

To conduct an acoustic-based test, engineers place sensors on valves and fire hydrants that are connected to the water system and listen for variations.



loss prevention

By Dave Johnston

New Orleans utility quickly located massive leak with acoustic-based detection system

The Sewerage and Water Board of New Orleans (SWBNO) has been using acoustic leak detection for about two decades. But in early 2011, it incorporated acoustic-based leak detection and pipe condition assessment services from Mississauga, Ontario, Canada-based Echologics into its water loss management and water pipe integrity assessment program designed to reduce non-revenue water (NRW). The International Water Assn. defines NRW as water that has been produced and is “lost” before it reaches the customer. According to the American Water Works Assn., NRW costs public water systems approximately \$2.8 billion in yearly revenue.

Mystery Water Flow

As part of its NRW initiative, SWBNO leverages acoustic-based leak detection and pipe condition assessment for a combination of ongoing flowmeter maintenance, distribution network leak detection and transmission main leak detection.

Following the installation of a flowmeter that was repaired by Echologics on a 50-in. transmission main, engineers noticed sudden increases of water flow with minimum night flows that roughly doubled in a matter of minutes. Because significant fluctuations in flow rates typically are indicative of major leaks or significant changes in mainline valve configuration, the engineers informed SWBNO that they suspected a problem.

Echologics engineers were dispatched to investigate the issue. They began by noninvasively surveying smaller mains that branched off of the 50-in. transmission main.

To conduct this kind of acoustic-based survey, engineers place two sensors on valves and fire hydrants connected to selected sections of a water system. Once the sensors are in place, a correlator listens for variations of acoustic signals induced in

the pipe by any of several means, including:

- Flowing water from fire hydrants;
- Physically tapping on appurtenances such as valves; and
- Attaching vibro-mechanical shakers to the system.

Analyzing changes in the acoustic signals enables engineers to pinpoint leaks and measure the effective wall thickness of pipes without breaking ground or disrupting service.

The acoustic-based leak detection system leverages proprietary sensor and signal conditioning technology that substantially reduces electronic “white” noise and ambient background noise often created by running water, traffic or pumps. Unlike traditional leak detection methods, the technology can accurately detect leaks and measure the effective wall thickness of pipe of all sizes and materials, as its enhanced correlator functions dramatically improve its accuracy when it comes to identifying and locating narrow-band leak noise. This capability is especially ideal for water service providers with plastic or asbestos cement (AC) pipes, multiple leak situations and scenarios where there is a large amount of background noise or where leak sensors have to be closely spaced.

The noninvasive investigation revealed the problem: a massive leak on a span of 20-in. AC pipe. The leak was located in a remote area close to a road embankment, but the engineers quickly discovered that this was no ordinary leak—it was a blown-off hydrant leak that was connected to the transmission main. Water was flowing out of the leak into a nearby drainage ditch.

Problem Solved

SWBNO crews immediately repaired the leak and flow rates returned to normal levels.



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TECHNOLOGY EMPHASIS

Echologics compared historical flow data to data collected after the leak was repaired, and the analysis concluded that the transmission main, which regularly flowed at 450,000 gal per hour, had been losing at least 7.2 million gal per day through the massive leak.

“Integrating acoustic-based leak detection and pipe condition assessment technology into our water loss management and water pipe integrity assessment program enabled us to detect and locate the leak. This leak would have likely remained unnoticed for at least six months due to its remote location, and might have continued to go unnoticed until secondary failure of the nearby

roadway occurred,” said Steve Bass, utility services administrator for SWBNO. “Not only did the project help us to reduce millions of gallons of non-revenue water, it probably averted a dangerous and expensive catastrophic roadway failure.”

Undetected leaks, such as the one noninvasively located by Echologics’ engineers, are a significant challenge facing water utilities. While the obvious symptoms of leaks include visible puddles, overall pressure drops, main breaks and what might appear to be sudden rises in water usage or flow rates, the average transmission main leak goes undetected for more than 20 years.

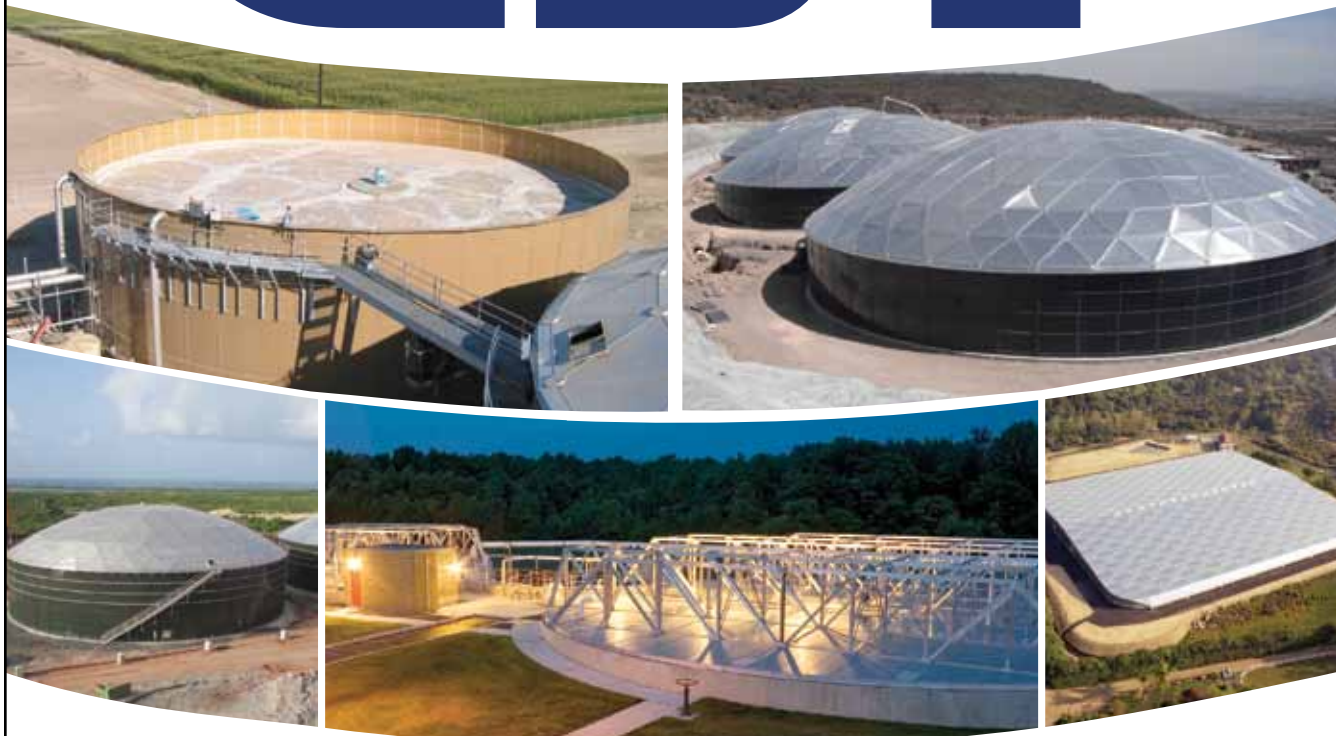
The use of acoustic-based leak detection and



The acoustic-based leak detection assessment pinpointed a massive leak on a span of pipe that was located in a remote area, close to a road embankment.

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pipe condition assessment technology is increasing among water service providers across North America, as well as Europe, South Africa, Singapore and Australia due to its accuracy and cost advantages over traditional methods.

Widespread Use

The Las Vegas Valley Water District (LVVWD) is another municipality that is using this kind of approach. While it has a relatively young water infrastructure experiencing very few main breaks per mile as compared to other major utilities, some of its pipes have started to fail more often due to corrosion and other factors. A particularly troublesome section of pipe was part of a 6.5-mile span of 16- to 36-in. mortar-lined, steel cylinder pipeline underneath some of the city’s most popular thoroughfares.

The pipe was installed in the 1950s without any cathodic protection or corrosion control and had experienced three main breaks over a five-year period. LVVWD expected to have to replace the entire 6.5-mile span of pipe—a major expense that could have cost as much as \$300 per ft and would disrupt busy roadways. By using noninvasive acoustics, however, the entire 6.5-mile span of pipe was surveyed in two weeks, and LVVWD found that the majority of the pipeline was still in good structural condition, as it contained more than 95% of its original wall thickness. Rehabilitation money was therefore prioritized to the areas with the greatest need.

“While constrained budgets continue to present difficult challenges for utilities, they do not have to place their efforts to reduce water loss and prioritize water system repairs and replacement on hold,” said Marc Bracken, vice president and general manager of Echologics. “Recent developments in noninvasive acoustics can provide utilities with the ability to cost-effectively and -efficiently locate leaks and measure the wall thickness of pipes in their water systems without having to undergo the expensive and time-consuming processes typically associated with traditional leak detection methods.” ^{LVVWD}

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