

Monitoring of Blade Bearings

Wolfgang Losert, Beate Burkhardt
eolotec GmbH, Nürnberg, Germany, +49 911 23 95 17 16, beate.burkhardt@eolotec.com

Summary

As blade bearings are getting older the importance to monitor them to guarantee proper functioning increases. The sensor system Blade Bearing Guard (BBG) enables permanent wear monitoring and offers information about the bearing conditions. It allows well-founded maintenance decisions, which are very valuable, especially regarding offshore turbines and the high maintenance costs involved.

1. The sensor system Blade Bearing Guard

The conventional method in condition monitoring, to measure vibrations, is not expedient in the area of blade bearings as they do not rotate but only slew. But the occurring damages all have in common that they are influencing directly or indirectly the deformation of the bearing rings.

1.1 Functionality of the system

In contrast to conventional vibration measurements, the BBG measures a distance with at least one contactless sensor per blade bearing. It is a relative measurement from the rotating to the standing ring (or reverse). The surface measured on is a gauge block, installed also at the bearing or close nearby. An example for a measuring setup is pictured in image 1.

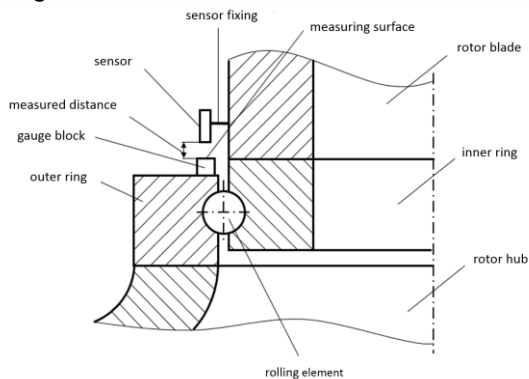


Image 1: Sensor positioning for axial measurement

Due to the rotation of the blades a defined alteration of load appears which is needed for the measuring of deformation. Due to the dominating bending moment M_y , resulting from the blade weight, the measurements show a sine-curve progression. An exemplary measurement is pictured in image 2. Its amplitude represents the deformation of the rings. To take also the bending moment M_x caused by the wind force into account, its correlation to wind speed and rotor speed is used. Last-mentioned can be derived from the sine curve and enables a classification of measurements by rotor speed.

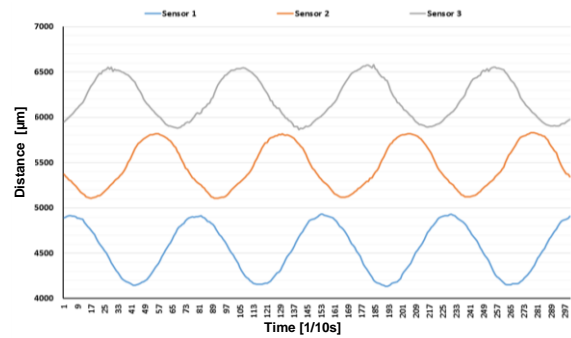


Image 2: Measurement example

1.2 Benefits of the system

Especially in offshore projects maintenance is demanding and expensive. Proactive and remote monitoring by BBG enables predictive maintenance and a significant cost reduction. The generated data offers important information for decision making and enables to schedule e.g. the exchange of bearings long in advance. Bearings showing uncritical damages can be monitored and further operated. This way the system has even the potential to avoid expensive exchanges.

2. Analyses and Database

Additional to the sensors a remote and analysis module, the "BBG-Box", is installed on the turbine. It processes the data and sends it via mobile network to a server, where a software analyses the data automatically. Trend lines indicating a possible damage progress are generated and alarm limits set. As the database grows, the system gets more and more intelligent. The operator can see actual measurements illustrated via an online access.

3. Conclusion

The BBG enables monitoring of blade bearings by measuring and analysing the ring deformation. It assures save operation and the predictability of damages enables to schedule service operations and to prevent downtimes.