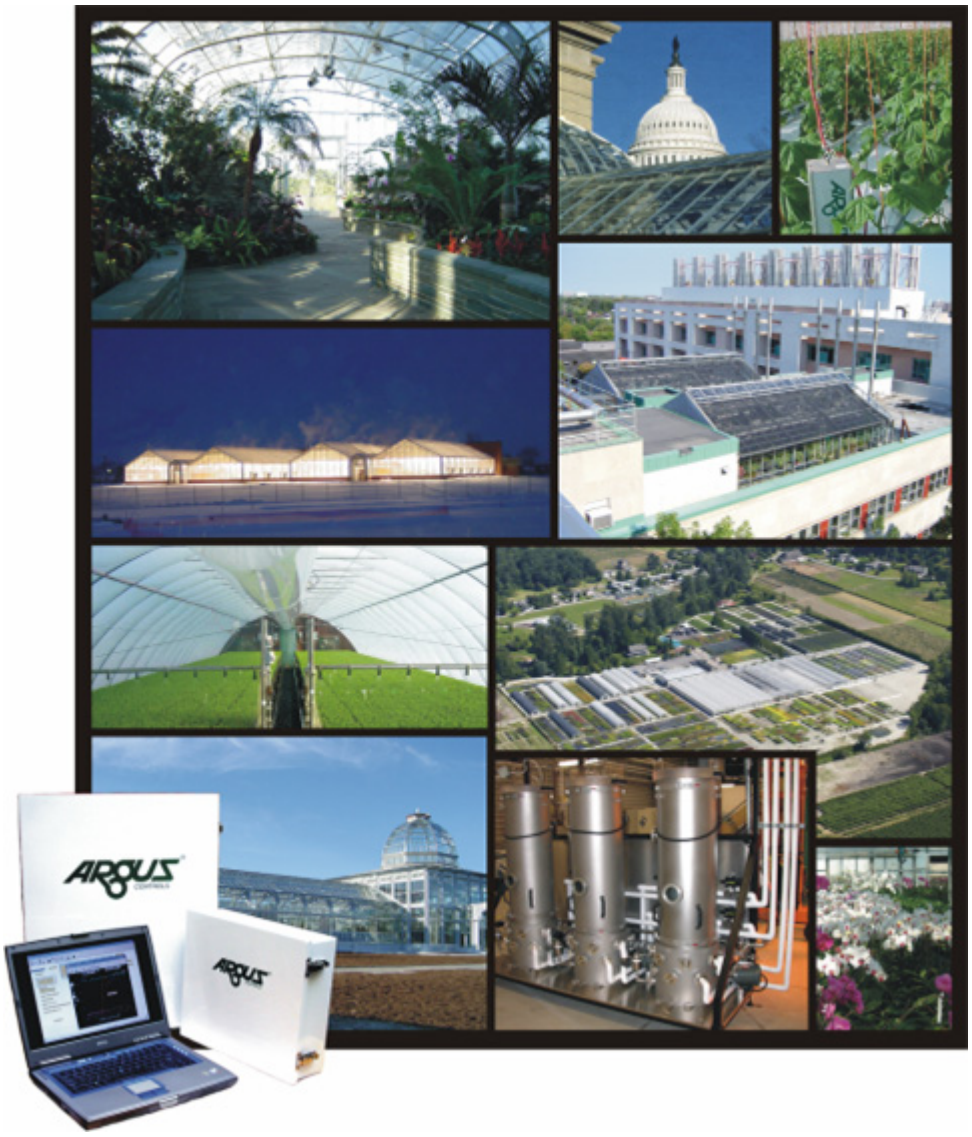
ARGUS CONTROLS

A CONVIRON COMPANY

Mixing Valves



August 3, 2017

Mixing Valves Application Note

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MIXING VALVES

Most radiant hot water heating systems in greenhouses use mixing valves to control the temperature of heating pipes. Both 3-way and 4-way valves are commonly used.

Mixing valves provide the ability to:

- Regulate the temperature of the heating pipes in a climate by controlling the flow of hot water from the central supply system to the local heating zone.
- Proportion and ration the available system heat over several independent zones, when boiler capacity is temporarily exceeded.

By carefully adjusting the temperature of the water in the heating pipes, the Argus system is able to closely balance the heating energy applied with the heat loss in each compartment. This results in very even temperature management.

The computer constantly monitors the compartment and outdoor conditions and compares them to target values. It then calculates the desired pipe temperature required to sustain the current air target setpoint and positions the mixing valve to achieve this pipe temperature in the local heating zone.

Pipe temperature sensors are used to provide feedback correction for valve positioning.

Types of Mixing Valves

3-Way Mixing Valves

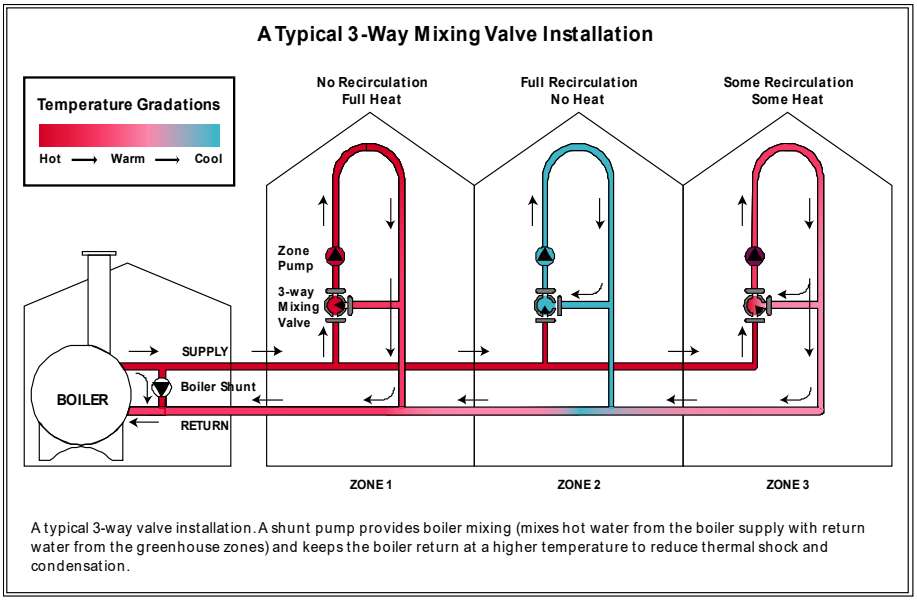

Figure 1. A typical 3-way mixing valve installation

Three-way valves are typically used in situations where **the central supply and return pipes are not recirculated by a** *ring main* **transport pump**. Zone recirculation pumps and mixing valves are used to circulate and recirculate the contents of each zone's heating pipes. When no heat is required, this is a closed loop. See "Figure 2 and 3" on page 5.

When heat is required, the Argus system opens the mixing valve, allowing hot water from the heating supply to be drawn into the zone loop by the zone pump. See "Figure 2 and 3" on page 5. When fully opened, no recirculation occurs within the compartment and full heating occurs. See "Figure 4" on page 5.

Three-way valves must be used when heat/cold storage is used with CO_2 extraction systems, as the design does not *contaminate* the main return water temperature with supply water. This

is a good design choice for operations up to a few acres in size with supply and return pipes up to a few hundred feet in length.

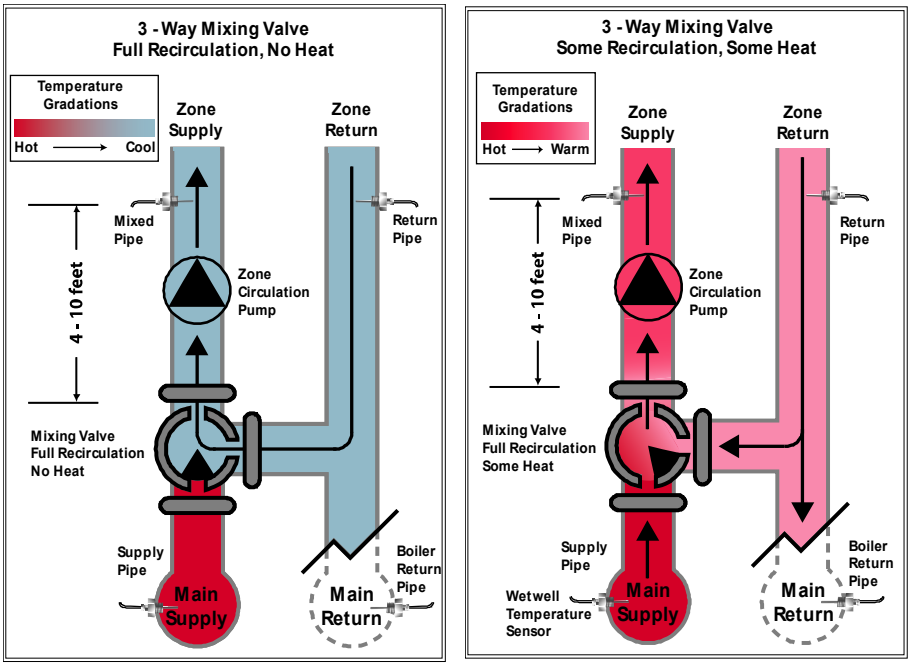

Figure 2 and 3

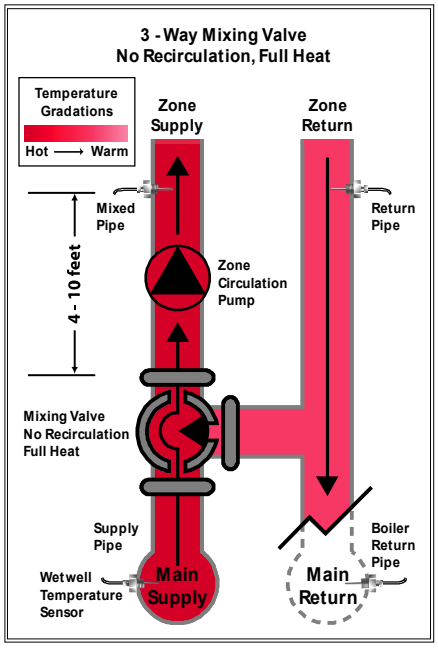

Figure 4

4-Way Mixing Valves

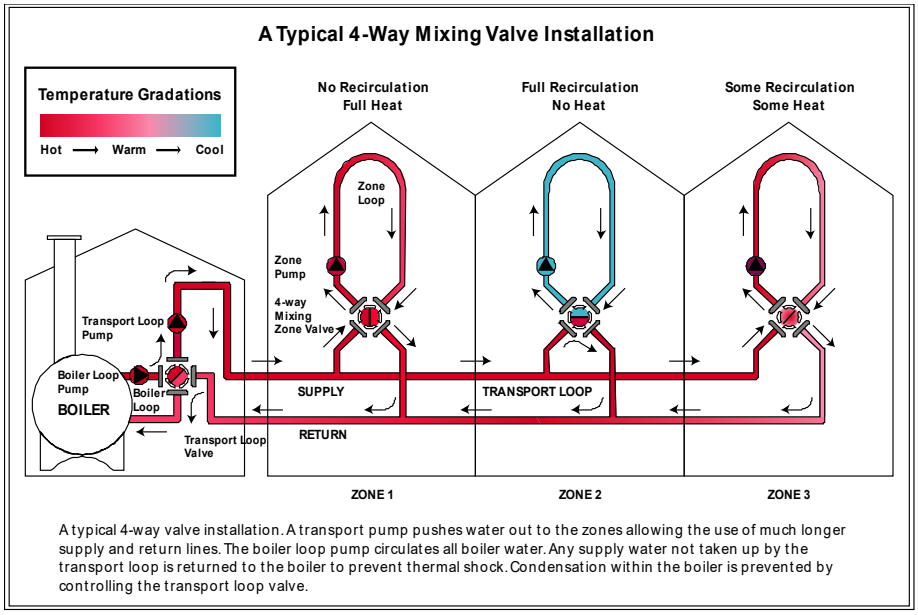

Figure 5. A typical 4-way mixing valve installation

Four-way valves are used when the zone is supplied by a transport or *ring main* system that has its own circulation pump to create a pressure differential between the supply and return sides of the system. In these systems, both the ring main and the individual zones can be continuously circulated independent of one another. When no heat is required by any of the zones, the ring main recirculates its hot water via a transport pump and each zone recirculates its water by means of a zone recirculating pump. See “Figure 6 and 7” on page 7.

When fully closed, both the supply and return pipes to the zone are isolated from the ring main. When heat is required, the 4-way valve opens to allow supply water to enter the zone and return water to exit the zone. See “Figure 6 and 7” on page 7. When full opened, supply water flows directly through the zone with no recirculation. See “Figure 8.” on page 7.

Four-way valves are normally only used with transport systems. They provide alternate pathways between the supply and return valves for any 'unused' hot water pushed through by the transport pump.

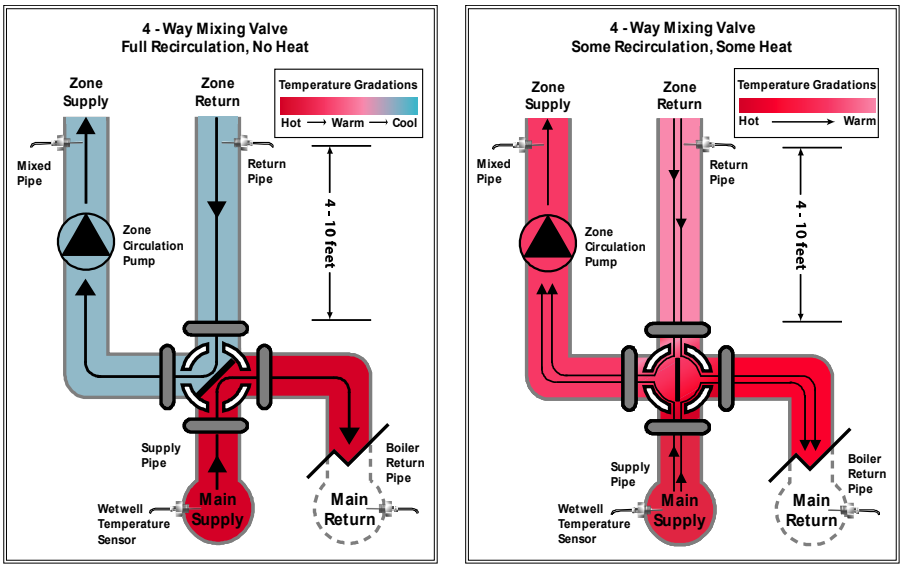

Figure 6 and 7

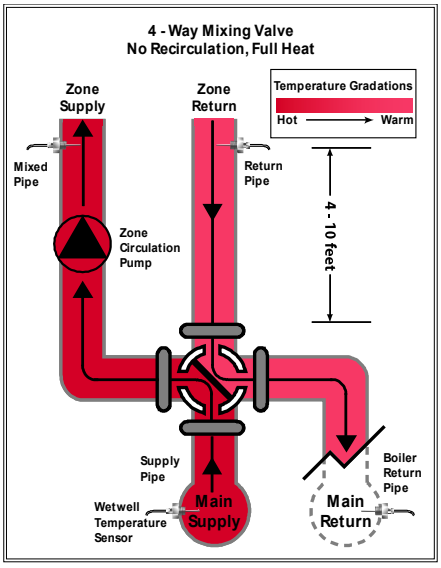

Figure 8.

Mixing Valve Control

The Argus control system is supplied with several specialized programs for managing hot water heating systems. By using pipe temperature control for operating mixing valves, the system is extremely responsive to changes in the amount of heating energy delivered to the climate zones. This helps to precisely match the current heating demand, avoiding costly overshoots.

Mixing valve movements can be controlled by either time or an optional position sensor. The control system can provide either direct digital control (ON/OFF or Tri State Floating) or analog (4-20ma) control output depending on the type of valve motor actuators you are using.

Several specialized mixing applications are supported including:

Heat Zone Mixing Valves

Heat Zone Mixing Valves request specific pipe temperatures based directly on their own current climate requirements.

- Minimum pipe temperatures can be specified for each heating period as well as during CO_2 application.
- You can also specify the minimum pipe temperature to use for each valve when snow-loading conditions are present.
- Maximum pipe temperature settings are provided to protect heat distribution equipment such as plastic piping.
- Crop activation settings enable you to configure time and light based pipe temperature increases.
- Boiler return temperature limit settings can be used to protect your central heating equipment and to allocate the available heat to specified priority zones during peak demand periods.
- Mixing valve operation can be grouped with circulating pumps. Many lead/lag pump options are provided including alternating or fixed cycling, and pipe temperature based secondary circ pump operation
- Calibration settings to allow for loose linkages and non-linear valve opening position/output proportional response ratios.

Heat /Cool Applications

- In addition to the standard heat zone features, you can manage mixing valves on systems that provide both heating and cooling through the same distribution equipment.
- Linearization tables to correct for non uniform output in relation to percent opening.

Stand Alone Mixing Valves

These types of valves operate similar to heat zone mixing valves except that they are optimized for non-climate uses such as bench or soil heating.

- Direct sensor based values can be used to control operation or multiple external values can be mapped and calibrated to govern valve operation.

Transport Mixing Valve Settings

- A transport mixing valve controls the pipe temperature of a hot water heating system's distribution piping (commonly known as a transport loop or a ring main).
- Usually, several heating zones draw their hot water from this common transport loop.
- The pipe temperature of the transport loop is controlled by the requirements of the heating zones connected to it.

Floating temperature offset above the highest zone request values. This enables the transport line to always attempt to have hotter water available (within the system wide constraints) than the highest temperature requested by the zones it supplies.

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