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Answers for industry.

Siemens Wind Power
relies on proven industrial automation
technology for its Wind Turbines

For its wind turbines, Siemens Wind Power relies on proven industrial automation technology

For anyone who wants to build wind turbines quickly and economically, the application of standard products and the development of modular systems is the way to go.

In its newest generation of wind turbines, Siemens Wind Power integrates the company's proven automation technology. This increases the construction quality as well as the availability of wind power facilities.

Wind turbines have been constructed for more than 30 years in the Danish city of Brande. In 2004, Siemens acquired Bonus Energy A/S and has increased the number of employees six-fold. Today the company delivers more than 1,000 turbines per year.

In addition, the company developed a joint platform strategy that enables many Joint system components to be used in different turbine configurations – similar to what is done in the automobile industry. By using platforms and an increased number of standard components, new turbine designs can be realized faster and more cost effectively.

“Our directly driven turbines are good examples,” says Morten Pilgaard Rasmussen, head of Research & Development at Siemens Wind Power.

“The developers’ goal was to decrease the number of components by 50 percent, while also reducing interfaces and complexity,” says Rasmussen. He points out that they also focused on integrating standard products and on lowering maintenance costs by making the machine design simpler, lighter, and more compact. Especially in the offshore area, where there is limited accessibility to the turbines, robustness and safety were also important considerations in the design. It goes without saying that all components must demonstrate the highest level of availability and safety even under harsh environmental conditions. A cornerstone in satisfying this requirement is the continuous monitoring of the turbine and the electrical system itself, which is accomplished using proven industrial automation technology from Siemens.

Standard products and increased availability

Michael Bjerre Laursen, head of the SICS (Siemens Integrated Control System) project at Siemens Wind Power, and his team developed a new control system for the turbines, based on industry-standard components.

For the evaluation of the basic technology for the SICS system, Siemens Wind Power studied the technologies and solutions already on the market. During this analysis, it came to light that Profinet as bus system, in connection with ET200S IO stations, had the best technical performance. “It was a very important decision for us to go with Profinet for the wind business,” says Laursen. “It was the first time we had used the open, industrial field bus. This provides us with a platform that meets our requirements fully and gives us access to a wide range of tested and certified standard components. With the introduction of Profinet, we also satisfied other key requirements with respect to product lifecycle and product availability.

We expect Profinet technology and components to be available for many years to come,” says Laursen.

“We wanted to reduce the number of proprietary solutions and components that we had previously. Even if it is still necessary to supplement these with customized design for special areas of application, our vision was to implement as many standard industrial products and solutions as possible. After all, proprietary solutions require additional effort. Variants must be developed and the solutions must be integrated with other systems or interfaces. For our customers and for us, the real value is in developing features that enhance the operation of our turbines. Thanks to our new SICS system platform, implemented by including a variety of components and technologies from Siemens Industrial Automation, we can now shift our development effort more toward development of our application,” explains Laursen.

Profinet, the worldwide standardized and manufacturer-independent network for automation, ensures the highest data consistency – from the field level up to the master level. The bus system can transfer standard and fail-safe signals on the same bus connection, which enables it to record and transfer all relevant quality and performance parameters of a wind energy plant. Higher availability through redundant networks, integrated standard security functions, and simple connection of other fieldbuses and third-party systems ensures the necessary investment protection.

For the industrial PC, the turbine manufacturer needed a computer that could operate under all conditions and also work together with Profinet. The Simatic Microbox PC427 was chosen for turbine control. A real-time-capable operating system runs in this embedded system as the turbine controller. Standard products in the intelligent ET200S terminals are deployed for the periphery, in combination with customized Profinet devices for special areas of the application.



Figure 1: Perfect interplay - the IPC Simatic 427 and 627 using PROFINET to communicate with Simatic ET 200 S within a wind turbine of Siemens Wind Power

Flexibility through a platform concept

“Using our SICS platform as the basis, we can create variants of the electrical system to be deployed throughout our entire turbine portfolio. The system has already been developed, tested, and certified in our 3MW direct drive machine, and can be tailored to and installed in

other turbines as well, for example our 6MW machine. This enables us to achieve synergies between projects,” says Laursen.

This solution offers many advantages. Industrial production can be started up relatively quickly to serve the expanding markets. Sensors, actuators, and subsystems can be directly connected to the turbine control system – without significant effort – either via Profinet or via a distributed I/O system with the ET200S series from the same supplier. The interface to pitch and converter control is implemented via Profinet, and the system remains open to integrate other system features as well – for example, the condition monitoring system or additional measurement systems to analyze the performance of the turbine.



Figure 2: Siemens Wind Turbines with direct drive and Profinet Technology

“We have a service center here in Brande from which we can monitor the entire installed fleet of turbines,” explains Laursen. “In case of a failure, we can log into the turbine remotely and perform exactly the same tasks as if we were operating the turbine locally. Profinet enables us to get more detailed information about the condition of the electrical system for service and maintenance.”

Positive feedback from the market

“With the SICS platform, we have a holistic solution that has received positive feedback from our key customers,” says Morten Pilgaard Rasmussen. “Our customers give high marks to our move toward standard components. These components have functioned reliably over a long period of time, and they guarantee a high degree of safety and availability. I believe the positive feedback is a result of our ability to combine a broad range of standard components and the fact that the competency for the entire turbine installation and system design is now in our own hands.”

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