MAINTENANCE PROGRAMS GET ATTENTION

by Ron Melchert

Along with development comes infrastructure expansion that requires maintenance. For some local governments, the hiring of staff to support infrastructure growth may progress at a much slower pace than is warranted. In Auburn Hills, Michigan, rapid growth and development sparked an interest in automated meter reading (AMR) for the water utility.

Consideration of incorporating new technology such as AMR to streamline meter reading, maintenance, and billing efforts proved to be a more practical solution than the alternative, that of adding personnel. The benefits of AMR will likely radiate out to improve other areas of the water utility.

INEFFICIENT METER READING SUPPRESSES MAINTENANCE ACTIVITIES

Auburn Hills was captive to a system whose previous meter-reading activities used three maintenance personnel and 360 man-days per year to collect water consumption data for monthly billing from 4,400 (currently 4,800) accounts, at an annual cost exceeding $100,000.

While 10 workdays per month were dedicated to reading meters, virtually no time was available to produce an unread-meter report and to make repairs to capture those "reads" in time for the current billing cycle. With other pressing issues dictated by development, as well as adding new accounts, many maintenance programs (hydrants, valves, manholes, sewer, and storm), including meter repair and replacement, were suppressed, with at best nominal progress being made. The result was an inefficient system that failed to optimize revenues and the use of human resources to support the water distribution system.

NEW TECHNOLOGY OFFERS A FRESH APPROACH

In the fall of 1999, funding was approved by the city council for the 2000 calendar-year budget to purchase a radio-frequency (RF) AMR system to replace the antiquated touch-read system. In May of budget year 2000, the city opened proposals to consider the purchase of an RF AMR system.

The goal was to enhance the efficiency of water meter reading and utility billing by achieving 100 percent of the water meter readings each month, while reducing the time and manpower required to capture consumption data. By incorporating RF AMR technology into water metering and billing functions, the goal could be, for the most part, accomplished. The savings and reallocation of resources would prove to benefit the utility in other ways.

EQUIPMENT IS PROPOSED

Five vendors responded to the request for proposals (RFP), submitting sealed bids that recommended similar equipment, with a wide range of costs associated with a turnkey operation. Each vendor provided a detailed demonstration of the equipment offered before a review committee made up of two public utilities employees and the manager.

The reading-system equipment consists of a handheld RF receiving unit with cradle for PC-to-handheld communications and battery charging; vehicle-base mounted RF receiving unit; route management software with license for the handheld unit and PC; meter interface units (MIUs), three days of training; and a set of operations manuals.

DATAMATIC FIREFLY IS PREFERRED

The city's review committee unanimously selected the Datamatic FIREFLY AMR System principally because of two essential components.

First, the Datamatic FIREFLY MIU can be connected to read the existing Sensus-encoded meters via a two-conductor wire. Because a substantial number of accounts had existing two-wire connections, installation concerns and costs were minimized simply by replacing the touchpad with the FIREFLY MIU, with no need to enter residential homes to change out wire. This gave residential customers a sense of security while eliminating the need for appointment scheduling and increasing installation productivity.

Second, the Datamatic FIREFLY offers a profiling feature that allows the city to archive water consumption data for up to 74 days when hourly reading intervals are set. This feature can be especially helpful in understanding customer peak use and system need for expansion, as well as in aiding the end-user with information stemming from an unexpected increase in water consumption, possibly because of leaks in plumbing or fixtures.

The city anticipates a payback of its initial investment of $426,500 by the end of the fourth year of full operation, during which year the savings will be close to $433,000.

No other vendor offered these beneficial features to aid in customer service and to settle billing disputes.

INSTALLATION AND OPERATION ARE ACHIEVED

The MIU is programmed to read the existing encoded meter and is placed in the same location as the previous touchpad, with minimal alterations to the exterior of the building. When activated, it begins reading the meter at preset, user-defined intervals. Water consumption data are saved within each MIU for up to 74 days when read in hourly increments.

The reading operation typically requires importing a route from the utility billing database to the route management program. The handheld or vehicle-based receiving units are loaded with the meter-reading route; reads are captured in the field and then uploaded back to the route management program. A file of read accounts is exported to the billing database to complete the cycle.

Installation of the new AMR system began in the spring of 2001. Installations were organized by routes so that monthly reading using both systems could be more easily managed until the change-over to the AMR system was completed. Some obstacles presented themselves that required meters to be changed out because of noncompatibility of older equipment. The change-out of noncompatible meters was viewed as beneficial rather than a setback because the new meters installed were more accurate and revenues were optimized. It took approximately one year to complete noncompatible meter changes and installation of the AMR equipment.

RETURN ON INVESTMENT IS GOOD

The cost of reading meters for a year under the old system (using year-2000 dollars) was approximately $102,304, including wages, benefits, and equipment used. Compounding that cost over a five-year period (2002 through 2007) to reflect wage increases and equipment rental of 3 percent per annum, plus an average 47.5 percent fringe-benefit package, brings the total cost to approximately $578,350 by year-end 2007.

Auburn Hills began realizing savings from AMR in 2002. The city anticipates a payback of its initial investment of $426,500 by the end of the fourth year of full operation, during which year the savings will be close to $433,000. With the new AMR system in place, the cost of reading meters

Figure 1. AMR System Savings

Year	Wages in Man-Days Worked		Fringe Benefits[3]		Equipment Rental[4]		Total Cost		Savings per Year
	18[1]	360[2]	18	360	18	360	18	360	
2000	$2,638	$52,762	$1,253	$25,062	$1,224	$24,480	$5,115	$102,304	$97,189
2001	$2,730	$54,609	$1,297	$25,939	$1,261	$25,214	$5,288	$105,762	$100,474
2002	$2,812	$56,247	$1,336	$26,717	$1,299	$25,971	$5,447	$108,935	$103,488
2003	$2,897	$57,934	$1,376	$27,519	$1,337	$26,750	$5,610	$112,203	$106,593
2004	$2,984	$59,672	$1,417	$28,344	$1,378	$27,552	$5,778	$115,569	$109,791
2005	$3,073	$61,463	$1,460	$29,195	$1,419	$28,379	$5,952	$119,036	$113,085
2006	$3,165	$63,306	$1,503	$30,071	$1,462	$29,230	$6,130	$122,607	$116,477
2007	$3,260	$65,206	$1,549	$30,973	$1,505	$30,107	$6,314	$126,286	$119,971
2008	$3,358	$67,162	$1,595	$31,902	$1,551	$31,011	$6,504	$130,074	$123,571
2009	$3,459	$69,177	$1,643	$32,859	$1,597	$31,941	$6,699	$133,976	$127,278
2010	$3,562	$71,252	$1,692	$33,845	$1,645	$32,899	$6,900	$137,996	$131,096
2011	$3,669	$73,389	$1,743	$34,860	$1,694	$33,886	$7,107	$142,136	$135,029
2012	$3,779	$75,591	$1,795	$35,906	$1,745	$34,903	$7,320	$146,400	$139,080

Total projected savings first year	$103,488
Accumulative to fourth year (pay back)	$432,957
Accumulative to fifth year	$549,434
Accumulative to 10th year	$1,221,971

[1]18 = 1 1/2 days/month X 12 months X 1 person.

[2]360 = 10 days/moth X 12 months X 3 persons.

[3]Fringe benefits @ 47.5 percent of wage average over 10 years.

[4]Equipment rental @ $8.50-per-hour average cost plus 3 percent inflation each year.

over the first five years of operation is projected to be $28,916. The projected savings for real man-hour wages and equipment over the same five-year period (2002 through 2007) using the AMR system is $549,434 ($578,350 - $28,916 = $549,434). At 10 years of operating the AMR system, a projected savings of $1,221,971 is expected (see Figure 1).

RESOURCES ARE REALLOCATED

In the second half of 2001, shortly after the AMR system installation had begun, the public utilities division was able to assign one of the meter readers to other water-system maintenance programs that were being neglected because of lack of personnel and new-development demand on staff time. In 2002, after complete installation of the AMR system, a second employee was dedicated to water system maintenance and another to meter maintenance. The wages and equipment cost savings for the year 2001 approached $17,625.

In 2002, the savings from AMR and from not adding new personnel reached approximately $103,500. The future looked bright, as personnel were redirected to preventative maintenance programs, where $140,000 of hydrant, valve, and meter inventory was available to work with from the previous year's purchase. The inventory was depleted by extensive repairs to gate valves and hydrants, as well as by rebuilding several pressure-reducing valves in 2002 and 2003.

READING EFFICIENCY/ METER MAINTENANCE PROGRAM PROGRESS

The touch-read system that was used prior to the commitment to replace it with RF AMR was time-consuming and labor-intensive. To get billing out to the customers on time, three employees were needed to collect meter readings over a 10-workday period. Reading files had to be exported back to the utility billing database for processing by the 15th of each month.

Consumption information had to be processed, the bill run completed, and bills in the mail by the 25th of each month. Many times, unread meters were estimated until repairs could be made to obtain an actual reading in the following month. Often, accounts would be estimated at minimum consumption for more than a year, and accurate billing was impossible. Cash flow and revenue optimization were hurt.

By incorporating AMR, monthly meter reading is now accomplished in one and one-half days by a single employee. Many unread accounts are repaired and reads obtained during the

reading cycle. Other unread meters are reported after the reading cycle is complete, repairs have been made, and reads obtained—usually within the next week. By the 10th of each month, the completed read file is exported back to the billing program, leaving ample time to prepare bills and mail them, normally around the 21st of the month.

In 2001, 86.8 percent of meters reported actual reads, leaving 13.2 percent of accounts estimated. As we approached full operation of AMR, actual meter reading over 2002 increased to a 99.19 percent average. The first 10 months of 2003 reached 99.52 percent on average, where fewer than one-half percent of accounts were estimated. The goal of achieving 100 percent of reads each month, while reducing the time and manpower required to read meters and bill customers, has for the most part been satisfied.

During the rest of the cycle, the billing clerk has the time to perform account audits and to reconcile conflicts or inaccuracies. The meter reader spends the remaining two weeks after reading and repairs in performing new-meter installations and old-meter change-outs, responding to high-consumption complaints, and doing final reads. The profiling feature is helpful when meeting with customers to settle billing complaints, and helps customers to understand their consumption habits. An organized meter maintenance program is evolving, thanks to the efficiency of AMR.

HYDRANT AND VALVE MAINTENANCE PROGRAMS ARE ESTABLISHED

As Auburn Hills develops, several thousand linear feet of water main and hundreds of fire hydrants and valves in gate-well structures are being constructed and dedicated to the city for public use each year. This infrastructure must be managed and included in preventative and corrective maintenance programs.

In 2002, after complete installation of the AMR system, a second employee was dedicated to water system maintenance and another to meter maintenance. The wages and equipment cost savings for the year 2001 approached $17,625.

These programs were understaffed and becoming more and more difficult to administer. Until AMR became operational, available maintenance personnel were able to tend to system needs only as an unstructured program, with insignificant progress.

Since AMR, two of the previous meter readers are now dedicated to a tech team that specializes in PRV, gate valve, hydrant, and booster station maintenance on a regular basis. The result is a water distribution system that is reliable and performance that is well understood in terms of daily demands like maximum day and peak-hour use.

The tech team is a valuable component of the maintenance program. Its members possess the required knowledge and have responded to system needs by providing information and recommendations that have redefined pressure districts and infrastructure improvements to better serve the community.

CONCLUSION

With the adoption of AMR technology, Auburn Hills will receive a payback, or return on investment, of $433,000 by the year 2006, and savings to the water fund in excess of $1.2 million by the year 2012. With capital improvements—including a 1 million-gallon water tower, radio-frequency SCADA telemetry installation, and water main replacements planned over the next several years—the savings will help to cushion the blow of anticipated expenses.

Future expansion of the water system may require additional personnel to maintain a high-quality water supply adequate to meet daily demands, expected services, and emergency response. With the advent of technology such as AMR, utilities can minimize personnel expenses and allocate resources to meet system demands efficiently. PM

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PM Third Annual Swimming Pool Issue

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If you serve in a community that provides a public pool for its citizens that has not already been featured in the magazine, and if the pool is distinctive in style, structure, operation, location, cost, or other management aspect, share this information in *PM*.

Send a 250- to 500-word description telling why the pool is distinctive to *PM* Editor, ICMA, 777 N. Capitol Street, N.E., Suite 500, Washington, D.C. 2002-4201; e-mail is preferred, at bpayne@icma.org. Electronic photo files in high-resolution PDF format are welcome. The deadline for information is August 16, 2004.