



**»» Bachmann system solutions
provide the basis
for future developments
in wind turbines. ««**

Dipl.-Ing. Thomas Schuckart
Process Engineer at W2E

MORE INNOVATIVE SPIRIT, MORE AVAILABILITY

Development partnership on an equal footing with W2E

W2E Wind to Energy develops complete multi-megawatt wind energy turbines for the onshore sector. The technology installed makes these systems stand out on account of their long service life, high technical availability and maximum yields. The control system is a key part of the turbine. W2E relies here on the system solutions of Bachmann electronic, enabling them to meet all the requirements set by the grid codes.



Founded by a team of seven in 2003, W2E Wind to Energy GmbH is a company that develops wind turbines in the multi-megawatt class. This also includes the certification and the operation of prototypes. W2E now has around 30 employees at its site in Rostock, North Germany. The company serves customers both in Asia and in Europe: These include companies such as Fuhrlander, AVIC Huide Wind power Engineering, EVIAG, A-Power, NuPower.

From concept development to the design of the machine elements, dynamic simulations and analyses, load calculations, FEM calculations, grid behavior analyses, operational management and closed-loop control, right through to the layout and specification of electrical and safety-related systems, all these are part W2E's range of services. New developments are always carried out in collaboration with a partner.

The development results are sold in the form of licenses as documentation. This documentation also enables licensees outside of the sector that do not have their own development department to produce, erect, commission and maintain a wind turbine. "We sell a kind of modular system," Thomas Schuckart describes the business model. He is one of the founders of the company and is responsible for the process engineering at W2E.

AN IMPRESSIVE CONCEPT

W2E supports the licensee with the market launch, quality assurance, the service concept, measuring, tests during the beta series as well as with series launch. "As all components and their manufacturers are listed in the documentation, supplier relationships are virtually provided at the same time," Anke

Hinske, information manager at W2E, explains. The Rostock company is thus offering an effective concept for launching new wind technologies on the market.

After the development of the 1.3 MW and the 2.5 MW turbines, which are suitable for series production, the Rostock team started on the development of a 2.0 MW turbine in 2008. The wind turbine manufacturer Fuhrlander joined them as partners. The new project also required the integration of a new controller. The engineers tested several manufacturers, including Bachmann electronic. These were required to provide a test program with several functions. "The devil is often in the detail, and this is where several manufacturers failed," Schuckart recalls. "We wanted to see their level of openness." Unlike other manufacturers, Bachmann developed the solution in collaboration with W2E and therefore passed the test with flying colors. "We were greatly impressed by both the openness of the Bachmann employees and that of their systems," Hinske added.

OPPORTUNITY FOR FURTHER DEVELOPMENT

"We decided to choose our new controller supplier because they enabled us to increase the

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- ▶ With a tower height of 160 meters and a rotor diameter of 120 meters, the highest wind turbine in the world was the first in-house development from W2E. Like all other turbines, it was also a license project that in this case arose in collaboration with the manufacturer Fuhrländer. It was erected in Laasow, around 100 kilometers south east of Berlin in 2006.

level of automation, not only because of the technology provided, but also because of the speed and special way in which our customer requirements were addressed," Schuckart explained their choice of Bachmann after the test. We saw here a chance for both parties to pursue further development and to push forward new innovations. "We enjoy a very high level of collaboration that is based on an equal footing and is more of a partnership," the developer confirms.

"With the system solutions such as the controller, GMP, Safety, CMS etc. Bachmann is providing the basis for our future developments in wind turbines. We add to this our know-how and are supported in the process by Bachmann," the engineer describes the basic ideas behind the collaboration. "The solutions fit our ideas and we value the innovative spirit." Whatever W2E needs, we develop jointly with Bachmann. The 2.0 MW turbine with a new yaw and control system is thus based on the Bachmann M1 controller.

IN-HOUSE TECHNOLOGIES

W2E systems have a patented drive train concept that shapes design and integration – the so-called Larus Compact®. "The forces of the rotor are directed into the tower structure before being transferred to the drive train," Hinske explains the principle. "This considerably reduces costs for maintenance and repair. The high availability and long service life of the components are ensured."

The plug & play concept as a central development criterion also leads to a reduced wiring requirement. This results in the use of pluggable electrical terminals in the entire installation. Personnel have access to all subsystems of the drive train structure so that only the relevant parts have to be moved for maintenance or replacement. The slip ring is also pluggable and the filters can likewise be accessed and exchanged simply.

The pitch system of a wind turbine is of central importance. It determines the loads on the entire installation and the safety in the event of overspeed. For this W2E developed the Larus Smart® that enables operating loads to be reduced by 20 to 25 percent and thus also the effect of extreme loads. This also functions according to the modular system, since it offers the three-fold independence of the individual pitch axes. "As good as redundancy and more than only one brake," Hinske adds. This enables the smooth movement of the pitches.

SAFETY IN A NEW FORM

The experts from Rostock are also implementing in the wind sector the safety technology that has already been tried and tested in industry. With their Larus Safe® safety system, based on the Bachmann safety solution, a matrix system is used instead of a safety chain. Larus Safe® responds selectively to triggering devices and signals such as emergency stop, vibration switches, limit value relays or similar components. By means of an event-oriented, differentiated release of the actuators, forces and torques

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are reduced as extreme loads. This therefore results in considerably less wear, for example on brakes or in the gearbox. Components are therefore ensured a longer life expectancy.

CERTIFIED AND A MATCH FOR ALL REQUIREMENTS

Bachmann's programmable safety technology enables all the regulations and prescribed functions, such as the Machinery Directive 2006/42/EC or the GL Guideline, to be implemented without any additional effort, thus simplifying series production. The safety modules, together with the necessary programming tools and function blocks, have all been certified by the TÜV Süd certification body in accordance with the relevant standards including ISO 13849 and EN 954. The UL508 safety approval also enables the system to be used in North America.

The actual development of the 2.0 MW wind turbine is complete, and it is now in the prototype and beta series phase. Two systems have already been erected and started in China and Germany. There are specific plans for at least 50 systems in China, India, USA and Brazil this year. The 2.0 MW turbine is designed for wind classes IEC 2a and 3a, has all the necessary and currently applicable certification, and meets the requirements set by the grid codes.

The GMP232 grid measurement and protection module from Bachmann has been instrumental in the meeting of grid code requirements. It links the value measuring with the grid monitoring and the grid management tasks. "The GMP helps to make the response of the turbine more transparent," Hinske says. With

the integrated Scope function, important grid variables can be displayed in high resolution. As a fully integrated module in the system, together with other plant parameters, the GMP provides differentiated decision criteria in order to also manage the increased requirements placed on the individual plant during a grid fault. In this way, the stable operation of the distribution grid is guaranteed. By using the GMP, W2E also meets the requirements for receiving the SDL bonus in accordance with the SDLWind Ordinance.

SHORTER DEVELOPMENT THANKS TO THE WIND TOOL BOX

W2E also uses the Wind Tool Box from Bachmann – the so-called Wind Turbine Essentials (WTE). This is a software package tailored to the needs of wind turbine manufacturers. It helps to considerably reduce the time required for developing and commissioning the controller software and the visualization. The WTE package covers many standard tasks required for the automation of wind turbines. This means that recurring functions no longer have to be implemented in the operational management program, but can be prepared in a configuration tool in the SolutionCenter, executed on the controller CPU and monitored and operated in a visualization.

FASTER OPTIMIZATION

This type of 2.0 MW turbine has been in place in Tarnow, around 50 kilometers south of Rostock, since November 2011. It was erected by Fuhrländer and is operated by W2E themselves. This enables the design engineers to see things from the point of view of the plant operator. "This is where we test and optimize our own development," Schuckart explains the activities of the company, "With Rostock close by we are able to carry out additional measurements in real time." The optimization of the automation is carried out on site together with Bachmann. "If outside faults occur, we have to respond quickly. This is only possible with the kind of point-to-point connection that exists between our technicians and those at Bachmann," the process engineer says.

With a nominal output of 3MW, a very large 120m rotor and a hybrid tower 140m in height, W2E is currently developing another turbine technology. The developers have been working on this project since the middle of last year, and the erection of the prototype is already in the approval phase. A special feature of the 3MW

turbine is the extension of the compact drive train with a new gear generator concept, the compact hybrid drive produced by Winergy. The area of condition monitoring is given greater importance in this turbine. The control system for this project is once again from Bachmann. "The support routes are short and direct so that Bachmann can keep an eye on the entire automation process," Schuckart explains the further collaboration. ■



2.0 MW turbine

Nominal power	2.0 MW
Rotor diameter	93 or 100 m
Wind class	IEC 2a or 3a
Cut-in wind speed	3 m/s
Nominal wind speed	12 m/s
Cut-out wind speed	25 m/s
Full load hours	3,701 h, 42% and 3,975 h, 45%
Hub height (tube tower)	85 and 100 m

Wind turbine The 2.0 MW wind turbine in Tarnow, Germany, 50 kilometers south of Rostock, was not only developed by W2E, but is also operated by the company itself. It was manufactured by Fuhrländer.

Drive train The patented Larus Compact® drive train concept directs forces from the rotor into the tower structure before being transferred to the drive train. This reduces the stress on components.

Pitch system The W2E pitch system, the Larus Smart®, reduces the operating loads of a wind turbine by 20 to 25 percent.

Safety modules The in-house safety system from W2E – Larus Safe® – is based on the Bachmann Safety solution.

People on the wind turbine Dipl.-Ing. Thomas Schuckart, Process Engineer at W2E, and Anke Hinske, Information Manager, on the nacelle of the W2E's own wind turbine in Tarnow.



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