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SARGENT & LUNDY TURNS TO FISHER SEVERE SERVICE GROUP FOR SKY VENT SOLUTION THAT REDUCES NOISE, VIBRATION, AND COSTS

One of the most challenging control valve applications within a combined cycle plant involves what is commonly referred to as the sky vent. The valve in this application controls the ramp rate of the heat recovery steam generator (HRSG) to protect it from thermal induced stresses. The valve releases steam to atmosphere during startup and shutdown and is required to withstand full process pressure.

With inlet pressures as high as 1950 psig dropping to atmospheric pressure across the sky vent valve, there is the potential for excessive noise and damaging vibration. To combat this, most solutions incorporate a control valve equipped with noise attenuating trim along with a diffuser or downstream silencer.

Engineering firm Sargent and Lundy recently designed a combined cycle power plant to be located in Corpus Christi, Texas. A particular issue concerned stresses on the piping systems, which prompted use of the smallest size possible downstream silencer in the sky vent application. The tradeoff to this answer, however, was that nearly all of the 1950 psig inlet pressure had to be reduced in the control valve, with a very high potential for excessive noise and vibration.

The Sargent and Lundy design engineers determined that a 6-inch valve would satisfy capacity and pressure control needs, although it would create an undesirably high outlet velocity. Operating temperatures up to 1065 degrees Fahrenheit added to the problem. At first pass, it appeared that a 24-inch valve could be the answer, albeit a costly one requiring an ANSI Class 2500 valve body in C12A material.

The Severe Service group within the Fisher Valve Division reviewed the sky vent application and proposed a valve alternative that would solve the noise/vibration and cost dilemma. The solution incorporated a 6-inch, pressure-balanced valve equipped with a Whisper Trim® III noise attenuating flow cage, along with a downstream 6x24-inch diffuser. This combination staged the pressure drop between the control valve and the downstream diffuser, a technique that met the pressure and noise control requirements as it minimized the control valve's size.

While the smaller valve size gave immediate cost savings, the Fisher solution also provided savings in piping costs. Sargent and Lundy engineers avoided having to redesign the piping and piping support systems, and by using a smaller valve size, minimized the amount of large piping required to connect the valve to the downstream silencer.

HPT VALVE WITH Cavitrol® TRIM REDUCES CAVITATION AND IMPROVES CONTROL IN BOILER FEEDWATER APPLICATION

A co-generation power plant in Pittsburgh, California had two valves providing split-range control in a boiler feedwater drum level system. The smaller, low-flow valve had problems with erosion and cavitation. (Cavitation, the formation and subsequent collapse of vapor in liquid fluids, is a major source of valve damage and vibration.) Plant operators were replacing the valve's trim every six months at a cost of $30,000 or more, not counting downtime.

Fortunately, the plant had an alliance agreement with Fisher®, and its Local Business Partner sent an engineer to the site to investigate and analyze the control and maintenance issues. In an effort to avoid a valve replacement, he added FIELDVUE® digital valve controllers to the existing valves and ran a series of diagnostic tests. Tuning the loop and modifying the control logic improved control, but the customer was still not satisfied with the existing valves' performance. The Local Business Partner concluded that one new Fisher valve could probably do the work of the two competitors' valves (and thus save the customer money).

The Fisher Severe Service team provided technical support for selecting and sizing the new replacement valve, a six-inch Design HPT with Cavitrol® III (four-stage) trim and ANSI Class V shut-off capabilities. Characterized Cavitrol trim stages the pressure drop by directing flow through successively larger flow areas and keeping the overall pressure drop above the vapor pressure. Cavitrol cages have specially-shaped holes, spaced diametrically around the cage circumference. These holes reduce fluid turbulence, dissipate fluid pressure, and help increase capacity.

The valve assembly included a FIELDVUE®DVC6020 instrument with Advanced Diagnostics capabilities. The instrument monitors the performance of this critical valve and provides data for its predictive maintenance.

The plant modified its piping to accommodate one valve instead of the split-range duo. The new Fisher valve was installed in November 2004 and the operators reported much improved control during startup and shutdown.

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