



KMP BRAND TECHNICAL BULLETIN

Gasket Kit Failures

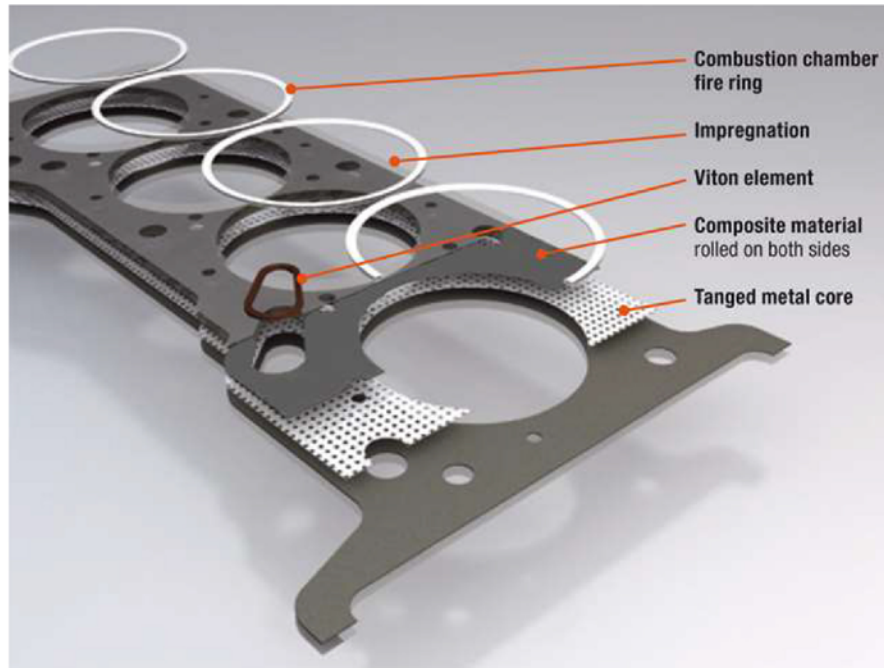


KB-15007

This bulletin will address the types of failures and the possible causes that can occur with cylinder head gaskets.

The head gasket seals the engine's combustion gases as well as the coolant and oil passages between the cylinder head and the block.

COMPOSITE HEAD GASKET CONSTRUCTION



The head gasket is a complex engine component and incorporates a considerable amount of technology to address the demanding conditions that are present in the diesel engines of today.

Besides performing the sealing of the combustion gases, coolant and oil, it must also withstand the temperature fluctuations, the high combustion pressures, have the capacity to compensate for component distortion and also be able to transfer the bolt clamping force.

So what happens when an engine fails because of an overheating problem or coolant mixing with the oil, and this occurs shortly after a cylinder head has been fitted – the blame is often put onto the cylinder head gasket.

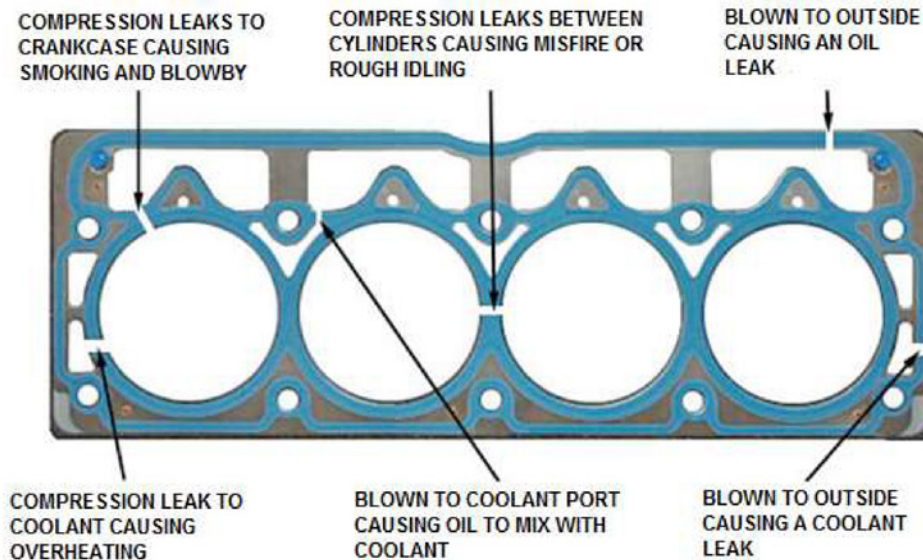
From the workshops point of view the installation of the head gasket was carried out in accordance with the normal repair procedures, so the problem must be a defective cylinder head gasket, or maybe not !

When a head gasket fails there is usually a good reason why it failed, the most common reason is usually overheating, which could have been caused by a coolant leak, a defective thermostat, a faulty water pump or a fan failure. Some of the possible causes are as follows.

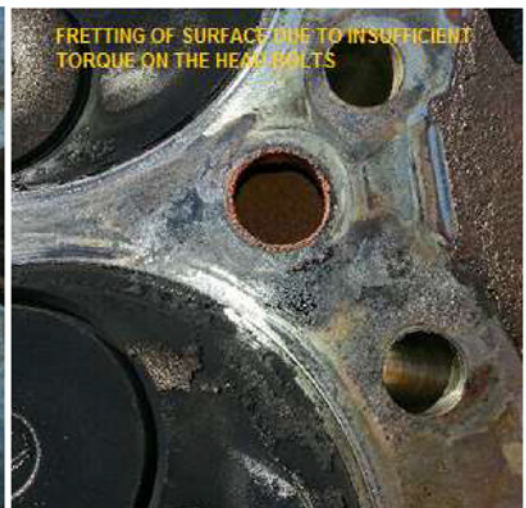
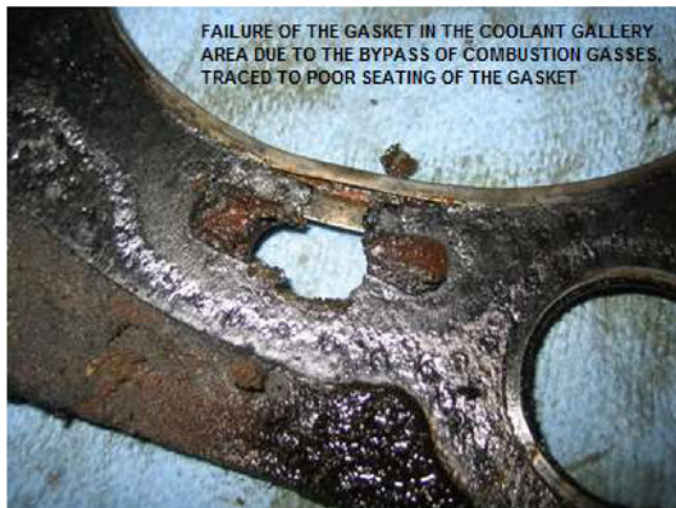
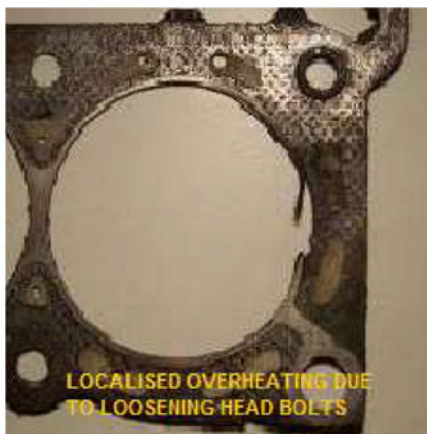
THE COMMON CAUSES OF FAILURE

- Head or block not clean, smooth or flat, wrong surface finish.
- Incorrect bolt tightening sequence or torque specifications when tightening the head bolts.
- Reusing stretched, damaged or dirty bolts.
- Using a sealer on a gasket which does not require a sealer.
- Operating conditions that overstress the gasket and cause it to fail (detonation and overheating).

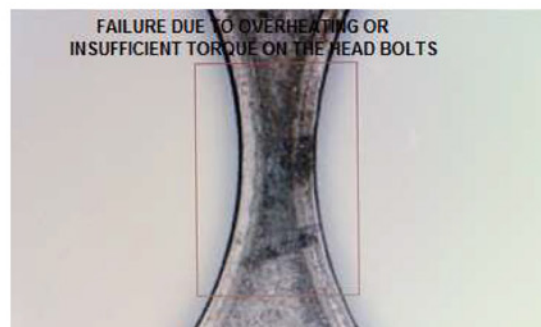
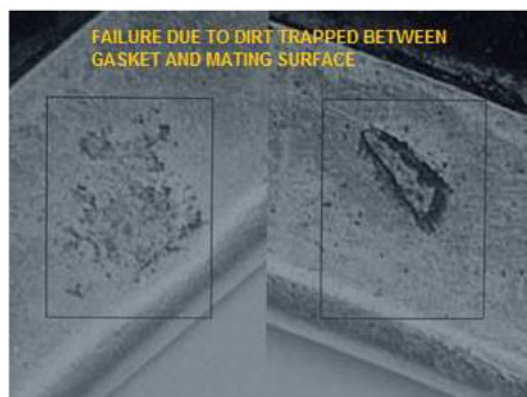
The possible areas where leakage can occur are shown below and an important point to remember is that the gasket which is removed should be carefully examined because it could provide a clue as to what caused the failure.



EXAMPLES OF FAILURES



WORN HEAD
GASKET
MATERIAL

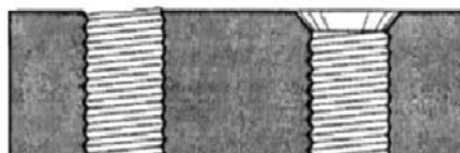


The above examples have resulted from a number of abnormalities varying from surface preparation, mating surface finish, debris entrapment, combustion irregularities, overheating and insufficient torque on the cylinder head fasteners.

An area which is often overlooked when the engine block has been skimmed are the threaded bolt holes. If the thread extends all the way to the surface it is possible for material to protrude above the surface when the head bolt is torqued – this displaced material is sufficient to cause a gasket failure. It is therefore preferable to run a bottoming tap through each threaded hole and then chamfer the hole as shown below.

BOLT HOLE WITH THREAD
RUNNING UP TO SURFACE

CHAMFERED BOLT
HOLE



Another area which is neglected when installing a new cylinder head gasket is the amount of liner protrusion, if this is incorrect there will not be the correct amount of compressive load exerted onto the new gasket and leakage will be inevitable.

An example of such an occurrence is referred to below.

After the second head gasket failure the mechanic was asked what the liner protrusion was and the response was "its within spec" – either it was not checked or it was never recorded.

The engine in question was a Cat C-16 and after the head was removed it was cleaned along with the block and spacer plate, and then a new shim was fitted between the block and spacer plate. The hold down bolts were installed to clamp the spacer plate tightly to the block and the liner protrusion was then measured. This resulted in a reading of 0.002 (0.0508mm), whereas it should have been between 0.005 to 0.007 (0.127 to 0.1778mm) – simply fitting another head gasket would not have resolved the problem.

Some mechanics believe that it is necessary to apply an additional sealer such as RTV sealant, shellac or other tacky sealants/adhesives prior to installation of the head gasket, this is definitely not good practice. The application of any type of chemical to the gasket could result in the prevention of the pre-existing coating from performing its intended function, namely "cold sealing", or the worse case scenario, the gasket could deteriorate and fail. The added thickness of a heavily applied sealer on a head gasket could also cause uneven loading and loss of torque retention which could also create leaks or cause the cylinder head to warp. **So never use any type of sealer on a coated gasket.**

The Golden Rules for installation of cylinder head gaskets

- Remove all remnants of the old gasket from the sealing surfaces of the cylinder head and the block.
- All threaded holes for the cylinder head bolts should be properly cleaned and checked for damage, and check that the bolts can be turned in easily.
- Inspect the two mating surfaces (cylinder head and the deck of the block) and remove any protrusions that maybe found. Using a straightedge make sure that both surfaces comply with the required specification with regard to flatness. Any depressions that are noted may necessitate machining of the face.
- Position the cylinder head gasket onto the block, taking care not to damage the coating.
- Position the cylinder head onto the gasket and avoid any damage to the sealing surface. Care should also be taken to assure that no foreign particles fall onto the gasket during this process.
- If cylinder head bolts are being reused always check that they have not been previously stretched. If oil is applied only a small amount should be applied to the threads and the underside of the bolt head; if a washer is also fitted then the oil should only be applied between the washer and bolt head and not on the face which contacts the cylinder head.
- The tightening of the bolts should be done in accordance with the sequence specified by the manufacturer, either from the centre diagonally or spirally towards the outside of the cylinder head. The torque/tightening angle should be applied gradually in accordance with specifications. Retightening of the bolts should be applied if specified by the manufacturer.

It is important to remember that simply replacing a failed cylinder head gasket without analysing why the failure occurred, could quite easily be the invitation to a repeated failure.

Simply fitting a new gasket does not necessarily remove the cause of the failure.