepare to install product.

Due to this impression, some operators exceed the recommended bend radius of their drill pipe when steering downward in hopes of reducing the perceived lost time. Based on the metal's ability to return to normal after being bent, the recommended bend radius should limit the angle an operator uses when drilling. When the bend radius is exceeded, the pipe is fatigued – thus reducing the useful life. Even if the drill pipe looks normal, the damage is done.

Costly replacement is not the only result of damaged drill pipe. When a drill string breaks downhole, operators need to plan a new route for product installation. And if the jobsite allows, they'll have to spend additional time and money unearthing the broken tooling.

To avoid costly repairs and replacements, be more efficient on jobsites, and extend the life of drill pipe, operators should become familiar with the recommended bend radius of their pipe. That begins with determining the proper entrance angle before digging begins. If an operator is unable to reach the recommended depth, they should set up again and try again. While a second round of orientating the drill and creating a new entrance path might seem like unnecessary downtime, it will keep drill pipe working for its full life.

EXERT APPROPRIATE TORQUE

Proper torque also plays an important role in extending the useful life of drill pipe. All the effort of paying attention to the recommended bend radius will be lost if operators ignore their torque when making up or breaking out drill strings.

To avoid unnecessary wear on the threads of the pin and box, users should always apply the manufacturer's recommended torque. For all Ditch Witch® HDD units, and most other HDD units, this recommended torque is the maximum rig torque in low speed. By applying this recommended torque at each make-up cycle, the stress the thread encounters from the bending and the drilling forces, is evenly spread across all components of the thread. This helps prevent improper loading and excessive wear. If the joint is not properly torqued, the pin and box can result in not only galling and grinding of the threads downhole, but also result in the pin and/or box carrying more load than the other member, which in turn results in mushrooming and failure.

Before a project even begins, operators can avoid overtorque by matching drill pipe to the drill on the jobsite. If the drill has 3,000 lbs of torque, the drill pipe used needs to be able to handle that amount.

Once on the job, operators can further reduce wear by bringing the pin and box together slowly, working up to the specific torque recommendation versus quickly spinning a drill up to its maximum torque. Operators should guide the two threads of a drill string together instead of forcing them into place. This requires vigilance

Operators should know recommended bend radius, how to maintain correct torque, and the proper use of drilling fluid



Consistent maintenance practices play a large role in getting the most out of drill pipe

by the operator, who can track the drill's gauges to make sure they are not driving the pin too hard. The heat created when forcing a pin and box together will begin to embrittle the thread, which can lead to breaks or weld the threads of the drill string together.

Easing into the recommended torque may require more time than forcing a drill string together, but it will help improve the life of the threads.

USE DRILLING FLUID TO YOUR ADVANTAGE

Drilling into the ground creates a lot of heat, which can cause unwelcome wear and tear on the outer surface of the drill pipe. To avoid excessive wear, water and other fluids are a necessity on the job. For example, drilling fluids, such as bentonite and polymers, can play an important role in keeping temperatures down and premature wear low, extending the life of drill pipe and tooling.

Without drilling fluid, operators increase the risk of the drill pipe breaking downhole. Drilling fluids are used to lubricate the components in the drill string as they slide along the bore walls, and carry the cuttings produced by the drilling tool out of the path of the string. Without these two critical functions, any material removed by the drilling tool is simply packed into another location in the bore. This results in significant wasted downhole horsepower, and greatly increases the risk of experiencing a stuck or stalled tool.

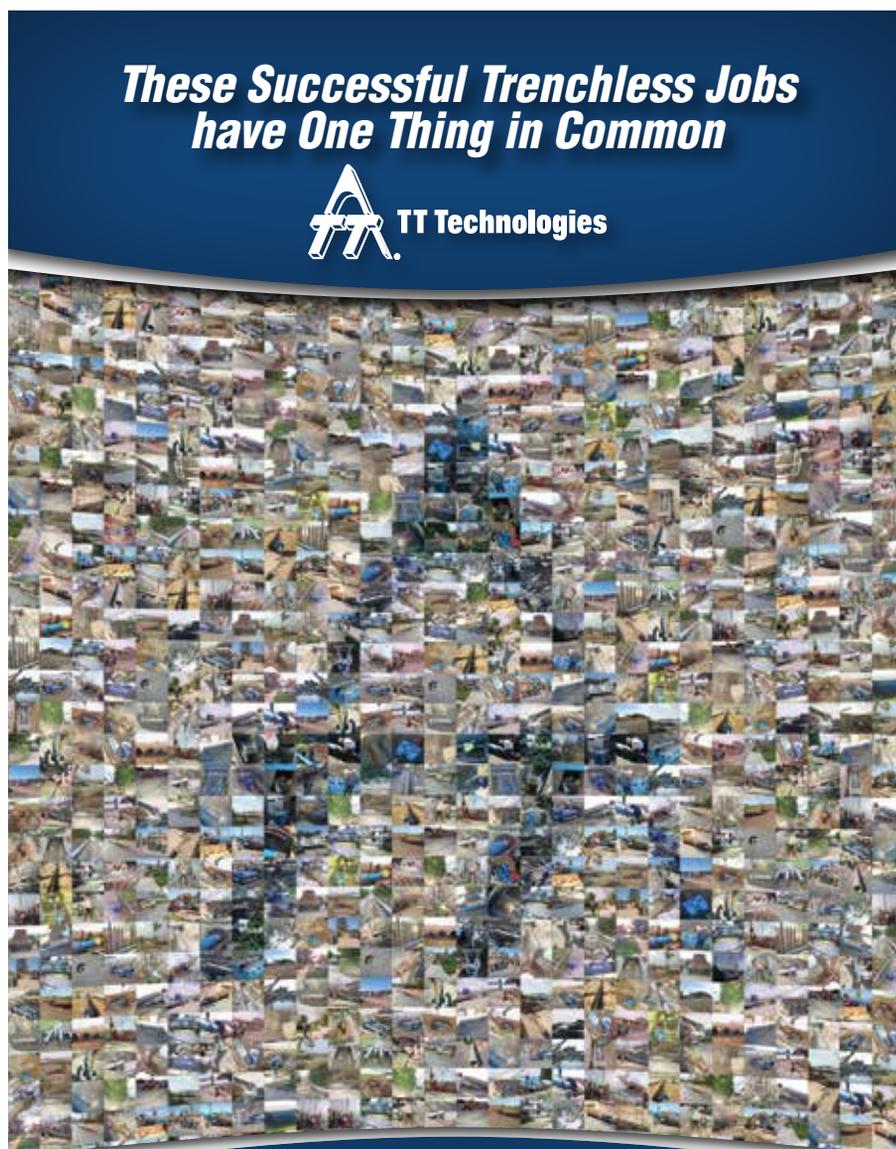
The proper and correct amount of drilling fluid and correct amount an operator should use directly correlates to the equipment being used and the jobsite ground conditions. For guidance, operators should consult with their dealers, who are trained on proper drilling fluids for the jobsite. They can also quickly check the Ditch Witch fluid formulator for advice.

FOLLOW A MAINTENANCE REGIMEN

Consistent maintenance practices also play a large role in getting the most out of drill pipe, especially when using new pipe. By investing a little time before each day on a job, operators will improve jobsite ROI, and reduce the worry of downtime correlated to a damaged pipe or broken drill string. Common maintenance practices include:

- Threading drill pipe together a few times before its first use on the job to break in threads
- Keeping threads clean if debris is present
- Thoroughly lubricating drill pipe before each use with the manufacturer's recommended drill pipe thread compound
- Inspecting drill pipe for sharp edges or any damaged thread, which indicates a string was previously forced together.

The normal wear and tear that occurs on a HDD jobsite does not have to cut down the useful life of drill pipe. Operators are encouraged to keep track of how they use their equipment, follow specified equipment recommendations for use, and properly maintain their equipment to increase drill pipe longevity. By following these practices, they'll be able to reduce the risk of unplanned downtime, and ultimately improve jobsite ROI. 🛠️



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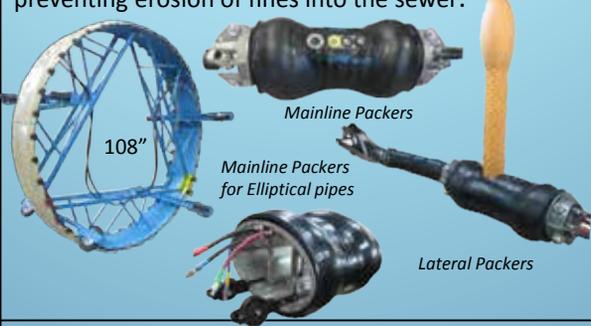
One of the more expensive pieces on the job is drill pipe

ABOUT THE AUTHOR:



Jeff Davis has over 25 years of valued customer experience and extensive underground construction

knowledge. He has held multiple roles within the Ditch Witch organization – from sales in the dealership organization, to trenchless training instructor and product specialist. As the HDD pipeline and distribution product manager, Jeff is responsible for the oversight of HDD tooling and drill pipe product development, helping to meet customer needs and provide solutions for underground construction professionals globally.

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Mud Reclaimers for the HDD and Water Well Markets:

They don't make you money, they save you lots of money!

By: Steve Bartlett, Tulsa Rig Iron

Mud reclaimers are used to mix and reclaim bentonite drilling fluids for the HDD and water well drilling contractors. The drillers use the drilling fluid to flush out cuttings

larger particles from the drilling mud and depositing the unwanted material over the side of the reclaimer. The spoils are collected in a container or in a pit dug next to the reclaimer.

over the sides. The desander cones are normally 10 inches in diameter and will process 500 gallons per minute (gpm) each, to between 40-50 micron solids size. The lighter weight fluid is cleaned down to 40-50 micron solids, where it passes out the top of the desander cone through the cone manifold and enters the next tank for further cleaning.

The next step is the desilter mud cleaner. This step normally utilizes utilizes 5-inch hydrocyclones cones that process 80 gpm each, to 15-25 micron solids size. The size of the cones will determine the "cut-point" size of the solid. The smaller the hydrocyclones cones, the finer the cut-point it will remove.



Spoils

from the bore path, and to cool the drill bit and electronics while boring. In rock applications the volume of drilling fluids pumped down-hole rotates the down-hole mud motor with the carbide cutting head. The drilling fluid is then collected at a pit usually located at the bore entrance or exit pit, and then transferred by submersible pump to the reclaimer for processing. The reclaimer will process the fluid in several stages.

The returned fluid is first pumped over the scalping shaker which has larger mesh screens (20 to 60 mesh) removing all the

The fluid that passes through the screens is collected in a tank and transferred by a centrifugal pump and processed thru the next step, which is the desander mud cleaner. Mud systems with less than 500 gallons of processing usually do not utilize this step, the fluid is sent directly to a desilter mud cleaner. The fluid is pumped through the side of the desander cone creating a rotating motion. The heavier material collects along the sides of the cones and drops out the bottom onto a shaker bed to be processed, dried, and the unwanted sand is deposited



Shakers

Production is based on the number of cones and the volume of fluid in the system. For example, a 1000 gpm unit will have two 10-inch cones (500 gpm each), and twelve 5-inch cones (80 gallons each). The cone banks are attached to a

“Drilling fluid that is re-used and not recycled is like using liquid sandpaper...”

manifold mounted over a shaker bed with different size mesh screens, to further dry the cuttings prior to depositing over the side or out the rear of the reclaimer. There are 3 types of shaker designs- 1) linear, 2) Elliptical, and 3) orbital.

The clean fluid is collected in the final tank where it can be tested for viscosity, sand content, and mud weight. The fluid may be mixed with more bentonite products to increase the viscosity as necessary to meet the driller's requirements.

The proper PH balance of the water is a critical starting point, which is needed to get the bentonite to yield properly. This is done by adding soda ash with a venturi style mud hopper. Once you have the desired PH, you are ready to add bentonite and other additives needed for an optimal mud mixture.

Most systems utilize pumps and mixing guns or some type of agitators in the tanks to keep the shear the bentonite fluid.

fees are increasing, and they have more restrictions than ever on material that is being dumped.



Mud jets

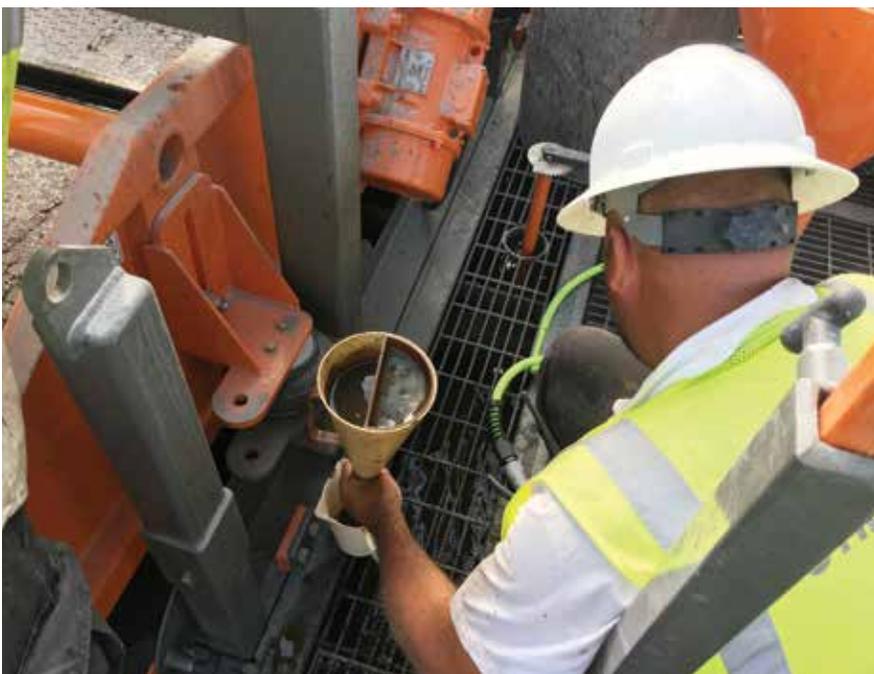
Finally a charge pump can be used to pump the clean drilling fluid back through either the Triplex mud pump or straight to the bore rig to be reused.

The advantages of using a reclaimer are:

- It reduces the amount of water needed to complete a bore by reusing the drilling fluid.
- It reduces the labor costs, wear and tear on vehicles, and dump site disposal fees incurred in drilling mud disposal. These

- It retains much of the bentonite properties so smaller amounts will be needed to retain the proper viscosity for the driller.

Drilling fluid that is re-used and not recycled is like using liquid sandpaper, which will greatly increase the wear of your pipe, pumps, and down hole tooling. Mud reclaimers do this by removing the abrasives in the mud to prevent excessive wear to the equipment it passes through. Using mud reclaimers will reduce your downtime and cost of rebuilding worn parts and equipment. †



Mud sample

ABOUT THE AUTHOR:



Steve Bartlett has served the Business Development role for Tulsa Rig Iron for 3 years, and is responsible for outside sales,

product training, customer relations, and working industry events.

He started his underground career with Ditch Witch Sales of Michigan in 1990 with the original Jet-Trac, and has been working in the underground industry since. Steve graduated from Central Michigan University in 1986 with a degree in Business Administration.

NASTT-SC and CUIRE Host Fourth Trenchless Technology and Pipe Conference (TTP 2019)

On Tuesday, May 21, 2019, the South Central Chapter of NASTT (NASTT-SC) and CUIRE will host the Fourth Trenchless Technology and Pipe Conference (TTP 2019) at the University of Texas at Arlington. Previous TTPs have attracted more than 300 professionals from municipalities, government agencies, consulting and design engineers, contractors, utility companies and manufacturing. TTP2019 attendees will receive a copy of all the presentations on a USB drive and a CEU/PDH certificate of completion will be awarded at the end of conference.

The conference will start with a plenary session with introduction and keynote presentations. NASTT-SC will award three students scholarships of \$2,500 each during this plenary session. After a morning break at the exhibit hall, the conference will continue with the following two tracks:

- New Installations (Microtunneling, Pipe Jacking, Pipe Ramming, Pilot Tube, Direct Pipe and Horizontal Directional Drilling).
- Pipeline Renewal and Replacement (CIPP, Pipe Bursting, Sliplining, Spray Applied Pipe Linings, and Manhole Renewal).

There will also be a special session of the impact of North Texas swelling soils on pipes.

During the above presentations, industry experts will present latest developments in trenchless technology methods and pipe materials, including case studies.

Ditch Witch and Hammerhead will sponsor a buffet BBQ lunch. Opportunities for different sponsorships (Platinum, Gold and Silver) are still available.



NASTT-SC Board Members at 2017 TTP, (l-r): Justin Taylor, Seth Matthesen, Josh Kercho, Alan Goodman, Luis Cuellar (missing: Jonghoon “John” Kim)

The following companies and organizations have exhibited their products and services in the past TTP conferences:

- | | | |
|--------------------------|-------------------------|------------------------------|
| • Ace Pipe Cleaning Inc. | • Fuquay Inc. | • Mears |
| • Akkerman | • Hammerhead Trenchless | • NASTT |
| • Alliance for PE Pipe | • Hobas Pipe USA | • Primus Line |
| • CUES, Inc. | • HTS Pipe Consultants | • SpectraShield Liner System |
| • CUIRE | • Insituform | • StraightLine HDD |
| • Ditch Witch | • IPR- South Central | • Tulsa Rig Iron |
| • Forterra | • LMK Technologies | • Vacmasters |

The NASTT Student Chapter at UT Arlington was established in September 2006 and currently has more than 50 members. The officers are Vijay Thakkar - President, Juhil Makwana - Vice President, Dhawani Shah - Secretary, and Vinayak (Vinny) Kaushal - Treasurer.

For more information on TTP 2019 Conference, email cuire@uta.edu, call CUIRE at 817-272-9177, or contact Mr. Alan Goodman at agoodman@hhtrenchless.com

OSU NASTT Student Chapter Report

OSU Construction Engineering Technology Students attend 2019 NASTT No-Dig Show, International Trenchless Technology Conference



Oklahoma State University undergraduate Construction Engineering Technology student, Sarah Sargent, was awarded a \$5,000 Michael E. Argent Memorial Scholarship at the 2019 No-Dig Show in Chicago, Illinois, a recent international construction and engineering conference. The Argent Scholarship is awarded based on a student's academic performance and an essay by the student on his or her interest in trenchless technology.

One Civil Engineering doctoral student, Jaehong Kim and three other Construction Engineering Technology undergraduate students, Tanner Fialkowski, Robert Russell, and Matthew Jackson, also attended the No-Dig Show.

From among members of 17 student chapters of the North American Society for Trenchless Technology (NASTT), OSU won third place in competitions for the best presentation by a student chapter.

The OSU NASTT Student Chapter contingent was led by Dr. Jonghoon 'John' Kim, assistant professor, in Construction Engineering Technology. Dr. Kim is currently a vice president of the NASTT South Central (Oklahoma and Texas) Chapter. Students interested in participating in future No-Dig Events should contact Dr. Jonghoon Kim at jongkim@okstate.edu.



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Tulsa Sinkhole Rehabilitation

Pipe Bursting & Pipe Fusion System Solves Sinkhole Dilemma



Sinkhole blocked access to electric company parking lot

Underground leakage from a faulty 6-inch clay pipeline – estimated to be 100 years old – was causing sinkholes to form under one of Downtown Tulsa’s original brick-lined alleyways. The city was forced to close the alley which blocked public access and also cut off the only access nearby electric utility workers had to the company parking lot. The need to rehabilitate the street was urgent.

Fast action was also necessary to rehab the pipe and upsize it to the standard 8-inch diameter for future maintenance. The city’s Sewer Operations & Maintenance department decided to rent a TT Technologies GrundoBurst reversible pneumatic pipe bursting unit to break up the old clay pipe. This made way for 337 feet of

fused pipe which was pulled in place with a HammerHead constant tension cable winch. The 8-inch HDPE pipe was fused together using the city’s in-house pipe fusion machine - the McElroy TracStar® 500. The McElroy unit joins pipe together with heat fusion technology to create a seamless, leak-free system.

The terminating manhole was out in the main street where a primary electric conduit was situated, which kept the crew from being able to optimally locate either the pipe insertion pit or burst equipment pit. Using the in-house and rented equipment allowed the city crew to pull the pipe from manhole to manhole in a short amount of time without having to tear up the street, further disrupting traffic.



Rented and in-house trenchless equipment allowed City to repair sinkhole without tearing up the street

Bringing outdated infrastructure into the 21st century with a modern HDPE pipeline has been a cost-saving measure for the City of Tulsa that benefits the environment and creates much safer driving conditions. The city completed the project in less than a week, getting the electric utility parking lot back open fast. Company employees were very appreciative of the quick repairs! †



337 LF of seamlessly fused 8-inch HDPE was pulled into place to complete the repair

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- Pre-event Good Practices Courses (Monday, Oct. 28, 2019)
- Two days of technical paper presentations
- Industry exhibits
- Networking opportunities
- And more!

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QUESTIONS? PLEASE CONTACT:

Greg Tippett, Chair, NASTT-NW

Email: gtippett@nastt-nw.com

Remco Kleinlugtenbelt,

No-Dig North 2019 Program Chair

Email: rkleinlugtenbelt@thurber.ca

EXHIBITOR OR SPONSORSHIP QUESTIONS? PLEASE CONTACT:

Brittany Cline, Events Manager

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