The Drive & Control Company

Rexroth
Bosch Group

ACoS – Low Cost of Energy due to Holistic Monitoring of Wind Turbines

Reduce operating costs – Increase availability

For wind farm operators across the world there is one factor that is becoming increasingly important: the cost of energy. The focus should be on these key points: Optimize the operation of your systems, increase availability and consequently lower your operating costs!

ACoS, the **A**dvanced **Co**ndition Monitoring **S**ystem, is the holistic system solution for monitoring the entire drive train from rotor to generator. ACoS enables plant operators to achieve a sustainable reduction in costs of energy over the lifecycle.

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Onshore wind turbines are becoming more powerful, but also more complex. Unscheduled downtime increases operating costs substantially. For offshore turbines, the consequences can be even more costly, as poor weather conditions often prevent access for long periods. A system failure during this period significantly reduces the amount of energy produced each year as operators are forced to wait for better weather conditions. In addition: Unscheduled service calls to offshore facilities generate disproportionally high service costs.

Holistic condition monitoring

At conventional power plants, utility companies have been relying on comprehensive condition monitoring for all major components for a long time now. This protects the value of their power plants and increases efficiency.

The formula for reducing cost of energy

- **Capital costs** of the wind turbines, especially the proportional investment cost: The costs for ACoS are very low when compared to the total investment, particularly as it replaces several individual solutions.
- **System operating costs**, primarily maintenance and service costs. With ACoS, maintenance requirements can be detected at an early stage and carried out in periods of low-wind. This lowers operating costs.
- **The amount of energy generated annually** by the system. It rises, as ACoS increases the availability of the wind turbine and minimizes system downtime.

$$\frac{\text{Capital costs + Operating costs} \quad \text{(with ACoS} \downarrow\text{)}}{\text{Annual electricity production} \quad \text{(with ACoS} \uparrow\text{)}}$$

= Lower cost of energy

Rexroth is now applying this method to wind turbines. The result: ACoS, the Advanced Condition Monitoring System. ACoS is the first system solution worldwide offering condition monitoring of all critical components, from blade tips to generator.

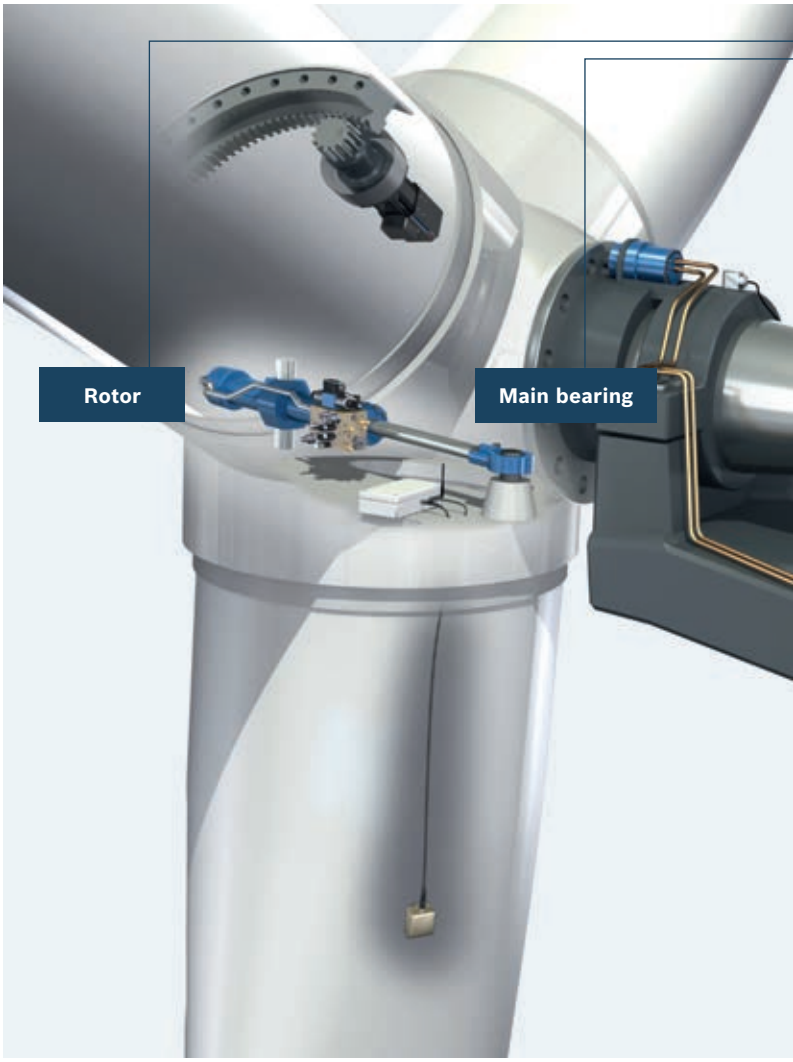
Easier, more reliable, more efficient

A condition monitoring system is only as good as the data and evaluation logic implemented. For the first time, ACoS from Rexroth globally connects condition monitoring of all drive train components of a wind turbine and intelligently links the measurement data from different sensors. The information regarding the state of the components is therefore of a much higher quality and makes it easy to immediately classify the data generated and take appropriate action.

Condition monitoring systems for wind turbines and Rexroth are an experienced team. For many years, BLADEcontrol has proven itself as a rotor blade monitoring system for wind turbines. In co-operation with technology company DMT, Rexroth has developed the world's first holistic condition monitoring for wind turbines. ACoS monitors the complete drive train starting with the rotor blades and covering the rotor shaft bearings, gearbox and coupling, and generator.

Rexroth brings together established and proven measurement and evaluation strategies into a single open platform with a holistic monitoring strategy. Moreover, ACoS offers the possibility of integrating further modules for component monitoring via standardized interfaces. This enables the results of particle counts in operating fluids or from systems for building monitoring, for example, to also form part of the overall picture.

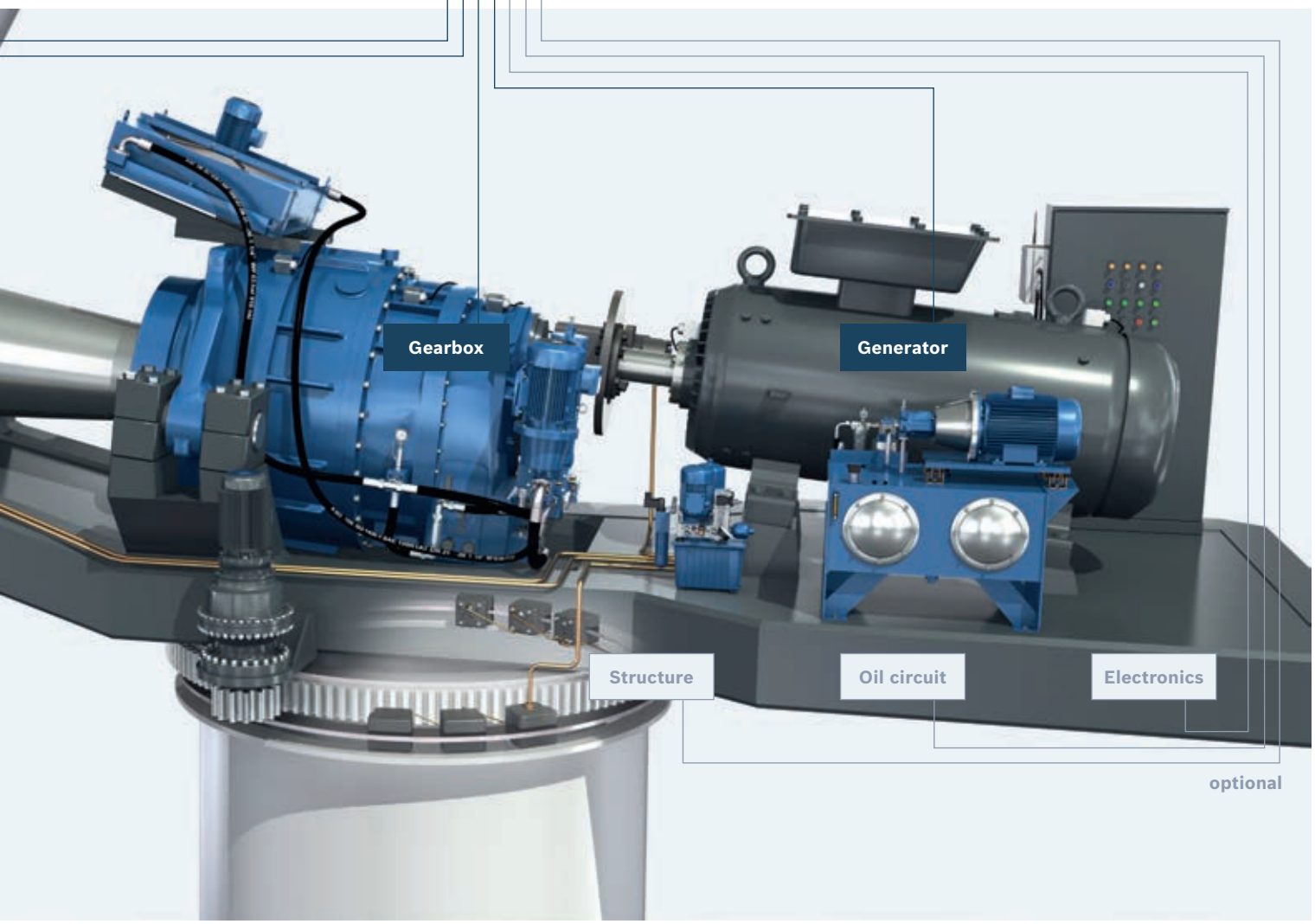
In the control room, the monitoring experts access all information from a unified user interface. The software combines all the data that is continually collected from the measurement and analysis processes. This way you are given more than just the sum of the individual data, as ACoS takes into account interaction and causalities. The holistic approach is therefore superior to isolated individual monitoring approaches.



Control station
- Visualization
- Correlation analysis
- Diagnostics
- Operation
- Data acquisition

Analysis and communication

Monitoring of
- Rotor condition and ice build-up
- Bearing vibration
- Load and speed oscillation
- Optional: Oil condition and oil circuit, status of electronic components and structure vibrations



Intelligent efficiency

With ACoS, the monitoring experts can access all vital status information for the entire drive train with a single click. You will soon find your way around the standardized user interface. The software automatically weights the importance of status data, prioritizing it in terms of urgency and thereby reducing the time necessary for analysis.

More detailed information
ACoS automatically correlates the measurement results of the sensors from different parts of the system. The system thereby detects the condition more accurately and reliably than individual systems.

Analyze more systems in less time
A standardized user interface for all subsystems reduces training time and speeds up analysis.

Low system costs
Integrated architecture and open connection to other systems reduce the system costs compared to individual solutions.

Longer service intervals
Condition-orientated maintenance extends the time between services as only essential work is carried out.

Service visits which can be planned
The service team can plan to carry out essential work during periods of good weather or low-wind. The required spare parts can be procured early – this reduces downtime.

Automatic ice detection
The ice detection is a function certified by Germanischer Lloyd, which detects icing directly on the rotor blade. Once the ice has gone, it allows for an automated restart of the turbine.

Your advantages

- ☑ Cost of energy reduced
- ☑ Maintenance costs reduced
- ☑ System damage avoided
- ☑ Availability increased
- ☑ Operation simplified
- ☑ Efficiency improved

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