FASTRAK™
The Best Boring News from DCI® Digital Control Incorporated DCI® Vol. 6, No. 2 - October 2007

Eclipse® TensiTrak™ System Developed to Regulate Gas Pipe Installations, Ends up as Driller's Friend

About 6 years ago DCI, through its German office, Digital Control GmbH, was asked to develop a device to measure and record the pull force and downhole mud pressure of a horizontal directional drilling (HDD) installation. This was in response to a mandate from the Belgian National Gas Association. All gas lines installed using the HDD method would have to be done with some kind of device that would demonstrate that the gas line's integrity was not compromised.

Since then, DCI has designed and streamlined its patented Eclipse® TensiTrak™ Pullback and Pressure Monitoring System. As seen in this photo, the TensiTrak™ device is positioned behind the reamer, between the swivel and the product. The TensiTrak™ unit measures and transmits the product's pull force as well as the annular mud pressure to the Eclipse® receiver. The receiver then transmits this information to the remote display at the drill so that immediate action can be taken if needed, instead of waiting for the break away to fail or the drilling mud to frac out. After the pullback is completed, the recorded data on the receiver can be downloaded to a computer for archiving and analysis.

Depending on our customer's typical pipe installation requirements, DCI manufactures two TensiTrak™ models, one that measures pull forces up to 60,000 lb (267 kN) and one that measures pull forces up to 100,000 lb (445 kN). Both of these models measure mud pressures up to 127 psi (876 kPa) and have a trackable range of 60 ft (18.3 m).

To date, the TensiTrak™ load and pressure monitoring system has been most popular in Europe, although municipalities, gas companies, pipe manufacturers, and contractors in the U.S. and Canada are starting to take notice.

In August 2007, The City and County of Broomfield, Colorado, replaced approximately 1000 ft (305 m) of an existing potable water main using Fusible PVC™—specifically, 16-in. (406-mm) DR 18 Fusible C-905® from Underground Solutions™ (UGSI). This pipe has been used in over 200 HDD projects since its introduction in the market in 2004. UGSI is working with Arizona State University to confirm the predictive tools used for determining pull force with Fusible PVC™. Because of PVC's unique strength and behavior, existing models do not adequately predict the pull force necessary for an HDD installation with Fusible PVC™. DCI's TensiTrak™ system was used to aid in this research, as well as confirm that the integrity of the new line was not compromised.

Under Broomfield's maintenance contract, BTrenchless, a Division of BT Construction out of Henderson, Colorado, used their DW 4020 to install the 1000-ft (305-m) water line approximately 10 ft (3 m) deep. The 5-in. (127-mm) pilot hole was prereamed in increasing

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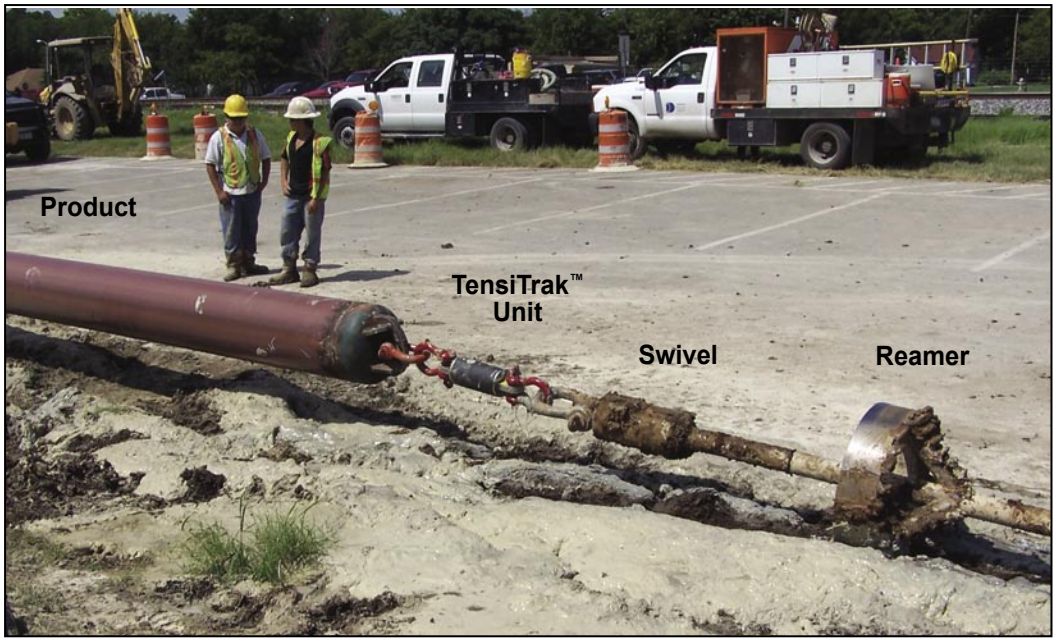


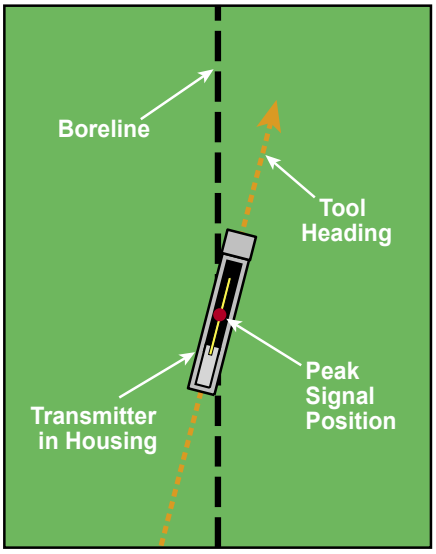
TensiTrak™ assembly with 18-in. (457-mm) steel casing ready for installation in Texas.

The FP Avenger Says, "Drill Straighter, Faster, and Safer Using the Front Point"

Even in the early days, tracking an HDD tool using a DCI-built locator was different than it was with the other locators on the market. This is because the antenna configuration in our locators has a unique design.

HDD tracking, until DCI's emergence, was based on the peak signal method—find the strongest signal number and you're over the head. This worked great until you had to drill next to or under a utility. Drilling in utility corridors is the name of the game in the HDD world, and if the signals coming from other utilities are strong enough or close enough to your transmitter's frequency, you might find peak signal in a place that is not over the head!

A major disappointment of the peak signal method is the "snaking" bore. The snaking bore happens when you don't know the heading of the tool. The tool may be on the boreline, just not heading down it, as shown in the sketch below. All appears okay until a rod or two get drilled in, and then the tool is tracked too far to the right. As a result, you end up steering left, then a little right, then a little left, etc., like a snake winding its way along your bore, as shown in the second sketch below.

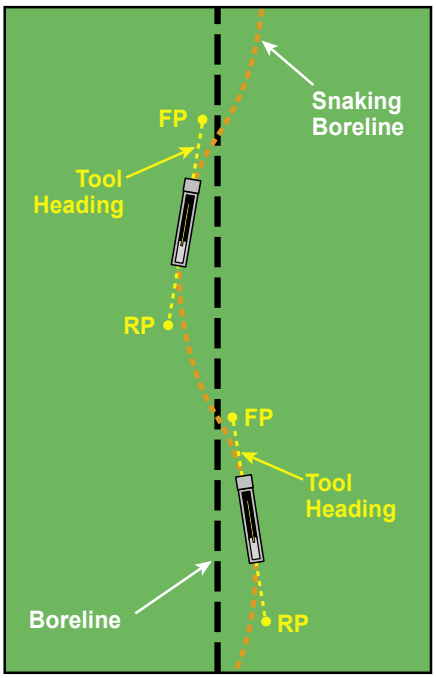


The tool is on the boreline, but its heading is to the right of the boreline.

To avoid this situation, DCI designs its systems to track the shape of the transmitter's field instead of sweeping for the biggest signal number. This means finding the tool using different locations within this field: the front point (FP), the rear point (RP), and the locate line.

Tracking all three of these locations at the end of every rod takes time, but it is not always necessary. For example, it is not necessary when your site conditions consist of relatively level ground with a correspondingly level borehole, thus maintaining a consistent depth. In this case, you can put the front point technique to work.

The following sketch shows how connecting the front and rear points establishes the tool's heading. Using this line of thinking we can also see that, if either of the points moves left or right, the tool's heading will change. This means that you only have to track one point—the front point—to know whether or not the heading is being maintained. Tracking the FP is also faster than sweeping, and you have the advantage of seeing the predicted depth reading there. The predicted depth is a calculation that the receiver's firmware makes to tell you the depth the tool will be at when it gets to the FP. On the Mark III, Mark IV, Mark V, and Eclipse® receivers, just hold in the trigger while at the FP and you will see the predicted depth. Another advantage to tracking the FP is speed—you can track the FP while the tool is moving!



The Snaking Bore

Stop Sweeping—Be like the FP Avenger!

Imagine that you are drilling and that the rod is just about down. You get out there and track the FP. The rod is down, you see where the tool is headed, you take a predicted depth reading, and check the pitch. Meanwhile, the crew is threading up the new rod and there you are, all ready with steering commands. However, being the astute locator that you are, just like the FP Avenger, your steering commands are always minimal. This time your only command is, "drill it in!"

Introducing the EXL—Bridging the Gap Between Butt Splices and Drilling Blind

Keeping up with our customers' scopes of work has led DCI to develop the new Eclipse® EXL long-range transmitter. This battery-operated transmitter is meant for those bores where you just need more signal. To get that, the EXL measures 4 in. (102 mm) longer than most DCI battery-operated transmitters, coming in at 19 in. (482 mm). Its stronger signal requires your EXL's housing to have 13-in. (33-mm) long slots and a DCI SuperCell™ Lithium Battery for optimal performance.

Early reports from contractors in Ireland, Louisiana, and Texas indicate that the EXL may "far outweigh the days of the cable," according to Andrew Catterall, of Thomas Swaine & Sons from Enniscorthy, County Wexford, Ireland. They recently installed three 12.4-in. (315-mm) dewatering transport pipes in Cork City. This project required three separate and parallel bores under a narrow road while running parallel to a telecom duct, a surface water drain, and eight power ducts, which came from the substation adjacent to this narrow road.

The crew used a combination of *Target Steering*® and walkover tracking on these shots, which in some areas had depth readings fluctuating by 11.8 in. (300 mm). Meanwhile, however, both the front and rear locate points were crystal clear, as were the pitch and roll readings. These bores weren't deep,

"Are butt splices really the only way to get this job done?" wonders industry newcomer Matt Mercer.

11.5 to 12.5 ft (3.5 to 3.8 m), so making butt splices seemed like overkill, but when coupled with the interference problems from the underground utilities and the substation, the wireline system seemed necessary. As it turned out, the EXL did the job with speed and accuracy—and no butt splices!

Another contractor, MABAK Directional out of Sanger, Texas, was using the Eclipse® dual-frequency transmitter in Single High mode when they lost the roll/pitch signal at 40 ft (12 m) near a cathodically protected gas line. DCI's Craig Caswell, who was onsite, conducted a current draw test and determined that the slots in MABAK's housing were in fact long enough to accommodate the EXL's requirements. It took only 30 hours of mud motor drilling over 4 days to complete the 2380-ft (725-m) bore.

B & K Underground from Tickfaw, Louisiana, was planning an 80-ft (24-m) deep canal shot with the Eclipse® cable transmitter. Owner Billy McDonald decided to use the EXL, and purchased a modified Vermeer Universal Housing. Even at the bore's deepest under the canal, some locating was achieved. The roll and pitch numbers were robust, however, and as they shallowed up to 65 ft (20 m), the front point guided them confidently into the exit location.

Matt's happy that the EXL is here to get the job done.

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stages to 24 in. (610 mm), and DCI's 100,000-lb (445-kN) TensiTrak™ device was installed into the downhole assembly, which included the new water line. The new water line's recommended safe pull force was rated at 120,000 lb (534 kN) including a safety factor and, given the smooth grass surface it was staged upon, rollers were only used at the entry to maintain a gentle bend into the tunnel. The pullback was halted for 40 minutes to change the drill pipe rack, and when it recommenced, the maximum pull force increased from an average of 18,000 to 22,710 lb (80 to 101 kN). The maximum mud pressure recorded was 7 psi (48 kPa), and this consistently low mud pressure reading may have been due to the three pressure relief holes installed at equal distances along the bore. The project was a success, and since then several thousand feet of USGI's Fusible PVC™ have been installed in Colorado using the HDD method.

In Canada, Avertex Utility Solutions, Inc., out of Orangeville, Ontario, has a little different take on using the TensiTrak™ system. They closely monitor the mud pressure numbers to increase their pullback speed during their HDD installations. For most ground conditions, the faster the speed, the higher the mud pressure and the greater the chance for frac outs. With the TensiTrak™ system, Avertex's proficiency in monitoring the rig's gauges, the pull force, and the mud pressure numbers gives them the ability to safely increase their pullback speeds while avoiding frac outs and maintaining their product's integrity.

DCI Restructures U.S. Field Service

We have recently made some changes in our field service organization to recognize two talented and committed individuals with key placements in the United States.

The first change involved relocating Julian Perez to manage the Midwest region, with Indianapolis as his base. Julian is now covering the following states: North Dakota, Wisconsin, Minnesota, Michigan, Ohio, Kentucky, Indiana, and Illinois. "This particular territory is one of DCI's largest and most active regions in the country," said Mike Young, DCI's U.S. field manager.

Julian's career with DCI began in 1998 on the production line and progressed into customer service. Julian has covered the southern Florida territory and spent the last 7 years in California managing the Southwest U.S.

Julian Perez demonstrates Eclipse receiver operation.

The second change introduces Susan Russell to the field, moving her from DCI's headquarters in Kent, Washington, to assume responsibility as area manager of the Southeast region. With an Atlanta base, Susan will be covering Tennessee, Georgia, Florida, and Alabama, providing field training and dealer support. Susan brings to the field more than 9 years of experience in a variety of key roles at DCI; she officially began this new role in August.

Susan's move into the field exemplifies DCI's commitment to rewarding great work and dedication. "Susan has worn many hats within the organization, most of those in the sales and marketing capacity," said Mike Young. "She has always been interested in a new challenge."

Susan Russell is ready to take your calls in the Southeastern U.S.

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