

# BEARING DAMAGE ANALYSIS

**TIMKEN**

## FOREIGN MATERIAL

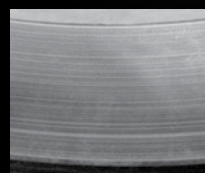
Typical causes include improper cleaning methods, poor oil filtration or seal wear which can lead to Point Surface Origin (PSO) spalls.



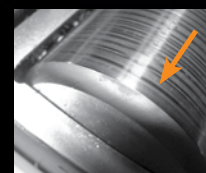
*Fine particle contamination*



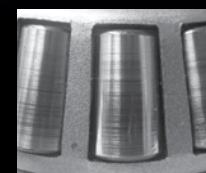
*Hard particle contamination*



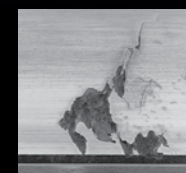
*Circumferential grooving*



*Circumferential grooving*



*Circumferential grooving*



*Point Surface Origin (PSO) spalling*

## CORROSION/ETCHING

Typical causes include damaged packaging, improper storage and worn or damaged seals.



*Light corrosion on the outer race*



*Advanced etching*



*Advanced corrosion and etching*



*Etching and corrosion*

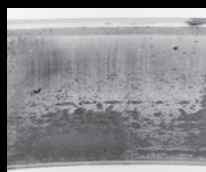


*Roller-spaced spalling*

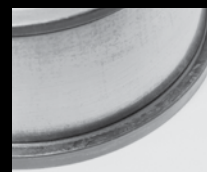


## INADEQUATE LUBRICATION

Typical causes include improper grease or oil viscosity, low lubricant flow rate, thin lube film from high loads/low RPM or high operation temperatures.



*Peeling*



*Rib and roller end heat damage*



*Rib and roller end heat damage*



*Scoring damage on roller end*



*Race deformation from excessive heat generation*



*Cage damage from bearing lockup*



*Cage damage from bearing lockup*

## EXCESSIVE PRELOAD AND OVERLOAD

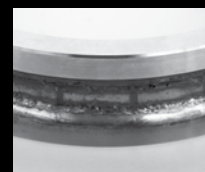
Typical causes include high load, misalignment and stress concentration.



*Fatigue resulting from heavy loads*



*Severely fatigued rollers from heavy load*



*Fatigue spalling from excessive preload*



*Severe peeling and spalling from heavy loads*



## MISALIGNMENT

Typical causes include high load, shaft or housing deflection, inaccurate housing or shaft machining, or misalignment during machinery setup.



*Elliptical roller path caused by misalignment*



*Geometric Stress Concentration (GSC) spalling on inner ring*



*Geometric Stress Concentration (GSC) spalling on outer ring*

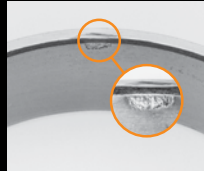


*Geometric Stress Concentration (GSC) spalling*

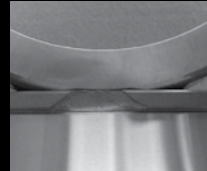


## HANDLING DAMAGE

Typical causes include improper tool selection (hardened drivers) and poor handling practices which can lead to Point Surface Origin (PSO) spalls.



*Outer ring denting*



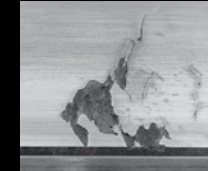
*Fractured inner ring rib*



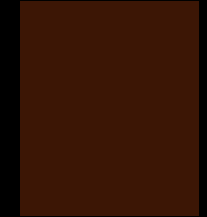
*Roller spaced nicking*



*Nicks and dents caused by rough handling*

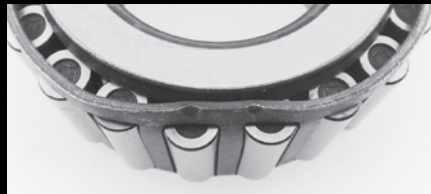


*Point Surface Origin (PSO) spalling*



## CAGE DAMAGE

Typical causes include improper handling, incorrect installation tools or poor installation procedures.

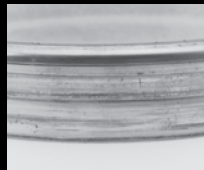


*Cage deformation*

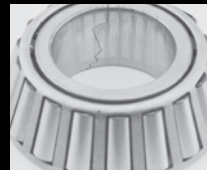


## IMPROPER FITTING PRACTICES IN HOUSING OR ON SHAFT

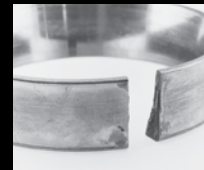
Typical causes include wrong size and poor form, shaft or housing stress risers and inaccurate machining.



*Loose outer ring fit in a wheel hub*



*Fracture on inner ring*



*Loose fit resulting in stretched and broken cup*

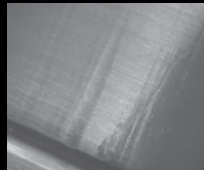


*Fractured wide inner ring with locking collar due to undersized shaft*

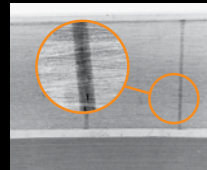


## BRINELL AND IMPACT DAMAGE

Typical causes include rough handling and shock loads exceeding the material's limits.



*Roller impact damage*



*True metal deformation*

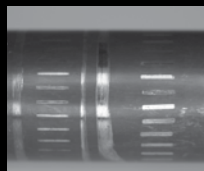


*Shock loading*

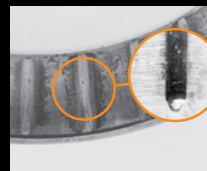


## FALSE BRINELLING

Typical causes include excessive vibration during shipment or when the shaft is stationary.



*False brinell on a shaft where a cylindrical bearing was mounted*



*Heavy false brinell on outer race*

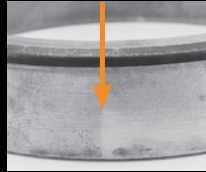


*Heavy false brinell on outer race*

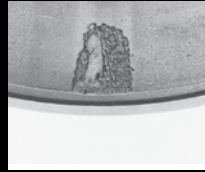


## HIGH SPOTS IN HOUSING

Typical causes include improper machining, grinding or repair methods.



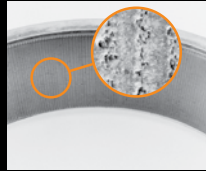
*Witness mark from high spot in the housing*



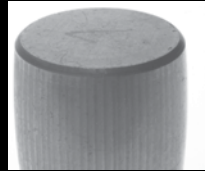
*Resulting localized spalling in raceway*

## BURNS FROM ELECTRIC CURRENT

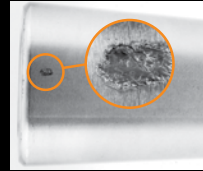
Typical causes include improper electrical grounding of equipment, welding damage or static discharge.



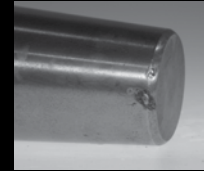
*Electric arc fluting*



*Fluting caused by electric current*



*Electric arc pitting*



*Roller with electric arc burns*



*Burns from electric current*

## ADHESIVE WEAR

Typical causes include improper oil film, excess cage friction and gross roller sliding.



*Roller flats, adhesive and skidding wear on raceway surface*



*Spherical roller bearing with adhesive wear*



*Roller end with adhesive wear*



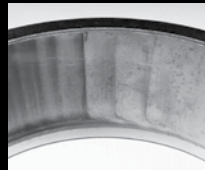
*Adhesive wear on bearing inner ring*

## EXCESSIVE ENDPLAY

Typical causes are improper setting leading to excessive looseness and small operating load zone.



*Wear at small ends of cage pocket and on roller bridges*



*Scalloping marks in the cup caused by excessive endplay*



*Cage pocket wear from excessive roller movement*

TO LEARN MORE ABOUT EACH DAMAGE MODE,  
CONTACT YOUR LOCAL TIMKEN SALES OR  
SERVICE REPRESENTATIVE.



### 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.

### 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.