Trenchless Technology Center Newsletter

JUNE 2014

RESEARCH HIGHLIGHT: Full-Scale Testing of a Partial Compaction Reamer

Recently the Trenchless Technology Center and The Charles Machine Works completed a full-scale field study aimed at evaluating a newly developed reamer technology, named 'partial compaction,' designed to minimize drilling fluid usage during HDD installations in silty and clayey soils. The test plan consisted of drilling five bores (installation lengths of 24 to 260 ft each) and installation of a 9-in. OD Fusible PVC pipe.

For each HDD installation the research team monitored and recorded drilling fluid usage, pull force/thrust and torque during the product pipe's pull back operation, borehole pressure at the pull head, and soil pressure in the immediate vicinity of the bore. In addition, soil characterization, borehole profile, drilling mud characteristics and the durations of the pilot bore, pre-ream and pullback operations were also recorded. The axial pull force applied to the product pipe and borehole pressure at the location of the pull head were recorded using a custom-built load cell (see Figure 1). Changes in the soil's horizontal pressure in the immediate vicinity of the pilot bore were recorded using vibrating-wire earth pressure cells.

Two of the bores (BH #1 and BH #2) featured standard installation practices, where a 3.5-in. pilot bore was followed by a pull-back operation using a 12-in. reamer ahead of the pipe product. In the remaining three bores (BH #3, BH #4, and BH #5), the construction sequence was altered to include a pre-ream operation (using either an 8- or 6-in. reamer), a pigging operation using a 'pigging' device of corresponding diameter, and a 9.75-in. partial compaction reamer. The tensile loads measured at the pipe's product pull head and the mud pressure in the borehole during the pull-back stage for the different bores are summarized in Figure 2 and Figure 3, respectively.

Based on the data collected during the five field tests, the utilization of a partial compaction reamer was found to reduce the volume of drilling fluid used during the pre-ream/pull-back stages by up to 33 percent without increase in the thrust, torque and associated borehole mud pressure. Compaction equal to 1.75 in. of the borehole wall (22 percent of the original borehole diameter) was found to be acceptable, resulting in negligible changes in the soil pressure immediately outside of the bore and no surface fracouts. The increase in installation time due to the pre-ream and pigging procedures associated with the partial compaction method was found to add 0.3 to 0.5 minutes per foot to the total duration of the installation (1.5 to 2.0 hours per 240 to 260 ft long installation of a 9-in. OD FPVC pipe).

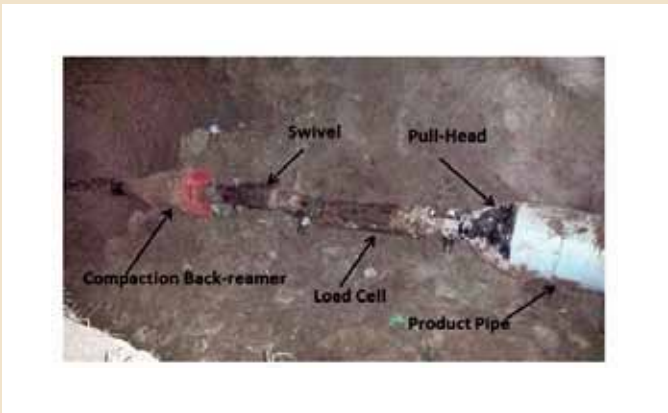

Figure 1. Partial compaction back-reaming and product pullback

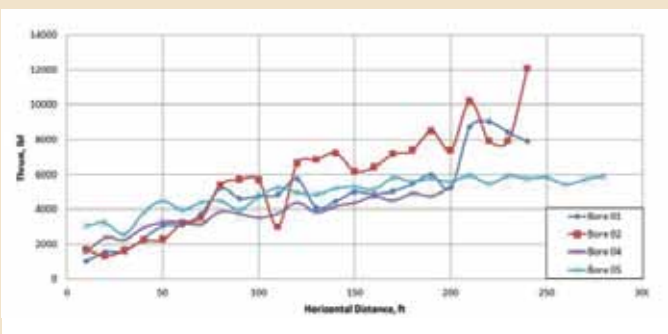

Figure 2: Thrust (lbf) at the pull-head during product pull operation (from load cell)

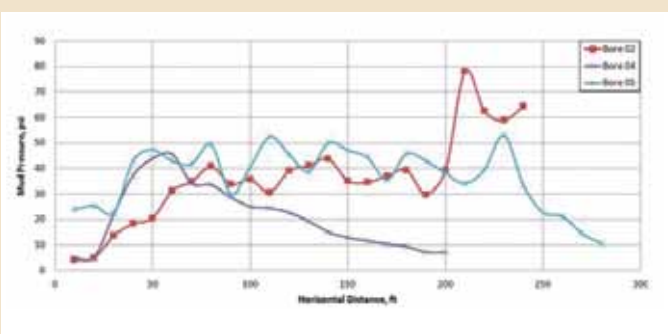

Figure 3: Mud pressure (psi) during product pull

2014 No-Dig: Louisiana Tech Student Experience

The Trenchless Technology Center (TTC) at Louisiana Tech University recently sent a group of five students to the 2014 NASTT No-Dig Show held at the Gaylord Palms Hotel and Convention Center in Orlando, Fla. The students spent four days participating in various challenges and student competitions, attending technical presentations and demonstrations, networking with colleagues and industry professionals, and browsing the exhibit hall, eager to absorb as much knowledge as they could while they were there. They also contributed to the event by aiding the conference staff, selling tickets for the auction, working in the information booth, and monitoring the room for technical presentations.

There were various challenges for the students from different universities during the No-Dig Show, including the Student Poster Competition and The Amazing Trenchless Race (CCTV Competition). Students from Louisiana Tech University and Queen's University participated together in The Amazing Trenchless Race with their team, Trenchlesser. They won the Best Name award and received a certificate and prize from the NASTT committee. Entertainment was provided at the kickoff breakfast and the closing lunch, along with a student chapter dinner provided by NASTT.

In the exhibit hall, students helped man the Trenchless Technology Center (TTC) booth. They worked in groups to represent the TTC, discuss TTC research, interact with visitors, and exchange contact information. In addition, they observed technical demonstrations and learned more about trenchless history through various exhibitors on the floor. NASTT's 2014 No-Dig Show was an excellent learning experience for the students.

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Trenchless Technology Center

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