

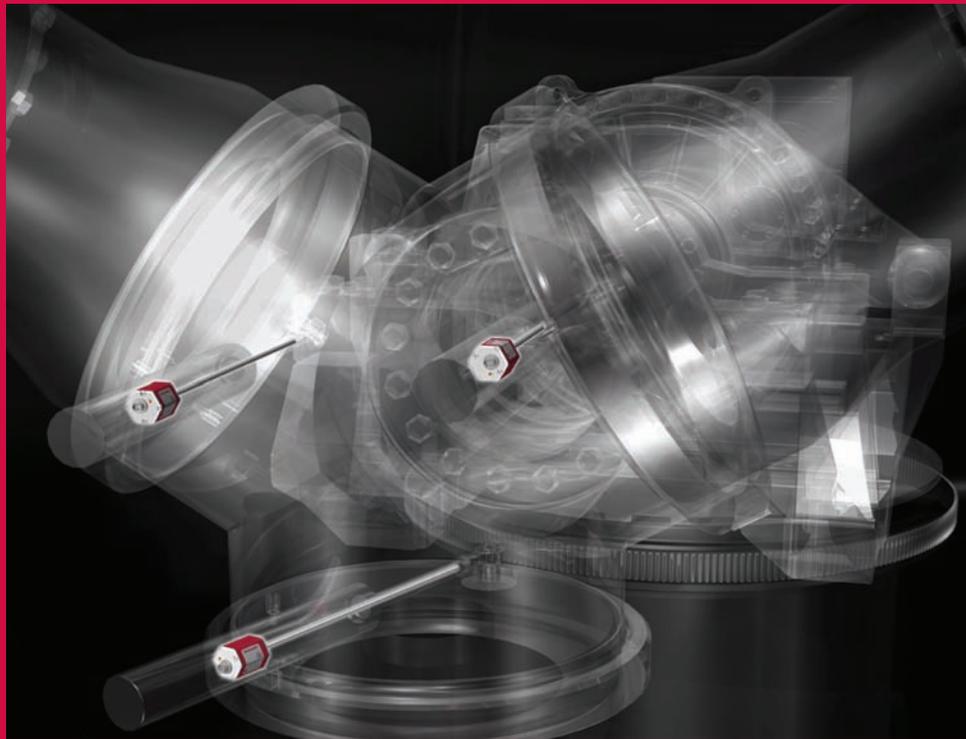
Temposonics®

Magnetostrictive Linear-Position Sensors

Absolute, Non-contact Position Sensors for



WIND ENERGY



The Measureable Difference

Wind Energy Growth Market

Wind energy is on the rise, reaching a power output of nearly 57,000 Megawatts in 2007 and continuing to increase. However, we must continue to focus on ways to build, test, deliver, and maintain wind turbines more effectively. MTS Systems can help by delivering position sensor technology that improves the energy efficiency of the turbines while providing greater safety and reducing maintenance costs.

A Green Future...

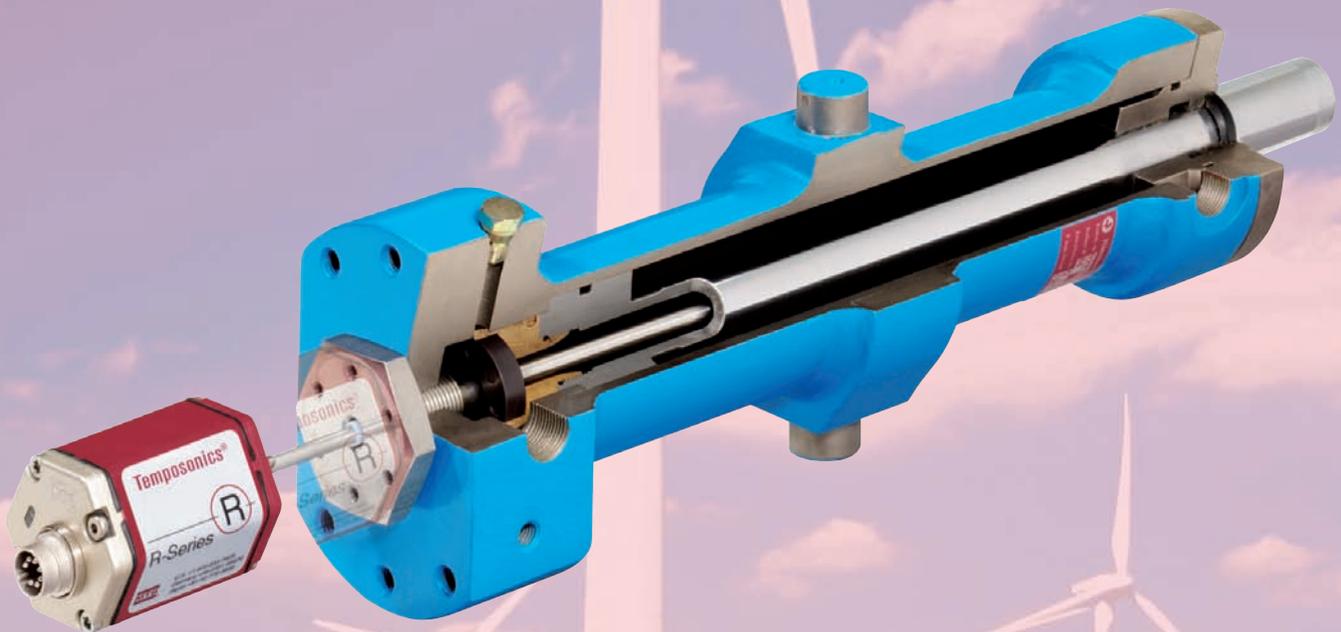
The call for reducing greenhouse gas emissions is growing throughout the world. Wind power has demonstrated great potential satisfying energy demand with a clean, safe and highly-efficient energy source.

At the same time, there is increasing demand for reliable and rugged components because wind turbines are subjected to tremendous aerodynamic forces and continuously changing wind conditions.

...with Temposonics

Temposonics position sensors are reliable, non-contact and maintenance-free. The R-Series sensor, for example, measure position and velocity with high accuracy and speed thanks to:

- High performance, integrated electronics
- IP 67 sealing
- Linearity $<\pm 0.01\%$ full stroke
- Repeatability $<\pm 0.001\%$ full stroke
- Resolution down to 1 micron
- Update time up to 10 kHz
- Operating temperature $-40\text{ }^{\circ}\text{C}$ ($-40\text{ }^{\circ}\text{F}$) to $75\text{ }^{\circ}\text{C}$ ($167\text{ }^{\circ}\text{F}$)



Modular, environmentally friendly design



Photo courtesy of pixelio.de

It depends on the Angle

An important part of wind turbine efficiency is Pitch Control. The input power of the turbine is controlled by dynamically adjusting the angle of the rotor blade. A control system uses independent hydraulic actuators to turn each individual blade at an angle between 0 and 90 degrees.

Under low wind conditions, the angle of the turbine blades is adjusted to achieve maximum efficiency and maintain constant electric power output. Since variations as small as a single degree can change the aerodynamics, accurate position feedback provided by MTS Sensors is critical.

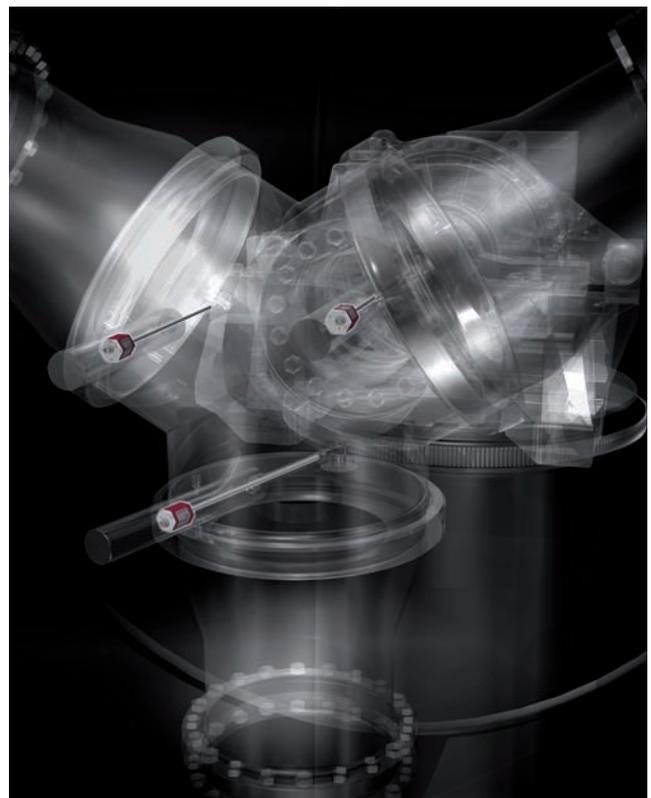
When the wind velocity exceeds the maximum permissible generator output, the blades are adjusted away from the optimum position to reduce the aerodynamic efficiency and maintain a suitable rotational velocity. Actively controlling the input power not only enables peak efficiency but also reduces the stress on the rotor, tower, and foundation for increased safety and longevity.

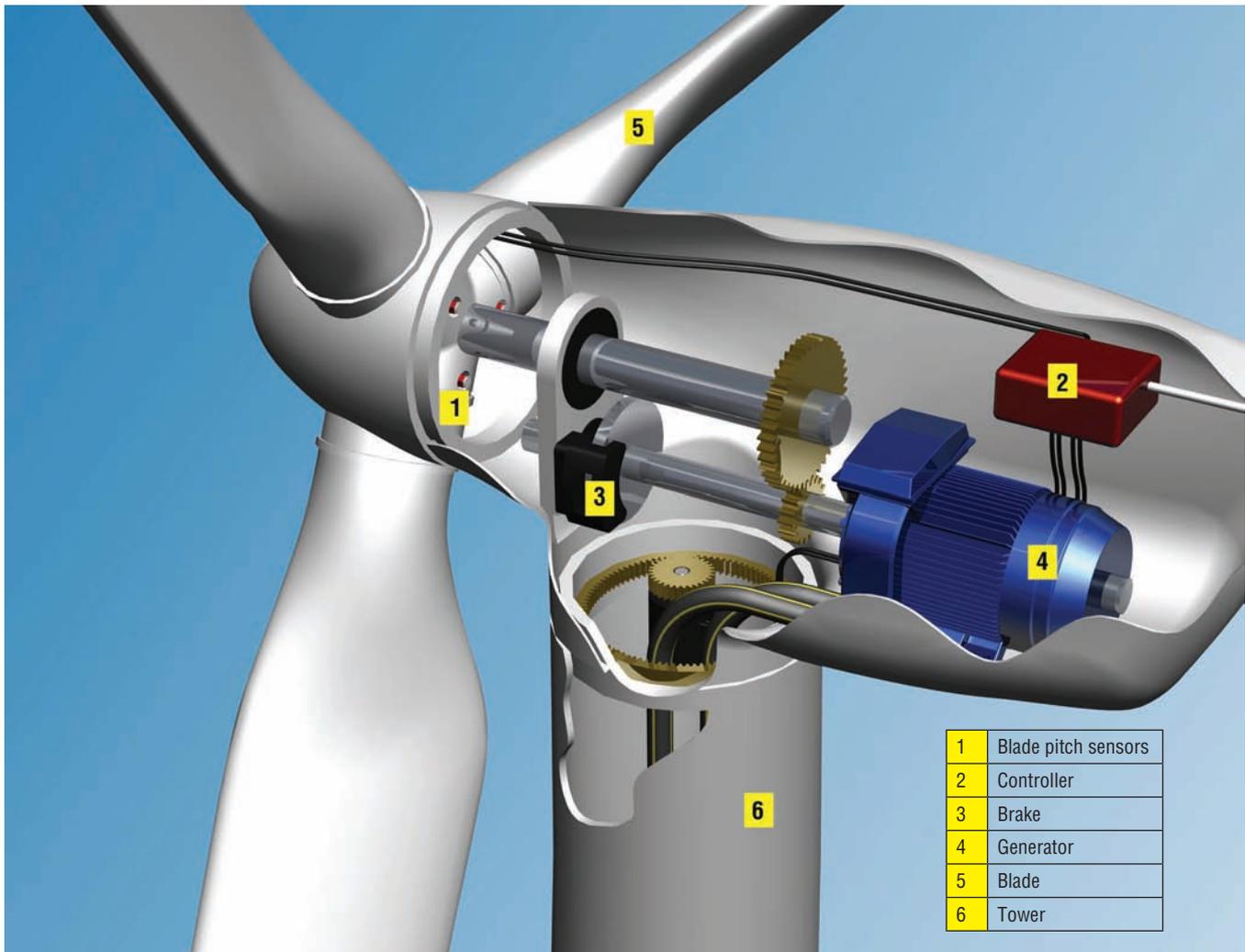
It's in the Technology

MTS has developed rod-style Temposonics sensors made especially for direct stroke measurement in hydraulic cylinders - like the inside of a rotor blade positioning mechanism. The pressure-resistant sensor pipe installs into a bore in the cylinder piston head and rod assembly. The sensor pipe protects the sensing element containing the magnetostrictive waveguide that carries the measuring signal. A ring magnet, secured on the piston head, travels over the sensor pipe without contact and provides the position signal through the wall of the pipe.

Reliable Sensors For your Environment

The accurate position and velocity measurements, available via a variety of interfaces (eg. SSI, Profibus, CAN, and DeviceNet), help to support early diagnosis of variation in the turbine operation. The difficult maintenance conditions of wind turbines due to rotor height and remote locations demand the reliable operation and functionality of Temposonics sensors. MTS Sensors have decades of experience in delivering high performance, high quality sensors to satisfy most any environment.





1	Blade pitch sensors
2	Controller
3	Brake
4	Generator
5	Blade
6	Tower

MTS Systems Corporation provides comprehensive test solutions for wind turbines, while the Sensors Division of MTS provides linear-position feedback for turbine safety and control applications

Part Number: 551167 Revision A 04-09

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All Temposonics sensors are covered by US patent number 5,545,984. Additional patents are pending.
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