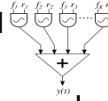




# What exactly is Motor oil made of?

The basic formula is: Base Oils + Additives = Motor Oil



**Base oils** can consist either of petroleum-based and/or of synthesized (non-petroleum) chemical compounds. They are responsible for the basic lubricating quality of motor oil that can be further enhanced by diverse additives (see below). The American Petroleum Institute (API) has defined 5 base oil categories:-

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## Mineral, Semi-Synthetic or Synthetic base stocks(Base oils)

Base stocks are either mineral based, semi-synthetic, synthetic or vegetable based. Most motor oils were mineral based until the late 1990s when Synthetics became more widely available at more affordable prices.

Mineral oils now fall into three main blends as categorized in Table 1 below. Improvements in blending of the base oils have reduced some of the problems that were typical of oils in the 1960s and 1970s. Depending on the level of refining, mineral oils can still suffer from inconsistent molecular sizing, weakness of unsaturated bonds and impurities such as Sulphur and Aromatics leading to shorter oil service life, poor film strength, low Viscosity Indices, and depositing on machine surfaces. Again, though, price will determine the quality of the base stock used in mineral based engine oils.

Synthetics are derived by a different refining process to offer better performance owing to their consistent molecular structure and purity.

# What are the advantages of Synthetics over Mineral oils?

- Superior wear control
- Superior friction control
- Superior thermal stability
- Superior aging characteristics
- Superior film strength
- Higher Viscosity Indices
- Superior detergency levels

Translated, that means:

- Improved fuel economy
- Improved power output
- Cleaner engine surfaces
- Longer oil life
- Reduced engine wear

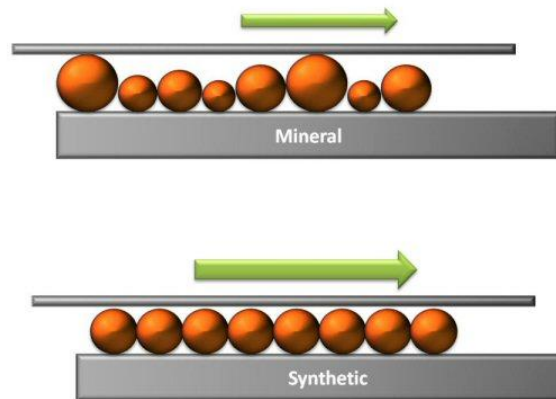


Figure 4 - Graphical representation of the difference in molecular sizing between mineral and synthetic base oils.

# What are the downsides to Synthetics?

Basically, synthetic oils cost as much as 3 times the cost of mineral derived oils. In real terms that is the only downside. Other issues often given as negatives of synthetics such as seal compatibility and additive solvency can be controlled. Issues such as viscosity often quoted as a reason for not being suitable in a classic car will depend on the selection of the correct oil. Unfortunately in the classic car community synthetics receive bad press for all the wrong reasons.

# What about Semi-Synthetics?

The implication is superior performance at a lower cost by combining a mineral and a synthetic base oil stock. There are no regulatory controls on what percentage mix constitutes a semi, so price and performance variation will occur. Do not be misled into thinking that the price difference on semi-synthetics is simply a marketing ploy, although it may well be.

# Mineral v/s Synthetic

The table below identifies the American Petroleum Institute (API) grading of base oils. Group I, II and III are all derived from crude oil which in effect means these are a mineral base oil. Group 4 is as close as you can get to a mineral oil in nature owing to its derivation from the Olefins in the gas industry. Group V oils will include all other forms of synthetically engineered oils such as Glycol and Ester based fluids, as well as Silicone fluids.

Group	Saturates		Sulphur Weight %	Viscosity Index	Process
I	< 90%	and/or	> 0.03	80 – 119	Solvent refined
II	> 90%	And	< 0.03	80 – 119	Hydro-processed
II+	"> 90%"	And	< 0.03	100 – 119	"Hydro-cracked"
III	> 90%	And	< 0.03	> 120	Severe "Hydro-cracked"
IV	Polyalphaolefins (PAO's)				Chemical reaction
Group V - all other synthetics					