SPECIAL REPORT

Water Distribution Reimagined

How Water Intelligence Is Optimizing Operations & Project Prioritization

WATER FINANCE & MANAGEMENT

MUELLER

EDITOR'S NOTE

A New Way of Thinking About Water Management

Since the beginning of the COVID-19 pandemic in the United States, virtually every industry has been working to deal with the ongoing crisis while preparing for the true long-term impact. While this is certainly the case in the water utility sector, there is a "glass is half-full" perspective.

If you work in the water industry, you will likely know that technology has been a major theme in recent years, particularly on the water distribution side. There are magazine articles, webinars and presentations at conferences all focused around digital technology, artificial intelligence, machine learning, etc. Network communication and real time data about a water utility's distribution system are no doubt transforming the field. Technologies are also becoming more affordable, and therefore more adoptable, for cash-strapped and notoriously risk-averse water utilities.

There has been a lot of talk this year about how technology will play a role in moving on from the coronavirus pandemic, while also helping to prepare the industry for the next crisis. In this exclusive, complimentary eBook from *Water Finance & Management* and Mueller, we examine some of the major advancements in water tech – from leak detection to pressure and quality monitoring – and how they are being adopted and applied by utilities right now, and how they can help the industry to continue to reimagine water distribution.

Thanks for downloading – enjoy!

Andrew Farr
Managing Editor
Water Finance & Management

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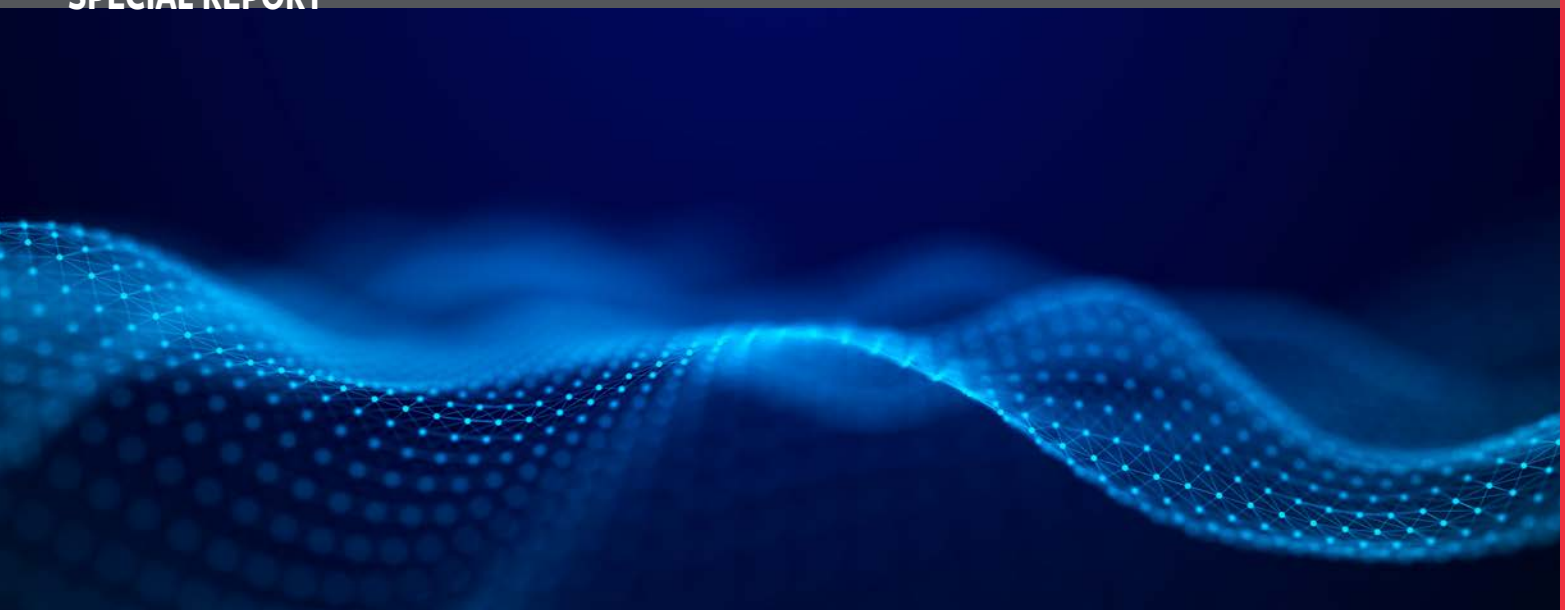


Stream of Innovation

A Look at Technology, R&D and Current Drivers for Change in Distribution System Management

By Andrew Farr

The water utility sector is frequently taking the temperature on innovation. When it comes to drinking water, there are important matters of public health at stake. So, with all the new advancements flooding the marketplace, it's interesting to examine how developments in distribution system management are being adopted and applied. What better time to examine this than in 2020, when utilities – like so many other industries – have been put to the test in the face of a crisis that has affected them from both an operational and economic standpoint.

The COVID-19 pandemic is the most recent crisis to challenge utilities. Many utility workers have been forced to work remotely, while other essential personnel who must remain in the office, at treatment plants or in the field, have had to take new precautions with regards to social distancing. Moving forward, most, if not all utility managers, will be thinking about the longer-term issues as they continue to grapple with the current crisis. Utilities must improve their workforce and infrastructure resiliency in order to reduce their vulnerability to recurrence of a pandemic or a similar crisis.

Technology: A Critical Investment

The coronavirus is yet another reminder of the critical role that drinking water and wastewater systems play in protecting public health and safety, and supporting the social and economic well-being of communities. In fact, readily-available digital technologies that did not exist a decade ago can help utilities address their major pain points and drive significant economic and environmental improvements right now. Remote monitoring and control of processes can help to ensure critical infrastructure remains in service when staff are working remotely.

Writing for *Water Finance & Management* in April, former utility leaders and industry experts George Hawkins (former DC Water CEO and general manager) and Andy Kricun (former CEO of chief engineer of Camden County Municipal Utilities Authority in New Jersey) identified three important themes that would arise as areas of opportunity as a result of the coronavirus pandemic. Hawkins and Kricun note that resilience, workforce and affordability will be key areas in which utilities can and should focus on now and in the future.

Kenji Takeuchi, senior vice president of technology solutions for Mueller Water Products, has a similar perspective and says COVID brings technology resilience in the water sector to the forefront.

"Having the ability to do remote workforce management, remote monitoring through sensors and through wireless platforms shows that technology can help mitigate these types of risks and pain points," he says. "Because of the crisis, we're starting to see the use case and the value of having the technology information without having to physically be there, become top of mind for water utilities," noting that industry studies on digital technology back up the trend.

One of those studies came from Bluefield Research in January 2020, which reported that over the next decade, annual capital expenditures for digital water solutions in the United States and Canada will rise from $5.4 billion (USD) in 2019 to $10.8 billion by 2030. The report suggests that the projections set the stage for more advanced monitoring and management of critical infrastructure.

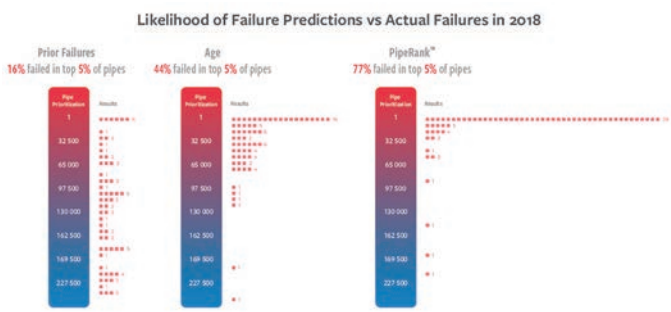
According to Bluefield, the forecast is an encouraging sign that more and more utilities are recognizing the potential for digital technologies to transform their operations and mitigate the risk of failure during a crisis event, while providing financial resilience.

Day-to-Day Utility Operations

While the COVID-19 pandemic has intensified the discussion around the importance of resilience, emergency planning and taking advantage of the most advanced systems to help manage water operations, it's important to remember these challenges did not just arise. Rather, utilities are tasked with these operational challenges every day – many of which have financial implications for both the utility.

"For a municipality or any one of our customers, it's all about how [technology] can help drive a better focus on utility spending, a return on that investment, and how it can help them run more efficiently and spend money in smarter ways," Takeuchi says. He explains that digital products drive efficiency in specific areas like addressing aging infrastructure of pipes and valves in a water network, and helps utility personnel prioritize repairs, replacements and how the workforce is utilized.

One piece of technology that in many ways exemplifies this on the water distribution side is the PipeRank™ virtual condition assessment which enables water utilities to get visibility into pipe failures before they happen. Historically, desktop condition assessment technologies relied on engineering judgment and linear or survival models that assumed degradation factors for pipe failure prediction. The PipeRank machine learning technology leverages on-site specific historical failure data and identifies causal factors for failures that are unique to each pipe network. The end result is an accurate prioritization of which pipes will likely break next. The utility can then focus their pipe repair program accordingly and avoid or minimize costly emergency repairs.



This figure compares the output accuracy of: Prior Failures, Age Based and PipeRank™ machine learning models for a utility in the Southwest.

The figure above shows a comparison among prior failures, age and the PipeRank machine learning model for a utility in the Southwest United States. In this example, each model was conducted using available pipe construction, historical failures, environmental information, and was used to prioritize all the pipe segments from most to least likely

to fail. The red dots in the diagram represent actual failures in the year following the modelling analysis.

The PipeRank model correctly placed 77 percent of the actual pipe failures in the top 5 percent of pipe segments most likely to fail. This compares favorably to 44 percent for the Age Based model and 16 percent for the Prior Failures model. The ability to define and predict which pipes will fail offers exciting opportunities to manage pipe networks more efficiently with better levels of service.

Artificial Intelligence and Where R&D Could be Focused

According to Bluefield's January report, the fastest growing technology segment in the water industry is in Information Management. The report notes that the accelerated growth is driven by the increasing flow of data from all utility departments (e.g. customer service, operations, finance) that needs to be collected, organized and leveraged for analysis.

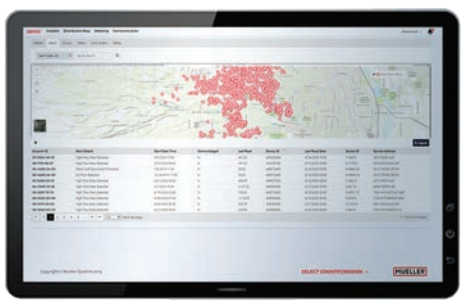
Larger utilities are also turning to artificial intelligence to address network and customer challenges including water loss, aging infrastructure and unforeseen climate events. Bluefield's forecast finds artificial intelligence (AI) technologies represent significant market opportunity with a $6.3 billion projected investment by 2030.

Takeuchi says AI is an area of opportunity for the water utility sector, which he thinks is just scratching the surface on AI/machine learning potential.

"The very foundation of what Mueller is investing heavily in is a software and data platform that allows us to give machine learning insights," he says, referencing Mueller's new Sentryx™ Water Intelligence platform. Sentryx has the ability to collect and display data and give insights on sensor-reported data throughout the distribution including pressure, flow, leak alerts and water quality data like chlorine levels, pH levels and temperature.

Takeuchi reiterates that it's all about prioritization. With Sentryx, he explains, utilities can prioritize assets, workforce and detect and predict events like leaks and monitor the condition of infrastructure.

"A lot of the use cases for AI in the water industry are about understanding the network – so we can understand many things like the pressure, condition of the pipes, or for demand/usage planning," he says.



Water Meters

"To create an AI approach to managing your water network, you have to be able to model your water network as accurately as possible, in a hydraulic model or digital twin. It's almost impossible to have a perfect model based on having an infinite number of sensors in the network. So, AI could be helpful in helping [utilities] estimate, predict and gain insights about what is going on in the water network.

For the generally risk-averse water utility sector, Takeuchi predicts adoption will soon accelerate at a faster pace.

"Compared to where we're going to be, and compared to the acceleration we're going to see, we're just at the beginning. I expect there to be an exponential acceptance beyond where we're at now," he says, pointing to other industries that have allowed technology to advance further.

"Whether it's the power industry or even oil and gas, you can see that the technology has advanced further and the value [those industries] are getting is clear," he adds. "There's no doubt that same value we're seeing in other industries will apply to the water industry."

Andrew Farr is the managing editor of *Water Finance & Management*.

Super Hydrants!

Merging State-of-the-Art Hydrant Performance and Data Integration

Fire hydrants have gone digital. It's an interesting subject considering the average person probably doesn't think much about hydrants other than to avoid parking their car in front of them. But in the water utility sector, Mueller is taking hydrants to the next level.

Throughout this eBook we will discuss water network data and analysis, and how integrating into a single platform to aid decision making is changing distribution system management. We'll look at this from the standpoint of the previously mentioned Mueller Sentryx™ Water Intelligence platform, which integrates this data to provide utility operators with insights and analysis about what is happening in their distribution system.

The hydrant with new digital capabilities – whether retrofitting an existing Mueller hydrant or installing a new one – is known as the Sentryx™ software enabled Super Centurion® hydrant.

The hydrant acts as a communications hub, housing state-of-the-art sensors that communicate data to the scalable, fully cloud-based Sentryx platform. This solution is designed for any size water distribution network. Back in the office, the Sentryx platform can display insights from these

data sources – including from pressure monitoring, leak detection and water quality – on any computer or tablet connected to the internet.

"We've packed it full of sensors so now you can get information on pressure and leaks. All of it gets relayed to the Sentryx Water Intelligence Platform," says Walter Wojick, Mueller Water Products' product manager for the Sentryx software enabled Super Centurion, who's been heavily involved in the development of the advanced hydrant.

Wojick says one of the features he's proud of is that the hydrant provides all of the traditional hydrant functions, plus the technology features. He notes a lot of products in the market provide new technology but detract from core functionality, leading to compromises.

"There are two different groups here who use hydrants," he explains. "You have folks who install hydrants, maintain hydrants and repair hydrants, these are operations crews, utility crews and contractor crews – they don't care about the data. They want a hydrant that acts like a normal hydrant, which is what we have provided. Plus, this smart hydrant has all the data and the technology for the folks who need it. It's really a product that brings together two very different uses in a really easy, user-friendly approach."

In terms of installation, field crews will retrofit existing hydrants with the permanent leak monitoring solution. The pressure monitoring system, Wojick says, can be installed easily by a typical utility hydrant crew. He says it's somewhat analogous to replacing a main valve and can take about 1 to 1.5 hours, depending on the condition of the hydrant. It's also important to note that the added digital components are virtually indistinguishable from the "traditional" hydrant, making it less susceptible to damage or theft.

The Sentryx software enabled Super Centurion hydrant is also capable of switching, from standard mode into transient mode when certain inputs are received, such that pressure transients can be investigated with the goal of identifying causes of pipe bursts, excessive energy costs and under-pressure conditions. Since the Sentryx platform is completely hosted in the cloud, users do not need to worry about new software to install or upgrade or licenses to manage. The Sentryx software enabled Super Centurion hydrant typically offers up to 10 years of battery life. The Sentryx Water Intelligence Platform also utilizes an open Application Programming Interface (API) structure, such that Mueller can work with utility customers to integrate third-party devices to accommodate any unique needs of a particular water system. With cybersecurity in mind, Mueller has developed these technology products; in addition, Mueller has also partnered with several leading technology service provider companies to protect both utility and customer data.

One of the challenges Sentryx aims to address is utilities having separate systems that would show only leaks, only pressure or only quality. Wojick describes Sentryx as a roadmap for utilities to tie multiple sensors into a single platform.

"This really shows how Sentryx is a one-stop-shop for getting a customer in one user interface all of this data from various sensors," Wojick says. "It's a platform that is scalable both in type and in number of sensors and it provides this data for quick, actionable decisions by utility folks who need to plan, deploy crews and manage aging infrastructure."

Wojick sums up by noting that the Sentryx software enabled Super Centurion hydrant is yet another example of an innovation aimed at helping prioritize infrastructure renewal in an effort to maintain assets and preserve utility funds.

"The infrastructure in North America is aging and the budgets to replace and repair are not growing in conjunction with that aging," he says. "So, we need to be more in tune and more accurate in how we repair and replace those sections of pipe. The Sentryx platform, with the pressure monitoring and leak detection [capabilities], provide that ability to get right to the problem location.

Stopping the Leakage

Modern Leak Detection Continues to Be a Focus Area for Utilities to Reduce Non-Revenue Water and Operating Expenses

By Andrew Farr

Water loss is an area in which many water systems have expended time and resources to address. In recent years, with evolving leak detection and metering systems, utilities can reduce their water loss rate and save money.

It is no secret that across the United States many cities are struggling with aging infrastructure, a primary cause of main breaks, leaks and physical water loss. Other areas throughout the country have dealt with severe drought conditions, which have depleted water sources,

making the water they do have an even more invaluable commodity. Conservation, and ensuring that water is not lost in the distribution process, is more critical than ever.

Helping utilities address water loss has been a primary focus for many manufacturers and service providers in the industry including Mueller which, through its Echologics division, has worked to enhance the ease by which utilities locate leaks. This is perhaps best demonstrated through the company's EchoShore®-DX fixed leak monitoring technology.

"In the past, leak monitoring was around to reduce non-revenue water, but leak monitoring now is also geared toward improving asset management and addressing specific repairs that are needed," says Hannah Lindsey, Echologics Product Manager for Mueller.

EchoShore-DX incorporates the use of acoustic monitors, which are installed in fire hydrant caps throughout the water system. The sensors then record data, including throughout the night, while listening for sounds of potential leaks. That data is then uploaded to a cloud-based user interface where it can be analyzed by utility staff to identify points of interest. The sensors are able to identify even faint acoustical noises emitted by leaks before they become detectable by conventional methods.

Lindsey says there are two areas she sees as key to improving water loss that EchoShore-DX technology helps to address: asset management and repair efficiency. She cites two utility use cases that illustrate the benefits.

Asset Management – East Bay Municipal Utility District

Water utilities want to maintain their infrastructure for as long as possible. Because EchoShore-DX finds leaks as a preventative measure, it helps utilities to do just that. Lindsey references some work done by East Bay Municipal Utility District (EBMUD) in Oakland, California, in which the utility was using EchoShore-DX to detect leaks in the distribution system. The utility is subject to penalties if treated, chlorinated water from the distribution system leaks into rivers, streams or waterways. Therefore, in addition to monitoring leaks at various points in the distribution system, it also monitors specific infrastructure in close proximity to waterways.

In June 2018, field crews at EBMUD were alerted to a potential leak that was occurring under a bridge near the bank of a river. "Water was gushing out of the water main and we were able to alert them of this possible catastrophic failure. The value connection to asset management is that we were able to prevent this leak from going on for a longer period of time," Lindsey explains, adding that field crews believed the leak could have gone unnoticed because of its proximity to the river. It was determined that the leak was resulting in 300 gallons of water per minute lost. "Because it was so large, we also drastically decreased the damage that would have occurred to that surrounding infrastructure," she says.

Repair Efficiency – New Jersey American Water

Leak Detection

New Jersey American Water serves 18 counties and more than 631,000 residential, commercial and industrial drinking water customers, and an additional 46,000 wastewater customers. A significant portion of its annual investment goes toward upgrading underground water mains, of which it has more than 8,500 miles. Since 2016, New Jersey American Water's operations and engineering teams have used EchoShore-DX to help find and fix leaks and prioritize repairs. In the first 18 months of implementation, EchoShore-DX enabled the utility to identify and repair 118 active leaks.

According to Russell Titus, Sr. Project Manager at New Jersey American Water, prior to beginning the program using EchoShore-DX, the utility had performed traditional

leak detection, going point-to-point, listening for leaks on services, hydrants and valves. The more labor-intensive approach required, on average, two to three years to perform leak detection on the entire system. Now with its new strategic approach of deploying the EchoShore-DX acoustic sensors throughout the system, the utility can prioritize areas where there has been a history of main breaks and areas where pipe has historically been weakest. Titus says the program has allowed New Jersey American Water to reduce the impact to customers and fix leaks on a more scheduled basis and reduce production of potable water.

"With the Sentryx platform, utilities can look at the analysis behind the data."

New Jersey American Water was able to save up to $1.9 million in operating expenses in the first two years of using EchoShore-DX. As of early 2019, its average water loss rate was down to 17 percent – compared to statewide averages of 25-30 percent. It is also estimated that 1.7 million gallons of water is saved per day from utilization of the EchoShore-DX technology.

New Capabilities & Integration with Sentryx™ Water Intelligence Platform

In taking a broader view of how acoustic leak detection technology has advanced in the marketplace, Lindsey says the early warning capabilities of new solutions like EchoShore-DX technology enable utilities to prioritize repairs based on actual need while also prioritizing the most effective allocation of repair crews.

"What's new today is that we have alerts that tell [field personnel] exactly where to go," she says. "And what's new for Echologics is we offer a high efficiency leak monitoring, enhancing the alert time. With the way we record and the way our analysis works, we can get a valuable leak alert in as little as four hours."

EchoShore-DX technology also has a history tracker component which uses an algorithm to automatically check for a correlation of leaks at specific locations that have a leak history. In that sense, the EchoShore-DX system can show the likeliness of a pipe that reports an anomaly of having a leak.

Lindsey explains that it is all centered around utilities maintaining critical pipelines and improving response time when there is a problem, adding that EchoShore-DX technology allows for better monitoring of critical areas in the distribution system, such as near hospitals or other essential businesses.

As the first Mueller product to be released on the SentryxTM Water Intelligence platform, EchoShore-DX can also give utilities the ability to turn data into insights. In addition to providing a range of data on possible leak locations and trends, users can simultaneously view data from other sensors like an increase or reduction in pressure that may relate to a problem area on a pipe.

"With the Sentryx platform, utilities can look at the analysis behind the data, look at where leak noises are persistent and view the trend of leak correlations over time," says Lindsey. "We're working to get our customers insightful data so that they can make more intelligent decisions about each of their unique water networks."

AQUARION Water Company
Stewards of the Environment™

Aquarion Water Company:

Proactive Leak Detection in Connecticut

Aquarion Water Company, based in Bridgeport, Connecticut, serves over 220,000 customer accounts encompassing more than 700,000 people in 57 cities and towns in Connecticut, Massachusetts and New Hampshire.

When the state regulator started raising red flags for water loss rates at a few of the utility's water systems in Fairfield County, Connecticut, Aquarion decided to be proactive and pilot an innovative fixed monitoring system to help detect and pinpoint leaks.

As Aquarion's Director of Utility Operations Art Bradshaw explains, the utility started exploring leak monitoring solutions in 2018-2019 with an eye on quality and accuracy. By late 2019, the projects went out to bid and Mueller was selected to provide the technology.

"Mueller had great references and the quality of the product was there," says Bradshaw, who has been with the utility for 36 years. "I personally like that the [EchoShore®-DX] is mounted on a hydrant cap. You

don't have go out into the road, stop traffic, and risk the safety of employees since all these hydrants are accessible from the side of the road. That was really something we valued in their product."

In what it calls a pilot study to reduce water loss, Aquarion began by installing 281 EchoShore-DX nodes in Greenwich, New Canaan, and in the Lordship section of South Stratford, Connecticut, 3 areas thought to be most prone to leaks. The system went online in April 2020 and, as of mid-September, had located six leaks with eight other persistent noises under investigation.

Sentryx Water Intelligence Platform

To operate the EchoShore-DX fixed leak monitoring solution in the three areas, nodes were installed on hydrants to capture the sound profiles of the connected pipelines. The data uploads nightly to a secure remote server. The server uses this acoustic data to correlate between adjacent nodes. The Echologics® Analysis Module (EAM) analyzes the correlation data and, if it detects a noise, a persistent correlated noise (PCN) alert is created on the Sentryx user interface for the utility to investigate.

"The dashboard is very easy to read," says Bradshaw, referring to viewing EchoShore data in the Sentryx Water Intelligence platform. "It gives you a bar graph of device communication. I can look back a month and get a snapshot of how the devices were communicating and what devices were recording noise. I can also see what is happening on any given day."

The Sentryx platform also displays a leak detection summary of the service area and what data is being collected from each node on the hydrants. It also shows ongoing field investigations, PCNs recommended for investigation, or any noise that is present over a period of time that could signify a leak.

Bradshaw adds that the Sentryx user interface also captures how many field investigations the utility has done recently, and how many of them are currently awaiting repairs. "It helps us plan our day, figure out who's doing what, and what direction we want to go," he says.

A Focus on Reducing Water Loss

While water loss is a concern for any water system, it has become an area of increased attention and emphasis for utilities. This is due in part to more advanced technologies designed to pinpoint leaks entering the marketplace, but could also be attributed to utilities valuing the full lifecycle cost of water.

From his perspective, Aquarion's Bradshaw says that lost water has a significant cost associated with it given the large cost to produce water. Aquarion's biggest operating costs tend to be the chemicals for treatment and energy to power its facilities.

"If we can reduce the usage of chemicals and the cost of the electricity in our plants," it's a huge savings," he says. "We certainly care about sustainability and we care about the environment, and we need to ensure we are meeting state regulations when it comes to water leakage - this is where the EchoShore-DX has been especially helpful."

Andrew Farr is the managing editor of *Water Finance & Management*.

A typical Aquarion hydrant after node installation.

Flushing and Pressure Monitoring

New Solutions Add Increased Intelligence for Water Utilities

As a matter of public health, the quality of drinking water and the condition of the infrastructure used to deliver it, has been under the microscope due to hot button issues like lead pipelines, PFAS and other emerging contaminants. With these issues facing even greater public scrutiny thanks to high-profile situations like the lead contamination crises where people who contracted Legionnaires' disease or Legionella in the last decade. Legionella is six times more prevalent today than it was in 1976 and 10 percent of people who contract the disease will die. Monitoring and protecting water quality is more important than ever.

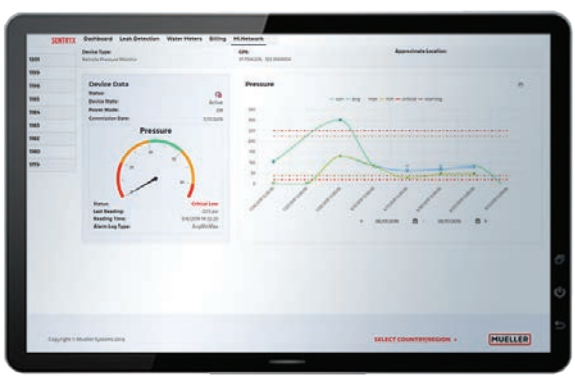
Water main flushing has long been considered an effective method to remove unwanted tastes, odors or discolorations of the water, and to improve chlorine residual. Most water distribution systems have areas where there are water lines that may not have sufficient demands to keep the detention time short enough to maintain minimum disinfectant residuals. Flushing is key to maintaining water quality and protecting against dangerous biofilm-related diseases.

Mueller's Hydro-Guard® suite of solutions, which we'll briefly examine here, include flushing, water sampling and pressure monitoring capabilities that are making each of these tasks easier for water utilities.

Automatic Flushing

As part of Hydro-Guard, Mueller offers automatic flushing systems. The Hydro-Guard automated S.M.A.R.T. flushing system monitors water quality conditions such as chlorine (total, free or combined), temperature, pH, turbidity, flow, pressure, and other conditions.

These devices monitor water quality conditions in real time and automatically initiate flushing as necessary to maintain disinfectant residuals as required by the U.S. Environmental Protection Agency, as well as state and local health agencies. The system allows the user to the set thresholds at which the device activates and improves the water quality at the installation point and areas served by the water lines adjoining the line being monitored. Additionally, the S.M.A.R.T. Flushing System can send event alerts when quality conditions warrant.



Pressure Monitoring

Water Quality

"The Hydro-Guard S.M.A.R.T. Flushing System is an active monitoring and mitigation system that also provides effective management of non-revenue water associated with flushing," says Harold Mosley product brand manager for Hydro-Guard, adding that the S.M.A.R.T. system prevents over-flushing by only purging the optimal water necessary for the improvement of water quality conditions in the water line.

Sampling Stations

Water sampling is another area that the Hydro-Guard solution addresses. Hydro-Guard includes water quality sampling stations, for both above and below-ground applications. These sampling stations are strategically placed in utility easements at sampling points so that water quality collection crews can sample for chlorine levels, disinfectant biproducts or general monitoring for contaminants in the distribution system without the need to access a customer's home or business. These devices are an effective alternative to sampling from hose bibs, which during the pandemic is essential, as more and more utilities retreat from allowing crews to enter the homes and businesses of clients.

The sampling stations can also be upgraded to include technology such as a built-in pressure monitoring system (see Durham, N.C. case study in sidebar). This unique Mueller advancement allows utility crews to obtain water quality samples while also having an easy installation point for system-wide pressure monitoring of water lines. The

pressure monitoring-equipped sample station allows for water distribution lines located approximately one mile from the installation to be observed in near-time.

Pressure Monitoring

Pressure monitoring has also been an area of increased emphasis for utility managers in recent years, as a reduction or increase in pressure can have a considerable impact on the condition of pipelines and can signify potential problems in the system, as well as impact water quality conditions.

The Mueller Hydro-Guard pressure monitoring solution is an advanced, cellular-based, monitoring system that can measure water pressure at critical distribution points around the clock. The system offers near-time event notification. When a logged data point is outside of a utility's normal operating threshold (as defined by the utility), a warning message is transmitted via both email and SMS text messaging. Text message alerts are typically received within minutes of the event occurrence. It is able to monitor standard state pressure at a rate of one reading every 15 seconds or measuring transient pressure at a rate of 256 reading per second. Additionally, utilities and engineering firms "We're taking technology and blending it into our core products." are utilizing the Sampling mode offered by this product to develop advanced, dynamic, near-time pressure models which they incorporate into hydraulic models. In Sampling, the device records water pressure at frequencies of once per 30 seconds or 60 seconds, and the data is logged in a raw state with no filtering.

"We're taking technology and blending it into our core products."

Hydro-Guard pressure monitoring systems can be installed a few ways. They can be installed via a service saddle on a distribution line in a roadway or sidewalk; in a meter box or vault on pressure reducing valves or other control valves; or on a water tank (measured in foot/head). They can also be installed on a Jones® wet barrel fire hydrant, not unlike the installation of an EchoShore®-DX solution, or incorporated into the stem and bonnet of the Mueller Super Centurion® dry barrel fire hydrant.

While Hydro-Guard pressure monitoring data can be integrated with a utility's SCADA system, Mueller is currently in the process of transitioning the pressure monitoring solutions to integrate with the Sentryx Water Intelligence Platform. When fully available it will allow utilities to view pressure information in Sentryx and make strategic decisions more seamlessly.

"I think the beauty of all this technology for Mueller, is that because Mueller is so diverse, everything works together very well," explains Mosley. "For example, you can have a fire hydrant, either wet or dry barrel, that has pressure monitoring and leak detection on it. You could also have a Singer® control valve and equip it with a pressure monitoring system to allow for both monitoring and pressure management from a single point in the distribution network where knowing and maintaining pressure is critical. You can also incorporate pressure monitoring into an automatic flushing system, thus giving you peace of mind that the flushing system started flushing and stopped when you expected it to do so.

"We're taking technology and blending it into our core infrastructure products. Our core products now become highly intelligent. The data collected is delivered to the utility so they can further their water quality improvement initiatives and have more accurate data, in near-time, to remove the guess work out of the decision-making process," concluded Mosley.

City of Durham, North Carolina, Improves Water Quality with 3-in-1 Hydro-Guard Remote Pressure Monitoring, Sampling and Flushing Stations

By Nathan Wiles

The City of Durham is committed to providing safe drinking water to a service population of more than 289,000. The city's Department of Water Management (DWM) ensures the delivery of water to approximately 99,000 service connections through 1,400 miles of watermains. Lake Michie and Little River Reservoir are the two sources that deliver raw water to the city's two treatment plants, using a combination of gravity flow and electric and hydro-powered pumping systems. Together, these plants have the combined treatment capacity of 64 million gallons per day (MGD) with an average demand is 28 MGD.

The two facilities have onsite raw water reservoirs that store approximately 135 million gallons and can sustain the city for two to three days. Like many municipalities Durham stores drinking water in covered

The city's water maintenance staff first added a 2-in. wet tap with a 2-in. gate valve before running a 2-in. copper pipe over to the Hydro-Guard station.

tanks on the treatment plant sites, ready for distribution. Treated water is also stored in elevated and ground level water storage tanks located throughout Durham. Levels in the towers are monitored remotely and usually filled each evening using off-peak pumping strategies.

The towers and elevated tanks help maintain pressure in the distribution system so that each household and business have sufficient flow. Any time pumps are part of a pressure zone or a district metered area (DMA), there is an increased risk for water surges or pressure spikes. The city has several DMA's to control this flow, but not every zone was being monitored for pressure fluctuations. After having an average of 12 main breaks a month over the last several years, DWM's Superintendent for Water & Sewer Maintenance, Junior Mobley, thought the city should explore ways to monitor pressure throughout its system.

At about the same time, the city was planning to upgrade its sampling stations to provide a higher level of

Connecting the 2-in. copper line to valve at the water main.

A 2-in. copper pipe connects the station to the water main.

The internal workings of the Hydro-Guard station with remote pressure monitoring, sampling and flushing capabilities.

water quality assurance and improve station locations. Over time, this would eliminate the need for staff to enter businesses to collect state-required water samples. It would also provide the opportunity to relocate and upgrade existing stations, improving access so that staff would no longer have to cross property lines, which often proved to be complicated and not always possible.

In researching the best solution, Mobley visited a Mueller Water Products' factory in Cleveland, Tennessee, where he was able to meet with Hydro-Guard engineers and explain the city's need for pressure monitoring.

"I was familiar with the Hydro-Guard flushing system from a previous job, but new to me on this visit were the additional features and technology capabilities of the Hydro-Guard [system] to also monitor pressure and water quality within these units," says Mobley. "Having a 3-in-1 solution would save time on installation, maintenance and monitoring."

The city identified the need for 21 Hydro-Guard stations that perform a combination of flushing, sampling and pressure monitoring. Also, for short-term solutions in areas where a 3-in-1 station has not been installed yet, staff have modified the remote pressure monitoring bracket so it can be installed on fire hydrants. Currently, staff have installed 11 pressure monitors on fire hydrants throughout the system. Installation was easily performed by the city's water maintenance staff.

"Similar to our existing setup, we just added a 2-in. wet tap with a 2-in. gate valve and then we run 2-in. copper pipe over to the station," says Mobley.

The remote pressure monitoring units have a cellular connection allowing city personnel to see the pressure in the system anytime and anywhere using a connected device. Users can choose a setting which records standard state pressure readings every 15 seconds or they can choose to measure transient pressure at a rate of 256 reading per second.

"If there is a spike in the system, I get an alert and can send a crew out to investigate," says Mobley. "This allows us to respond quicker and usually before we receive customer complaints about a hydrant being hit or a water main break."

The combination stations will replace all the older sampling stations. This also allows city water crews to do multiple tasks at the same location. For example, if chlorine is low at the site, operators can immediately initiate flushing until the chlorine levels are within the acceptable range.

"The Hydro-Guard units have given us more visibility into the system with remote pressure monitoring, and improved efficiencies in water quality sampling and flushing capabilities," says Mobley. With continued success, the city anticipates adding more units over the next five years.

Nathan Wiles is Hydro-Guard Territory Manager for Mueller Water Products.

Completed installation of the 3-in-1 Hydro-Guard station.