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## **Is your slip showing? The diagnosis and fixes for slipped cylinder liners**

The Range Rover/Discovery petrol engines were originally all 3.5 litres but modifications over the years removed more and more metal between the cylinders in the quest for greater engine capacity and power. This is the primary reason why liner slippage was quite rare in the 3.5 litre version, yet is not uncommon in later versions. Of course, despite having been responsible for the modifications, the manufacturers denied all knowledge of the problem, leaving owners frustrated and without hope of any manufacturer compensation. The slipped cylinder liner is arguably one of the more serious and expensive problems potentially affecting owners of a V8 Land Rover petrol engine.

Overheating is the principal cause of slipping liners, as it is for warped cylinder heads, seized pistons and several other nasty consequences. Once the temperature indicator goes into the red, serious damage of some kind is merely a function of time. One of the reasons is the different co-efficient of expansion of the cast steel or iron liners that are pressed into an aluminium alloy engine block. As with a warped head or blown gasket, compression of the affected cylinders will be reduced and it is quite likely that coolant from the water jacket surrounding the cylinder may enter the cylinder and be discharged through the exhaust.

There are actually only two places the missing coolant can go – onto the ground via a leak OR out of the tail pipe. The unfortunate owner may experience a loss of power, but more likely, an unexplained loss of coolant, at least initially. This is where diagnosis becomes so critical. A faulty head gasket, including cylinder head servicing may cost around \$2400, but fixing a liner usually requires a major machining and/or an engine replacement costing up to \$9,000. So what does the owner need to know to ensure the workshop is approaching the issue honestly?

The first step is to visually search for any and all leaks of coolant. This includes not only the radiator and hoses, but also the rear of the engine where the valley gasket might be leaking. A bright light and/or mirror, plus a crawl under the vehicle will usually identify a leak here. It is important to look along the chassis rails for signs of coolant. Another frequent place for leakage is the heater core and/or O-rings linking the engine water jacket to the heater. If the carpets inside the vehicle are wet, this is where the coolant might be going. Heater core work is not a cheap fix, but obviously, there is little point in fixing other leaks without doing this job first. It might just be the solution.

The next check is a compression test. All cylinders should be within about 10% of each other and if one or two cylinders have significantly lower compression it is inevitable that a problem exists with a head gasket, at the very least. Removing spark plugs and checking for wetness may identify a coolant leaking into a cylinder.

Sooner or later, it will be necessary to fix the problem professionally. However, this is where it all starts to get tricky. Is the vehicle reliable in other respects? If the service history indicates that the air suspension, brakes, transmission, steering and both the interior and exterior of the vehicle are in good condition, there will be a compelling reason to retain and rectify the engine problems. A major engine repair should make

the engine as good, if not better than new but there will be little point in spending a considerable amount of money for engine work on something that is falling apart.

Accurate diagnosis of the problem is essential because the work required may be contained to something less costly than a rebuild. For example, it is entirely possible that the problem is a defective head gasket and/or warped head so around \$2400 would cover the cost of removal, machining, and replacement with new gaskets.



This is a failed gasket – hard to tell the difference until the heads come off



This is a slipped liner – photo courtesy of Ron Beckett

For the sake of argument, let's proceed on the basis of a liner (or maybe two) being the source of the problem. What do we do now?

One option is to replace the engine with a used engine. However, the cost is likely to approach \$6,500 depending on availability and if the heads are serviced as described above and there is no guarantee that other faults will not appear, requiring additional future expenditure.



The second option is to rework the existing engine and there is much benefit in dealing with the “devil you know.” If the performance used to be entirely satisfactory then this would make sense. Boring the block, fitting top hat liners, crack-testing and skimming heads would effectively deliver “better than new” results. Of course, ALL cylinders would receive the new liners, not just those where the original liners slipped. The loss of the vehicle for a few more days is irrelevant.

“Top hat” liners

For another \$1,000 it would be possible to include balancing of the crank, pistons and a new camshaft - delivering even better performance. This investment would be justified on an otherwise good vehicle.

As always, the advice from a reliable workshop is essential. Any mechanic can change an engine, but it takes both skill and integrity to deliver the most cost-effective solution, relative to the overall condition of the vehicle, its intended use and the cost of repair. Always ask for a 90-day or 5000 Km guarantee as a minimum condition before proceeding.