

HOW IS AN ENGINE OIL MADE?

There are two main components that all engine oils are made of, basestocks and the additive package. The base fluid typically makes up the bulk of the oil (70-95%). Additive chemicals are then added to enhance the positive qualities of the basestocks and to overcome whatever negative qualities there may be.

There are two main types of basestocks, petroleum and synthetic.

Petroleum basestocks are a purified form of crude oil and have been used as the base for automotive lubricants since motor oils were first developed.

Synthetic basestocks, on the other hand, are chemically engineered in a lab specifically for the purpose of lubrication. They are engineered from pure compounds that contain no contaminants which must be removed via purification. Synthetic basestocks have been around since the early 1900's but were not widely used in automotive type applications until the 70's.

PETROLEUM BASESTOCKS

Petroleum basestocks are refined from crude oil, it must be run through a series of purification steps to improve the following desirable lubrication qualities:

Viscosity Index

A measure of an oil's ability to maintain its viscosity over a wide temperature range. The higher the number, the less change in viscosity with a change in temperature. Better oils will generally have higher viscosity indexes.

Low Temperature Performance

The better an oil will flow at low temperatures, the better its low temperature performance. Better low temperature performance provides more immediate engine protection at start-up in cold weather climates.

High Temperature Performance

How well does an oil hold together under extremely hot conditions. Will it burn off easily? Will it allow metal to metal contact under hot conditions as a result of viscosity loss (shear)? Obviously, better oils will hold together more effectively under extreme heat.

Oxidation Resistance

Oxidation occurs when oxygen reacts with the components of an oil to form sludge and other engine deposits. Oxidation leads to increased oil viscosity making the engine work harder to pump the oil through its system. An oil should be able to resist oxidation.

“HYDROCRACKED” (HC) or MOLECULARLY CONVERTED (MC) BASESTOCKS

There are many petroleum oils available on the market that are so pure and refined, they can now be passed off as synthetics.

They are not made from true synthetic basestocks (at least not in the way that synthetics have traditionally been defined), but they have so little in common with traditional petroleum basestocks, it is really somewhat silly to classify them as petroleum oils. Petroleum oil basestocks can be put through a super-extreme refining process called “hydrocracking”. In some cases, as in the case of one particular name-brand “synthetic” oil, these highly refined petroleum basestocks can actually be termed and sold as “synthetic”.

It is completely legal for lubricants manufacturers to label these oils as “synthetic”.

These are extremely high performance petroleum basestocks, but they are not truly

synthetic the way that most people understand the term and will not necessarily perform to the same level as a premium synthetic oil like PAO (poly alpha olefins) or Esters.

Hydrocracking involves changing the actual structure of many of the oil basestock molecules by breaking and fragmenting different molecular structures into far more stable ones. This results in a basestock which has far better thermal and oxidative stability as well as a better ability to maintain proper viscosity through a wide temperature range - when compared to a typical petroleum basestock.

Although contaminants are still present, and these are still petroleum basestocks, contamination is minimal and performance characteristics are high. This process also can turn a wider range of crude oil stock into well-performing petroleum lubricant basestocks.

SYNTHETIC BASESTOCKS

Synthetic oil basestocks have very little in common with their petroleum "cousins". They are used for a similar purpose. But, while one is designed specifically for the purpose of lubrication (built brick by brick), the other has been simply transformed into something that will adequately do the job.

In the case of synthetic basestocks the first step is the most important. The lubricant manufacturer first decides what the final lubricant is going to be used for. Once that is determined, research is done to determine what lubricant characteristics will be best suited to that particular application. Only then is manufacture of the actual lubricant basestocks begun.

On the surface, the manufacture of synthetic basestocks may seem far more simplistic than the manufacture of a petroleum oil. In the case of synthetics, materials of low molecular weight are chemically reacted with each other to produce materials of higher molecular weight with very specific lubricating properties.

There is no need to separate the basestocks into fractions of differing molecular weight because the intended molecular weight is formed at the start. There is no need to extract contaminants or transform them into something useful because there are no contaminants to begin with.

Nevertheless, it is important to understand that the particular materials used for chemical reaction and the methods used for those reactions will result in synthetic basestocks of varying quality. Experience is essential to proper manufacture of a quality synthetic basestocks.

Synthetic basestocks manufactured in this way will have the following basic benefits over their petroleum basestock counterparts: improved low and high temperature performance, improved oxidative and thermal stability, enhanced frictional characteristics and longer lubricant life.

THE IMPORTANCE OF THE ADDITIVE PACKAGE

Although the basestock of an oil will be a major determining factor in the lubrication quality of an oil, chemical additives play a major part in making sure that it does all that it is supposed to do. The chemical additive package of an oil is just as important to insuring the quality of a lubricant as is the particular basestock used.

The chemical additive package of an oil is designed to perform a number of tasks and each task is performed by a particular type of chemical. The quality of the chemicals used and the manner in which they are blended plays a large part in determining how well the additive package does its job.

As the quality of the additive chemicals increases, so does the price. In addition, proper

blending takes a great deal of research. This requires much time and, again, money. Therefore, manufacturers will, of course, charge more for motor oils which contain a high quality additive package than those with lower quality additive packages. They simply can't afford not to.

Each chemical within an oils additive package plays a different role in boosting the beneficial properties of it's host lubricant (basestock).