

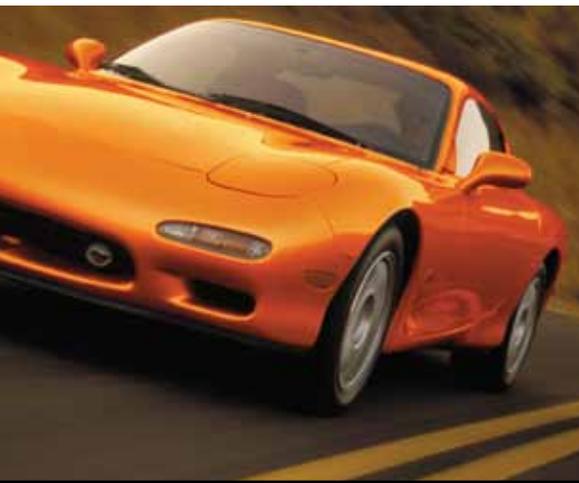
Automotive TechTips

TIMKEN
Where You Turn

Volume 7 • Issue 2 Part 2 of a 2-Part Series

Maximizing bearing performance and life remains an objective throughout The Timken Company, from design teams and manufacturing associates to our field sales team and distributors. TechTips help you install and maintain Timken® bearings, seals and components to maximize their life and performance and the systems in which they operate. For more information regarding Timken automotive products and services, visit www.timken.com or contact your local Timken distributor.

BALL BEARING DAMAGE ANALYSIS



The most common types of bearing damage that may result in a reduction of bearing or application life are often caused by:

- insufficient maintenance practices***
- mishandling***
- improper installation and fitting practices***
- inadequate lubrication***
- excessive application loads***
- contamination***

The following offers a quick reference to the common types/causes of bearing damage.

FRETTING CORROSION



Fretting on inner ring due to out-of-round shaft.



Fretting on the outer ring due to out-of-round housing bore.

FOREIGN MATERIAL / CONTAMINATION



Fine particle abrasive wear on the inner race, commonly known as 'frosting'.



Gross contamination resulting from harsh operating conditions and/or seal failure.



Lubrication characteristics of the grease are compromised by water ingress.

FATIGUE SPALLING



Inclusion origin: spalling from oxides or other hard inclusions in bearing steel.



Geometric stress concentration (GSC): spalling from misalignment, system deflections or heavy loading.



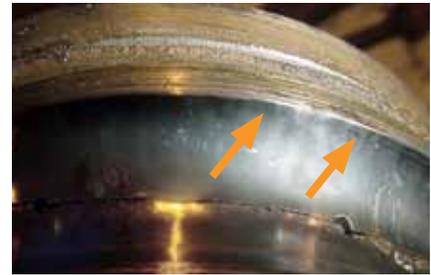
Point surface origin (PSO): spalling from contamination in the ball path or raised metal exceeding the lubricant film thickness.

GREASE ETCHING



Chemical reaction of grease and moisture in a prolonged static condition resulting in pitting and corrosion. A 'witness mark' is generated at each ball location on the inner race.

TRUE BRINELLING



Damage from shock or excessive loads.

FALSE BRINELLING



Wear caused by vibration or axial movement between the balls and races in a static condition.

⚠ WARNING Failure to observe the following warnings could create a risk of serious injury.

Proper maintenance and handling procedures are critical. Always follow installation instructions and maintain proper lubrication.

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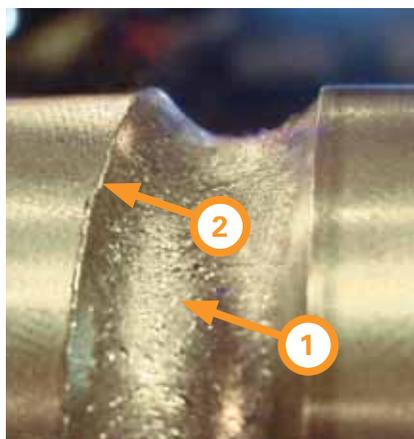


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INADEQUATE LUBRICATION



Metal-to-metal contact from lubricant film breakdown resulting in a: 1) polished appearance on the inner race followed by an orange peel texture and, 2) raised edge on the thrust shoulder.

OVERLOAD



Softening and deformation of the thrust shoulder caused by excessive loads. The discoloration on the inner ring is the result of elevated temperatures.

IMPROPER INSTALLATION



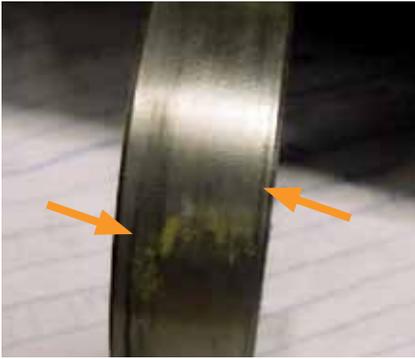
Bearing supported by only one-third of its outer ring width within housing.



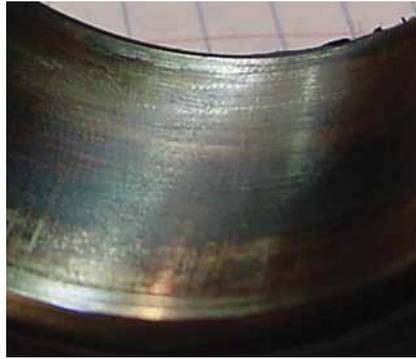
Distorted seal due to interference with adjacent mating parts.



Seal damage due to improper installation procedure and/or tools.



Irregular marks on the outer ring caused by improper seating in the housing.



Loose inner ring fit on a rotating shaft resulting in discoloration from heat generation.

CAGE DAMAGE



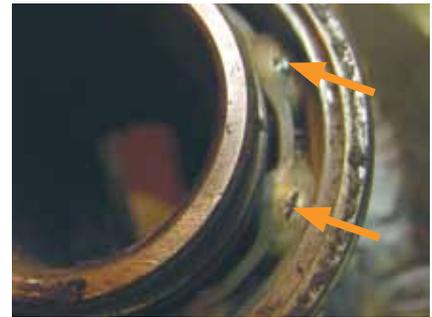
Metal cage damage due to misalignment or excessive speed.



Axial crack on inner ring due to oversized or out-of-round shaft.



Inner ring cracking due to excessive taper on the shaft.



Polymer cage damage due to improper installation procedure. The bearing seal was pressed into the cage.

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