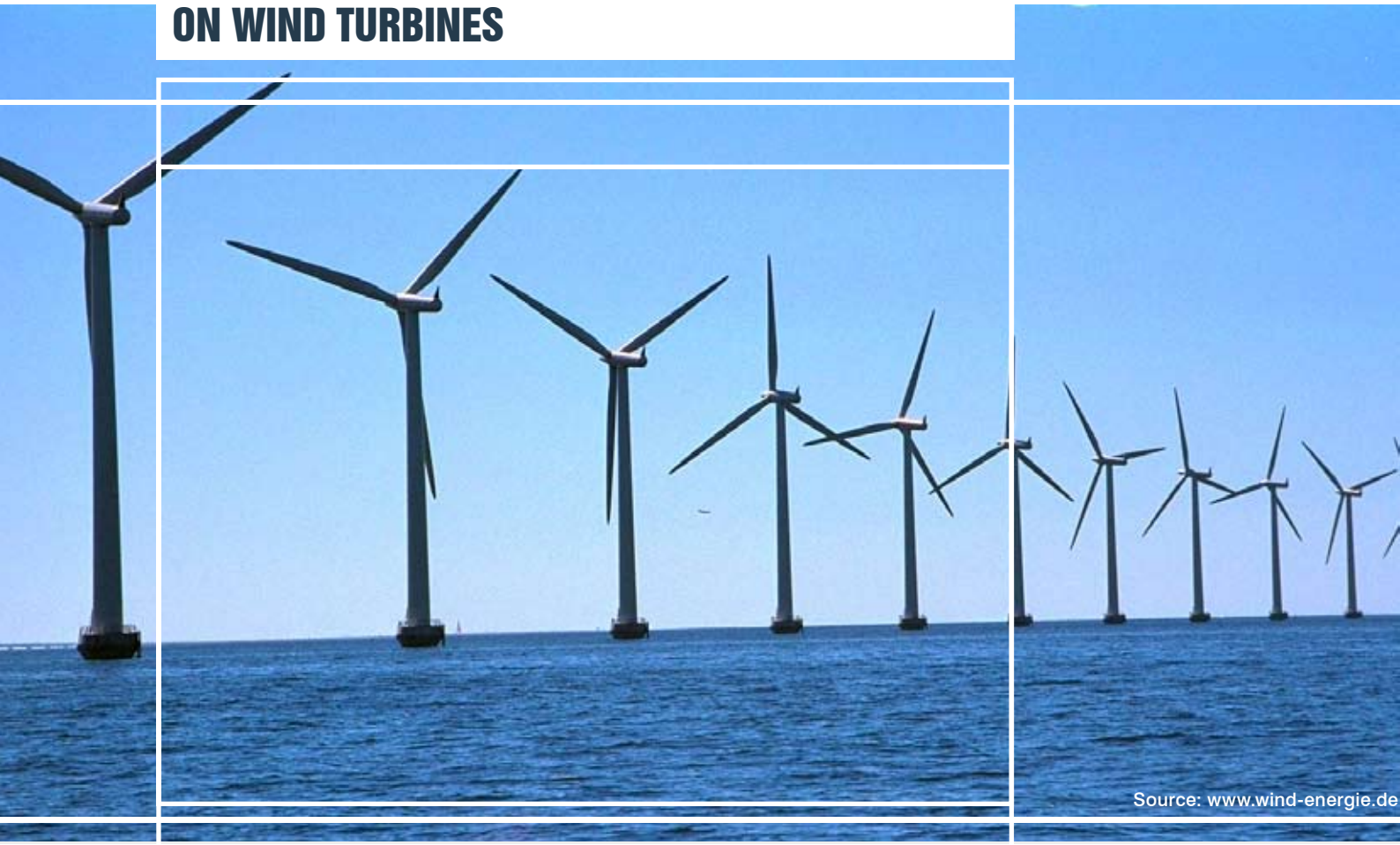
MICRO-EPSILON

More Precision.

DISPLACEMENT AND PROFILE MEASUREMENT ON WIND TURBINES



Source: www.wind-energie.de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DISPLACEMENT AND PROFILE MEASUREMENT ON WIND TURBINES

Further to the last amendment of EEG 2009, in which electricity generation using renewable energies was increased from 25% to 30%, wind turbines are expected to have an even greater market potential.

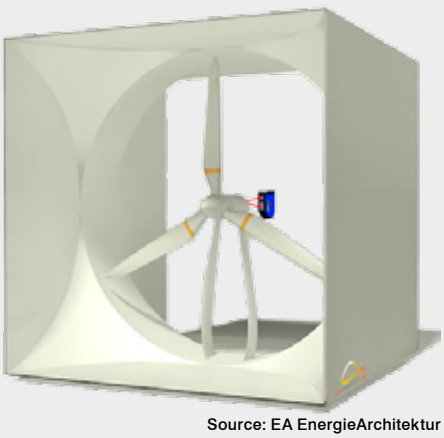
This relatively new use of modern technology still has much potential for optimisation. The use of modern testing methods provides high quality and operational reliability. For this reason, displacement sensors are being utilised more and more for the development, production and operation of wind turbines.

The sensor system for controlling wind turbines is very important as the movement of the gondola and the rotors is performed automatically and therefore needs to be measured. Repair and maintenance work for land-based systems already have high risk potential. In the case of offshore systems, this high riskis combined with enormous technical costs, as special purpose ships for complex tasks have long waiting times.

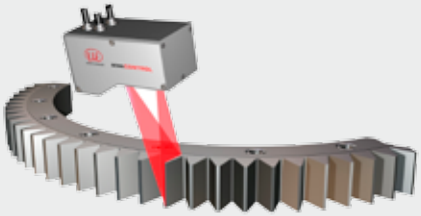
Modern sensors help to prevent repairs and optimise maintenance cycles. This starts with the design of the components.


Source: Fraunhofer Institut IWES, Bremerhaven

Load tests on rotor blades in a test rig. Draw-wire sensors perform the measuring task.


Source: EA EnergieArchitektur

Vibration measurement on the generator of small wind turbines for buildings with optoNCDT.



Laser scanners for checking wear are used on the toothed gear wheel for the azimuth adjustment.

Rotors under load

Some test rigs are being developed for load tests on wind turbine rotor blades, which enable the simulation of real loads caused, by different wind and weather conditions. Here, it is important to ensure that the expensive rotor is not destroyed. Typical rotors now measure between 40m and 60m in length. By applying mechanical loads, the tip of the rotor blade can be distorted by up to 10m. The rotor blade is mounted horizontally in the test rig. Steel cables are routed to the rotor using guide pulleys and attached to the rotor blade at various positions, either directly or via mechanical clamps. Several draw-wire sensors are used on the test rig for measuring the distortion. Two sensors at each traction point measure the deflection and torsion of the rotor blade. The draw-wire sensors in this application operate with measuring ranges between 3m and 10m. The digital signal output is directly included for further simulation and analyses.


Quelle: www.wind-energie.de

Inspected weld seams

For the wind turbine tower design, tubular steel towers are very common and usually consist of two to five segments, each one being 20m to 30m in length. A segment of a tower is rolled from 20mm to 40mm thick steel sheet and then welded. The individual segments are bolted together and also welded whereby a flange has to be welded onto the segment for the bolted variant. In doing so, each weld seam must be capable of withstanding the high loads of the tower in its finished form. A quality inspection of the weld seams is therefore a critical step in ensuring the safety of the wind turbine.

The inspection of a weld seam is performed using laser scanners from Micro-Epsilon. These laser scanners from Micro-Epsilon are already being used in many other industry sectors for the automatic, precision inspection of weld seams, e.g. for oil and gas pipelines. Here, the weld seams also have to be reliably inspected to ensure they meet the high quality requirements of customers.

SENSORS USED

Displacement measurement using draw-wire sensors

The P115 series is available for larger measuring ranges. The P115 series is equipped for harsh applications with mounting grooves, metal housing and high spring force. Measuring ranges between 3m and 15m are used. All common field buses and analogue outputs are provided for the connection of the sensor.

Displacement measurement using laser sensors

optoNCDT 1402 is a laser sensor with an integrated digital signal processor. Due to its automatic exposure regulation, the non-contact sensor measures distances against a wide variety of material surfaces. The sensor adapts to each measurement task using a swivelling cable connector, analogue output and RS422.

Profile measurement using laser scanners

scanCONTROL is used for the two-dimensional measurement of surface profiles. For this, a laser line is projected onto the surface. A high quality receiving optical system projects the diffuse reflected light from this laser line onto a highly sensitive sensor matrix.

wireSENSOR P115

- Measuring ranges 3m … 15m
- Robust aluminium housing
- Outputs: HTL, TTL, SSI, CO, PB, P, U, I
- Simple and reliable measuring principle

optoNCDT1402

- 1.5kHz measuring rate
- 8 measuring ranges from 5mm to 600mm
- Peak selection
- Trigger input, RS422
- Scalable analogue output

scanCONTROL 2800/2810

- Profile width: 25, 55, 100, 245mm
- Resolution max. 0.01mm
- Distortion-free recording of profiles
- With integrated profile evaluation if required
- Intelligent evaluation software

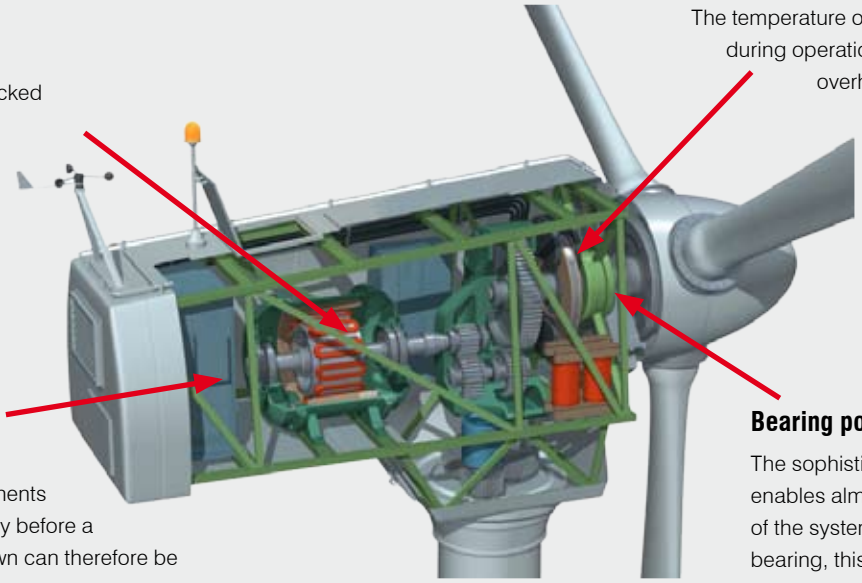
TEMPERATURE MEASUREMENT ON WIND TURBINES

Generator windings

The temperature of the generator windings is checked using non-contact temperature sensors for the operational monitoring.

Electrical components

All electrical components in a wind turbine can be monitored by using a non-contact temperature sensor. Damaged components begin to heat up noticeably before a defect occurs. A breakdown can therefore be avoided.



Gearbox

The temperature of the gearbox is measured during operation. Components that overheat on the gearbox indicate a potential problem with that part. Maintenance can then be scheduled.

Bearing points

The sophisticated mounting of the rotor enables almost friction-free operation of the system. If defects occur in the bearing, this manifests itself in the form of friction heat, which can be measured by temperature sensors.

SENSORS USED

Using Micro-Epsilon non-contact temperature sensors, it is possible to continuously monitor components in a wind turbine and achieve operational monitoring without gaps. The measuring systems are distinguished by their very compact measuring heads, easy integration and installation using digital interfaces (e.g. CAN, Profibus, Ethernet) and a very attractive price/performance ratio. Costly, unexpected shutdowns are prevented and so productivity increases due to continuous operation monitoring.

thermoMETER CT

- Economically priced and high precision
- Temperature ranges from -50°C to 975°C
- One of the smallest infrared sensors in the world with 22:1 optical resolution
- Up to 180°C ambient temperature without cooling

thermoMETER CTM1/M2/M3

- For measurement on metal surfaces
- Temperature ranges from 50°C to 1,800°C

thermoMETER CTfast

- For very fast moving objects
- Temperature ranges from -50°C to 975°C
- Extremely fast measuring times (3ms)

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