

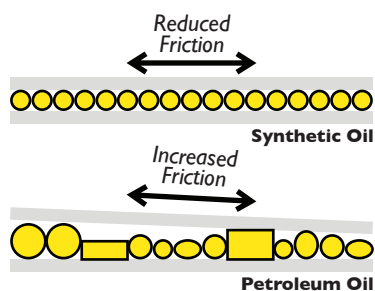
## WHAT ARE SYNTHETIC LUBRICANTS?

Synthetic lubricants are engineered products created by chemical reactions through the precise application of pressure and temperature to a specific recipe of components. Unlike mineral based lubricants, synthetics are not refined. All of the components are high in purity with strong molecular bonds. As a result, the end product is a pure compound, less vulnerable to oxidation, highly resistant to breakdown, and uniform in molecular size.

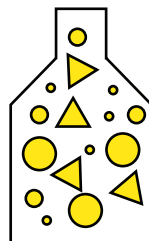
### Molecular Structure – Mineral/Petroleum Based Lubricants vs Synthetic Lubricants

When comparing these two types of lubricants, mineral oil would be like having a container filled with many different balls of different shapes and sizes, such as footballs, baseballs, tennis balls, ping-pong balls, soccer balls, golf balls, etc. Mineral oils contain thousands, if not millions, of different chemical structures (molecules).

Synthetic oils would be the equivalent of having a container filled with just one type of ball (tennis balls). Every structure in the container of synthetic oil is almost identical to the structure beside it. This molecular size uniformity keeps synthetics from jellifying when it's cold (they do not contain waxes), and its specific molecular structure keeps it from thinning-out under heat; therefore, the lubricant's protective characteristics are more predictable.

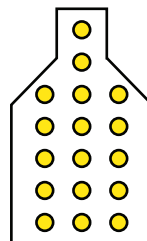


Conventional Petroleum Lubricant



Molecular Inconsistency

Synthetic Engineered Lubricant



Molecular Uniformity

### Gear Wear

The issue of gear wear is also a consideration. Tests have proven synthetic lubricants make gears more efficient than mineral oils. A polyglycol showed the highest efficiency (18 percent more than the high-performing mineral oil). Synthetic hydrocarbon gear oil also increased the efficiency of the best gears by eight to nine percent. The performance of synthetic lubricants in food-grade applications in accordance with USDA-HI food contact is also a benefit.

### Traction Coefficient

Compared to mineral oil molecules, synthetic lubricants, for example, have up to a 30 percent advantage over mineral oils for traction coefficient. This means the force needed to move a load is less, which means less horsepower to do the work.

In a gear reducer, the lubricant in the tooth mesh is sheared, and the lower the traction coefficient, the lower the energy dissipated due to lubricant shearing. The difference is realized by low amperage draw on the motor and reduced lubricant/gear temperature. Changing to a low-traction synthetic will reduce power consumption in a spur/helical gear by 0.5 percent for each reduction, and up to 8 percent for high-reduction worm gears.

### Advantages of Synthetic Oils:

- Their ability to outperform mineral oils at high operating temperatures (above 150 degrees F) and, at low operating temperatures (below 0 degrees F).
- Because of their molecular uniformity, they excel at: Reducing friction, Improving power and fuel efficiency, Reduced heat, Reduced component wear.
- Higher oil film strength
- Excellent resistance to oxidation and thermal breakdown
- Higher viscosity index which extends their service life