This was not the whole story, however, as the reduced space for flow was being exacerbated by the lower coolant flow found with the original thermostat configuration. When the PRT was fitted, with its significantly increased flow on the bypass circuit and reaction to pressure changes, this increased flow in the tight spots completely cured the boiling issue.

He also mentioned that some of the main 'through' bolts to the original specification were not always reliable and would lose their elasticity after being fitted, and the clamping load would be lost with obvious consequences to head gasket performance. It is for this reason that the 10.9 specification bolts were introduced along with the MLS gasket when the MG Motor TF arrived.

## Routes to a Reliable K Series Engine

Clearly there is a strong case to mimic the specification of the MG Motor TF for better reliability. While this is not always going to be possible, other measures can be taken to reduce the chances that you will be left stranded at the side of the road with a cooked engine. I must emphasize that it is very unusual for HGF to occur suddenly without prior warning, and the first signs may appear up to twelve months before the major failure. In nearly all cases there will be a continuing coolant loss, but this on its own is not conclusive of HGF, as leaks can occur elsewhere.

What is always needed is corroboration, and this most commonly comes from seeing the emulsification of coolant/oil mix in the oil on the dipstick, around the oil filler neck, although traces of emulsification in cars that are infrequently used or make journeys of less than five miles in winter can sometimes just be down to condensation. The next most common symptom is a clear external coolant leak from the exhaust side of the join line between head and block. When a HGF has been confirmed by the corroboration of at least two conditions, it is amazing that some owners still put off doing anything to correct the problem. Many only react when the engine fails in a big way, which usually involves significant overheating and damage.

In standard operation the K series can suffer annealing (softening) of the head face material due to the high temperatures that are seen on the exhaust side of the engine. What this means is that clear and very obvious half-moon shaped grooves appear on the exhaust side of the head face, caused by the gasket fire rings being pressed into the softened alloy. Very slight marking of a head face that you can run a fingernail across without it catching can be machined off and the engine may still usually give reasonable service, but where the grooves are deep enough to trip over then skimming on

*Fig. 4.31 When HGF is allowed to develop to the point where the engine stops, the coolant turns to a light tar.*

*Fig. 4.32 The head gasket becomes a gooey mess.*

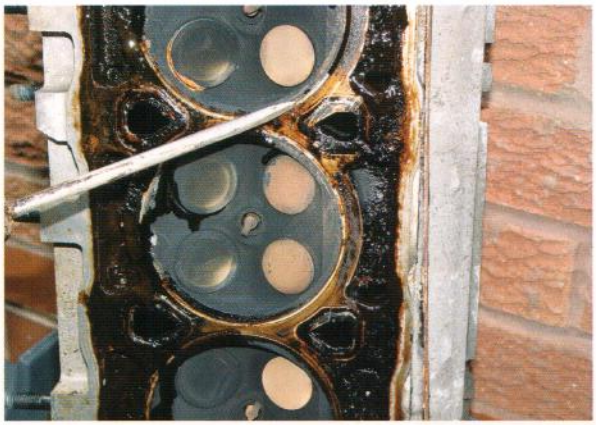


*Fig. 4.33 As well as the head face being covered in the tar, the gasket fire rings have sunk deep into the softened head face leaving deep grooves that scraps the head.*

*Fig. 4.34 This engine was run until it just stopped and all the plastics started to melt, with the cam cover reduced to a blob.*

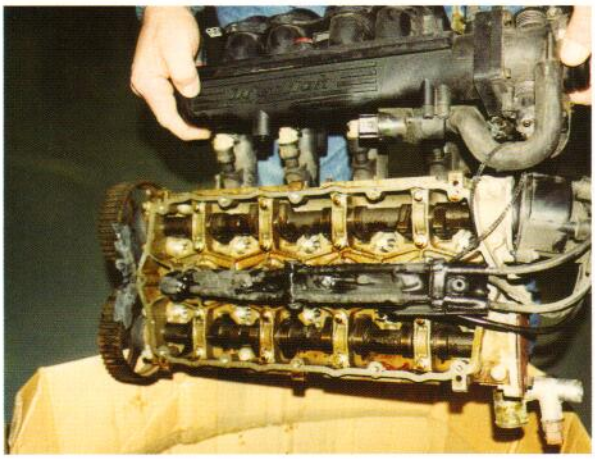


Fig. 4.35 The spark plug cover blended into the HT leads.

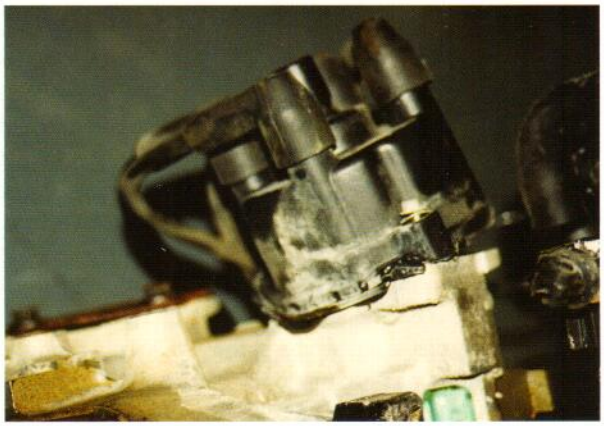


Fig. 4.36 The distributor cap was well on the way to joining the cam covers.

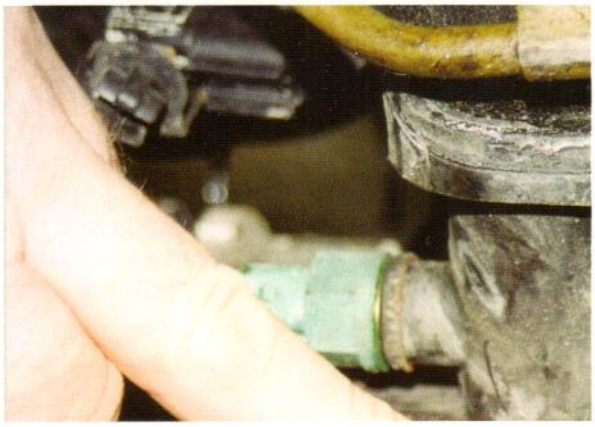


Fig. 4.37 Surprisingly, though, the plastic inlet manifold was just melting at the join onto the cylinder head.

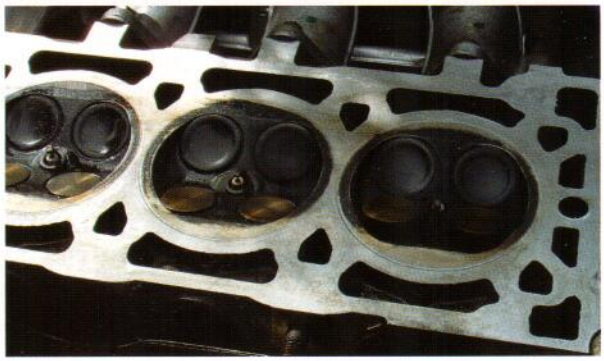


Fig. 4.38 When a head anneals (softens) the gasket fire rings sink into the head material, always on the hotter exhaust side, leaving clear grooves. Skimming alone fails to solve this as it will recur as soon as the head is refitted.

its own is a waste of time as the new gasket fire rings will have created new grooves within the first fifty miles of use. It is a gamble whether the problem recurs within a few hundred miles or a few thousand. It is possible to have the head face treated to reinstate the appropriate hardness, but this is a very specialized process and access to this will normally be very limited.

The only long-term cure is to replace the head or use a Payen, Gosney or similar 'head saver shim', which come in various dimensions, commonly between 0.025in and 0.036in (0.6– 0.9mm) thick. The rigidity of these stainless steel shims spreads the loads coming from the gasket fire rings across the head face, so preventing any more damage. They can be used with either SLS or MLS gaskets.

Before looking at MLS gaskets in more detail, I have an observation relating to service life following replacement of an SLS gasket with another SLS gasket. When the job was done properly and there was no rapid repeat failure due to a fault being overlooked, it was common for the second gasket to last between 1½ times to twice the mileage that the engine covered before the first HGF.

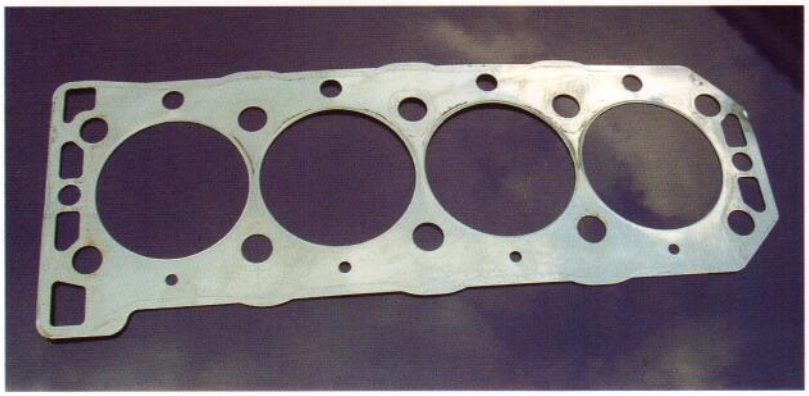
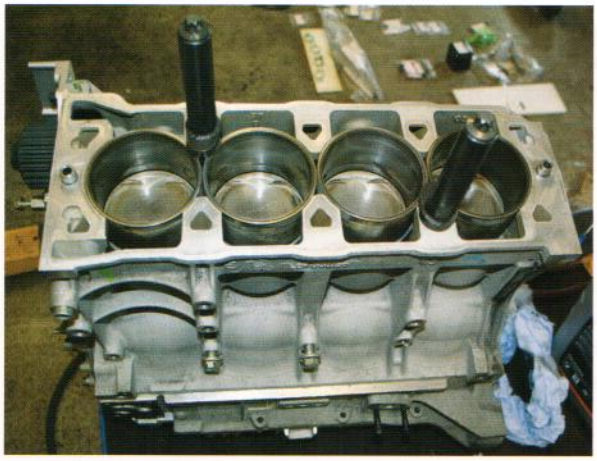


Fig. 4.39 A 'Head Saver Shim', like this one from Payen, is fitted as a solution.

The earlier mention of the MLS design has already described it as a series of steel layers. In the Land Rover, XPart and SAIC supplied parts, and most of the aftermarket alternatives. The construction consists of a main shim to which are attached two upper and two lower embossed subordinate shims (*see* Figs 4.8 and 4.9 above).

Since the MLS gaskets cannot suffer the same degradation and displacement to which the SLS gasket was prone, they would need to physically break up to achieve the same failure. That doesn't mean leakage is not impossible, and it has been reported on a few early MLS gaskets, but importantly it was not necessarily a gasket issue and this time the coolant loss is



TOP LEFT: Fig. 4.71 *Once the through bolts have been removed you must never turn a K series engine over unless you have fitted liner clamps to stop the pistons lifting the liners of their seats in the block and breaking the seals. (Austin Garages)*

TOP RIGHT: Fig. 4.72 *A simple alternative to liner clamps can be made from steel tube and a series of washers.*

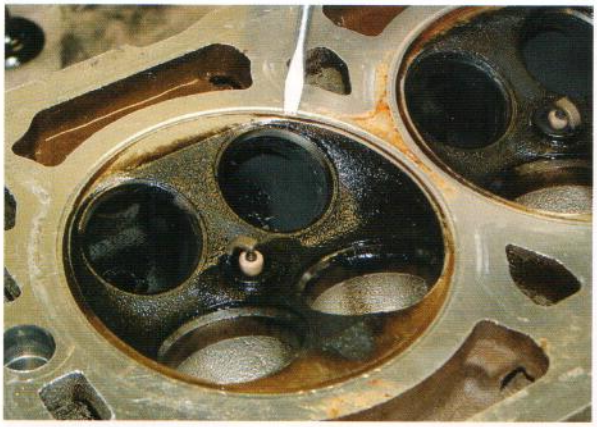
head and catch all the fluids dripping out of it.

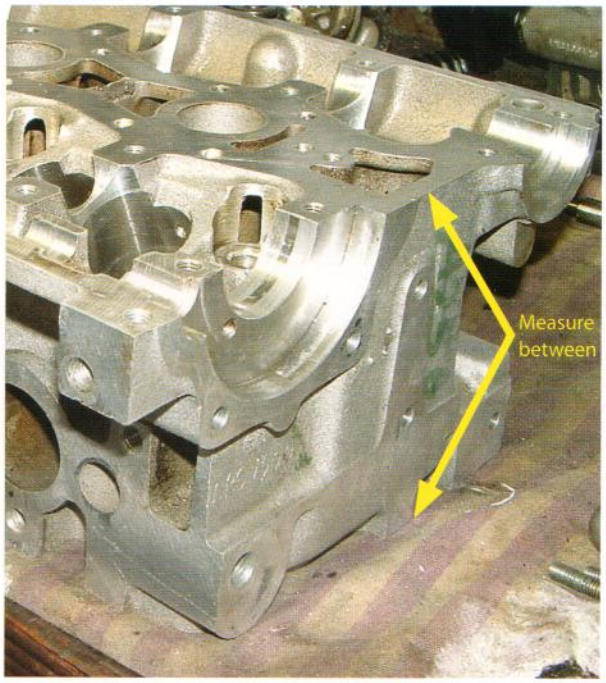
Do *not* turn the engine over unless you have first fitted the specific liner clamping tools, or made ones up yourself from tubing and larger flat washers, otherwise the care taken to remove the head without disturbing a liner will probably be undone as the piston movement upwards will lift the liner as well. Home-made ones need not have the shaped feet, just strong flat washers that are able to cover the tops of adjacent liners with a tube length of approximately 110mm.

It is now time to remove the inlet manifold to allow you to clean up the head so you can assess its condition, which is very important if the engine has suffered an overheating condition. The first area to check will be the head face. You are looking for half-moon indents into the head face on the exhaust side. If indents are present deeper than slight marks that you may catch a fingernail on, this is a clear indication of an annealed (softened) head material and skimming on its own will not alter this.

The 0.012in (0.3mm) thick additional shim with an MLS gasket set is designed to help reduce the spot loads through the compressed gasket fire rings, assuming the correct hardness of the head face. However, when there are clear signs of indentation this shim is very unlikely to be rigid enough to do anything beyond delaying further sinkage and loss of seal before another HGF. The shim is also designed to reduce the incidence of boiling coolant erosion.

In these cases the simplest solution aside from another head is to use the 'Head Saver Shim' (*see* Fig. 4.39), which






ABOVE: Fig. 4.73 *If you find indentations where the gasket fire rings sat when removing the head, usually on the exhaust side, it is a sure sign the head has annealed (softened) and has officially become unserviceable. This head has clear indents all round as indicated.*

RIGHT: Fig. 4.74 *When looking to skim a head, or to check a newly acquired head, it is important to know the actual head thickness to assess if it has been skimmed before and by how much. The arrows indicate where that measurement should be done.*

will have enough rigidity to spread the clamping loads and provide long-term reliability from what in 'factory' eyes would have been a scrap head casting. Fitting a 'Saver Shim' is simple enough and replaces the extra shim of the MLS gasket kit after the head has been further skimmed. Before fitting, smear Wellseal gasket sealant over the whole surface in contact with the cylinder head, specifically noting that the 'Saver Shim' is always against the head.

The depth of additional skimming is calculated by measuring the current thickness of the head between the head face and the top face without the cam carrier, which in the original standard form was 119mm plus or minus 0.05mm. This will indicate if the head has been previously skimmed and by approximately how much. You now measure the thickness of the 'Saver Shim' and subtract the amount the head has been previously skimmed from the 'Saver Shim' thickness. This gives the final figure of the amount of metal needed to be removed from the head face.

In respect to general skimming of K series heads, there is a far too common approach that if the head is off, skim it – irrespective of whether the head needs skimming or not. Fortunately, most engineering shops have a sensible approach and skim as little as they can to 'clean' any marks off the head face, rather than remove a greater amount. As time passes and engines age, however, it becomes clear that the scenario of perhaps two or even three gasket replacements, each seeing a skim, is cumulatively going to remove a significant amount of material, way above the maximum normal skim limit.

A lesser-known concern, however, is that skimming can create more problems than it cures. This comes from the fact that factory skimming not only creates a flat clean surface, it also creates a non-porous surface. Skimming with a sharp tool cuts the surface of the head very cleanly, opens up the castings structure and can create porosity. If heads are to be skimmed, then in very basic terms this should be done with a 'blunt' tool as this then 'drags' material and in doing so creates a sealed (burnished) surface. The more accurate description of this cutting process is 'negative rake' with a single-point cutting tool.

Finally, on the skimming front are the practical restrictions that apply to VVC engines, as their valves are so much closer to the head face. As a result their practical skim limit is far less than an

*Fig. 4.75 Valves are close to the head face that restricts the maximum skim limit and on this MPi head with small valves there is more scope for skimming.*

*Fig. 4.76 On VVC heads, where the bigger valves are much closer to the head face, skimming is more of a problem.*

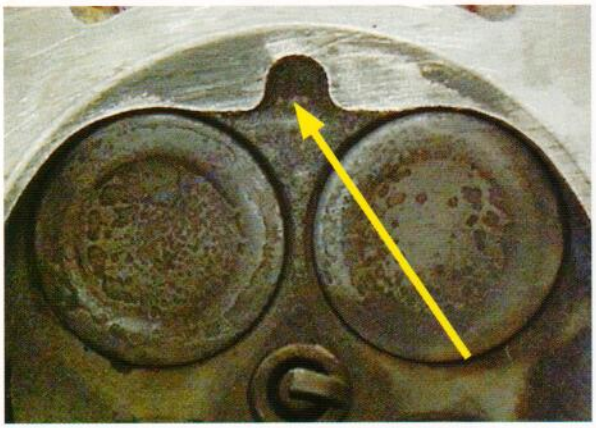


*Fig. 4.77 An indication of previous skimming often comes from looking at the dimpled recess in the combustion chamber. This head has not been modified.*

*Fig. 4.78 A skimmed head looks like this. Some heads may even have seen the dimple completely skimmed away.*