SAVINGS WITH SYNTHETICS

LUBRICANTS THAT PROTECT, PERFORM, AND LAST

WHAT'S A LUBRICANT?

Lubricants have two main components: a base oil and an additive pack. The base oil comprises most of the lubricant formulation and determines its performance capabilities with respect to oxidation stability, film strength and inherent viscosity index. The additive pack provides enhancements to the lubricant performance that are desirable for a specific application.

WHAT'S A SYNTHETIC LUBRICANT?

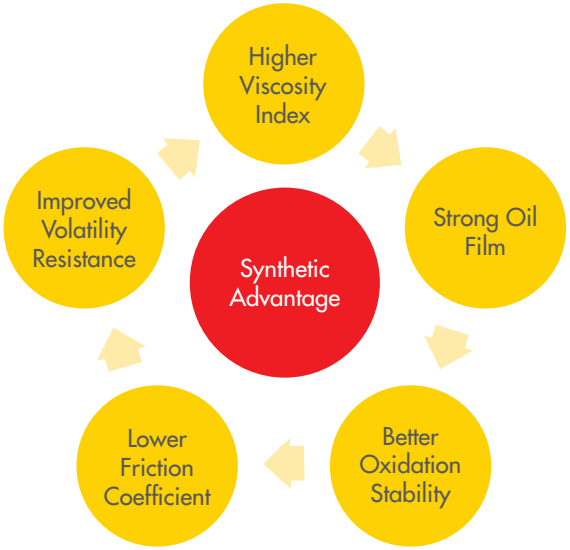
When crude is brought into the refinery, processing takes place to remove any molecules that don't help in the actual job of the lubricant. With synthetic oils, greater refining takes place and a more pure, robust molecule is produced.

Synthetic based oils (Group III, IV and V classed based oils) are man-made chemically synthesized oils which result in consistent uniformity in appearance and performance. Group IV is reserved for Poly Alpha Olefins aka PAO's, and historically have been the most common and compatible. Group V based oils are specialized, having specific properties.

Recently, synthetic base stocks made from natural using gas-to-liquid (GTL) technology have been used to make finished lubricants. They are classified as a Group III but exhibit enhanced performance characteristics when compared to traditional Group III base stocks refined from crude oil.

HOW SYNTHETIC LUBRICANTS SAVE TIME AND MONEY

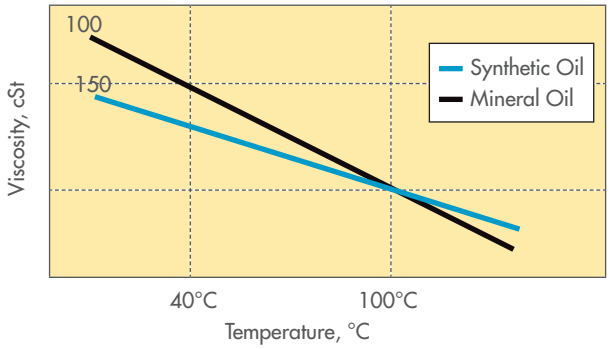
Synthetics are problem solvers and when problems are solved it saves you time and money. **There are five key properties that give synthetic lubricants an advantage over mineral oil:**



1. HIGHER VISCOSITY INDEX

Viscosity is the main feature that influences the effectiveness of lubrication. A low viscosity fluid will pour like water, while a high viscosity fluid will pour more like molasses. It's important to know what the right viscosity is needed for a specific application and for the lubricant to then be able to maintain that viscosity within the normal operating conditions.

The viscosity index measures how much a fluid's viscosity will change with a change in temperature. It's more desirable to have a fluid that has less change in viscosity with a change in temperature. Therefore, you want an oil with a high viscosity index.

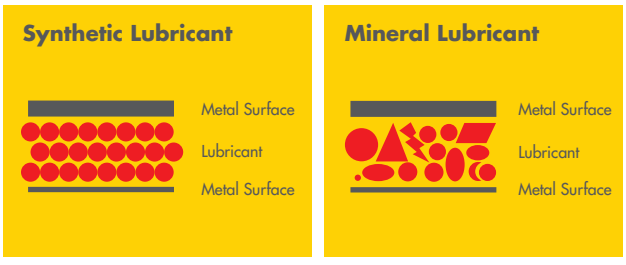


The synthetic base stock's inherent high viscosity index means a wider operating temperature range, better oil flow at cold temperatures, and thicker oil film at hot temperatures. Better lubrication across a wider temperature range means less wear and a longer component life.

2. STRONG OIL FILM

Synthetic lubricants have similar molecular structures of the same shape and size. When there's a uniform structure, the lubricant molecules form a tight, strong oil film, which can affect the performance of the lubricant.

Mineral molecules do not stack upon each other as tightly as synthetics. A mineral lubricant may have the same oil thickness as a synthetic lubricant, but the strength of its oil film is much weaker.



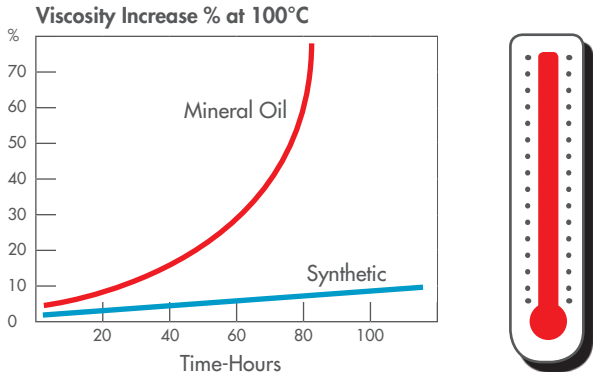
*Depiction of molecules are for learning purposes only. Mineral oil molecules are not shaped like thunderbolts.

Synthetic lubricants have strong oil film properties that enable the lubricant to have better wear protection and a longer component life.

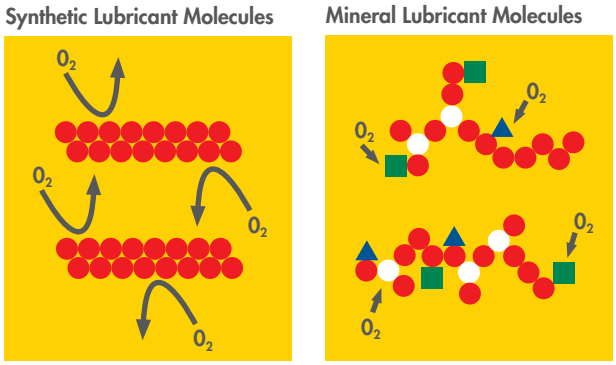
3. OXIDATION STABILITY

Oxidation of a lubricant is the breakdown of the molecules due to the reaction with oxygen to form acid by-products. The acid by-products are typically known as sludge and are detrimental to the lubricant performance.

Lubricant formulations made with mineral base oils tend to oxidize at lower temperatures and at a higher rate when compared to their synthetic counterparts. The mineral oil's less desirable molecular structures provide many targets for the oxidation reaction to occur.



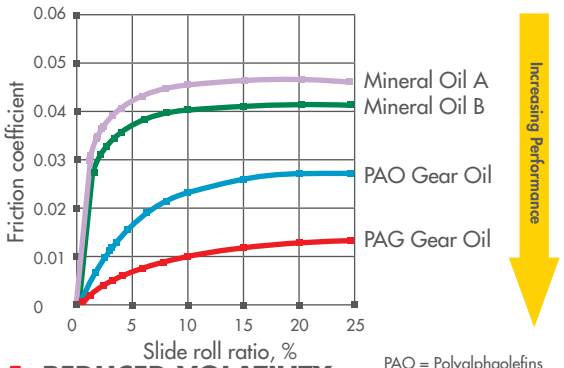
A comparable lubricant formulated with a synthetic base stock is inherently resistant to the oxidation reaction. This is because of the uniformity of the molecular structure and its engineered design that prevents the molecule from having any weak spots for the oxygen to attack. This resistance provides oxidation stability, preventing both sludge from forming and oil from thickening. More importantly, it can provide a longer drain interval and better wear performance.



Depiction of molecules are for learning purposes only.

4. LOWER FRICTION COEFFICIENT

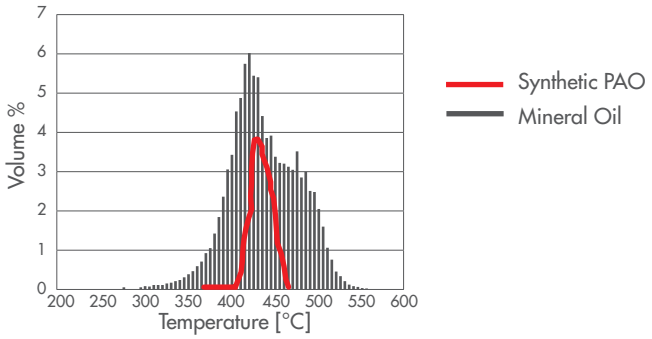
With a synthetic lubricant, metals can slide smoothly over those uniform molecules yielding a reduction in friction. This lower friction coefficient causes an increase in overall performance. Even within the lubricant molecules themselves, there is less internal friction being created. This is an important feature because less energy is being consumed within the lubricant and leads to better energy efficiency.



PAO = Polyalphaolefins
PAG = Polyalkylene Glycol

5. REDUCED VOLATILITY

Volatility is the readiness of a fluid to evaporate, meaning that part of its component is essentially being boiled off. Mineral oils have a wide range of molecular structures with a wide range of different boiling points. Therefore, the components that have a lower boiling point have the potential to be removed from the formulation and enter into the atmosphere. This is an important lubricant property in fluids that are exposed to high operating temperatures, such as engine oils.



A synthetic lubricant has a tighter range of molecular structures and boiling points, causing it to be much less prone to volatilization. Using a fluid that will help reduce volatility in emissions is an easy fix from a cost standpoint. Even further, this is the solution of the future. More and more engines are going to be leaning towards these higher performing synthetic base oils.

Reduced volatility means less oil loss. The benefit of this is less oil required for make-up and better performance from an emissions standpoint.

MAJOR APPLICATIONS OF SYNTHETIC-BASE FLUIDS

Synthetic Type	Application
GTL, Grp III and/or Grp IV (PAOs)	Most widely used; Gearboxes; Screw compressors; Blowers; Fans; Passenger car motor oil; Motors
Diesters/Triesters	Reciprocating compressors; Oil mist systems; High temperature chains; Rotary screw compressors; Biodegradable hydraulic systems
Polyol Esters	Aeroderivative gas turbines; Aviation jet engine oils
Polyakylene Gylcols (PAGs)	Worm gears; Reciprocating gas compressor cylinder lube; Rotary screw gas compressors; Rotary screw air compressors
Alkylated Aromatics	Refrigeration compressors
Phosphate Esters	Fire-resistant hydraulic fluid for EHC systems – steam turbines