

## Tech Talk tips / techniques / training

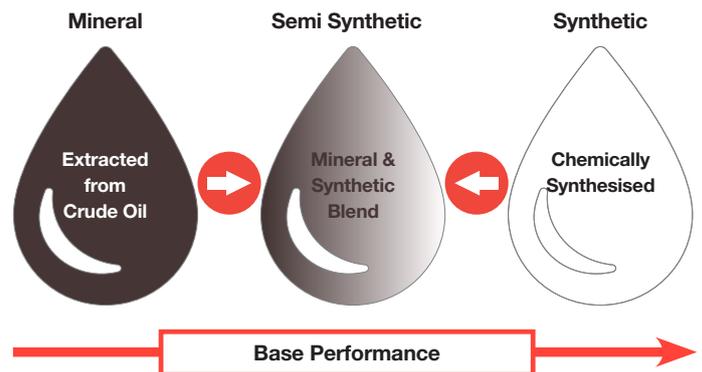
### Base Oil Types

The main component of any engine oil is base oil and all engine oils are classified as either mineral, semi-synthetic or fully synthetic depending on the type of base oil used (Figure 1).

Engine oils classified as mineral use base oils that are separated from crude oil by conventional solvent refining and are themselves defined as 'Mineral'. Engine oils classified as fully synthetic use so called 'Synthetic' base oils that are produced via a series of chemical reactions which tailor their properties to give a much higher level of base performance than mineral oils. An engine oil that is classified as semi synthetic is made from a blend of mineral and synthetic base oils in varying proportions and in performance terms fits somewhere between mineral and fully synthetic.

The American Petroleum Institute (API) has categorized base oils into five categories. The first three groups are refined from petroleum crude oil. Group IV base oils are PAO (polyalphaolefin) oils. Group V is for all other base oils not included in Groups I through IV. Before all the additives are added to the mixture, engine oils begin as one or more of these five API groups.

Fig. 1 - Types of base oil used in engine oil formulations.



### How much base oil is used in the final product?

Typically base oil accounts for 60-90% of common passenger vehicle oil, with the rest being additives like viscosity improvers, detergents, dispersants etc. – which are tailored to different manufacturers engine requirements.

Fig. 2 – API base oil categories.

API Base Oil Categories				
Group	Sulphur (%)		Saturates (%)	Viscosity Index
I	>0.03	and/or	< 90	80 to 120
II	≤ 0.03	and	≥ 90	80 to 120
III	≤ 0.03	and	≥ 90	≥ 120
IV	PAO synthetic lubricants			
V	Other base oils not classified above (specialist products)			

Performance

## Tech Talk tips / techniques / training

### Mineral base oils (Group I & II). Where do they come from?

**Mineral base** oil is one of the products of crude oil processing, as shown in Figure 3. Unlike fuels (extracted directly from crude oil distillation), mineral base oils go through a series of complex, highly energy consuming and expensive refining processes. Different types of base oils are obtained depending on the chosen refining technique (Figure 4 shows the typical relationship between refining process used and resulting type of base oil).

Fig. 3 - Crude Oil distillation process

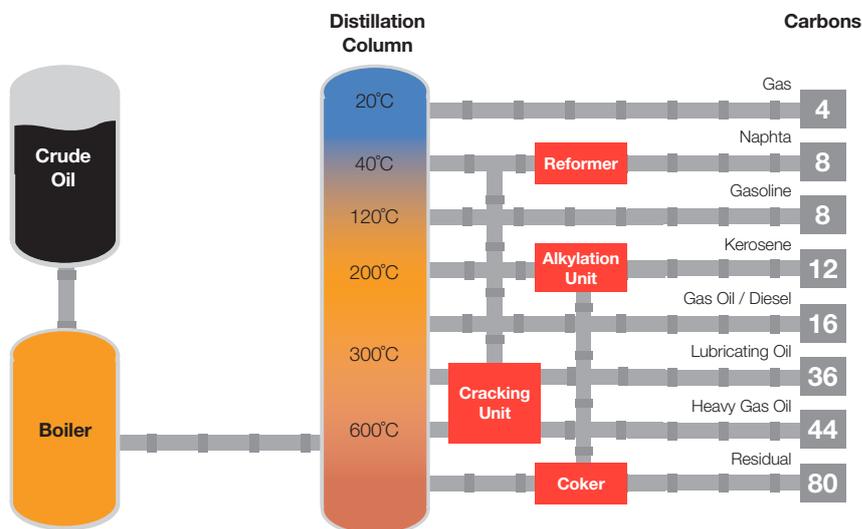


Fig. 4 - Refining process of Group I vs. Group II.

Group I	Group II
Solvent refined	Moderate Hydrocracking

### I've heard Comma's mineral and semi synthetic oils have gone from Group I to Group II. What are the benefits of this change?

As we can see from the API Base Oil Categories (Figure 2), this change was driven with an increase in performance in mind. Oxidation and thermal stability are two key properties for engine oils and better performance at these levels means better protection against the formation of harmful acids, varnish, sludge and deposits that are formed at high temperatures. Other benefits from Group II when compared to Group I base oils include lower volatility which means there is less oil loss in high temperature operating conditions. Furthermore, the tendency is for new formulations that are being developed and tested by additive companies in conjunction with OEM's, to use Group II base oils instead of Group I, which ultimately may create opportunities to expand the performance claims we make for the products affected by this change.

### What products were affected by this change?

Only mineral and semi synthetic 10W40, 15W40 and 20W50 engine oil grades have seen the mineral base oil part of their formulation upgraded. This change doesn't impact the range of applications but improves the underlying performance as previously described.

It is possible that users might notice a slight change in colour and smell of some of these products, however that is a consequence of this change, as colour and smell in this particular instance is not an indicator of quality or performance. You can be absolutely confident that you are actually getting an even higher quality product, backed up with Comma's unique application 100% Compatibility Guarantee.