CITGO LUBRICANTS

Webinar Executive Summary

Lubricant Additives for the non-Chemist
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Lubricant compositions vary by the application in which the lubricant is to be used. All lubricants are composed mostly of base oil, but the amount and types of additives in them can vary significantly. Engine oils and automatic transmission fluids are highly additized, while turbine oils contain some of the lowest additive concentrations. Engine oil is formulated specifically for use in internal combustion engines, containing detergent and dispersant additives. Automatic transmission fluids contain antiwear and friction modifier additives. Automotive gear oils contain high concentrations of antiwear and extreme pressure additives. Industrial gear oils also contain antiwear and extreme pressure, but without viscosity modifiers. Hydraulic fluids contain antiwear and antioxidant additives. Finally, turbine oils contain antioxidants and rust inhibitors.

There are many different types of additives that impart many different properties to lubricants. Viscosity modifier (VM) is a polymeric material that changes size with changes in temperature. It is used to increase the viscosity index in multi-grade engine oils and high VI hydraulic fluids. Dispersants are used to keep engine contaminants in dispersion in the oil so that they do not deposit in the engine. Detergent additives are used to neutralize acidic products of combustion and to help keep engine components clean. Antiwear (AW) additives form a protective layer on metal surfaces. Extreme pressure (EP) additives react with metal surfaces to form a layer that enhances the load-carrying capacity of the lubricant. Antioxidants (AO) are sacrificial materials that preferentially react with oxygen to prevent the oxidation of the base oil in the lubricant. Friction modifier (FM) additives are used to modify the frictional characteristics of engine oils and automatic transmission fluids. Rust inhibitors (RI) protect ferrous metal surfaces from the effects of corrosive materials such as water or acids. Corrosion Inhibitor (CI) additives protect non-ferrous metals (mainly copper alloys) from corrosion. Pour point depressant (PPD) additives disrupt the formation of wax crystals in oil, thereby reducing the pour point of the product. Demulsifier additives help to enhance the water shedding properties of products. Foam inhibitors, also known as antifoam (AF) additives, destabilize foam, allowing bubbles to break more easily. AF additives are typically used at very low concentrations. Seal swell additives are used to condition older seals to reduce oil leakage in high-mileage engines, transmission fluids, and hydraulic fluids. Dye is added to lubricants to impart a distinctive color. Color is sometimes used to differentiate between products (red ATD vs. amber engine oil) or to indicate a specific brand. Additives that are unique to grease include tackiness additives and lubricating solids (e.g. graphite, molybdenum disulfide, PTFE). Many additives are surface active, and they compete for space on metal surfaces to which to attach. Lubricant formulation is a careful balance of additives to produce the properties that are desired in the specific product. Aftermarket engine oil additives can disrupt the balance of the engine oil formulation. It is best not to add aftermarket additives to engine oil.