



SLUDGE

Hot Topic

There is a common misconception that some types of engine oil cause sludge. In this talk we will investigate what sludge is, how it forms and how to prevent it. Also how top-quality motor oil keeps engines free of sludge, deposits and corrosion. Sludge is a thick, dark substance that can build up and clog the oil flow passages, oil return passages within an engine together with the filter elements.

The Sludge Monster

Most mechanics will have pulled down an engine or seen one that has been consumed by the 'sludge monster'. It's not pretty and has been the cause of death of many engines. The first sign that an engine has been inhabited by the sludge monster usually becomes obvious during an oil change when thick goo dribbles out of the sump drain hole or nothing at all! We usually identify these fatal cases of sludge monster victims after the vehicle arrives at the workshop on the back of a tow truck.

Contaminants and sludge

Contaminants are deadly enemies of an engine. They enter with the air flow and are also generated by the friction of metal against metal. You may be surprised to learn that for every 100 litres of fuel burned in an engine; the following by products are produced:

- 90 to 120 litres of water.
- 3 to 10 litres of unburned fuel.
- 0.5 to 3 kilograms of soot and carbon.
- 0.25 to 1 kilograms of varnish.
- 1 to 4 kilograms of sulphuric and nitric acid.

A significant percentage of these by-products end up in the motor oil. Detergents and dispersants in the oil must be able to keep most of these contaminants neutralised or suspended in the oil as insoluble microscopic particles so they do not form sludge, damaging deposits or corrosion. When the waste materials are dispersed properly in the oil, the filter can trap the larger particles. During an oil change, the contaminants too small to be filtered are removed with the engine oil. This sounds perfect in theory, however people get involved and undesirable effects follow.

How sludge forms

Sludge formation starts when the chemically suspended particles of contaminants begin to settle out of the oil. Its is a challenging task for engine oil to suspend all the contaminants it encounters, and any engine oil can do this successfully, to a point. Valvoline along with other quality motor oils are able to perform this task more effectively and for longer periods of time. If however the oil is not changed often enough, a breaking point will be reached. This breaking point is either when there are too many



contaminants to handle or when the oil's chemical defences are weakened, and it is caused by two main things:

- Excessive accumulation of contaminants in the oil and
- Chemical changes in the make-up of the oil itself caused by the depletion of the additives and oxidation.

Other factors likely to contribute to sludge formation include:

- Going too long between oil changes.
- Failing to change the oil filter.
- Operation under severe driving conditions, stop start, heavy traffic and short trips.

A surprise visit from the sludge monster

You may also be surprise to learn that running an engine running low on oil for a prolonged period can cause sludge. The detergent and oxidation inhibitors are important components of the additive package that prevent sludge from forming. When an engine is run low on oil, these additives have to work overtime to do their job. There is simply less of the additive package available to do the work of suspending particles and preventing oxidation (thickening) of the oil. Here is a surprising fact, running an engine just one litre low on oil for 55 hours can increase the viscosity of the oil by over 1000%. This is like running really, really, really thick oil in your car's engine.

Eliminate Surprises

To avoid surprise visits from the sludge monster, use a quality engine oil like Valvoline with its superior additive packages and change it at recommended intervals. Also ensure that the service interval reflects operating conditions of the vehicle. For severe duty change more frequently.

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Photos of the sludge monster

The three photos below give an indication of the effect of the engine sludge and the impact it has on the oil filter. The level of deterioration in the filter in turns foretells of the likely engine damage.

Image 1 shows a new filter with distinct pleating of the filter paper and an absence of varnish end sludge.

Image 2 shows a heavily saturated filter, evidenced by the paper pleating beginning to collapse. The likely impacts on the engine will include the following:

- Partial blocking of the filter leading to the opening of the bypass valve allowing unfiltered oil to flow through the engine.
- Increased engine wear
- Increased oil consumption.

Image 3 shows a heavily blocked oil filter with only partial paper pleating and the presence of varnish end sludge.

The likely impacts on the engine will include the following:

- Damaged filter paper, with no effective oil filtration.
- Inhibited oil flow to critical parts of the engine leading to increased engine wear.
- Restriction in oil pump pick up.
- Weaker engine performance.
- Increased engine noise.

Image 4 shows a totally blocked oil filter with virtually no paper pleating present. This will result in the following:

- Accelerated engine wear and possible failure.
- Increased fuel consumption.
- Lower engine performance.
- Increased oil consumption.
- Blocked oil pump pick up.
- Possible ring sticking and varnish deposits on pistons.



1. New Filter



2. Near Saturation



3. Heavily Blocked



4. Totally Blocked