Wind power

A bright forecast for icy blades

Germany gets more of its renewable energy from wind power than any other source. Both onshore and off, wind farms have faced immense pressure to innovate. Systems need to be designed and built to withstand dynamic loads and severe weather year after year without failure. Particularly in the winter months, ice accumulation on the blades has been a notorious source of unscheduled downtime. Accepting the challenge, LEINE LINDE SYSTEMS just needed to find the right partner to implement its plans: B&R.

Source: iStock

A fierce, cold wind sweeps in from the northwest carrying a payload of valuable, renewable energy. Yet, the wind turbines stand motionless, their rotor blades encrusted with a layer of ice. The tendency of ice to accumulate on turbine blades depends on the atmospheric conditions. In-cloud icing can occur at temperatures of –10 °C to 5 °C. Add to that high humidity, fog or rain, and more substantial accumulation is not uncommon. If the iced-up blades were to keep rotating, chunks that break off could be flung hundreds of meters, endangering anyone who happens to be in the area.

Clean energy in any weather

LEINE LINDE SYSTEMS knows how this can be prevented. Founded in 2012, the Hamburg-based subsidiary of Swedish LEINE & LINDE AB has established itself as an expert consultant for applications throughout the wind power industry. In addition to the products of its parent group – including encoders, slip rings, sensors and motors – the company also offers systems engineering and project

Ralf Düllmann
CTO, LEINE LINDE SYSTEMS

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management services for wind power applications. The most significant wind power markets are currently found in Europe, China and South America.

To develop its new IPMS ice prevention system, LEINE LINDE SYSTEMS needed to find a supplier for a compact control solution. Feedback from elsewhere in the parent group reported very positive experiences with B&R, and B&R controllers already offered interfaces for the group's EnDat sensors, so the decision was quickly made.

During development of the IPMS, LEINE LINDE SYSTEMS worked together closely with the team at B&R's Hannover location, from the preparation of the functional and design specifications to the selection of the ideal B&R X20 controller and I/O modules. "Our partnership with B&R has been built with long-term sustainability in mind. We had a clearly defined goal of avoiding the use of multiple systems – instead relying on a go-to partner for the entire solution. B&R has been a perfect fit since the very beginning," says Ralf Düllmann, CTO of LEINE LINDE SYSTEMS.

When the conditions are right

The IPMS system is designed to detect and prevent the accumulation of ice on wind turbine rotor blades. The problems with ice range from unevenly distributed weight that brings the turbine out of balance to the safety hazard known as "ice throw" when blades shed their ice mid-rotation. To counter these effects, the IPMS system monitors a specific set of meteorological parameters and alerts operating personnel if the conditions pose a risk of ice accumulation. A network camera installed in the system allows operators to view the situation remotely using a smartphone or PC and either shut the turbine down immediately or have an automatic shutdown triggered by defined alarm levels.

The key advantage of the IPMS system is that it provides early detection of ice-causing conditions. Shutting turbines down before ice accumulates helps minimize lost yield because it is no longer necessary to wait for the ice to melt before resuming operation. It also opens up options for reacting to different situations, such as stopping rotation to avoid collecting additional moisture or switching on a blade heating system in advance.

"In most cases, regulations or operating licenses require a visual inspection to confirm that the blades are free of ice before the turbine can resume operation. This is typically handled by an employee on site, but with IPMS the verification can be performed remotely. That saves time and money," explains Matthias Finke, senior product manager at LEINE LINDE SYSTEMS.

Trends in wind power

The industry trend is towards taller turbines with longer blades. As wide open spaces grow scarce, turbines are increasingly being placed in weak-wind areas, ports, industrial zones and woodlands – where safety plays an even more prominent role.

Rather than simply building a scaled-up version of an existing installation, new turbines are being completely redesigned with more extensive sensor technology and more efficient use of construction materials to maximize both availability and safety.

In 2015, Germany generated more electricity from wind power than nuclear power for the first time in history. By 2025, the country aims to further increase the share of electricity generated from renewable sources to at least 40%. In the long term, offshore wind farms alone are expected to supply the grid with around 15,000 megawatts. Today, wind power accounts for more than 9% of the electricity produced in Germany. ←