KMP BRAND TECHNICAL BULLETIN

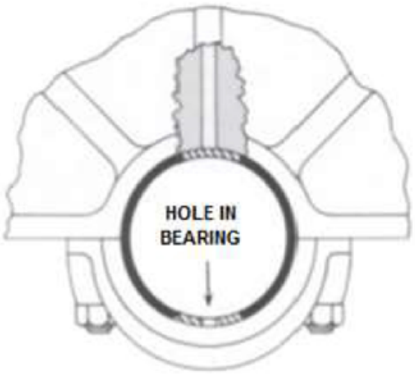
ENGINE BEARING FAILURES PART 2

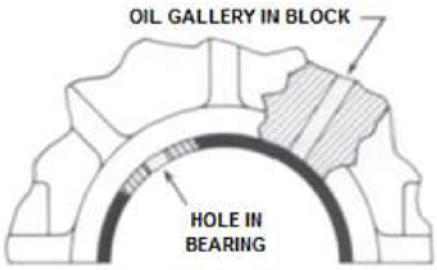
KB-15002-2

ENGINE BEARING FAILURES

ASSEMBLY ERRORS

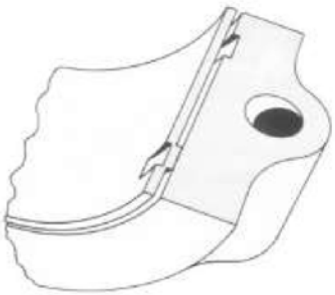
Engine bearings will not function properly if they are installed wrong. In many cases, incorrect assembly will result in premature failure of the bearing.
The following illustrations show some typical assembly errors which can be made during the installation of engine bearings.



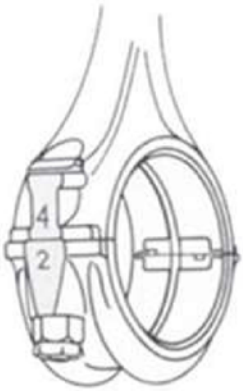


OIL HOLE IN BEARING NOT ALIGNED

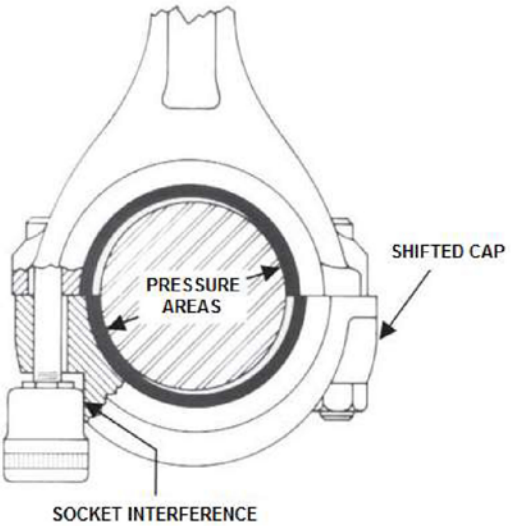
The illustrations below indicates the resultant damage, note that after one of these failures only one pair of shells sustained damage.



LUG NOT LOCATED
CORRECTLY



WRONG BEARING CAP OR
CAP IS REVERSED



SOCKET INTERFERENCE

In all of the above instances the assembly error will have created an area of abnormal pressure and as a consequence the loss of lubrication will create excessive localised wear in that area.
The wear pattern will be very similar to the example shown for "excessive crush".

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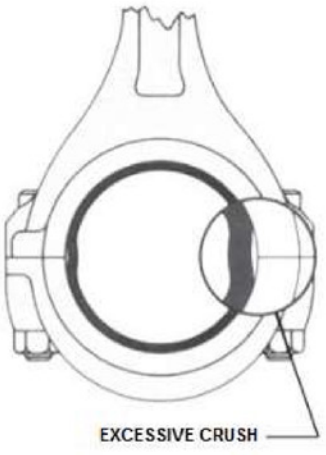
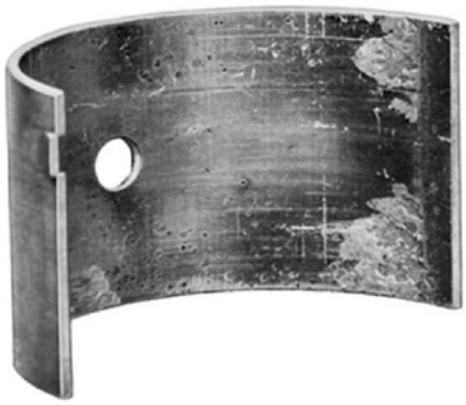
ENGINE BEARING FAILURES

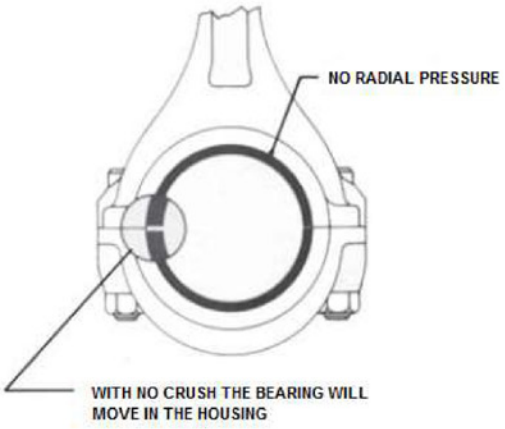
EXCESSIVE CRUSH

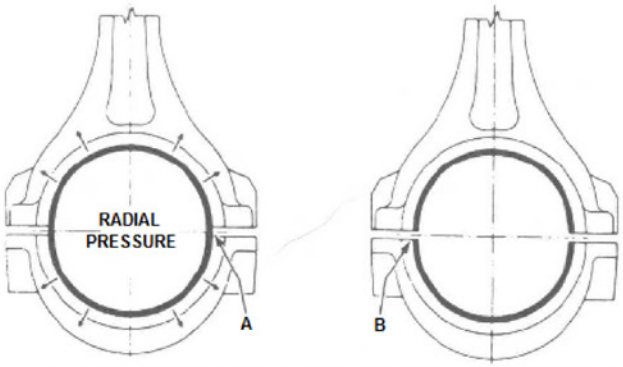




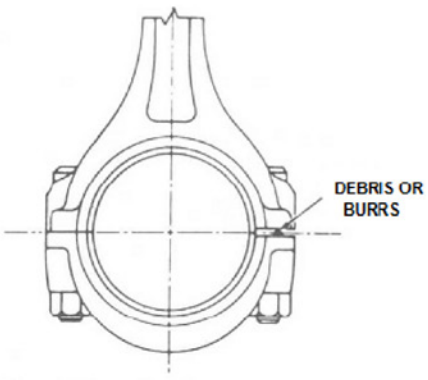
When the bearing shell is fitted into its location there is a small amount of material which extends beyond the housing and only when the bearing cap is tightened into position the bearing shells are then forced tightly into the housing; the good contact also creates the necessary heat transfer – so the "extra" material is referred to as the bearing crush.
However, if there is too much crush then the additional material will bulge as indicated above, and this will cause the type of damage shown in the illustration on the right. So what could result in this type of failure ?
Machining had taken place on the mating faces of the housing, either to remove fretting marks or reduce oil clearance, or, the bearing cap fasteners were over-tightened at assembly.

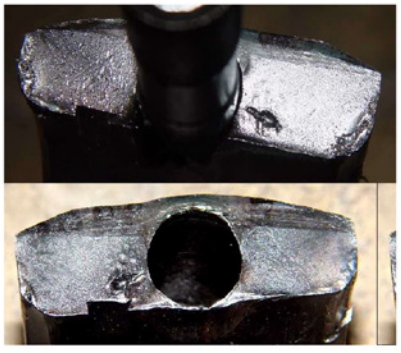
INSUFFICIENT CRUSH





BEARING PARTING FACES AT "A" HAVE BEEN FILED DOWN "B" WHICH ELIMINATES THE RADIAL PRESSURE





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ENGINE BEARING FAILURES

Wear pattern created on the back of the bearing due to the movement.

Fretting and polishing due to movement.

Oil has worked its way into the space between the two surfaces and resulted in these markings.

Insufficient crush results in the loss of radial pressure and therefore there is inadequate heat transfer into the bearing housing; this is necessary to avoid the bearing from overheating which causes the deterioration of the bearing material, the consequence of which is evidenced below.

To summarise, insufficient crush may have resulted for any one of the following reasons:-
Bearing parting faces filed down because it was assumed this would achieve a better fit.
Debris or burrs trapped between the mating faces of the bearing cap.
The housing bore was the incorrect size.
Fasteners were not correctly torqued during assembly – note the additional information.

When fasteners are not correctly torqued the consequences can be far more catastrophic than just a bearing failure – loose connecting rod fasteners could result in a completely destroyed engine when the rod separates from the crankshaft.

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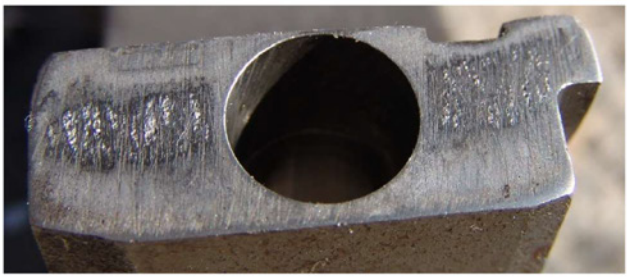
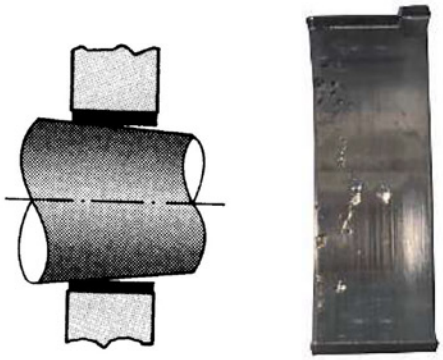
Inspection of the mating faces clearly evidence the presence of fretting (as a result of movement), and the photograph on the right shows the normal appearance of a mating face.

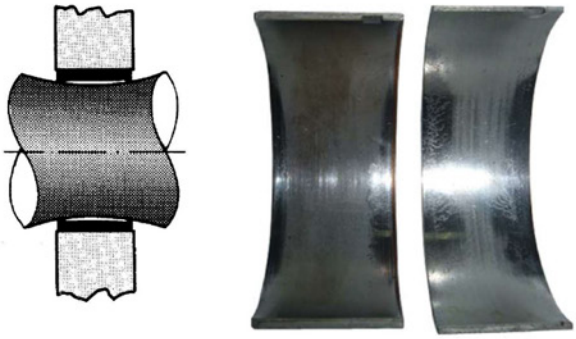


INCORRECT MACHINING

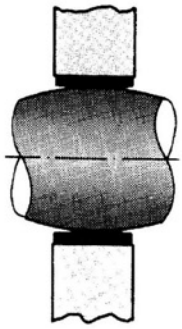
During the regrind of a crankshaft problems can arise which will create unusual wear patterns on the bearings; the ground journal could be tapered, hour glass or barrel shaped.

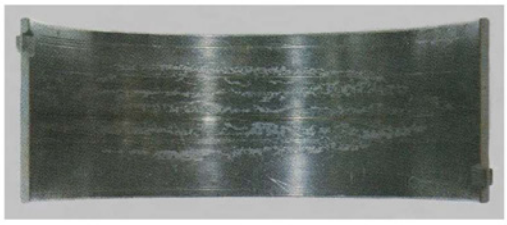


Tapered journal



Hour-glass journal





Barrel shaped journal

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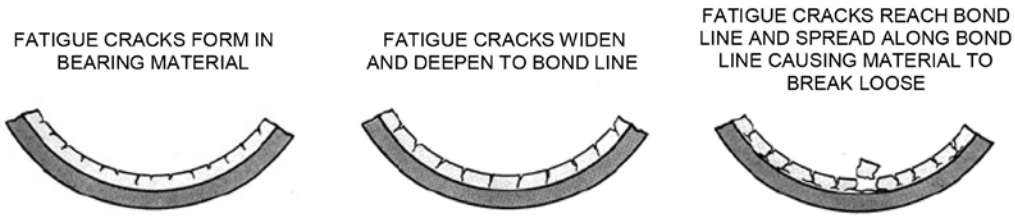
When the fillet radius is too big this can cause excessive pressure on the bearing which will result in a premature failure – specifications should be strictly adhered to because too small a radius will weaken the crankshaft in this very critical area.

Example of Fillet Ride

SURFACE FATIGUE

Surface fatigue can occur when the normal service life of the bearing has been exceeded, alternatively, an assembly problem has occurred which has created excessive loading in a localised area and this results in the fatigue of the bearing material.



Whilst a bearing bore or journal may appear to be round, there may be deviations from a true round form. These deviations consist of low and high spots which may have been created during a machining process and are referred to as "lobes".

The photographs below show the contact pattern where the bearing pressed against the high spots (lobes) in the connecting rod bore and the resultant damage.

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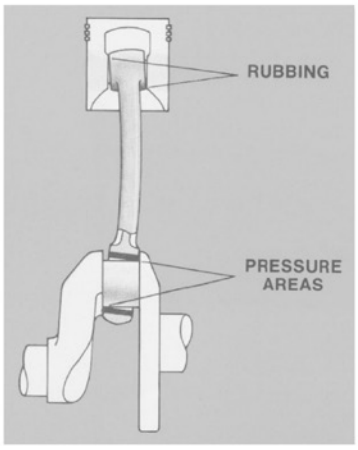
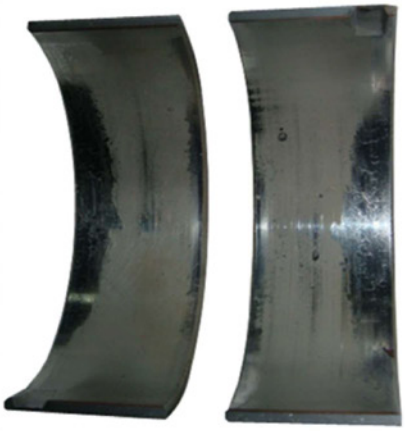
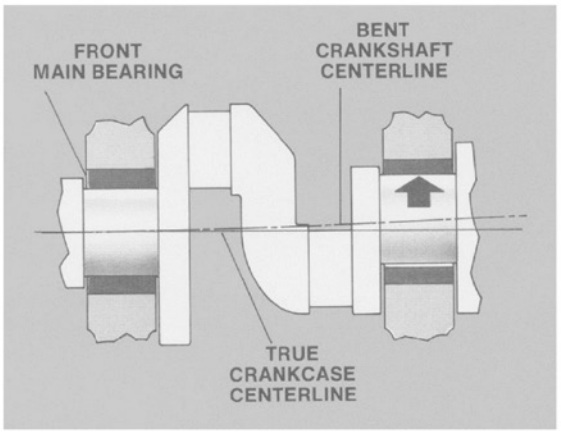
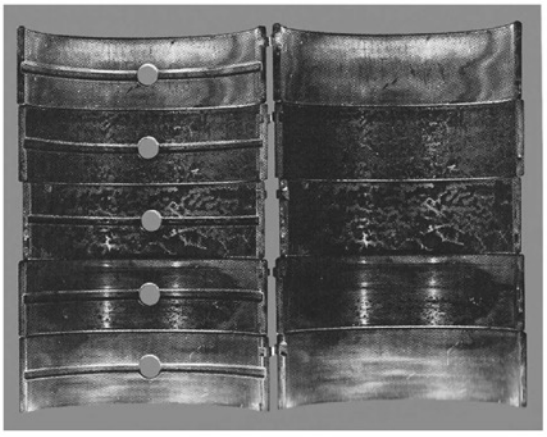
Another possible cause of an unusual wear pattern on the bearing shells can be created by a bent or twisted connecting rod, see below.





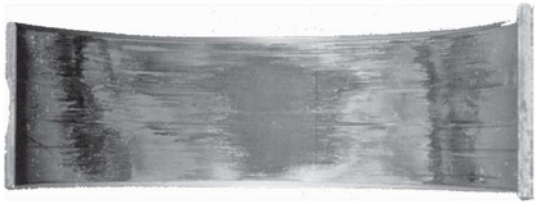
A crankshaft which is bent will also create excessive loading and the resultant bearing damage in the area of distortion; as seen in the photograph damage varies from bearing to bearing.





Note : a similar wear pattern could be created by a distorted engine block.

Other possible causes of bearing degradation are CORROSION and CAVITATION both of which are illustrated below.



When evaluating bearing failures concentrate on collecting evidence, not on determining the cause of the failure, irrespective of how obvious the cause may appear. Do not arrive at a conclusion until all the evidence is considered.

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