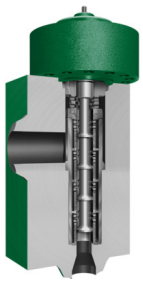
Fisher CAV4 Improves Boiler Feedwater Control and Eliminates Recurring Seat Leakage Issue

RESULTS

- Special CAV4 trim design provided protection against cavitation services
- Ensured shutoff integrity
- Improved operations and maintenance efficiency



Emerson's Fisher CAV4 valve is a specially designed solution for boiler feedwater pump recirculation, with the capability to handle up to an 8,000 psi pressure drop.

APPLICATION

A power plant's operating pressure and efficiency are highly dependent upon the performance of its feedwater pumps. Each feedwater pump must be protected from low flow operation and loss of net positive suction head (NPSH), which are conditions that always occur at plant startup and shutdown. At low flow the pump can overheat, and the water flowing through the pump can separate, causing vortices that cavitate and damage the pump. Protection against overheating and cavitation is gained by recirculating a minimum amount of flow to the pump inlet.

Maintaining this minimum flow is the task of the boiler feed pump recirculation valve. It recirculates a portion of the total pump flow back to a collection reservoir, such as a deaerator or condenser hot well. Because of the differential between the high pump outlet pressure and the low pressure at the collection vessel, the recirculation valve is exposed to some of the most difficult operating conditions in the plant.

CUSTOMER

Linghuan Zhongli Power Private Limited. Anhui Thermal Power Plant 4X320MW

CHALLENGE

Unit 2 of Anhui Thermal Power Plant uses 2 hydraulic pumps and 1 electric pump. The boiler feedwater pump recirculation control valves were installed in 2008. After a couple of years in service, the valve was found to be leaking internally and the extent of leakage increased over time. With a leaking recirculation valve, the feed pump needs to work harder to compensate for the reduced flow to the boiler. As a result, the feed pump system efficiency was reduced, affecting the overall plant

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efficiency. Multiple attempts to address the issue were not successful as Anhau was not able to get the proper root cause analysis and effective solution from the original valve supplier to resolve the valve leakage concern on site.

SOLUTION

Emerson, with support from the Local Business Partner (Wetrol), collaborated with customer to perform a site walkdown in 2017 and the longstanding recirculation valve leakage issue was highlighted. The application, control problems, and leakage concern were studied with both the Operations and Maintenance teams. Considering the potential risk of external valve leakage if the internal leakage issue remained unresolved, the overall safety concerns were also discussed.

Following up on the issue, Emerson and Wetrol were engaged during the 2017 plant overhaul to provide in-depth application and service expertise for the installed valve and actuation. Attempts to temporarily improve the installed valve shutoff was made through actuation optimization. However, due to the extent of the internal trim damage, it was proposed to replace the complete valve as the long-term solution.

The application and process conditions were reviewed, and the control valve was required to take pressure drop from 24.75 MPa to 1.1 MPa, with cavitation protection. At the same time, as the valve is normally closed, ensuring Class V shutoff integrity is important. A lower shutoff could result in low flow leakage between the plug and seat, potentially affecting the feed pump effectiveness and reducing the overall plant efficiency.

Emerson recommended a Fisher CAV4 valve specially designed for boiler feedwater pump recirculation with the capability to handle up to 8,000 psi pressure drop. A properly sized Fisher CAV4 valve directs flow through a series of successively larger flow areas, with each causing a reduction in pressure. This “staging” of the overall pressure drop results in more than 90% of the total drop being taken in the early stages, where there is little danger of bubbles forming. The later stages ensure low inlet pressure and minimal fluid energy exiting the trim. The pressure staging, together with the separation of shutoff and throttling within the CAV4 trim, prevents clearance-flow erosion.

Considering the technical, service, and site support from Emerson and Wetrol, Anhui decided to collaborate with Emerson to upgrade their Unit 2 recirculation valve. The CAV4 solution is successfully installed on site and continues to improve the control performance and prolonged shutoff integrity.

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