A new dimension in large size bearing testing

John Skiller, Martin Goebel, Philipp Schmid
SKF

Summary
As wind turbine designs grow beyond ratings of 10MW, the importance of consistently and economically satisfying performance levels is more urgent than ever.

Greater demands bring a new set of technical challenges. Modelling and simulation tools play a key role in the design process, but real world application conditions push mechanical designs to their limits and can expose phenomena not otherwise predicted. Is there a better way to verify the performance of these new generation machines and their large, critical bearing components? Until recently, the answer has been no.

Inaugurated in June 2017, the Sven Wingquist Test Center for large size bearings is pushing industry boundaries to test larger bearings, greater loads and higher speeds. It’s the biggest test center for large size bearings in the world, designed to test them under realistic conditions.

Main shaft test rig
- Dynamic application of high load, especially bending moments
- Radial load: 8 MN
- Axial load: 8 MN
- Bending moment: up to 40 MNm (typically)
- Rotational speed: 30 r/min
- Bearing size: up to 6 m

Two gigantic test rigs
Two unique test rigs enable realistic dynamic loads, with a capability of recreating extreme load conditions. The test programme aims at current developments as well as supporting conceptual studies for future solutions, hence offering scope for bearings exceeding today’s performance levels.

The Main Shaft Test Rig is the world’s first that can not only test a single wind bearing (up to 6m outside diameter), but also the complete bearing assembly with surrounding components. The rig overall is about 9x11x8 m. and weighs about 700 tonnes.

It is the first test rig in the world to apply combined dynamic loads to large size bearings with a hydraulic system that recreates extreme operating conditions for today’s and tomorrow’s largest turbine classes.

The Dynamic Development Test Rig, the comparatively smaller of the two, has nevertheless impressive parameters. It is dedicated to dynamic testing at high rotation speeds for large size bearings under the most demanding conditions, such as for wind gearboxes. The 300-tonne test rig also provides a flexible capability in several other heavy industrial applications (such as marine, mining, steel, paper or cement industries).

Conclusions
Bearings at this scale should operate flawlessly for the complete lifetime, this is a crucial aspect of wind turbine profitability. This lifetime – including all conceivable loads in the course of this time – are reproduced in the new test center very realistically within a couple of weeks, through an accelerated procedure and hence contributing a valuable step in the validation process.

Furthermore, the new SKF testing center doesn’t just support technical improvements in bearings. The accumulated data will enable the development of more reliable simulation methods and tools as well as improving diagnostic capabilities.

The Sven Wingquist Test Center will hence bring new opportunities to manage large size bearings, delivering more effective, durable solutions in their respective applications.

A center for sustainability
The Sven Wingquist Test Center has been built to the most advanced environmental standards possible. With test run time reduction due to unique capabilities of the test rigs, there is huge potential for energy savings. Another contribution to environmental friendliness is the fact that waste heat is recovered and fed into the heating system of the SKF factory close by.

This resource saving capability of both test rigs has gained the support of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety as well as the support of the Bavarian Ministry of Economic Affairs and Media, Energy and Technology.

Main shaft test rig
- High speeds and dynamic load application
- Radial load: 7 MN
- Axial load: 3 MN
- Bending moment: 10 MNm
- Rotational speed: 250 r/min
- Bearing size: up to 2,5 m

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