Bearings development and manufacturing
Baker Hughes bearings development program

Objective

Improve performance

- Higher load
- Higher speed

Effective design to decrease pad temperature

Optimal bearing reliability and performance prediction

Decrease oil flow consumption
Optimal solutions

- Improved reliability
- Optimal oil consumption
- Reduced temperature and stress
- Increased time between maintenance cycles
- Simple installation and replacement without shaft removal
- Highest quality finishes and precise tolerances
- Integrated instrumentation
- Greater performance prediction
- Additive manufacturing capability

Baker Hughes journal bearings can support a load of 270 tons with an oil film as thin as ¼ of a human hair.

Including

Lufkin Gears
da Baker Hughes business
gear and bearings technologies
Advanced modeling

Bearing selection and detailed design are conducted using thermo-fluid dynamic simulations. Oil supply and bearing geometry are CFD modelled to ensure minimum oil flow and best thermal management. Results are validated by test rig in collaboration with our Advanced Sensor Lab.

New bearing line

Our new manufacturing line supplies a wide range of bearing designs and new materials to provide optimal solutions to fit various combinations of load, speed and space requirements. Innovative materials and manufacturing technologies have been developed to withstand critical operating conditions.

Test rig and support

The test rig for thrust and journal bearings can be used with variable oil inlet temperature up to 60°C for a max speed of 24,000 rpm. Its load capabilities cover a wide range of application requirements, performing full size TB and JB static tests, and dynamic test in collaboration with the University of Pisa.
Advanced modeling

Rotordynamic model

1D

3D

Geometry definition
SOLID and FLUID contour

SOLID domain
Temperature contour

Fluid film domain

Elasto-thermo CFD simulation
# Mechanical parameters test rig

## Test specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. speed</td>
<td>24,000 rpm</td>
</tr>
<tr>
<td>Max. TB ext. diameter</td>
<td>700 mm</td>
</tr>
<tr>
<td>Max. axial load</td>
<td>600 kN</td>
</tr>
<tr>
<td>Max. JB diameter</td>
<td>320 mm</td>
</tr>
<tr>
<td>Max. radial load</td>
<td>300 kN</td>
</tr>
<tr>
<td>Lube oil flow capability</td>
<td>1,000 L/min</td>
</tr>
</tbody>
</table>
Dynamic coefficient test rig

Test specifications

- **Max. power**: 630 KW
- **Max. rotating speed**: 24,000 rpm
- **Bearings bore range**: 150–300 mm
- **Max. journal load**: 270 kN

In collaboration with Università di Pisa
# Bearings portfolio

## Journal bearing (55-400 mm)
- **Tilting pad**
  - Ball and socket
  - Rocker pivot
- **Fixed geometry**
  - Pressure dam
  - Offset half
  - Multi tapered land
  - Elliptical

## Thrust bearing (2-26 inches)
- **Tilting pad ball and socket**
- **Fixed geometry**
  - Steel
  - Cr Cu

## Combined journal + thrust (55-400 mm JB)
- Thrust tilting pad/JB fixed
- Thrust tilting pad/JB tilting
- Thrust fixed / JB fixed

### Under development
- Additive integrated pivot
- Squeeze film damper
- High-speed, direct-lube journal bearings
- High-speed, high-load thrust bearings

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Dedicated manufacturing line

Our new bearings manufacturing line covers the complete production process from receiving to shipping, and has the capacity to produce thousands of bearings per year. It produces our entire portfolio of journal bearings (tilting pad, fixed geometry), thrust bearings, combined journal+thrust bearings; and it includes new in-house technology for babbitting with centrifugal casting.

- Temperature-controlled facility
- Internal centrifugal casting for babbitt
- Re-babbitting and repair of bearings from any original equipment manufacturer (OEM)
- Fully certified ultrasonic and dye-penetrant testing
- Coordinate measuring machine (CMM) inspection services
- CNC and manual machining of parts
- Three independent machining lines (fixed geometry bearings, pad machining, housing machining)
- Flow production concept in accordance with lean manufacturing rules
- Additive manufacturing capability