NOT LOSING WATER IN KANSAS ANYMORE


The city of Olathe, Kan., replaced 34,000 outdated water meters and installed an AMI system to enhance water efficiencies.

City reaps water- and energy-efficiency benefits from new AMI network

By Craig Hannah

Municipalities must make tough choices each year as they manage costs, provide safe drinking water to the community, serve their customers and drive toward meeting important environmental goals. One barrier to achieving these goals is consistent water loss. The economic impact of water loss can be significant, often causing cities to pour dollars down the drain.

The implementation of an automated meter reading (AMR) or advanced metering infrastructure (AMI) system is one way to accomplish many of these objectives while effectively reducing apparent water loss. AMR/AMI systems can improve the efficiency of water distribution systems, increase billable revenue and help build greener communities.

Many municipalities are benefiting from AMR and AMI technology. In fact, a survey of attendees at the American Water Works Assn. (AWWA) ACE11 conference in Washington, D.C., reported a 10% year-over-year increase in the planned or completed deployment of smart water meter systems.

Water Loss Management

Olathe, Kan., is a prime example of a local government that is setting the standard for water and energy efficiency in the U.S. With a population of 125,000, it is the fifth largest city in the state of Kansas. In preparation for continued growth, it sought a municipal water solution to promote cost- and energy-efficiency.

City leadership chose Johnson Controls, an energy services company (ESCO), to implement a variety of energy- and water-efficiency improvements, including the replacement of more than 34,000 water meters as part of an AMI system designed to help Olathe ensure accurate water rates for its citizens. Through Johnson Controls, the utility selected the AquaSense intelligent water management solution from Sensus, which includes the FlexNet AMI communications network.

The new AMI system, the focus of the energy and water program, helped mitigate apparent water losses that were increasing steadily due to aging water meters, according to the city. Coupled with existing water meter reading and billing processes prone to human error, the old infrastructure provided poor accuracy. Thousands of Olathe's small water meters were tested and found to be 85% accurate or less, and many meters had been in service for nearly 35 years.

Through AquaSense, the city is expecting to reduce its apparent water loss, increase billable usage and revenue, lower its operational and maintenance expenditures, and provide superior customer service to its residents.

Now that city workers are able to read meters remotely, human error in the billing process is greatly reduced, and employees can focus on tasks that are essential to providing quality municipal services. The reduction of fuel usage in manual meter reading saves operational costs, and carbon dioxide emissions are reduced because service personnel no longer need to drive to residences to read meters.

Special reporting features are available through the communication network that enable the city to monitor and report on the status of critical accounts, accounts that have abnormally high or low billed usage, and accounts that generate conditional alarms. This ensures the distribution and billing systems remain in peak operating conditions at all times. It also allows the utility an opportunity to provide enhanced customer service, such as promptly informing citizens about potential leaks at their property.

Water Meter Research

The city of Olathe is taking standard water loss management to a new level by going beyond a typical AMI system installation. Helping set an example for other municipalities nationwide, the partnership between Olathe and Johnson Controls includes a research component, which was presented at the AWWA ACE11 conference.

Academics from the Utah Water Research Laboratory (UWRL) and engineers from the ESCO have teamed up to investigate new electromagnetic and transit-time ultrasonic water meters by comparing their performance to traditional mechanical meters at typical residences, using Olathe as the first test site.

Also called solid-state or static water meters, these new technologies previously were impractical for small water meters because of the need for a constant power supply. Developments in battery technology have made static water meters a viable option for accurate water metering.

The driving force behind the research is to determine whether a typical residence would register a noticeable increase in water flow at very low flow rates with a static water meter versus a mechanical water meter. Additional objectives include:

- Understanding if a typical residence with a static water meter versus a mechanical water meter would experience a noticeable increase in billable usage over time.
- Determining if the water and sewer revenue generated through an increase in registration offsets the higher initial cost of the solid-state water meters.

The research process was set up using special tandem water meter setters that enabled the ESCO


As part of a research study at 23 residences, a static meter (top) sits next to a mechanical meter (bottom) in a tandem setting to measure and compare water usage rates between the two meter types.

to install both a static water meter and traditional mechanical water meter at 23 residences in Olathe.

With a new Sensus iPERL electromagnetic water meter on one branch and a new Senus SRII oscillating piston positive-displacement water meter on the other branch of the tandem setter, the assembly was connected to the city's AMI system. This setup supports the collection of hourly usage data and provides identical water flow rates, ensuring further accuracy. The tandem meter setter assembly also was tested at the UWRL and was found to have no effect on the accuracy of either meter.

At the end of each monthly billing cycle, the city provides a billing system extract to the ESCO that includes the hourly usage data for each meter and the date and time of the reading. The ESCO and UWRL actively monitor and analyze this data with the intention of drafting an academic report that will be submitted to AWWA for publication in 2012.

Ten months into the research project, the findings provided notable results. Overall, the electromagnetic meters had registered 2.27% more usage than the positive-displacement meters. At nine of 23 residences, the static water meters registered slightly more usage than the positive-displacement water meters. At 13 of the 23 residences, the positive-displacement water meters registered more usage than the electromagnetic meters. One residence became unoccupied shortly after the experiment commenced.

While the results, to date, indicate that new static water meters may offer no appreciable increase in billable usage compared to new mechanical water meters, this is expected to change over time, as viscous effects and water quality issues negatively affect the accuracy of the positive-displacement water meters. The ESCO recently began a similar study using Badger Meter's Badger E-25 transit-time ultrasonic meters, Badger Model 25 nutating disc positive-displacement meters, and the same tandem setters at 10 residential sites.

Innovative Financing

Olathe's AMI system and water meter research are at the heart of its energy and water program, but a variety of additional energy conservation and operational efficiency improvements were implemented as part of a performance contract.

Performance contracting enables a municipality to offset water loss management improvements from a combination of operational and maintenance savings, as well as from increased billable usage. The ESCO financially guarantees that the utility will realize the calculated benefits, and the ESCO will pay the city for savings not realized in the contract time frame.

Over the course of the 12-year performance contract, the AMI system, combined with other energy-efficiency improvements, is expected to generate more than $17.4 million in savings. The additional revenue will offset other energy-efficiency improvements throughout the Olathe Municipal Services campus, including:

- A solar hot water system for the city's fleet washing station;
- A heater in the welding shop that is fueled by waste motor oil from city vehicles;
- Smart vending machine control systems that operate only when the area is occupied or to maintain product quality;
- Re-commissioned and upgraded HVAC systems; and
- Variable-frequency drives on large pump motors at the city's wastewater plant.

Smart Water Loss Management

Olathe's leadership in smart water loss management is apparent through the steps it has taken to reduce operational and energy costs, improve environmental impact and exercise fiscal responsibility with the community in mind. The aforementioned AWWA survey also revealed that 70% of respondents were in some phase of smart water system deployment, compared to 60% the previous year.

Cities across the country can expect the wave of smart water metering innovation to continue with Olathe exemplifying its benefits. WWD

Craig Hannah, P.E., is development manager, Municipal Utility Solutions Team, for Johnson Controls and volunteers on the American Water Works Assn. Water Loss Control and Customer Metering Practices Committees. Hannah can be reached at craig.c.hannah@jci.com or 806.632.0063.

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