



KMP BRAND TECHNICAL BULLETIN

Diagnosing Common Complaints on Cylinder Liners

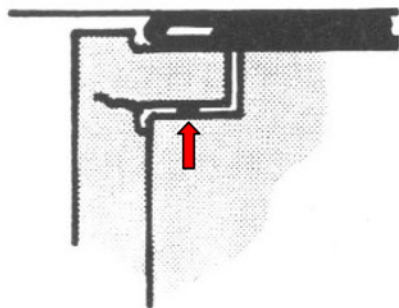


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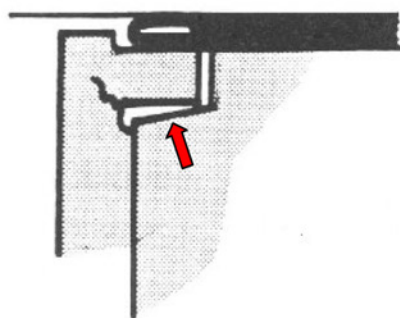
DIAGNOSING COMMON COMPLAINTS ON CYLINDER LINERS

- FLANGE FRACTURES
- VERTICAL FRACTURES
- BORE DISTORTIONS

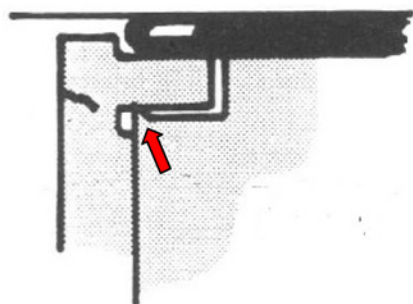
Possible causes of liner flange fracture:



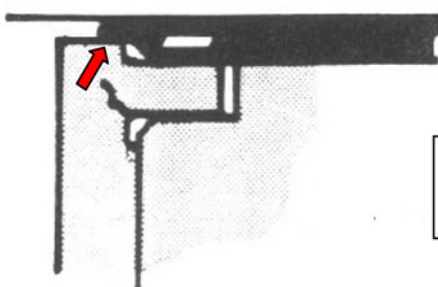
Dirt trapped between the flange and the counterbore



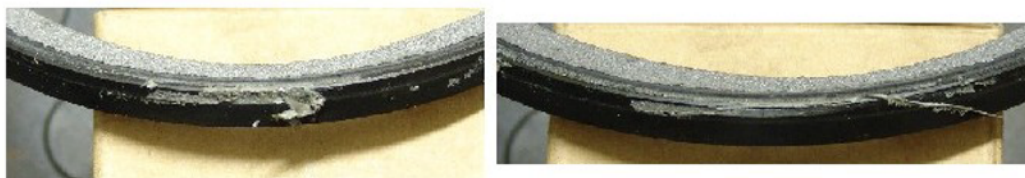
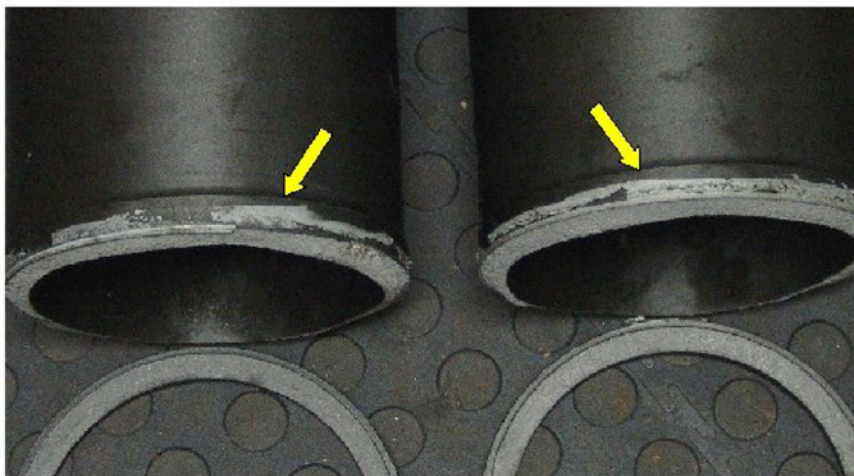
Cylinder block counterbore not square



Burr or sharp corner left after the machining of the counterbore



Either the incorrect cylinder gasket used or the gasket incorrectly positioned

DIAGNOSING COMMON COMPLAINTS ON CYLINDER LINERS**SOME EXAMPLES OF LINER FLANGE FAILURES****EXAMPLE 1**

Excessive use of silicone sealant resulted in this failure, the sealant prevented the flange from seating correctly on the deck, and as a consequence liner protrusions were out of specification.

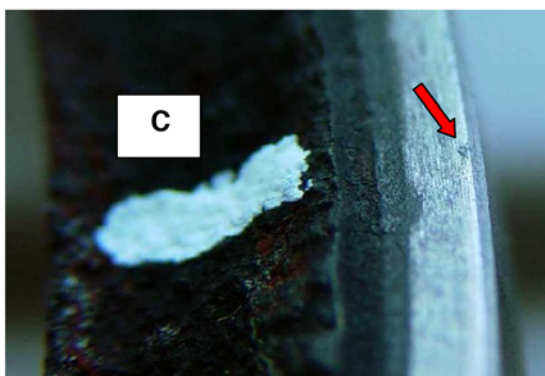
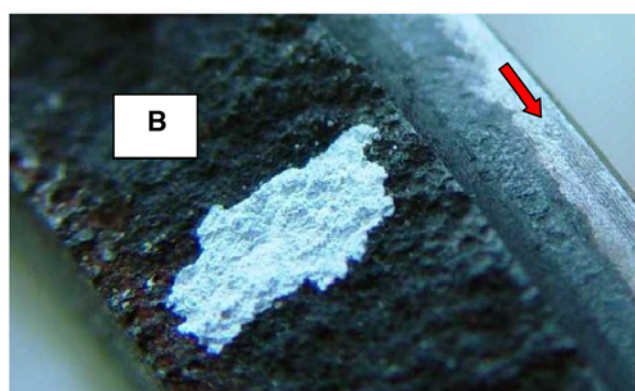
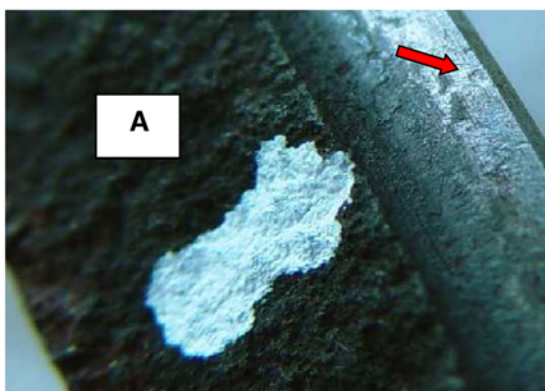
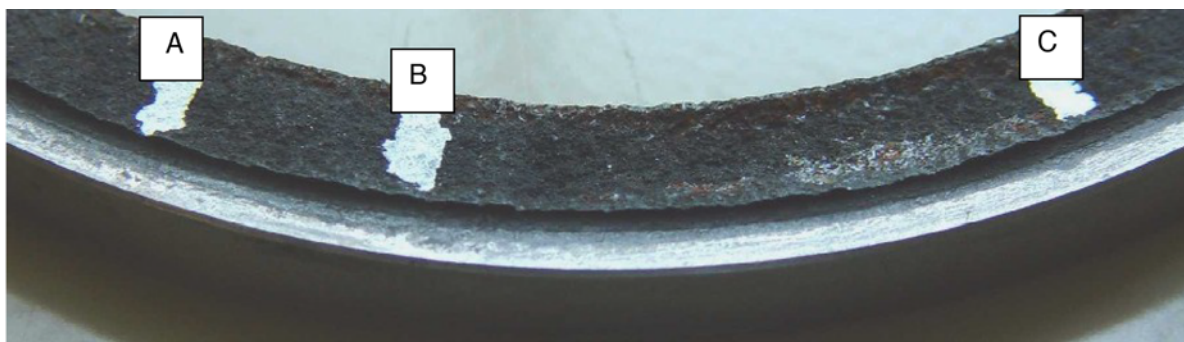
The correct liner protrusion is critical for a successful engine rebuild.

Advisory note, there is a time and a place for the use of silicone sealant, and this is not one of them!!

**EXAMPLE 2**

These liners were fitted without a cylinder head gasket which resulted in the cylinder head making direct contact with the liner fire dam.

A similar failure pattern would occur if the liner protrusion was excessive.



Debris trapped between the underside of the flange and the area where the liner flange was seated is what resulted in this failure.

The indentations caused by the debris are shown in photographs A, B and C.

EXAMPLE 3

There are several factors that can contribute to liner flange failures, but in most cases they are related to the condition of the block which receives the liners.

In other instances the flanges are fractured because of careless workmanship and the complete disregard for O.E installation procedures.

- Counterbore with uneven wear, variations in depth or not parallel to the deck.
- Counterbore badly worn resulting in the inner seating edge to slope inwards.
- Cleanliness of liner and block.
- Unequal liner protrusion.
- Failure to torque the cylinder head bolts in the correct sequence.
- Exceeding the specified torque settings for the cylinder head bolts.

DIAGNOSING COMMON COMPLAINTS ON CYLINDER LINERS

Flange failures occur as the result of abnormal stresses being imposed on the flange; the resultant fracture can appear at installation or be progressive and only appear shortly after the engine is returned to service.

VERTICAL FRACTURES

Because the liners are centrifugally cast the grain structure of the material offers considerable resistance to vertical cracking under normal operating conditions. However, rough handling either in transit or at installation can result in a vertical crack either from the flange area downwards or the lower sealing ring area upwards.



Alternatively, vertical cracks can result from either severe cavitation erosion (to be addressed in a later publication) or from piston seizure.

LINER BORE DISTORTION

One of the final processes during liner manufacture is the vertical honing of the liner bore which achieves a uniform internal diameter from top to bottom. Unfortunately careless installation of the sealing o-rings at the bottom of the liner can result in a complete engine overhaul being wrecked – this contradicts the belief that the rubber o-ring will merely reshape to suit the groove into which it has been fitted. Twisted or rolled o-rings will result in the distortion of the liner bore when the liner is fitted into the block. When the ring is twisted the material in the area of the twist becomes hard and the hardening is further accelerated by the high temperatures which are present during engine operation. The resultant pressures are then exerted on the liner causing distortion and the reduction of the running clearances between the piston skirt and the liner bore, this will then culminate in scuffing. In some configurations the liner also has a crevice seal in addition to the o-rings, and if incorrectly installed this can also result in bore restriction – see figures 1, 2 & 3.

DIAGNOSING COMMON COMPLAINTS ON CYLINDER LINERS



FIGURE 1

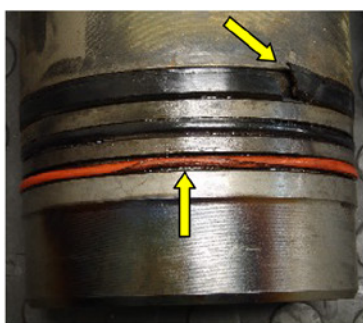


FIGURE 2

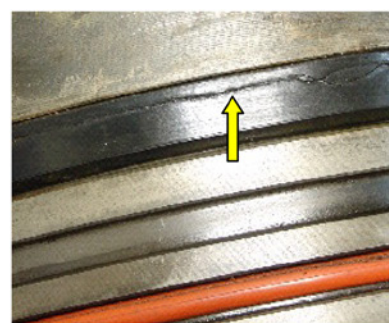
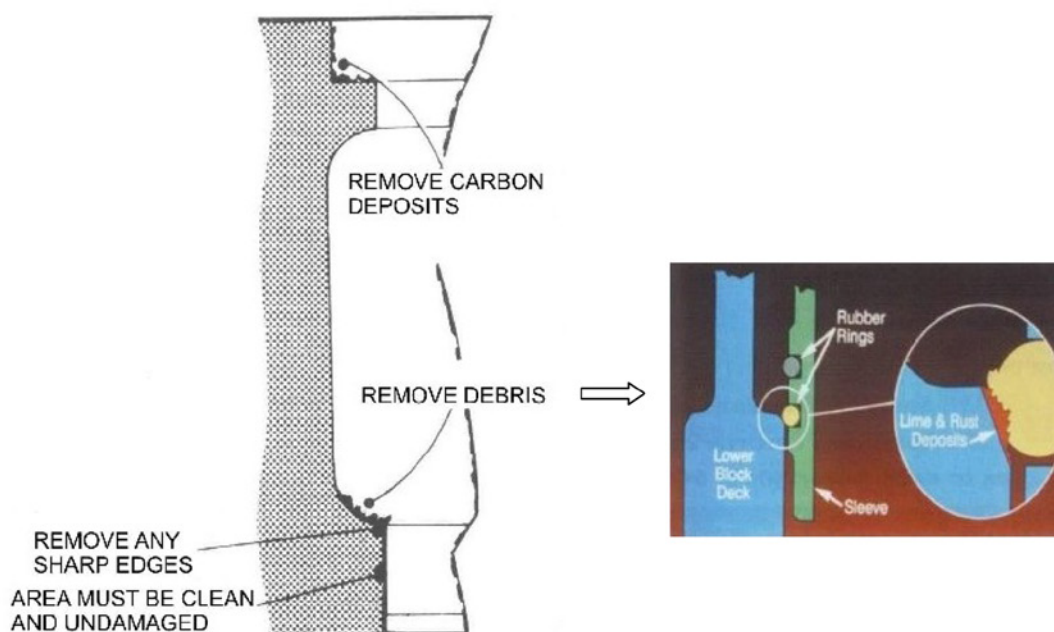
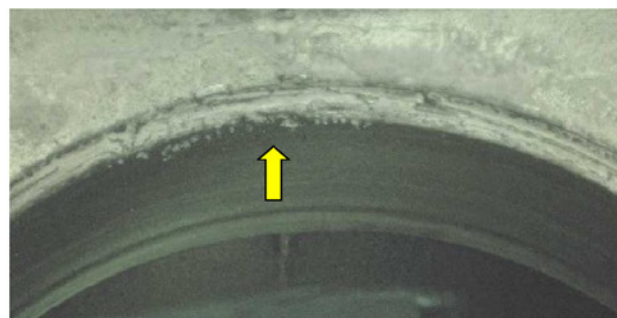
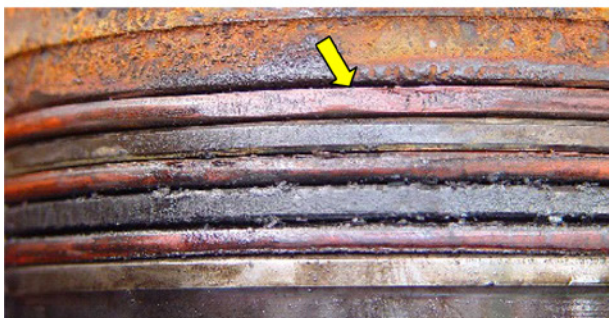


FIGURE 3

So what can be done to prevent such failures and ensure that the work that has been done, does not have to be redone.



Make sure the counterbore area is clear of any kind of debris. The lower deck area where the bottom of the liner is located is another very important area and this should also be free of any form of debris or damage.



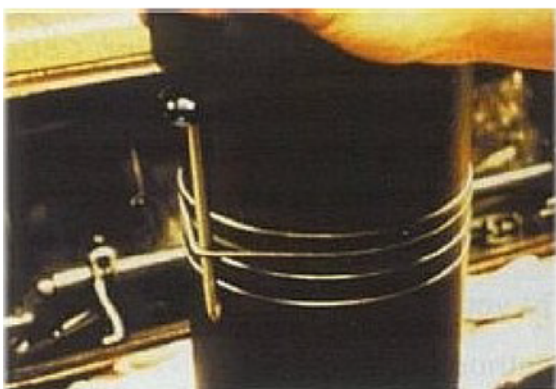
SEAL DAMAGE CAUSED BY POOR CONDITION OF THE LOWER DECK

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So the block has been cleaned and inspected and is now ready for the installation of the liners, but first the o-ring seals have to be fitted to the liners.

Many installers believe that the o-ring seals should be liberally coated with some form of lubricant, rubber grease, oil or even soap prior to installing them into the seal grooves – this is totally wrong.

The correct method is to install the o-ring seals dry into the liner grooves, this ensures that the seals “bite” into the dry surface and thus prevent them from moving when the liner is installed into the block. Once the seals are in place they must be checked to ascertain that they have not been twisted during installation.



The recommended way to remove any possible twists, is to insert a round rod like a Phillips screwdriver behind the seal and then move it around the full circumference of the seal. The seal “flash” line (see note *) should then be checked and this should run in a continuous straight line around the entire circumference of the o-ring.

** During production of the o-ring the moulding process results in a “flash” line in the centre of the outside diameter of the seal.*

When all the o-ring seals have been fitted into their respective grooves and checked for possible twisting, only then should a liberal amount of lubricant be applied to the outer diameter of the o-rings.

As the liner is inserted into the block there will be a slight resistance as the o-rings are compressed into their grooves, this is normal, however, if undue resistance is noted then the liner should be removed and the cause investigated and rectified.



**DESTINED TO FAIL – TWISTED O-RINGS AND
THE UNECESSARY USE OF SILICON SEALER**