Feedwater Heater Isolation

CASE STUDY

Reliable Isolation for Maintenance / Repair

Conditions	
Plant Type:	Subcritical
Location:	Before and / or after each high pressure feedwater heater or train of heaters
Service:	High pressure treated feedwater
Temperature:	475 F (246 C)
Pressure:	2,800 psi (193 bar)
Valve Model:	C-Series
Valve Size:	16-inch reduced bore
Class:	1500
Materials:	Ball / Seat: 17-4 PH / CCC Body: A105 End Connection: BW Schedule 160
Operator:	Electric
Cycling:	How many tube leaks a feedwater heater will have during a year determines the number of cycles. However, it can be as moderate as once a year. Although this valve does not cycle often, it must absolutely operate and seal off completely when called upon.

The new MOGAS metal seated ball valves were used in conjunction with a remaining gate valve as double-block and bleed.

Application

The feedwater heaters provide heat transfer from extraction steam to the feedwater, thereby improving the overall plant efficiency. These heaters are of a shell and tube design and on occasion, have tube leaks which require isolation of the heaters. Tight isolation is critical for several reasons:

- Tight shutoff will allow the heater to be worked on and repaired while the unit is online and the parallel string is in service.
- With high pressure heaters out of service, it can make as much as a 20–33 percent decrease in thermal efficiency.
- If the heater isolation valves do not hold tight, feedwater will leak toward the heater drain system and, depending upon the leak rate, could overload the drain system. This in turn could cause a flooded heater and increase boiler make-up water.

Safety

The biggest safety concern for the station was flashing steam. Should a person be inside one of the feedwater heaters repairing tube leaks and an isolation valve leak-by occurs, that feedwater could flash to steam and burn the employee.

Challenge

Most of the valves replaced were large gate valves with a history of leaking-by. Because feedwater heater isolation valves remain in the open position most of the time, gate valves can become jammed or seize and therefore can be difficult to close. This jamming can result from rust or scale buildup in the sealing troughs / ribs as well as by thermal expansion.

Solution

The MOGAS quarter-turn ball valve design has sealing components which are precisely mate-lapped with sharp leading edges on the metal seats that act as windshield wipers to wipe the ball clean of any buildup during each operation. Also, the seats are protected in the open position.

Results

To date, these valves have proven to operate more reliably and quickly than the previous gate valves. The stations have been able to sustain longer run times between major outages because of ability to safely repair the heaters online. To date, this major North American utility has purchased 14 of these large bore valves for two of their power generating stations.

Summary

MOGAS originally began replacing traditional gate valves in feedwater heater isolation service in 1988 and now has over two decades of proven experience in this application.

MOGAS® SEVERE SERVICE BALL VALVES

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1 Matched ball and seat sets
- Two-sided seat lapping delivers outstanding seal performance
- Each ball and seat set are “blued” to verify continual contact is achieved across entire seat face
- Sealing surfaces are not exposed to torturous effects of high pressure steam or high temperature feedwater

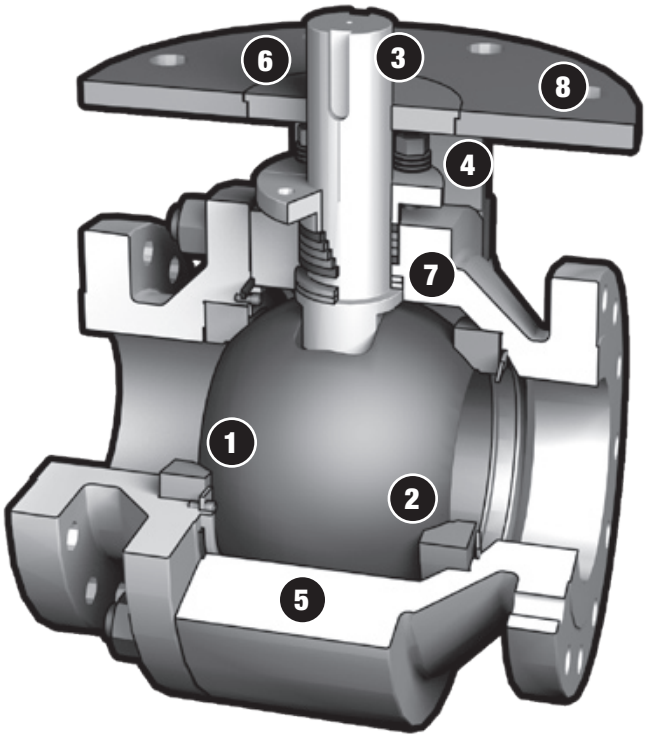
2 Metal-to-metal seats
- Sharp leading edge design of seat ring “wipes” sealing surface each time valve is operated

3 Oversized stems
- MOGAS provides oversized stems to accommodate torque increases that can happen over time

4 Standard live-loaded packing
- Live loads of stem packing gland ensure constant packing energization

5 Forged body
- Designed to withstand high temperatures up to 1652 F (900 C)
- High pressure up to 30,000 psig (2068 bar g)

6 Stem support bushing
- Secondary stem bearing guide eliminates movement and packing deformation caused by side-loading of stem by the actuator
- Stem bushing prevents stem blowout and is coated for wear resistance



7 Pressure-energized inner stem seal
- Two hard coated and lapped metal thrust bearings serve as both a pressure-energized inner stem seal and stem guide
- Bearings prevent migration of media into the packing box
- Lapped surfaces provide tight seal in combination with line pressure exerting additional vertical force

8 Sturdy mounting bracket
- To properly support actuator weight, MOGAS heavy duty mounting brackets are first welded or bolted into place then machined for precise alignment

Additional features

Bidirectional sealing
- Floating ball design provides bidirectional sealing

Reliable coating
- Use of identical base materials ensures thermal growth properties are consistent for the ball and seat
- Coatings on ball and seats have compatible thermal growth rates to prevent bond failure
- Rounded ball bore edges eliminate risk of coating spalling
- Two types of coatings — spray and fused, which is metallurgically-bonded, and HVOF, which is mechanically-bonded

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