Using Dirty Service Trim in Critical Valves Provides Four More Days of Uptime per Year

RESULTS

- Eliminated the build-up of magnetite and plugging of the valve's cage and seat
- Avoided shutting down an HRSG unit to acid-clean the valves, saving $30,000 USD and two days of lost generation per unit, per procedure
- Extended runtime in a critical-to-process application

APPLICATION

Drum level control valves in triple-pressure, feedwater service

CUSTOMER

Combined-cycle plant in central Florida, USA

CHALLENGE

A combined-cycle plant operates with multiple power blocks. Each block has two combustion turbines and two triple-pressure heat recovery steam generators (HRSG) that feed into a common steam turbine. The three pressures for the HRSGs are high (HP), intermediate (IP), and low (LP).

Between annual maintenance outages, the plant was having trouble with plugging cages in drum level control valves (LCV). Magnetite would build-up until it restricted flow capacity (see photo in lower right). LCV cage fouling occurred every six months and across all four power blocks (eight HRSGs). The fix required a unit shut down so the valves could be acid cleaned. Each cleaning required the stop and re-start of a thermal cycling gas turbine—at a cost of $30,000 in materials and labor plus two days of downtime.

Facility managers called Emerson's local business partner, Control Southern, for a long-term solution to a costly, chronic issue.

SOLUTION

Emerson personnel began by evaluating the chemistry: measuring pH of the feedwater (intially 9.7), collecting iron transport samples, and reducing the dissolubility of magnetite by increasing the pH.

An average pH shift of 0.2 points upwards resulted in a 10 to 50% reduction in iron transport as measured in condensate on LP feedwater, IP drums, and HP drums. The goal was to achieve less than 2 parts per billion (ppb) in the feedwater and less than 5 ppb in the drums.

"Emerson engineers and chemistry experts evaluated our process conditions and valve-plugging issues. The solution and support they provided has improved the reliability and uptime of all four power blocks."

Mechanical System Engineer
Combined-cycle plant

Magnetite is a common iron oxide mineral with natural magnetic properties. Over time, it filled the flow passages of the valve cage, causing problems for the power plant.

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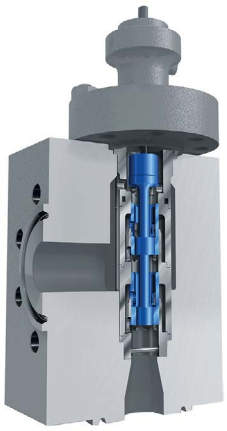
Though the pH change reduced the frequency of cleaning, the IP drum cages still plugged over time. For a longer term solution, the team recommended a multi-stage replacement trim to reduce the pressure drops and velocities as the feedwater passed through the valve. Fisher™ Dirty Service Trim (DST) would also help the valves resist corrosion and plugging.

During a planned outage in 2015, the team upgraded existing Cavitrol™ III 2-stage trim in power block 4A's level control valve (LCV) to DST, designed to pass particulate like magnetite without plugging. An evaluation proved it was effective; the LCV with DST was operating near the desired 50% range and staying there. In 2016, DST was added to LCVs in power block 3A and power block 3B. Six months later, those valves were maintaining a consistent position and providing reliable performance. The final valve in power block 4B got new trim in December 2016 and is performing well.

The DST solution has delivered more uptime for all four units.

The station engineer at the combined-cycle plant decided to make all four drum level control valves the same body size. That allowed for interchangeable parts and reduced the inventory between the four power blocks.



Fisher Dirty Service Trim utilizes a series of flow restrictions and expansions to eliminate cavitation while allowing particulates up to 19 mm (3/4 inch) in diameter to pass through without plugging. Its design addresses pressure drops in the early stages and results in more efficient operation.

RESOURCES

Brochure: Cavitation Control for Dirty Service Applications
http://emr.sn/Ix3a

Product Webpage: Dirty Service Trim
http://emr.sn/P4IK

http://www.Facebook.com/FisherValves
http://www.YouTube.com/user/FisherControlValve
http://www.Twitter.com/FisherValves
http://www.LinkedIn.com/groups/Fisher-3941826

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