



GLOSSARY

This Glossary is offered as a concise source of basic information about petroleum products—their properties, the processes by which they are made, the test methods used to assess product characteristics and assure consistent quality, and the types of equipment and materials that rely on petroleum products for their operation or manufacture.

An italicized word or phrase within a definition indicates that the term is defined separately under its own heading.

A

absolute viscosity — the ratio of shear stress to shear rate. It is a fluid's internal resistance to flow. The common unit of absolute viscosity is the poise (see *viscosity*). Absolute viscosity divided by the fluid's density equals kinematic viscosity.

absorption — the taking up, assimilation, or incorporation of one material into another.

acid — a chemical substance that can react with metals to form salts and with bases or alkalis to form salts plus water. Acids contain hydrogen and they form hydrogen ions (H⁺) in water. They are considered strong or weak depending on the hydrogen ion concentration in the solution.

acid number — see *neutralization number*.

additive — a chemical added in small quantities to a petroleum product to impart or improve certain properties.

AGMA — American Gear Manufacturers Association, which as one of its activities establishes and promotes standards for gears and lubricants.

alkaline — the property of a substance, product, or mixture that gives it the chemical character of a base or alkali, as contrasted to an acid.

aniline point — lowest temperature at which a specified quantity of aniline (a benzene derivative) is soluble in a specified quantity of a petroleum product, as determined by test method ASTM D611 or D1012; hence, an empirical measure of the solvent power of a hydrocarbon.

antioxidant — see *oxidation inhibitor*.

antiwear agent — an additive that minimizes wear caused by metal-to-metal contact during conditions of mild boundary lubrication (e.g., stops and starts, oscillating motion). The additive reacts chemically with, and forms a film on metal surfaces under normal operating conditions.

API (American Petroleum Institute) — trade association of petroleum producers, refiners, marketers, and transporters, organized for the advancement of the petroleum industry by conducting research, gathering and disseminating information, and maintaining cooperation between government and the industry on all matters of mutual interest.

API Service Categories — gasoline and diesel engine oil quality levels established jointly by API, SAE, and ASTM, and sometimes called SAE or API/SAE categories.

API gravity — see *specific gravity*.

aromatic — unsaturated hydrocarbon identified by one or more benzene rings or by chemical behavior similar to benzene.

ash content — noncombustible residue of a lubricating oil or fuel, determined in accordance with ASTM D582 and D874 (sulfated ash).

ashless dispersant — cleanliness additive for crankcase oils. It is widely used in lubricants for aviation piston engines. Unlike conventional crankcase-oil detergents, ashless dispersants do not contain metallic compounds. See *dispersant*.

ASTM (American Society for Testing and Materials) — an organization devoted to “the promotion of knowledge of the materials of engineering, and the standardization of specifications and methods of testing.” A preponderance of the data used to describe, identify, or specify petroleum products is determined in accordance with ASTM test methods.

autoignition temperature — minimum temperature at which a combustible fluid will burst into flame without an extraneous ignition source.

B

base — one of a broad class of compounds that react with acids to form salts plus water.

base number — see *neutralization number*.

base oils — base stocks and base stock blends used as an inert ingredient or diluent in the manufacture of automotive and industrial lubricants, and some industrial, agricultural, and consumer chemicals.

base stock — a primary refined petroleum fraction, usually a lube oil, into which additives and other oils are blended to produce finished products.

bright stock — high viscosity oils, highly refined and dewaxed to make clear products of good color, produced from residual stocks, or bottoms; used for blending with lower viscosity oils.

Brookfield viscosity — apparent viscosity of an oil, as determined under test method ASTM D2983.

bulk modulus — measure of a fluid's resistance to compressibility; the reciprocal of compressibility.

C

carbon residue — percent of coked material remaining after a sample of lubricating oil has been exposed to high temperatures under ASTM D189 (Conradson) or D524 (Ramsbottom). Results of these tests are reported as a percentage of the weight of the original sample.

catalyst — substance that contributes to a chemical reaction without, itself, undergoing any change.

centipoises — see *viscosity*.

centistokes — see *viscosity*.

centralized lubrication — system under which grease or oil is dispensed automatically from a reservoir directly to the lubricated parts of one or more machines. Flow is maintained by a pump or battery of pumps operating on a common rail, and the amount of lubricant supplied to each point can be regulated by metering devices at each point.

channel point — a measure of the lowest temperature at which a gear lubricant may be used safely.

Cleveland Open Cup (COC) — test (ASTM D92) for determining the flash point and fire point of all petroleum products except fuel oil and products with flash points below 70°C (175°F).

cloud point — temperature at which a cloud or haze of wax crystals appears at the bottom of a sample of lubricating oil in a test jar, when cooled under conditions prescribed by test method ASTM D2500.

Cold Cranking Simulator (CCS) — a high shear viscometer used to measure viscosity of crankcase oils at low temperature (0°F).

compatibility — the ability of petroleum products to form a homogeneous mixture that neither separates nor is altered by chemical interaction.

compounded oil — special blend of petroleum oil with small amounts of fatty or synthetic fatty oils added to them to impart special properties.

compressor — any of a wide variety of mechanisms designed to compress air or other gas to produce useful work.

corrosion — chemical attack on a metal or other solid by contaminants in a lubricant or coolant.

corrosion inhibitor — additive for protecting metal surfaces against chemical attack by water or other contaminants.

cutting fluid — fluid, usually of petroleum origin, for cooling and lubricating the tool and work in machining and grinding.

D

demulsibility — ability of an oil to separate from water, as determined by ASTM D1401 or D2711.

detergent — an additive in crankcase oils generally combined with (and confused with) dispersant additives. A detergent chemically neutralizes acidic contaminants in the oil before they become insoluble and fall out of the oil, forming sludge.

detergent-dispersant — engine oil additive that is a combination of a detergent and a dispersant; important in preventing the formation of sludge and other engine deposits.

dielectric strength (breakdown voltage) — minimum voltage required to produce an electric arc through an oil sample, as measured by test method ASTM D877; hence, an indication of the insulating (arc preventive) properties of a transformer oil. A low dielectric strength may indicate contamination, especially by water.

dispersant — engine oil additive that helps prevent sludge, varnish, and other engine deposits by breaking up insoluble contaminant particles already formed. Particles are kept finely divided so that they can remain “dispersed” or colloiddally suspended in the oil.

dropping point — the temperature at which a grease passes from a semisolid to a liquid state under specified test conditions ASTM D556. It is an indication of whether a grease will flow from a bearing at operating temperature.

E

emulsibility — the ability of an oil to emulsify with water. The oil becomes suspended in the water in minute particles in a more or less stable form.

emulsion — intimate mixture of oil and water, generally of a milky or cloudy appearance.

engine deposits — hard or persistent accumulations of sludge, varnish, and carbonaceous residues due to blow-by of unburned and partially burned (partially oxidized) fuel, or from partial breakdown of the crankcase lubricant.

EP additive — lubricant additive that prevents sliding metal surfaces from seizing under conditions of extreme pressure (EP). At the high local temperatures associated with metal-to-metal contact, an EP additive combines chemically with the metal to form a surface film that prevents the welding of opposing asperities, and the consequent scoring that is destructive to sliding surfaces under high loads.

F

film strength — property of a lubricant which acts to prevent scuffing or scoring of bearing surfaces.

fire point — the minimum sample temperature at which vapor is produced at a sufficient rate to sustain combustion. Specifically, it is the lowest sample temperature at which the ignited vapor persists in burning for at least 5 seconds.

flash point — minimum temperature of a petroleum product or other combustible fluid at which vapor is produced at a rate sufficient to yield a combustible mixture. Specifically, it is the lowest sample temperature at which the air vapor mixture will “flash” in the presence of an ignition source (small flame).

floc point — temperature at which waxy materials in a lubricating oil separate from a mixture of oil and FREON R-12 refrigerant, giving a cloudy appearance to the mixture.

fluid friction — A liquid's internal resistance to flow. See *friction*.

foaming — occurrence of a frothy mixture of air and a petroleum product (e.g., lubricant, fuel oil) that can reduce the effectiveness of the product, and cause sluggish hydraulic operation, air binding of oil pumps, and over-flow of tanks or sumps.

foam inhibitor — an additive which causes foam to dissipate more rapidly. It promotes the combination of small bubbles into large bubbles which burst more easily.

freezing point — a specific temperature that can be defined in two ways, depending on the ASTM test used.

friction — resistance to the motion of one surface relative to another. The amount of friction is dependent on the smoothness of the contacting surfaces, as well as the force with which they are pressed together.

G

grease — mixture of a fluid lubricant (usually a petroleum oil) and a thickener (usually a soap) dispersed in the oil. Because greases do not flow readily, they are used where extended lubrication is required and where oil would not be retained.

H

heat of combustion — measure of the available energy content of a fuel, under controlled conditions specified by test method ASTM D240 or D2382.

hydrocarbon — chemical compound of hydrogen and carbon; also called an organic compound. Hydrogen and carbon atoms can be combined in virtually countless ways to make a diversity of products.

hydrolytic stability — ability of additives and certain synthetic lubricants to resist chemical decomposition (hydrolysis) in the presence of water.

I

ILSAC (International Lubricant Standardization & Approval Committee) —

composed of Japanese and U.S. automobile manufacturers, it initiates and promotes the development of passenger vehicle engine oil performance specifications.

inhibitor — additive that improves the performance of a petroleum product through the control of undesirable chemical reactions. See *corrosion inhibitor*, *oxidation inhibitor*, *rust inhibitor*.

inorganic compound — chemical compound, usually mineral, that does not include hydrocarbons and their derivatives.

insolubles — test for contaminants in used lubricating oils, under conditions prescribed by test method ASTM D893.

ISO — International Standards Organization.

ISO viscosity classification system — international system, approved by the International Standards Organization (ISO), for classifying industrial lubricants according to viscosity. Each ISO viscosity grade number designation corresponds to the mid-point of a viscosity range expressed in centistokes (cSt) at 40°C.

K

kinematic viscosity — absolute viscosity of a fluid divided by its density at the same temperature of measurement. It is the measure of a fluid's resistance to flow under gravity, as determined by test method ASTM D445.

L

load wear index — measure of the relative ability of a lubricant to prevent wear under applied loads; it is calculated from data obtained from the Four Ball EP Method.

lubrication — Control of friction and wear by the introduction of a friction-reducing film between moving surfaces in contact. The lubricant used may be a fluid, solid, or plastic substance.

lubricity — Ability of an oil or grease to lubricate; also called film strength. Lubricity can be enhanced by additive treatment.

M

melting point — the temperature at which a solid substance melts or becomes liquid. Grease melting point is determined by placing a small amount of the grease on the bulb of a thermometer and heating in hot air until the grease begins to run off. Also see [dropping point](#).

mineral oil — Any petroleum oil, as contrasted to animal or vegetable oils. Also, a highly refined petroleum distillate, or white oil, used medicinally as a laxative.

miscible — capable of being mixed in any concentration without separation of phases.

moly, moly sulfide — see [molybdenum disulfide](#).

molybdenum disulfide — a black, lustrous powder (MoS₂) that serves as a dry-film lubricant in certain high temperature and high vacuum applications.

multigrade oil — engine oil that meets the requirements of more than one SAE (Society of Automotive Engineers) viscosity grade classification (see [SAE viscosity grades](#)), and may therefore be suitable for use over a wider temperature range than a single grade oil.

N

naphthene — hydrocarbon characterized by saturated carbon atoms in a ring structure, and having the general formula C_nH_{2n}; also called cycloparaffin or cycloalkane. See [pale oil](#).

naphthenic — see [naphthene](#).

neutralization number — also called neut number, an indication of the acidity or alkalinity of an oil; the number is the weight in milligrams of the amount of acid (hydrochloric acid [HCl]) or base (potassium hydroxide [KOH]) required to neutralize one gram of the oil, in accordance with test method ASTM D664 (potentiometric method) or ASTM D974 (colorimetric method).

neutral oils — paraffinic base oils of low or medium viscosity obtained in petroleum distillation and prepared by various methods. They derive their name from the fact that they have not been treated with either an acid or an alkali.

Newtonian fluid — fluid, such as a straight mineral oil, whose viscosity does not change with rate of flow.

NLGI (National Lubricating Grease Institute) — trade association whose main interest is grease and grease technology.

NLGI consistency grades — simplified system established by the National Lubricating Grease Institute (NLGI) for rating the consistency of grease.

NMMA — National Marine Manufacturers Association.

O

octane number — expression of the antiknock properties of a gasoline, relative to that of a standard reference fuel. There are two distinct types of octane number measured in the laboratory: Research Octane Number (RON) and Motor Octane Number (MON), determined in accordance with ASTM D2699 and D2700, respectively.

oil — a greasy unctuous liquid of vegetable, animal, mineral, or synthetic origin.

oxidation — a form of chemical deterioration to which petroleum products, like most other organic materials, are subject. The resistance of many petroleum products to oxidation, however, is very high. Oxidation usually involves the addition of oxygen atoms, and the result is nearly always one of degradation.

oxidation inhibitor — substance added in small quantities to a petroleum product to increase its oxidation resistance, thereby lengthening its service or storage life; also called an antioxidant.

oxidation stability — resistance of a petroleum product to oxidation; hence a measure of its potential service or storage life. There are a number of ASTM tests to determine the oxidation stability of a lubricant or fuel, all of which are intended to simulate service conditions on an accelerated basis.

P

pale oil — straight naphthenic mineral oil, straw or pale yellow in color, used as a once-through lubricant and in the formulation of process oils. Naphthenic lubricating oils have low pour points owing to their very low wax content, and good solvency properties.

paraffin — hydrocarbon identified by saturated straight (normal) or branched (iso) carbon chains. Paraffins are relatively nonreactive and have excellent oxidation stability. In contrast to naphthenic (see *naphthene*) oils, paraffinic lube oils have relatively high wax content and pour point, and generally have a high viscosity index.

paraffinic — see *paraffin*.

penetration (grease) — measure of the consistency of a grease, utilizing a penetrometer. Penetration is reported as the tenths of a millimeter (penetration number) that a standard cone, acting under the influence of gravity, will penetrate the grease sample under test conditions prescribed by test method ASTM D217. Standard test temperature is 25°C (77°F). The higher the penetration number, the softer the grease.

poise — CGS unit of absolute viscosity; shear stress (in dynes per square centimeter) required to move one layer of fluid along another over a total layer thickness of one centimeter at a shear rate of one centimeter per second. Dimensions are dyne-sec/cm². The centipoise (cP) is 1/100 of a poise and is the unit of absolute viscosity most commonly used.

pour point — is a widely used low temperature flow indicator and is 5°F above the temperature to which a normally liquid petroleum product maintains fluidity.

pour point depressant — additive used to lower the pour point of a petroleum product.

ppm — parts per million.

process oil — oil that serves as a temporary or permanent component of a manufactured product.

Q

quenching — immersion of a heated manufactured steel part, such as a gear or axle, in a fluid to achieve rapid and uniform cooling. Petroleum oils are often used for this purpose. Quenching provides hardness superior to that possible if the heat-treated part were allowed to cool slowly in air.

R

R&O — rust and oxidation-inhibited term applied to highly refined industrial lubricating oils formulated for long service in circulating systems, compressors, hydraulic systems, bearing housing, gear cases, etc. The finest R&O oils are often referred to as turbine oils.

rheology — study of the deformation and flow of matter in terms of stress, strain, temperature, and time. The rheological properties of a grease are commonly measured by penetration and apparent viscosity.

rust inhibitor — a lubricant additive for protecting ferrous (iron and steel) components from rusting caused by water contamination or other harmful materials from oil degradation.

S

SAE (Society of Automotive Engineers) — organization responsible for the establishment of many U.S. automotive and aviation standards, including the viscosity classifications of engine oils and gear oils.

SAE viscosity grades — engine oil classification system as outlined in the Society of Automotive Engineers (SAE) standard J300, based on the measured viscosity of the oil at either -18°C (0°F), using test method ASTM D2602, or at 100°C (212°F), using ASTM D445. If the viscosity is measured at -18°C , the grade number of the oil includes the suffix “W” (e.g., SAE 20W), denoting suitability for winter use.

shear — deformation which occurs when parallel planes of a body are displaced relative to each other in a direction parallel to themselves.

shear rate — rate at which adjacent layers of a fluid move with respect to each other, usually expressed as reciprocal seconds.

shear stability — ability of a fluid to maintain a stable shear rate over a period of time.

shear stress — frictional force overcome in sliding one “layer” of fluid along another, as in any fluid flow. The shear stress of a petroleum oil or other Newtonian fluid at a given temperature varies directly with shear rate (velocity). The ratio between shear stress and shear rate is constant; this ratio is termed viscosity.

sludge — in gasoline engines, a soft, black, mayonnaise-like emulsion of water, other combustion by-products, and oil formed during low-temperature engine operation.

soap — the salt of an acid derived from animal or vegetable matter. Metallic soaps are used in the manufacture of grease.

specific gravity — for petroleum products, the ratio of the mass of a given volume of product and the mass of an equal volume of water, at the same temperature. The standard reference temperature is 15.6°C (60°F). Specific gravity is determined by test method ASTM D1298. The higher the specific gravity, the heavier the product.

STLE (Society of Tribology and Lubrication Engineers) — an organization intended to advance the knowledge and application of lubrication and related sciences.

straight mineral oil — petroleum oil containing no additives.

sulfated ash — the ash content of fresh, compounded lubricating oil as determined by ASTM D874. Indicates level of metallic additives in the oil.

synthetic lubricant — a lubricating fluid made with synthetic base stock featuring higher lubrication performance than a conventional lubricant. A synthetic base stock is composed of chemically altered molecules. A synthetic base stock could be a severely hydroprocessed Group III oil, or it could be a chemically synthesized oil like a polyalphaolefin.

T

tackiness agent — additive used to increase the adhesive properties of a lubricant, improve retention, and prevent dripping and splattering.

texture — that property of a lubricating grease which is observed when a small portion of it is compressed and the pressure slowly released.

thermal stability — ability to resist chemical degradation at high temperatures.

total acid number (TAN) — see [neutralization number](#).

total base number (TBN) — see [neutralization number](#).

tribology — science of the interactions between surfaces moving relative to each other. Such interactions usually involve the interplay of two primary factors: the load, or force, perpendicular to the surfaces, and the frictional force that impedes movement.

U

USP (United States Pharmacopeia) — compendium of drugs, drug formulas, quality standards and tests published by the United States Pharmacopeial Convention, Inc., which also publishes the NF (National Formulary).

V

viscosity — measurement of a fluid's resistance to flow. The common metric unit of absolute viscosity is the poise, which is defined as the force in dynes required to move a surface one square centimeter in area past a parallel surface at a speed of one centimeter per second, with the surfaces separated by a fluid film one centimeter thick.

viscosity index — empirical, unitless number indicating the effect of temperature change on the kinematic viscosity of an oil. Liquids change viscosity with temperature, becoming less viscous when heated; the higher the viscosity index of an oil, the lower its tendency to change viscosity with temperature.

viscosity index improver — lubricant additive, usually a high molecular weight polymer, that reduces the tendency of an oil to change viscosity with temperature. Multigrade oils, which provide effective lubrication over a broad temperature range, usually contain viscosity index improvers.

Volatile Organic Compounds (VOC) — any organic compound that evaporates or vaporizes under operating conditions. There are many government regulations regarding the release of VOCs.

volatility — expression of evaporation tendency. The more volatile a petroleum liquid, the lower its boiling point and the greater its flammability.

W

wear — the attrition or rubbing away of the surface of a material as a result of mechanical action.

white oil — highly refined straight mineral oil, essentially colorless, odorless, and tasteless. White oils have a high degree of chemical stability. USP white oils are used as base oil in food grade lubricants.

Z

ZDDP (zinc dialkyl dithiophosphate or zinc diaryl dithiophosphate) — widely used as an antiwear agent in motor oils to protect heavily loaded parts, particularly the valve train mechanisms (such as the camshaft and cam followers) from excessive wear. It is also used as an antiwear agent in hydraulic fluids and certain other products.