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PROCESS INSTRUMENTATION

How to Reduce Water Hammer

with the Siemens SIPART PS2 Valve Positioner

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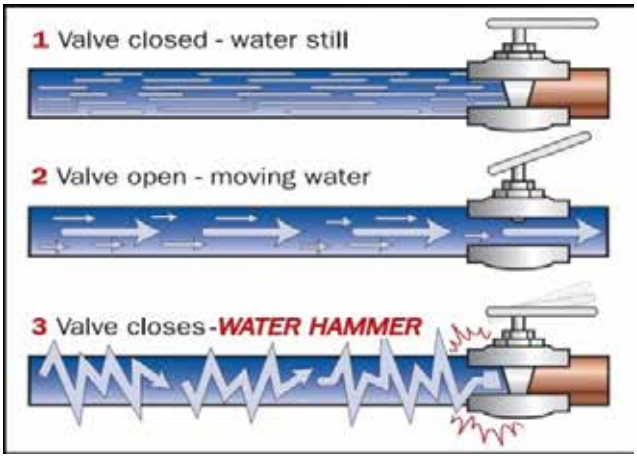
Water hammer is a very common term in the world of water. Not only can this phenomenon happen in water treatment plants but also just about any pumping system and even steam systems. The effects of water hammer vary from loud banging noise, to pipe vibration, pipe breakage, equipment damage, and sometimes total system failure.

What is water hammer and what causes it?
In valve applications, water hammer is the result of a valve suddenly closing in a system. The water (fluid or gas) is forced to stop and change direction suddenly. This creates a pressure surge and causes massive "wave like" forces to move back and forth through the pipeline. The quicker the valve closes the more severe the effects will be to the pipe, valve and system.



There are more than a few ways that today's marketplace deals with water hammer. Some of these include: re-sizing the piping to decrease velocity, utilizing water towers and/or air vessels, installing water hammer arrestors, shortening pipe lengths and rearranging larger piping with shorter small-run pipes to reduce velocity. Additionally, some users will utilize a controller to ramp the valve in a slower manner. In these situations, a controller is an additional piece of equipment required to control the valve. It works in conjunction with a traditional pneumatic valve positioner since they cannot ramp on their own.

A Different Solution

A much more savvy way of dealing with water hammer is to address this phenomenon at its source with the Siemens SIPART PS2 smart, digital valve positioner. This device operates on instrument air (pneumatic air) but utilizes a motherboard to provide communication, configurability and control. The "PS2" employs a piezo valve block instead of a traditional spool valve to control the valve set point. It operates with an on/off action and when it reaches set point, traps the air in the actuator. At this point the PS2 is virtually bleed-less, saving thousands of dollars a year in plant air consumption. Additionally, the piezo valve block can open and close as fast as 2 milliseconds, which allow for tight control and accuracy of the smallest step changes.

To address water hammer, the SIPART PS2 has the ability to ramp your valve open and closed as slow or fast as you require. This means you can eliminate the controller and potentially many of the expensive solutions the industry uses today. A user can rely on the PS2 to monitor the actual stroking speeds. If you're experiencing pressure surges, simply adjust the ramping parameter to a desired stroke time to slow it down. The maximum ramping time available is 400 seconds, and there are two independent parameters so ramping time in one direction can be different from the other! It's important to note that even if the plant experiences supply pressure fluctuations and the positioner sees an increase in supply air, ramping times remains unaffected. In addition, the PS2 has a manual bypass feature, so manual valve control can be done with the local pushbuttons and display. This ramping feature also affects the return from manual mode to automatic positioner control, this way your process can experience a bump-less return to automatic control.

Conclusion

In conclusion, water hammer is a common occurrence throughout many plants and the effects of it can be very expensive and time consuming. Invest your resources into a solution that will address the source of the issue. The configurability of the SIPART PS2 is what makes it a great fit for water hammer applications. It allows users to control the source of the issue with the added benefit of environmental savings via its unique low bleed operation.

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