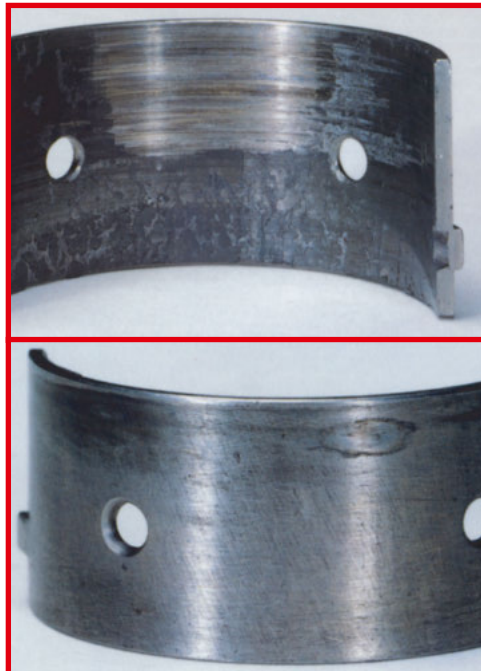


Inbuilt debris



Symptom: Localised surface disruption of bearing surface. The back of the bearing will be marked or indented behind the area of damage.
Cause: Foreign material assembled between the back of a bearing and its housing.
Effect: This causes bearing distortion, localised high pressures and breakdown of the lubricating oil film with consequent damage.
Remedy: Inspect the bearing housing and shaft for damage. Repair or replace as necessary. Ensure cleanliness when fitting new bearings.

Scoring by harmful particles



Symptom: Isolated deep scores in lining surface.
Cause: Isolated debris particles from casting or grinding processes passed the bearing without being embedded. Blocked oil filter.
Remedy: Ensure pristine cleanliness of components, tools and hands while working on an engine. Flush the engine with clean oil with external oilpump after finishing assembly works and prior to starting the engine. Replace oil filter according to manufacturer's specifications.

Erosion by dirt



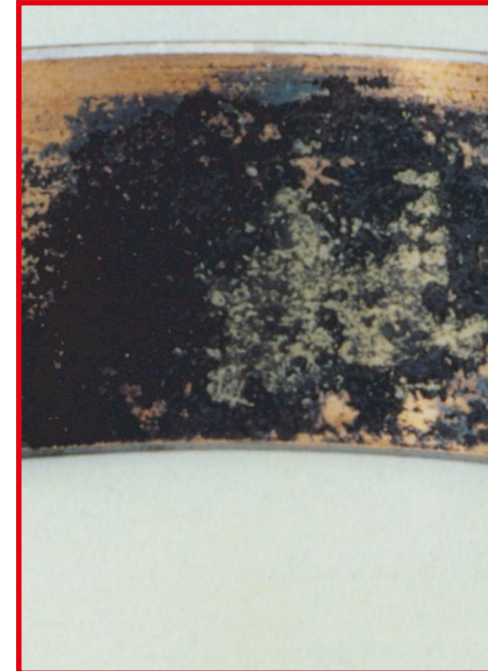
Symptom: Premature bearing wear. The internal surfaces may appear scratched and/or have embedded debris. Erosion may also be visible adjacent to an oil groove or hole.
Cause: Lubricating oil contaminated with abrasive material.
Remedy: Thoroughly clean the engine, including the lubrication system. This type of damage may affect all moving engine components, which should be inspected and repaired or renewed as necessary. Ensure that the air and oil filtration systems are functioning correctly and that all connections, pipes and oil galleries are in good condition, and without leaks. Pay particular attention to cleanliness when re-assembling the engine. Use clean, new engine oil.

Fretting corrosion on steelback



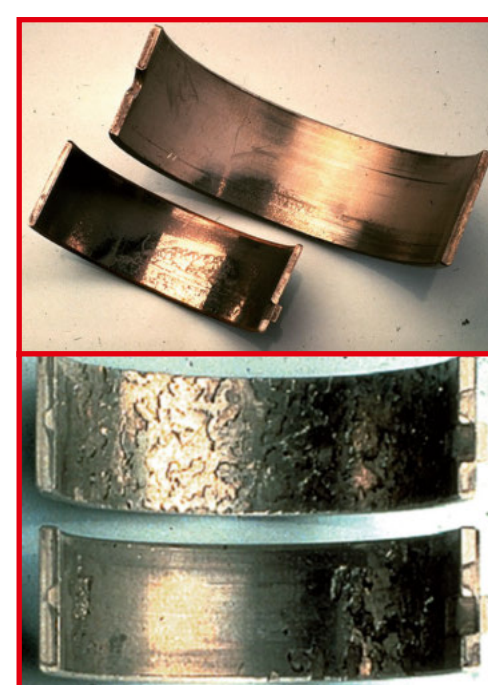
Symptom: Fretting marks on steelback of bearing shell, often located close to the parting lines of the shell.
Cause: Micro-movement of bearing shell versus housing bore surface due to loss of correct pressfit. Incorrectly tightened bearing bolts. Debris on parting faces of housing. Repeated or continuous engine overspeed. Use of bearing shells with incorrect spread.
Remedy: Tighten bearing bolts correctly. Check inner diameter of housing bore. Check cleanliness of housing parting faces. Prevent engine overspeed. Change oil and oil filter.

Bearing lining corrosion



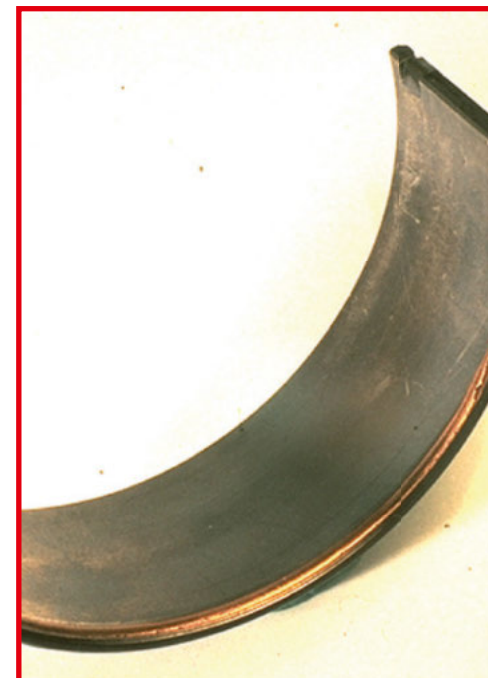
Symptom: Corrosion of the bearing material. The surface will be worn and discoloured with a porous appearance.
Cause: Engine has been used with degraded or contaminated oil that has become acidic. This firstly promotes wear of the bearing protective overlay plate, then corrosion of the bearing material because of exceeded oil change interval.
Remedy: Thoroughly clean the engine, paying particular attention to all the lubricating system. Inspect all bearings and bushes and renew any which may be damaged. Use clean, new engine oil.

Overplate fatigue



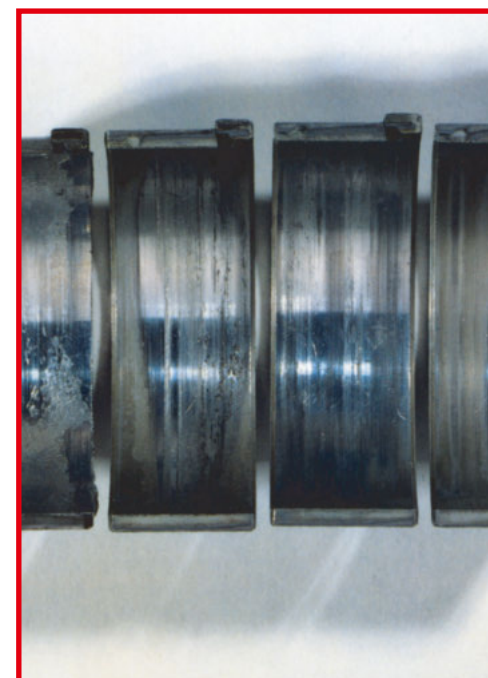
Symptom: Breakouts of lining material showing „bark-beetle“ pattern in main loaded zone of bearing.
Cause: Overloaded bearing material due to: Installation of non suitable bearings. Edge loading of bearing due to shaft deformation or imperfect shaft geometry. Irregular combustion. Engine tuning.
Remedy: Install correct bearing type. Check axial shape of journal. Check geometry and alignment of housing bore. Check operation conditions.

Fillet override



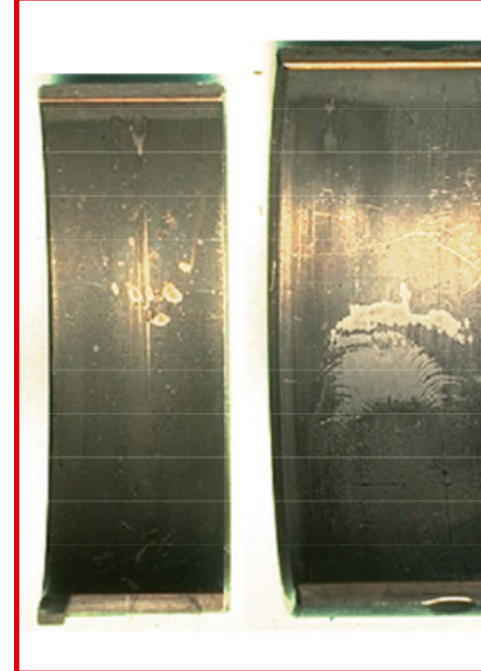
Symptom: Inner surface of bearing contacts journal fillet on one or both ends of the shell. Lining material is worn down at bearing edge(s) along its circumference.
Cause: Bearing shell is too wide. Inner chamfer of shell is too small. Journal was incorrectly ground; fillet(s) are too wide. Clearance of thrust bearing is too wide. Incorrect alignment of thrust bearing.
Remedy: Check type of bearing shell, bearing width and size of chamfer. Inspect shape of journal fillets. Check axial clearance of crankshaft.

Insufficient lubrication



Symptom: Wiping or melting of the bearing surface which may progress to fatigue and destruction of the bearing material.
Cause: Disruption of the oil film between a bearing and its journal. This results in prolonged metal to metal contact with consequent friction and high temperatures which melt the bearing material. Intermittent or failure of the oil supply, misalignment between housing and journal, distorted or misshaped housing or journal can all cause oil film disruption.
Remedy: Ensure that the lubrication system is clean and functioning correctly. Inspect journals and housing for size, shape and alignment. Correct as necessary, fit new bearings.

Overplate erosion by cavitation



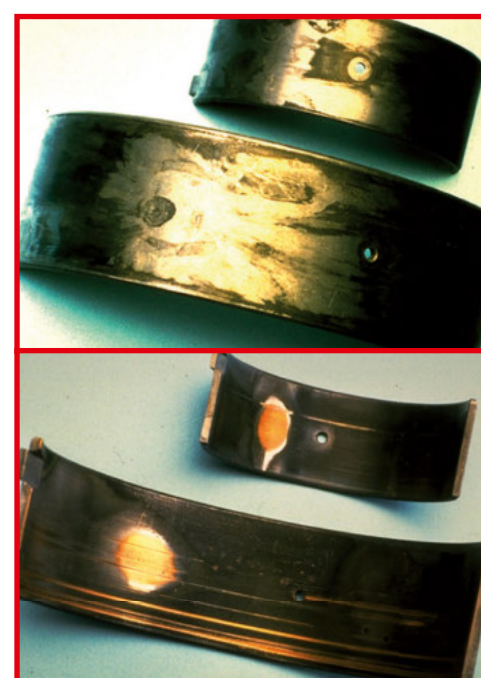
Symptom: Overplate material is locally resolved from sliding surface. Faulty spots are located symmetric or centric in bearing sliding surface or behind end of an oil groove.
Cause: Water or coolant in engine oil. Excessive oil flow velocity. Knocking combustion. Incorrect, big bearing clearance. Oil aeration.
Remedy: Check water content in engine oil. Safeguard correct bearing clearance and oil flow. Check combustion and engine operation conditions.

Misalignment



Symptom: Overplate wear only in the crown area of bearing shell towards the edge zones. Worn zones are shifted against each other in circumferential direction.
Cause: Centerlines of bearing and journal are not parallel.
Remedy: Connecting rod: Check big end bore: centerline of housing bore must point exactly perpendicular to the thrustface levels of conrod. Make sure both thrustface levels are exactly parallel.
Main bearing: Check alignment of housing bores in main bearing line.

Local overplate wear due to tin flash migration on steelback



Symptom: Heavy local overplate wear. Local concentration of tin on steel back.
Cause: Micro-movement of bearing shell versus housing bore surface due to low pressfit.
Remedy: Check inner diameter of housing bore. Check cleanliness of housing parting faces. Tighten bearing bolts correctly.

