

Actuation addresses water hammer problems

President **Dave Buchwald** of Pipestone Equipment, a supplier of SIPOS Aktorik's actuators, provides insights into the challenges of surge control and explains how specialist actuation technology solved this condition at a pump station.

Rapidly opening or closing a valve causes pressure transients in pipelines, also known as water hammer. This can result in pressures well over "steady state" values, causing water surge that can critically damage pipes and process control equipment. As such the importance of controlling water hammer in pump stations is widely recognized by utilities and pump stations.

President Dave Buchwald of the UK company Pipestone Equipment explained that "Fluid system analysis and water hammer prevention is an important topic for the water industry. Typical triggers include pump start up/shut down, power failure and the sudden opening/closure of line valves: a simplified model of the flowing column would resemble a metal cylinder suddenly stopped 'dead' by a concrete wall. Resulting problems include damaged valves, which are essential to the plant or station's operation, which, if affected, present serious challenges for hydraulic engineers.

"One example of an application where addressing water hammer was a key requirement is at East Cherry Creek Valley (ECCV) water and sanitation district pump station, which serves 50,000 people. A

linear characteristic was essential for flow control from a high volume pump: if this had not been achieved, a hammer effect would have resulted, potentially damaging the station's water system.

"Due to its variable speed capability, SIPOS' actuator technology meets the challenges of such installations. The company's SIPOS 5 actuator range, with its stroke-time-curve function, provides a tool that meets the demands of users, such as ECCV, who need to protect against water hammer. A travel-dependant, adjustable positioning time for the actuation technology generates a linear flow through the ball valve which enables fine-tuning of operating speeds through ten different positions to prevent water hammer.

"Additionally, with the capability of continued operation using a battery backup, the actuation technology also provides a fail safe option. If a power failure occurs, the actuator will close in emergency mode in different speeds using power from an uninterruptible power supply, this allows for the system to shut down safely via individually programmed positioning time curves for open/close/emergency mode.

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"As with any process control application, the goal is simplicity and reliability with optimized equipment. The equipment should be sized for worst-case conditions – this is usually a failure of electrical power (or other pump tripping scenario), while pumping at the maximum rate of flow. While this is generally a low probability

situation, it is important due to the magnitude of the resulting transient and the extent of damage that can be caused.

"The magnitude of the transients associated with daily pump starts and stops must also be reviewed: these are lower intensity scenarios but much higher probability events which lead to chronic pressure fluctuations and general fatigue within system components, ultimately causing failure. As a result, basic calculations must allow for both high and low probability transient conditions with different criteria for acceptable transient magnitudes."

In conclusion, the challenges of controlling water surge should not be underestimated, Buchwald explained. The condition has to be preempted and controlled. Left to their own devices, water surges can cripple the operation of a plant, works, or station. While generalities of water hammer can be detailed and surge scenarios predicted, it is essential that each installation is individually assessed with tailored solutions using specially designed software.

SIPOS Aktorik is based in Altdorf, Germany. For more information, contact www.sipos.de and www.pipestoneeq.com.



SIPOS Aktorik actuators address water hammer at ECCV pump station.



Dave Buchwald of Pipestone Equipment spotlights the challenges of surge control.