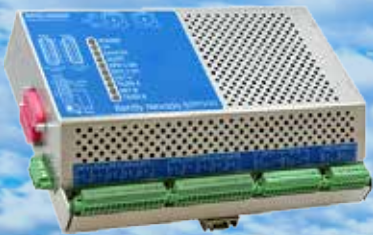


Bently Nevada ADAPT.Wind Condition Monitoring Solution

A smarter way to operate your wind farm



GE
Measurement & Control

ADAPT.Wind

With the increasing demand for clean energy, the wind sector continues to grow; and so do the challenges associated with achieving lower levelized cost of energy (LCOE). Wind farm owners and operators must find ways to operate smarter and maintain profitability by controlling operating and maintenance costs.

Bently Nevada* ADAPT.Wind* condition monitoring solution addresses those very concerns by proactively detecting impending drivetrain issues. From transducers to monitors and software, this integrated and scalable solution enables you to intelligently manage wind farm assets, increase availability and decrease maintenance expenses. ADAPT.Wind solution is an integral component of a condition based maintenance methodology which can be applied to any turbine manufacturers' equipment.

Bently Nevada's wind power and condition monitoring experts know the turbines and instrumentation. We can provide a single point of contact for the entire project. We'll work with you to assess your needs, design and deploy a custom solution, and help you maintain the solution over the entire life cycle.

Why Monitor?

Wind turbines can endure unpredictable conditions that negatively impact operation. Advanced condition monitoring techniques and experience are critical to reliably managing your assets.

The Gearbox Is Priority #1

Planetary/helical gearbox failure is a primary concern for manufacturers and operators. *As much as 25%–30% of wind farm operating and maintenance costs are associated with the gearbox alone.*

A Bently Nevada integrated condition monitoring system enables operators to understand the gearbox condition remotely. Dependable knowledge of the gearbox condition enables continued operation and revenue generation when a defect is not significant, while mitigating the risk of run to failure, an unplanned outage or catastrophic event.

Proactive condition monitoring across your fleet also helps operators plan efficiently for and coordinate maintenance outages. Consolidating maintenance into one outage, and scheduling one crane, can save hundreds of thousands of dollars.

Increase availability by shifting from time-based to condition-based maintenance. Advanced planning helps shorten maintenance intervals and optimize maintenance outages.

Improve reliability by establishing baseline operating conditions for the drivetrain.

Early warning/detection can reduce crane costs by identifying problems soon enough to perform some maintenance up-tower.



Drivetrain Instrumentation

Bently Nevada accelerometers and speed sensors



60M100 Condition Monitoring System

Powerful continuous up-tower signal processing



ADAPT.Wind Software

Trending and diagnostic analysis

ADAPT.Wind customers have reported annual savings of \$1000-\$3000 per turbine for new units.

Why ADAPT.Wind Software?

Understand How Your Unit Operates from Day 1

Reliable continuous condition monitoring for the gearbox, generator, main bearing, and tower sway enables you to understand issues weeks, or even months in advance.

Domain Knowledge

We've embedded more than 50 years of Bently Nevada condition monitoring expertise into this solution, gained from having more than two million permanently installed transducers and monitoring channels—the largest installed base in the world. And the ADAPT.Wind software incorporates the intelligence of System 1* software, Bently Nevada's industry-leading optimization and diagnostic software platform. By transforming data into knowledge, owners and operators alike can make informed decisions with confidence.

Network-Friendly and Scalable

The powerful up-tower processor contains all configurations and algorithms with inputs from accelerometers on the main bearing, gearbox, and generator; and from the integrated turbine control system. The ADAPT.Wind software can also be integrated with SCADA systems while minimizing congestion on the SCADA network.

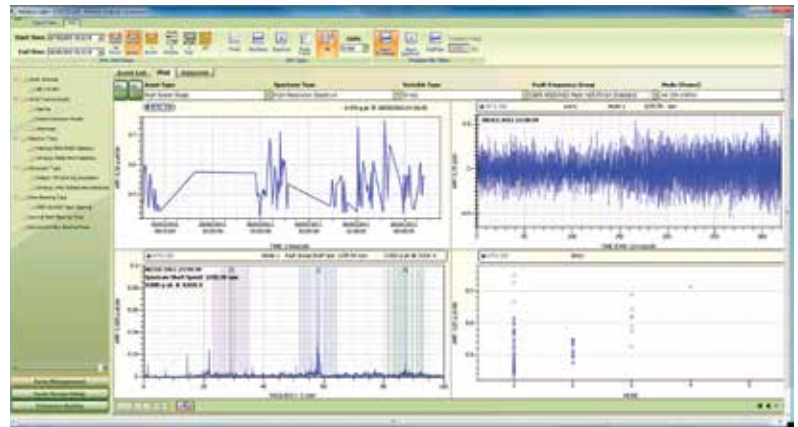
This solution is equally applicable for one or many wind farms. An entire wind farm can be monitored locally from the wind farm office. You can also remotely monitor a wind farm or the entire fleet from a central location. Centralized management enables increased productivity.

Advanced Technology that Solves Gearbox Complexities

Our patented **Planetary Cumulative Impulse Detection** algorithm is a set of measurements that detect and trend the passage of debris particles through the planetary stage of a wind turbine gearbox. This provides greater insight into gearbox condition and helps pinpoint problem areas. The **Dynamic Energy Index (DEI)** algorithm is specifically designed for variable speed machines. DEI spreads the variation over five bands of operation for more accurate spectral energy calculations and earlier fault detection.

Powerful Diagnostics and Intuitive Displays

Comprehensive alarm, diagnostic, analytic and reporting capabilities provide a clear picture of turbine health and facilitate maintenance with actionable recommendations. 150 static variables are monitored and trended for each wind turbine generator, and high resolution waveform data are collected for the general, bearing and gear measurements. Familiar navigation and filtering make it easy to access precisely the information you're looking for.



Service and Expertise...Delivered

To ensure your continued success, Bently Nevada offers custom service solutions from 24/7 remote monitoring to on-demand technical support. We'll work with you to craft a solution that delivers precisely the level of support you need.

Engineered by wind turbine and condition monitoring experts and backed by trusted services, the ADAPT.Wind solution is a smart investment that pays dividends across your fleet.

Turbine Support

As part of the Bently Nevada team's effort to make life easier for wind farm operators, **ADAPT.Wind can now be deployed on any kind of wind turbine, regardless of the manufacturer.**

ADAPT.Wind Configuration

Configuring turbines with the ADAPT.Wind software couldn't be easier. Bently Nevada's configuration technology leverages a growing database of turbine information, and the system is adding more turbines every day. With this database, configuration is completed in three easy steps:

1. Select your turbine type (make/model)
2. Select drivetrain components, such as main bearing, gearbox, or generator (make/model)
3. Send the configuration to the 3701/60A monitor

That's it!

With our most recent release, we've also given you the flexibility of placing a speed sensor wherever it is most convenient for you. If you have a once-per-turn sensor in the high speed shaft, just tell the software "1 event per revolution" and "high speed shaft." If you want to tap off a 2048-pulse-per-revolution encoder on the low speed shaft, no problem! Just configure that as well. We can even handle speed sensors on intermediate stage shafts within the gearbox.

At Bently Nevada, we understand your turbines, and we understand that you may have hundreds of turbines to operate and an endless list of other tasks to complete on a daily basis. Vibration is the foundation of what we do. Let us handle all the legwork to get your CMS system up and running with the best diagnostics available on the market.

Integrated Oil Particle Sensor

The ADAPT.Wind software offers the most advanced and powerful vibration diagnostics available on the market today. Additionally, there are other complimentary technologies available to help monitor your turbine. Notably, oil particle detectors can provide a confirmation of suspected damage detected by the ADAPT.Wind vibration system.

To provide a single, simple interface to all of your condition monitoring data, whether it is vibration or oil particle, the ADAPT.Wind system now provides support for direct integration of the leading oil particle sensors.

You can directly connect either a GasTOPS MetalSCAN sensor or a Macom to the 60M100 wind condition monitor. There is no longer a need to have an additional monitoring system associated with these sensors. Simply connect the pulse output from these sensors to the 60M100, configure the system to include the sensor, and you will instantly see trending data for particle counts and rates in the ADAPT.Wind software interface. The system will automatically fire alarms if those particle counts or rates exceed the preconfigured (and user-configurable) thresholds.

For more information about Bently Nevada Asset Condition Monitoring solutions for wind turbines, contact your local GE sales professional or visit us online at

www.gemeasurement.com
www.60M100.com

GE Measurement & Control
1631 Bently Parkway South
Minden, Nevada 89423 USA
+1 775.782.3611

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