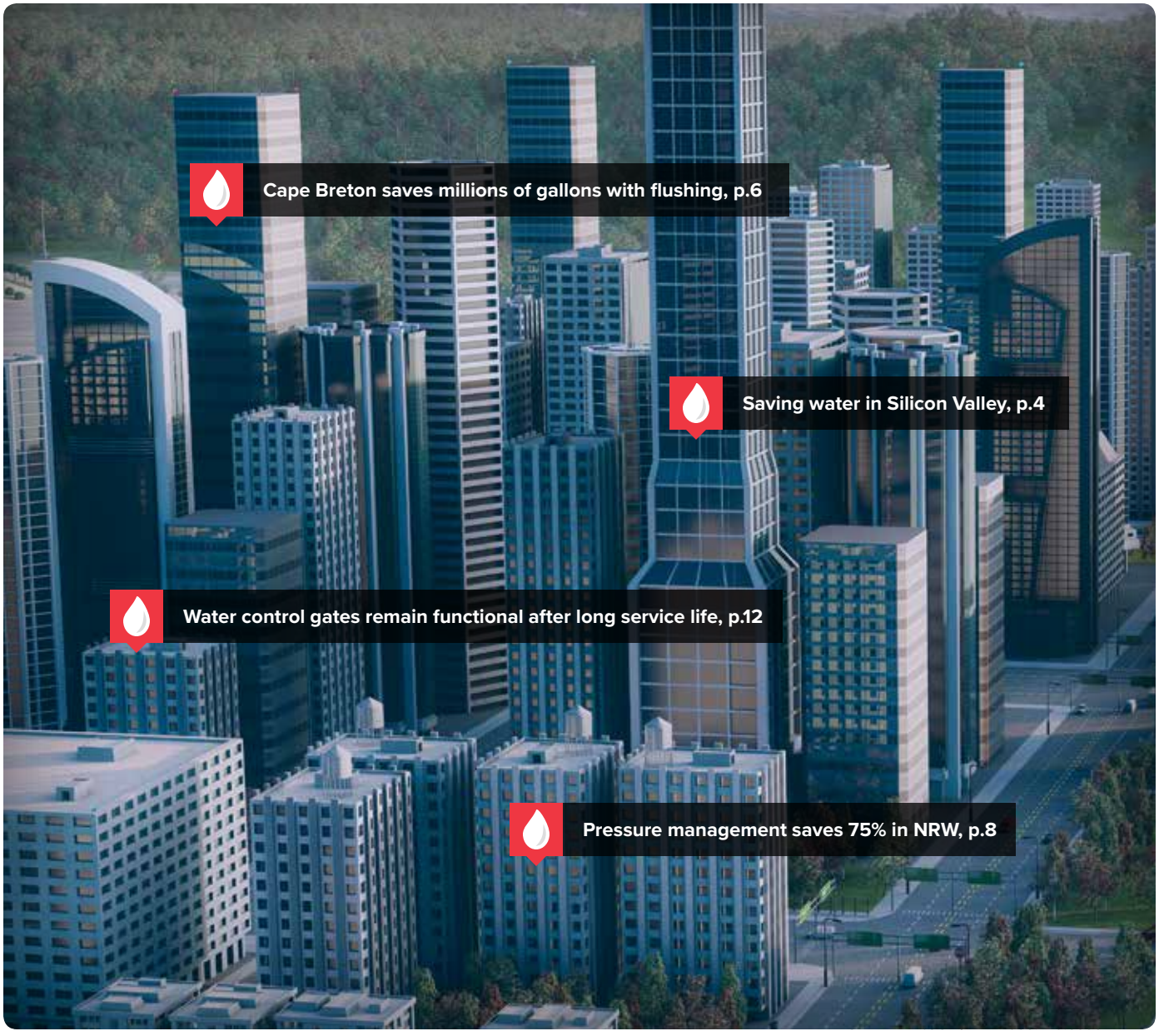
AGING WATER INFRASTRUCTURE SOLUTIONS HANDBOOK

TAKE CONTROL OF YOUR WATER NETWORK



TAKE CONTROL

In areas where freshwater resources are limited, aging infrastructure remains a significant challenge for water utilities. With the miles of pipelines underneath streets getting closer to the end of their useful life, leakage rates increase or worse, main breaks occur. While every dollar counts in business, every drop counts even more for water utilities.

Combating Water Loss with Technology

Water loss and non-revenue water (NRW) are enormous obstacles for utilities and the communities they serve. The emergence of the Internet of Things (IoT) and smart technologies has made it possible for utilities to get a better grasp on NRW. In this publication, you will find success stories and tips on how to take control of the water that is flowing through your aging water distribution systems. Brought to you by Mueller Water Products, the *Aging Water Infrastructure Solutions Handbook* encompasses the "journey" of potable water and how Mueller® solutions have made an impact:

- At the water source
- At the treatment plant
- In pipes below ground
- On the street, and
- In the cloud, where the data lives

As a single-source supplier for utilities, Mueller Water Products provides a key partnership for those who are looking to gain better perspectives on their non-revenue water and have goals to rein in water loss.

MUELLER

IN THIS ISSUE

THE POWER OF PORTFOLIO & DATA

Mark Magda, Singer® senior technical sales and training manager, discusses how smart technologies can help utilities reduce water loss to meet customer demands while also maintaining their bottom lines.

Q: In your opinion, what are the main challenges facing utilities as they tackle water loss?
Magda: There are many regions where freshwater resources are inadequate for domestic and economic development. Aging infrastructure and lack of adequate clean water to meet human drinking water and sanitation needs is a concern for utilities. Reducing non-revenue water (NRW), pipe breaks and maintaining water quality is a key focus and challenge for water utilities.

Q: Is there a standard approach to combating water loss?
M: Accurate metering, water auditing and effective water loss control ensure an equitable recovery of revenue based on level of service and wise use of available water resources. Implementing the four principal leakage reduction measures is a solid and proven approach in reducing NRW and pipe breaks.

Q: What advantages do utilities gain by working with companies like Mueller Water Products in trying to reduce water loss?
M: Mueller® products, system solutions and industry-leading expertise in leakage reduction is the primary advantage. First is active leakage control, starting with accurate metering and physical leakage detection.

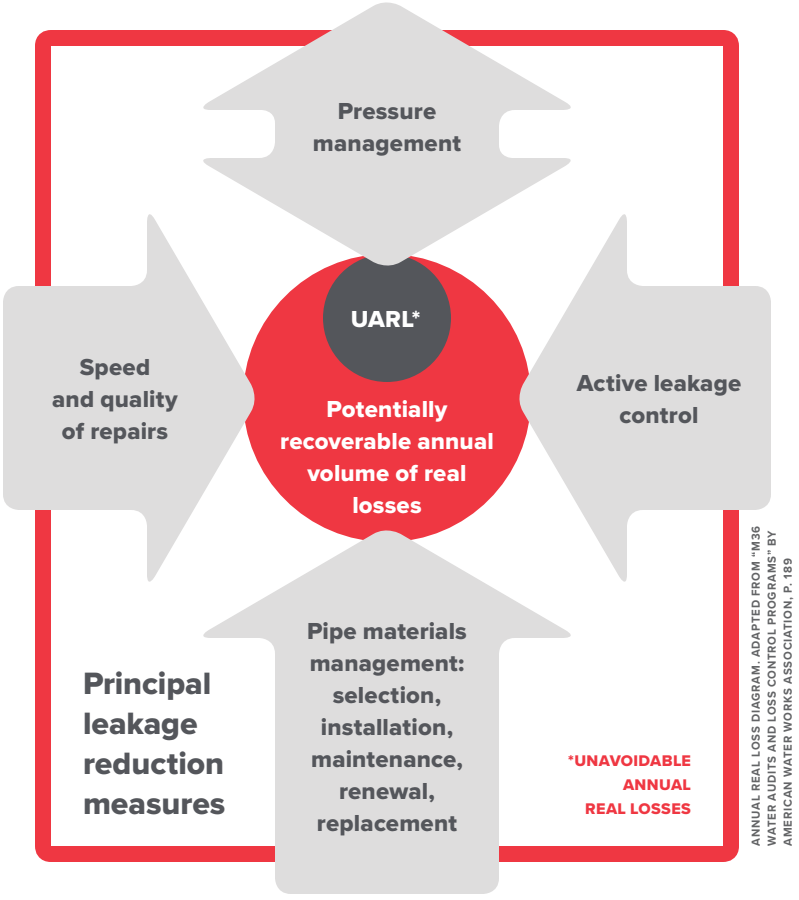
Second is pipe and underground asset condition assessment, as well as the physical products designed for ground burial and service connection.

Next are quality repairs with superior repair clamp technology and service saddle products for a wide variety of transmission line materials.

The final segment is maintenance of water quality through pressure management, and maintaince of system flows, pressures and tank levels.

Q: What role do smart technologies play in reducing water loss? How will they change the way a utility tackles water loss in the future?
M: Understanding your utility and its operation is the first step in developing an NRW and water quality strategy. Smart technologies monitor and provide feedback in real time of what is going on in the distribution system. Listening for and repairing leaks to avoid pipe breaks and consequential damages can save the cost, time and labor of a catastrophic transmission line failure.

Pressure monitoring within the network and gathering real-time data ensure adequate storage tank levels and supply pressures can support system demand and maintain fire flow. Monitoring quality aspects such as water temperature, pH, chlorine residual and turbidity are important factors in providing a safe supply. Smart technologies provide key indicators from the distribution system to enable utilities to make informed decisions in reducing water loss and maintaining sustainable infrastructure. ■



SAVING WATER IN SILICON VALLEY

San Jose Water gets proactive about main breaks and water loss

For many cities throughout the country, severe drought conditions have reduced water sources, making water an even more invaluable commodity. San Jose Water was faced with such a challenge after one of the worst droughts to the region in U.S. history. After a successful pilot program, the utility selected EchoShore®-DX sensors to become a central part of its water loss control program.

Drought Recovery

Since 1866, San Jose Water has grown to serve more than 1 million customers in a 140-square-mile-area in Silicon Valley today. From 2011 to 2017, the state of California at large experienced one of the worst droughts to the region in history, reducing many reservoirs and resulting in a statewide emergency and pressure on residents and utilities to find ways to both cut and conserve water.

"The recent historic drought in California and subsequent calls for customer conservation raised awareness as well as customer expectations for San Jose Water to take proactive steps towards effective and active control of its real-water loss," said Jake Walsh, director of capital planning & asset management for San Jose Water.

As a result, San Jose Water implemented a pilot water loss control program that would quickly capture, correct and prevent water loss within the distribution network.

The Search for a Strategic Approach

San Jose's water distribution network consists of about 2,400 miles of water mains. Previously, the utility used a traditional approach to leak detection, waiting for leaks on its buried water mains to surface before it would intervene, and an annual proactive inspection program for its above grade water mains. For the new pilot program, San Jose Water was in search of a technology that would allow them to take a more strategic approach to capturing and preventing water loss.

San Jose Water reached out to Echologics during the initial phase of the pilot, and EchoShore-DX sensors were recommended as the technological solution for the project. The acoustic sensors, embedded into hydrant caps, capture acoustic sound waves travelling through the pipe and use the resulting data file to correlate leak locations.

Initial results were positive for the San Jose Water pilot project. "Prior to investing in acoustic leak detection, we assumed that leaks were typically surfacing within a few days to a week," said Walsh. "However, we've found quite the opposite and determined that some leaks were non-surfacing for more than 5 years. Within two months of commissioning the units, we found 36 non-surfacing leaks ranging from as small as 3 gph to as large as 30 gpm."

With the ability to detect underground leaks long before they surface, San Jose Water can now focus on regularly assessing the conditions of its water mains. The visualization tools and graphs allow the utility to track points of interest and make determinations regarding field investigations. "The best part of this is that we can schedule these investigations, which allows us to more effectively allocate our limited resources," Walsh said.

Meeting the Challenge

EchoShore-DX sensors are a critical part of San Jose Water's leak detection and water loss program, allowing the utility to stay ahead of existing leaks while monitoring for any potential new leaks. It has been able to see tangible benefits of deploying the technology in addition to saving over an estimated 40 million gallons of water to date, and will continue to add sensors to its distribution network of about 19,000 hydrants. ■

REVOLUTIONIZING METER-READING

South Walton Utility Co. Inc. implements true two-way network to improve billing & water conservation

Over in northwest Florida, Miramar Beach is located in the southern part of Walton County and features white sand beaches and recreation opportunities that attract thousands of tourists each year. Since 2000, Miramar Beach has also tripled in population. This explosive growth has created a number of new issues, including the decreasing efficacy of the community's outdated water metering system.

Problem Areas

South Walton Utility Co. Inc. (SWUCI) manages Miramar Beach's water and wastewater. In the past, an employee would drive around reading meters, but as that employee approached retirement, the utility realized its metering system needed updating.

"We decided that having a meter reader who actually touched every single meter every month was becoming antiquated," said Alicia Keeter, general manager for SWUCI. "It was a lot for one person. As we grew in size, we needed to adapt to technology and to add automated metering infrastructure."

SWUCI also needed to address a looming regulatory issue that potentially could cost it a great deal of money: The Florida Department of Environmental Protection (DEP) required the utility to begin changing out backflow preventers every 10 years. Keeter knew that automatic backflow detection would allow the utility to change them out less frequently, thus saving more money.

Choosing a Solution

The utility assessed a number of systems before making its decision, but ultimately selected the Mueller Systems Mi.Net® system.

"It's a true two-way AMI system that allows them to read the meters without having to have a meter reader who drives around," said Bobby Barker, territory manager, Alabama and Florida, for Mueller Systems. "All the information comes into the office daily via radio frequency back to a tower—a collector mounted on a water tank."

The Mi.Net system connects meters, distribution sensors and control devices to provide near-real-time data that help SWUCI monitor water consumption and identify leaks. If the system detects any problems, it immediately sends emails and alarms to administrators, who can address the issue in a timely fashion, saving the utility money and reducing water loss.

Additionally, the system sends an alert when backflow conditions are detected, helping the utility remain compliant with DEP regulations. Keeter said that previously, the meters were not reading and they were not detecting issues until much later. "We would go to zero usage not only one month, but two months, because of the way that we read the system," Keeter said. "Then you have to go back out and check to make sure there's not a problem with the meter. We catch these sooner now—within a couple of days."

She added that the system also has helped from a conservation standpoint, allowing the utility to meet the Northwester Florida Water Management District's requirement that it minimize water loss.

Looking Ahead

Keeter and Barker also are discussing other ways the company can help the utility become even more efficient and keep up with Miramar Beach's population expansion, including leak detection, remote shutoff meters, and the customer portal. Said Keeter: "Those are projects that we look forward to in the future with Mueller." ■

CAPE BRETON GETS TOUGH ON NRW

Saving millions of gallons of water with just a single automatic flushing unit

The Cape Breton Regional Municipal (CBRM) Water Utility in Nova Scotia supplies potable water to a population of 81,000, which is distributed over 478 miles of pipeline. To do this, they operate, maintain and manage five water treatment plants, six pumping stations, 11 water storage tanks, eight sources of supply, 2,900 fire hydrants, 28,700 water meters and thousands of valves.

All municipal water distribution systems require flushing to maintain chlorine residual levels and prevent the buildup of biofilms. CBRM, like many municipalities of its size, uses a variety of conventional flushing methods for discharging stagnant water, including service 'bleeder' lines (operating 365 days a year) and periodic manual hydrant flushing. This results in more than tens of millions of gallons of treated water going back into the environment. The cost of non-revenue water (NRW) represents a significant cost when considering the expense of treating and pumping water throughout the distribution system. Real costs of NRW are difficult to determine per flush event, as operational costs and asset depreciation are also difficult to ascertain.

When Greg Campbell, CBRM Water Utility's water systems engineer, learned about automated programmable flushing at the Municipal Public Works Association of Nova Scotia in 2017, it became obvious there was a solution to significantly reduce the NRW problem occurring at their MacLeod Street flush point.

Mueller Co. consulted with the CBRM Water Utility in the months afterward and went to the site to better understand the logistics of adding a Hydro-Guard® HG-8 permanent automatic flushing unit to the MacLeod Street service bleeder line. The existing line used for conventional flushing had an old Mueller® inverted key curb stop that remained fully open, controlling the water flushed through a 3/4" polyethylene tubing to the atmosphere. The Hydro-Guard HG-8 was attached to the existing curb stop as a reliable connection for the flusher's outlet line. Though a curb stop was not required for the automated flushing device's outlet connection, the municipality did not want to jeopardize the service bleeder line's integrity, as it had been dependable for years of daily use at a relatively high pressure. By adding a new Mueller Oriseal® curb stop on the inlet connection of the automated flushing device and an adjustable arch base service box, the flushing unit was quickly connected. All that was left was to return the gravel and softly compact the ground over the installation area.

It's important to ensure that flushing units are suitable to the environment in which they are operating. In colder climates, like Cape Breton Island, where winter temperatures can be consistently below freezing, it is necessary to place mechanical components in the ground below frost depths. This can add a degree of difficulty when it comes to accessibility. To overcome this challenge, the internal components of the HG-8 are mounted on a movable platform that is connected to the inlet and outlet piping.

CBRM Water Utility thought outside of the box when they decided to utilize the existing bleeder line to minimize installation effort and cost for their HG-8. Not only is the municipality saving 5.7 million gallons of water per installation annually, they are practicing responsible environmental stewardship. ■

HYDRANT SOLUTIONS TO PREVENT WATER LOSS

WET BARREL

Jones® J-5000 Tell-Tale Breakoff Check Valves

Jones J-5000 tell-tale check valves for wet barrel hydrants minimize water and pressure loss in the case of a vehicle accident. When a hydrant is struck by a vehicle in a high-impact traffic accident, the hydrant and adapter plates are released from the lower barrel, providing a clean break and minimizing physical damage. The check valve then completely shuts off and remains closed to prevent water and pressure loss. A low-volume stream of water is released through a "thorough-hole" located in the operating valve, minimizing water hammer and providing a visual notification of hydrant damage.

J-5000 check valves are available in ductile iron, bronze and stainless steel constructions, and come in 90-degree Shoe with Flanged, MJ, Mueller AquaGrip® or Slip-On Inlet configurations. The valves adapt to all current and past Jones hydrant designs.

DRY BARREL

Mueller® Security Solutions

Mueller Co. offers several hydrant security solutions to protect against contamination of public water.

The Super Centurion® 250/HS high-security fire hydrant resists both accidental and deliberate water contamination while allowing normal hydrant operation without any tools. The hydrant's custom-designed shoe includes a check valve that lasts more than 1 million cycles and is positioned ahead of the hydrant so as not to interfere with normal hydrant maintenance or repair.

The Mueller Hydrant-Defender® (shown) is an active hydrant security option that prevents unauthorized access to the nozzles and operating nut. The adjustable, stainless steel straps accommodate hydrant dimension differences and are available to fit almost any three-way hydrant.

The company also offers two hydrant nuts: the Tamper-Proof Operating Nut and the Tamper-Resistant Hydrant Hold-Down Nut. The Tamper-Proof Nut is a cast iron cap that cannot be gripped by common tools. It spins freely on the hydrant bonnet, shielding and protecting the operating mechanism. The Tamper-Resistant Hydrant Hold-Down Nut surrounds the operating nut and helps to prevent unauthorized use of hydrants. Both hydrant nuts may be installed on new Centurion hydrants or retrofit for Centurion and Mueller Improved hydrants.

LEAK DETECTION FOR FIELD CREWS

LeakFinder®-ST Advanced Leak Detection Correlator

The award-winning LeakFinder-ST correlator is a result of extensive research and input from global leak detection experts on the user interface and equipment design that best meets the needs of a utility. It is technologically advanced but also easy to use. Our expertise in manufacturing, reliability engineering, advanced signal processing and software engineering has proven to produce state-of-the-art correlators that:

- Accurately pinpoint leaks, avoiding dry holes
- Can find quiet leaks with superior leak resolution
- Have rapid correlation time
- Are easy to use with no previous leak detection required
- Are rugged, compact and easy to transport
- Work on multiple pipe materials, including PVC

PRESSURE MANAGEMENT SAVES 75% IN NRW, REDUCES POWER CONSUMPTION BY 33%

Indonesian city reduces pipe breakage by 300%

Malang City in Indonesia supplies water to an estimated 120,000 service connections, amounting to roughly 600,000 people, or about 70 percent of the city's population. Roughly 30 percent of the supply to customers is gravity-fed directly from springs, and 70 percent of the supply is pumped

to eight storage reservoirs with a total maximum storage capacity of 18,000 cubic meters. However, a lack of water supply and low reservoir levels due to leakage and pipe bursts lead to 30 percent of the population being regularly deprived of water supply from the normal distribution mains.

With daily pipe bursts, reservoirs dropping to 20 percent of capacity at night, and leakage rates hitting an estimated high of 41 percent, or 400 litres/second (1 million cubic meters per month), Teguh Cahyono, the director of non-revenue water (NRW) for the city's water department, brought a team of experts together to create a water loss management plan.

The consensus was to develop numerous control zones or district metering areas (DMAs) with a single source of water comprising a meter and a pilot-operated control valve at the source of the DMA. Once the flow into the DMA and to users is measured, pressure can be managed. There is a direct correlation to pressure and leakage; if you reduce pressure you will reduce leakage, with the ultimate goal of giving clients just enough pressure to serve their needs while eliminating overpressures.

One of the most difficult aspects of the project was getting senior PDAM Malang City water directors and politicians to approve the budget necessary to fund such an ambitious plan. To demonstrate ROI and that the goals were achievable, PDAM Malang installed three test DMAs and pressure relief valves (PRVs) near a problem reservoir. The pipe bursts stopped, leakage was greatly reduced and reservoir levels were maintained. The directors were convinced, and the project moved forward at a rapid rate.

DMA construction began with an initial 42 Singer® S106 2PR-BT (100mm-500mm) valves installed. In Malang City the average pressure in the main distribution lines range from 2 bar (30 psi) to 4 bar (60 psi). In order to reduce this, we've added two pressure-reducing pilots to the main diaphragm-operated control valve. One pilot is set lower for night pressure (low demand) and the other for daytime pressure (high demand), so they are able to relatively and accurately maintain pressure at the critical point. This is typically the most challenging pressure point in the DMA. This technology is controlled by a simple IP-68 (waterproof) timing device controlled by a locally available 9-volt battery that switches pressure at a predetermined time. The new valves were able to reduce the pressure during high demand in the daytime to 2 bar (30 psi) and further reduce the night pressure to 1.5 bar (22.5 psi).

With the initial 42 units, which is less than 30 percent of the overall requirement of the project, the results were significant. Leakage was reduced from 41 percent to a level of 27.7 percent. In terms of volume, this means leakage was reduced from 400 litres per second to 250 litres per second, reducing the leakage rate by 150 litres per second, or 388,800 cubic meters per month. With an additional combination of 96 Singer PRVs, the leakage was reduced to 20 percent. This resulted in a savings of 750,000 cubic meters per month. ■

Pressure Management Solutions to Monitor Vital Changes in Pressure

When it comes to pressure management, real-time pressure change alerts are invaluable tools for operators. The Hydro-Guard® system offers steady-state and transient measuring.

"Steady-state measures pressure 15 times per second, while transient measures 265 times per second. With that precision, the systems can create warning zones for customized alerts," said Harold Mosley, Mueller product brand manager.

If the device detects pressure outside a desired range, it sends an email or text message alert. The units can be installed in a valve box, pump station or water tank, and monitoring systems send data over cellular connections. Text messages typically arrive within two minutes of a warning or alert being triggered. That speed was especially helpful for Liberty Utilities in California, when a fire hydrant was struck by a car.

"They actually received their warning notices from the pressure monitoring system before their SCADA reacted or they got a call from the local authorities," Mosley said.

Cellular functionality is included in the price for the first year, with further service available through an annual subscription. Cybersecurity is a crucial feature. "We are using AES encryption, as well as other methods, to make sure the data can't even be found on the web," Mosley said.

To access data and make changes, the network has a user hierarchy with varying levels of interaction. Each user has a unique login and password. The lowest level status allows any user to view data for a particular period. Real-time data can be viewed through observance mode, which Mosley said is great for SCADA operators.

At Hixson Utility District in Tennessee, the operator received an alert in the middle of the night. After 15 minutes there was no alert that all had returned to normal, so he visited the site, where he found a water main break. "If it had not been addressed, it might not have been found until the next morning, which would have caused catastrophic damage," Mosley said.

Hot Tapping DI & C900 Plastic Pipe

Designed for hot tapping ductile iron pipe and thick-wall C900 plastic pipe, the Mueller® H-306 fabricated steel tapping sleeve is made from A36 fabricated steel and meets the requirements of AWWA C223. The outlet flange material is carbon steel and meets or exceeds all applicable requirements of ANSI B16.1, Class 125 and in accordance with MSS-SP60. The H-306 features an integral bolt flange, Rilsan nylon coating, working pressures up to 300 psi, and is available sizes from 4 in. to 16 in. It is also certified to ANSI/NSF 61 and includes a ¾-in. NPT brass test plug. The H-306 is an economical tapping sleeve ideally suited for use with Mueller CL-12, C1-36 and Mega-Lite® drilling machines, and used with a wide variety of pipe materials installed in less corrosive soil environments.

Reliable Flow Control and Isolation Valves

Mueller resilient wedge gate valves offer reduced operating torque and superior resistance to wear and tear. The polymer-covered wedge guides slide easily within the body channels for easy operation and extended life of service. Wedge gate valves feature Mueller PRO-GARD® epoxy coating system and a smooth internal passage that resists sediment collection and helps prevent turbulence. The valves can be ordered with Mueller AquaGrip® system, which combines the compression connection and restraint system into one easy installation package. It features pressure responsive sealing and visual indication of proper tightening to ensure a leak-tight seal.

GETTING AHEAD OF WATER MAIN BREAKS

Integrating condition assessment data with asset management programs in Maryland

The Washington Suburban Sanitary Commission (WSSC) is one of the largest water utilities in the United States, serving more than 1.8 million residents in Prince George's Country and Montgomery County in Maryland. The utility operates three reservoirs that combine for a typical holding capacity of 14 billion gallons, two water filtration plants with a 390 MGD total capacity, and six wastewater drinking plants with a total capacity of 95.6 MGD. The utility's water infrastructure consists of more than 5,657 miles of water main lines and 5,687 miles of sewer pipeline. A sizeable portion of these were aging and needed to be replaced, so to begin the pipe replacement process, WSSC selected its buried water line, which consists of over 150,000 pipe lengths that ranging from 200 feet to more than 1,000 feet.

The Old Assessment Model

WSSC previously only used the decay model to help assess and prioritize pipe replacement projects. Although it is a trusted industry standard, there are drawbacks to using the model to replace water main lines.

"Because it's buried, you can't see it for yourself, and unlike sewer pipe, you can't go inside with a camera or robot, so it's largely been hypothetical," said Fred Pfeifer, WSSC's asset strategy manager.

The ages that WSSC had for its pipes were based on original industry estimates, which can be unreliable. "For example, a manufacturer in 1930 would say the pipe would last for 75 years without having anything to predicate that on, and nobody ever went back to determine if that 75 was right or wrong," he said.

Discovering Acoustic-Based Condition Assessment Technology

In 2011, WSSC was introduced to ePulse®, a technology that uses acoustic sensors to noninvasively calculate minimum wall thickness of pipe segments and check for leaks throughout the water distribution system. In spring 2012, WSSC launched a pilot study to test ePulse on 32 cast iron pipeline segments that had been previously selected for replacement based on decay model predictions.

Contrary to decay model calculations, the ePulse approach found that approximately 70 percent of the cast iron pipes still had sufficient levels of wall thickness. The WSSC was able to verify these results by performing in-field, visual and ultrasonic testing.

Following the pilot study and field test, recommendations were made to include the technology in WSSC's pipe inspection program. Acoustic-based condition assessment provides WSSC with a more cost-effective and efficient way to inspect pipes and select future water mains for replacement projects. ■

SINGAPORE IMPLEMENTS SMART TECHNOLOGY TO MONITOR CRITICAL MAINS

Echologics® advanced permanent leak monitoring systems have been deployed in parts of Singapore using a wireless network. This smart water network solution, monitoring key sections of the city's critical large-diameter pipeline, will help minimize water losses by locating leaks promptly, improving response times and reducing impact to end users and the public.

As part of Singapore's smart water grid system implementation to support PUB, Singapore's National Water Agency's mission to supply clean water 24/7 to its customers, 120 EchoShore®-TX smart sensors were installed on more than 62

miles of the city's pipe network, with daily leak monitoring scheduled for the next three years. Not only will this non-intrusive leak detection platform notify PUB of a leak or anomaly, it will also monitor advancement of those leaks. This will result in significant savings of valuable resources such as manpower and time, by reducing need for routine site inspections.

In 2018, the EchoShore-TX system detected a leak on a DN700 buried steel pipe segment running alongside an expressway. PUB's field crew was notified and it confirmed the leak through ground sounding and visual inspections. After excavation, a 13-mm corrosion hole was located at the bottom of a pipe, within 500 mm of the location identified by the system. Since it had not yet surfaced and was in a remote location, the leak would not have been identified until it had grown significantly.

Effectively Managing Aging Water Infrastructure

Don Shields, vice president of engineering for New Jersey American Water (NJAW), offers insight on how NJAW uses Echologics technologies to manage and repair its aging water infrastructure.

Q: What are some of NJAW's key challenges when dealing with aging water infrastructure?
Shields: Aging water infrastructure requires investment. We spend about $300 million a year in our capital program to take care of aging infrastructure, including pipes, valves, hydrants and services. The key challenge is making sure that we allocate those dollars to the right projects.

Q: How have Echologics technologies helped NJAW more effectively allocate its dollars?
S: NJAW employs two Echologics technologies that allow us to better optimize our capital spending for aging pipelines. First, we use ePulse condition assessment to help us determine the remaining service life of our pipelines. This information is critical to planning the replacement or rehabilitation of our water mains. Second, we use EchoShore-DX acoustic monitoring to help us prioritize leaks through our work management system. With daily monitoring, we are able to watch leaks grow and quickly mobilize field resources to address the leaks with the highest risk.

Q: Can you give an example of the ROI NJAW has gotten from deploying leak detection technologies?
S: In our Washington system we had a significant challenge with leaks that resulted in us potentially exceeding our water allocation permit. We were staring at a million-dollar investment for a new well. EchoShore-DX technology allowed us to identify over 400 gpm of leaks. To avoid a million-dollar capital project and also get ROI less than a year was substantial and helped keep our rates stable.

Q: Has NJAW's partnership with Echologics provided benefits in addition to leak detection?
S: We started a significant partnership with Echologics for leak detection; now that Echologics is part of the larger Mueller family, it really helps us manage our infrastructure and supply chain. We purchase significant numbers of valves and hydrants from Mueller.

WATER CONTROL GATES REMAIN IN COMMAND

At water reclamation facility, gates stay functional even after environmental deterioriation

The W.B. Casey Water Resource Recovery Facility (WRRF) in Jonesboro, Ga., operated by the Clayton County Water Authority, has a permitted treatment capacity of 24 million gal per day (mgd) and currently treats an average of 15 mgd with physical, chemical and biological treatment focused on biological nutrient removal. Final effluent polishing is accomplished by constructed wetlands treatment at the E.L. Huie Natural Treatment Systems facility.

The WRRF was upgraded to its current capacity in 2004. At that time the first Hydro Gate® water control gates from Henry Pratt Company were installed. With more than 100 years of experience, Hydro-Gate has a reputation for providing superior quality water control gates for many industries. The stainless steel slide gates are manufactured in accordance with AWWA C561. The Clayton County Water Authority selected the gates using its procurement scoring process, taking into consideration capital cost, lifecycle cost, company longevity, product reputation and recommendations from an engineering company.

Twelve Hydro Gate gates, designed for flow control, were installed: six gates in the preliminary treatment process, three on the inlet to the primary clarifiers and three on the activated sludge/mixed liquor splitter box. Originally, the gates were installed for manual operation, but because they were so large, the facility decided to add actuators for ease of operation. Since their installation, the gates have operated smoothly; however, in 2008, newly discovered concrete corrosion damage in the facility's preliminary treatment system raised concern.

Unexpected Challenges

When staff started seeing hydrogen sulfide concentrations averaging 150 ppm but peaking at more than 500 ppm in its preliminary treatment unit, they realized this was a major concern. As the concrete corrosion progressed, the rebar became fully exposed. Concrete material was collecting in the preliminary treatment influent channels where six Hydro Gate gates were being used for flow isolation. This material began to build up in the gate tracks, so that the gates could track up and down, but would not fully close.

The concrete surface in the preliminary treatment structure required rehabilitation and the gates needed inspection for damage. The water authority expected it would have to rebuild or replace the gates.

Gates Intact Amid Facility Rehab

Construction began in 2015 to rehabilitate the concrete, rebuild the existing fine screen units and replace or refurbish the HydroGate gates. The contractor evaluated the gates and found they had held up well in the harsh environment—only their "J" seals needed replacing. These seals were included in the construction contract whether or not the gates were replaced or refurbished, saving the water authority more than $250,000. Henry Pratt Company accommodated the order for the seals with a quick turnaround. Then, the contractor removed the gates and replaced the seals on site. The original gates continue to operate as intended with minimal maintenance. The facility staff are satisfied with the gates' reliability and do not foresee replacing them soon. ■

Smart Sensors Provide Water Distribution System Data Insights

Hassan Ali, senior vice president, Mueller Water Products, discusses smart sensors and the valuable information they can provide utilities on their distribution systems.

Q: Utilities have tremendous amounts of data and system control within a water treatment plant, but what happens to that visibility once the water leaves the plant and enters the distribution network?
Ali: Because treatment plants have power and communication capability that are wired, it's easy to get data from water treatment plants. Outside the water treatment plant, other than a few locations where the utilities have maybe added some pressure monitoring that's wired, they have no visibility on what's happening to the water. So when leaks occur, most of the time it's a surprise for the water utility. If we start putting sensors in the water network through advances in technology, there's a huge value proposition.

Q: Which types of Mueller smart sensors can be added to a water distribution network, and how do they benefit a utility?
A: Currently there are sensors for leak detection, such as acoustic sensors, and sensors for remote pressure monitoring. At any point in the system where the utility wants to know the water pressure, we can send that information back. Our Hydro-Guard® unit automatically flushes to maintain chlorine levels in certain areas in the water system. For transmission mains, we have the EchoShore®-TX, a leak detection monitoring system that can have also have other sensor inputs.

Q: Why should utilities adopt smart sensors into their water networks?
A: Ultimately there has to be a business justification. There are really three benefits. One is that leaking water costs utilities money. They're pumping water into the ground, so there's a return on investment by catching leaks early.

The second reason is to mitigate risk. We have many case studies now where the utility was able to intervene in the leak on its own schedule without overtime and avoid a catastrophic failure.

The final reason is environmental. Water has chlorine in it, and many of our clients are in areas where if too much water leaks into the watershed, the chlorine concentration can go up and kill wildlife.

Q: What is concept of the Mueller smarter hydrant, and why should utilities look at this smart water approach?
A: We're incorporating more technology into the fire hydrant, putting leak detection and pressure monitoring all in one place. The value of that to a customer is many-fold. Primarily we have installed leak detection systems that have an eight-month payback in terms of reducing water loss. Many customers are also worried about pressure. If they have a break, and they also have data to prove they maintained a minimum pressure, then they may not have to issue a boil water advisory.

Surge-Anticipating Pressure Relief Valves

Pipe bursts as a result of transients and surges within a piping network are commonplace around the world, resulting in large volumes of NRW loss. Anywhere that pumps start and stop suddenly due to PLC failure or power loss during storms, there is a risk of surge damage to the pumping and piping system. All pump stations should have some sort of surge protection.

Singer® surge-anticipating relief valves react to the periods of low pressure after power failures. A second pilot opens the valve whenever the system pressure falls below its set point. How low the second pilot is set should be carefully considered, but it should always be set lower than static less full flow friction. By sensing the dip in pressure, the surge anticipating relief valve has time to be at least partially open when the wave returns, thereby reducing the overpressure.

The stable pressure after operation must exceed the pilot setting to ensure the valve closes and does not drain the entire pipeline. Correct sizing of the surge anticipating relief valve is very important, and oversizing the surge anticipating relief valve can be a common mistake. Consulting with the valve manufacturer, or working with a knowledgeable surge consultant, is always recommended.

PLANNING FOR PUMP CONTROL

Valves help prevent pump and pipe damage at San Diego County pumping facility

As populations grow and the threats of drought loom, water utilities seek ways to ensure residents have adequate access to the water they need. In Southern California, the San Diego County Water Authority (SDCWA) has implemented the multi-faceted Emergency Storage Plan to ensure availability of water to the San Diego area in case of an interruption in imported water deliveries.

A key element in the Emergency Storage Plan's system of reservoirs, pipelines and pumping stations is the San Vicente Pumping Facilities, a pump station, surge control facility and connecting pipeline system that was completed in 2010.

From Reservoir to Distribution

The San Vicente Pumping Facilities are designed to move water from the San Vicente Reservoir to the SDCWA water delivery system via the 11-mile-long San Vicente Pipeline. Originally constructed in 1943, the San Vicente Reservoir recently underwent a major upgrade to raise its dam by 117 ft, more than doubling its storage capacity to 157,000 acre-ft. The San Vicente Pumping Facilities are able to pump 300 million gal per day from the reservoir—an amount that represents approximately half of the San Diego area's daily water use.

The pumping facilities utilize three primary elements to get water from the reservoir to the water distribution system. First, a pump station pumps water from the reservoir uphill to the surge control facility, protecting pipeline that often fail due to fatigue caused by pressure spikes. Situated atop a hill overlooking the reservoir, the surge control facility's 3-million-gal tank is built into a basin, so only the top 20 ft of it are visible. From there, gravity flow takes the water to the SDCWA's Second Aqueduct via the San Vicente Pipeline.

Providing Pump Control

Essential to the pumping facilities is a Pratt® rotary cone valve—the largest the company has ever produced—that provides pump control. "Pumps create surges to the piping system when they are started," said Ed Schutz, Pratt® senior sales manager. "Pump control valves are utilized to minimize or eliminate the surges to the system when a pump is started."

The benefit of utilizing this valve is that the company supplies a complete pump control valve system, including the not only the valve itself, but also controls that manage opening and closing the valve, as well as the speed of those operations, and an accumulator system, a hydraulic power pack that supplies hydraulic fluid at the proper volume and pressure to open and close the valve. During a power outage, the accumulator system provides stored power to close the valve. "This is important, as when a pump loses power, the column of pumped water will return to the pump—and cause major damage," Schutz said. "The control will sense this and close the valve before damage to the pump can occur."

Pratt pump control options also includes metal seated ball valves, rubber seated ball valves and butterfly valves. For water utilities looking for long-term reliable valve operation, Schutz recommends a "full ported valve, such as a ball and cone valve, and require system responsibility for the valve, valve actuator, valve controls, and hydraulic accumulator system." Full ported valves such as ball or cone valves can be utilized as isolation valves, he said, with benefits including near-zero headloss and ability to be "placed near turbulent water flow, such as near pumps and elbows." ■

HOW VALVES ARE USED AT DAMS

Did you know?

- Dams of all sizes contain thousands of valves.

- Large dams, especially those providing hydroelectric power, include:
  - Gate valves
  - Globe valves
  - Check valves
  - Ball valves
  - Butterfly valves

- Valves adjust water flow in the reservoir behind dams while maintaining proper depth. This is critical in times of both drought and flooding.
- Dams provide critical water resources and, in some cases, renewable electrical energy for communities.
- The most common style of gate or valve in a dam is a rolling type. Often, gates or valves are designed differently than how they would be in other applications.

Slide Gates

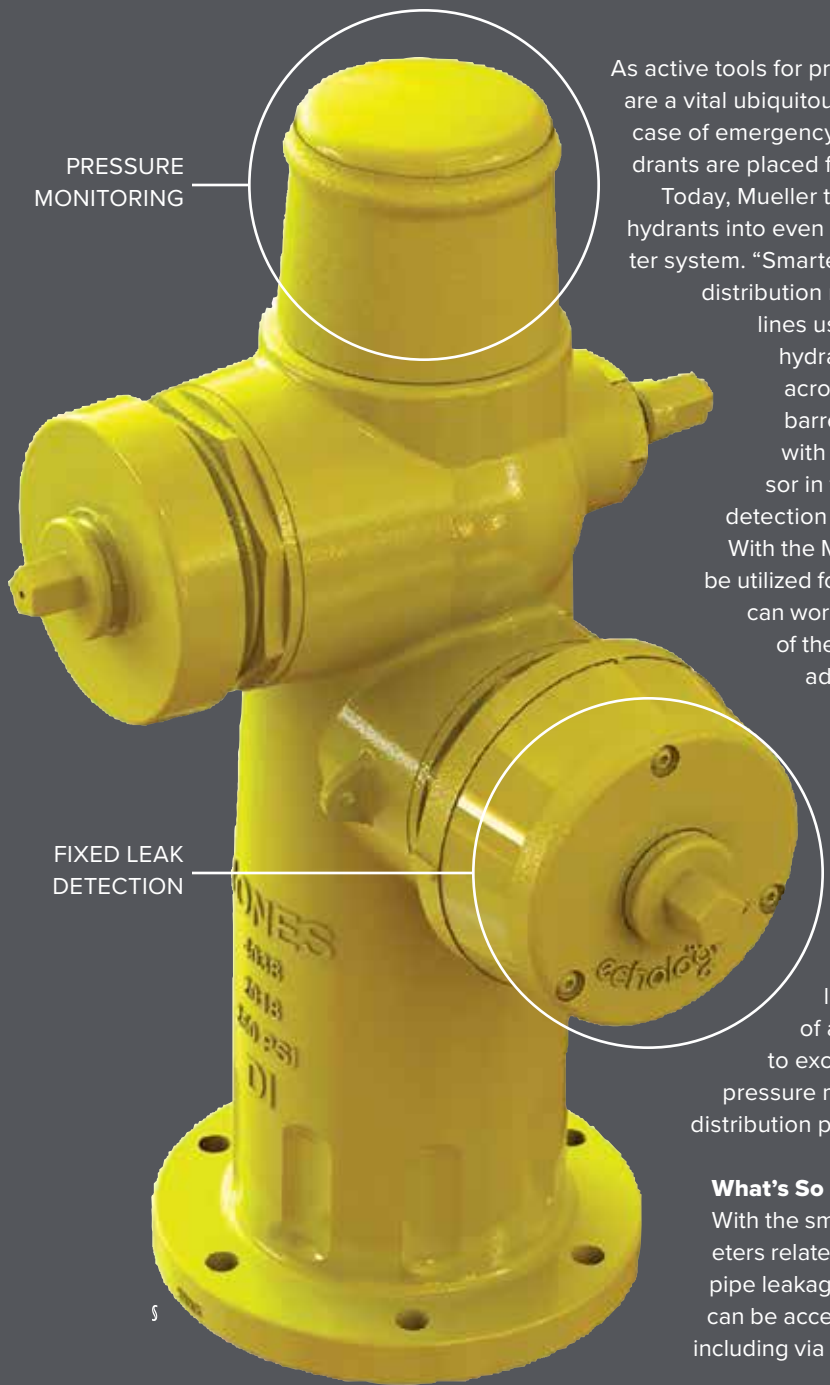
Designed with low leakage requirements in corrosive environments in mind, the Hydro® Gate HG561 Stainless Steel Slide Gate is ideal for applications at water and wastewater treatment plants, low-head reservoirs and power plants. The side guide seal assembly features an ultra-high molecular weight polymer that positively retains the slide and forms a watertight seal. The frame, slide, stem and fasteners come in stainless steel type 304 and 316, depending on the application. The gate, frame and yoke design conform to AWWA C561 and all seals are factory adjusted and inspected so no adjustment is required in the field.

Altitude Valves

Singer® altitude and float valves are automatic mechanical control valves, used to control the level in reservoirs or tanks. These control valves are used to ensure the reservoirs or tanks do not overflow and lose water down the drain.

An altitude valve is a mechanical valve that uses a sensing line from the reservoir or tank, to a highly sensitive pilot, that allows the valve to open or close to maintain a user set level of the water. Altitude valves can be designed to open once the water level begins to drop, usually around 1 to 2 ft, or can be equipped to allow for a user to adjust drawdown of the water level to allow for more tank or reservoir turnover.

THE FUTURE OF MINIMIZING WATER LOSS & MAIN BREAKS IS SMARTER



As active tools for protecting life and property, fire hydrants are a vital ubiquitous presence in cities. They are there in case of emergency—meaning that for the most part, fire hydrants are placed for moments that may or may not happen.

Today, Mueller technology has evolved to transform fire hydrants into even more crucial components of a city's water system. "Smarter" fire hydrants monitor pressure in the distribution network and detect leaks in the pipelines using integrated technologies. To make hydrants new central hubs for communication across the distribution network, Jones wet barrel fire hydrants can now be equipped with a Hydro-Guard pressure monitoring sensor in the dome top and EchoShore-DX leak detection node as the nozzle cap.

With the Mueller® smarter hydrant, these assets can be utilized for more than active fire protection—they can work 24/7 to help utilities take back control of the water flowing through their systems. In addition to new Jones hydrants, any existing wet barrel fire hydrant with a dome top can be converted into a smarter hydrant.

Why Fire Hydrants?

While pressure monitoring and leak detection technologies can be deployed at other points in the distribution network, fire hydrants are the most low-profile and accessible components of a city's water system. Utilities won't have to excavate or clean access pits to deploy pressure monitoring and leak detection for their distribution pipes.

What's So Smart About It?

With the smarter hydrant, utilities can monitor parameters related to water pressure changes and potential pipe leakages in their system. Data is collected and can be accessed or distributed in a variety of ways, including via web portal and mobile alerts. ■