DIAGNOSTICS
Bearing failures

Bearings are a wearing part and will fail eventually. Despite being machined to very close tolerances from high-performance steel, bearings have a limited service life. Indeed, the loads applied to bearings will eventually result in fatigue failure of the material which limits the service life. However, on top of the fatigue failures, many other external factors to the bearings influence the life and can lead to premature failure.

With extensive experience in fault diagnosis and prevention in relation to bearings, NTN Europe wishes to share its expertise with you. Being able to distinguish between natural fatigue and abnormal failure, you will then be able to make the most of our products and thus boost performance.

The main causes of bearing damage

1. Corrosion by oxidation
2. Fretting corrosion
3. False brinelling
4. Surface spalling initiated at the surface (ÉSIS)
5. Deep spalling initiated at the surface (ÉPIS)
6. Deep spalling initiated at a depth (ÉPIP)
7. Electro-erosion
8. Plastic deformation
9. Rupture
10. Wear under the action of particles
11. Wear by friction
12. Spalling by axial overload
13. Indentations

General recommendations

- Store the bearings flat in an air-conditioned room
- Avoid stacking cardboard boxes with heavy bearings
- Use NTN-SNR range methods and tools
- Check and respect the mounting adjustments
- Refer to the plans and assembly drawings
- Work in clean conditions
- Lubricate the bearings with the correct amount of
- grease before commissioning
- Ensure the effectiveness of the sealing devices

1 Corrosion by oxidation

OBSERVATION

- Marks or pits

CAUSE

- Pollution by water, old oil, hydraulic fluid or aggressive additives

NTN Europe recommendations

- Purge the bearings and remove the old lubricants
- Avoid water contacting the bearings

2 Fretting corrosion

OBSERVATION

- Oxide layer on the outer surfaces of the bearing

CAUSE

- Microscopic displacement between ring and suppor

NTN Europe recommendations

- Check the precision and seat adjustments
- Use NTN-SNR anti-fretting paste and an induction heater to install the bearing on the shaft

3 False brinelling

OBSERVATION

- Corrosion due to friction between rolling elements and raceways

CAUSE

- In the static state, vibrations or oscillations shear the oil film

NTN Europe recommendations

- Avoid storing stationary rotating machines near sources of vibration such as a compressor or vibrating unit
- The bearings must be stored flat

4 Surface spalling initiated at the surface (ÉSIS)

OBSERVATION

- Surface spalling initiated at the surface

CAUSES

- Inadequate lubrication (quantity/quality)
- Rupture of the oil film
- Presence of small, very fine and hard particles

NTN Europe recommendations

- Check the temperature level
- Choose a suitable lubricant (quantity and viscosity) as well as an automatic lubrication system
- Avoid the intrusion of solid particles and liquids during and after mounting

5 DEEP spalling initiated at a depth (ÉPIS)

OBSERVATION

- Spalling initiated on a surface defect (indentation, impact, corrosion, excess stress, etc.)

CAUSES

- Solid contamination
- Impact
- Entry of corrosive liquid
- Misalignment or deformation of the housing or the shaft

NTN Europe recommendations

- Avoid introducing contaminants when mounting
- Control the geometry and quality of seats to avoid stresses due to misalignment in the bearings

6 DEEP spalling initiated at a depth (ÉPIP)

OBSERVATION

- Spalling that is generally elliptical

CAUSE

- Cyclic stresses (causing the natural death of the bearing due to fatigue)

NTN Europe recommendations

- Use a monitoring system on equipment to detect vibrations and noises associated with the start of spalling due to fatigue
- Follow a predictive maintenance schedule for bearing replacement
- Make sure the bearing is compatible

7 Electro-erosion

OBSERVATION

- Piqûres ou cannelures

CAUSE

- An electric current passing through a bearing

NTN Europe recommendation

- Make sure electric currents do not pass through the bearing. For generator and electric motor applications, choose NTN MEGAOHM insulated bearings

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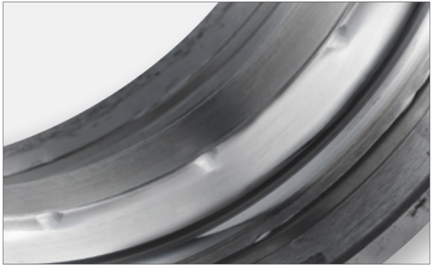
8 Plastic deformation

OBSERVATION

- Marks from rolling housings on raceways

CAUSE

- Incorrect mounting or significant and short overload



NTN Europe recommendations

- Use the correct mounting method and SNR tools
- Ensure rolling elements do not transmit a static overload

9 Rupture

OBSERVATION

- Ring rupture

CAUSE

- Shocks, overload, bending force, fatigue or thermal overstresses

NTN Europe recommendations

- Never strike a bearing directly with a hammer
- Check the conditon of the seats before mounting
- Use the correct mounting method and suitable tools
- Quickly replace a noisy bearing

10 Wear under the action of particles

OBSERVATION

- Matt surface, streaks or pits on rolling housings and raceways

CAUSE

- Solid particle abrasion in boundary lubrication

NTN Europe recommendations

- Choose a sealing device that is effective against the penetration of solid particles (seals, shields)
- Make sure to use a clean lubricant for maintenance
- Use a lubricant

11 Wear by friction

OBSERVATION

- Metal elements welded to one another

CAUSE

- Significant sliding due to temperature rise

NTN Europe recommendations

- Use a suitable lubricant in terms of quantity and quality and a suitable bearing in terms of load and speed

12 Spalling by axial overload

OBSERVATION

- Presence of spalling on one side of the bearing raceways

CAUSE

- Excessive axial load

NTN Europe recommendations

- Check the floating bearing is free to move

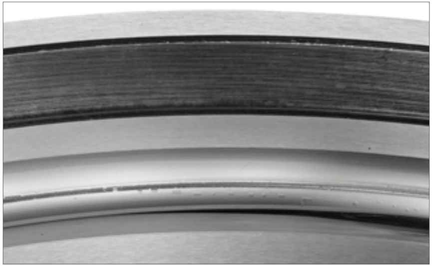
13 Indentations

OBSERVATION

- Holes on the surface of the raceway by rolling hard particles between rolling elements and raceways under load

CAUSE

- Pollution of the lubricant with hard particle



NTN Europe recommendations

- Identify the origin of the pollution: metal chips in the lubricant, spalled bearing, etc.

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