

Downsurge Eliminated

Rachel Hartman

Val-Matic Valve & Mfg. Corp.

The Problem

In 2008, Steve Crump of Crump Co., a Val-Matic Valve & Mfg. Corp. Representative, encountered problems at The Kern-Tulare Water District in Bakersfield, California. The Water District was experiencing a slamming tilted-disc check valve with a leaking oil dashpot and butterfly valve with a leaky seat. A Val-Matic competitor's tilting-disc check valve consistently slammed at pump start up and its top mounted dashpot was leaking oil. Around the same time, a different competitor's Butterfly Valve seat began leaking.



Failed Butterfly Valve

The Application

Dan Antonini, the General Superintendent of the Kern-Tulare Water District explained how the system operates: the pumps lift water from a pond about 10 feet high into a 4-mile-long 36" pipeline at 110 psig and 16,000 gallons per minute (gpm) with three pumps running. The flow through the valves is 5,500 gpm (8.78 feet per second). In addition, there is a massive 8 feet diameter by 30 feet long hydropneumatic surge tank with two 24" pipe connections to the header; this is designed to prevent column separation and absorb surges.



Leaking Dashpot

The Investigation

In order to measure the system dynamics, Val-Matic's Vice President of Engineering, John Ballun, visited the site to investigate the slamming problem. 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, a data period of 0.025 sec., and 5,000 readings (125 sec). After the pumps were running they were intentionally tripped to simulate the on/off operation of the pumping systems so the pressure transients could be recorded. At this time a loud slam was heard and simultaneously water sprayed out of the well-service air valve in the line.

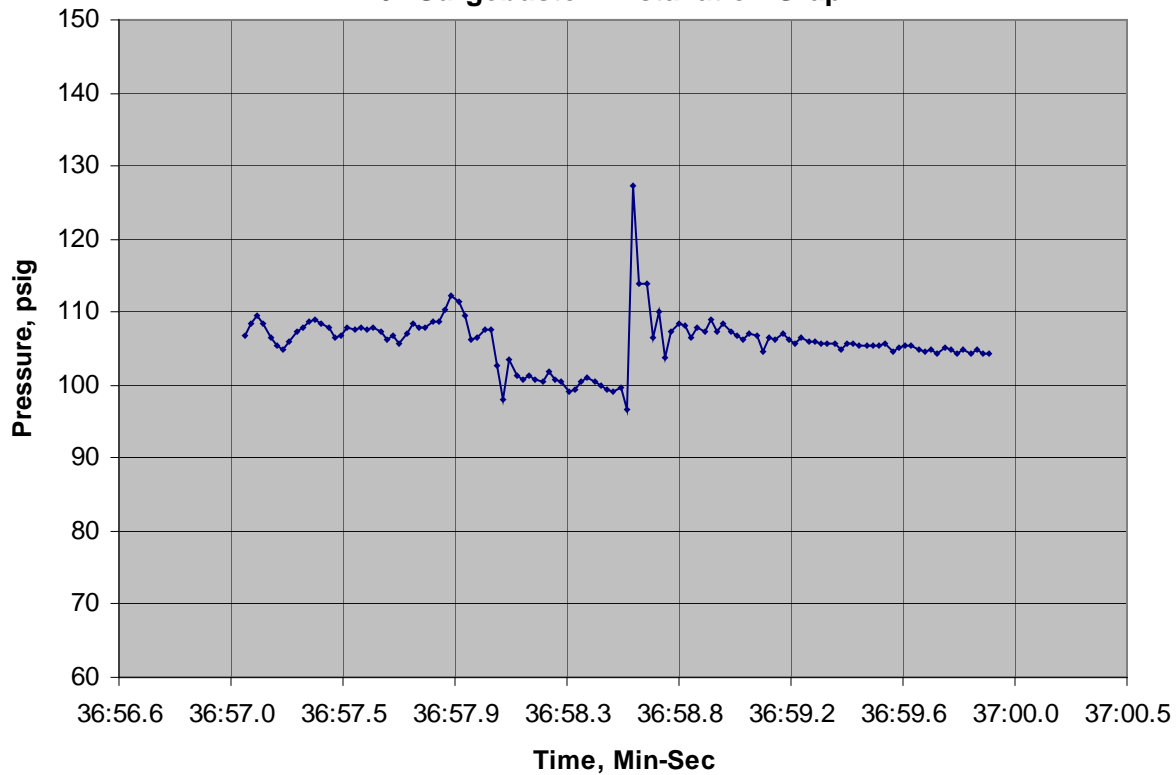


Hydropneumatic Surge Tank

The Analysis

The data from the transducer from both before and after the Surgebuster[®] was installed, was exported into a spreadsheet and a 3-second time period was graphed. In both cases, the pumping pressure before the trip was about 108 psig indicating that the valve was fully open. In both tests, the flow reversal time was about 0.50 sec., which translates into a deceleration of 8.78/0.50 or 18 ft/sec². Before installing the Surgebuster[®], the valve allowed significant flow reversal, which caused a downsurge to 65 psig and water discharge from the air valve and a pressure rise to 119 psig. After the installation (see 16" Surgebuster[®] Installation Graph below), the downsurge was eliminated and the pressure rose to an acceptable 127 psig.

16" Surgebuster® Installation Graph



Conclusion

Val-Matic replaced the slamming hydraulic-assisted tilting-disc check valve with the Surgebuster® HD. The Surgebuster® HD is Val-Matic's swing check valve with only 2 moving parts – a disc and spring which close the valve disc rapidly thus minimizing slamming. After cycling the pumps, the owners were pleased with the lack of slamming the Surgebuster® provided and the elimination of the leaking oil dashpot.

The original Butterfly valve was replaced by the Val-Matic American-BFV® Butterfly valve which eliminated the leakage. Val-Matic's Butterfly valve features the Tri-Loc system, which allows for easy seat adjustment and or replacement using only a socket wrench - no hypodermic needles or epoxies required. Val-Matic Valve & Mfg. Corp.'s product line keeps your applications running smoothly by offering superior valves at an affordable price.



**Val-Matic Surgebuster® HD and
Val-Matic American-BFV® Butterfly Valve installed**