Emerson Bearing
Service. Inventory. Solutions.

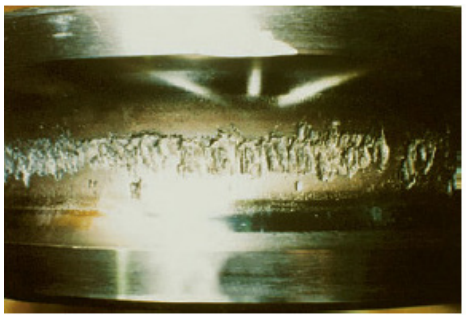
Bearing Failure Analysis

The accurate diagnosis of a bearing failure is imperative to prevent repeated failures and their additional expenses. While performing failure analysis is commonly left to outside vendors, the actual collecting of information can make a great difference in correctly diagnosing a bearing failure.

Here are some common failure types. Contact Us for further assistance.

Flaking

Surface of the raceway and rolling elements peels away in flakes Conspicuous hills and valleys form soon afterward.



Causes

- Excessive load, fatigue life, improper handling
- Improper mounting
- Improper precision in the shaft or housing
- Insufficient clearance
- Contamination
- Rust
- Improper lubrication
- Drop in hardness due to abnormally high temperatures

Correction

- Select a different type of bearing
- Reevaluate the clearance
- Improve the precision in the shaft or housing
- Review application conditions
- Improve assembly method and handling
- Reevaluate the layout (design) of the area around the bearing
- Review lubricant type and lubrication methods

Peeling

Patches of minute flaking or peeling. Innumerable hair•line cracks visible though not yet peeling.

Causes

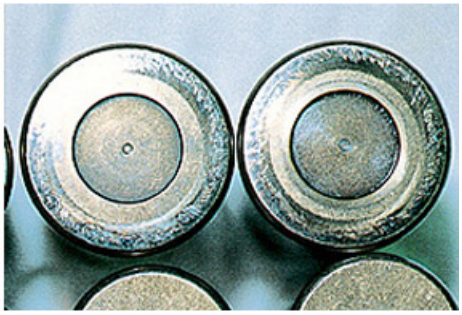
- Infiltration of bearing by foreign matter
- Insufficient lubrication

Correction

- Reevaluate of lubrication type and lubrication methods.
- Improve sealing performance (to prevent infiltration of foreign matter)
- Take care of operate smoothly

Spalling

Score accompanying seizing. Mounting score in axial direction. Scores on roller end face and guide rib•cycloidal scores. Scratches in spinning direction on raceway surface and rolling contact surfaces.



Causes

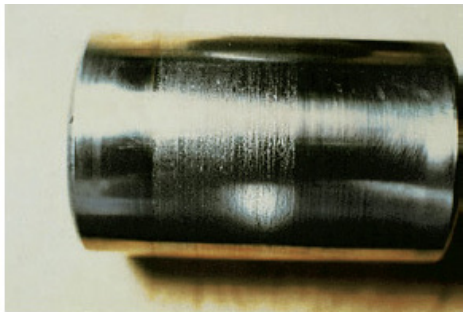
- Poor mounting and removing practice
- Oil film discontinuation on the contact surface due to excessive radial load, foreign object trapping, or excessive pre•load
- Slippage or poor lubrication of rolling elements

Correction

- Improvement in mounting and removing procedures
- Improvement in operation conditions
- Correction of pre•load
- Selection of adequate lubricant and lubrication system
- Improvement of sealing efficiency

Smearing and Scuffing

The surface becomes rough and some small deposits form. Scuffing generally refers to roughness on the race collar and the ends of the rollers.



Causes

- Inadequate lubrication
- Entrapped foreign particles
- Roller skewing due to a misaligned bearing
- Bare spots in the collar oil film due to large axial loading
- Surface roughness
- Excessive slippage of the rolling elements

Correction

- Reevaluation of the lubricant type and lubrication method
- Bolster sealing performance
- Review preload
- Review service conditions
- Improve assembly method and handing

Wear

The surfaces wear and dimensional deformation results. Wear is often accompanied by roughness and scratches.

Causes

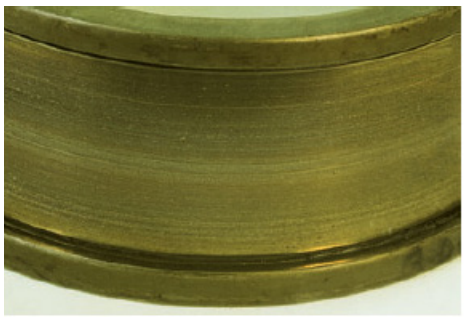
- Entrapment of foreign particles in the lubricant
- Inadequate lubrication
- Skewed rollers

Correction

- Review lubricant type and lubrication method
- Improve sealing performance
- Take steps to prevent misalignment

Speckles and Discoloration

Luster of raceway surfaces is gone; surface is matted, rough, and / or evenly dimpled. Surface covered with minute dents.



Causes

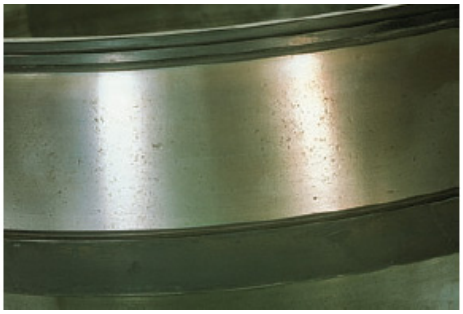
- Infiltration of bearing by foreign matter
- Insufficient lubrication

Correction

- Reevaluation of the lubricant type and lubrication method
- Review sealing mechanisms
- Examine lubrication oil purity (filter may be excessively dirty, etc.)

Indentations / Dents and Scratches

Scoring during assembly, gouges due to hard foreign objects, and surface denting due to mechanical shock.



Causes

- Entrapment of foreign objects
- Bite•in on the flaked•off side
- Dropping or other mechanical shocks due to careless handing
- Assembled misaligned

Correction

- Improve handling and assembly methods
- Bolster sealing performance (measures for preventing foreign matter from getting in)
- Check area surrounding bearing (when caused by metal fragments)

Chipping

Partial chipping of inner ring, outer ring, or rolling elements.

Causes

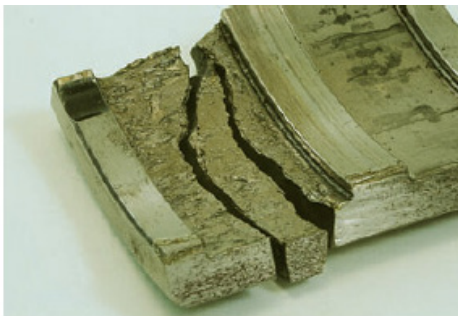
- Trapping of large solid foreign objects impacts or excessive load
- Poor handling

Correction

- Trouble shooting and improvements of impacts and excessive load
- Improvement in handling
- Improvement in sealing characteristics

Cracking and Notching

Localized flaking occurs. Little cracks or notches appear.



Causes

- Excessive shock loads
- Improper handling (use of steel hammer, cutting by large particles of foreign matter)
- Formation of decomposed surface layer due to improper lubrication
- Excessive interference
- Large flaking
- Frication cracking
- Imprecision of mounting mate (oversized fillet radius) radius)

Correction

- Review lubricant (friction crack prevention)
- Select proper interference and review materials
- Review service conditions
- Improve assembly procedures and take more care in handling

Rust and Corrosion

Luster of raceway surfaces is gone; surface is matted, rough, and / or evenly dimpled. Surface covered with minute dents.

Causes

- Poor storage conditions
- Poor packaging
- Insufficient rust inhibitor
- Penetration by water, acid, etc.
- Handling with bare hands

Correction

- Take measures to prevent rusting while in storage
- Periodically inspect the lubricating oil
- Improve sealing performance
- Improve assembly method and handling

Seizing / Seizure

Scoring during assembly, gouges due to hard foreign objects, and surface denting due to mechanical shock.

Causes

- Insufficient clearance (including clearances made smaller by local deformation
- Insufficient lubrication or improper lubrication
- Excessive loads (excessive preload)
- Skewed rollers
- Reduction in hardness due to abnormal temperature rise

Correction

- Review lubrication type and quantity
- Check for proper clearance
- Take steps to prevent misalignment
- Review application conditions
- Improve assembly method and handling

Fretting and Fretting Corrosion

Partial chipping of inner ring, outer ring, or rolling elements.

Causes

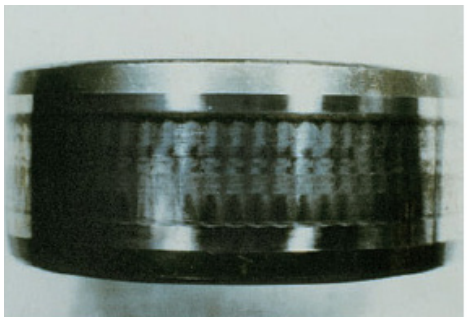
- Insufficient interference
- Small bearing oscillation angle
- Insufficient lubrication (unlubricated)
- Fluctuating loads
- Vibrating during transport, vibration while stopped

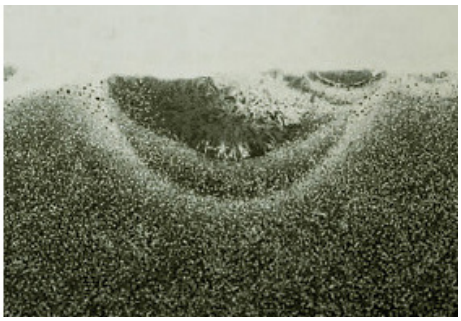
Correction

- Select a different kind of bearing
- Select a different type of lubricant
- Review the interference and apply a coat of lubricant to fitting surface
- Pack the inner and outer rings separately for transport

Electrical Pitting / Electrolytic Corrosion

Localized flaking occurs. Little cracks or notches appear.





Causes

- Electric current flowing through the rollersradius)

Correction

- Create a bypass circuit for the current
- Insulate the bearing

Rolling Path Skewing

Luster of raceway surfaces is gone; surface is matted, rough, and / or evenly dimpled. Surface covered with minute dents.

Causes

- Shaft or housing of insufficient accuracy
- Improper installation
- Insufficient shaft or housing rigidity
- Shaft whirling caused by excessive internal bearing clearances

Correction

- Reinspect bearing's internal clearances
- Review accuracy of shaft and housing finish
- Review rigidity of shaft and housing

Damage to Retainers / Cage Damage

Scoring during assembly, gouges due to hard foreign objects, and surface denting due to mechanical shock.

Causes

- Excessive moment loading
- High speed or excessive speed fluctuations
- Inadequate lubrication
- Impact with foreign objects
- Excessive vibration
- Improper mounting (mounted misaligned)

Correction

- Reevaluation of lubrication conditions
- Review of cage type selection
- Investigate shaft and housing rigidity
- Review service conditions
- Improve assembly method and handling

Creeping

Partial chipping of inner ring, outer ring, or rolling elements.

Causes

- Insufficient interference in the mating section
- Sleeve not fastened down properly
- Abnormal temperature rise
- Excessive loads

Correction

- Reevaluate the interference
- Reevaluate usage conditions
- Review the precision of the shaft and housing
- Raceway end panel scuffing