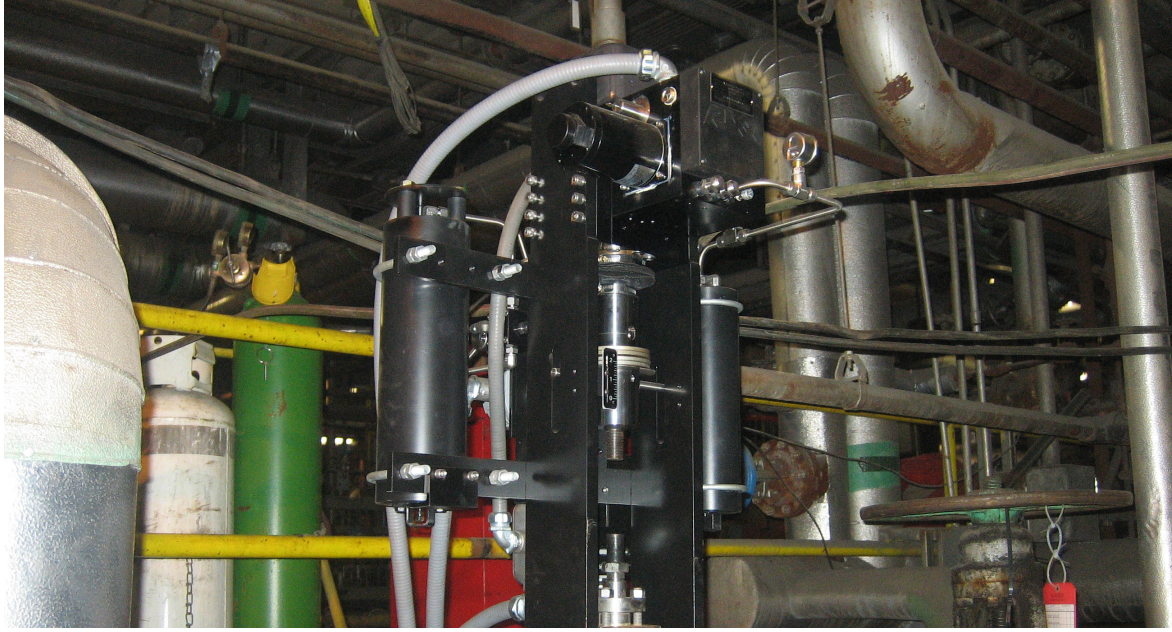
POWER



BOILER FEEDWATER
RECIRCULATION VALVE

BACKGROUND: Specific to the design and piping layout of every plant is a Net Positive Suction Head (NPSH) available for a boiler feedpump. This defines the inlet pressure at the suction side of the pump, due to the effects of gravity and system design. If the pump draw were to exceed the NPSH, the inlet line pressure would drop below the vapor pressure, resulting in flashing and cavitation. Not only would the cavitating feedwater physically damage the pump, the reduced flow rate would allow it to overheat.

To prevent this, a minimum available flow must be maintained to circulate through the pump, regardless of downstream boiler load requirements. To protect the boiler feedpump from damaging conditions, plants have a recirculation line that bypasses the boiler and recirculates feedwater directly back to the deaerator or to the condenser. This recirculation line is designed to make certain that the boiler feedpump has the required flow available to protect the pump at all boiler load conditions.

KEY TO SUCCESS is responsive and repeatable control of the Boiler Feedwater Recirculation (BFR) Valve, which protects the plant's investment in the boiler feedpump while still allowing the feedpump to deliver the required flow to the boiler. Depending upon plant type and design, the feedwater recirculation valve sees upstream pressure in the 2500-4500PSI range, and is responsible for taking almost a full pressure drop across the valve. Since this valve is usually closed during normal operation of the plant, the valve is typically designed for Class V shutoff, and needs to fail open on loss of power

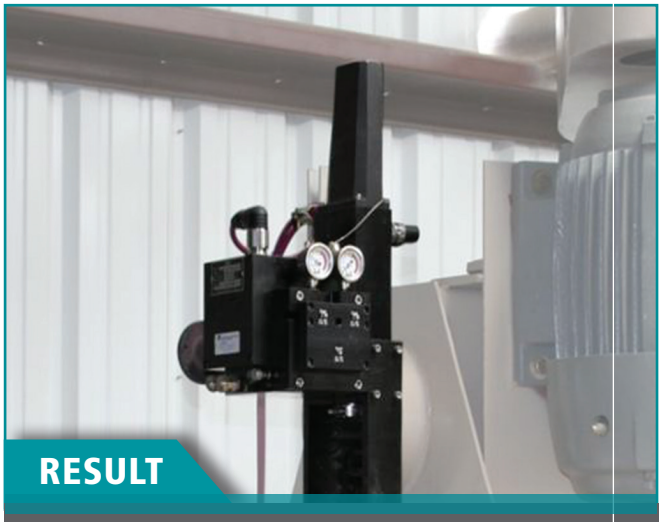
PROBLEM: Tight shut-off is critical to protect the valve trim of a BFR valve. Due to the high upstream pressure, a small amount of seat leakage may ultimately result in the destruction of the trim and lead to a more substantial leak path. It is common for this valve to have trim rebuilds and or retrofits frequently.

Many plants are now required to operate at lower load conditions more frequently. When plants are operating at low load, accurate recirculation is required to protect the pump and provide operational efficiency. The feedwater pump provides flow to both the feedwater control valve and to the recirculation line, while the recirculation valve maintains enough flow through the pump to keep it from cavitating. However, providing too much flow through the feedwater recirculation valve is lost energy for the plant.

If the valve seat becomes damaged, the leakage is compounded quickly due to high pressure "wire-draw" of the seats, causing the leak path to get substantial quickly. As the leak path becomes greater, the pump has to work harder to get the flow to the boiler, as a larger and larger portion of the flow is being unnecessarily recirculated through the BFR valve. As the boiler load requirement increases, the boiler may be unable to receive full rated flow of the pump due to a leaking BFR valve, and be required to operate below full load capability.

Most plants are still utilizing pneumatic spring and diaphragm actuators to actuate their Feedwater Recirculation Valves. A downside to pneumatic actuators is their lack of rigidity. As air is the operating medium and is compressible, pneumatic actuators can often be "moved" by the process. Pneumatic actuators do not have the stiffness that is inherent to a hydraulic actuator and therefore do not have the ability to control as accurately when small steps are required. The rigidness of a hydraulic actuator is well suited for an application requiring fine control and tight shut-off such as boiler feedwater recirculation.

SOLUTION: Based on the company's proprietary, Electraulic® Technology, REXA Actuators offer a rugged, responsive, and repeatable solution for feedwater recirculation applications. These actuators are designed for continuous modulating service with an adjustable dead-band as tight as 0.05% of stroke. The virtual incompressibility of hydraulics provides repeatable, stiff, and accurate valve control performance and allows for tight shut-off.



RESULT

Upgrading from pneumatic actuators to REXA Electraulic™ Actuators on boiler feedwater recirculation valves can provide immediate benefits for any power plant. Maintenance savings can be immediately realized through tighter shut-off, improving trim life of the control valve, and reducing labor and material costs.

An upgrade to REXA Electraulic™ Actuators from pneumatic actuators may yield the following operational improvements:

- Greater boiler efficiency
- Increased ramp rate
- More unit availability (improved ability to survive process upsets)
- Improvement in unit turn-down (minimum load operation)

In most plants, the ROI for upgrading to a REXA Electraulic™ Actuator on the boiler feedwater recirculation valve can be counted in a matter of weeks.

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