

# Using Technology to Monitor and Maintain Wind Turbines

September 17, 2013

By [Justin Martino](#)

Tulsa, OK -- The use of technology in power plants to automatically monitor systems has become industry standard, which isn't a surprise in an industry working to cut the cost of every kilowatt-hour. Although wind power isn't unique in the use of technology, the value of that technology may be more central to efficiently operating a wind power project.



"In the old days, at a big power plant, you had your boiler operators and your fire tenders and the people who actually walked around the plant and manually recorded temperatures and pressures and checked on things on an hourly basis and wrote that information down on the logbooks," Greg Shelton, service director for Alstom Wind North America said. "The evolution of the industry has been through technology – if we use 25 people to walk around and do this manually, can we use 10 people and do it with technology?"

While a natural gas-fired combined cycle power plant may benefit from the use of automated monitoring to increase efficiency, the same sort of system becomes essential at wind power project that may cover thousands of acres of land.

"It was realized very soon that if we put a utility-scale wind power plant that's comprised of 200 turbines spread out over 4,000 acres of land, we're going to need some sort of technology that can monitor absolutely every aspect of operation of the turbine remotely, just because the economics of having that many people climb 400 feet off the ground to do this kind of stuff would never work," Shelton said.

Every original equipment manufacturer offers some sort of supervisory control and data acquisition (SCADA) system with its turbine. The job of the SCADA is to continuously monitor the temperatures and production of a wind turbine and discover potential problems before they become large failures.

Unlike a fossil fuel-fired power plant, wind power projects do not typically have an on-site staff on a 24-hour-a-day, seven-day-a-week basis. For wind power projects, the first line of defense may be on the site or hundreds of miles away.

"Certain times, if you're troubleshooting issues or if there's a fault on the turbine, you can stop it, you can reset the faults, look at the statuses and start the turbine back up, or attempt to," Shelton said. "Sometimes instead of sending people out to the turbine, our initial response can be through the control system remotely. The nice thing about these systems is you can do it from an office in Richmond or from the operations building on site, because the access is web-based."

Although a SCADA system is used to monitor systems in real time, the operation of the system can be much more sophisticated. Shelton said the WindAccess system also includes historical data and historical data reporting capabilities. That would allow someone monitoring the system to not only see the current temperature of a bearing, but also check to see what the bearing temperature has been over the past day or even month.

Allowing the operator to see the performance of a part being monitored over a longer period of time allows the company to prioritize when maintenance is done on a particular turbine in order to avoid an alarm state that could shut the turbine down, Shelton said.

WindAccess monitors more than 100 different data points, according to Shelton, and additional modules can be added in order to provide an even more detailed analysis. Those modules could allow for more condition monitoring that would record vibration and other similar factors. Although extra modules might come at a higher cost, Shelton said they allow the operator to potentially avoid more problems.

"I think it boils down to being as proactive as possible," he said. "To go to the next step would require more comprehensive data through vibration analysis and accelerometers, and the real driver for that is to reduce the cost of energy. If you can predict or have a better understanding of downtime events, then you can schedule a corrective action when the wind isn't blowing and have the turbines be available 100 percent during the times its possible to generate electricity."

A Siemens wind power site uses the WebWPS SCADA system, which provides a web-based interface with a variety of status views of electrical and mechanical data, operation

and fault status, and weather and grid data, said Merete Hoe, head of Siemens Energy's Wind Service Diagnostics Center. In addition, the company offers a variety of Remote Diagnostic Services that allows the customer a higher element of risk control and the freedom to choose.

"For a customer, it is absolutely crucial to get diagnostic advice as early as possible and to have diagnostic experts to respond to technical questions," Hoe said. "Detecting an error before it becomes serious is both a science and an art. With our data mining diagnostics, we can find even the smallest indicator that something may not be operating normally."

As part of the company's RDS services, it also utilizes 24/7 Remote Monitoring Centers. Hoe said in 80 percent of all alarm cases registered in the centers, the technical support team is able to resolve the issue remotely without the need for a visit to the site. The average response time to an alarm is 10 minutes, with 99 percent receiving a response within an hour.

Siemens' Premium RDS package includes vibration diagnostics, which offer early detection of irregularities before they can potentially turn into breakdowns. The diagnostic also carries out precise online vibration measurement on main components, Hoe said.

Hoe expects prognostic services to be a major focus in the future development of remote services for wind power projects.

"Prognostic services advise precisely what a customer could do at a recommended time," she said. "Like in the airplane and car industry, effective data mining and a huge knowledge base will give the best diagnostic and prognostic advices. A wind power site in the future will use remote data mining to make dynamic and automatic service planning. "

Although the use of technology to monitor equipment may be an industry standard, solutions to use technology to avoid sending people into the tower if possible is also developing. Helical Robotics is one company working with wind project operators to use technology to lower costs and increase safety at sites by using robots to perform tasks that would otherwise require sending a person up the tower.

Helical Robotics President and CEO Bruce Schlee said the company builds mobile platforms and works with other companies to design end solutions that suit a customer's needs.

"Our business model is to partner with people from the industry to cocreate solutions as opposed to offer a turnkey solution for the industry," he said.

Currently, the company offers three platforms "off the shelf" with carrying capacities of five

pounds, 20 pounds and 100 pounds. The platforms can be developed to perform a variety of tasks, including monitoring the conditions of the blades with video, allowing a picture to be taken from 30 feet away as opposed to 600 feet away without climbing the tower, or to place sensors used for testing.

A mobile platform with a five-pound capacity sells for \$10,000. While Schlee said that might sound expensive, it could save thousands of dollars in the long run when performing tasks such as sensor deployment.

"It's \$2,500 a day to bring a lift truck out there, whereas our robot allows you to go out there, drive it up, turn it off, leave it there for a week, and when you have to move it, you go move it," he said. "So that machine would pay for itself in five days opposed to renting a lift truck."

Schlee said he is also talking with some companies about the possibility of building bigger mobile platforms that could use robotic arms to perform service on the blades.

"You might be talking about a \$200,000 robot, but you're talking about \$250,000 just to mobilize the crane, then you have to send it from tower to tower," he said. "If the scale is right and you can use one of our platforms and not have to mobilize a crane, the platform pays for itself in a day."

One of the company's mobile platforms can climb a tower in around three minutes, Schlee said.

As wind power becomes more common for power generation, it can be expected the technology used to service it will become more sophisticated. In an industry where every dollar is important, utilizing the proper technology can make a major difference for a wind project operator.

[Read more wind energy news here.](#)

