

TEST RIG FOR LARGE TURBINE JOURNAL BEARINGS AT THE INSTITUTE FOR PRODUCT DEVELOPMENT (LPE) RUHR-UNIVERSITY BOCHUM

Since the foundation of the institute in 1969 (Prof. Seifert) the research on journal bearings is an inherent part of the institute.

Especially since the completion of the test rig for large turbine journal bearings in 1985, experimental and theoretical studies on radial journal bearings and sealing systems have been conducted continuously in the context of dissertations and industrial projects. Due to its unique equipment the test rig is able to measure turbine bearings in original size and gather film thickness and pressure distributions in very high resolution in both circumferential and axial direction.

MAIN DATA OF THE TEST RIG:

- Driving power: 1,2 MW
- Shaft diameter: 500 mm
- Bearing width: max. 500 mm
- Bearing outer diameter: max. 1000 mm
- Speed: 200 up to 4000 rpm
- Steady radial force: vertical, 0 - 1 MN
- Unsteady force: up to 100 kN at 60 Hz
- Oil supply up to 60 l/s at max. 6 bar

DATA ACQUISITION:

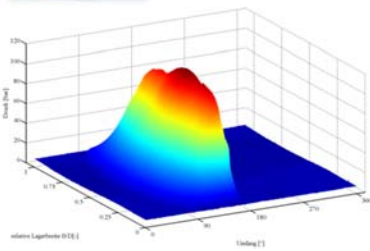
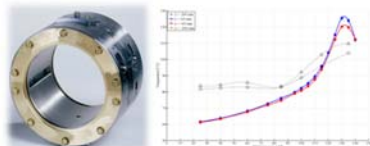
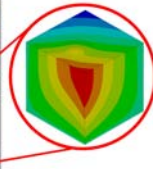
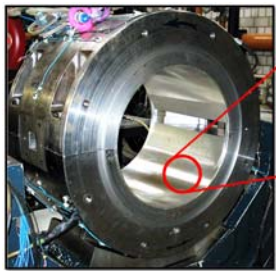
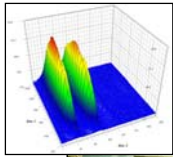
- Shaft speed
- Steady load
- Oil flow rate and oil pressure
- Oil temperature at in- and outlet
- Friction power
- Temperature at the sliding surface
- Temperature at the bearing back
- Relative movement shaft-bearing
- Axial position of the shaft
- Oil film pressure distribution
- Oil film thickness distribution



The oil film thickness and pressure sensors are located at the surface of the shaft. Lubrication film thickness and pressure distributions across both circumference and length of the bearing are measured by slowly shifting the rotating shaft in axial direction. The measured data is transferred by a slipping assembly.

EXEMPLARY MEASURING POSSIBILITIES

- Lubricant thickness and pressure distributions for comparison with predictions
- Determination of max. load capacity with respect to min. film thickness and max. temperature
- Determination of stiffness and damping coefficients (including flexibility of housing, pivot, etc.)



RESEARCH FOCUS JOURNAL BEARINGS

TARGET

Experimental investigations of the static and dynamic operational characteristics of large turbine journal bearing and sealing technologies

APPROACH

The Approach can be structured in the following fields:

- Investigations of the static and dynamic performance of tilting-pad bearings
- Investigation of new bearing developments and new bearing technologies
- Joint project to investigate tilting-pad bearings with a higher load capacity for large turbo machines
- Numerical simulation and experimental investigation of the stiffness and damping coefficients of large journal bearings
- Investigations of the performance of sealing systems for turbo machines

RESULTS

So far the following results could be achieved:

- Computer based tools to analyze the force distribution and flow characteristics of large journal bearings
- Test results relevant to the static and dynamic performance of different bearing types and designs
- Test results relevant to geometric variations of bearings, supply conditions and type of lubricant
- Perceptions to the influence of the material elasticity on the stiffness and damping coefficients of hydrodynamic journal bearings

Project partners:

- Siemens AG
- Gleitlagertechnik Weißbacher
 - John Crane GmbH
- Waukesha Bearings Corporation

