ADVANCED CONCEPT – GREATER YIELD

New wind turbine generation of e.n.o. energy

▲ **Installation of an e.n.o. energy wind energy plant** in Saxony-Anhalt

e.n.o. energy

e.n.o. energy was founded in 1999 and has since then become an established player in the wind energy sector. The group of companies provides for the planning and erecting of turnkey wind farms, for sale or for proprietary operation, as well as their maintenance and operational management. At present the company has 80 employees in Germany, Sweden and France.

e.n.o. energy has been successful in the erection of wind turbines since 1999, and has been developing, producing and selling its own wind turbines for the German and international market since 2008. The company produces the e.n.o. 82 in series production in Rostock (Germany). The prototype of the e.n.o. 92 was erected in July 2010. The wind turbine generators of e.n.o energy stand out on account of their high quality equipment: The components of prestigious European suppliers are used exclusively. The M1 from Bachmann electronic is being used for the control system. As a completely new development, the e.n.o. 92 underwent a large number of conceptual changes compared to the 82 type series. As well as improvements made in terms of ease of mounting and maintenance, the increased grid connection quality as required by the market was of key importance. A considerable number of adaptions were also implemented in the overall electrical system: The e.n.o. 92 was provided with a full power inverter concept coupled with an electrically excited synchronous generator.

Compared to conventional systems, this concept enables the control to be adjusted flexibly even in difficult grid conditions. However, this increases requirements in terms of open and closed-loop technology at the same time, and so e.n.o. energy systems therefore developed a completely new control system for the e.n.o. 92 series. Besides the electrical hardware such as control cabinets and cabling, a new SCADA solution and grid management concept was developed: "The greatest challenge, however, was the fact that we had to write a completely new control software in addition to developing the control system," Stefan Bockholt, head of design at e.n.o. energy systems, explains.

> ***"Bachmann's excellent development environment provided us with considerable support in meeting the challenges we faced."***
>
> Stefan Bockholt
>
> Head of design
> e.n.o. energy systems

TRIED AND TRUSTED BACHMANN M1 CONTROLLER

The proven Bachmann M1 controller, which offers the performance required for the complex open-loop and closed-loop control tasks involved, was selected as the PLC system. "The robust hardware, the self-contained development environment for the software, the visualization already provided with the Wind Application Box, and the good customer support from Bachmann electronic directly on site were key factors in our decision," Stefan Bockholt explained. "We were also impressed by the excellent reputation of Bachmann in the wind sector," Stefan Bockholt adds.

DO-IT-YOURSELF YIELD MAXIMIZATION

The e.n.o. 92 is equipped with a host of algorithms for increasing efficiency and thus maximizing yield. This could be achieved thanks to the controller software developed in-house. Even complex control algorithms for the load optimized operation of the turbine were implemented. These primarily reduce the level of alternating loads on the mechanical system, thus increasing the reliability and service life of all components. The machine control unit is also provided with extensive closed-loop control systems for improving grid connection behavior. Thus all the open and closed-loop control functions stipulated by the System Service Ordinance (SDLWindV) have been implemented. In conjunction with the advanced generator inverter concept and likewise the newly developed e.n.o. gridmaster grid management system for wind farms, the e.n.o. 92 is well placed to secure the SDL bonus for projects in Germany.

DOUBLE USE FOR BACHMANN HARDWARE

The e.n.o. gridmaster grid management system is also based on Bachmann's proven M1 controller hardware and is normally used at the grid connection point. "In my opinion, Bachmann's excellent development environment with MPLS, the SolutionCenter and the Wind Application Box provided us with considerable support in meeting the challenges we faced," Stefan Bockholt explains another benefit of the Bachmann system. "The software libraries and the very good hardware documentation were also very helpful," the design manager added.

The grid management is used to control wind farms according to the requirements of the grid connection point. This system can also control the active and reactive power output of the individual turbines in the wind farm and can thus ensure the required participation of generation plants in the static voltage and frequency maintenance as required by the SDLWindV Ordinance. Although e.n.o. gridmaster is optimized for turbines of e.n.o. energy systems it is not restricted to these plants: The concept can also be used in so-called hybrid farms in which generator units of different manufacturers are operated.

HIGH PROVEN AVAILABILITY

Practical experience has shown that the requirements placed on the control system have been completely fulfilled. This was demonstrated by the short commissioning period and the smooth test run of the e.n.o. 92 prototype at the Kirch Mulsow site in Germany. The strategic decision to develop a proprietary controller concept was critical for this success. It enabled tests and adaptions to be carried out swiftly right through to the very reliable operation of the entire system. As a result, the prototype could already show a level of availability of over 93% in the first month. Now after over one year of operation and an achieved power supply of 6.5 million kilowatt hours, the turbine is reaching availability levels of between 98 and 99%.