



BEARING FAILURES:

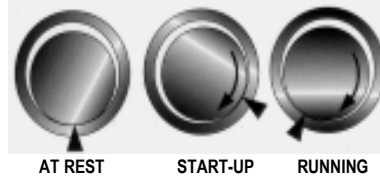
ANTI-FRICTION COMPONENTS



Engine bearings depend on a film of oil to keep shaft and bearing surfaces separated.

ENGINE BEARINGS RIDE ON A FILM OF OIL

OIL FILM FORMATION



Bearings fail when the oil film breaks down or when the bearing is overloaded. The oil film is generated by shaft rotation.

At rest, the shaft and bearing are in contact. On start-up the shaft rubs the bearing briefly. While running, the shaft pulls oil from the clearance space into the wedge-shaped area between the shaft and bearing. The oil wedge lifts the shaft off its bearing and supports it during engine operation. With normal operating conditions and a continuous supply of clean oil the shaft and bearing surfaces will remain separated. When bearing damage occurs you must determine and correct the cause before you install new parts.

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| | <p style="text-align: center;">NORMAL WEAR</p> <p>Appearance: Uniform wear pattern over approximately 2/3 of the bearing's surface. Wear should diminish near the parting line ends of the bearing, and the wear pattern should extend uniformly across the bearing in the axial direction.</p> |
| | <p style="text-align: center;">SCORING</p> <p>Appearance: Bearing surface deeply scratched and torn.</p> <p>Causes: Excessive foreign particle contamination. Poor crankshaft surface finish. Insufficient lubrication.</p> |
| | <p style="text-align: center;">HOT SHORT</p> <p>Appearance: Bearing surface wiped and torn, blackened from heat, with patches of lining material torn cleanly from steel backing.</p> <p>Causes: Breakdown of lubrication and resulting high friction elevates operating temperature. Lead in bearing material melts and allows shaft to tear away patches of bearing lining. Lack of lubrication. Wiping. Dirt contamination. Concentrated loading (misalignment, etc.).</p> |
| | <p style="text-align: center;">CORROSION</p> <p>Appearance: Bearing surface darkened, spongy, etched by chemical attack.</p> <p>Causes: Acids in oil. Excessive operating temperature. Excessive blow-by. Coolant contamination of oil. Use of high sulfur fuel. Excessive oil change interval.</p> |
| | <p style="text-align: center;">FRETTING</p> <p>Appearance: Bearing back polished from movement in housing. Areas of pock marks or build-up due to metal transfer between bearing and housing.</p> <p>Causes: Insufficient crush. Oversize housing. Bearing cap not torqued properly. Foreign object between cap and housing faces. Over-stressed cap bolts.</p> |
| | <p style="text-align: center;">WIPED</p> <p>Appearance: Bearing surface smeared or scratched and torn. Bearing metal melted and re-solidified along the edges.</p> <p>Causes: Lubrication system not primed before start-up. Clogged oil passage. Oil pump failure. Improper installation (oil hole blocked). Concentrated loading in localized area of bearing. Misalignment of shaft and bearing surfaces. Insufficient clearance.</p> |

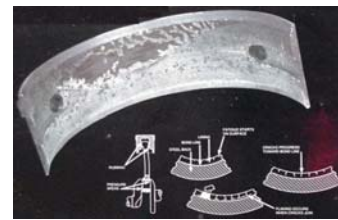
CAUSES AND PREVENTION



FATIGUE

Appearance: Bearing surface cracked, areas of lining broken out leaving craters with ragged edges.

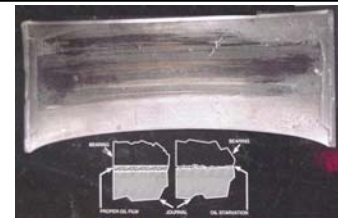
Causes: Overloading (lugging engine at low speed under high load, overfueling, detonation). Bearing material of inadequate fatigue strength for application. Localized concentration of load due to misalignment (edge loading, bent rod, tapered, hourglass, or barrel shaped housing or journal). Bearing lining weakened by corrosion.



OIL STARVATION

Appearance: Bearing surface streaked and smeared with worst damage at center. Heat discoloration. May show pick-up of bearing material on shaft depending on severity. NOTE: This condition will progress into "Wiping" and "Hot Short".

Causes: Low oil level, blocked oil pick-up, oil pump failure, blocked oil hole or oil passage, excessive dilution of oil by fuel or coolant, lubrication system not primed before start-up, overspeed.



OVERLAY FATIGUE

Appearance: Network of fine cracks in surface layer of a Trimetal bearing.

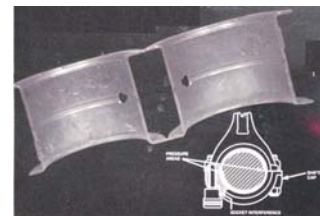
Causes: Overloading (lugging engine at low speed under high load, overfueling, detonation). Localized concentration of load due to misalignment (edge loading, bent rod, tapered, hourglass, or barrel shaped housing or journal). Note: Moderate overlay fatigue especially in localized areas may be considered part of the break-in process. Bearing may be re-used. Severe overlay fatigue, especially in a high-performance engine may be due to the wrong bearing selection. Use of special competition parts with thinner overlay is recommended.



CAP SHIFT

Appearance: Wear or fatigue near bearing parting lines on opposite sides in upper and lower bearing halves.

Causes: Mixed bearing caps. Reversed bearing cap. Poor doweling of cap to housing. Use of oversize socket. Housing not machined and assembled at same bolt torque. Mating faces of housing not flat and parallel.



ACCELERATED WEAR

Appearance: Wall thickness reduced from original dimension. Bearing surface worn and polished but not smeared, torn, or scored. No evidence of heat. No embedded foreign particles.

Causes: Poor journal surface finish. Wear in the presence of adequate lubrication to prevent heat build-up and wiping is caused by peaks in the journal surface finish profile which penetrate the oil film and abrade the bearing. Always grind opposite to rotation and polish in the direction of rotation.



DIRT ON BEARING BACK

Appearance: Concentrated area of distress on bearing I.D. with corresponding mark or discontinuity on O.D.

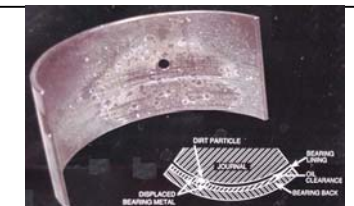
Causes: Foreign particle trapped between bearing back and housing. Damage to bearing back or housing bore (nick, burr, etc.). High spot on bearing back or housing bore due to fretting.



DIRT EMBEDMENT

Appearance: Bearing surface speckled, darkened and lightly or heavily scratched.

Causes: Foreign particle contamination. Engine components not thoroughly cleaned prior to assembly. Wear particles from another engine component. Faulty air filtration. Neglected oil filter replacement. Dirt entering engine during oil addition.



DISTORTED CRANKCASE

Appearance: With main bearings arranged as installed in the engine, bearings show a progression of damage from one to another.

Causes: Main bearing bores out of alignment. Engine overheating. Improper tightening of engine components (bearing caps, heads, manifolds, etc.). Engine not properly or uniformly supported (large stationary engines).

