Pipe Assessments through Keyholes
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Dennis Jarnecke - GTI

Pipe Assessments Through Keyholes

GTI researchers are developing a system that can assess the condition of pipes directly through 18-inch-diameter "keyholes."

"There is considerable industry interest in advancing keyhole technologies," explains GTI's Dennis Jarnecke, Senior Engineer. "Consequently, at GTI we've been working to develop a variety of tools that can be used in keyhole operations. This project has the promise of providing a way to determine the condition of a pipe without having to conduct extensive excavations or expensive alternatives."

In this project, under the sponsorship of Operations Technology Development, NFP, researchers at GTI are working with pipeline assessment provider American Investigation and Assessment, Inc. (AIA), to further develop, modify and enhance AIA's Broadband Electromagnetic (BEM) commercial inspection system to allow for its use in keyhole excavations.

"BEM methods can identify and locate metal loss, cast-iron graphitization, and cracks," Jarnecke notes. "However, BEM technology does not require contact with the metal to detect pits and other metal loss. In addition, systems can be lightweight and portable. We expect that using BEM technology over alternative pipeline-assessment methods can reduce inspection costs by as much as 50 percent."

Recent developments using BEM sensors to inspect pipeline systems have proven effective overseas.

BEM technology has been used in the Australian oil and gas exploration industry for many years; and is currently being used in the mineral industry in the search for massive sulfide ore deposits. The technology has since been modified for acquiring detailed information about the condition of surface or sub-surface ferrous pipelines and facilities. Public Service Electric & Gas Corp. was the first utility to successfully use this technology in the United States in 2002 to evaluate the integrity of two critical 30-inch-diameter cast-iron mains in underwater crossings operating at 15 psig, installed in 1914 in Newark, NJ.

In the inspection process, BEM technology induces eddy currents to flow in close proximity to a transmitter/receiver in a ferrous pipe. These eddy currents migrate with time, allowing operators to obtain a complete ferrous pipe profiles. External pipe-wall condition assessments are typically carried out on all types of ferrous pipelines to explore the integrity of the pipe wall. Individual readings are taken along the surface of a pipe. The coating (bitumen, polyethylene, or even concrete) does not need to be removed. With the aid of a temporary marked grid around the outside of the pipe allowing for accurate positioning of each reading taken, the wall can be scanned.

The project began in 2004 with an intensive survey of project sponsors and others in the industry to determine applications and needs for the BEM technology. In early 2005, a prototype tool was developed, modified, and successfully tested at NW Natural, Southern California Gas Company, and National Fuel Gas Company.

Tests of the inspection system are being conducted on various types of pipes at varying conditions and with different coatings to determine the sensitivity and accuracy of the enhanced BEM system. In addition, researchers are developing an array of sensors and long-handled tooling to allow the BEM device to be take circumferential readings through small openings.

Following prototype modifications, field tests will be conducted by gas utilities in 2006 to determine the need for further modifications.

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