

16. Bearing Damage and Corrective Measures

If handled correctly, bearings can generally be used for a long time before reaching their fatigue life. If damage occurs prematurely, the problem could stem from improper bearing selection, handling or lubrication. In this occurs, take note of the type of machine on which the bearings is used, the place where it is mounted, service

conditions and surrounding structure. By investigating several possible causes surmised from the type of damage and condition at the time the damage occurred, it is possible to prevent the same kind of damage from reoccurring. **Table 16.1** gives the main causes of bearing damage and remedies for correcting the problem.

Table 16.1 Bearing damage, main causes of bearing damage and remedies for correcting the problem

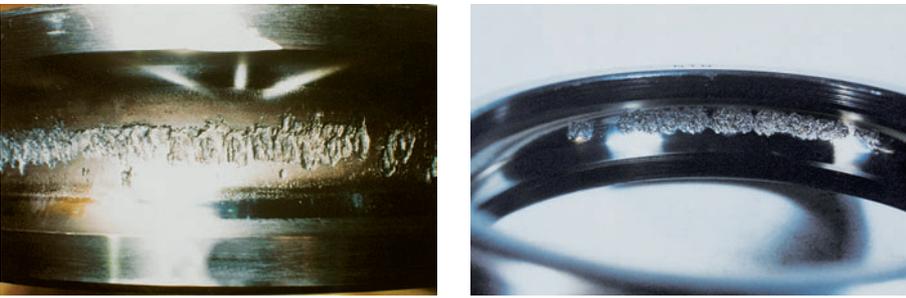
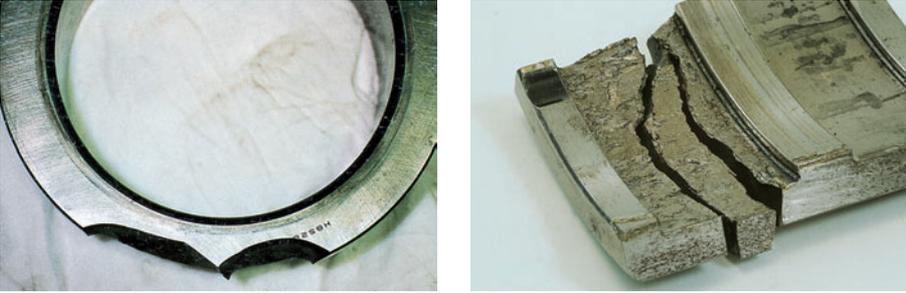
Description		
<p>Flaking</p> <p>Surface of the raceway and rolling elements peels away in flakes Conspicuous hills and valleys form soon afterward.</p> 	<p>Causes</p> <ul style="list-style-type: none"> • Excessive load, fatigue life, improper handling • Improper mounting. • Improper precision in the shaft or housing. • Insufficient clearance. • Contamination. • Rust. • Improper lubrication • Drop in hardness due to abnormally high temperatures. <p>Correction</p> <ul style="list-style-type: none"> • Select a different type of bearing. • Reevaluate the clearance. • Improve the precision of the shaft and 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. 	
<p>Seizure</p> <p>The bearing heats up and becomes discolored. Eventually the bearing will seize up.</p> 	<p>Causes</p> <ul style="list-style-type: none"> • Insufficient clearance (including clearances made smaller by local deformation). • Insufficient lubrication or improper lubricant. • Excessive loads (excessive preload). • Skewed rollers. • Reduction in hardness due to abnormal temperature rise <p>Correction</p> <ul style="list-style-type: none"> • Riview lubricant type and quantity. • Check for proper clearance. (Increase clearances.) • Take steps to prevent misalignment. • Review application conditions. • Improve assembly method and handling. 	
<p>Cracking and notching</p> <p>Localized flaking occurs. Little cracks or notches appear.</p> 	<p>Causes</p> <ul style="list-style-type: none"> • 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. • Friction cracking. • Imprecision of mounting mate (oversized fillet radius) <p>Correction</p> <ul style="list-style-type: none"> • Review lubricant (friction crack prevention). • Select proper interference and review materials. • Review service conditions. • Improve assembly procedures and take more care in handling. 	

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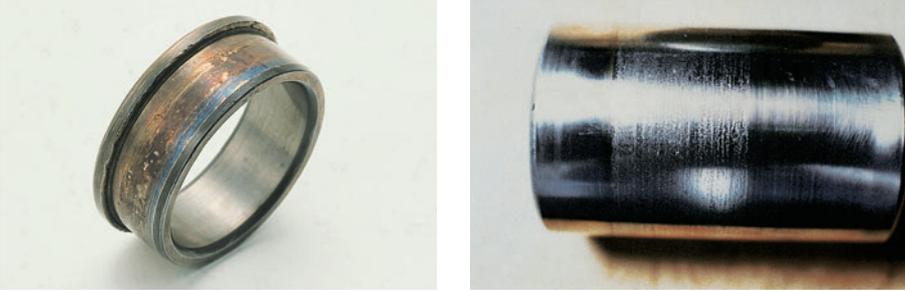
Description		
Cage damage Rivets break or become loose resulting in cage damage.		Causes <ul style="list-style-type: none"> Excessive moment loading. High speed or excessive speed fluctuations. Inadequate lubrication. Impact with foreign objects. Excessive vibration. Improper mounting. (Mounted misaligned)
		Correction <ul style="list-style-type: none"> Reevaluation of lubrication conditions. Review of cage type selection. Investigate shaft and housing rigidity. Review service conditions. Improve assembly method and handling.
Rolling path skewing Abrasion or an irregular, rolling path skewing left by rolling elements along raceway surfaces.		Causes <ul style="list-style-type: none"> Shaft or housing of insufficient accuracy. Improper installation. Insufficient shaft or housing rigidity. Shaft whirling caused by excessive internal bearing clearances.
		Correction <ul style="list-style-type: none"> Reinspect bearing's internal clearances. Review accuracy of shaft and housing finish. Review rigidity of shaft and housing.
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 <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> Reevaluation of the lubricant type and lubrication method. Bolster sealing performance. Review preload. Review service conditions. Improve assembly method and handling
Rust and corrosion The surface becomes either partially or fully rusted, and occasionally rust even occurs along the rolling element pitch lines.		Causes <ul style="list-style-type: none"> Poor storage conditions. Poor packaging. Insufficient rust inhibitor. Penetration by water, acid, etc. Handling with bare hands.
		Correction <ul style="list-style-type: none"> Take measures to prevent rusting while in storage. Periodically inspect the lubricating oil. Improve sealing performance. Improve assembly method and handling.

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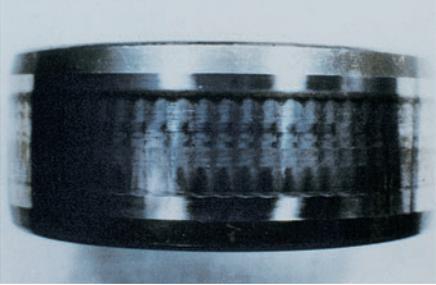
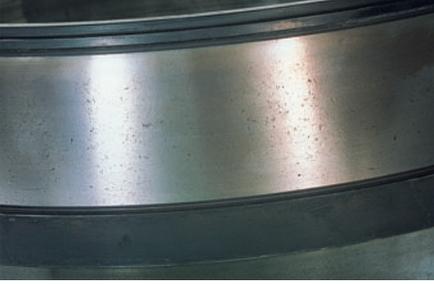
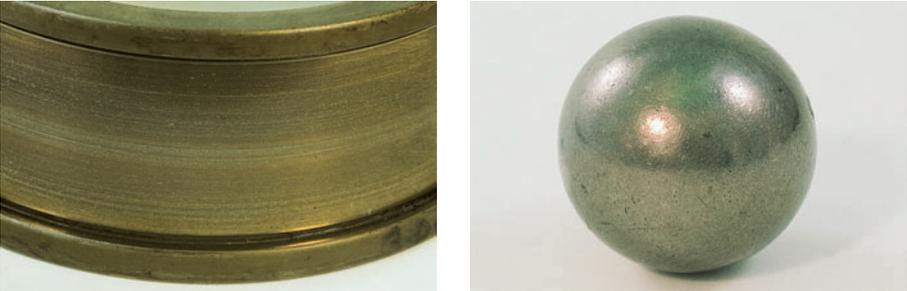
Description		
Fretting	There are two types of fretting. In one, a rusty wear powder forms on the mating surfaces. In the other, brinelling indentations form on the raceway at the rolling element pitch.	<div style="display: flex; flex-direction: column;"> <div style="background-color: #d3d3d3; padding: 5px; writing-mode: vertical-rl; transform: rotate(180deg);">Causes</div> <ul style="list-style-type: none"> ● Insufficient interference. ● Small bearing oscillation angle. ● Insufficient lubrication.(unlubricated) ● Fluctuating loads. ● Vibration during transport, vibration while stopped. <hr/> <div style="background-color: #d3d3d3; padding: 5px; writing-mode: vertical-rl; transform: rotate(180deg);">Correction</div> <ul style="list-style-type: none"> ● 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. </div>
		
Wear	The surfaces wear and dimensional deformation results. Wear is often accompanied by roughness and scratches.	<div style="display: flex; flex-direction: column;"> <div style="background-color: #d3d3d3; padding: 5px; writing-mode: vertical-rl; transform: rotate(180deg);">Causes</div> <ul style="list-style-type: none"> ● Entrapment of foreign particles in the lubricant. ● Inadequate lubrication. ● Skewed rollers. <hr/> <div style="background-color: #d3d3d3; padding: 5px; writing-mode: vertical-rl; transform: rotate(180deg);">Correction</div> <ul style="list-style-type: none"> ● Review lubricant type and lubrication methods. ● Improve sealing performance. ● Take steps to prevent misalignment. </div>
		
Electrolytic corrosion	Pits form on the raceway. The pits gradually grow into ripples.	<div style="display: flex; flex-direction: column;"> <div style="background-color: #d3d3d3; padding: 5px; writing-mode: vertical-rl; transform: rotate(180deg);">Causes</div> <ul style="list-style-type: none"> ● Electric current flowing through the rollers. <hr/> <div style="background-color: #d3d3d3; padding: 5px; writing-mode: vertical-rl; transform: rotate(180deg);">Correction</div> <ul style="list-style-type: none"> ● Create a bypass circuit for the current. ● Insulate the bearing. </div>
		
Dents and scratches	Scoring during assembly, gouges due to hard foreign objects, and surface denting due to mechanical shock.	<div style="display: flex; flex-direction: column;"> <div style="background-color: #d3d3d3; padding: 5px; writing-mode: vertical-rl; transform: rotate(180deg);">Causes</div> <ul style="list-style-type: none"> ● Entrapment of foreign objects. ● Bite-in on the flaked-off side. ● Dropping or other mechanical shocks due to careless handling. ● Assembled misaligned. <hr/> <div style="background-color: #d3d3d3; padding: 5px; writing-mode: vertical-rl; transform: rotate(180deg);">Correction</div> <ul style="list-style-type: none"> ● 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) </div>
		

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Description		
Creeping Surface becomes mirrored by sliding of inside and outside diameter surfaces. May be accompanied by discoloration or score.		Causes <ul style="list-style-type: none"> • Insufficient interference in the mating section. • Sleeve not fastened down properly. • Abnormal temperature rise. • Excessive loads.
		Correction <ul style="list-style-type: none"> • Reevaluate the interference. • Reevaluate usage conditions. • Review the precision of the shaft and housing. • Raceway end panel scuffing
Speckles and discoloration Luster of raceway surfaces is gone; surface is matted, rough, and / or evenly dimpled. Surface covered with minute dents.		Causes <ul style="list-style-type: none"> • Infiltration of bearing by foreign matter. • Insufficient lubrication.
		Correction <ul style="list-style-type: none"> • Reevaluation of lubricant type and lubrication method. • Review sealing mechanisms. • Examine lubrication oil purity. (filter may be excessively dirty, etc.)
Peeling Patches of minute flaking or peeling (size, approx. 10 μm). Innumerable hair-line cracks visible though not yet peeling. (This type of damage frequently seen on roller bearings.)		Causes <ul style="list-style-type: none"> • Infiltration of bearing by foreign matter. • Insufficient lubrication.
		Correction <ul style="list-style-type: none"> • Reevaluation of lubricant type and lubrication method. • Improve sealing performance. (to prevent infiltration of foreign matter) • Take care to operate smoothly.