

Severe Service Journal

A Publication of Emerson's Severe Service Team

Volume 4 Issue 6, July 2006

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DIRTY SERVICE TRIM ADDRESSES PLUGGED FEEDWATER VALVES

Several years ago, a 450-megawatt power plant in Michigan experienced repeated issues with plugged cages in its boiler feedwater valves. These valves utilized a small passage, anti-cavitation trim to address recirculation and startup needs. The valves usually provided less than three months of operation before the plugging would reduce capacity to the point of affecting plant operation.

This is a common problem in many older power plants that experience issues with debris in the feedwater lines. Most anti-cavitation trims rely upon small passages to eliminate the potential for cavitation. As in this example, these types of trim can serve as great "strainers."

In order to address this issue, the plant turned to members of the Fisher Engineered Products group. Their solution incorporated large passages that allowed the entrained particulate to pass and also provided pressure staging to eliminate the formation of damaging cavitation. The Dirty Service Trim, commonly referred to as DST, has been used repeatedly in applications where plugging and cavitation control are concerns.

The DST design uses combined axial and radial flow paths that feature large openings, allowing for the flow of particulate up to 3/4-inch in diameter. The large passages not only allow the particulate to pass, but also eliminate the potential for velocity-induced erosion effects. The DST design also incorporates a protected seat that separates the shutoff and throttling locations. All significant pressure drop is, therefore, taken downstream of the seating surface. As a result, the seating surfaces are not worn away by throttling control action.

Since the trim has been installed in 1996, the valves have not needed maintenance. No issues with either capacity reduction or leakage through the valves have occurred.



PROPER VALVE SELECTION ELIMINATES ISSUES WITH VALVE OUTLET VELOCITY AND SUBSEQUENT NOISE

Several years ago, a gas production plant in Saudi Arabia experienced cracking of a 54-inch Acid Flare Header made of Inconel. The site engineers carried out vibration tests to determine the cause of the damage and proposed several changes to the piping system. The changes were implemented, but the vibration problem continued. Eventually, the piping and the header supports also cracked.

Site engineers conducted another historical review of the problem, but this time, they included process data in the evaluation. A fluid dynamics calculation was performed utilizing computational fluid dynamics (CFD) software to simulate overall process conditions. The detailed simulation included sonic velocity calculations, gas velocity and vibration correlations, and pressure drop calculations.

The analysis revealed that the 10-inch valves in the header system were the main contributors to the excessive vibration. Though the valves incorporated noise abatement trim, they were undersized and generated outlet velocities over 0.7 Mach. This not only created unacceptable noise levels, but also led to velocity-induced vibration of the piping system. The original vendor suggested that they install a new type of noise attenuating trim. The Fisher solution incorporated the necessary trim-noise abatement, and the correct body size to eliminate outlet-velocity generated noise.

The trim is WhisperFlo, a multi-path, multistage noise control technology that can reduce noise up to 40 dBA, surpassing conventional noise trims by five to ten dBA. The chosen valve body reduced the valve outlet velocity to 0.3 Mach, further reducing the noise and eliminating the vibration affecting the pipe.

This example is typical with some manufacturers in the control valve industry. A control valve is selected based on the required C_v to pass the flow and address the noise generated by the trim. The outlet size of the valve is generally ignored. If an inadequate valve body size is chosen, the valve, piping system, and downstream equipment are at risk of premature failure.

The Fisher solution eliminated all issues with noise, vibration and subsequent piping damage. These valves have been running without issue for the past three years.



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