

# Hirschmann Electronics constructs data network off Danish coast Offshore wind power plant goes online via Ethernet

Onshore wind power plants have been successfully interconnected using Ethernet for some years. Now that technology is also being deployed for data transfer at sea: the world's first power plant of its kind, with a total of 80 wind turbines, was commissioned into operation in mid December 2002 some 40 kilometers off the Danish North Sea coastal town of Esbjerg. The Ethernet data network was planned by Hirschmann Electronics of Neckartenzlingen, Germany, and constructed using the company's own components.



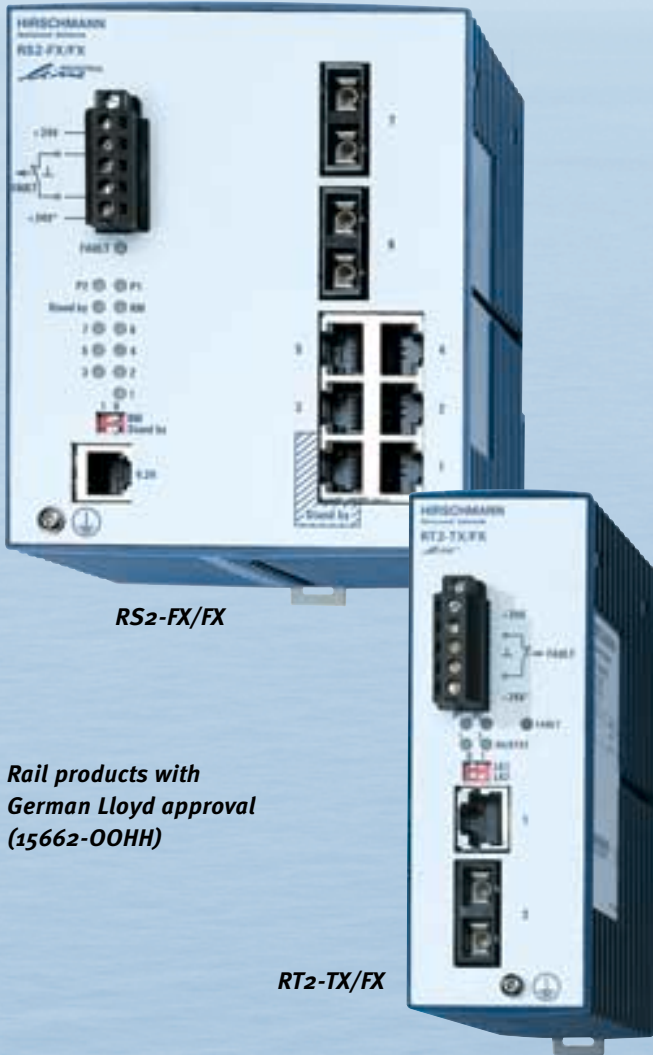
The wind turbines, each with a rotor diameter of 80 meters, are 110 meters tall. Each of the 450 tonne giants is supported on 25 to 40 meter long steel struts anchored deep in the sea bed. The wind power plant covers a total area of 20 square kilometers.

This major maritime project will in future enable the power company Elsam A/S, based in Fredericia, Denmark, to produce some 600 million kilowatt-hours of electricity per year. That is equivalent to a whole year's demand from 150,000 households, or in other words almost two percent of Denmark's total annual electricity consumption.

The turbines are completely autonomous units each equipped with an advanced computer system controlling and monitoring the operation of the wind turbines. The Ethernet data network links the turbines and the onshore SCADA system (Supervisory Control and Data Acquisition) together. Onshore, all relevant information is presented to the operators on computer screens and all data in the turbines and databases can be accessed by the technicians.

“To ensure plant-wide communications with no interfaces and costly data conversion from different systems, a single unified transfer protocol was required”, explains Senior Engineer Peter Christiansen from Tech-wise AS, a subsidiary of Elsam, responsible for the specification of the entire communication system of the wind power plant. That meant the only option was an Ethernet solution. “Today we can assert with confidence that we made the right choice. The data network has proved its worth in practical operation of the wind power plant right from its commissioning some six months ago”, Christiansen continues.

Some 60 kilometers of cable was laid on the sea bed. In order to reliably cover the long distances involved, as well as to guard against interference from electromagnetic fields (the power and data cables are housed in a single hybrid cable), mainly fiber-optic cables are used for communication. Copper cable is used only right at the end, to connect up the controllers and other terminal equipment in the gondolas.



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The data network is divided into 10 loops, each interconnecting eight wind turbines. A switch and transceiver from the Rail-Familie for each tower ensure smooth data flows. “This is the only equipment currently on the market which is marine approved by the Germanischer Lloyd specifically for use at sea. For example, it offers interference, vibration and shock protection well beyond industrial norms”, says Stefan Hafner, the Hirschmann project manager.

The 10 loops are connected via two “MACH 3000” series backbone switches mounted on a platform in the ocean. From there, two data lines link to the land-based control center, housing another two “MACH 3000” switches. The active main connection is executed as a single-mode fiber-optic cable with a transfer rate of 1 Gigabit per second. The redundant connection is a wireless radio link running at 34 Megabits per second. This means the essential functions of the wind farm can be maintained in the event of a failure of the main connection.

“After having installed Ethernet technology in naval, passenger and merchant ships and on oil rigs, the successful project off the Danish North Sea coast opens up another interesting field of maritime applications for Hirschmann”, comments Stefan Hafner. Similar projects are currently in planning off the coasts of the UK, Spain and Canada.

This article was produced in collaboration with Elsam A/S.

Photos: Elsam A/S

