Improve Availability and Operational Flexibility

Control Valves for Power Generation

Leverage Emerson's Fisher™ valves, actuators, & instruments to reduce operating costs and improve your plant flexibility, availability, and reliability.

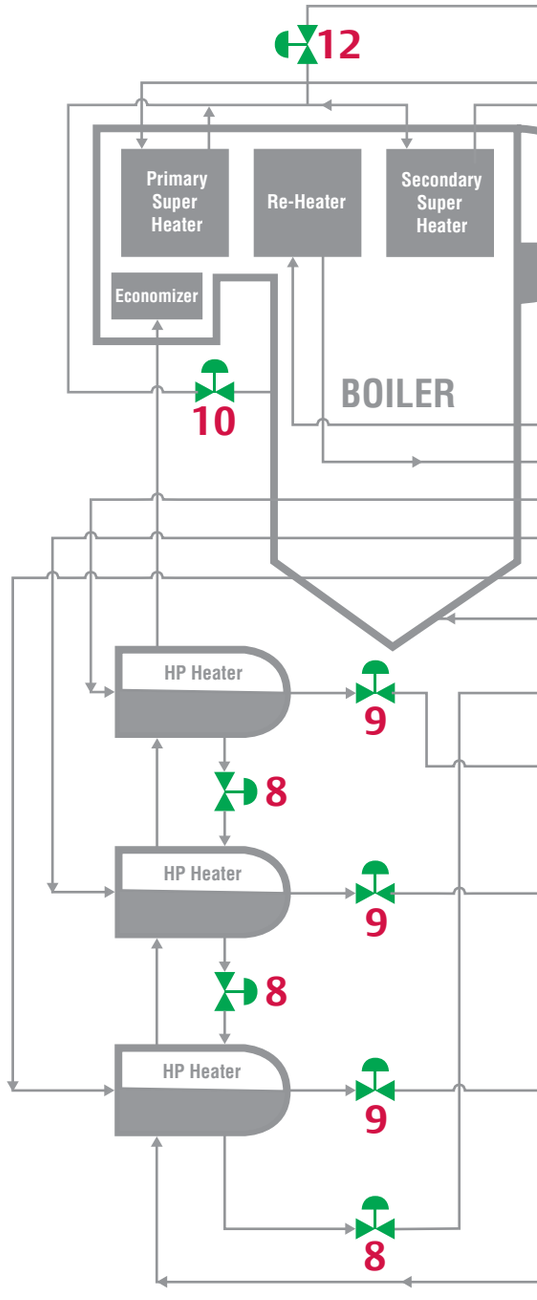
EMERSON

THE CONDENSATE SYSTEM

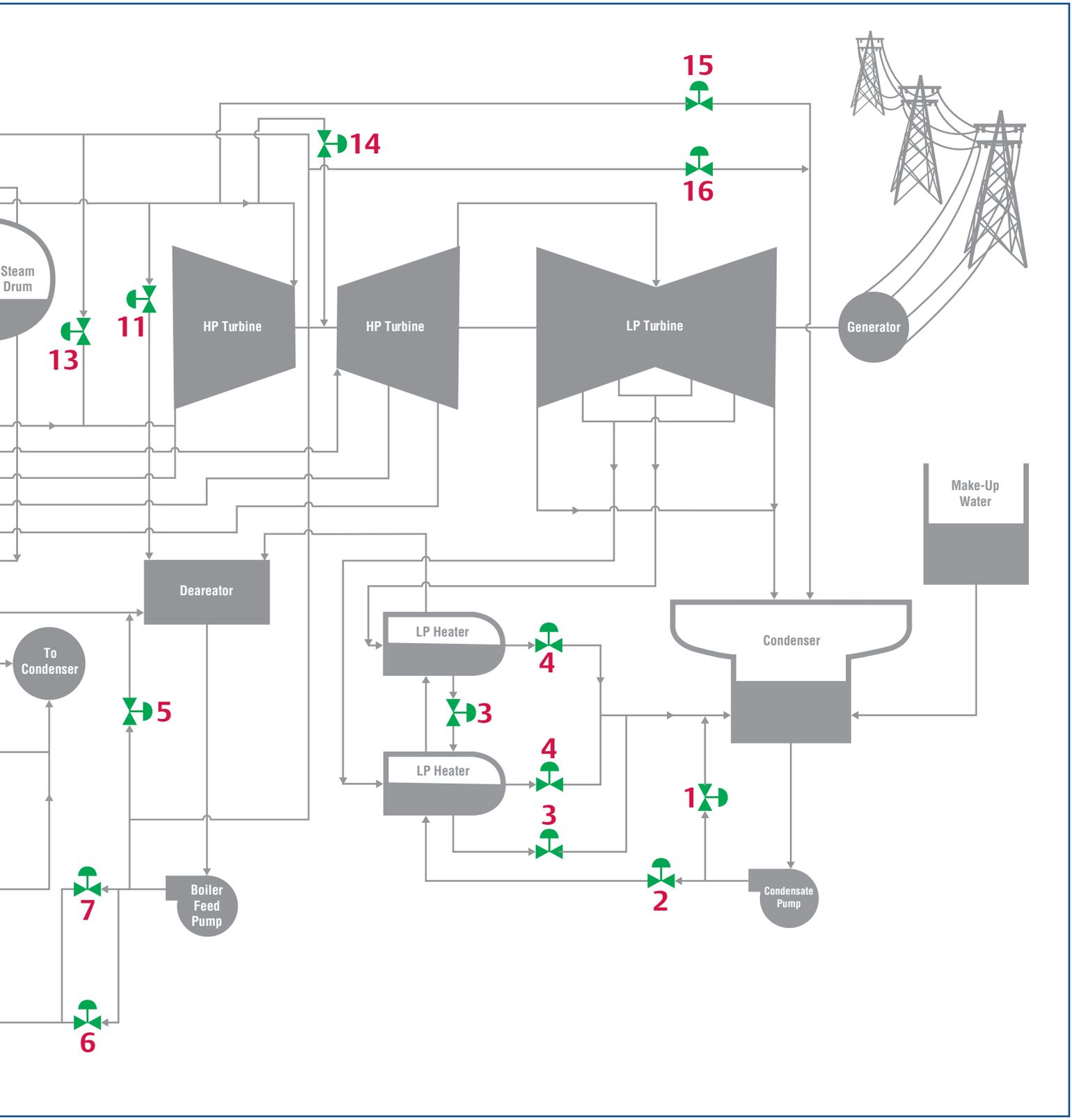
THE FEEDWATER SYSTEM

THE MAIN STEAM SYSTEM

THE HEATER DRAIN SYSTEM



Conventional Power Plant



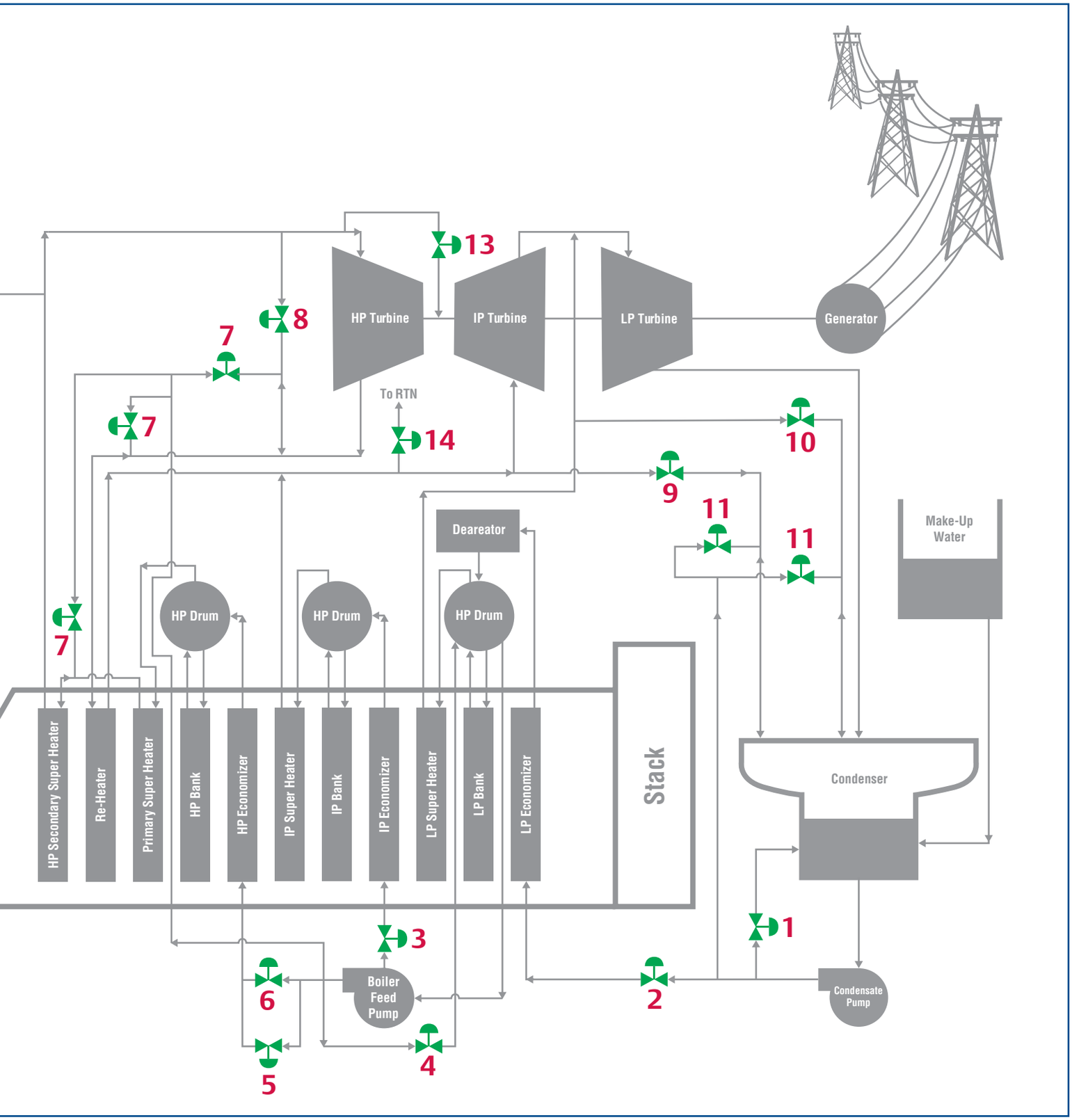
THE CONDENSATE SYSTEM

THE FEEDWATER SYSTEM

THE MAIN STEAM SYSTEM

THE FUEL GAS SYSTEM

Combined Cycle Power Plant



The Condensate System

Condensate Pump Recirculation Valve

As one of the most critical pieces of equipment in a power plant, the condenser provides a high vacuum environment where the turbine output and efficiency is maximized and the exhaust is condensed to water. It is a condensate collection point for the steam generator.

From the condenser, the condensate flows into the condensate pump and then through the other components in the condensate system.

In order to protect pumps from overheating and to prevent cavitation, Fisher condensate pump recirculation valves withstand varying outlet conditions by providing the recommended minimum flow of condensate through the pump.

PRODUCT FEATURES

- Advanced sealing technology prevents seat damage and eliminates condensate leakage.
- High rangeability protects the pump from damage and provides excellent system control.
- Anti-cavitation trim reduces noise and vibration for extended service life.
- Characterized cage provides low-flow cavitation protection during initial operation and necessary flow as pressure rises.
- Optional trim allows passing of 19 mm (.75 in) particulate.
- Optional reducers engineered to meet piping requirements.

Deaerator Level Control Valve

The deaerator serves many functions in a power plant. Its primary function is to minimize entrained oxygen in the feedwater. It must also provide additional heat to the feedwater flowing to the boiler and store an adequate amount of feedwater to provide sufficient suction head to the feedpump. This is a challenging application and requires a valve that can handle cavitating, low flow rates during startup, and allows for high capacity at low pressure drops during normal operation.

In order for the deaerator to serve all of its functions properly and efficiently, consistent deaerator level must be maintained.

Fisher deaerator level control valves maintain a consistent deaerator level while handling extreme flow rates and minimizing the effects of cavitation.

PRODUCT FEATURES

- Advanced sealing technology provides tight shutoff and maintains consistent deaerator level during startup.
- High turndown handles extreme flow rates.
- Anti-cavitation trim reduces noise and vibration for extended service life.
- Characterized cage provides low-flow cavitation protection during initial operation and necessary flow as pressure rises.
- Optional trim allows passing of 19 mm (.75 in) particulate.
- High thrust, low maintenance pneumatic actuator.

The Feedwater System

Boiler Feedwater Startup and Regulator Valve

In the normal range of plant operation, the boiler feedwater regulator experiences high flow rates with low differential pressure. However, during startup, this valve experiences low flow rates with very high differential pressure, which can cause severe cavitation damage. Some feedwater systems are designed using one valve to handle startup and normal operating conditions. Others are designed using a separate small startup valve to handle low flow, cavitating conditions and a second larger valve to handle high flow rates required for normal operation.

Fisher feedwater startup and regulator valves are engineered to eliminate cavitation during initial operation and provide the rangeability required for smooth transition from startup through full load operation.

HP/IP Drum Level Control Valve

The high pressure (HP) and intermediate pressure (IP) drum level control application is fairly moderate during typical plant operation. However, during startup the pressure drop across the valves, particularly the HP drum level control valve, can produce damaging cavitation.

Fisher HP and IP drum level control valves are designed to eliminate cavitation during startup while providing the rangeability required for smooth transition to normal operation.

PRODUCT FEATURES

- Advanced sealing technology provides tight shutoff and extends service life.
- High turndown handles extreme flow rates.
- Characterized cage provides low-flow cavitation protection during initial operation and necessary flow as pressure rises.
- Optional trim allows passing of 19 mm (.75 in) particulate.
- One valve solution: Offers anti-cavitation protection during low flow, high pressure drop startup, and unrestricted high flow during low pressure drop, full load conditions.
- Two valve solution: Offers a dedicated startup valve to handle cavitating conditions in parallel with a larger standard trim valve, handling full load conditions.
- Pneumatic piston actuator provides highly accurate step positioning and stable valve response.

Boiler Feedpump Recirculation Valve

The boiler feedpump recirculation valve faces some of the toughest conditions of any control valve in a power plant. The boiler feedpump takes its suction from the deaerator at relatively low pressure, and increases the pressure to approximately 10 percent above the main steam pressure. During startup or low load conditions, flow to the boiler may not be adequate to meet the minimum flow requirements of the boiler feedpump.

Fisher boiler feedpump recirculation valves protect the feedpump by ensuring adequate flow is passing through the pump at all times. They are engineered to handle extreme cavitation caused by high temperatures and pressure drops. Where issues with flow accelerated corrosion exist, Fisher boiler feedpump recirculation valves allow high levels of entrained particulate to pass.

PRODUCT FEATURES

- Controls pressure drops up to 586 bar (8,500 psi).
- Advanced sealing technology provides tight shutoff and extends service life.
- High turndown handles extreme flow rates.
- Anti-cavitation trim reduces noise and vibration for extended service life.
- Characterized cage provides low-flow cavitation protection during initial operation and necessary flow as pressure rises.
- Optional trim allows passing of 19 mm (.75 in) particulate.
- Globe and angle body designs available.
- Pneumatic piston actuator provides highly accurate step positioning and stable valve response.

The Main Steam System

Superheat Spray Valve

Varying load requirements cause varying steam temperatures. In order to ensure optimum heat rate and to protect the steam turbine, the steam temperature in the superheat sections of the boiler must be controlled.

Fisher superheat spray valves accurately control the amount of water injected into the steam attemperator or cooler, providing optimal main steam temperature control and stability. This prevents damage to the turbine and results in efficient turbine operation.

Reheat Spray Valve

To increase the thermal efficiency of a steam generator and improve the overall heat rate of a unit, a reheater is incorporated in the power cycle. This is a particularly challenging application and requires a reheat spray valve to maintain precise reheat temperature control.

Fisher reheat spray valves provide optimal hot reheat steam temperature control and high rangeability, while minimizing the damaging effects of cavitation.

Sootblower Valve

When firing fuels such as coal, oil, or other waste products, degradation of the boiler tubes becomes a concern. Deposits from the combustion process can collect on the heat exchanging tubes, which reduces thermal efficiency and may cause operational problems.

Fisher sootblower valves provide steam to the sootblower system to remove deposits from the boiler tubes while withstanding high pressure, high vibration, and thermal cycling to maintain unit efficiency.

PRODUCT FEATURES

- High rangeability for excellent system control.
- Advanced sealing technology provides Class V shutoff and extends service life.
- Customized sootblower trim reduces noise and withstands heavy vibration.
- Anti-cavitation trim reduces noise and vibration.

HP/IP/LP Turbine Bypass Spraywater Valve

Turbine bypass spraywater valves serve a similar function to that of the other spraywater valves in a power plant. Rather than precisely controlling temperature, these valves provide adequate water to the desuperheater to bring the steam temperature to near saturation temperature. This occurs when turbine bypass applications are discharging into the condenser.

When HP bypass applications discharge to cold reheat, adequate water must be provided to reduce the main steam temperature to cold reheat temperature. Similarly, for hot reheat bypass applications discharging to LP steam, sufficient water must be provided to reduce hot reheat temperature to LP steam temperature.

Fisher HP, IP, and LP turbine bypass spraywater valves provide accurate steam temperature and mimic actual process conditions of a normally operating power plant, providing precise water injection.

PRODUCT FEATURES

- Optimized in combination with turbine bypass valves.
- High rangeability for excellent system control.
- Advanced sealing technology provides Class V shutoff and extend
- Anti-cavitation trim reduces noise and vibration.

The Main Steam System

HP/IP/LP Turbine Bypass Valve

Turbine bypass systems are essential for the flexible operation of combined cycle power plants, as well as large, modern coal-fired plants. Turbine bypass systems permit operation of the steam generator independently of the turbine during startup, shutdown, and plant upset conditions. They must be adequately sized to meet the needs of normal startup and shutdown, as well as transients. They must also operate at acceptable noise levels.

Fisher turbine bypass systems enhance operational flexibility during transient operating conditions. As a result, startup times are reduced and equipment life and overall plant availability is increased.

PRODUCT FEATURES

- Custom designs meet piping arrangements.
- Noise abatement technology and rugged cage guiding reduces noise levels to provide smooth and stable operation.
- Variable geometry spray nozzles ensure complete mixing and rapid vaporization of spray water for efficient temperature control.
- Repeatable Class V shutoff at temperatures up to 593°C (1100°F).
- Enhanced designs engineered to withstand high thermal cycling applications.
- High rangeability for excellent system control.
- Pneumatic piston actuator for highly accurate step positioning and stable valve response.

Deaerator Pegging Steam Valve

The deaerator pegging steam valve provides steam that gives positive pressure to the deaerator or IP and LP drum to prevent air from being drawn into the feedwater system during plant startup. Steam from this valve also heats the feedwater. Steam may come from a low pressure package boiler or the plant main steam line.

Fisher pegging steam valves ensure pressure reduction and noise attenuation, regardless of steam source.

Steam Seal Regulator Valve

Steam seal regulator systems have several valves that experience varying conditions. The steam seal feed valve takes full main steam pressure down to 0.2 to 0.3 bar (3 to 5 psig). This extreme pressure drop presents several challenges including noise and vibration.

Fisher steam seal regulator valves contain noise abatement trim to combat these tough challenges.

PRODUCT FEATURES

- Noise abatement technology reduces the harmful effects of noise and vibration.
- Optional in-line diffuser for additional noise abatement.
- Rugged design engineered to withstand full main steam pressure drop.
- Advanced sealing technology provides Class V shutoff and extends service life.
- Pneumatic piston actuator for highly accurate step positioning and stable valve response.

Sky Vent System

Sky Vent Valve

Sky vent valves may operate during startup and shutdown of the heat recovery steam generator, bypassing main steam around the steam turbine to the atmosphere.

Fisher sky vent valves are engineered to withstand the full pressure drop that occurs as the valve dumps high pressure and temperature steam directly to the atmosphere. They operate quietly during dump operation and provide tight shutoff during normal operation, preventing valuable steam leakage.

PRODUCT FEATURES

- Advanced sealing technology provides tight shutoff and extends service life.
- Noise abatement technology reduces the harmful effects of noise and vibration.
- Components engineered for high temperature service.

Ring Style Attemperator

As with any superheated steam cycle, the temperature of the superheat needs to be controlled to ensure that it does not exceed the material limits of the steam turbine and boiler. Temperature control is accomplished by use of an attemperator or desuperheater that injects a controlled amount of cooling water into the superheated steam flow.

Fisher ring style attemperators are designed to work in conjunction with supporting superheat and reheat control valves to provide optimal steam temperature and stability. This prevents damage to the turbine and extends service life.

PRODUCT FEATURES

- Flexible designs from NPS 8 to 48.
- Optional liner prevents thermal cracking caused by water impingement on pipe.
- High turndown for high efficiency.
- Variable geometry spray nozzles ensure complete mixing and rapid vaporization of spray water for efficient temperature control.

Desuperheaters

Insertion Style Attemperator

Fisher insertion style attemperators are designed to work in conjunction with supporting superheat and reheat control valves. It is mechanically atomized with single or multiple, fixed geometry spray nozzles that are intended for applications with nearly constant load. Proven Fisher anti-flashing nozzles provide the required amount of water needed for accurate temperature control in the steam turbine and boiler.

The Fisher severe service insertion style desuperheater is structurally suited for severe applications where the desuperheater is exposed to high thermal cycling and stress, high steam velocities, and flow induced vibration.

PRODUCT FEATURES

- Vortex shedding technology minimizes vibration and extends service life.
- NPS 3, 4, and 6 available for pipes up to 152 cm (60 in) diameter.
- Water flange connection offers high rangeability for excellent system control.
- Solutions available for a wide range of steam velocities.
- Variable geometry spray nozzles ensure complete mixing and rapid vaporization of spray water for efficient temperature control.

HP/LP Feedwater Heater Normal Drain Valve

Proper functioning of the heater drain system is critical to maintaining optimum heat rate and protecting the turbine from possible water induction. The feedwater heater normal drain valves must provide stable feedwater heater level control.

Fisher HP and LP feedwater heater normal drain valves provide level control optimized to the characteristics of each specific feedwater heater and prevent the damaging effects caused by flashing.

HP/LP Feedwater Heater Emergency Drain Valve

Feedwater heater emergency drain valves normally operate closed, and tight valve shutoff is critical. A leaking emergency drain can have a 2-5-plus megawatt negative impact on plant output.

Fisher feedwater heater emergency drain valves operate quickly and properly to maintain consistent feedwater heater level when called upon and prevent damage incurred by flashing.

PRODUCT FEATURES

- Body materials eliminate erosion caused by flashing.
- Linear valve trim optimized to each feedwater heater eliminates noise and cavitation.
- Advanced sealing technology provides Class V shutoff and extends service life.
- Precise level control without oscillation.
- Globe, angle, and rotary designs available.

Fuel Gas System

Fuel Control Valve

The primary function of the fuel control valve is to provide fuel to the combustion turbine. The challenge of this application is that the fuel control valve must be designed to work in conjunction with other fuel control and air valves supporting operation of the combustion turbine. Depending upon the age and frame size, the number of fuel control valves can vary and may differ in size.

Fisher fuel control valves are designed to work in conjunction with supporting fuel and air control valves to improve efficiency of the gas turbine. They eliminate startup issues related to inaccurate level of the control valve. Their quick response enhances a turbine-driven generator's ability to respond to step changes.

PRODUCT FEATURES

- Proven, optimized designs customized to the specific need of combustion turbine application.
- Rotary valve design provides high rangeability for excellent system control.
- Globe and angle valves available, which increase flexibility.
- Three-way valves are used for fuel control in older turbine designs.
- Custom trim designs available for extended service life.

Air Extraction Valve

Air extraction valves may be located in the exhaust compartment of the turbine. The primary purpose of this valve is to protect the compressor, during startup or shutdown, from axial over thrusting by relieving some pressure in the system. This is sometimes called compressor surge or compressor stall.

The exhaust compartment may experience ambient conditions between 93 to 260°C (200 to 500°F), depending on turbine frame size. Typically, frame sizes have the same design, which includes four air extraction valves. Most of the time, two of these valves are located on the 9th stage of the turbine section (LP compressor bleed) and the other two are located on the 11th stage of the turbine section (HP compressor bleed).
Fisher air extraction valve packages offer fast-acting performance, while maintaining tight shutoff to prevent costly leakage and pressure loss in your system.

PRODUCT FEATURES

- Outstanding performance under extreme pressure and temperature conditions.
- Maintains tight shutoff and is available in a fire-tested version.
- Available as either a flangeless (wafer-style) design or as a single-flange (lugged) design.
- Can be supplied with one of several dynamic seals that can be used in a variety of demanding applications.
- A keyed drive shaft combines with a variety of handlevers, handwheels, or pneumatic piston diaphragm actuators.

Inlet Bleed Heat

Inlet Bleed Heat Valve

Sources of ambient air may initiate ice formation. To avoid this inlet air phenomenon, compressed air is bled at intermediate stages of compression and released back to the inlet guide vane, which prevents the ice formation (anti-icing). This is an intermittent function of the inlet bleed heat valve and is needed only when cold or humid conditions arise.

Antisurge or turbine-trip (compressor protection) is achieved when the inlet guide vane, along with the inlet bleed control valve, regulate the amount of air to the turbine. The compressor typically maintains a consistent speed. When subjected to low operating conditions, such as startup or shut down, air can be diverted to the inlet guide vane, protecting the compressor while managing turbine speed.

PRODUCT FEATURES

- Fluid control in economical, high-capacity valve bodies, which keeps the valve outlet velocities within practical limits.
- Meets a variety of service requirements, such as power plants, where oversized piping is used to limit fluid flow velocity.
- Advanced sealing technology provides tight shutoff and extends service life.
- Noise abatement technology and rugged cage guiding reduces noise levels to smooth and stable operation.
- Advanced technology provided allows critical stroking speed requirements to be met.

Severe Service Ball Valve

In both conventional and combined cycle power plants, steam loss to the atmosphere or the condenser is a critical performance indicator. This makes tight shutoff for vent and drain valves a high priority. Severe service on/off ball valves are found around the steam turbine, the boiler, and in the low points on steam lines throughout a facility. Leaks in these applications cause steam loss and damage to the wire draw seat, stem area body, and turbine. Leaks can also cause downstream pipe erosion and safety hazards for personnel.

Fisher severe service ball valves are designed around severe service applications where tight shutoff is critical. These valves are ideal for on/off applications in which high temperature, high pressure, or erosive conditions are to be expected.

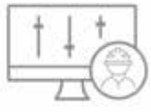
PRODUCT FEATURES

- Integral metal seat eliminates a potential leak path and helps prevent leakage issues.
- Unique ball and shaft design provides a larger shaft slot and expanded seating surface for better sealing and a more reliable connection.
- The spring protector and bi-directional seat allow sealing capability from both flow directions so if reverse pressure is applied, the seal is maintained.
- Advanced coating options are uniquely bonded on the sealing components for added durability in harsh service conditions and high-cycle applications.

Continuous support in the face of changing market and operating conditions.

Emerson leads the way with industry-defining end-to-end digital service experiences, helping you achieve superior outcomes through our maintenance, reliability, and performance offerings. The tools we've developed support the digital transformation of the power industry, providing the confidence to extract the maximum value from your service and technology investments. Our teams partner with you across the globe to help you maintain safe operation, improve reliability, and optimize plant performance.

With 100+ regional service centers and 80+ mobile service centers worldwide, local experts are available to work with you to understand your unique challenges and help you find a solution. Our broad portfolio of service offerings allows us to tailor our support to align with your specific business goals.



Connected Services

Leverage smart valve technology and Emerson expertise to help your workforce make informed performance and reliability decisions at speed.

Outage Services

Identify, prioritize, and plan long term plant reliability improvements to reduce maintenance events and improve generation performance.

Education and Training

Train new hires, improve your current workforce skills, and help your team adapt to new technology or products.

Startup and Commissioning

Certified technicians meticulously work through approvals, calibration, testing, and certification to deliver a comprehensive handover, on time and on budget.

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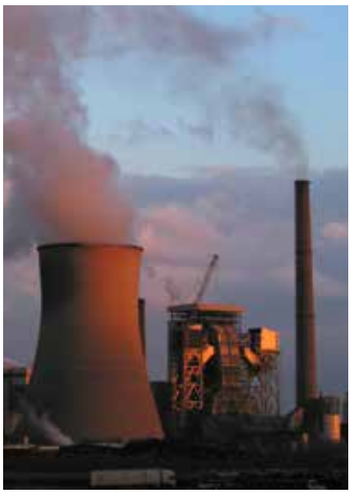

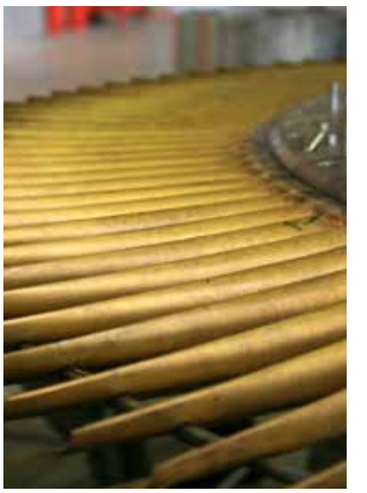

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