



Mastering Steam Turbine Operations in the Modern Energy Landscape

Despite the growing focus on renewables and decarbonisation, steam turbines are indispensable in power plants—still delivering optimal performance and enhanced plant efficiency, reliability and safety measures.

The ongoing sustainable energy transition and geopolitical events, such as the Russian-Ukraine war, have intensified the reliance on thermal power plants. Renewable fuel sources are on the surge. Coal-fired power plants have dynamically changed power outputs.

Steam turbines, as the core of the power generation energy sector, are under pressure to ensure higher plant availability to accommodate dynamic operational requirements—cycling more frequently to balance loads, optimising fuel costs and integrating renewables into their grid.

Ensuring plant efficiency and reliability

Achieving plant efficiency and reliability in the ever-evolving landscape of power generation requires a strategic approach, and the effective operation of steam turbines plays a critical role in this pursuit.

“With the adoption of renewables, power plants are now, more than in the past, required to adjust their output and balance the supply and demand to compensate for the variable electricity supply from renewable sources,” QianXi Koh, Asia Pacific Power Industry Manager for Control Valves and Instruments at Emerson stated, stressing that this is likewise the case for many coal-fired power plants, with operations shifting gears from base-load to peaking-load amidst the waves of renewables.

The main challenge with cycling loads, however, is thermal stress. Operating conditions pose increased thermal and mechanical stresses on major equipment and components, resulting in fatigue and failure. This leads to frequent outages and maintenance, reduced plant availability, and higher costs of repair and manpower.

Yielding operational excellence through advanced control technology for steam turbines

Advanced control technology emerges as a crucial factor in the quest for operational excellence. Steam turbines, being substantial investments for power plants, demand precise and advanced control technology to maintain performance and protect this critical asset.

These require not only peak performance but also robust protection against operational challenges. To address these demands head-on and tackle the challenges posed by varying loads, Emerson's portfolio utilises reliable steam conditioning, turbine bypass, and effective isolation of the steam turbine during different operational phases.

The [Fisher™ ATST Steam-Atomized Desuperheater](#) and the [Sempell™ Bled Steam Check Valve](#), for instance, showcase the transformative impact of technology on steam turbine efficiency and reliability. The ATST desuperheater's additive manufacturing-enabled steam-atomized water injection forms extremely fine water droplets into a fog-like mist over a wide operating range, ensuring optimal temperature control and reducing piping wear. Meanwhile, the Sempell check valve prevents steam backflow from the pre-heaters to the steam turbine, safeguarding the turbine from potential damage during emergency stops.

Discover how Fisher ATST Desuperheaters from Emerson offer a crucial solution to prevent overspray damage in attemperator systems through this [video](#).



Figure 1: Fisher ATST Steam-Atomized Desuperheater

Improving safety measures and leveraging data analytics

Maintaining the reliability of steam turbine operations comes with ensuring their safety, and the features of non-return turbine protection check valves play a crucial role in this regard. Such features include:

- Complete disc closure at no-flow conditions
- Anti-rotational devices to avoid damage from induced flow instability
- Free-swinging disc operation
- A vertical seat design
- And rapid closure during fast air exhaust, amongst others

These elements collectively contribute to reduced internal turbulence and pressure loss, ensuring the longevity of the turbine.

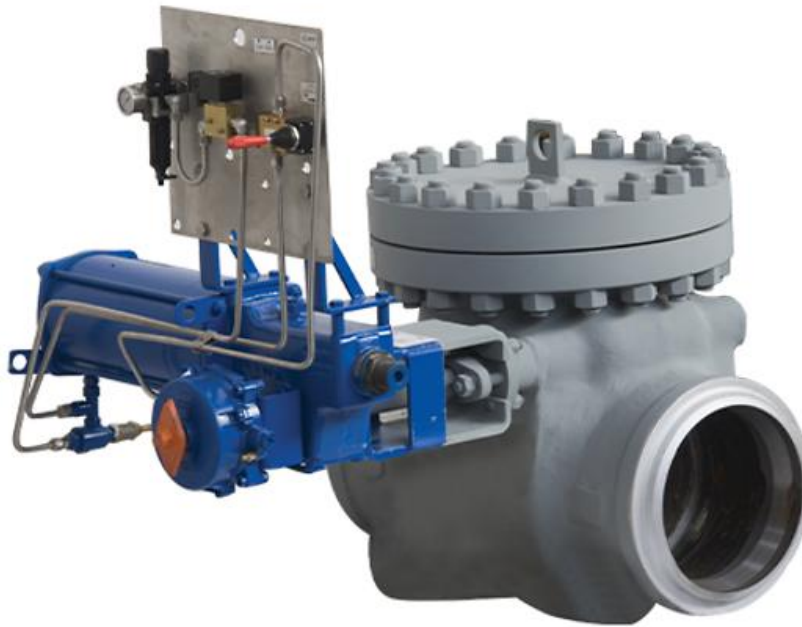


Figure 2: Sempell Fasani Bled Steam Check Valve

In the era of Industry 4.0, power plant operators can also leverage data analytics and digital solutions to fine-tune operations with real-time insights into the performance of steam turbines. Predictive maintenance based on data-driven assessments allows for identifying potential issues before they escalate.

For example, valves, critical components in the turbine operation, can be monitored using Emerson's Valve Condition Monitoring service. This real-time, non-intrusive health monitoring by Emerson valve experts allows operators to identify poorly performing valves through diagnostics, enabling a proactive approach to shutdowns and turnarounds, addressing issues before they impact plant operations.

Wrap-up

Mastering steam turbine operations is a crucial endeavour for power plants navigating the complexities of the modern energy landscape. Embracing advanced control technology, innovative solutions and robust safety measures can help yield stories of success and energy sustainability. Discover Emerson's cutting-edge solutions and effectively navigate the complexities of the modern energy landscape by visiting [emerson.com](https://www.emerson.com).