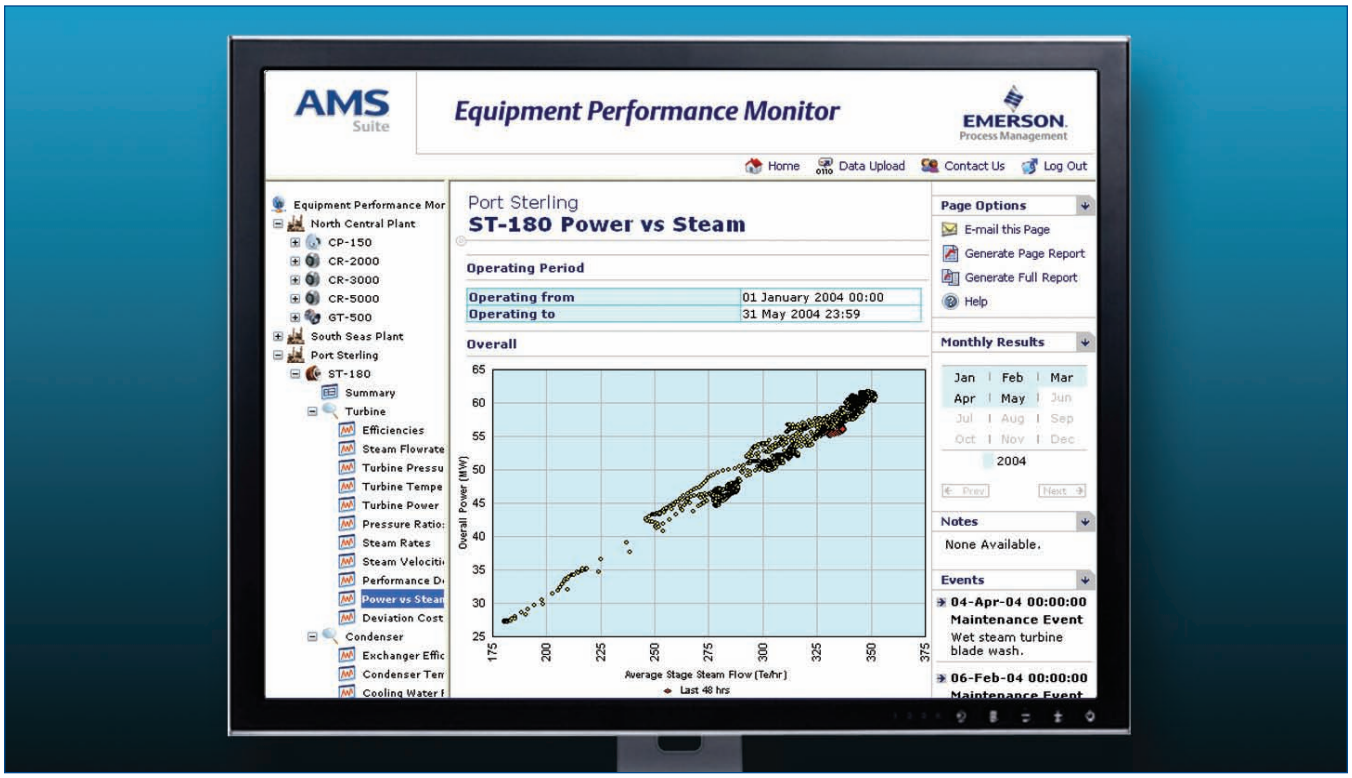
Performance Monitoring - Steam Turbines



Scatter chart displays the relationship of steam flowrate and power.

- *Reduce operating costs and maximize production*
- *Increase availability and reliability*
- *Assess the effect of blade washes*
- *Identify optimum range of throttle loading rates*
- *Maintain power demand to the plant or grid*
- *Avoid catastrophic shutdowns*
- *Reduce maintenance expenditure*
- *Determine the underlying causes of operating deviations*

Enable Predictive Maintenance

AMS Performance Monitor provides the tool to achieve peak performance of Steam Turbines. It facilitates the move to predictive and proactive maintenance programs, thereby maximizing equipment performance.

Equipment Categories

- Power Generation
  - Condensing Passout
  - Back Pressure
- Mechanical Drive
- Fixed / Variable Speed
- Multiple Stages (Extraction / Admission)

AMS Suite: Equipment Performance Monitor

Success Stories

- Pinpointed the root cause of a major power generation failure (~ 2 x30MW) caused by clogged throttle nozzles.
- Evaluated an existing extraction flow control philosophy to optimize power production and site steam usage.
- Developed an effective blade wash strategy to maximize power production and minimize equipment downtime which generated an additional $2.4M over an 18 month period.

Capabilities

- Assess performance relative to manufacturers' specifications or baseline performance.
- Conduct detailed thermodynamic analysis of machine operation.
- Indicate fouling, including admission valves.
- Determine best operating practices for extraction or admission flowrates.
- Infer stage performance to highlight maintenance requirements.
- Evaluate the effect of operation on efficiency, heat rate, and power output.
- Diagnose the root cause of performance degradation.

Key Performance Indicators (KPIs)

The following are presented using ASME PTC 6 thermodynamic custom-built modeling techniques:

- **Isentropic Efficiency** - Used to determine machine performance trends and effects of maintenance activities.
- **Power Characteristics** - The power generation, together with the expected generation at design or clean conditions.
- **Efficiency/Power Deviation** - Load independent comparison relative to design.
- **Pressure Ratios** - Used together with the efficiency curves to determine optimum stage performance selection.
- **Steam Velocities** - Used as an indicator of the amount of energy removed from the steam feedstock at each stage.
- **Steam Rates** - Illustrates changes in performance deviation, relative to isentropic expansion.
- **Power vs. Steam** - Scatter plot identifies turbine degradation and optimum control regions.
- **Operating Loss Cost** - Tracks current and historical 'lost opportunity' — both instantaneous and cumulative.
- **Exchanger Efficiencies** - Track fouling effects and performance changes both current and historical.
- **Exchanger Duty/UA** - Detailed analysis of actual duties and UA values, both relative to design.
- **Condensate Pressure vs. Duty** - Determine optimum operational parameters for specified condenser duties.
- **Cooling Water Flow vs. Condensate Flow** - Determine the correct flowrate of cooling water to employ with respect to the condensate flow.
- **Operating Loss Cost** - Track cost of performance degradation (based on design/reference).

Steam Turbine Demonstration available at www.AMSPerformanceMonitor.com

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