

A photograph of a water treatment facility. In the foreground, a series of aeration tanks are visible, with water cascading over a series of metal bars. The water is a vibrant blue-green color. In the background, a large, complex steel structure, likely part of the facility's infrastructure, extends across the frame. The sky is a clear, bright blue. The overall scene is industrial and clean.

Panasonic

How is the IoT Changing
Water Asset Management?

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TOUGHBOOK[®]

Water Utility Challenges

Water professionals shoulder continuous responsibility for providing safe, clean water to residents and businesses, ensuring fire protection capability, and treating wastewater. They protect the environment and the public health while facing challenges like aging infrastructure, budgetary constraints, new regulations and quality issues.

To meet these challenges, utilities will need to optimize operations and better manage their systems' assets.

Using the Internet of Things (IoT) to Improve Water Utility Efficiency

By relying on new technologies, water utilities can improve operational efficiency and effectively manage system assets. An International Data Corporation Study

shows that utilities are one of the top four industries forecasted to spend the most on Internet of Things (IoT) solutions in 2019. Utilities are projected to spend \$61 billion on IoT, particularly on smart grids for electric, gas and water.

While implementing IoT technology may seem like a competing need to the above challenges, it actually provides a way to resolve these challenges.

Water professionals are already data dependent for process monitoring and control, flow measurement, utility billing, maintenance management, system modeling and other uses. Today's utilities are becoming better able to interconnect data sources to optimize operations, increase efficiency, and make better business decisions. By improving management of the utility's assets and using data to target problem areas, managers can also delay or reduce the cost of capital improvements.



How is the IoT Changing Water Asset Management?

The Internet of Things (IoT) is one of the ways water utilities are collecting the data they need to operate more efficiently. The IoT refers to the billions of physical devices around the world that are connected to the internet, collecting and sharing data in real time. Some of the ways that smart water technology and the IoT can improve water systems are:



Streamlining operations for greater efficiency and improved workforce utilization



Reducing response time for service calls



Saving water by reducing leakage and increasing conservation



Increasing revenues with more accurate metering technology



Improving transparency and customer communication and service



Preventing sanitary sewer overflows, environmental damage, avoiding regulatory fines



Targeting areas for water or sewer main replacement more accurately



Saving energy and chemicals by optimizing process controls.

+ Utility Challenges Highlights

Aging Infrastructure and Funding Shortfalls – The American Society of Civil Engineer's latest Infrastructure Report Card gives Drinking Water a grade of "D," and Wastewater a grade of D+, with nearly \$1.3 billion in infrastructure needs.

Loss of Institutional Knowledge – A 2018 report from the U.S. Government Accountability Office projects 8.2 percent of existing water operators will need to be replaced annually through 2026.

Need for Increased Resilience – Natural and manmade disasters, increased cyber-threats, and climate change mean utilities must withstand or quickly recover from events.

Additional and Increasingly Stringent Regulations – Rules and regulations constantly change. On the horizon is per- and polyfluoroalkyl substances (PFAS) and possible revisions to the Lead and Copper Rule.

Increased Requirements for Sustainability – Utilities are pressured to improve sustainability by reducing electrical and chemical use and embracing green technologies.

IoT Success Story

Here is an excellent example of how new technologies improved system performance in multiple ways.

Las Vegas Valley Water Management District

- ✓ Acoustic leak detection in distribution system uncovered thousands of leaks
- ✓ Real-time notifications and location sent to mobile devices
- ✓ Fast response for leak repair, eliminating major breaks and cave-ins
- ✓ Increased water conservation by millions of gallons
- ✓ Capital savings by targeting and prioritizing infrastructure replacement projects
- ✓ Improved business decision-making

The Las Vegas Valley Water District (LVVWD) leak monitoring project is a water conservation showcase site for The Global City Teams Challenge, a network of project teams using IoT technologies within a smart city or community environment. Concerned about water loss and major pipe failure, LVVWD installed permanent acoustic leak detection devices in the aging 30-inch diameter main that runs through the Las Vegas Strip. LVVWD also has leak detection devices deployed on smaller pipes throughout the service area.

Big data analytics and a communication system combine with the utility's control system and geographic information system (GIS) to provide real-time visualization of any leaks. Leak notifications are immediately sent to Panasonic TOUGHBOOK® mobile devices so field crews can quickly make repairs.

Since 2004, the leak detection system has led to the discovery of over 2,500 water leaks, saving over 665 million gallons of precious water. In addition, the leak detection devices, in conjunction with pipe condition assessments have saved millions of dollars in capital costs by narrowly targeting and prioritizing major pipeline replacements.

IoT System Components for Utilities

The IoT is made up of components that vary depending on each utility's unique challenges and priorities. Often, these systems are built incrementally, so flexibility and scalability of the IoT technology is important. While some utilities prefer a major technology overhaul, many prefer to start with "low hanging fruit," with a quick return on investment.

Most utilities have some or all of this basic infrastructure to integrate with IoT:

SCADA

Supervisory Control and Data Acquisition – an electronic monitoring and control system that sends instantaneous data on system operations—tank levels, equipment status, monitoring parameters (temperature, pH, disinfectant levels, etc.). Allows for off-site monitoring/control and emergency callout.

GIS

Geographic Information System – a combination of mapping and data, showing the location and detailed information of the utility's assets.

CMMS

Computerized Maintenance Management System – Tracks work orders for preventive, predictive, and reactive maintenance for system equipment.

Utility Asset Management Software

Tracks inventory, age, condition and replacement of system assets.



Smart Meters

Automated meter reading (AMR) or advance metering infrastructure (AMI) that replaces manual read meters. In addition to recording water use, these smart systems can have additional sensors to help locate leaks, note water pressure, temperature or quality problems, and provide automated shutoff and turn-on capability.

Other IoT systems can also provide data to enrich utility enterprise software, hydraulic modeling software, customer information systems, billing, and fleet tracking software.

New software, hardware, and IoT solutions are on the horizon, including systems that integrate with other City utility networks including electric, gas, lighting, weather monitoring, and social media. As technologies become available, integrating the data so that it is visual, understandable, and easily usable will become ever more important.

IoT and the Mobile Worker

Field workers are critical players for water utilities. They are the “boots on the ground,” responsible for operating and maintaining equipment, pipelines, treatment facilities, and pumping systems. These employees work shifts covering 24-hours per day, 7 days per week, often at remote locations and in the field. In addition to scheduled operations, they respond to emergencies and customer complaints.

Mobile workers are sometimes overlooked when designing IoT systems and may not be asked for input or kept abreast of planning activities. Utilities must not make this mistake.

Here’s how workers in the field are using mobile solutions to gather data from IoT systems and access information from utility systems to help guide their work and make informed decisions in real-time:



Clear, quick and detailed communication.

With mobile technology field technicians can respond to problems and emergencies more quickly. Work order requests are more accurate, and data sent through an IoT network can be tracked, recorded, and instantly available.



Accurate location of infrastructure.

With GIS mapping, field operators can accurately locate infrastructure. This expedites finding valves to shut off water for a main break repair or traveling to the location of a sanitary sewer overflow or other trouble calls—reducing water loss or preventing environmental damage.



Early Problem Resolution.

The ability to access SCADA through mobile devices provides workers with critical information on system status and alarms. Problems can be resolved before they become emergencies.



Automated meter reading (AMR).

With AMR, mobile devices connect to smart meters for drive-by meter reading, which is much more accurate than manual readings. In addition, cost savings on personnel, overtime, vehicles and fuel can be significant.



Preventive maintenance schedules and work orders.

Access to a computerized maintenance management system (CMMS) gives workers the information they need to complete and record tasks so they can be tracked immediately.



Respond effectively to natural or manmade disasters.

Information can be gathered and recorded quickly when an immediate response is necessary. Also, the GIS mapping functions help field workers find critical infrastructure when above-ground structures have been damaged or destroyed. During emergency events, first responders and utilities can access FirstNet®, a dedicated high-speed network for public safety to stay in touch and coordinate resources.

IoT and the Mobile Worker

Mobile Device Requirements

Mobile devices for utility workers have a tough life. They may be left in hot trucks, carried in freezing or rainy weather, handled by wet or dirty hands, and used while wearing gloves. They may be bounced around in vehicles or dropped. As a result, these mobile devices should be extremely rugged to withstand these conditions. In addition, they should be:

- Compatible with the utility's software and IoT infrastructure.
- Easy to configure and use.
- Capable of accessing FirstNet for emergency response.

Barriers to IoT Implementation

Water utilities are often slow to try new technologies. Budgets may be tight, and often geared at maintaining a level of service versus implementing new methods of work. When it's a publicly owned organization, expenditures must be approved by councils or commissions that may not understand how IoT can benefit the utility and its customers. Utility staff may be interested in IoT solutions but are too busy with day-to-day activities to develop and implement an IoT strategy.



IoT Implementation Steps

Plan your strategy: Develop a strategy first to help guide the purchase of hardware, software or services. Engage field workers during planning and throughout the implementation to help you understand process and task requirements. Address these questions during the strategic planning stage.

- What technologies are currently in place? (SCADA, CMMS, GIS, other?)
- What are the top priority problems that could benefit from the IoT?
- How will IoT be implemented?
 - Complete Overhaul – jump in all the way with a complete new system
 - Incremental – start small with quick wins, then expand as needed
- Which technologies do you need to address your high-priority objectives? (such as leak detectors, flow sensors, smart meters, mobile devices)
- Is that technology flexible and scalable?
- Who will be using the technology and how?
- Will it integrate easily with existing technologies?

Get stakeholder buy-in: Determine who will be using the new technology and how they will be affected. Explaining the benefits of the new IoT technology is important, as well as learning how the technology will affect them and any concerns or suggestions they may have. Potential users may benefit by talking with existing users of the proposed technology as well.

Evaluate potential solutions. Do your research and consult with other water utilities that have had experience with IoT technology. Engage with technical experts – service providers or manufacturer’s representatives that can help you turn your strategy into a plan; establish the technical requirements and understand what equipment, software, and services you will need to acquire. You should clearly understand project costs and how the technology will interface with existing systems, as well as implementation and training requirements.

For more information about how Panasonic can help water utilities improve efficiency, explore our website or visit the [Knowledge Center](#).

TOUGHBOOK®

Panasonic offers hardware, software, and services that can help you design the best mobile solution for your IoT initiatives.

Services:

Our services team is a U.S.-based support network with rapid turnaround on repairs and access to specialized services and experts providing field engineering, consulting and deployment services.

Software:

Panasonic provides mobile application services, including industry-leading mobile device management (MDM) and device security software.

Hardware:

Panasonic TOUGHBOOK® rugged laptops, 2-in-1s, tablets and handholds are durable, reliable and engineered to withstand the heat, cold and storm conditions that utility workers handle on the job every day.