

## Bently Nevada\* Wind Turbine Condition Monitoring and Diagnostics

application package

The Wind Turbines Application Package is an advanced online machine condition monitoring and diagnostic software package for wind turbine drive trains. Specifically designed to work with Bently Nevada Trendmaster\* Dynamic Scanning Module (DSM) hardware and System 1\* database and display, this package enables monitoring and diagnostics of important wind turbine drive train mechanical condition parameters such as vibration and temperature. This online solution allows operators and maintenance personnel to correlate machinery-related information with other operational information such as machine speed, electrical load, and wind speed. From this information, wind turbine condition is better understood, and proactive decisions can be made regarding maintenance, scheduling, and safe operation of the units.

In development of the new wind turbine monitoring system, the Bently Nevada team tapped into its 40-plus years of machinery monitoring experience and proven technology. A series of accelerometers, shaft speed sensors, and optional sensors to measure tower sway, bearing temperature, and oil condition are mounted on drive train components. Machine condition data is continuously sampled and preconditioned by the Trendmaster DSM located in the nacelle up-tower. Fiber optic connections run down the tower from the DSM to standard Ethernet switches. System 1 provides the distributed asset management software solution throughout the wind farm network.

### Benefits

- **Optimized maintenance strategies, effectiveness, and activity.** Advance your wind turbine maintenance strategy by using real-time condition status and early event detection capabilities to direct maintenance activities based on asset condition, rather than strictly a time-based or run-to-failure approach.
- **Reduced risk to operations with respect to capability, safety, and business performance.** Monitor and evaluate developing problems and schedule repairs when impact is minimal.
- **Controlled costs through more effective planning and avoiding unexpected shutdowns/catastrophic failures.** Plan and schedule corrective maintenance early, before complete bearing or gearbox failure occurs, and minimize collateral damage to adjacent components.
- **Cost Savings by reducing manual data collection requirements.** Reduce manpower requirements for manual data collection throughout the wind farm.
- **Improved Root Cause Diagnostics.** Capture knowledge about the ways in which the equipment degrades and promote a shift in maintenance culture from reactive to proactive.
- **Reduced damage to equipment from operation outside design parameters.** Correlate wind turbine mechanical behavior and condition indicators with operational information to help maximize wind turbine service life.



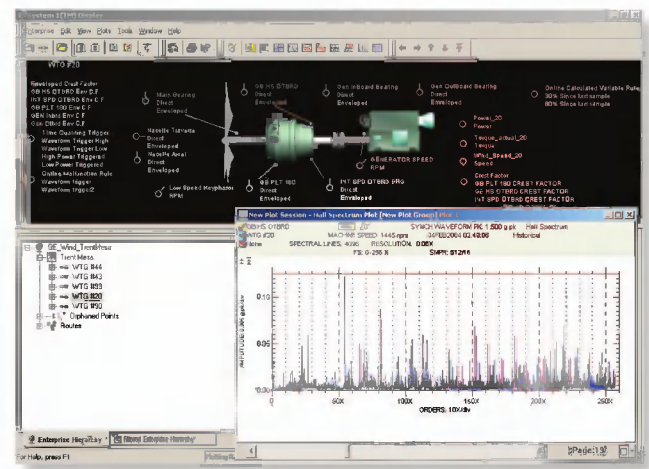
This highly capable package offers high-resolution data acquisition, trending, sophisticated alarming, exception reporting, and user notification. As wind turbines inherently have high levels of vibratory noise, the DSM and System 1 software utilize a dynamic data processing method called acceleration enveloping to enhance acceleration signals, allowing early detection of small vibration level changes indicative of roller element bearing and gear wear.

Tightly integrated with System 1, Decision Support\* with RuleDesk\* enables intelligent alarms and notifications, and customization of knowledge-based rules.

Actionable Information\* - in the form of "what happened," "where," "when," "how bad is it," and "what should be done about it" - is automatically sent to personnel who can take action to affect wind turbine operation and maintenance planning.

## Capabilities

- Proven system - based on the Trendmaster platform introduced in 1989, and backed by the global leader of machine condition monitoring systems
- Acceleration enveloping for early fault identification in roller element bearings and gears
- Speed and phase information for all vibration measurements for accurate trending and correlation
- Remote access capability, including for offshore wind farms
- Automated data analysis and advisories
- Proactive operator "smart" advisories available on a 24/7 basis
- Allianz® certification for European applications
- Decision Support RulePak for enhanced management capability available



For complete product specifications and ordering information:  
 — contact your local salesperson  
 — call 775-782-3611 and ask for "System 1" at the prompt  
 — e-mail us at [system1info@ge.com](mailto:system1info@ge.com)  
 — visit our Web site at [www.gepower.com/system1](http://www.gepower.com/system1)

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