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CONTROL VALVE OPERATION

TOP 10 BEST PRACTICES

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Top 10 Best Practices for Control Valve Operators

Every control valve application is unique. While general guidelines and standards of practice exist for how they should be used, they aren't always followed. Since a control valve is often installed after the pipe is in place, each control valve must be adapted to the specific application. With so many applications being unique to the utility, there are some best practices that every control valve operator should have in their toolbox before trying to tackle some of the more difficult modulating concepts. Here are my top ten most important facts for diaphragm operated, automatic control valves.

1. **A diaphragm operated, automatic control valve, regardless of the manufacturer, operates from the same hydraulic principles as any other diaphragm operated, automatic control valve.**
   - Hydraulic pilots require differential pressure through the valve to operate. That principle is a foundation of how these valves work regardless of who makes them. The existence of a pressure gradient is essential to flow. No voodoo here, just the work of Newton, Bernoulli, Archimedes, and Pascal.

2. **A steel or brass fitting with a small hole is essential to the normal operation of a control valve. Without it, the valve won't operate as intended.**
   - This fitting is the fixed restriction. The fixed restriction reduces the flow of water to the top cover/bonnet through the pilot system that allows us to direct the inlet pressure above the diaphragm; thus closing the valve. The pilot reacts to the pre-set pressure, allowing pressure to move downstream through the pilot plumbing, relieving pressure above the diaphragm. The flow allowed off the cover or bonnet by the pilot needs to exceed the volume allowed to enter the pilot system by the restriction fitting. This creates the area of low pressure at the cover connection; thus opening the valve.

3. **Proper start-up and control valve commissioning requires knowledge of the entire distribution system, not just the valve itself.**
   - While there are many questions that should be asked during valve commissioning, the most common error is lack of understanding of the rest of the system. For instance: If water and pressure are allowed to go downstream, can the infrastructure downstream handle that pressure? Will pipe come out of the ground? Will there be damages to residential or commercial properties when the valve opens? Take the time to know your entire system before starting the valve.

4. **Pressure reducing hydraulic pilots should only be set in the field when inlet pressure and downstream demand exist in the system.**
   - For new control valves, it is easiest to have the hydraulic pilots set by the factory. However, repurposed valves may require adjustments in the field or when a valve is serviced and brought back online. When restarting pressure reducing valves, ensure the pilot can sense the downstream pressure before setting in the field. This requires demand in the system to see the pressure on the downstream side of the valve. Without demand, pilot adjustments will not register properly. A pilot can be set in static condition if absolutely required but it is always good practice to let the valve function normally to achieve the proper setting of the valve. If you need to set a valve without flow. Please seek the assistance of your Technical Specialist. All manufacturers are here to help you with the abnormal requirements.

5. **Preventative maintenance programs are essential to ensuring full life from control valves.**
   - Preventative maintenance programs should be put in place to exercise the isolation valves, check the condition of tubing/hoses, inspect for leaks, check the condition of the elastomers, ensure proper operation of the valve, and confirmation of pilot settings. The frequency will vary from valve to valve based on application, environment, water quality and usage. The first year of service should be used to determine the frequency of maintenance by conducting quarterly inspections and adjust accordingly.

Singer® 106/206-PR-SM Pressure Reducing Control Valve with Integral Back-up

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6. Strainer blockage is the top reason pressure reducing valves fail, and allowing higher pressure downstream of the control valve.

- A blocked or clogged strainer will stop water from flowing through the pilot system effecting the ability to put water on top of the top cover/bonnet of the valve. When this happens, the main valve opens due to the control chamber not holding the inlet pressure. The pilot on a pressure reducing valve will shut and attempt to close the valve. However, as no water is available for the valve to close, high pressure pass through the control valve and over-pressurize the downstream side. Manual blowdown and higher capacity strainers are available for reclaimed, lower water quality and higher particulate water applications to help prevent this from happening.

7. Pressure relief control valves, fire demand, and high flow valves absolutely need to be exercised to ensure they work when they are needed.

- Unless the system is being used for fire-fighting or an unusually large demand occurs, control valves may never open. Valves that spend the majority of their service life in a “just in case” scenario need to be exercised. This process involves forcing the valve open hydraulically (using the isolation ball valves to allow water off the top of the cover) and operating the valve for 5 to 10 minutes before returning the valve to the normal closed position. Biologic growth and turbidity may also affect the valve’s proper operation. Certain applications like this may consider an oxy-nitride treated stem to increase lubricity and ensure that the valve operates.

8. Cavitation is not something that is caused by the type of valve; it is influenced by the water pressure at the inlet vs. the water pressure at the outlet.

- Cavitation occurs when the inlet pressure of a valve is decreased by 65% or greater on the outlet of the valve. Anytime you have an application that goes to the atmosphere or sub-atmosphere, cavitation could occur. In these applications, there is no such thing as “eliminating cavitation”, but rather controlling how and where it takes place in the system, effectively dissipating the energy from the cavitation. Please consult your preferred manufacturer about options to help control cavitation.

9. When integrating automation, instrumentation, and electronics into automatic control valves, what happens when the power goes out?

- Electricity and water do not typically mix well. However, this is the year 2020 and utilities everywhere are working on ease of accessibility, controlling infrastructure remotely, and automating processes on a global scale. However, have you asked what happens when the power goes out? What will my control valve do if it is fully reliant on electricity to function? It is a good idea to have hydraulic redundancy in your applications, or at least know that you can control your system to fail in a closed, open, or last position to protect your infrastructure.

Multiple Singer® control valves enclosed: Pressure Reducing, Pressure Relief, and Pressure Sustaining Valve with Anti-Cavitation trim in 16” ANSI Class 300

10. Education is essential to the foundation, growth, and development of any engineer, utility operator, or water management professional.

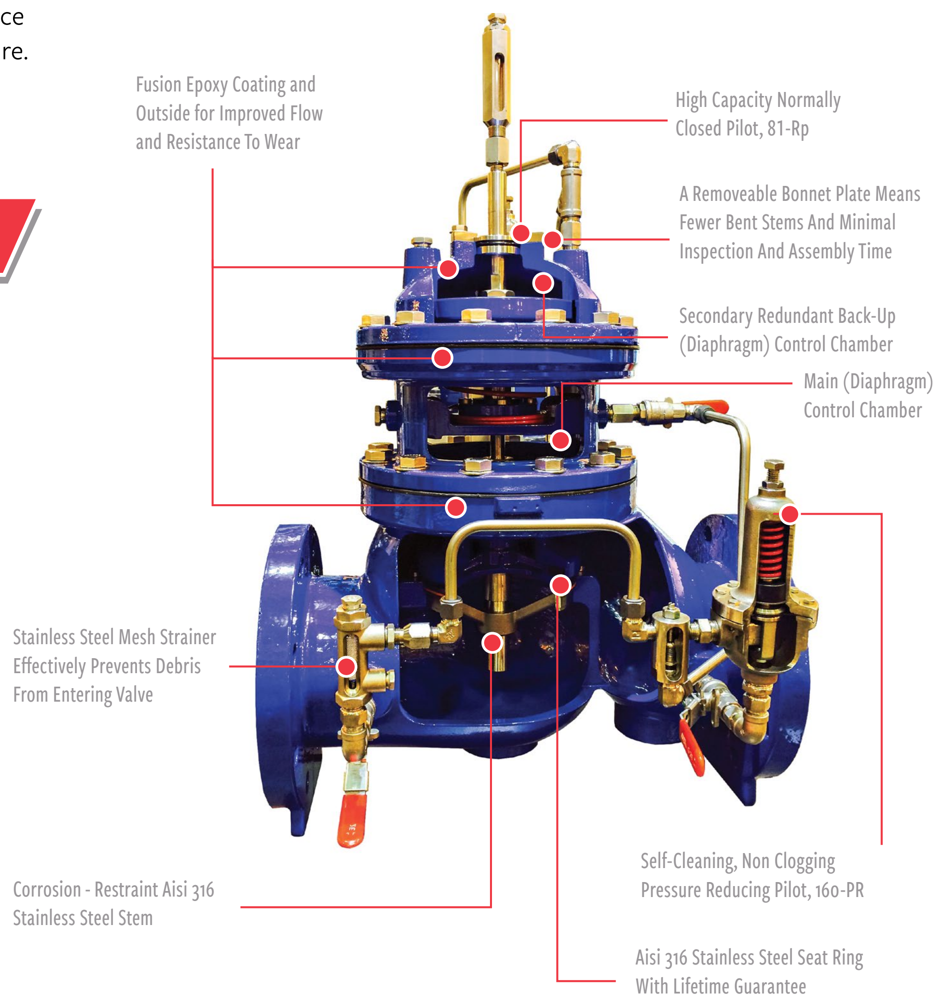
- There isn't a school you can go to or a degree you can get that fully prepares you for the challenges of automatic control valves. (Yes, traditional education gives you a basis for understanding operation, but doesn't teach finer points of the industry.) For this reason, on the job experience and in-house training programs are usually the hallmark for education in this field. Mueller® and other control valve manufacturers provide rich curriculums -on applications and products in this field. Please invest in your knowledge and attend a course provided by your preferred automatic control valve manufacturer!

Diaphragm operated, automatic control valves represent a small and important portion in the overall picture of a utility's distribution system. In many cases, control valves are singularly responsible for the successful operation of multiple applications; from tank fill and sustainment of upstream pressure to flow control and electronics integration. However, their operation is dependent on other appurtenances such as pumps, air release valves, and other equipment in the distribution system. Learning how each water distribution system works is paramount to understanding the valuable role control valves play in system stability, customer service and infrastructure maintenance.

Discover the Singer® Advantage

The PR-SM provides guaranteed performance despite primary system malfunction or failure. So, what's the difference between the Singer® PR-SM and others on the market? Take a look.

Click here to watch solution demo



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Not all regulatory requirements are available in all sizes and model combinations. We will provide approval details upon request.

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