



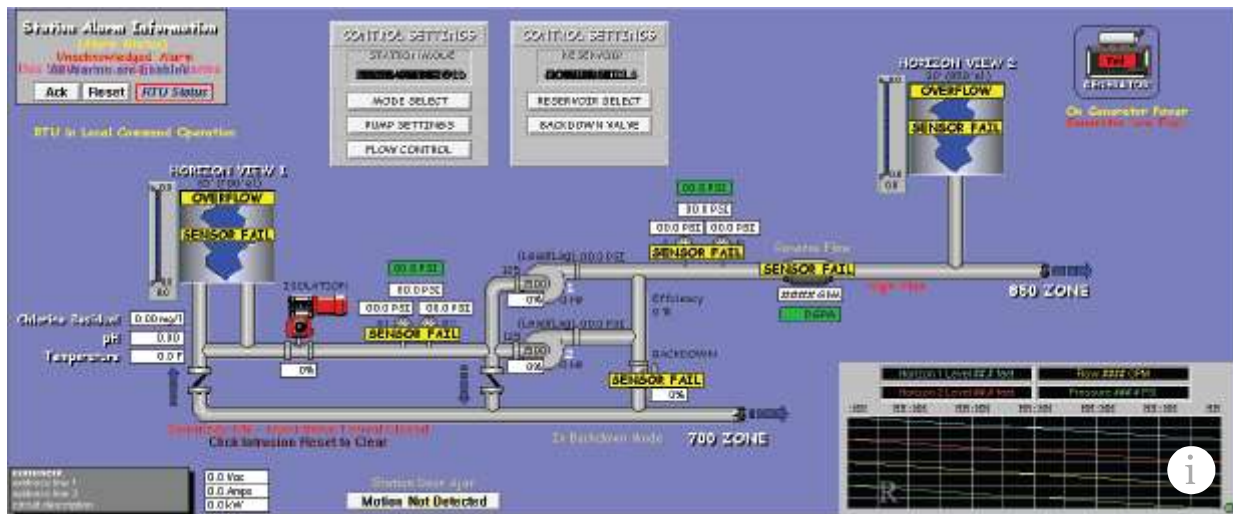
Technology Ensures Resiliency

Reinforcing the sector means leaning forward on system management

Greg Jackson

As if the convergence of a sector worker shortage and the pandemic was not enough to cause water utility managers to have concerns, millions of people across the country have experienced extreme weather that has brought cities to a standstill and left residents and commercial and industrial businesses without water for washing, drinking, or flushing. The effects of climate change threaten water sources and make water infrastructure more vulnerable, as communities are experiencing firsthand. The underinvestment in water infrastructure and technology to assist in

managing these systems poses risks to public health, economies, and the environment. This all points to the critical role technology upgrades play in ensuring water resiliency.



A 2017 Arcadis report, titled *Empowering Water Utility Innovation*, points out "As North American water utilities imagine the future of providing on-demand, high-quality, affordable water and sanitation services to the hundreds of millions of customers who depend on them, the question isn't, whether the water sector needs to innovate, but, rather, what happens if it doesn't?"

The report and associated Water Research Foundation and Water Environment & Reuse Foundation study found that 91% of surveyed utilities believed innovation was critical to the future of their organizations, while less than 40% believed they were fully leveraging it. Supporting these findings is the AWWA 2018 State of the Water Industry report that lists multiple barriers to innovation or change. Among them are resources and risk, but also a lack of openness to new ideas or willingness to pursue innovation. Surprisingly, of the responding utilities, many had not fully implemented a supervisory control and data acquisition (SCADA) system. Only 55% of small utilities, 71% of medium utilities, 82% of large utilities, and only 87% of very large utilities had fully implemented SCADA. If all utilities are not using SCADA, they certainly are not adopting complementary technologies such as cloud- or mobile-based applications, which would help optimize the capacity of their assets.

Innovative Technology

In the March 2019 open access book, *A Call to Cities: Run out of Water or Create Resilience and Abundance*, authors Will Sarni and Josh Sperling wrote, "Business as usual has not led to sustainable, healthy, nor resilient future pathways for urban and rural communities. However, necessity has been noted as a unique catalyst for innovation and may prove a key motivator for new approaches." Resource stress and scarcity foster innovation in technologies, financing, business models, and partnerships, which will play a critical role in moving from where we are to improving water resiliency. Following are some examples of this.

The U.S. Environmental Protection Agency (EPA) and Sandia National Laboratories have developed the Water Network Tool for Resilience (WNTR) to quantify resilience of drinking water distribution systems. WNTR can help water utilities explore the capacity of their systems to handle disasters and guide the planning necessary to make systems more resilient over time. The EPA's website includes a downloadable webinar with WNTR tools and resources. According to the website, "WNTR has an application programming interface (API) that is flexible and allows for changes to the network structure and operations, along with simulation of disruptive incidents and recovery actions."

Another catalyst for innovative technology is the Leaders Innovation Forum for Technology (LIFT), which seeks to accelerate the adoption of new and innovative technologies. LIFT was created and is supported by the Water Environment Federation (Alexandria, Virginia) and The Water Research Foundation (Denver).

Fortunately, leading utilities are leveraging technology to enable a new — digitally driven — way to operate; some are using smart meters, IoT, artificial intelligence, and cloud connected sensors to provide a real-time view of assets to minimize downtime and increase resiliency. Software then analyzes and reports on various aspects of utility and facility operations, sending that information to the appropriate people in the workforce, anytime it is needed, anywhere they are.

Another technology being implemented is alarm notification software that seamlessly works with existing SCADA and automation platforms to push critical alarm and event details to remote workers in any abnormal operating conditions. Utilities staff can use this software to receive alerts via SMS, voice and email, and via mobile app to streamline decision making through push notifications. This allows the team to quickly see what is wrong, send an acknowledgement, and monitor alarm condition changes in

real-time, right from a smartphone. The mobile app also promotes team problem solving through a chat feature that helps teams converse, brainstorm, and share solutions on-the-fly, from wherever they are — whether in the facility, at home, or on the road. Another benefit of the mobile app is how efficiency is improved through the team visibility feature that shows who has seen an alarm as well as who has acknowledged it, reducing guesswork and redundant responses.

Some examples of what remote monitoring software can be used for are:

- ***Maintain water quality.*** Remote sensors detect bacteria, sediment, and pH can monitor water quality on a continuous basis.
- ***Detect leaks.*** Municipalities modernizing their networks have started to include pressure sensors across their piping and sometimes even retrofit sensors onto existing infrastructure.
- ***Increase equipment life.*** Remote monitoring sensors can oversee hundreds of key components of water treatment and distributions systems.

Conclusion

In the forward to Arcadis' 2017 report, Global Cities Director John J. Batten said, "Utilities are the hands in which governments and cities put their trust in to provide water to citizens and businesses. In the face of climate change and the need to manage assets, innovation is the clear and needed answer for water utilities to evolve and thrive."

Utilities that incorporate innovative technologies are more likely to realize sustainability dividends water resiliency, efficiency, and quality. Forward-thinking municipalities are incorporating state-of-the-art digital technology to avoid unanticipated risks. These innovations can drive significant economic and environmental improvements and ensure continuity in service, particularly when workers are remote or because of extreme weather conditions.

Remote Monitoring in Action

Bellevue, Washington

Bellevue is a rolling mid-sized city with a population of 149,000 and is located east of Seattle on the shores of Lake Washington. The city's drinking water, sewer, and stormwater systems, spread across 96 km² (37 mi²) includes 24 reservoirs, 22 pump stations, 145 active pressure reducing valve stations, and more than 965 km (600 mi) of pipe.

Bellevue's water infrastructure is aging. A single water main break can cut service to homes for an extended period. In response, close to 200 million USD has been set aside to renew or replace pipes, pumps, and reservoirs over the next decade. With so much at stake, maintenance crews need to anticipate issues ahead of time as well as quickly respond when equipment fails. This is even more important after hours and on weekends when there aren't as many crews in the field.

The list of things that can go wrong is long — from pipe pressure swings to power and communication failures to flood control malfunctions. The water service wants to be alerted to such problems within two minutes after coming into their SCADA system.

Faster Alarm Response After Hours

Previously, the water and wastewater departments used a pager system and an auto dialer to connect to an answering service after hours. But the answering service could not be relied on, so they connected a remote alarm notification system's SMS text solution to replace it. Now when a high- or low-pressure alarm is triggered, a text is automatically sent to the smartphone of the on-call operator. If no one acknowledges after a certain time, the alert immediately escalates to the next technician on the list, and so on.

Telemetry technician Mike Hetzler recalls how a recent water main break illustrates this software's value. Typically, staff would be alerted to after-hours water main breaks by the public. No longer.

"Early detection of low pipeline pressures because of a remote alarm notification software text alerted operations staff (who then alerted maintenance staff) of the water main problem before public notification reached our after-hours staff. The remote alarm notification gave us a faster response to this after-hours emergency," Hetzler said.

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