Solutions for Steam Turbine Automation

Fully Integrated Solutions for Increased Performance and Reliability
ABB offers a wide variety of system solutions for all of your turbine automation needs. For more than 40 years, we have provided control systems for turbine applications ranging from a 100 kW single stage turbine to a 1300 MW nuclear power plant turbine. We have supplied control systems for all types of rotating machinery, including a wide variety of applications for more than 1,200 turbines worldwide and 30 different turbine OEMs.

Our capabilities in the fields of mechanical/hydraulic design, electrical generator auxiliaries and condition monitoring complement our vast array of in-house expertise and allow us to provide our customers with complete solutions. We invest substantial resources in research and development in order to continually provide innovative and improved products and services to our customers, both now and in the future. Our concentration is on complete system solutions.

Steam Turbine Automation

Over the last 40 years, ABB has proven its expertise in more than 1,200 turbine automation projects with most turbine OEMs. These solutions cover control, protection and turbine supervisory equipment and are tightly integrated into the plant automation system with the advantage of seamless integration of operation, engineering and diagnostic functions.

By utilizing a fully integrated solution, our customers can take advantage of the benefits of a common platform including: engineering design standards, engineering tools, and operator graphics. A common platform also minimizes the amount of investment needed for hardware spares, reduces training requirements, and eliminates the need for serial interfaces. Additionally, our open architecture allows us to seamlessly interface to any DCS platform, in every industry.

ABB is committed to being your system solutions provider for power generation, helping you meet the automation challenges of today and tomorrow.
Steam Turbine Automation

**Turbine Governor Applications**
ABB has developed, tested and implemented digital logic for standard governor control functions for all types of turbo-machinery:
- Utility steam turbine generators
- Fossil fueled power plants
- Combined cycle power plants
- Industrial steam turbine generators
- Straight flow turbines
- Single and double auto extraction turbines
- Auxiliary mechanical drives
- Feed pump turbines
- Industrial frame units

The standard ABB governor includes all of the typical control functions for base speed and load control, including complete starting and loading control modes, synchronization when applicable, remote mode interface, valve testing, and monitoring/alarming.

**Turbine Protection**
ABB can provide turbine protection as a separate system or fully integrated into the control system. Utilizing our turbine protection module, we can easily implement 2-out-of-3 trip schemes to properly protect your large rotating assets. In addition to the overspeed trip function, these modules also provide turbine protection from overspeed by offering a variety of load loss and trip anticipation functions. Additional trip functions based on process parameters can be integrated into the protection system to satisfy your overall turbine protection requirements.

**Automatic Turbine Start-Up**
ABB can provide start-up sequencing to ensure proper start-up of the turbine from turning gear to full load. The sequence logic communicates with the base speed and load controller by sending speed setpoints, load setpoints, ramp rates and commands to initiate mode selections and valve transfers. In addition to selecting and monitoring soak times, the sequence also generates hold conditions based on information from monitor routines.
Steam Turbine Automation

**Turbine Auxiliaries**
ABB has developed a number of logic templates to interface with all motor starters and electrical circuit solenoid valves. These logic templates have been developed with circuit considerations for sustained outputs, momentary start and stop outputs, failsafe outputs, seal-in contacts, open/close valves, valves with intermediate positions and much more. They can be applied to meet the interface needs of the various pumps, motors and valves on and around the turbine island.

**Mechanical/Hydraulic Design**
As a result of years of experience, ABB has developed a comprehensive portfolio of hydraulic components that fit all needs for actuation of the main turbine valves. ABB can supply a wide variety of hydraulic components to be applied to high pressure or low pressure hydraulic systems. These hydraulic components include: final element actuators, pilot valve actuators, trip oil status manifolds, trip solenoid manifolds, accumulator stands, and hydraulic power units.

**Electro-hydraulic Control (EHC) & Protection Systems**
ABB has design capabilities for complete EHC systems based on our many hydraulic components. We provide complete engineering including: custom component design and mounting, speed wheel and speed probe mounting, system modification and installation engineering, as well as oil system piping.
Condition Monitoring and Assessment
ABB has developed a family of products to meet all of your condition monitoring and assessment needs including platform specific I/O modules for protection and monitoring, as well as two separate client software packages. Analyst™ allows a user to perform graphical analysis of rotating machinery data and MCM Expert provides automated and continuous intelligent analysis of all rotating machinery data. Analyst™ is a user-directed graphical analysis tool with specialized plots for assessing the condition of rotating machinery. MCM Expert is a rule-based automated diagnostic system that continuously monitors incoming data to determine faults in common rotating machines.

Generator Electrical Auxiliaries
ABB is one of the few companies to offer a complete electrical balance of plant (eBoP) solution portfolio. We have the experience required for designing and delivering turnkey eBoP solutions tailored to steam turbo-generating units.

Excitation
In a power plant, excitation systems have a powerful impact on generator dynamic performance and availability, ensuring quality of generator voltage and reactive power, the i.e. quality of power plant delivered energy to consumers. The main functions of the excitation system are to provide variable direct current with short-time overload capability, controlling terminal voltage with suitable accuracy, and ensuring stable operation with networks and/or other machines. ABB supplies state-of-the-art microprocessor based voltage regulators for all kinds of synchronous machines with rotating exciter and static excitation systems for high performance control.
### Generator and Unit Protection
The term generator unit protection is the combination of protections for the generator, unit transformer and auxiliary transformer in power plants. ABB has a wide choice of protective devices available, covering the following: machine differential, reverse power, loss of excitation, phase unbalance, voltage restrained or controlled overcurrent, backup distance protection, 100% stator ground, over and underfrequency, overvoltage, Volts per Hertz, undervoltage and inadvertent energization protection.

### Synchronization
Live network system components cannot be connected unless their voltage curves and phases coincide, otherwise the electrical stresses become too high and can lead to distortion of system equipment. Synchronization instruments are used in all power generation plants and networks to ensure safe and reliable operation. Digital dual channel and redundant synchronizing systems are available, allowing selection of a higher degree of safety and availability.

### Grid Connections
ABB can provide the complete grid connection from generator terminals to the high voltage substation.

ABB has a standardized type range of generator bus ducts for pressurized and atmospheric applications used for larger generators.

Our generator circuit breakers meet the IEEE C37.013 standard and have enclosures that allow for the integration of disconnect switches, grounding switches, short-circuit connections, current and voltage transformers, protective capacitors, surge protectors, and starting and braking switches.
Steam Turbine Automation

ABB can provide unit transformers with a variety of cooling systems to meet project specific demands. For combined cycled power plants, we can provide a cost effective solution using a three winding transformer, allowing the gas and steam turbine generators to be connected to the same transformer.

Our unit auxiliary transformers are available as dry type transformers or oil immersed transformers. This portfolio includes transformers for excitation systems and static starting systems.

Steam Turbine Simulator
Based on the latest state-of-the-art in hardware and software, ABB offers a generic simulator for steam power plants. In addition to the turbine and the boiler, which are simulated as the main process components, this simulator also maps the turbine control system, a simplified boiler control, and a coordinating unit control concept. The simulator has been designed for training onsite personnel, optimizing operating procedures, testing the plant’s behavior under varying conditions, and controlling unusual and critical situations based on real-life disturbance scenarios. At the unit control level, the basic modes of operation, the coordination of boiler or turbine following control mode are explained and viewed under real-time conditions.

Commitment to R&D
In addition to corporate level R&D, our business unit is committed to the development of products specific to the area of turbine automation including I/O modules for: turbine protection, valve positioning, auto synchronization and condition monitoring.

Installation Services
In addition to our in-house expertise, ABB has partnered with industry-recognized contractors and has working relationships with most major AE firms to provide a full complement of start-up and installation services including: on-site supervision and technical support of customer or 3rd party manpower resources, complete turnkey responsibility for installation and commissioning, as well as many other related on-site services such as system audits, vibration analysis, training, and maintenance services.

Life Cycle Commitment
We support our customer base through global service contracts assisted by a strong localized service organization. This organization offers advanced and efficient services from a comprehensive and modular portfolio to provide: emergency remediation, preventive maintenance and remote diagnostic services. Additionally, we help our customers maintain their financial and intellectual investment in their assets through training programs, consulting services and comprehensive migration strategies for system upgrades and retrofits.

ABB is committed to being the world leader in providing total integrated automation solutions for power generation, allowing our customers to meet the complex automation challenges of today and tomorrow.

A complete portfolio of services