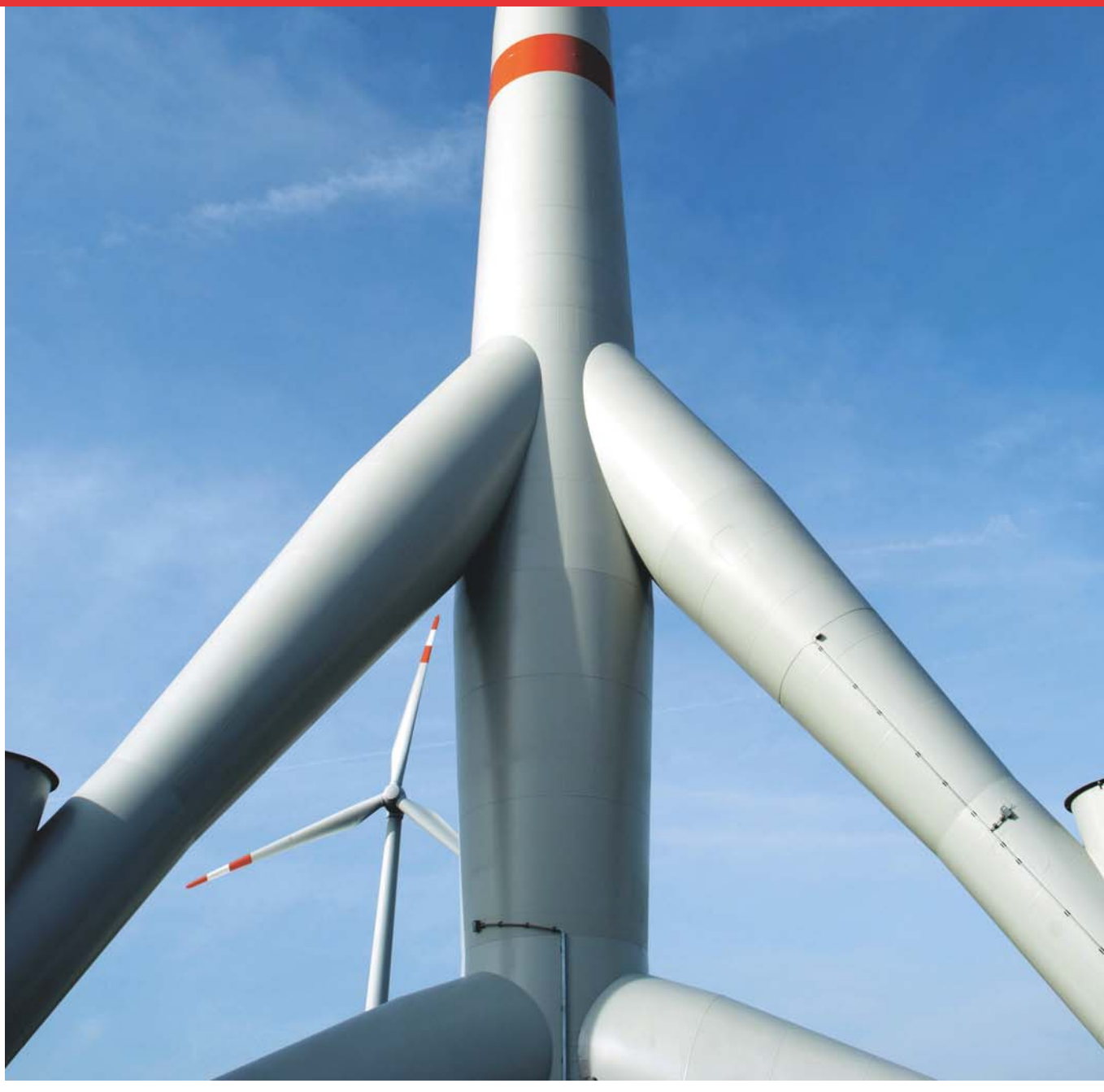
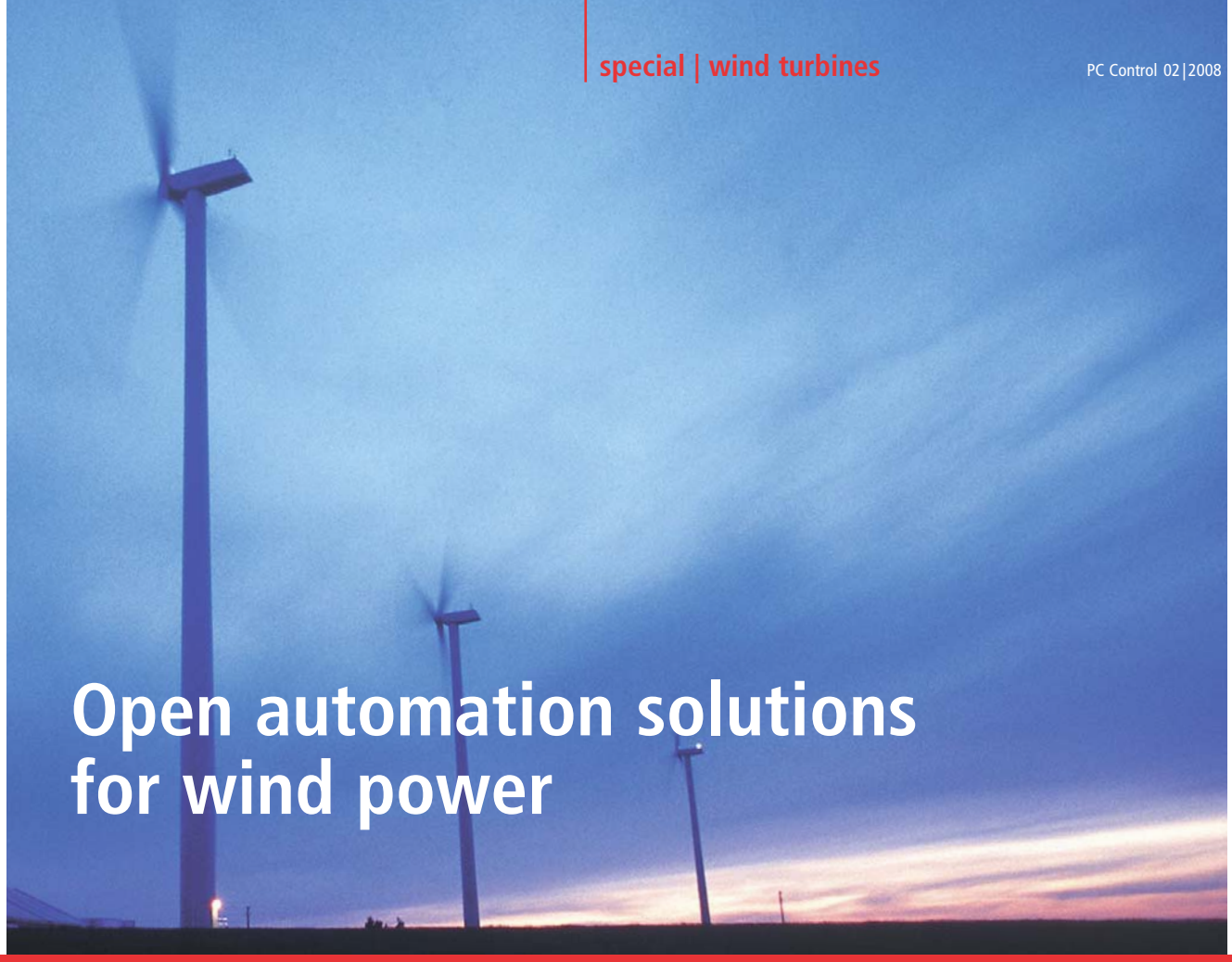
Special: PC Control for wind turbines





Open automation solutions for wind power

The use of renewable forms of energy such as wind power has become well established in the global energy supply. This was given vital impetus in particular by the global efforts to reduce emissions of CO_2.

In the course of this development, besides the European markets which were dominant until recently, new markets such as China and India or – once again – the USA, are pushing themselves to the fore at terrific speed and placing new demands on wind turbines and their automation. Representative of these demands are the requirements made by different conditions for feeding the grid and by greatly extended climatic operating conditions. Whereas up until a few years ago the use of wind turbines under Arctic or desert climatic conditions was an exception for research purposes, nowadays the fulfillment of these extreme conditions has almost been elevated to an industry standard. Manufacturers of wind turbines therefore face the task of retaining maximum flexibility in face of the continually changing demands of the market in order to keep their products competitive.

Beckhoff PC-based control technology and automation components are nowadays in use in wind turbines up to a size of 5 MW – including cold climate regions such as the North Cape and extreme climatic regions such as Inner Mongolia.

Continuity and flexibility using PC-based control

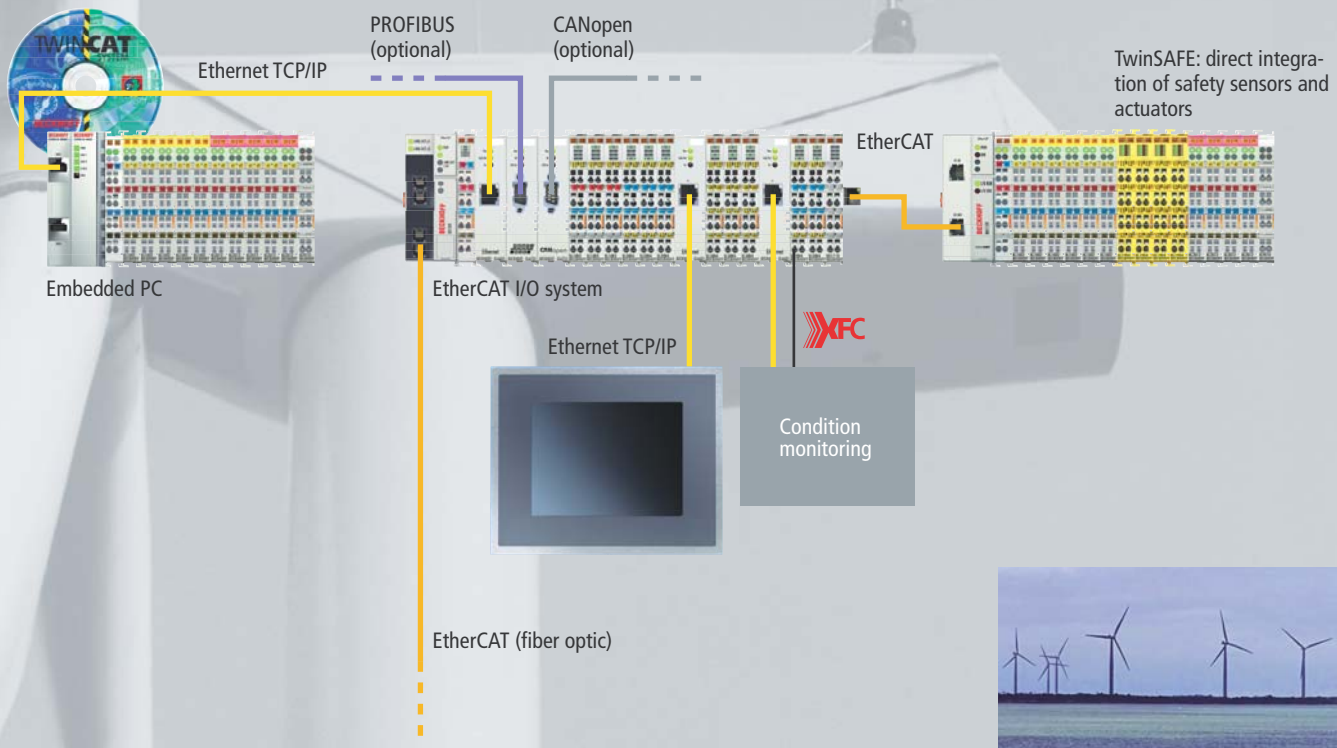
Beckhoff implements open automation systems on the principle of PC-based control technology. This openness in relation to the software and hardware interfaces enables the turbine manufacturers to adapt their systems to varying demands both in the first draft design and also for later system expansion or modification at low cost.

The open, scalable TwinCAT automation software is a software PLC for PCs. Programming in accordance with the international IEC 61131-3 standard guarantees the turbine manufacturers high investment security. The utilization of technological standards based on the Windows operating system opens up numerous expansion options and allows the user to benefit from the rapid development of the computer industry. It also enables the universal use of one technology for all types of turbines.

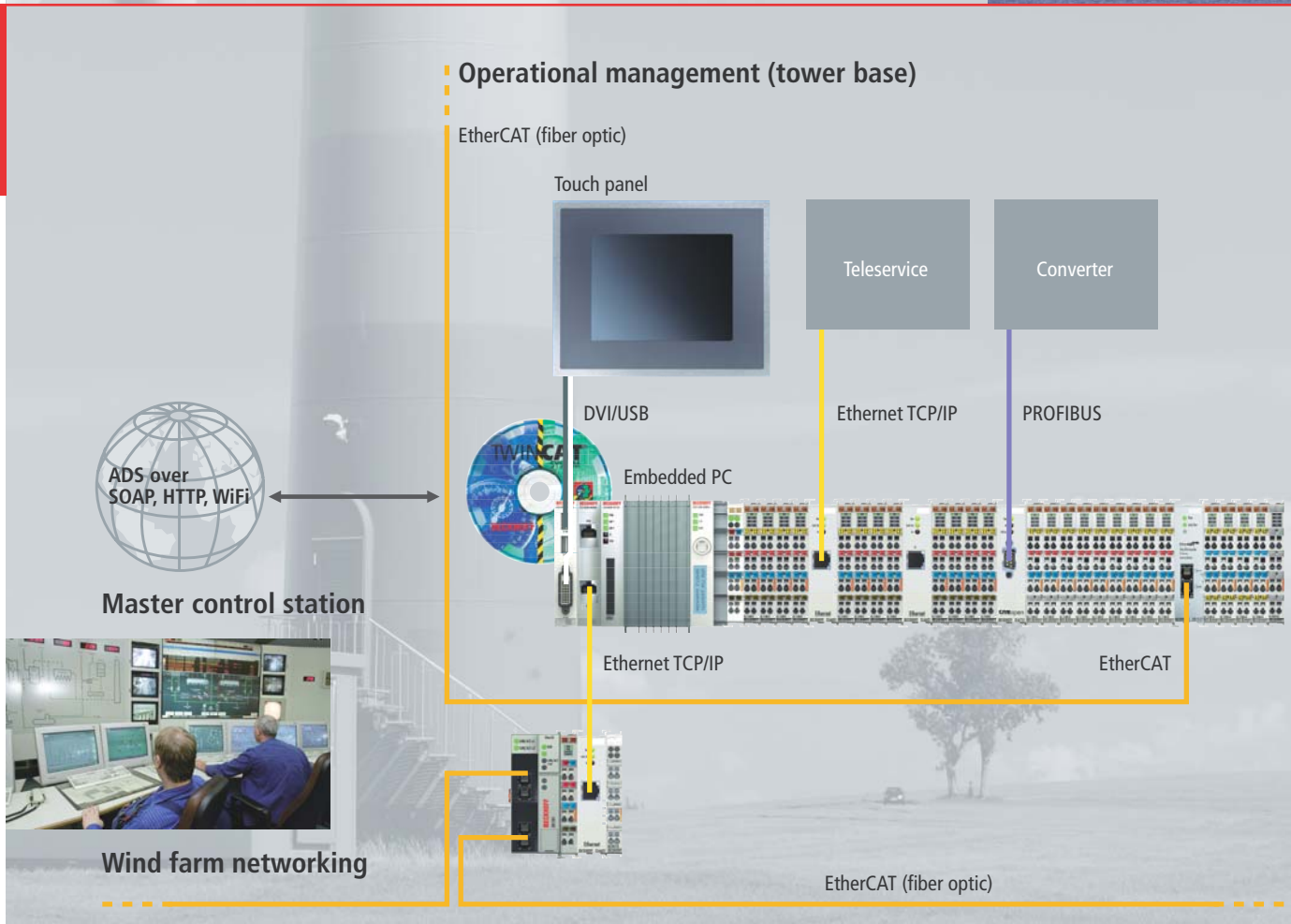
Data provision and data management in particular occupy a key position for control and evaluation of turbine performance both vertically (from the machine to the central control room) and horizontally (between the individual intelligent components and sub-systems of the turbine and

Pitch control

Operational management (nacelle)



Operational management (tower base)



Master control station

Wind farm networking

Advantages of Beckhoff technology for wind turbines

- advanced technologies, tried and tested in a wide range of industrial applications
- flexible, modular system, consisting of: Industrial and Embedded PCs, controllers, displays, Bus Couplers, Bus Terminals and fieldbus systems
- special terminals available as standard: 3-phase power measurement terminal, oscilloscope terminal, PWM, etc.
- straightforward integration with any relevant industrial bus system, no limits regarding combination options: EtherCAT, Ethernet, DeviceNet, CANopen, PROFIBUS, Modbus, Interbus, RS232, RS485, etc.
- integrated safety Bus Terminals (TwinSAFE)
- single software tool (TwinCAT) for all automation hardware platforms
- open industrial standards: (IEC 61131-3, Ethernet TCP/IP, PLCopen, OPC)
- genuine real-time characteristics (jitter < 10 µs)
- wind-specific customer know-how encapsulated in application software

also between the turbines within a wind farm). Local data banks as a basis for the higher ranking data backup and data preparation do not pose any problems for the PC whatsoever. Porting all functions to PC hardware also simplifies data transfer – generally via Ethernet – to the production databases and ERP systems.

EtherCAT: High-performance communication system for the tower/nacelle and the control room

Beckhoff supplies a complete range of fieldbus components for all common I/O and fieldbus systems. The Bus Terminals and EtherCAT Terminals available are sufficient for the complete range of signal types and fieldbuses that are of relevance for wind power.
EtherCAT, the fast Ethernet-based fieldbus, offers optimum real-time properties for time-critical process requirements without the need for special hardware in the central processing unit. With XFC technology (eXtreme Fast Control Technology) a time resolution of < 100 ns is possible with the time stamp technique. Sensor signals can be read with sampling times of less than 10 µs.

Integrated safety using TwinSAFE

In recent years, operational safety and work safety have played an ever larger part in machine construction. With TwinSAFE, Beckhoff offers an integrated system solution with optimum synergy between automation technology and safety technology. TwinSAFE integrates safety functions in the existing control architecture and in particular helps to significantly reduce the wiring costs for the higher-level hard-wired safety chain in the wind turbine.

→ www.beckhoff.com/wind