

# Savings By The Million

By Tim Mense & Craig C. Hannah

Colby, Kan.,  
saves water,  
money with  
new meters &  
leak sensors

In the summer of 2011, with a statewide drought in its second year, Colby, Kan., began looking to reduce the more than 100 million gal of water lost annually from leaks in its aging transmission system.

City leaders were considering raising water fees up to 10% when they decided to partner with Johnson Controls, a provider of energy and water efficiency solutions. The company proposed a \$1.78-million project that would detect leaks and create an automated meter reading (AMR) system to accurately read new water and electric meters throughout the 3.3-sq-mile service area.

By enabling distribution system leak repairs and recapturing revenue from inaccurate water and polyphase electric meters, the project would be self-funded with projected benefits of \$2.9 million over the 20-year finance period. There would be no need for higher fees or added taxes for Colby's 5,500 residents and its businesses.

## Pre-Project Study

A pre-project study selected 2010 as a baseline for future comparisons. An American Water Works Assn. water audit, conducted by Johnson Controls, indicated that Colby's water losses were nearly 154 million gal per year. The losses fell into two categories: 117 million gal of real losses (mostly from leaks and breaks) and 37 million gallons of apparent losses (mostly caused by inaccurate meters, reading and billing errors, unmetered usage and unauthorized usage). In 2010, these real and apparent water losses cost the city more than \$94,000.

To reduce the real losses, a total of 584 leak sensors were installed alongside Colby's new water meters. A leak within any pressurized line creates a mechanical vibration up and down the line. The system records those vibrations in the early morning hours, when system pressure is at its highest and both usage and ambient noise are at their lowest levels. The frequency data is both stored and transmitted through the new mobile AMR system endpoints.

## AMR in Action

There are about 55 miles of water mains in the Colby service area. The majority of the lines are metallic, with a small portion of polyvinyl chloride (PVC). In areas with mostly metallic lines, the leak sensors were permanently fastened to the service line with a stainless steel U-bolt immediately upstream of the water meter at every third service along the side of the street nearest to the main. In areas with mostly non-metallic lines, the spacing decreased to one leak sensor for every other service, because the vibrations dampen quickly on those types of line.

The firm providing the leak detection technology analyzes the data, identifies and prioritizes the probable and possible leak sites, and posts the findings to a secure website. Utility staff can then export the list of probable and possible leak sites into either a spreadsheet or a work order management system. The results also are displayed on either a map or a satellite photo of Colby. Probable leak sites are colored in red and possible leak sites are colored in yellow.

Once a repair has been made, Colby staff documents the repair on the secure website, and a blue lightning bolt is displayed near the repair. Tracking the repaired leaks enables Colby to craft a capital improvement plan based upon which sections of line might merit replacement.

It did not take long for the system to show its value. The first leak was detected after only the twelfth sensor had been installed. Mike Albers, technology director for Colby, said that before the sensors were installed, the city knew of leaks only when they grew so large that water finally percolated above ground.

"Each year we will be saving millions of gallons of water, which is very precious in this drought-stricken part of the country," Albers said. "Also, the system will help us determine how to spend our limited resources to get the best results for our investment."

New water meters will help reduce apparent water loss and increase both billable usage and revenue. While the majority of the nearly 2,500 water meters in the Colby system were installed a dozen years earlier during its first AMR deployment, some were found to be more than 40 years old, and the overall weighted average accuracy of the small meter population was 93% accurate. Johnson Controls engineers also ensured that the correct type of meter was installed at each service.

The new AMR system for the electric utility also can read polyphase meters, which was impossible with the previous system.

## Over Time

While Colby is satisfied with a mobile AMR system for now, the Colby leadership had the vision to choose a system that can be migrated into a full fixed-based, advanced metering infrastructure (AMI)



A leak detection sensor on a water pipe



system in the future without any stranded assets.

With new utility meters installed, the city can redirect the \$40,000 it previously had budgeted each year for meter and AMR system repair. Eliminating manual readings of polyphase electric meters will save Colby more than \$7,500 annually. The city also expects to recapture \$55,000 annually from accurate water meters and from repairing leaks and breaks, as well as another \$29,000 annually from having accurate polyphase electric meters.

Rather than postponing decisions when action was needed, Colby officials took the necessary steps to modernize the city's infrastructure. As a result, the city will reduce water losses, accurately bill for utility use and postpone the need to seek higher fees or taxes from residents and businesses—and did so in a way that the improvements will pay for themselves over time, with a performance guarantee. **WWD**

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A crew installs a residential water meter as part of a new AMR system.

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