

Broken or Cracked Cylinder Liners

The cylinder block has machined counter bores into which the cylinder liners fit. The liners are "Wet" which means the engine coolant is in direct contact with the liner. This is very important to know since the quality of the coolant can "Make or Break" the liner in terms of reliability and long life. More of this later.

The liner has a flange at the top which must fit exactly into the counter bore to make a perfect "Fit" around its circumference. A "Cylinder head gasket" seals the top of the liner, the top "Deck" of the cylinder block and the cylinder head. The gasket must seal the combustion pressures, the coolant and hold the liner in place whilst fitting correctly onto the top of the liner flange.

When the cylinder head nuts or bolts are tightened the cylinder head is very firmly pressed against the cylinder block. The nuts or bolts are designed to achieve a very secure joint between the cylinder head and cylinder block. This means that an enormous force is applied to the liner flange. This force, via the cylinder head gasket, must be applied vertically to the liner flange. The correct gasket, intended for the engine, MUST be used.

Wet Cylinder Liners are made from grey cast iron. Since this material is very brittle flexing can't be tolerated! Fitment of liners is super critical, incorrect "Stand proud", dirt or "Bad" liner seats WILL lead to radial fracturing of the liner near the top. Cleanliness during fitting is of critical importance! Engineers Blue can be used to check the seating. Incorrect liner seats can be corrected by using valve "Grinding Paste" to remove high spots. There must be a 45 deg chamfer on the edge of the liner seat. Stand proud can be adjusted by using shims.

"Incorrect" liner seats can be caused by;

Warping of the cylinder block caused by over heating.

Frost damage causing block cracking.

Incorrect liner stand proud.

Bad machining of liner seats.

Dirt underneath the liner flange.

Incorrect cylinder head nut or bolt tightening.

Incorrect cylinder head gasket leading to poor clamping forces.

Research has shown that incorrect coolant, leading to "Cavitation Erosion", can also initiate liner cracking. At a microscopic level grey cast iron consists of flakes of metal, once erosion sets in these flakes are compromised and cracks can occur. Cavitation erosion is caused by vacuum bubbles imploding which "Eats" away at the metal. There are many theories regarding the formation of these vacuum bubbles. The two main ones are vibration of the liner during the combustion process and "Piston slap" caused by the piston hitting the liner on the thrust side during the power stroke. This damage usually occurs at the top and sides of the liner where it is in close proximity with the parent cylinder block.

Erosion at the bottom of the liner doesn't normally cause liner cracking problems and can, amongst other theories, be caused by electrolytic action.

Good quality antifreeze contains many additives to reduce cavitation and when changed at the correct intervals goes a long way in preventing liner cracking. Poor quality water must be avoided.

Cracked or eroded liners can lead to either coolant entering the sump or pressurisation of the coolant system. The symptom of this is either emulsified engine oil or oil in the top of the radiator.