



A Better Class of Oil

OIL FUNCTIONS

To properly lubricate, an oil or grease must:

Lubricate Parts and Prevent Wear

This is the basic function of all oils. Keeping the moving parts separated. In general the thicker the oil film, the better the wear protection, but the oil additives also play an important role. Modern additives often allow an oil of slightly lesser viscosity to be used and still provide the same level of protection.

Reduce Friction

The film of oil reduces friction simply because there is no metal-to-metal contact. The heavier the oil though, the greater the drag and hence more heat may be generated. Correct oil selection is therefore a balance of what is needed to protect the component without generating excessive drag.

Protect Against Rust and Corrosion

As oils degrade they form corrosive by-products so the oil contains anti-corrosion and acid neutralising additives to protect components.

Keep Components Clean

Oils need to be very stable under heat and not cause system deposits. Different oils will last different lengths of time in a given application.

Be Compatible with Seals

The oil must lubricate and not cause deterioration of seals.

Prevent Foam

Foam reduces the lubrication properties of the oil, therefore industrial oils must be resistant to foaming or be able to 'release' any foam quickly.

Special Properties for engine oils

Permit Easy Starting

Most wear occurs in an engine at start up. Therefore, the oil must have the correct low temperature viscosity to flow quickly to the bearings and valve train to prevent wear. Some engines require low viscosity oils to start at all, especially some of the new diesel engines found in four wheel drives, where the oil is used to operate the pump to prime the fuel injectors.

Cool the Engine

At least 40% of the engine is cooled by the oil, not the radiator system. This means the oil is always under heat stress (oxidation) as it transfers heat from hot spots back to the sump. This includes main and big end bearings, the crankshaft, rods, other bearings plus timing gear and pistons.

Reduce Combustion Chamber Deposits

Some oil will always reach the combustion chamber - either via the cylinder walls or via the valves. It is then burned off with the fuel. So it must burn clean enough that it does not build up on valve seats or pistons tops which can cause problems.



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Special Properties for Gear and Differential Oils

- Must protect against pitting, spalling, scoring and scuffing caused by the large shear loads placed on the oil by the gear set.
- Protect against copper corrosion. Older technologies were not kind to copper alloys and used to turn them black via chemical attack. Most modern hypoid oils do not tend to do this due to advances in technologies.
- Limited slip oils must enable the cone or clutch to work properly when distributing power to the drive wheels. As such, they contain a special friction modifier to achieve this. It should be noted that oils designed for use in limited slip differentials can be used in standard hypoid differentials.

Additives

There are many types of oils and greases and they use many of the same types of ingredients. However, these are put together a little differently. Not all of these are found in every oil or grease. Firstly you have base oils, made from either crude oil at a refinery or man-made (synthetics). To achieve the functions required by finished lubricants, you must then put additives in the oil. These all do different things.

Detergents

Any oil with an API engine rating of SC or above has a level of detergency. This detergency level is not necessarily related to all of the quoted API ratings of the oil, as some high detergent diesel oils may only meet lower petrol engine oil specifications. It is a balance. Detergents are usually metallic compounds and they control deposits and keep engines clean. They can clean up dirty engines depending on the product.

Dispersants

These are usually ashless (non metallic) organic chemicals. They keep contaminants and by-products dispersed in the oil helping to prevent deposits from forming. They are highly effective in controlling low temperature contaminants. They can keep them so fine in suspension, they pass through the oil filter with the oil additives!

Extreme Pressure Additives

API GL-2 and up oils, all contain extreme pressure (EP) additives of some description. They tend to be sulphur-phosphorus based although chlorine is also used. Some types are also found in compressor and hydraulic oils, and especially in slideway oils and chain lubricants.

Friction Modifiers

These reduce friction and vary in chemical nature depending on the type of oil.

Friction Modifiers - Engine Oils

Used to reduce internal engine friction and are common in low viscosity oils where fuel economy is important. They are also effective anti-wear agents. Current technologies do not cause the same problems with bore glazing as in the past.



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Friction Modifiers - Transmission and Gear

The most important part of an ATF and a purpose designed MTF is the friction modifier. These enable the transmission to function correctly so the end user has smooth gear changes. In limited slip differentials, these prevent chatter and squawk and ensure the differential works as it should. They are all different types of chemistry.

Oxidation Inhibitors

Reduce oxygen attack on the oil, reducing oil thickening, especially at high temperatures.

Rust and Corrosion Inhibitors

Prevent rust and attack on metal surfaces from acids.

Anti-Wear Agents

Prevent wear due to seizure or scuffing of rubbing surfaces. They are normally zinc, phosphorus or other organo-metallic types.

Foam Depressants/Air Release Agents

Prevent foam from forming, thereby maintaining a lubrication film and the ability of the oil to be pumped at the required rate.

Pour Point Depressants

Reduce the oils tendency to crystallise at low temperatures, ie it's ability to pour.

Viscosity Index Improvers (VII)

These change the oil's rate of thinning out (the VI) as temperatures increase - ie make multigrade oils. They are polymers that expand as temperature increases - think of them as like a slowly uncoiling spring. VIIs change the Viscosity Index (VI) of a product - the higher this number is, the less the oil viscosity will change with temperature. There are many different types and those used in engine oils are very different to those in gear oils, as an example.

