For the first time in Germany a test bench for wind turbine main shafts will be accessible to the public at Fraunhofer IWES by the end of 2014. With this test bench it is possible to simulate 20 years of main shaft operation time within half a year of testing.

The “BeBen“ Project

“BeBen“ is the title of a long term collaborative research project between Fraunhofer IWES, Hamburg University of Applied Sciences (HAW) and Suzlon Energy GmbH funded by the BMU (Federal Ministry for the Environment, Nature Conservation and Nuclear Security). „BeBen“ is a German abbreviation and can be translated as accelerated experimental endurance strength verification for large wind turbine components using the example of main shafts. The project’s major aims can be summarized as:

- Comparison of theoretical and experimental endurance strengths
- Adjustment of certification guidelines
- Material savings

Some highlights of the project scope:

- Material tests (s-n curve, impact test)
- Development and acquisition of a main shaft fatigue test bench
- Full scale main shaft fatigue tests

Finding an Appropriate Test Bench Design

The aim of the fatigue tests is not only to damage the specimen, rather it is important to reproduce a realistic loading and thus wear and tear as occur in operational wind turbine main shafts. For this reason we have conducted a detailed analysis of simulated and measured load time series for the main shaft. After processing the data using the „Rain-Flow-Counting“ method, lifetime damage was calculated based on Miner’s rule. An important output of those analyses is the information on which degrees of freedom are relevant for fatigue damage mechanisms and thus helping us to design an adequate test bench.
Services

- MBS and FEM modeling
- Damage calculation
- Design optimization with different focuses
- Test campaign planning
- Main shaft full-scale testing under realistic conditions
- Experimental model verification
- Measurement campaigns
- Component s-n-curves determination
- Certification process support

Test Bench Key Features

- Max. bending moment: 15 MNm
- Max. radial force: 3MN
- Max. rotational speed: 60 rpm
- Drive power: 300 kW
- Heavy-duty foundation
- Flexible test arrangements possible