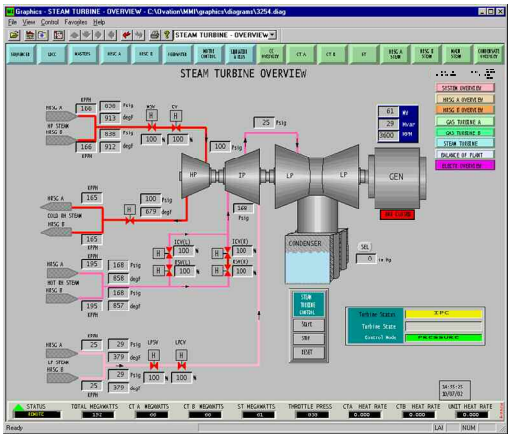
Steam Turbine Control Solutions

Data Sheet

Features

- Maximizes turbine life
- Vast experience with various turbine types from a variety of turbine manufacturers
- Centered on reliability, safety, and efficient operation
- Clear, concise view of key turbine parameters
- Various protection schemes
- Fully coordinated turbine and boiler control



Innovative Steam Turbine Control Solutions

Utilities worldwide are increasingly focused on maintaining reliable power generation in order to meet the growing demand for electricity. A key factor in maximizing plant availability is efficient turbine operation. Accurate control and monitoring of turbine processes extends life cycles and protects plant generation to meet power demands.

For more than 50 years, Emerson Process Management (Emerson) has been an industry leader in controlling every aspect of a power plant, including the steam turbine. Today, as older turbines operate beyond their original life expectancy, better control is a necessity. Emerson's Steam Turbine solutions use state-of-the-art Ovation® technology to give today's utilities the most flexible, powerful control system available.

Since 1963, steam turbine control has been a mainstay of our business. From over 130 AEH units installed in the 1960's to over 175 DEH Mod I, II, II, and Ovation systems to date, we have developed a proven solution combining all the design and operational knowledge of previous systems. Our long history of retrofitting turbines from leading manufacturers, including Westinghouse, ABB, and General Electric improves the reliability and availability of your turbines. Our experience extends across the board with various turbine types including:

- Straight flow and two section condensing
- Single and double reheat
- Triple and four flow low pressure
- Tandem and cross compound

Ovation digital controls offer you many advantages including a clear, concise view of key turbine parameters, various protection schemes and seamless, full coordinated turbine and boiler control. By working above the normal standards of turbine control, we have created a system that maximizes the life of today's turbines

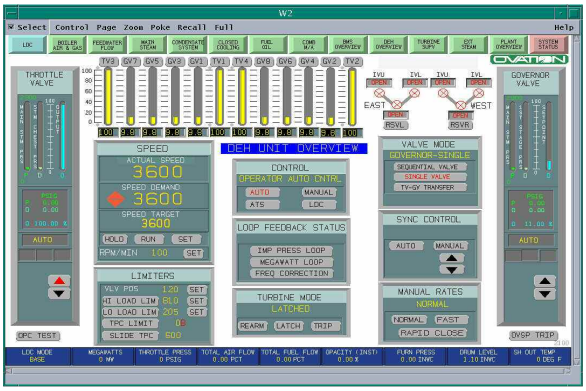
Controlling Your Steam Turbines

Our vast experience in the power generation industry has given us many opportunities to work with turbine control systems from various manufacturers. Our control philosophy for each solution centers on efficient operation, reliability, and safety. Steam turbine functions included within our solution include:

- Speed feedback loop
- Megawatt feedback loop
- Operator adjustable speed or MW demand and rate selection
- Initial load pickup at breaker closure
- Flow feedback loop

- Load limiting
- Initial pressure limiting
- Critical speed detection
- Valve test capability
- Valve calibration
- Individual valve curves
- Valve position indication
- Synchronizer interface
- Remote control interface

Our Solutions for Westinghouse Steam Turbines



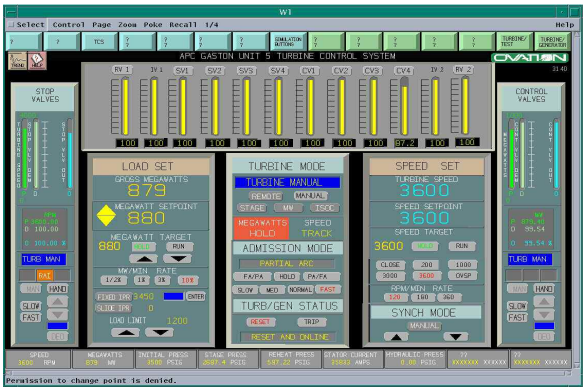
The Emerson steam turbine package performs all of the original Westinghouse AEH or DEH Overspeed protection and operator automatic control functions. Protection and testing functions normally include:

- 103% electrical overspeed protection
- Load drop anticipator
- Fast valving
- Valve test capability
- Mechanical/electrical overspeed testing
- Pre-programmed blade resonance ranges for improved turbine protection
- Pre-programmed turbine runbacks

Control functions normally included for Westinghouse turbines are:

- Remote latching of the turbine
- Throttle valve speed control
- TV/GV transfer and graphical position indication
- GV speed and load control
- Automatic synchronizer interface
- Speed, megawatt, and first stage pressure feedback loops
- Minimum load pickup on breaker closure
- Throttle pressure compensation on breaker closure
- Operator adjustable speed demand, speed rate, valve position limit, load demand, and load rate
- Remote control interface for automatic dispatch, boiler control, etc.
- Open/close graphic indication for all non-modulating steam valves
- Throttle pressure limiter – operator adjustable and remote
- Operator adjustable high and low load limits

Our Solutions for GE Steam Turbines



The Emerson steam turbine package performs all of the original GE control and protection functions. Normally included with this solution is:

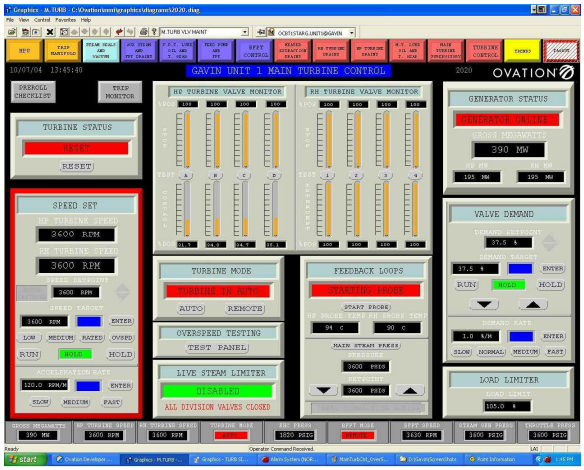
- Backup over speed protection
- Power load unbalance
- Trip anticipator
- Oil trip testing
- Turbine speed regulation
- Trip trap
- Turbine valve testing
- Mechanical/electrical over speed testing
- Preprogrammed blade resonance ranges for improved turbine protection
- Pre-programmed turbine runbacks

Control functions normally included for GE turbines are:

- Turbine pre-warming
- Remote latching of the turbine
- SV speed and load control
- FA/PA transfer
- CV speed and load control
- Automatic synchronizer interface
- Stage pressure feedback loop

- Speed feedback loop
- Megawatt feedback loop
- Minimum load pickup and initial breaker compensation on breaker closure
- Operator adjustable speed demand, speed rate, load demand, load rate
- Remote control interface for automatic dispatch, boiler control, etc.
- SV,CV, and IV graphical position indication
- Open and close indication for all non-modulating steam valves
- Initial pressure flow limiter

Our Solutions for BBC Steam Turbines



The Emerson steam turbine package performs all of the original BBC control and protection functions. Normally included with this solution is:

- Electrical overspeed protection
- Fast valving
- Valve test capability
- Mechanical/electrical overspeed testing
- Start probe protection
- Pre-programmed blade resonance ranges for improved turbine protection
- Turbine runbacks
- Acceleration limiter

Control functions normally included for BBC turbines are:

- Remote latching of the turbine
- CV speed and load control
- Automatic synchronizer interface
- Speed, starting probe, and throttle pressure feedback loops
- Minimum load pickup on breaker closure
- Throttle pressure compensation on breaker closure
- Operator adjustable speed demand, speed rate, valve position limit, load demand, and load rate
- Remote control interface for automatic dispatch, boiler control, etc.
- Graphic position indication for all modulating steam valves
- Throttle pressure limiter – operator adjustable and remote
- Operator adjustable high load limits

Built on a Solid Foundation

Revolutionary Ovation technology is the basis for Emerson's Steam Turbine Control solution. Compatible Ovation building blocks allow for flexible combination of various components and subsystems to match specific plant configurations. Ovations built in redundancy and self-diagnostics increases reliability, reducing expensive system downtime.

A broad range of subsystems, each designed for specific applications, are used to create our steam turbine controls. Applications include process control, data retrieval, general-purpose computation and man-machine interface. All subsystems are linked together by the powerful Ovation Network. An Operator/Engineer workstation provides a high-resolution window to the process for control graphics, diagnostics, trending, alarms, and plant status displays. Engineering functions are performed through powerful tools to configure and maintain the Ovation control system. Combining functions within a single workstation reduces equipment costs, spare parts, and space requirements.

The Ovation Controller executes simple or complex modulating and sequential steam turbine control strategies, as well as performs data acquisition functions. Standard I/O such as the sequence of events and link controller modules provide 1 msec. resolution of turbine operations and interfaces to OEM systems using standard protocols respectively. Specialized I/O modules for speed detection and valve position provide additional protection against turbine failures.

The Speed Detector Module determines the speed of the equipment by measuring the frequency of the tachometer output signal. Converted to 16 and 32 bit binary numbers the output signal is then used to detect and regulate equipment over speed

The Valve Positioner Module provides closed loop position control of the steam turbine valve. Valve styles controlled by this module include throttle, governor, interceptor, extraction, and bypass.

Connecting To Your Controls – Protecting Your Investments

Typically new plants will purchase the turbine controls directly from the turbine OEM. Our steam turbine control solution recognizes your investment in these products and includes connectivity packages so we can interface state-of-the-art Emerson controls with your pre-purchased turbine control system. Our vast turbine experience has connected turbine controls from GE, Toshiba, Mitsubishi, and Siemens to our control systems.