

By Rachel Hartman

Doing Away with Downsurge

Swing-type check valve addresses valve slamming and pressure surges

In 2008, the Kern-Tulare Water District (KTWD) in Bakersfield, Calif., faced a decades-old slamming tilted-disc check valve with a leaking oil dashpot. A tilted-disc check valve is considered a robust check valve with a port opening 140% of the pipe size to reduce headloss. The purpose of the oil dashpot is to control the opening and closing of the check valve in the 5- to 30-second operating range to reduce surges and check valve slam. The dashpot, however, requires regular care and monthly maintenance to remain fully operational.

When KTWD's valve fell out of the maintenance regimen, valve slamming and pressure surges occurred. Around the same time, a competitor's butterfly valve seat began leaking.

The Application

Dan Antonini, general superintendent of the KTWD, explained how the system operates: The pumps lift water from a pond about 10 ft high into a 4-mile-long, 36-in. pipeline at 110 psig and 16,000 gal per minute (gpm) with three pumps running. The flow through the valves is 5,500 gpm, or 8.78 ft per second.

In addition, there is a massive 8-ft-diameter by 30-ft-long hydropneumatic surge tank with two 24-in. pipe connections to the header. Surge tanks are partially filled with water and have compressed air over the water. They are designed to rapidly expel water to prevent column separation after power failure and pump shutdown and absorb surges in the pumping system from normal operation.

Over the years, the tilted-disc check valves have required regular maintenance to remain operational. The oil levels in the dashpot tanks required adjustment, and the air pressure in one of the tanks continued to decay. The district wanted to investigate alternate and simpler valve solutions for this application. But due to the fact that the system included a surge tank, a conventional swing check valve—even with an air cushion—could not be considered because of slamming potential.

The Solution

After a review of alternate valve technologies, Val-Matic replaced one of the high-maintenance 16-in. tilted-disc check valves with a Surgebuster check valve, a swing-type check valve with resilient disc and spring-assisted closure. The valve has gained a strong reputation as a simple, cost-effective solution with features exceeding those of conventional check valves. It is furnished as a standard valve in ductile-iron construction with fusion-bonded epoxy coating rated to 250 psig.

The Surgebuster is designed with a slanted seat, short 35-degree stroke and a disc accelerator to close rapidly upon pump shutdown and reduce check valve slam. Studies have shown that its closing characteristics are similar to those of a silent check valve; therefore, this type of valve is ideally suited for pumping systems with hydropneumatic surge tanks. In surge tank applications, the check valve closes rapidly to prevent slam and keep the surge tank water from being lost backward through the pump during shutdown.

The original butterfly valve was replaced with the Val-Matic American-BFV butterfly valve, which eliminated the leakage. The new solution features the Tri-Loc system, which allows for easy seat adjustment or replacement using only a socket wrench—no hypodermic needles or epoxies required.

The Investigation

In order to measure the system dynamics, a team from Val-Matic visited the site to monitor the system operation. A high-speed pressure transducer was installed on the downstream pipe elbow. The transducer was connected through a USB interface module to a laptop and set with a window trigger of 20.8/0.4 psig, data period of 0.025 seconds and limit of 5,000 readings.

After the pumps were running for a few minutes, they were intentionally tripped to simulate the on/off operation of the pumping systems so that the pressure transients could be recorded. After installing the Surgebuster HD, the valve did not allow flow reversal and the downsurge was eliminated, allowing the pressure to rise to an acceptable 127 psig (see Figure 1). WWD

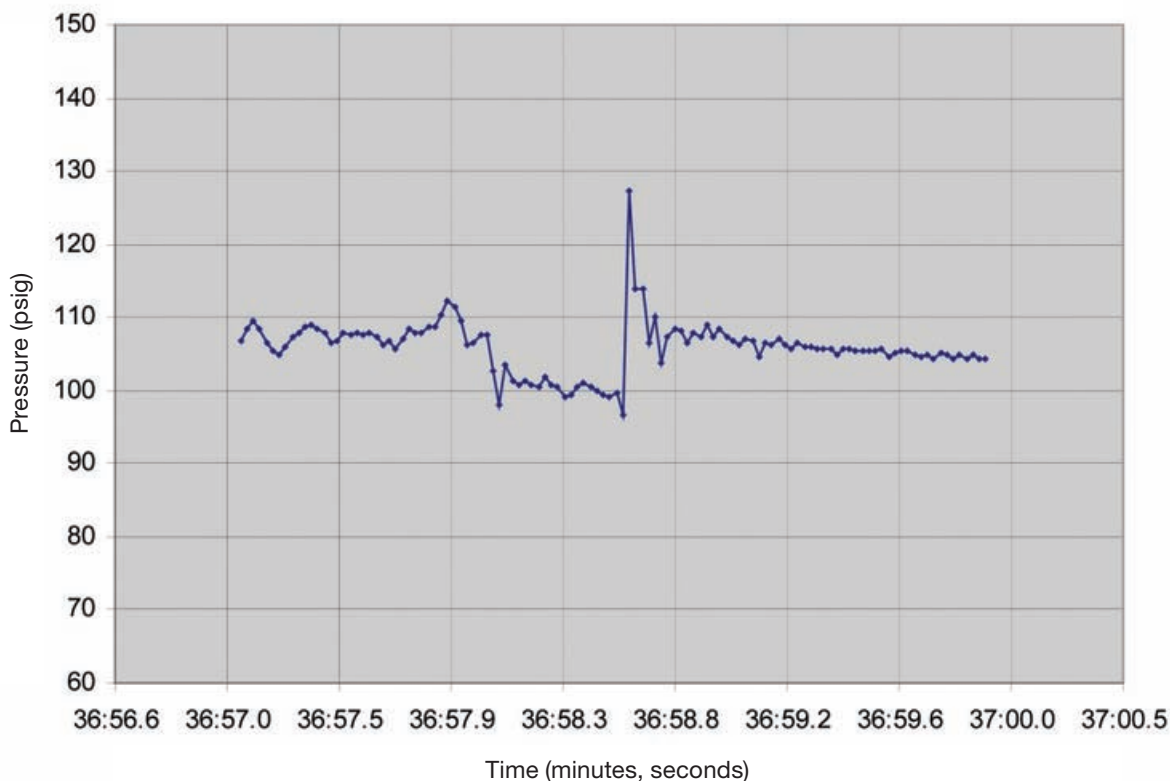
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(clockwise from top left)
1. Failed butterfly valve
2. Leaking dashpot
3. Val-Matic American-BFV butterfly valve installation

Figure 1. Installation Graph of 16-in. Surgebuster



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