Tapered Roller Bearing Damage

Recognizing causes and types of bearing damage can help you prevent further damage resulting in improved bearing life and performance.

Fatigue Spalling

Geometric stress concentration (GSC): Misalignment, system deflections and heavy loading.

Point surface origin (PSO): Debris and raised metal exceeding the lubricant film thickness.

Inclusion origin: Oxides or other hard inclusions in bearing steel.

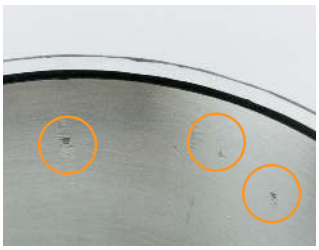
Deformation

Bearing cone (inner race) large rib face deformation: Metal flow from excessive heat generation.

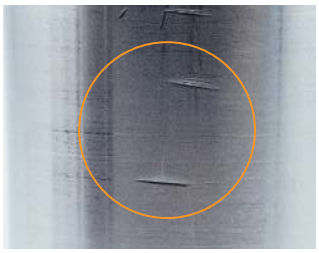
Deformation

Total bearing lock-up: Rollers skew and slide sideways.

Handling Damage



Roller spaced nicking: Raised metal on races from contact with roller edges.



Roller nicking and denting: Rough handling or installation damage.

Bearing cup (outer race) face denting: Indentations from hardened driver.

Skill Level: Easy | Special Tools: None

TIMKEN

Cage Damage

Cage deformation: Improperly installed or dropped bearing.

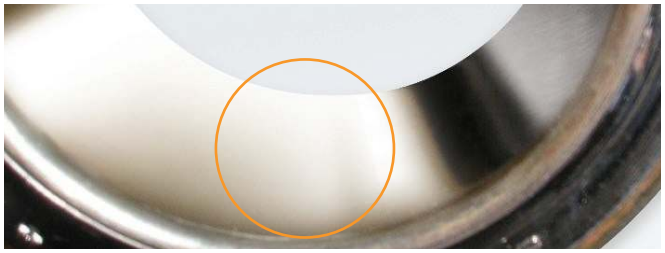
Rollers binding and skewing: Cage ring compressed or interfered with during installation or service.

Excessive End Play Damage

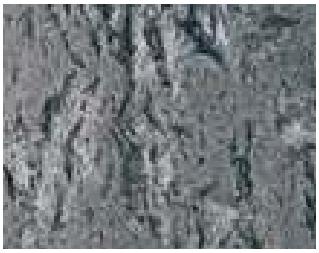
Cage pocket wear: Heavy contact between rollers and cage pocket surfaces caused by bearing operating too loosely.

Scalloping: Uneven localized wear resulting from excessive end play.

Excessive Preload or Overload Damage



Bearing cone (inner race) bore polishing: Contact wear and creeping on shaft caused by lack of lubrication and cone bore contraction from excessively tight setting (preload).



Full race width fatigue spalling: Caused by heavy loads creating a thin lubricant film and elevated temperatures.

*Damage caused by excessive preload can appear similar to damage caused by inadequate lubrication.

Scoring

Roller end scoring: Metal-to-metal contact from breakdown of lubricant film.

Bearing cone (inner race) large rib face scoring: 'Welding' and heat damage from metal-to-metal contact.

Improper Fit Damage

Bearing cone (inner race) bore damage: Fractured cone due to out-of-round or oversized shaft.

Improper Fit Damage

Bearing cup (outer race) spinning: Loose cup fit in a rotating wheel hub.

Foreign Material Damage

Abrasive wear: Fine abrasive particle contamination.

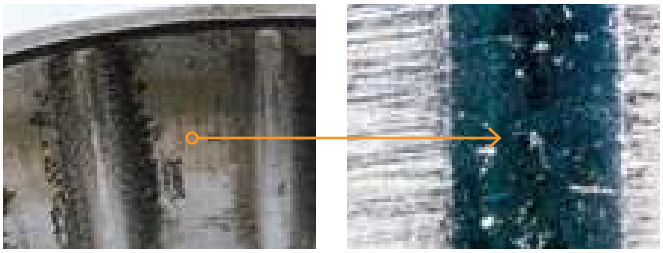
Bruising: Debris from other fatigued parts, inadequate sealing or poor maintenance.

Grooving: Large particle contamination embedding into soft cage material.

Peeling

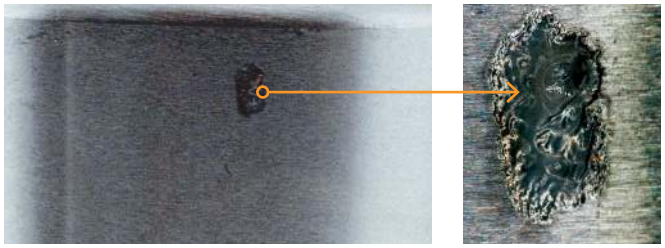
Micro-spalling: due to thin lubricant film from high loads and low RPM or elevated temperatures.

False Brinelling

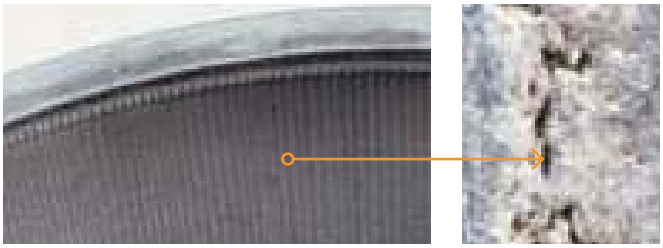


Wear caused by vibration or relative axial movement between rollers and races.

Electric Current Damage



Electric arc pitting: Burns created by improper electric grounding while bearing is stationary.



Fluting: Series of axial burns caused by electric current passing through the bearing while rotating.

Visit timken.com/techseries
to enroll in free technical training.

Get more TechTips online at
www.timken.com/techtips

Corrosion/Etching Damage

Staining: Surface stain with no significant corrosion from moisture.

Etching: Rusting with pitting and corrosion from moisture.

Line spalling: Roller spaced spalling from bearings operating after etching damage.

True Brinelling

Damage from shock or impact.

Misalignment Damage

Irregular roller path from deflection, inaccurate machining or wear of bearing seats.

High Spots In Cup Seats

Localized spalling on the bearing cup (outer race) from stress riser created by split housing pinch point.

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

Never spin a bearing with compressed air. The components may be forcefully expelled.
Proper maintenance and handling practices are critical. Always follow installation instructions and maintain proper lubrication.
A bearing/component should not be put into service if its shelf life has been exceeded.

CAUTION
Failure to follow these cautions may result in property damage

Use of improper bearing fits may cause damage to equipment.
Do not use damaged bearings.

TechTips is not intended to substitute for the specific recommendations of your equipment suppliers.

Every reasonable effort has been made to ensure the accuracy of the information contained in this writing, but no liability is accepted for errors, omissions or for any other reason.

TIMKEN

The Timken team applies their know-how to improve the reliability and performance of machinery in diverse markets worldwide. The company designs, makes and markets high-performance mechanical components, including bearings, gears, belts, chain and related mechanical power transmission products and services.

www.timken.com/aftermarket

Stronger. **Commitment.** Stronger. **Value.** Stronger. **Worldwide.** Stronger. **Together.** | **Stronger.** By Design.