Valmet DNA Machine Monitoring

Online system for power plant machinery protection and condition monitoring

Valmet DNA Machine Monitoring measures and analyzes the mechanical condition and performance of turbo generators and critical process machinery in a power plant, based on vibration measurements and other machine parameters. DNA Machine Monitoring provides both protection and diagnostics for critical machinery, as well as condition monitoring and analysis tools for predictive maintenance of auxiliary machinery. Online machine condition monitoring works 24/7, thus providing the fastest possible way to act on problems and to secure the production, protect the assets and increase safety in the working environment.

DNA Machine Monitoring can work as a fully integrated application in the Valmet DNA automation platform or as a stand-alone system.

Online machine condition monitoring is based on fixed installed sensors on the machinery, cabled to monitoring substations where measurement data is collected in real time for critical machinery and in cyclic intervals for auxiliary machinery. Alarms are generated when pre-set alarm limits are exceeded. Fault analysis is performed with comprehensive signal analysis tools. Defect development is monitored by tracking historic trends, thus providing the tool for predictive maintenance and for scheduling shut-downs.

Machine condition monitoring enables the detection of mechanical faults caused by:

- bearing wear and instabilities
- unbalance
- misalignment
- thermal expansion
- axial movement
- shaft defects
- wear and looseness
- gear mesh problems
- resonances.

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Machine protection

Measurements for turbo generator protection interlocking to avoid severe machinery damages
Valmet's I/O units for protection monitoring are designed in accordance with API 670 standards to fulfill the demand for fast measurement cycles. Common measurements for protection interlocking are: relative shaft vibration, differential expansion, thrust position and casing expansion.

Eddy current probes are used for shaft displacement measurements, and vibration velocity sensors or accelerometers for absolute vibration measurements. 4-20 mA outputs of calculated vibration characteristics are available from the I/O units to the safety system for protective interlocks.

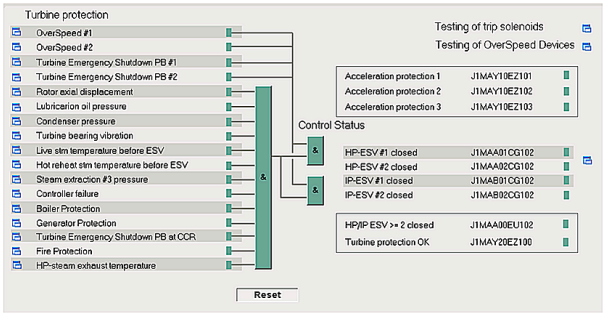
Turbo generator diagnostic

Machine diagnostic provides the tools to analyze the turbo generator during run-up/coast down and steady state phases

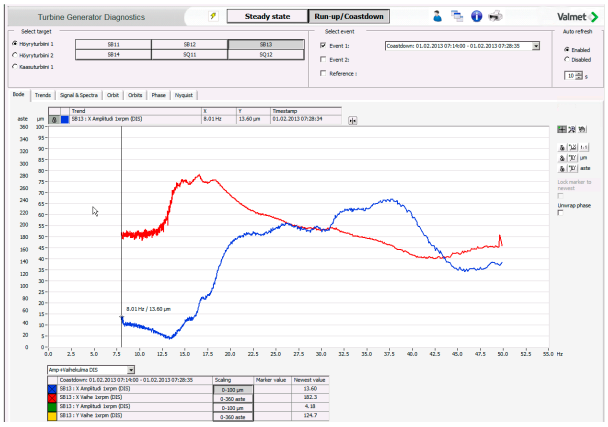
The turbo generator diagnostic application performs fast real-time measurements and analysis in run-up and coast down phases. Efficient diagnostic tools, such as Bode plot and Nyquist diagram, are available for analyzing the turbo generator performance when passing through critical speeds. Shaft orbits, polar plots and vibration spectra are available for monitoring in the steady state production phase.

Machine condition monitoring

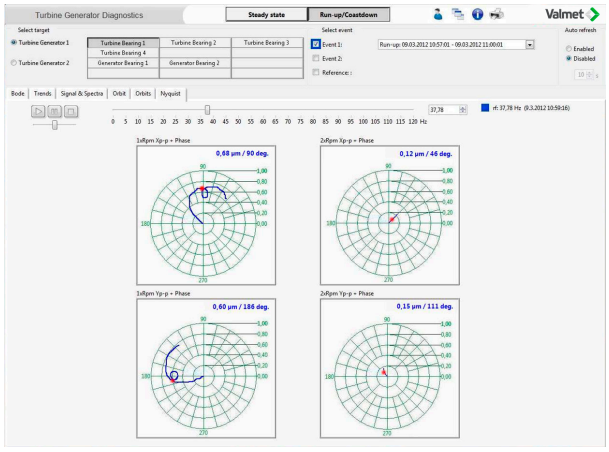
Monitoring tools for auxiliary machinery
Auxiliary machinery, like fans and pumps, can be monitored with efficient condition monitoring tools. The application provides alarm handling and analysis tools for time signals and spectra. History trends of vibration characteristics are available for tracking fault development.



Turbine protection logic



Turbine run-up Bode plot



Turbine run-up Nyquist diagram

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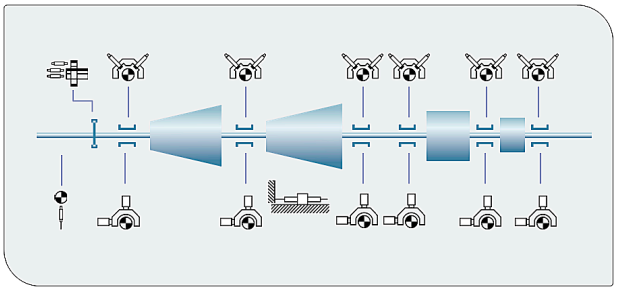
DNA Machine Monitoring parameters

The following parameters can be measured and monitored for turbo generators:

- relative bearing vibrations
- absolute bearing housing/machine case vibrations
- thrust position
- differential expansion
- case expansion
- eccentricity
- speed/key phasor
- gap voltage.

Correlating parameters e.g.:

- active/reactive power
- bearing temperature
- bearing oil pressure.



DNA Machine Monitoring components

I/O units for protection

- AIF4 units designed in accordance with API 670
- AIF4E for Eddy current probes
- AIF4V for velometers and accelerometers
- 20 kHz sampling frequency
- <100 ms update for protection parameters
- four-channel units
- 4-20 mA output for each channel
- 10 s sample buffers for diagnostic application
- buffered diagnostic output for each channel

- works independently after power-up (protection)
- galvanic isolation between field and system as well as between channels

ACN process controller for diagnostics

- ACN MR high-performance process controller
- no moving parts (HDD, CD, etc.)
- 2 GB SD card
- five Ethernet ports
- two USB ports
- redundant power supply
- self-diagnostic
- communication to third party (Modbus TCP)
- an integrated part of the Valmet DNA system network

- configuration of I/O units with standard Valmet DNA engineering tools

I/O units for condition monitoring

- AIF8V unit for vibration and DC parameter measurement
- AIF8T unit for trigger and status signals
- eight-channel parallel measurement
- 16 bit AD converter
- 20 kHz sampling frequency
- 50 s continuous signal ring buffer
- 4 mA constant current supply for IEPE sensors

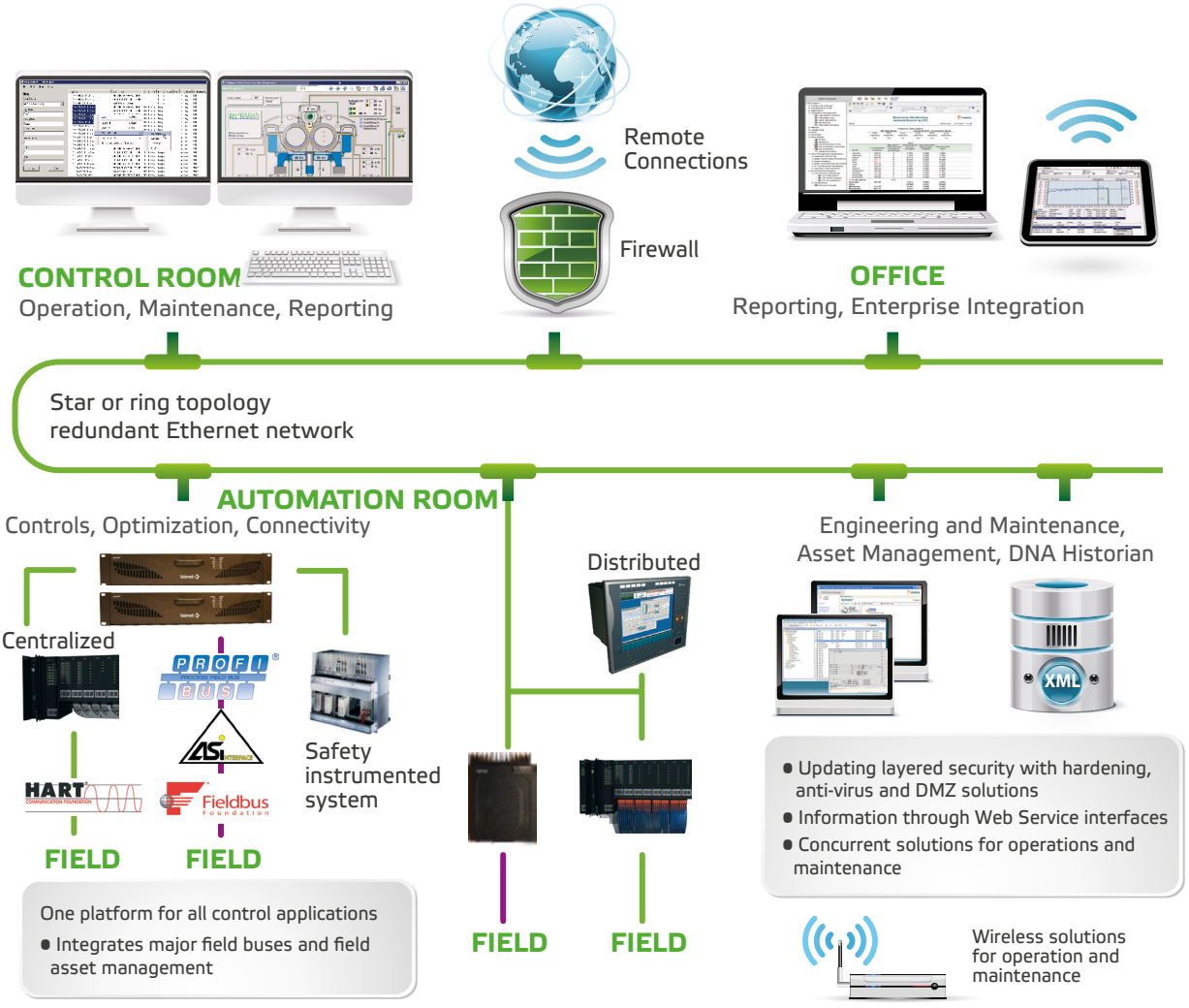
- continuous power supply for all sensors
- galvanic isolation between field and system

ACN process controller for condition monitoring

- ACN RT for centralized installation, ACN CS for field and centralized installation
- Intel Celeron Processor 2 GHz or higher
- 512 MB of RAM memory (max 2 GB)
- two Ethernet ports, 10/100 Base-T
- two USB ports
- no moving parts (HDD, CD, etc.)
- two serial ports, RS-232

System integration brings cost benefits

An integrated solution allows shared system resources to be utilized for control and condition monitoring applications. The same operator work stations, history databases, system networks and engineering tools can be used by all applications. System maintenance is easier because only one engineering environment is needed.



For more information, contact your local Valmet office. www.valmet.com