



# DIAGNOSTICS

## BEARING FAILURES

NTN® **SNR**®

[www.ntn-snr.com](http://www.ntn-snr.com)



With You

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-SNR 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.

## PRINCIPALES CAUSES D'AVARIES

**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-SNR 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 support

### NTN-SNR 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-SNR 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-SNR 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 (ÉPIP)

### 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-SNR 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-SNR 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

- Pits or grooves

### CAUSES

- An electric current passing through a bearing

### NTN-SNR RECOMMENDATION

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



## 8

# PLASTIC DEFORMATION

## OBSERVATION

- Marks from rolling housings on raceways

## CAUSE

- Incorrect mounting or significant and short overload

## NTN-SNR RECOMMENDATIONS

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



## 9 RUPTURE

### OBSERVATION

- Ring rupture

### CAUSES

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

### NTN-SNR RECOMMENDATIONS

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



## 10 WEAR UNDER THE ACTION OF PARTICLES

### OBSERVATION

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

### CAUSES

- Solid particle abrasion in boundary lubrication

### NTN-SNR RECOMMENDATIONS

- Choose an NTN-SNR 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-SNR RECOMMENDATION

- 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-SNR RECOMMENDATION

- Check the floating bearing is free to move





## 13 INDENTATIONS

### OBSERVATION

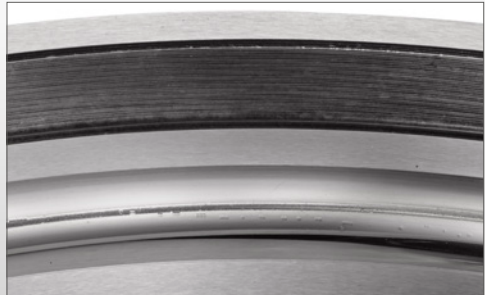
- Holes on the surface of the raceway by rolling hard particles between rolling elements and raceways under load

### CAUSE

- Pollution of the lubricant with hard particle

### NTN-SNR RECOMMENDATION

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









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