

Synthetics vs. Conventional Lubricants 101

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One of the most often asked questions about synthetic lubricants is “What is the difference between synthetic lubricants and conventional lubricants?” Judging from the number of different responses to this question, there does not appear to be one specific answer. Since there are so many different angles to answering this question, and the people answering the question are all well-meaning, professional individuals, the real answer to the question must start with “it depends”.

Whether synthetic or petroleum-based, lubricants consist of polymer chains and additives. The base materials in conventional lubricants are a little easier to characterize as a group. The polymer chains originate from the ground as crude oil which contains many undesired elements. The refining process removes these undesirable materials to the extent possible within the technology and cost constraints of the refiner and the resulting portion that is targeted towards lubricants is used to manufacture many different conventional lubricant products.

Synthetic lubricants as a category have continually been declared separate and distinctly “different and better” than conventional lubricants. There are a variety of very different categories of synthetically manufactured base oils that are used to formulate products in this category. Common base oils include Group III base oils, PAO’s, esters, PAG’s and many other more highly engineering materials. They are proven to do a better overall job of protecting equipment in many cases and last longer than conventional lubricants. The two operative words are “different and better.” So what is the real difference between synthetic lubricants and conventional lubricants? Are synthetic lubricants distinctly different and better than conventional lubricants? Let’s take a look at a specific example to help answer this question for a specific situation. The example below outlines general viscometric properties an ISO 46 hydraulic oil labeled as conventional and one labeled as synthetic. In this example, there are wide differences in viscometric properties between the conventional and synthetic product.

	ISO 46 Conventional Hydraulic Oil	ISO 46 Synthetic Hydraulic Oil
Viscosity @ 100°C (cSt)	6.76	8.50
Viscosity @ 40°C (cSt)	47.12	46.71
Viscosity Index	96	161
Pour Point °C	-30	-44
Brookfield Viscosity @ -40 °C	>1,000,000	35,500
Cost	1.0	1.5-2.5

Since different is not necessarily better, let's take a look at what is different and if different also equals better. The kinematic viscosity is very close between the two products at 40 degrees C but as both hydraulic oils are heated, the synthetic product maintains a higher viscosity and is almost 2 centistokes higher at 100 degrees C which is reflected in the viscosity index (161 vs. 96). Different yes, but better? It depends – on the application and the equilibrium running temperature of the application. Will the extra viscosity in the synthetic product provide better protection in a hot running hydraulic system? Will the equipment last longer with the synthetic product due to the extra viscosity in hot environments? Questions that can only be answered through field validation.

Now let's look at the cold temperature properties of the two different lubricants. The pour point is 14 degrees C lower for the synthetic hydraulic oil and the Brookfield Viscosity at -40 degrees C is much lower for the synthetic product. Different yes, but better? It depends on the application environment, running temperature of the hydraulic system and the temperature at which the system is started. Spikes in pressure related to cold, thick lubricants have been proven to weaken and burst hydraulic lines over time. Will the significant difference in Brookfield viscosity lead to operational and maintenance issues in a mobile hydraulic system during winter in Michigan? It depends on the equipment design, temperature extremes, startup procedures, duty cycle etc.

Viscosity is one of the most important properties of a lubricant. The proper thickness must be maintained during optimal running conditions to ensure that equipment does not fail prematurely. What about the times equipment is running in severe conditions or extreme environments either hot or cold? How does the accumulated time run at these extremes effect the life of the equipment, maintenance frequency and even overall lubricant life? These are all good questions maintenance managers, equipment owners and equipment operators struggle with every time they select a lubricant for an application. It depends on the severity of the operating environment and the impact the viscosity change has on the equipment.

Different yes, but better? The difference in properties outlined in this one example do lead to better operational and maintenance results in many cases but it depends on a number of different factors and it comes at a cost. Through continuous improvement activities and cost reduction initiatives, many lubricant providers are helping customers discover new ways to provide better outcomes, challenge paradigms and reduce overall costs. Synthetic lubricants many times are a part of these initiatives. "I have heard of synthetics before, but what's the difference between synthetics and conventional lubricants?" So are synthetics different? Better? It depends on a number of things but the best places to start is find out what is ailing your customer and theorize if there is a way to fix it. Synthetic lubricants may just provide a key to unlocking a door that previously could not be opened.