KMP BRAND TECHNICAL BULLETIN

ENGINE BEARING FAILURES

KB-15002

ENGINE BEARING FAILURES

The service life of the bearings are expected to be the same as the overhaul life of the engine ***under normal operating conditions and recommended maintenance practices.***

It is important to have an effective preventative maintenance program for the engine and its supporting systems, because this will maximize the engine bearing life.

Preventative maintenance starts with the operator conducting a **daily inspection of the engine for correct fluid levels** and the replenishment of any low fluids.

Periodic maintenance inspection of the **engines air inlet, cooling, fuel, and exhaust systems** must be scheduled as each of these related systems can affect the life of engine bearings.

These periodic inspection schedules are available in the appropriate manufacturer's engine service manual.

Maximum bearing life, as well as long engine life, will depend upon the implementation of an established maintenance program that is strictly adhered to.

The majority of bearing failures (approximately 45%) are caused by dirt and foreign particles which result from either careless handling, lack of cleanliness, or failure to follow a maintenance program.

Ensure that the engine oil used in the engine meets the manufacturer's lubricating oil requirements. The requirements for proper lubricating oil are based on SAE Viscosity Grade and API Service Designation.

Filters make up an integral part of the fuel and lubricating systems, therefore proper filter selection and maintenance are important to achieve satisfactory engine operation and service life. However it is important to remember that filters should be used to maintain a clean system, not to clean up a contaminated one !!

It should be noted that filter performance and test specifications vary between manufacturers.

INVESTIGATING A BEARING FAILURE

Determining the primary cause of engine bearing damage is critical to the continued satisfactory operation of the engine after it has been repaired, because if the reasons are not determined, then the rebuilt engine may experience a repeat failure.

The investigation of bearing damage should consider all the facts and conditions related to the damage, do all the bearings exhibit the same wear patterns or is only one of the bearings damaged?

Sometimes secondary damage can make it difficult to determine the primary cause.

It is important to examine all engine components as the engine is disassembled.

Examination of only the damaged bearing is only one step in determining the cause of the failure.

It is important to be familiar with the types of engine bearings and the way they are manufactured when trying to determine the primary cause of bearing damage.

There are three basic constructions for the connecting rod and crankshaft bearings these are illustrated below.

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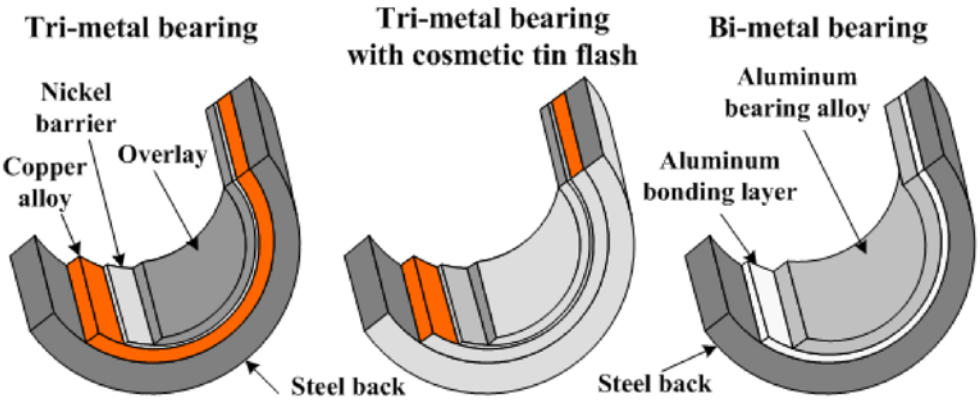
ENGINE BEARING FAILURES



Flashing - Tin plating covering the entire bearing for the protection prior to installation.
Overlay - Alloy mainly of lead with tin to provide embedability, conformability, and protection against marginal lubrication.
Barrier - Nickel layer plated over the lining to prevent chemical reaction between the lining and overlay.
Lining - Alloy mainly of copper and lead for maximum fatigue strength.
Backing - Made of steel to provide support for the bearing lining.

The main bearings consist of an upper and lower shell.
The lower shell is fitted into the removable cap that supports the crankshaft.
To obtain maximum load carrying capacity the lower shell has no oil hole or grooves, whereas the upper shell is grooved or slotted and is located in the engine block bores.
Lubrication is channelled through the grooves and holes from the crankshaft main journals, it is therefore important that upper and lower main bearing shells must not be reversed in their position in the engine.
In order to prevent an incorrect installation from happening, the locating tang on the upper and lower shells are normally in different positions.
The connecting rod bearings also have an upper and lower shell and these are fitted in a similar manner to the main bearings.
The upper shell may or may not have a means of supplying lubricating oil to the piston pin/bushings and cool the underside of the piston.
The locating tangs are provided in order to assist in installing the shells in the correct position in the bore of the connecting rod.

Statistics indicate that the percentage of bearing failures are attributed to the causes shown in the table below.

MAJOR CAUSES OF PREMATURE BEARING FAILURE

Dirt 45.4%

Misassembly 12.8%

Misalignment 12.6%

Insufficient Lubrication.....11.4%

Overloading 8.1%

Corrosion 3.7%

Improper Journal Finish 3.2%

Other 2.8%

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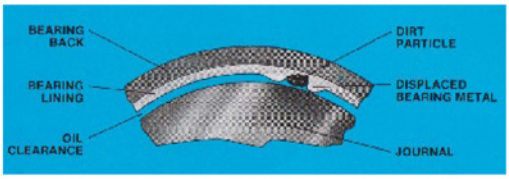
Damage from Oil Contamination

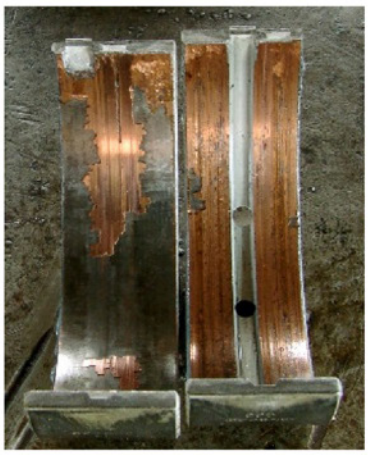


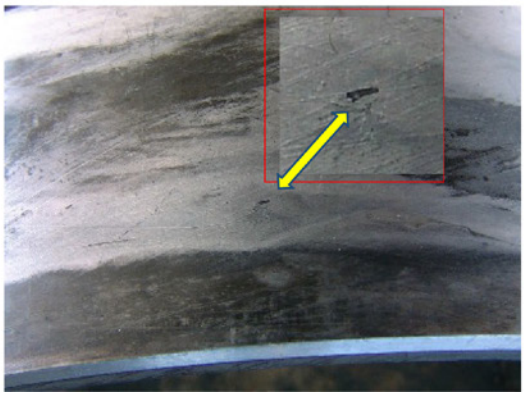
Foreign particles are embedded in the lining of the bearing whilst the larger particles pass between the ?oil clearance" and create light to heavy gouge marks in the surface of the bearing lining as illustrated above.

Possible causes

- Inadequate cleaning of the engine and components prior to assembly.
- Contamination (dust/dirt) entering the engine through the air-intake manifold or faulty air filtration.
- Debris generated by the wear of other engine parts and this then enters the circulating engine oil.
- Failure to replace oil filter and/or air filter at specified service intervals.

Damage from Assembly Contamination





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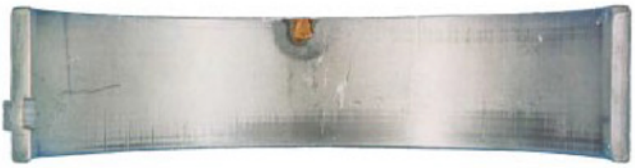
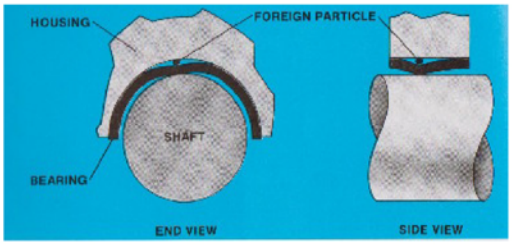
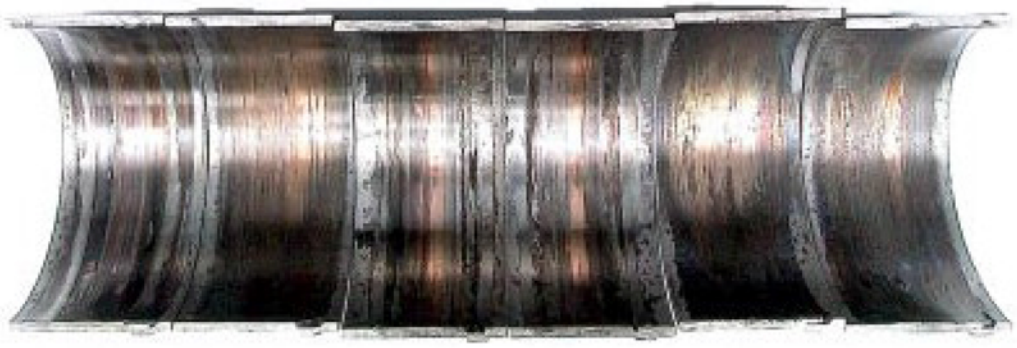


Foreign particle between the bearing and its housing which prevents proper contact of the bearing back with the surface of the housing base. Adequate contact is necessary for the efficient transfer of heat away from the bearing surface. Localised heat combined with uneven load distribution will reduce the life of the bearing and wear patterns similar to the examples above will be evidenced on the affected bearings.



Damage from Lack of Lubrication



Without sufficient lubrication to separate the running surfaces the bearing and journal come into contact and the frictional heat that is created will rapidly destroy the bearings as evidenced above.

There are several possible causes for this type of failure, besides the obvious one that the engine was started without oil in the sump !!

- Proper oil flow prevented by blocked oil galleries
- Oil suction line damaged or blocked
- Clogged oil filter
- Oil pump not functioning correctly
- Defective oil pressure relief valve
- Inadequate priming of lubrication system prior to start-up
- If undersize bearings were used there could have been insufficient oil clearance (the use of Plastigage® during assembly will eliminate this possibility)
- Oil dilution either from fuel or coolant
- An assembly error – further explanation will follow

The term "lack of lubrication" can be a misleading term because it is sometimes assumed that one is implying that there was no oil in the engine.

Wiping and Hot Short are other terms which are used when metal to metal contact occurs, but they have also resulted because the oil film was eliminated or greatly reduced; the important point is to establish why the phenomena occurred.

To be continued

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