Base Oil

Crude petroleum oil is a mixture of a wide variety of hydrocarbon compounds of different molecular sizes, determined by the number of carbon atoms linked together with hydrogen atoms to form a chain-like structure. In general, the longer the hydrocarbon chain, the higher its boiling temperature. Through the oil-refining process of distillation, crude oil can be separated into its various components due to the fact that they vaporize, or boil off (longer chains separate from short chains), at different temperatures. These vapors are then cooled and condensed back into liquids such as solvents, gasoline, diesel fuel, and lubricating oils. These base lubricating oils are called base stocks, which are further purified and blended with various performance ingredients to make finished engine oils, hydraulic oils, transmission fluids, and gear lubes.

API Group Classifications

Lubricating oil base stocks are classified according to their chemical structure and sulfur content. A carbon atom can have up to four other atoms attached to it. Natural gas, or methane, is the simplest hydrocarbon compound, with four hydrogen atoms attached to one carbon atom. Lubricating oils are long chains of carbon atoms linked together, with hydrogen atoms attached to all the other available spots on the carbon chain. Sometimes the carbon atoms can be joined together in what are called double or even triple bonds, with fewer spots for hydrogen atoms to attach to the chain. Unfortunately in these situations, the hydrocarbon molecules are less stable and can react with other compounds inside an operating system to form gums, varnishes, sludge, and other harmful deposits.

API Group I

API Group I base stocks were for many years the main component in engine oil, and performed adequately in yesterday's engine operating conditions. Group I base stocks contained hydrocarbon chains with significant amounts of multiple bonds and higher amounts of sulfur contaminants. As engine operating temperatures and horsepower outputs have increased, it has been found that engine oils made with Group I base stocks are not capable of withstanding these harsh operating conditions. They break down to form gums, varnishes, and carbon deposits.

API Group II and Group III

API Group II and Group III base stocks are further refined to remove almost all sulfur content and reduce the number of multiple bonds in the hydrocarbon molecules. This process is called hydro-treating. In addition, a more severe refining process called hydrocracking can be used to break apart extremely long hydrocarbon chains to produce a very pure and stable base stock. These two processes produce base stocks that are much more stable and capable of resisting high-temperature breakdown and deposit formation. John Deere Plus-50™ II SAE 15W-40 and 10W-30 engine oil are blended using only the highest-quality Group II and Group III base stocks to help keep engines clean and free of harmful and performance-robbing deposits.

Group IV

Lubricating oils can be formulated using synthetically made base stocks instead of those refined from crude oil. There are sophisticated chemical processes that can link together carbon and hydrogen atoms to produce very uniform hydrocarbon molecules with very precise chemical and physical properties. Classified as Group IV base stocks, these synthetic lubricants can offer performance advantages over mineral oil base stocks. These advantages include better high-temperature performance by resisting high-temperature oil breakdown, oxidation thickening, and deposit formation; and better cold-temperature performance by retaining more fluid to quickly flow to moving parts at start-up, in very cold conditions, building oil pressure and lessening start-up wear. John Deere Plus-50 II SAE 0W-40 Synthetic engine oil, blended with the highest-quality synthetic base stocks, is the best choice for use in extremely cold environments to ensure maximum engine-lubrication protection.

Facts About Oil and Its Usage

Off-road engines have different needs:

- The off-road engine (farm or industrial) has less stop-and-go operation and performs most of the time at normal operating temperatures. Load factors range from 70 to 80 percent of the continuous rated load.
- An on-highway engine (truck and automobile) is subjected to more stop-and-go operation, idling, and cold-engine operation. It is seldom subjected to the off-road engine's extended high-load operation. Load factors range from 40 to 50 percent of the continuous rated load.
- **Manufacturer's engine oil specifications take into consideration these differences when formulating or specifying oils for their engines.**

Operator's manual recommendations are critical:

- Lubrication recommendations in operator's manuals ensure good performance over a long period of time. Refer to the operator's manual and follow the recommended lubrication practices.
- Oil changes are necessary regardless of base stock type.
- Oil loses many of its lubrication qualities as it absorbs contaminants and its additives are depleted.
- Oil thickens as it breaks down and oxidizes. If it gets thinner during use, fuel dilution or coolant leak may be the cause.
- Oil oxidation and excessive contamination cause the oil to eventually become unfit for further use.