

What is Motor Oil Made Of?

by Mike Maddox



Automotive service professionals know that motor oil is the lifeblood of an engine; but how many know what it actually is and how it works? Differences in formulations, even within the same brand, can be as broad as the base oil type (e.g., synthetic or conventional), or as specific as the additive package used.

Roughly 80 to 85 percent of a typical motor oil is base oil. Not all base oils are the same, however, and their differences go well beyond "conventional" versus "synthetic."

Base oils vary widely in their physical and chemical properties, due to the different sources of base oil and different methods of processing. In order to help simplify the base oil market, the American Petroleum Institute (API) developed a classification system for base oil. This system divides base oils into five different groups based on their physical and chemical properties.

In general, these groups can be described as follows:

- Group I base oils are typically the least refined of all base oils. They are most often utilized in straight-weight, conventional motor oils.

- Group II base oils are more refined than Group I, with further processing designed to remove impurities and improve the oil's properties as a lubricant. Group II oils are often used when creating many of today's multi-

grade conventional motor oils.

- Group III base oils are more refined than Group II oils; in fact, the refining processes they undergo result in base oils that perform at the same level as polyalphaolefin (PAO) base oil or other synthetic base oils. As a result, Group III oils are also synthetic base oils.

- Group IV base oils are PAO base oils, sometimes known as "historical synthetics" or man-made molecules.

- Group V oils are essentially anything that will not fit into the previous four categories, such as esters and polyolesters.

While base oil makes up about 85 percent of a bottle of motor oil, the remaining 15 percent is a combination of additives referred to as the "additive package." These additives play a key role in helping to keep an engine clean and protected from varnish and sludge, as well as help protect against wear, heat and acids. An additive package can consist of antioxidants, anti-wear agents, detergents, dispersants, friction modifiers and viscosity index improvers, with each component responsible for at least one separate task.

Antioxidants in motor oil help the oil cope with the high temperature extremes inside the engine, while anti-wear additives assist in lubricating the moving components. Dispersants keep impurities in the engine oil, such as blow-by debris, in suspension so the oil filter can remove the contaminants before the oil travels

to critical engine parts or so the contaminants get drained out at the next oil change.

Detergents help keep high-temperature surfaces such as pistons clean, while friction modifiers help to reduce friction in critical areas of the engine, which can help enhance the vehicle's fuel economy. Finally, viscosity index improvers are chemical additives that are added to motor oil to help ensure proper oil viscosity in extreme cold and hot operating conditions, enabling the development of multi-grade oils such as SAE 5W-20.

Properly functioning motor oils help enhance fuel economy, prevent sludge and varnish deposits and maintain proper low-temperature pump-ability. While helping perform these functions, the additives in motor oil are consumed at different rates, which vary with vehicle, engine type and driving conditions. Most automotive and motor oil manufacturers encourage automotive professionals to follow owner's manual guidelines for oil specification and oil drain interval for every vehicle.

Regular oil changes are one of the most important things that can be done to help maximize the life of an engine. Premium quality motor oils are designed to maintain their effectiveness over the life of the oil drain, which helps in keeping the engine clean. ♦

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