

Coked oil and substantial sludge formation within the engine have become a significant service problem in modern light duty diesel engines operating in the Australian environment. This is particularly so in vehicles used for stop/start city driving or 100kph / low load highway cruising. As a rule, this is not the fault of poor-quality oil. This oil sludge formation is the result of a combination of factors, including carbon, soot, heat, fuel, water, acids, dirt and engine coolant.

UNBURNT FUEL / CARBON / SOOT

A typical light duty diesel takes around 15 minutes to reach normal operating temperature. A diesel engine will not achieve optimal combustion efficiency until it is at full operating temperature. During the warm up cycle, the engine will experience inefficient combustion, resulting in excessive volume of unburnt, or partially burnt fuel and combustion by-products, for example, carbon and soot in the combustion chamber.

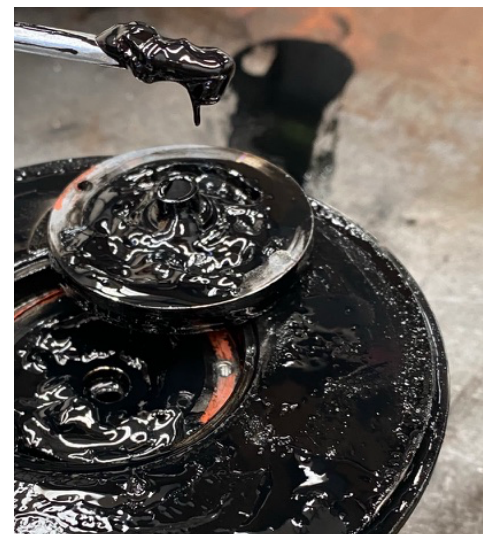
The unburnt fuel flows into the crankcase past the piston rings (potentially decreasing ring life in the process), eventually mixing with the oil. Carbon and soot are deliberately trapped in the oil by dispersants included in the oil formulation, specifically for that purpose, in order to neutralise combustion acids and reduce varnishing deposits. All of the preceding is trapped in the oil.

The unburnt fuel is chemically unstable and reacts with itself and the oil, along with its included contaminants to form gum, varnish and asphaltic type compounds. The carbon and soot further contribute to the problem via "soot loading" of the oil. All of which contribute to sludge formation within the crankcase.

A typical 250,000km light duty diesel will have a 25mm thick build-up of this sludge around the inside of the sump, which will not be removed by simply draining the oil and changing the filter.

MOISTURE CONTAMINATION

Short trips (less than 15 minutes), frequent stop/start usage and prolonged idling increase the moisture contamination of the oil. Air warmed within the engine's crankcase and exhaust blow-by gases both contain water condensation. If the engine cannot reach full operating temperature, for any of the preceding reasons, this condensation cannot evaporate and becomes emulsified in the oil, again contributing to sludge formation.



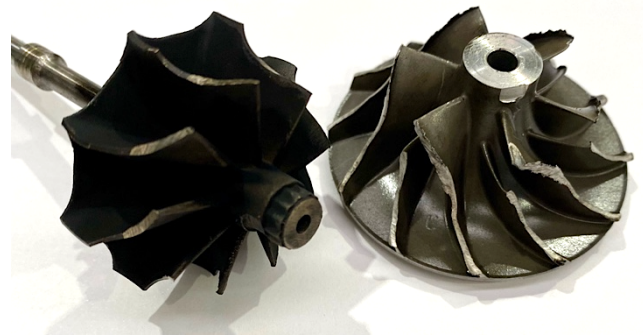
LIGHT DUTY DIESEL OPERATION

As a result of the vehicle acceleration of a light duty diesel being somewhat less than that of an equivalent petrol engine; diesel vehicle operators tend to use more throttle opening. The resultant fuel loads further contribute to the general fuel issues described above. What needs to be remembered is that diesel fuel and its combustion by-products are significantly less volatile than petrol equivalents, thus are far less likely to be driven off at typical diesel engine operating temperatures and as a consequence, totally accumulative. Hence the oil contamination issue is far more prevalent in a diesel engine than an equivalent petrol one.

EFFECT OF COKED, OIL SLUDGE ON TURBOCHARGER LIFE

Engine oil degraded as described above is the single biggest cause of turbocharger failure (40%) frequently occurring within kilometres of installing a new turbocharger, given that a regular oil/filter change will not remove the coked oil sludge from within the crankcase. Oil degraded in this way breaks the hydrostatic oil film which normally supports the bronze bush (bearing) and main turbocharger shaft.

Catastrophic turbocharger failure is then inevitable as the turbine and compressor wheels come into contact with their respective housings.



It is for this reason that the sump/main oil pickup should be removed and cleaned whenever a new Turbocharger is installed.

BEST PREVENTATIVE SERVICE ACTIONS

- Replace oil and filter ever 5,000 KMs. In heavy duty, Off Road applications, every 2,500 KMs.
- Ensure the fuel injectors are serviced regularly and replaced when necessary. (Max 250,000KM)
- Ensure the injection pump calibration and timing are correctly set.
- Use the correct specification, highest possible quality oil and oil filter.
- Try to use the vehicle such that it always reaches normal operating temperature for at least part of the trip.

For more information go to www.cateran.com.au or call the Cateran Technical Hotline on 1300 176 071

