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The Magazine

Remote Diagnostics

Remote diagnostics informs wind turbine O&M

Who wants to be able to predict the future? In a competitive business, accurate foresight is a key advantage. Siemens diagnostics specialists rely not on crystal balls, but on highly advanced data analysis to recommend and perform both remote and on-site wind service and maintenance operations.

Big data analysis is a boom business in many industries. However, the trend of locating wind farms in extreme environments like deserts or offshore specifically highlights the role of diagnostics in the wind power business, where predictive maintenance reduces operations and maintenance costs.

At the Siemens Remote Diagnostic Center for wind turbines in Brande, Denmark, diagnostic experts monitor a global fleet of about 10,000 installed turbines (both on- and offshore) around the clock, watching for signals of erratic turbine behavior. The diagnostics performed in Brande helps Siemens with predictive, responsive, and interactive service solutions. Based on historical as well as operational data, Siemens experts can tailor O&M for maximum efficiency and maximum customer benefit.

Remote detection of irregularities at the Siemens center can save costs and enhance productivity.

Reactive: The quick fix

A reactive intervention means returning the turbine to action as quickly as possible. "Faults that require immediate reaction are like a flat tire," says Merete Hoe, the head of the Remote Diagnostic Center. "You can't continue down the highway. But in 85 percent of cases where the turbine has stopped by itself, we can restart it remotely and get it temporarily up and running again."

At the same time, the diagnostics experts advise customers on how to fix the problem permanently – replace the "spare tire", as it were – the next time they do go out to the turbine. "As a result, customers achieve lower operation and maintenance costs, longer productive periods, and a greater ability to plan service," adds Hoe.

Proactive: Picking up good vibrations – and bad

One of multiple proactive aspects is vibration diagnostics, where each turbine's unique "vibration fingerprint" is compared with its actual vibration patterns to detect irregularities that can indicate the potential for fast- or slow-developing damage. More than 34,000 data analyses are currently performed each year that can predict more than 98 percent of all gear-tooth cracks as well as damage to the gearbox, generator, or main bearings.

The RDS also monitors configurations closely: For each turbine, around 3,000 parameters can be adapted individually with control software that optimizes operations for the conditions affecting the turbine in question. The experts can immediately tell if, for whatever reason, the parameter settings are negatively affecting the performance of the turbine. A "digital twin" for each turbine displays what it should look like, given the best available information, at any moment. Any major divergence from that model sets off an immediate response, with notifications to both the customer and the site crew.

Interactive: Talking to the customer

Merete Hoe, Head of the Siemens Remote Diagnostic Center in Brande, Denmark, is responsible for more than 150 diagnostics specialists globally.

The third aspect of Merete Hoe's work is interaction: "We have a really strong support structure. If our customers have technical questions, we put them in touch with a diagnostic supporter – either in the country, in the region, or in our headquarters." Siemens strives to support all customer staff, including those who will have to go out to a turbine for servicing, and to prepare them with the best possible diagnostic advice.

"Here, our work is not just about data. We need to talk to those people," says Hoe. "For us, our diagnosis sometimes seems self-explanatory, which isn't always the case; there is always this human factor, and it's important for us to remember we are sending real people out to a site and that they should be able to reach us when they have a need."

Competitive advantage

This ability to make predictions dynamically about developments and requirements in various locations around the world, based on component knowledge, is currently being developed for multiple sectors, both internally within Siemens and for customers, enhancing service efficiency while also delivering a competitive edge versus market players that do not have such accurate predictive powers.

But wind turbines are a special case, says Hoe, because of the vast differences in operational environments (and thus, in the diagnostic models) between, say, a turbine situated in the hot plains of Texas and an offshore turbine standing in the North Sea off Norway. "There are 400 sensors in each turbine. We need cutting-edge diagnostic models based on highly advanced neural network calculations, linear regressions, and all the data about these environments to ensure the turbines can run whenever possible in as extreme conditions as possible," she explains.

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Merete Hoe, Head of the Siemens Remote Diagnostic Center

This know-how has grown to become a tremendous asset for Siemens over the years. The experience gathered from two million diagnostic cases handled by Siemens over the last 15 years constitutes a knowledge base of real-time information about how each incident emerged and was predicted, prevented, or handled, says Hoe: "If it's not the biggest, it's certainly one of the biggest knowledge repositories in the entire wind-power industry. The models we develop are crucial for our own analytical work, but they also enable the designers of Siemens turbines to learn more about the conditions in which their products must perform, which is a huge advantage."

Christopher Findlay, Journalist in Zurich
Picture credits: Siemens

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