For Severe Service Control Solutions, Turn to Fisher Technology and Innovation

AEP USES FISHER VALVES IN SUPERHEATER BYPASS SYSTEMS AND ELIMINATES CAVITATION PROBLEMS

The Fisher Valve Division replaced control valves within the superheater bypass systems at American Electric Power's Amos 1 & 2 generating stations. Both units utilize 800 MW supercritical once-through boilers that require the bypass systems to handle 1.4 million pounds of fluid ranging from cold water to superheated steam.

As originally installed, each bypass system utilized six valves: two for initial cold water circulation and four to handle steam flow during the later stages of startup. Because the valves lacked cavitation protection, they were noisy and always required maintenance during each outage. They also delayed startup on numerous occasions.

During initial startup, high-pressure (3000 psig) water is routed through the valves to the flash tank, which is under minimal pressure. In this mode of operation, damaging cavitation is possible. (Cavitation, the formation and subsequent collapse of vapor in liquid fluids, is a major source of valve damage and vibration.)

As the unit continues to ramp, the fluid temperature and flash tank pressure increase causing the fluid to flash rather than cavitate. This creates concerns about erosion caused by the high velocity steam carrying entrained water droplets past the metal trim components of the valve.

As the fluid temperature continues to rise, the fluid turns into steam creating the need for noise attenuation. At this point, the bypass system begins to shut down as it transfers to once-through operation. After this occurs, the valves act as relief valves, dumping the entire steam load to the flash tank during a unit trip to prevent the safety valves from lifting.

As part of the units' selective catalytic reduction (SCR) upgrade, modernization of the superheater bypass system was explored. Based on previous experiences at other AEP units, plant personnel considered replacing the six-valve system with a two-valve arrangement.

This solution provides better control during startup, quicker startup times and reduced maintenance costs.

The solution consisted of 6-inch Special Class 2987 Rated EHD valves with characterized Cavitrol® III, 3-stage trim designed specifically for the application. Cavitrol trim is designed to eliminate damaging cavitation by staging the pressure drop, ensuring that the pressure never drops below the vapor pressure.

Characterizing the trim allows the valves to handle the initial startup conditions where cavitation concerns arise. The trim is also designed to eliminate erosion to the valve seat and plug by utilizing a lower metal piston ring around the plug. This virtually eliminates all clearance flow between the plug and cage, which is a common

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source of control valve plug and seat erosion. The cavitation protection then eventually gives way to less staging as the downstream pressure increases and more flow is required.

Proper characterization is a necessity to account for the given phase changes. The Cavitrol trim eliminates damaging cavitation during initial startup and provides protection against flashing damage by reducing the available energy at the outlet of the trim. The staged pressure drop also helps to reduce the velocity of the steam thus reducing the associated valve noise.

Superheater bypass valves can have a huge impact on the bottom line of a power plant. Older valve designs do not address the severe nature of the service in terms of cavitation and noise protection. Another concern is valve shutoff. Leaking valves in this service can cost a plant between 1 - 15 MW. Fisher engineers' experience in these applications shows that replacing the superheater bypass valves can yield plant savings of $250K or more.

For more severe service solutions see us at www.fishersevereservice.com.