

Internet of  
Water –  
A Powerful Tool  
for Safety,  
Conservation,  
and Efficiency

Public safety relies heavily on clean water, and the world's need for safe water heightens every day. As it can affect water quality, the condition of a premise plumbing system can have a direct impact on the safety of occupants and visitors. The ability to remotely monitor and control water temperature, flow, and other parameters in a quick and precise way is vital to delivering healthy, safe water in an efficient manner. Internet of Water, or IoW, technology can help fulfill these needs with digital mixing and connected components like sensors and cloud-based monitoring. IoW has the power to transform decision making for both water safety and water conservation. The extent to which COVID-19 has impacted public health and the increased prevalence of Legionella bacteria have highlighted the need for:

1. Visibility of water temperature, flow, and quality even when off-site
2. A way to remotely control water temperatures
3. Automated monitoring and reporting of premise plumbing water parameters and facility management activity
4. Connected products that help increase safety and efficiency
5. Reliable ways to reduce the risk of Legionella and other harmful bacteria

The plumbing industry is now embracing the ability for IoW technology to deliver higher levels of safety, efficiency, and connectivity. IoW can empower facility managers and engineers to proactively prevent issues before they arise, rather than having to react to or control an issue once it has occurred. One powerful example of IoW technology is digital mixing, which incorporates the use of sensors and remote communication. These connected elements can provide more control over water temperature and other parameters, improve water conservation, and allow for faster, more educated decisions about the premise plumbing system.

## **A Triple Threat in IoW – Digital Mixing, Sensors, and Remote Communication**

Digital mixing technology places real-time information at your fingertips to aid in quick decision making when safety is a concern, and for operational decisions to help conserve water, perform more efficiently, and reduce system downtime and the associated costs. There are three main technology-driven components in a digital mixing solution:

1. The controller's algorithm, or the mind
2. Sensors, which serve as the eyes and ears
3. Cloud-based technology and mobile apps, which serve as a voice for the user



The digital mixing controller algorithm processes data from the mixed temperature outlet sensor and signals the actuator to make thousands of tiny adjustments to maintain set point in real time. Sensors relay key system data for pressure, temperature, and flow for troubleshooting and optimization. The cloud-based technology and mobile apps give facility managers the ability to see vital data, quickly make informed decisions, and act remotely no matter their location.

Digital water mixing controls hot water delivery through a programmable valve or system that processes temperature, flow, and pressure data, which is obtained from the hot and cold water inlets, mixed outlet, and sensors on the mixed water return. High-speed electronic actuation modulates a simple ball valve that allows the setpoint to be maintained. Fast, responsive digital technology enables the collection of a large amount of data which can be stored and

communicated through a building automation system (BAS) or locally at the controller, providing intelligence at the foundation of the entire plumbing system.

Digital mixing solutions can increase visibility and monitoring capabilities of mixing assets across multiple locations through cloud-based technology and mobile apps. Remote access and off-site alerts enable a facility manager to see and monitor the condition of their premise plumbing water system(s) from anywhere. This information can be used for quick decision making when control of the system matters the most.

Much is at stake in controlling water quality and temperature in a commercial or institutional facility. Today, more people than ever are living or staying in very large facilities. Regardless of the challenges, they expect to have access to hot water whenever they need it.

Serious risks, such as Legionella growth, scalding, and thermal shock are associated with mismanaged water temperature. Legionella bacteria are destroyed almost instantly at water temperatures above 160°F, but at temperatures between 70°F and 115°F, their growth is abundant.

Uncontrolled and unmonitored water distribution systems can create high-temperature scalding hazards in bathtubs, sinks, and showers. The severity of scalding injuries depends on the temperature of the hot water and duration of the exposure.

### **Conserving Energy With Digital Technology**

*A look at how mechanical and digital water mixing technologies handle the plumbing system sanitization process illustrates how smart technology helps manage energy use. In mechanical mixing, a critical factor is approach temperature. It can vary by valve design and technology anywhere from 5°F to more than 25°F more. Approach temperature determines the highest mixed outlet temperature achievable based on hot water inlet temperature. For example, with a hot water inlet temperature of 120°F at a 20°F approach, the maximum temperature of mixed water that could come out of the valve would be 100°F.*

$$120^{\circ}\text{F} - 20^{\circ}\text{F} = 100^{\circ}\text{F}$$

*With a 5°F approach, only 105°F (vs. 120°F) incoming hot water would be required to attain a 100°F outlet temperature.*

$$105^{\circ}\text{F} - 5^{\circ}\text{F} = 100^{\circ}\text{F}$$

*Because of the positive close-off of the cold water port with digital mixing technology, the full inlet hot water temperature can be obtained on the mixed outlet side. To achieve a mixed outlet temperature of 140°F, incoming hot water would only have to be 140°F.*

*Plumbing system sanitization is a process that is particularly important in healthcare facilities, such as hospitals and assisted living facilities, where it is used as part of a broader infection control effort. For a high-temperature sanitization setpoint of 160°F (the temperature at which Legionella bacteria are destroyed), a hot water supply of 160°F would be needed.*

*Using a mechanical valve, depending on the design and the technology, the hot water supply would need to be as hot as 185°F to ensure water temperatures would be maintained at 160°F throughout the system. The digital mixing approach, with its much lower temperature requirements, is significantly more energy efficient. In addition, when the process is complete, the TMV outlet temperature has to be reset and the system rebalanced. With digital technology, the resetting and rebalancing occur automatically.*

According to the Centers for Disease Control, every year between 8,000 and 18,000 people in the U.S. are hospitalized with Legionnaire's disease, which results from the Legionella virus. Not only do waterborne illnesses like Legionella lead to thousands of hospitalizations each year, they also require costly medical treatments for patients, and can cost a facility millions in Legionella-related lawsuits. There are also thousands of scald burns that occur every year in the U.S.

To meet these challenges, you need better visibility and accessibility to your data. Instant access to detailed, timely information enables facility managers to make quick decisions as problems arise. A proactive monitoring program enabled by IoT can help reduce risks, predict trends, and improve operational efficiency. The IntelliStation Jr does this by making your digital mixing systems accessible online with the OnSite app on your computer or mobile phone. Proactive monitoring enables three key control measures that help address modern-day public safety risks:

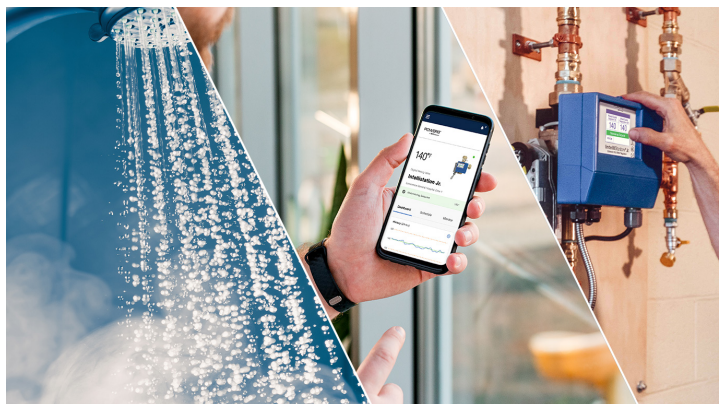
- Allows for quick decisions based on real data
- Allows facility managers to more easily manager their systems
- Generates automatic reports showing trends and performance

### **Fast Data for Fast Decisions**

IoT-enabled digital mixing gives facility managers, administrators and infection control professionals the ability to act more quickly in response to unsafe water temperature and out-of-range flow parameters in times of normal operation, emergency situations, and pandemic environments. Facility managers can ensure hot water and building occupants are safe and comfortable with a quick look at their phone or computer. If a temperature is out of safe range a facility manager can immediately be notified, and take necessary action. Despite business closings and occupancy limits due to COVID-19 restrictions, facilities professionals still need a safe way to efficiently manage the water systems in these buildings. IoT technology makes this possible by providing remote control of temperature and other parameters across multiple devices and locations.

### **Smart Management**

When it comes to facility management, knowledge is power. IoT connectivity gives facility managers data nearly in real time and allows them to manage all digital mixing valve assets securely – whether on site or remote – with safeguarded owner and administration levels of usability. Potential hazards are easily identified via text or email notifications that can be prioritized by the level of safety and potential liability. After receiving an alert, adjustments can be made right from their phone or computer.



Access to remote monitoring gives managers the ability to react quickly to environments conducive to the growth of Legionella and other bacteria. The quicker adjustments can be made, the quicker the source of bacteria can be identified, and risk can be reduced. In this

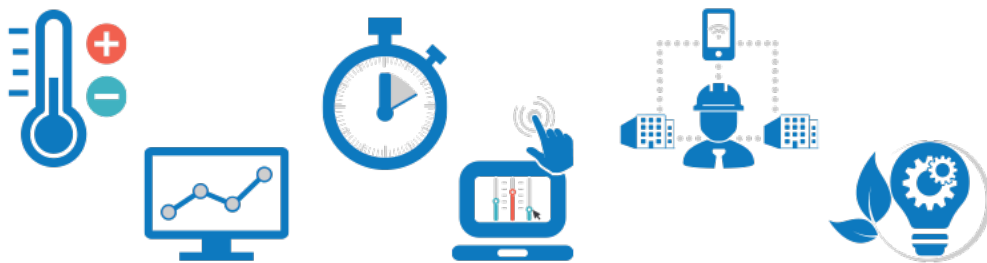
scenario, smart hot water management not only helps facility managers and property owners improve safety and comfort, it also minimizes litigation risk.

## Automatic Reporting

Automated reporting provides an overview of the health of a premise plumbing system and how efficiently it can regulate water temperature. This knowledge can help a facility team transition from the default approach which is to react, to a more proactive one by taking consistent action to reduce the risks of Legionella, liability, and litigation.

Automatic reporting makes it easy to document all activity, parameter fluctuations, and emergency responses in a timely manner, and facilitates the integration of these details into a water management plan. Hospitals are mandated by the Centers for Medical & Medicare Services to have a water management plan, which is also a requirement of ASHRAE Standard 188. Access to historical data including activity and performance streamlines the process of managing a water management plan and preparing for inspection.

A regular performance history review creates the opportunity for appropriate changes to be made in order to optimize the system. With detailed insight into a building's water system, strategic decisions can be made to maximize energy and water conservation. Automatic reporting also enhances data efficacy, which can be inaccurate when gathered manually. With the support of IoT connectivity, facilities professionals can eliminate guesswork and make smarter, data-driven decisions.



Digital mixing systems, which integrate the use of sensors, cloud-based technologies, and mobile apps, can improve the condition of premise plumbing systems by providing:

### Precise temperature control

- Digital mixing enables temperature control within  $\pm 2^{\circ}\text{F}$  even during low and zero-demand periods, which provides significantly more control than mechanical valves. This level of precision supports building safety and more efficient management of plumbing systems.
- With digital mixing, you can deliver zoned or system-wide high-temperature purges to mitigate the risks associated with Legionella and other waterborne bacteria.

### Intelligent data

- Connectivity allows for enhanced system monitoring and control, making it easier for facility managers to track and react to changes as needed to ensure safety.
- Detailed data provides a better understanding of the health and safety of a premise plumbing system and how efficiently it delivers hot water.

- Accurately capture data points such as activity, parameter fluctuations, and emergency responses that can easily be integrated into a water management plan.

#### **Faster response time**

- Access instant control of your hot water system to respond to unsafe water temperatures and out-of-range flow parameters in a timely manner.
- System alerts sent through text or email support preventative maintenance and fast response to potentially dangerous conditions.

#### **Remote control and monitoring**

- A digital mixing system can be integrated with a building automation system (BAS) to enable remote monitoring and control of water temperatures in a commercial or institutional building, resulting in connected building management.
- Securely manage all digital mixing valve assets on-site or remotely with three user levels: owner, administrative, and user.

#### **Reduced labor**

- Digital mixing reduces how frequently staff is required to complete robust, time-consuming outlet inspections. This is more typical for POU.
- With the ability to monitor and adjust multiple campuses and locations using connected mobile apps, one facility manager has visibility to multiple sites at once.

#### **Increased efficiency**

- The user interface of a connected digital mixing system can display energy usage data in therms, BTUs, gigajoules, and kilowatts.
- Tighter outlet temperature control (+/- 2F) vs. traditional thermostatic mixing valves (up to +/- 7F) saves valuable energy. See the [cost savings calculator](#) for the IntelliStation Digital Mixing Valve.

Plumbing engineers and facility managers are responsible for designing and managing efficient systems that consistently provide safe water throughout a building while reducing the health risks of Legionella, scalding, and thermal shock. Connected IoT solutions can provide higher levels of control, safety, and efficiency during normal operation, emergencies, and even pandemic circumstances.

As the plumbing industry embraces connected technologies such as digital mixing that utilizes sensors and cloud-based mobile apps to provide detailed data, we can better monitor the health of our premise plumbing systems to make more informed decisions and ensure building safety.

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