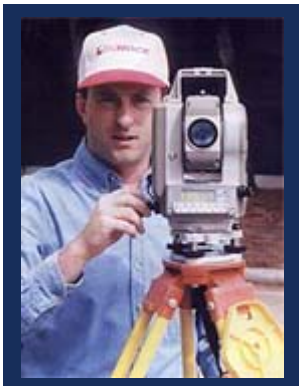
Navigating Bends in Alabama Swampland

by Paul Miller

When the Alabama Gas Corp. gas utility Alagasco needed to complete a 10-in. gas distribution pipeline under the Autagua Creek at Booth, Ala., it discovered a maze of obstacles in a severely restricted right-of-way to make any driller's life miserable.



INROCK's Jay Miller uses an EDM transit to verify the pipeline route in order to optimize the plan of the drillpath.

The site lay more within swamp wetlands than under the creek, The drill-path also crossed under a railroad. However, the pipeline corridor allowed only 10 to 15 ft. either way of the centerline. In addition, the design called for five PIs (points of intersection or bends) in the profile of the pipeline.

Gary Moberley calibrates the steering tool interface which sends navigational data to the driller.

When Sunland Construction Co. Inc. of Eunice, La., received the original pipeline project, it was designed for open-cut construction. Site problems led both Sunland and Alagasco to consider an alternative proposal to install the pipeline by directional drilling.

James Daigle, vice president of Sunland Construction, said they called on the navigation services of ***INROCK®*** **Guidance Systems Inc.**, Houston, to assist in the pipeline project. With the expertise of Jay miller from ***INROCK®***, Sunland was able to smooth the bends and negotiate a successful crossing with a single horizontal curve in the pipeline design. The overall length of the crossing was 2,170 ft.

HOT SPOTS

Tommy Taylor was the Alagasco project manager for the Autagua crossing. Taylor said the pipeline corridor included archaeological sites regarded as "got spots," that would have required separate excavations and sifting. This additional work could have delayed the project which was to serve an industrial customer, and also would have resulted in about $200,000 in additional costs. The wetlands also gave both the owner and contractor cause for sensitivity in handling the environment.

Miller began the survey process by completing a thorough survey of the pipeline route. Using a land survey transit with an electronic distance measuring (EDM) instrument, Miller verified the route, establishing precise locations of the points of restriction in relation to the planned location of the drilling rig.

With the survey completed, Miller was able to map out an alternative pipeline route that eliminated all but one of the PIs. It required a sharp horizontal turn in order to meet tie-ins required for the pipeline.


Sunland's directional drill rig begins the hole-opening phase of the drilling operations.

Sunland deployed an HDD rig with 475,000 lbs of thrust and pullback capacity for the Autagua crossing. The rack-and-pinion drill rig was custom designed and built by Sunland's drilling superintendent Butch Kabala. Soils encountered at the drill site included sand, pea gravel and clay. Sunland used bentonite and mud-handling equipment supplied by Parchem for the project.

GUIDING THE CURVE

In guiding the drilling process, ***INROCK®*** employed a steering tool system with Tracking abilities to provide continuous navigation data. The steering tool is situated downhole in non-magnetic collars behind the motor or jetting assembly and transmits data to the interface unit via a single conductor wire. The information is sent to the driller's console so that constant drill head positioning can be maintained. The tracking grid system aids in determining accurate horizontal location at the launch and exit points of the drill.


INROCK's steering tool system provides continuous updates for the drilling navigator.

Sunland began the horizontal curve at 1,061 ft from the entry point just short of the midpoint of the bore. The design called for a 4.5 degree curve to the left. "We planned the curve to allow a stress factor that was very acceptable," said Miller, "We kept it well in excess of the bend capacities of the product pipe."

Miller identified critical elements in constructing a directionally drilled crossing with horizontal curves. "One item often overlooked is the additional stress induced in the pipeline through the sections of the borehole in which you are building angle and turning at the same time," explained Miller. He said the typical rule is to use a bend radius of 100 times the pipe diameter. Several special formulas and calculations are also used in the design considerations as well as the guidance and tracking, said Miller.

Daigle said they were able to take the drilled crossing on a long slow radius which minimized the pipeline stress. The crossing proceeded without incident and the pipeline was tied in successfully.

"The precise navigation services were certainly essential in ensuring the success of the crossing." said Daigle.