

Manheim Borough Authority



15 East High St Manheim, Pennsylvania 17545

WATER METER PROJECT REPORT

By David L. Fenicle- Manheim Borough Authority Operations Manager

Background

Manheim Borough Authority (MBA) is a small water and wastewater Authority supplying approximately 3,000 water and 2,300 wastewater customers in the Manheim area. The area of service is the Borough of Manheim and portions of Penn and Rapho Townships, Lancaster County, Pennsylvania. MBA produces approximately 600,000 gallons a day average of water with a plant permitted capacity of 1,063,000 gallons. In October of 2008, the Authority Board recognized the high rate of failure with its water meters throughout its system. The repair and replacement of the existing meters were extreme and causing budget shortfalls. After some investigation of meter failures, it was determined that the cause of the failures was due to age and scaling from an unknown sandy substance inside the metering chamber. The meter failure was not only affecting the operations and maintenance costs, it was directly influencing revenue and expense reports. The production to point of sale reports was showing a 50% loss in

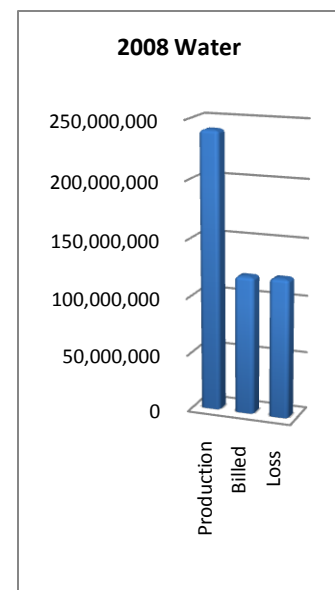


Figure 1 2008 Production Loss Chart

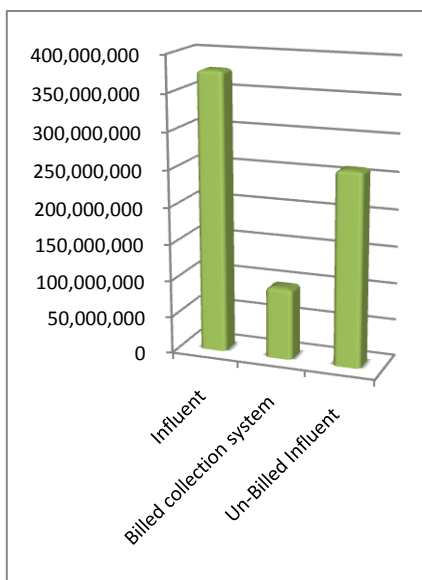


Figure 2 2008 Wastewater Treatment

water revenues. (Figure 1). Not only was the revenue of water affected, but it was also causing shortfalls in the wastewater revenues. (Figure 2)

The Authority was faced with two problems to correct. One, to replace all of the meters in the system; and two, find the cause of the sandy scaling in the distribution system.

The sandy scaling was a priority; however after determining that it did not pose a health risk or

regulatory risk the Authority turned its focus toward metering technology and its recent design advancements.

As meter research began, testing revealed the source of the sandy scaling to be Calcium Chloride. This substance is a consequence of the type of water source and water treatment process. Finding the cause of the scaling at this juncture meant that the Authority could address both issues simultaneously.

The research on meter technology found meters with no moving internal parts (fluid oscillation technology) and traditional meters with internal moving parts. Extensive research determined that a large part of the industry was already focusing its attention, and diligently working on, fluid oscillation technology for residential water meter service. The research uncovered that one company was already producing this type of meter, and was on the market in the residential water service for over fifteen years. The study also found that two other major water meter manufacturers were preparing to release their version of a residential fluid oscillation water meter in the very near future.

The need for accurate metering data over the range of actual domestic household water was very important. The Authority was facing a 100% rate increase over the next five years, due to a loss of revenue from the prior year, and new wastewater discharge limits, as a result of the Chesapeake Bay, EPA and Pennsylvania DEP requirements to embark in a wastewater plant upgrade costing \$11 million.

Approach

The Authority contacted meter manufacturers to gather information on types of residential meters available. Once we established the players we were able to contact the suppliers and request information and demonstration of a meter available that would fit our needs. The suppliers volunteered to participate in a trial period for us to test meters throughout our system.

The goal was to evaluate accuracy, reading technology, and functionality. We supplied an example of a failed meter and meter chamber for illustration. All suppliers were asked if they felt that the condition of our meter chambers were a concern. What issues they would foresee, if they would be the provider of meters for our system. Current meter standards include performance and specifications under normal water conditions, but data was not available on performance and durability under severe water conditions like ours. However the fluid oscillation technology had data from severe operation such as in the oil fields, this type of condition was much more extreme than we needed. The fluid oscillation meters are designed to function properly regardless of containments or sediments in the water supply and

can accurately varying levels of water quality. The suppliers of the mechanical moving part meters were concerned with the scaling and particulates, and requested that we solve the scaling and particulate issue before we install new meters.

Altogether we were able to test twenty meters, representing four different manufacturers. Meter bodies were either brass or polymer. The primary element of each meter was a fluid oscillation, propeller or an oscillating piston, and the secondary element was either a generator or a direct-reading register head. In addition we were looking for meters that were equipped with interface systems designed to meet the demands of the future advanced metering infrastructure (AMI) projects.



Severn Trent (Elster AMCO) Smart Meter

Water quality was also a priority and finding the source of the sandy scaling ended up easier than we anticipated. Reaching out to other water company's and authorities outside of

Pennsylvania with similar problems, we were able to give a chemical name to our sandy condition (Calcium Chloride) this is attributed to the ground source water supply containing Calcium (hard water) which is attributed to the high limestone mineral content in our aquifer, this is indigenous in our region. The Chloride is a byproduct of Chlorine. The Authority uses Chlorine for the disinfection of its water supply. The catalyst to the Calcium and the Chlorine was when the Authority upgraded its water treatment plant in 2001. We installed an Air Stripper as part of treatment. An air stripper removes volatile gaseous compounds (VOC) dissolved in a contaminated water stream and transfers them to an air stream.

The determined course of action was to utilize a sequestering agent. With help from the Authority's Engineer (Yves E. Pollart, PE BCEE, Vice President, Rettew Associates) we requested data and specifications on sequestering agents to sequester and remove the Calcium Chloride in the water distribution system. After research the recommended product was from Aqua Smart Inc. (makers of SeaQuest). We submitted the permit process for Pennsylvania DEP, installed the equipment in February 2010, and were authorized in March 2010 to administer the sequestering agent. The SeaQuest was introduced at a specific location, after filtration in the water

treatment plant. The dosing that our system required was approximately eleven pounds of sequestering material per 700,000 gallons of water.

Results

The Authority determined the need for new water meter technology with added treatment to the water system. The process was relatively a fast process. The Authority authorized the Engineer to write a bid to incorporate new water meters with a radio read system that read the entire system daily (*Figure 3*). We also wanted technology that had the capability

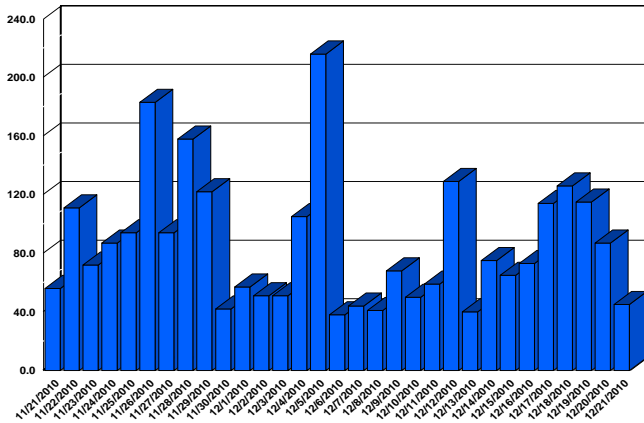


Figure 3 Actual example of water usage chart

for leak detection, high/low consumption usage, and tamper notification. (*Figure 4*)

The bid included meter replacement (residential), reading technology system wide (AMI), software, transmitter equipment, and dual flow check valves. The bid was available in late 2009, awarded in early 2010 and installation started in the spring of 2010. The bid was awarded to Delta Engineering Inc. the manufactured meter equipment was the Severn Trent Smart Meter (Elster AMCO), reading equipment or AMI technology is KP Electronics Inc. The project was financed using a commercial leasing option. The term was a seven year lease; first year deferred, allowing the meters to be installed before the lease payments start. The amount of the lease was for a total of the entire project. The total bid project cost was \$1,071,000; however project completion total came in at \$1,041,000.

To date, the Authority's revenue increased by an average of \$42,000 per month.

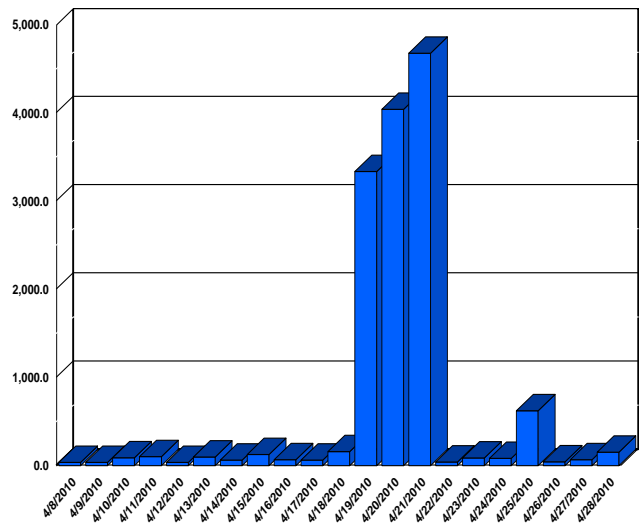


Figure 4 Actual example showing leak detection



KP Electronics AMI equipment

Debt service on the meter replacement project is \$204,000 annually. With the replacement of the meters, we re-evaluated the previous rate study. The meter project allowed us to go from a 100% projected increase over five years to a 60% rate increase. The information that is now provided by the new meter technology also allows the Authority to have accurate

accountability of the water and wastewater. The new technology has been instrumental in locating leaks, inflow and infiltration. The Authority has not had a full year of readings; however the amount of water loss has reduced by 10% as of 8/31/2010. The original numbers at the beginning of the study reflected an allowable acceptable water loss of 16% in the complete water distribution system.

The sequestering agent was installed and has been in operation since the early spring of 2010. The results are favorable. We are already showing signs of reduction, and loosening of the Calcium Chloride in the distribution system.

Conclusion

The Authority board has been very supportive in allowing the staff to implement the new meter project and sequestering agent. With the increase in revenue and the accurate accountability, the board sees the value in the new meters project.

With newer technologies on the horizons, it is very important to review the type and condition of the metering system. We feel that it makes perfect sense to evaluate metering equipment every ten to fifteen years. The new meter technology we purchased has some service maintenance requirements. The battery

*(2010 Report Card for Pennsylvania Infrastructure)
“Public water systems should introduce Smart Technology to water metering. Water meters are the direct link between the distribution system, the consumer and the billing department. Over time, the meters begin to wear down and allowed unbilled water to pass by the meter without being read. Estimates for a current meter replacement program from the Manheim Borough Authority in Lancaster, Pennsylvania, show that they could be under-billing customers by as much as 35 percent due to slow meter readings. With the advances in metering technology, and the introduction of meters without moving parts, customers can be more accurately billed for the water they use and distributors will be better able to track water usage to determine the presence of a leak. Proper billing can help reduce the funding gap without an official rate increase.”*

life on AMI equipment is ten years while the meter battery life is fifteen years. Meters are the cash register of the Authority, therefore it's vital to have accurate metering. Accurate metering also helps in customer confidence and allows us to help our customers understand how to conserve and manage their water consumption. Now that we have the new meter and AMI system in place, billing questions regarding consumption are easily explained. Another benefit with the AMI system is that it allows the utility to be flexible in the frequency of billing customers. In the MBA's system we bill by quarters, sending bills monthly. As a utility we recognize the challenges to have a steady revenue stream; however the AMI allows even more options of billing. In 2009-10 the Authority took the approach to be proactive with technology. Billing software, meters and AMI is the key to a strong building block of all Authorities. ■

Manheim Borough Authority ♦ *15 East High Street* ♦ *Manheim Pennsylvania 17545*