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WHISPERFLO™ TACKLES RESPONSE AND CAPACITY LIMITATIONS

A Middle Eastern ethylene plant recently experienced capacity issues with their main compressor anti-surge valves. The anti-surge valves are the most critical valves in the entire facility. A compressor surge event occurs when gas begins to flow in the reverse direction through the impellers in a compressor. This can have undesirable consequences in terms of upsetting operations, altering internal compressor clearances and stressing compressor seals. The anti-surge or recycle valve allows a portion of the compressor flow to be diverted back to the compressor inlet to ensure that the compressor does not experience a surge event. Because of the limited capacity in the existing valves, protection of the compressor was of utmost concern.

Typical requirements of anti-surge valves include: Extremely fast stroking speeds (less than two seconds), high capacity, extreme noise attenuation (up to 30 dBA) and very stable throttling control. All of these are necessary to protect the compressor in a surge event while also protecting the piping from noise induced vibration.

The plant turned to Fisher to provide a solution that could address the capacity needs while meeting noise requirements and minimizing piping changes. The local business partner worked with the severe service experts in the factory to develop a solution that would address all three factors.

The solution consisted of five fabricated type valves that incorporated the proven WhisperFlo noise attenuation trim (See Figure 1). WhisperFlo is a multi-path, multi-stage noise abatement technology that can reduce noise by up to 40 dBA, surpassing conventional noise trims by five to ten dBA. The trim was also characterized to match capacity with the complex compressor performance curve. The fabricated bodies provided flexibility in meeting the existing face to face dimensions. After engineering was completed, piping modifications were required on only one valve, which is a huge feat given that the capacity in the valves nearly doubled without an impact in noise generation.

To address the fast stroking speed requirements, the valve was equipped with Fisher's fast stroke, anti-surge actuation package. This package eliminates the large amount of accessories typically seen in fast stroke applications while also improving long term performance. Also included were FIELDVUE digital valve positioners equipped with performance diagnostics that provide real-time diagnostic information. This will allow the plant to monitor valve performance while in service and to identify any potential issues without bringing the unit offline.

Figure 1: Anti-Surge Valve Ready for Shipment

Because of a tight turnaround schedule, the valves were built and shipped in 13 weeks. This allowed the plant to install the valves, and bring the unit back online in time.

WHISPERFLO™ REPLACES NOISY FLARE VALVES

Four years ago, a Middle Eastern refinery conducted a noise survey and found nearly 50 valves that were very noisy and required replacement. The plant has been in the process of replacing these valves since that time. The most recent situation involved replacement of two 10" flare valves. The valves possessed little noise attenuation and were also undersized when considering valve outlet velocity. High valve outlet velocities can lead to excessive vibration of the downstream piping systems, and is a phenomenon that is commonly overlooked in compressible flows.

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Control valves are typically selected in sizes smaller than the adjacent piping for economic reasons, but the piping is still subject to the typical selection process using gas density and mass flow rate. This selection process usually leads to a larger pipe downstream of the pressure-reducing valve.

With a smaller size control valve, a reducer or expander is required to mate the control valve with the piping. Problems can occur with this configuration because the velocity related turbulence generated by the expander at the valve outlet creates its own noise that often exceeds that which is generated by the valve itself. This turbulence is caused by the difference in gas velocity between the valve outlet and downstream pipe creating an additional noise source.

To address the noisy flare valves one 20x16 Type EWT and one 16x12 Type EWT both utilizing the proven WhisperFlo noise abatement trim was proposed. WhisperFlo is a multi-path, multi-stage noise abatement technology that can reduce noise by up to 40 dBA, surpassing conventional noise trims by five to ten dBA. The combination of WhisperFlo and the correct valve outlet size ensures that the plant will not experience any noise issues generated at the valve or the downstream piping.

Coupled with other replacements, the plant continues to look to Fisher to solve their difficult noise problems. Fisher Controls has dedicated itself to providing noise prediction tools to ensure that plants will not experience noise related issues after installation. The research conducted and developed tools provide the user with the comfort and satisfaction that their valve system will perform to the required specifications.

TURBINE BYPASS VALVE REPLACEMENT ELIMINATES $170,000 IN PLANT SHUTDOWN COSTS

A waste burning power plant in the United Kingdom was experiencing repeated issues with a turbine bypass valve. The valves consistently failed to open during a station trip, which resulted in the entire plant shutting down. It would take the plant up to six hours to start back up and fully running again. The plant estimated that this cost them $10,000 every time it happened. Up to this point, the existing valve had cost them well over $170,000 due to repeated plant shutdowns and startups.

Turbine bypass applications are critical from a number of factors. First off, tight shutoff is critical to overall plant performance. With high pressure steam leaking directly to the condenser, the heat rate and overall output of the unit can be affected. The ability to operate at a moment's notice and to open quickly is also key. Because of the high pressure drop taken through the valve during operation, noise and subsequent downstream vibration is possible.

In order to address the application, a 6" Type EWD was supplied that was fitted with the proven WhisperFlo (See Figure 2) noise abatement trim and C-seal trim for tight shutoff. WhisperFlo is a multi-path, multi-stage noise abatement technology that can reduce noise by up to 40 dBA, surpassing conventional noise trims by five to ten dBA. The C-seal trim is designed to provide ANSI Class V shutoff at temperatures up to 1100F.

Figure 2: WhisperFlo™ Discs Prior to Assembly

A week after installation, the valve was called into service when the plant was disconnected from the grid. The valve worked perfectly allowing the steam to go to the condenser and in half an hour, the plant was reconnected to the grid. The valve was gradually closed and unit was put back on full power.

After another few weeks, it was realized that the plant had gained an additional two MW of output due to improved shutoff in the bypass valve. This provided the plant at least another $150,000 in additional revenue.

Based upon the success of these valves, the utility began to replace valves in the boiler feedwater system that also had issues with leakage and operability. The replacement of the drum level valves reduced the startup time necessary to bring the unit to full load.

With the success of these few valve installations, the plant has standardized on the Fisher solution to handle their most critical, severe applications.