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Tienken Road Reconstruction

Talk Data To Me:

How Oakland County Harnesses Big Sewer Data with H2Ometrics

Kalamazoo Road Commission

Kalamazoo Township Local Infrastucture Three Year Plan

Talk Data To Me:

How Oakland County Harnesses Big Sewer Data with H2Ometrics

BY LORI BYRON - ANN ARBOR, MICHIGAN

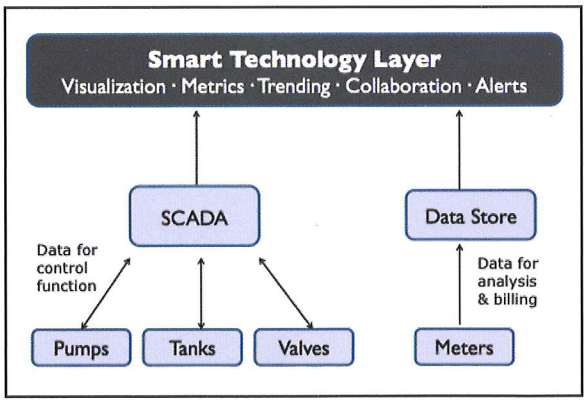
In July 2015, the Oakland County Water Resources Commissioner's Office (OCWRC) went live with a new tool aimed at transforming data management in the water and wastewater utilities sector.

The rise of cloud computing and the web as a distributed application platform offer utility operators the chance to manage their systems, right from their smartphones. Applications like H2Ometrics promise to help utilities improve the accuracy of billing, better manage demands to reduce overall costs, and prioritize infrastructure repairs to stretch limited funds, extending the life of the system.

THE CHALLENGE: THE PROMISEES AND THE REALITY OF BIG DATA

Big Data is being touted as a game changer for everything from healthcare to government, but there is a catch. Generating value from operational and customer data is much, much harder than you'd think.

For one thing, there's just so darned much of it. Data is now being measured in zettabytes (that's 1,0007.) Technology research firm Gartner predicted that "through 2017, 60 percent of big data projects will fail to go beyond piloting and experimentation and will be abandoned."



Smart applications like H2Ometrics monitor and analyze huge amounts of data, boosting effeciency and productivity for users.

Consulting giant Bain reports, "many large organizations are already drowning in data, much of it held in silos where it cannot easily be accessed, organized, linked or interrogated."

That's the case with many large utility operators, like Oakland County, which provides water and wastewater services for 25 member communities, serving nearly 700,000 people. Reviewing and analyzing data from more than 240 devices – flow meters and rain gauges – with multiple measurements made by each device every few minutes, collected over 20-plus years, created more than a billion data points.

Until recently, the available tools, even custom-built applications like the one that Oakland County commissioned and used for nearly two decades, could not manage data quickly, easily or produce insights that operators could use to make better decisions. Cumbersome spreadsheets and slow data transfers were a concern for staffers.

It's a challenge that Robert Czachorski, PE, co-founder of H2Ometrics, was excited to tackle. "Big data holds so much value for system operators, but most of the time, it's trapped, with no way to extract the right information to make timely decisions. The advances in technology make it possible to know minute-by-minute what's happening in your system and to spot trends over time."

CUSTOMER COLLABERATION - REAL TIME

Oakland County uses H2Ometrics for wholesale billing, system operations and data analytics, primarily on the sewer side.

Let's take a closer look at billing, one of the most important applications for the county. Oakland County accepts sanitary sewage from 25 communities and calculates charges using flow-metering data. Many large systems are moving to meter-based billing because its increased accuracy is useful in changing behavior in consumers, incenting conservation and asset management in wholesale customers.

Tim Prince, PE, manages the operations and maintenance of local sewage disposal systems, local water systems and sewer retention treatment facilities for Oakland County. "We're managing large amounts of data. Data-based billing can be very labor intensive. For our system, it's fairly complicated. We handle a lot more diverse information with such devices as meters, rain gauges and level sensors. It is far more extensive than what is handled by most municipalities. Likewise, the people needing

access to that data are magnified significantly. Our 25 municipal sewage disposal customers all have an engineer and/or a Department of Public Works (DPW) Director to scrutinize the bills. The challenge was, how do we make that data readily available to our customer communities?

"Before H2Ometrics, when we'd get a question or a request for a piece of information, asking what happened on a certain day in a certain district, we'd download it from our system, and then post it on an FTP site, where the customer would download it. It was pretty labor intensive and cumbersome. It could take a couple of hours just to resolve a question."

"Now, our customers have direct access to all of the data for their community. They just pick the data and time period they want to look at and there it is. They can see usage trends or track down a potential problem right away."

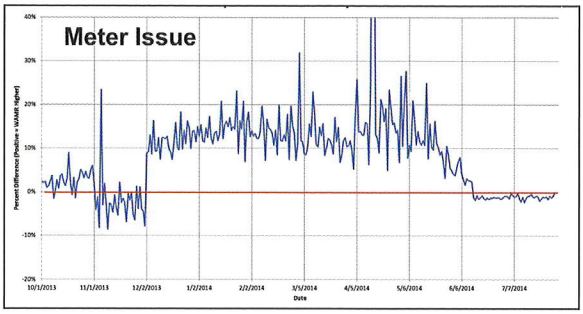
MAKING THE MOST OF METERS

Meter-based billing for water is the industry standard, but for sewer services most entities still charge customers based on water usage or number of buildings connected to the system. The meters, which must be placed directly into the sewage flow, are vulnerable to corrosion, rocks, rags and other debris.

Because of these hazards, the data produced by the meters requires a three-step process to use:

1.) 'scrubbing' to monitor meter performance,
2.) editing to ensure accuracy and correct drops, and
3.) analysis and manipulation to prepare the bills.

Czachorski points to H2Ometrics' annotation system - the ability to mark a section of data and add a description and comments to the tag – as a feature that promotes confidence and collaboration between system owners and wholesale customers. Multiple users look at the display and can add comments to any tag, facilitating cloud-based collaboration around the data. "This is being used in the meter-based billing system to flag issues in the data and log comments for what caused the issue and how it was corrected, for example."Correcting data when a meter malfunctions is more complex than it seems. Because the data is used for billing, the editing must use the best substitution processes available and provide confidence to the municipal customers paying the sewer bills that the edit is accurate. For example, sanitary sewer systems behave differently during dry periods than during wet periods. H2Ometrics has several tools to make dry-weather and wet-weather edits.



Graphs alert users of meter issues, preventing customer overbilling.

"With our old system, it's a manual process," says Prince. "There's a lot of meter math. Right now, Oakland County is paying a consultant to do that for us on a quarterly basis. We had limited ability and couldn't seasonally vary. A lot of editing was done manually especially during wet weather conditions."

Creating the billing for the county's 25 wholesale customers was a multi-step chore that took hours to complete. To calculate the bills for each customer, there are at least 10 different steps, previously done in complex spreadsheets. H2Ometrics promises to reduce the effort required for billing by more than 75 percent.
"We're still integrating the new system, but when we start using H2Ometrics to do the billing it will be much quicker, automated, and ultimately will result in a cost savings," says Prince.

MANAGING DEMAND TO REDUCE COST

Utilities across the country are under pressure to practice demand management to conserve resources, reduce operating costs and postpone or avoid capital costs. Implementing load management arrangements, like peak hour limits, are effective because they motivate customer communities to use local storage to manage demand efficiently, rather than building larger systems.

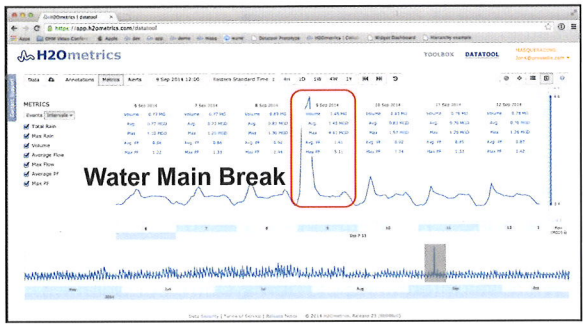
While Oakland County is primarily using H2Ometrics for sewer management, Prince is using the tool for one of its wholesale water customers, the City of Farmington Hills. Farmington Hills, which gets water from the newly formed Great Lakes Water Authority, has a contract provision that penalizes exceeding peak flow limits. Farmington Hills uses local storage to stay below the contract limits.

A number of H2Ometrics features are designed to track and manage usage levels. "H2Ometrics can alert us to high flows which could indicate a water main break," says Prince. "We can set up alarms on our phones that alert us if the flow falls below a certain pressure, which can indicate a control problem."

TALK DATA TO ME, CONT.

To emphasize the kinds of problems that system operators faced before tools with real-time alerts became available, Czachorski tells the story of two communities that shared an emergency relief valve connecting the cities. The valve was installed so that one city could provide water services to the neighboring community in an emergency.

"Maintenance personnel accidentally left the connecting valve open and it wasn't found for five years. One city had to pay the other more than $5 million in fees to offset the increased water bills. A real-time monitoring tool like H2Ometrics would have alerted the operators to the increased usage within hours, not years."

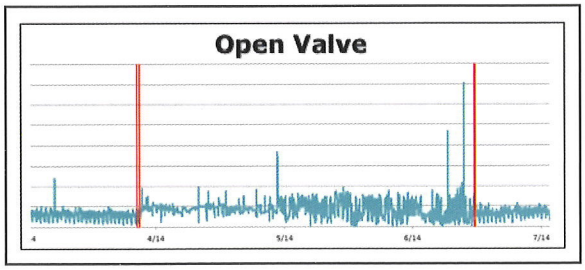


A spike indicates a water main break, which sends an alert to an operator's smart phone.

ASSET MANAGEMENT AND SYSTEM IMPROVEMENT PLANNING

Cash-strapped utility providers strive to stretch limited funds with asset management. However, the expanse of infrastructure and its individual components make it difficult to prioritize. You can't manage a billion data points on a spreadsheet effectively – it's just too time consuming.

Czachorski says recent technological advances allow tools like H2Ometrics to quickly process large volumes of data over the web, providing analytics that operators can use to determine their system's condition.



Noticing an open valve in minutes rather than days can prevent the loss of millions of gallons of water.

Faster processing power means creating actionable output from the vast and complex database of measurements.

Two regional sewer districts within Oakland County, the Evergreen-Farmington Sewage Disposal System and the Clinton-Oakland Sewage Disposal System are under Michigan Department of Environmental Quality (MDEQ) consent orders to reduce the risk of sanitary sewer overflows and basement flooding.

"Oakland County is using our metrics tool that gives analytics for things like rainfall and groundwater infiltration. Most systems don't compute the analytics because it's very labor intensive, but H2Ometrics does it almost automatically. One analyst can track this for a few hours a month," explains Czachorski.

The sewer metering and rainfall data is valuable in understanding system performance, preparing models of the system and recommending improvements to correct any problems found in the systems.

SECURITY AND PERFORMANCE

Security is a major issue for government entities as well as the private sector. H2Ometrics' relies on cloud computing and its software-as-a-service model. While some have raised concerns about data vulnerability, Oakland County representatives felt confident about moving to the new platform because of strict security and redundancy.

Czachorski explains, "We access the data as one-way, read only. We never get access to the 'control layer,' so it's impossible for us to affect the utility controls. We use the same encryption used for on-line banking or credit card transactions to encrypt the data in the browser."

"We have our own quality records and we back-up our data and store copies on our own server," says Prince. "Plus, we put provisions in the contract to protect us and our data."

WE HAVE THE TECHNOLOGY

"Limited funding and resources make it difficult for governments to invest in infrastructure. Fortunately, technological advancements like cloud computing and powerful web browsers are leading to breakthrough new tools to harness big data for a better, faster, stronger government.

See Oakland County's H2Ometrics application live at: https://vimeo.com/135012741. For more information, visit www.H2Ometrics.com