

Digital
Technology –
the Next
Generation of
Water Mixing

The different media—paraffin, ether, and bimetal—essentially work the same way but with differing degrees of effectiveness. The heat transfer expands the media and changes the ratio of hot to cold water. As the temperature gets warmer, the stainless steel piston moves up, closing off the hot water and opening the cold to maintain the setpoint temperature.

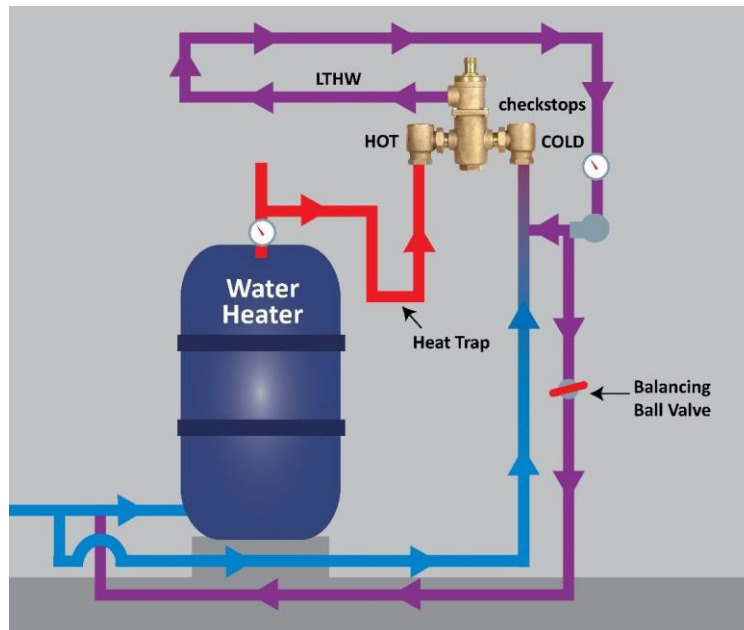


Figure 3—Thermostatic Mixing Valve in a Plumbing System

TMV Requirements

For TMVs to work correctly, the system must be properly designed and balanced. TMVs work most effectively under ideal conditions, for example, with equal inlet supply pressures or when there is no more than a 20% pressure differential across the inlets.

Several characteristics of TMVs determine how well they can meet the demands of different applications: For example, TMVs:

- are subject to temperature creep in low- or no-demand periods, typically overnight
- require checks and regular maintenance to avoid performance problems
- tend to be more susceptible to problems caused by water chemistry because the actuator operates in the water
- may experience performance issues related to flow rates and valve sizing (Because larger valves handling lower flow rates can have difficulty controlling temperature TMVs need to be sized properly.)
- cannot communicate through a building automation system or the internet

A Newer, Smarter Approach

Digital water mixing represents a significant leap in the technology used to control hot water delivery. This approach incorporates a programmable valve or system to process temperature, flow, and pressure data, which is obtained from sensors on the hot and cold water inlets, mixed outlet, and the mixed-water return. High-speed electronic actuation modulates a simple ball valve that allows the setpoint to be maintained with improved accuracy.

Digital technology is very fast and responsive. It enables collection of a large amount of data, which can be communicated through a building automation system (BAS) or locally, at the controller, providing intelligence at the foundation of the entire plumbing system.

Energy Conservation 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. 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.

Legionellae Growth Chart

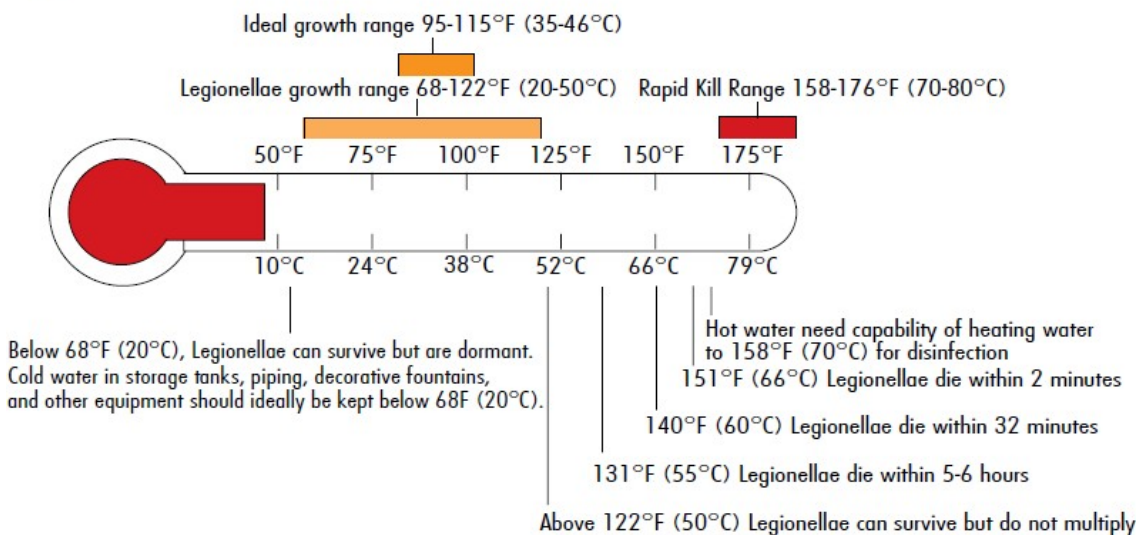


Figure 4—How Legionella Bacteria are Affected by Temperature

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 that 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 re-set and the system re-balanced. With digital technology, the re-setting and re-balancing occur automatically.

Why Worry About Legionella?

Of the many waterborne pathogens that can cause illness, the Legionella bacterium is the leading **waterborne** cause of disease outbreaks in the United States. Legionella grows in freshwater environments, and when people aspirate (or breathe in) airborne moisture carrying it, they become at risk of acquiring Legionnaires' disease, a severe type of pneumonia.

Legionnaires' disease is especially serious for certain segments of the population, including:

- People 50 years of age or older
- Smokers
- Individuals with underlying medical conditions, chronic lung disease or immunosuppression

Water Tempering at Its Finest

Since 1891, Powers, a Watts brand, has provided distribution, point-of-use, and emergency water-mixing and temperature solutions used in residential, commercial, and institutional applications. Its T/P technology provides superior protection against temperature and pressure changes. In 1924, Powers developed the first modern pressure balance valve, enhancing bather safety and comfort as modern plumbing evolved.

The company's digital mixing solution is the Powers IntelliStation™, a smart mixing and recirculation system for domestic hot water. It provides the precise control and insight into a plumbing system needed by commercial and institutional facilities such as healthcare facilities, hotels, educational institutions, and correctional facilities.

Integrated into a building automation system (BAS), the IntelliStation allows facility managers to remotely monitor and control water temperatures to provide safe, efficient hot water delivery. In addition, the IntelliStation provides features that ease installation, repair, and system maintenance.

Learn more at [Watts.com/our-story/brands/intellistation-family](https://www.watts.com/our-story/brands/intellistation-family).