

## Machinery Health Monitor (MHM)

### Background

Large rotating machinery is a key driver to nuclear plant profitability. Unexpected downtime on critical assets such as the main steam turbine, reactor coolant pumps and feed pumps can be financially devastating with the cost of maintenance and the loss of production. Reliable operation requires a protection strategy that limits the possibility of catastrophic failure and incorporates health monitoring, which can help utilities make informed decisions of when to perform maintenance.

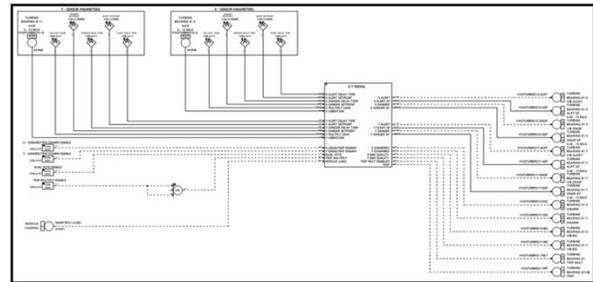
A continuous protection and prediction monitoring system that reviews and records more than over-speed conditions provides operators and maintenance personnel with the information they need to safely operate their rotating machinery.

### Description

Westinghouse uses the Ovation® Machinery Health Monitor™ (MHM) IO module, which provides a scalable solution to meet the protection and prediction requirements of large rotating machinery within a nuclear plant. Measurements of parameters such as:

- Radial shaft vibration
- Eddy current DC gap voltage
- Bearing case vibration
- Accelerometer bias voltage
- Axial thrust position
- Shaft eccentricity
- Speed
- Zero speed and reverse rotation
- Phase
- Differential expansion
- Case expansion

These signals can all be monitored in real-time, as well as historically reviewed. The Ovation MHM can be configured to act as protection only, prediction only, or as a combined system. Additionally, tools are provided to allow a seamless integration with the Ovation Distributed Control System (DCS), which operates and interfaces with the rotating assets. The module also uses standard Ovation Control Builder logic.



Typical Control Logic Sheet for MHM Interface

### Protection Features

- Logic built to API 670 standard
- Standard Ovation module that installs directly into Ovation DCS cabinets using redundant controllers
- Standard Ovation relay output modules that allows for configurable trip logic to be carried out by the DCS
- Direct communication to Ovation DCS
- Built-in tools to assist integration with Ovation DCS (parameter value, alarm set-points, channel status, module status), which can be displayed on Ovation operator graphics
- Redundant +24V power supplies

### Prediction Features

MHM application provides users with:

- Predictive monitoring performance for rotating assets
- Analysis tools for prediction (plotting, trending, transient recording, waveform, spectral analysis, orbit plots)
- Adaptive monitoring for changing process conditions
- Ability to accept inputs from other turbine supervisory equipment and still provide full prediction benefits

## Integration with DCS

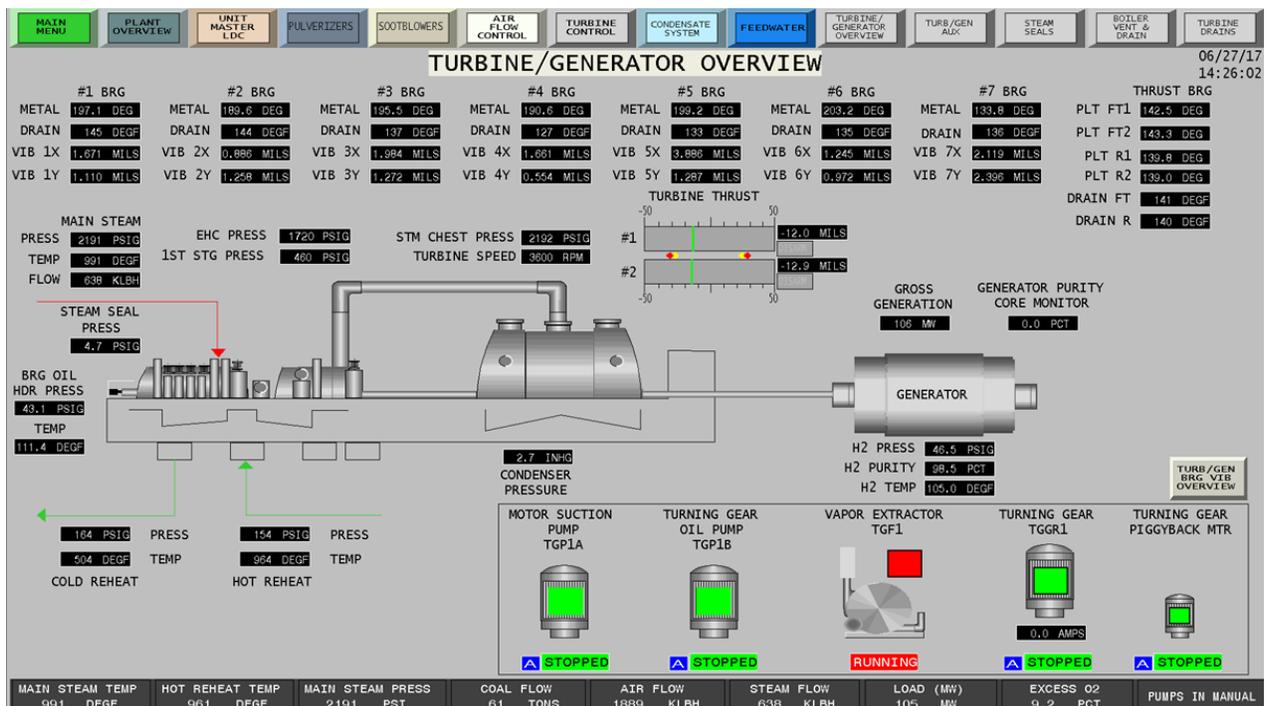
- Direct communication with Ovation system
- Turbine Generator Rotor Monitoring displays are provided with Ovation Turbine Control System
- Ability to integrate with existing turbine supervisory equipment

## Instrumentation

The Ovation MHM has the ability to interface many of the industry standard monitoring sensors such as eddy current displacement sensors, accelerometers, velometers and linear-voltage differential transducers. This often allows the customer to decide whether to re-use existing installed sensors, or to replace with new, calibrated sensors. The solution can be scalable from single module to full implementation, including sensors, converters, brackets, cables and installation services.

## Benefits

- Troubleshoot transient occurrences from an Ovation computer
- Integration with Ovation DCS Graphics (see Ovation rotor monitoring graphic)
- Continuous real-time parameter status and values available to operators
- API 670-compliant protection
- Predictive alerts
- Analysis tools to make informed decisions
- Scalable solution to meet prediction and protection needs
- Uses standard Ovation DCS equipment



Ovation Rotor Monitoring

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