

9. Trouble-shooting Bearing Problems

Rolling contact bearings must be carefully handled, mounted, and maintained in order to operate satisfactorily.

The cause of unsatisfactory operation must be determined to prevent recurrence. There are three categories of data which should be gathered to enable the correct diagnosis of bearing problems:

- Time of occurrence.
- Symptoms during operation.
- Condition of bearing.

Although the origin of bearing problems can sometimes be determined using data from only one of the data categories, quick and accurate analysis requires as much data as possible.

See Tables 9.1, [9.2](#) and [9.3](#).

Table 9.1 Time of Occurrence

Time of Occurrence \ Cause	Bearing selection	Design or manufacture of other drive parts	Lubricant type, system or amount	Defective bearing	Bearing installation	Seal failure
Soon after installation	○	○	○	○	○	
Soon after periodic disassembly			○		○	
Soon after re-lubrication			○			
After replacement or repair of other drive parts		○	○		○	
During normal operation						○

Table 9.2 Symptom During Operation

Operation condition		Cause	Remarks
Noise	Low level metallic sound	Impressions on raceway	Check with audiophone, vibration pickup, etc.
	High level metallic sound	Loss of clearance, poor lubrication	
	Irregular sound	Excess clearance, contaminants, defect of rolling element surface, improper lube	
	Ever-changing sound	Change of clearance by temperature rise Defect in progress on raceway	
Abnormal temperature rise		Loss of clearance, creep, insufficient or excess lubricant, excess load	Use a surface thermometer.
Reduction in accuracy		Raceway or rolling element broken by impurities, or insufficient lubricant	Example: Lathe: stick-slip marks Grinder: wavy pattern Cold roll mill: occulating wave pattern
Unstable operation		Broken raceway, rolling element Foreign matter Excess clearance	Example: vibration
Contaminated lubricant		Poor lubrication, foreign matter, wear	

Table 9.3**(1) Premature Flaking****(2) Seizure****(3) Breakage****(4) Brinelling****(5) Fretting****(6) Smearing****(7) Excessive Wear****(8) Rusting, Corrosion****(9) Creep**

(1) Premature Flaking

The repeated heavy stress cycle between the bearing raceway and rolling element surface results in fatigue cracks which become loosened from bearing materials.

■ Causes

- Abnormal axial load or excessive load caused by expanded shaft.
- Deflection or misalignment of shaft.
- Poor parallelism of inner and outer rings.
- Poor lubrication
- Rusting, Nicks, Galling from dirt, etc.

■ Countermeasures

- Abnormal axial load or excessive load caused by expanded shaft.
- Deflection or misalignment of shaft.
- Poor parallelism of inner and outer rings.
- Poor lubrication
- Rusting, Nicks, Galling from dirt, etc.



(2) Seizure

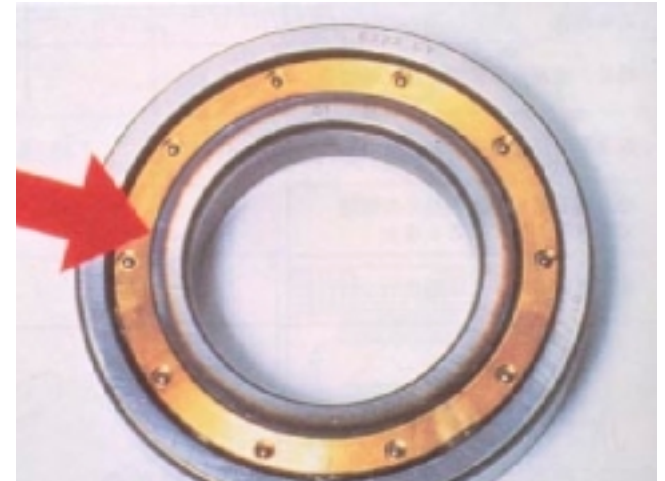
Bearing is seized up by excessive heat. Discoloration, softening and fusion of raceway and rolling element.

■ Causes

- Loss of clearance
- Operating over limiting speed
- Poor or improper lubricant.

■ Countermeasures

- Review fitting and bearing clearance.
- Review type of bearing.
- Select a proper lubricant, and feed it in proper quantity.



(3) Breakage

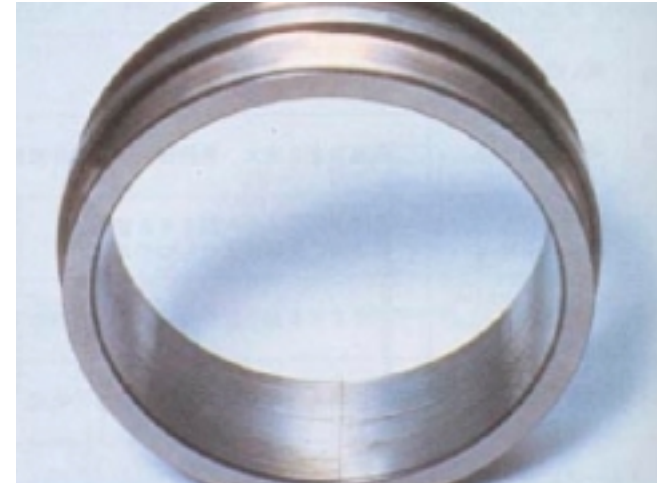
Splits and cracks in the inner/outer ring or rolling element.

■ Causes

- Excessive interference fit.
- Bearing seat has larger corner radius than bearing.
- Excess clearance during operation.
- Excess impact load.

■ Countermeasures

- Check fits. Finish shaft and sleeve to higher accuracy.
- Make shaft corner radius smaller than that of the bearing.
- Check fits and bearing clearance.
- Re-check load conditions.



(4) Brinelling

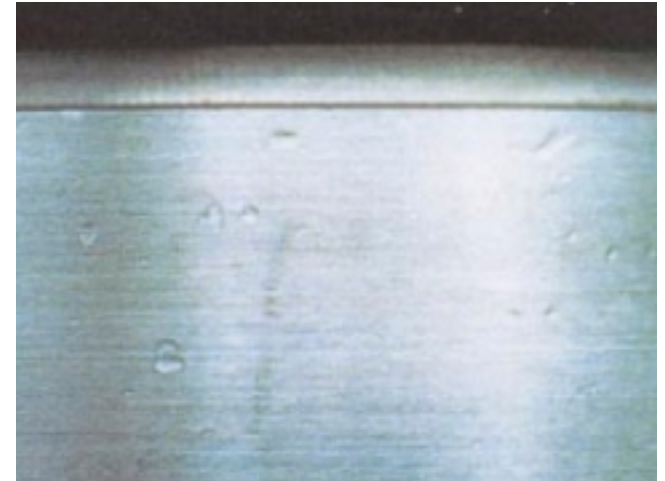
Brinelling, indentation and pear skin of bearing raceway and rolling element.

■ Causes

- Impact applied during mounting.
- Impact from dropped bearing
- Contamination
- Load applied to bearing at rest in excess of static load rating.

■ Countermeasures

- Carefully handle the bearing.
- Clean shaft and housing
- Improve the sealing
- Re-check load conditions.



(5) Fretting

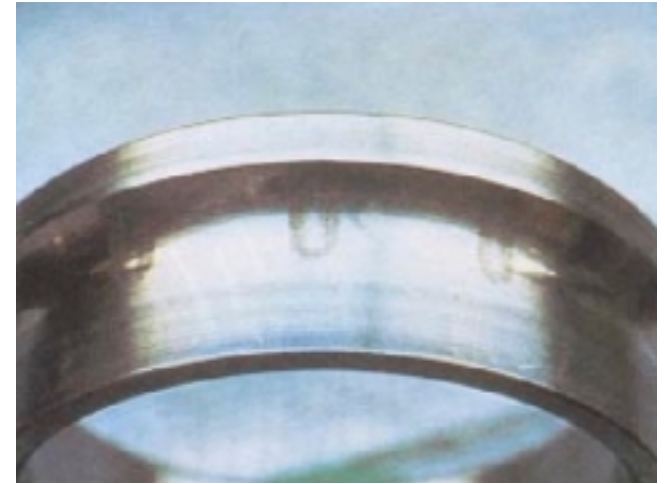
Occurred when a small relative motion is repeatedly caused in non rotating bearing. Fretting surface wear producing red colored particles at fitting surface.

■ Causes

- Vibration applied to bearing at rest (e. g. during shipment)
- swing with smaller amplitude.
- Minute clearance on fit surface.
- Slight sliding during operation as a result reduced interference under a load.

■ Countermeasures

- Fix the shaft and housing during shipment.
- Apply a preload. Use oil for lubrication.
- Increase the interference.
- Apply oil



(6) Smearing

Metal to metal contact due to the destruction of oil film.
Sliding motion between outer/inner ring and rolling element.

■ Causes

- Excess axial load. Misalignment of bearing.
- Poor lubrication.
- Intrusion and galling of foreign matter.
- High acceleration on start-up.

■ Countermeasures

- Correct mounting errors.
- Review the load condition.
- Select a proper lubricant, and feed it in proper quantity.
- Improve the sealing.
- Clean shaft and housing.
- Avoid sharp acceleration.



(7) Excessive Wear

Abnormal wear of flange face, rolling element and retainer.

■ Causes

- Foreign matter and corrosion acting as lapping agent
- Insufficient or incorrect lubricant.

■ Countermeasures

- Improve sealing
- Clean shaft and housing
- Check lubricant for type and amount.



(8) Rusting, Corrosion

Rusting and corrosion of bearing ring and rolling element surface.

■ Causes

- Improper storage, cleaning.
- Improper washing oil.
- Poor rust prevention
- Corrosive gas, liquid or water.
- Handling with unprotected hand.
- Chemical action of lubricant.

■ Countermeasures

- Improve storage and handling.
- Re-check washing oil
- Review rust prevention.
- Improve sealing
- Correct handling.
- Check lubricant.



(9) Creep

Galling, wear, sliding and discoloration of fit face.

■ Causes

- Insufficient interference.
- Insufficient tightened sleeve.
- Insufficient surface pressure due to low rigidity and inaccurate shaft and housing.

■ Countermeasures

- Check fits.
- Tighten sleeve
- Redesign for greater rigidity.

