

LUBRICATION

7.0 LUBRICATION

The engine of a vehicle is made up of several parts with surfaces in contact. This leads to increased wear of the contacting surfaces as a result of friction. A reduction in the surface wear is required and this is done by the introduction of a viscous fluid to reduce the friction between surfaces. This fluid introduced to reduce friction and wear is known as a lubricant. What happens is that moving parts in contact are separated by a thin layer of oil. When oil is properly maintained and a minimal amount of dirt accumulates in it, the rate of wear in the engine is minimized. When an engine is initially started in the day, the crankshaft rubs on the bearing until a wedge of oil is re-established when pressurized oil reaches the bearing.

7.1 ENGINE OIL

Engine oil contains a lot of additive packages. It does not only provide lubrication, it cleans, cools, inhibits rust inside the engine and it also helps the piston rings against the walls of the cylinder, provide the sealing of the combustion chamber.

7.2 OIL LEVEL IN AN ENGINE

Appropriate oil level in an engine keeps the oil pickup screen submerged in oil under all operating conditions. If the oil level is low, serious damage could occur in some of the engine components. The crankshaft bearings can be damaged or the piston can become scuffed.

If the oil level is too high, the spinning crankshaft can dip into the oil and throw it unto the cylinder walls in such quantity that the oil rings will be overwhelmed. This can result in excessive exhaust smoke. In addition to the crankcase heating the oil, it churns it up, mixing it with air. Aerated oil does not provide sufficient oil pressure and results in collapsed hydraulic lifters or even a broken crankshaft.

When checking the oil level in an engine, the vehicle should be on a level surface.

7.3 ENGINE OIL VISCOSITY

Viscosity is a measure of a liquid's resistance to flow or deformation. It is a term used to describe the thickness or body of engine oil.

Some oils have only one viscosity rating, but most new engine oils have multiple viscosity, and are often called **multi-vis**.

An interpretation of SAE 10W-30 is as follows:

SAE = Society of Automotive Engineers

10W = The viscosity of oil when measured at 0 °F (-18 °C) (the "W" means winter grade).

30 = The viscosity of the oil when measured at 212 °F (100 °C)

Note: the ability of an engine oil to resist change in viscosity with rising temperature is called its Viscosity Index. A viscosity index improver can deteriorate enough in use which could cause a multi-vis oil like 10W-40 to become 10W-30.

Multi-vis oil plays a great role in combating engine wear because it flows more quickly to the bearings when the engine is first started. This is specifically important during cold weather.

7.4 SINGLE AND MULTI-GRADE ENGINE OIL

It should be noted that a single type of engine oil is not designed / produced by manufacturers to fit into all engines. Vehicles make various demands which are influenced by various conditions such as temperature, climatic conditions, models, etc.

Engine oil is not designed to be a simple fluid. It is designed with a lot of substances which are primarily oil based.

7.4.1 Single Grade Oil

These are oils that cannot take additives and the most known of this is a polymer which enhances viscosity or modifies it in general.

As it is known, oil is rated at two conditions: the cold (W: winter) and the hot (at 100 °C). The numerical value before the W shows the weight of the oil; the higher the number, the heavier the oil and more viscous the oil.

This means an engine oil with a higher value before the W will travel at a slower pace through the mating parts in cold weather while the one with a lower numerical value will travel faster in the same condition. As the operating temperature increases, the viscous properties of this kind of oil vary and widen.

7.4.2 Multi Grade Oil

The invention / production of multi-grade engine oils were born by the need to bring the viscosity levels of oil closer in the face of varying operating temperatures.

For multi-grade oils with SAE ratings 5W20 and 5W30, at cold temperatures, they will have the same viscosity and flow at the same rate but at higher temperatures, the rating with 20 will flow faster than the one with 30. It should be noted that, the one with 20 will thin faster and degrade with higher temperatures compared to the one with 30.

It should be noted that higher viscosity leads to increase in fuel consumption and it is advised that specification from car manufacturers should be adhered to.

7.5 OIL ADDITIVES

Engine oils (other than SA) contain additive packages that make up as much as one-third of the volume of the content. Important parts of the additive package include:

- **Pour-point depressants** that allow the oil to flow in very cold weather
- **Corrosion and rust inhibitors** that help the oil to stick to metal surfaces.
- **Antifoam additives:** that helps dissipate bubbles that form as oil is moved around the engine.
- **Friction modifiers** that reduce the friction between moving parts, resulting in less heat, reduced wear and improved fuel economy.
- **Oxidation inhibitors** that prevent oil from thickening.

- **Antiwear additives** that combine chemically with engine metals during periods of high load.

There are several benefits from changing engine oil:

- Oil's additives are depleted over time and changing the oil replenishes them.
- The oil filter takes out only particles larger than a certain size, periodic oil changes help to clean the smaller contaminants from the oil.
- Unburned contaminants like fuel and acids are removed with the oil.
- Sludge is removed.

7.6 OIL SERVICE RATINGS

The American Petroleum Institute (API) sets the service ratings of oil, which progress from SA through SM. Straight mineral oil, with no additives, is classified as "SA". SA and SB graded oils are only for very light – duty applications and although they are found sometimes in the market, they are obsolete for automotive engines. SM oil has many high-quality additives and will work well in any engine, except cam-in-block engines with flat tappets.

Gasoline and diesel engines have different rating systems:

The "S" means the Oil is for spark ignition engines.

Diesel engine oils are rated from CA through CI. The "C" means commercial or that the oil is rated for engines with compression ignition. The latest diesel engine rating is CI-4PLUS.