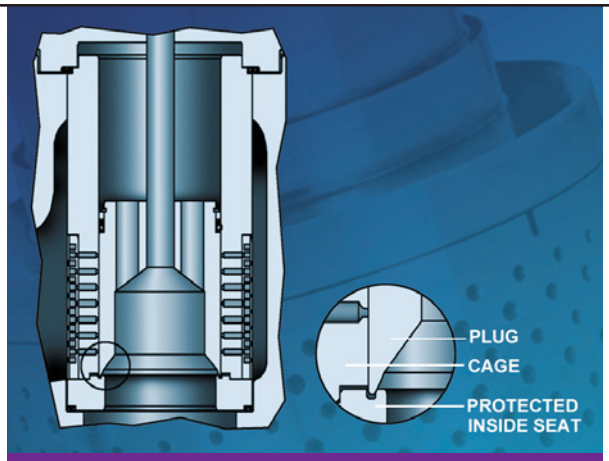
Leakage Reduced in Superheater Bypass Valves Using Protected Inside Seat

RESULTS

- Flash tank pressure has been maintained at 50 psig indicating no valve leakage.
- Expected cost savings in excess of $3 million annually due to decreased feed water pumping load, increased plant capacity, and reduction in overall heat rate.



The protected inside seat for control valves with Cavitrol™ III trim addresses seat leakage issues due to plug-tip erosion.

APPLICATION

Superheater bypass valves.

CUSTOMER

Large municipal electric utility.

CHALLENGE

Superheater bypass valves experience some of the most severe operating conditions in a supercritical power plant. The valves are required to pass cold water initially, then hot water and eventually super-heated steam. During these operating phases, the valves may be exposed to damaging cavitation and flashing as well as extremely high temperatures.

Plant engineers at a large municipal electric utility evaluated several valve replacement options before specifying four Fisher™ 8-inch ANSI 2500 globe valves equipped with Cavitrol™ III 4-stage trim with a C-seal. Upon installation, the company noticed an immediate improvement in plant performance including increased capacity and efficiency, and reduced maintenance cost.

However, because of the severe operating conditions, the valves began to leak after only three to five start-ups and the leakage was increasing over time. This was causing the downstream flash tank pressure to rise to 150 psig during normal plant operation when it should be approximately 50 psig.

It was determined that the leakage was being caused by plug erosion due to particulate or low-flow throttling. The erosion results in decreased shutoff capability and possible valve failure.

FISHER™ For more information:
www.Fisher.com

EMERSON™

D351646X012/Oct8

SOLUTION

To help combat the leakage problem, Experitec. Inc., (the Emerson Impact Partner) has made periodic upgrades to the valves. While these upgrades have helped, none have solved the leakage problem to the extent that the customer or Emerson would have liked.

Because other power customers were also experiencing this problem, Emerson engineers developed a trim design called protected inside seat to solve the problem. For control valves with standard Cavitrol III trim designs, shutoff occurs when the radius tip of the plug, located on the lower outside edge of the plug, contacts the beveled seat ring. On the protected inside seat design, the plug seat consists of a bevel on the inside of the plug tip and enters a machined groove in the upper surface of the seat ring. Since surfaces for shutoff are inside the plug tip and the radius in the groove of the seat ring, the protected seat feature does not expose shutoff surfaces to potential erosion in the flow stream. The plug and seat are made of 440C to combat the high stress levels found in the plug tip.

The protected inside seat was installed in May in each of the four superheater bypass valves. Engineers from Emerson and Experitec supervised the installation. A key metric for this application is stability of the flash tank pressure to prove the integrity of the seat.

Since May and after approximately six unit start-ups, flash tank pressure has been maintained at about 50 psig which indicates no leakage. If flash tank pressure continues to hold, the customer expects a cost savings in excess of $3 million to $4 million annually due to decreased feed water pumping load, increased plant capacity, and reduction in overall heat rate.

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

FISHER™ For more information:
www.Fisher.com

EMERSON™

D351646X012/Oct8