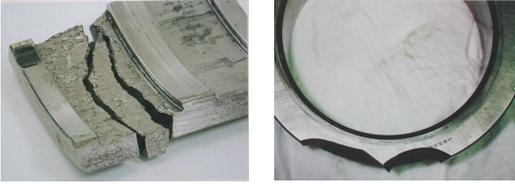
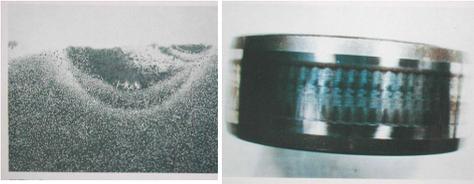
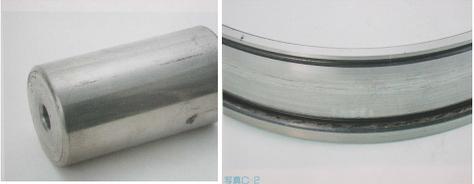


17. Bearing Damage and Corrective Measures

While it is of course impossible to directly observe bearings in operation, one can get a good idea of how they

are operating by monitoring noise, vibration, temperature and lubricant condition. Types of damage typically encountered are presented in Table 17.1.

	Description	Causes	Correction
<p>Flaking</p> 	<p>The surface of the race way wearing away. Conspicuous hills and valleys form soon thereafter.</p>	<ul style="list-style-type: none"> Excessive loads or improper handling. Improper mounting. Improper precision in the shaft or housing. Insufficient clearance. Contamination. Rust. Drop in hardness due to abnormally high temperatures. 	<ul style="list-style-type: none"> Review application conditions. Select a different type of bearing. Reevaluate the clearance. Improve the precision of the shaft and housing. Reevaluate the layout (design) of the area around the bearing. Review assembly procedures. Review lubricant type and lubrication methods.
<p>Seizure</p> 	<p>The bearing heats up and becomes discolored. Eventually the bearing will seize up.</p>	<ul style="list-style-type: none"> Insufficient clearance (including clearances made smaller by local deformation). Insufficient lubrication or improper lubricant. Excessive loads (excessive pressure). Skewed rollers. 	<ul style="list-style-type: none"> Check for proper clearance. (Increase clearances.) Review lubricant type and quantity. Review application conditions. Take steps to prevent misalignment. Reevaluate the design of the area around the bearing (including fitting of the bearing). Improve assembly procedures.
<p>Cracking and Notching</p> 		<ul style="list-style-type: none"> Excessive shock loads. Excessive interference. Large flaking. Friction cracking. Inadequate abutment or chamfer. Improper handling. (gouges from large foreign objects.) 	<ul style="list-style-type: none"> Review application conditions. Select proper interference and review materials. Improve assembly procedures and take more care in handling. Take measures to prevent friction cracking. (Review lubricant type.) Reevaluate the design of the area around the bearing.
<p>Retainer Damage</p> 	<p>Rivets break or become loose resulting in retainer damage.</p>	<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) Abnormal temperature rise. (Plastic retainers) 	<ul style="list-style-type: none"> Review of application conditions. Reevaluation of lubrication conditions. Review of retainer type selection. Take more care in handling. Investigate shaft and housing rigidity.
<p>Smearing</p> 	<p>The surface becomes rough and some small deposits form. Scuffing generally refers to roughness on the race collar and the ends of the rollers.</p>	<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. 	<ul style="list-style-type: none"> Reevaluation of the lubricant type and lubrication method. Review of operating conditions. Setting of a suitable pre-load. Improve sealing performance. Take care to handle the bearing properly.

	Description	Causes	Correction
<p>Rust and Corrosion</p> 	<p>The surface becomes either partially or fully rusted, and occasionally rust even occurs along the rolling element pitch lines.</p>	<ul style="list-style-type: none"> • Poor storage conditions. • Poor packaging. • Insufficient rust inhibitor. • Penetration by water, acid, etc. • Handling with bare hands. 	<ul style="list-style-type: none"> • Take measures to prevent rusting while in storage. • Improve sealing performance. • Periodically inspect the lubricating oil. • Take care when handling the bearing.
<p>Fretting</p> 	<p>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.</p>	<ul style="list-style-type: none"> • Insufficient interference. • Small bearing oscillation angle. • Insufficient lubrication. • Fluctuating loads. • Vibration during transport. 	<ul style="list-style-type: none"> • Review the interference and apply a coat of lubricant. • Pack the inner and outer rings separately for transport. • When the two cannot be separated, apply a pre-load. • Select a different kind of lubricant. • Select a different type of bearing.
<p>Wear</p> 	<p>The surfaces wear and dimensional deformation results. Wear is often accompanied by roughness and scratches.</p>	<ul style="list-style-type: none"> • Entrapment of foreign particles in the lubricant. • Inadequate lubrication. • Skewed rollers. 	<ul style="list-style-type: none"> • Review lubricant type and lubrication methods. • Improve sealing performance. • Take steps to prevent misalignment.
<p>Electrical Pitting</p> 	<p>Pits form on the raceway. The pits gradually grow into ripples.</p>	<ul style="list-style-type: none"> • Electric current flowing through the rollers. 	<ul style="list-style-type: none"> • Create a bypass circuit for the current. • Insulate the bearing so that current does not pass through it.
<p>Dents and scratches</p> 	<p>Scoring during assembly, gouges due to hard foreign objects, and surface denting due to mechanical shocks.</p>	<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. 	<ul style="list-style-type: none"> • Improve handling and assembly methods. • Take measures to prevent the entrapment of foreign objects. • Should the damage have been caused by little pieces of metal, thoroughly check all other locations.
<p>Slipping or Creep</p> 	<p>Slipping is accompanied by mirrorlike or discolored surfaces on the ID and OD. Scuffing may also occur.</p>	<ul style="list-style-type: none"> • Insufficient interference in the mating section. • Sleeve not fastened down properly. • Abnormal temperature rise. • Excessive loads. 	<ul style="list-style-type: none"> • Reevaluate the interference. • Reevaluate usage conditions. • Review the precision of the shaft and housing.

	Description	Causes	Correction
<p>Peeling</p>	<p>Patches of minute flaking or peeling (size, approx. 10 μ m). Innumerable hair-line cracks visible though not yet peeling. (This type of damage frequently seen on roller bearings.)</p>	<ul style="list-style-type: none"> • Infiltration of bearing by foreign matter. • Insufficient lubrication. 	<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.
			