

## -A

**AAMA** - American Automobile Manufacturers Association.

**AAR** - American Association of Railroads.

**Absolute viscosity** - A term used interchangeably with viscosity to distinguish it from kinematic viscosity or commercial viscosity. It is occasionally referred to as dynamic viscosity. See Viscosity.

Absolute viscosity and kinematic viscosity are expressed in fundamental units. Commercial viscosity such as Saybolt viscosity is expressed in arbitrary units.

**Absorption** - The process by which one substance draws another substance into itself.

Examples: a sponge picking up water; an oil recovering gasoline from wet natural gas.

**ACEA** - Association des Constructeurs Europeens (Association of European Automotive Manufacturers).

**Acid** - A member of an important and fundamental category of chemical substances characterized by having an available reactive hydrogen and requiring an alkali to neutralize them. Acid solutions usually have a sour, biting, and tart taste, like vinegar.

**Acid Sludge** - The residue left after treating petroleum oil with sulfuric acid for the removal of impurities. It is a black, viscous substance containing the spent acid and impurities.

**Acid Treating** - A refining process in which unfinished petroleum products, such as gasoline, kerosene, and lubricating oil stocks, are contacted with sulfuric acid to improve their color, odor, and other properties.

**Acidity** - In lubricants, acidity denotes the presence of acid-type constituents whose concentration is usually defined in terms of acid number. The constituents vary in nature and may or may not markedly influence the behavior of the lubricant. (See also Acid Number.)

**Acid Number** - See Strong Acid Number and Total Acid Number.

**Additive** - A chemical compound or compounds added to a lubricant for the purpose of imparting new properties or to improve those properties which the lubricant already has.

**Additive Level** - The total percentage of all additives in an oil.

**Adhesion** - The force or forces causing two materials such as a lubricating grease and a metal, to stick together.

**Adsorption** – The process by which a substance is taken up on the surface of a solid by chemical or physical action.

**AFV** - Alternate Fuel Vehicle.

**AGMA** - American Gear Manufacturers Association, an organization serving the gear industry.

**Air Entrainment** - The incorporation of air in the form of bubbles as a dispersed phase in the bulk liquid. Air may be entrained in a liquid through mechanical means and/or by release of dissolved air due to a sudden change in environment. The presence of entrained air is usually readily apparent from the appearance of the liquid (i.e., bubbly, opaque, etc.) while dissolved air can only be determined by analysis.

**Alkali** - In chemistry, any substance having basic properties. The term is applied to hydroxides of ammonium, lithium, potassium, and sodium. They are soluble in water; have the power to neutralize acids and form salts. They turn red litmus blue. In a more general sense, the term is also applied to the hydroxides of the so-called alkaline earth metals-barium, calcium, and strontium.

**Almen EP lubricant Tester** - A journal bearing machine used for determining the load-carrying capacity or extreme pressure properties of gear lubricants.

**Ambient Temperature** - Temperature of the area or atmosphere around a process, (not the operating temperature of the process itself).

**Anhydrous** - Free of water, especially of crystallization.

**Aniline Point** - The Aniline Point of a petroleum product is the lowest temperature at which it is completely miscible with an equal volume of freshly distilled aniline.

**Anti-foam Agent** - An additive used to control foam.

**Anti-freeze Solution** - A fluid, such as ethylene or propylene glycol, which is added to or used to replace the water in the cooling system of engines in order to prevent freezing.

**Anti-friction Bearing** - A rolling contact type bearing in which the rotating or moving member is supported or guided by means of ball or roller elements. Does not mean without friction.

**Antioxidant** - A substance that retards the action of oxidation.

**API** - American Petroleum Institute

**API Gravity** - A gravity scale established by the API and in general use in the petroleum industry, the unity being called the "API degree." This unit is defined in terms of specific gravity as follows:

$$\text{Degrees API} = [141.5 / \text{sp.gr.}(60^\circ\text{F}/60^\circ\text{F})] - 131.5$$

**Apparent viscosity** - A measure of the resistance to flow of a grease whose viscosity varies with shear rate. It is defined as the ratio of the shear stress to the shear rate calculated from Poiseuille's equation at a given rate of shear and is expressed in poises. It must be reported as the value at a given shear rate and temperature.

**Aromatic** - Derived from, or characterized by, the presence of the benzene ring.

**Ash Content** - The percent by weight of residue left after the combustion of an oil sample (ASTM Method D 482).

**ASLE** - American Society of Lubrication Engineers. This society is now known as the Society of Tribologists and Lubrication Engineers (STLE). The ASLE had published standards for machine tool lubricants.

**Asphalt** - Black to dark-brown solid or semisolid cementitious material which gradually liquifies when heated and in which the predominating constituents are bitumen's. These occur in the solid and semisolid form in nature; are obtained by refining petroleum; or are combinations of one another or with petroleum or derivatives thereof.

**Asphaltic** - Essentially composed of or similar to asphalt. Frequently applied to naphthenic base lubricating oils derived from crudes that contain asphalt.

**ASTM** - American Society for Testing Materials, a society for developing standards for materials and test methods.

**ASTM Colorimeter** - Apparatus widely used for determining the color of lubricating oils; (ASTM Method D 1500). The color so determined is known as ASTM color.

**ASTM Distillation** - A distillation test made on such products as gasoline and kerosene to determine the initial and final boiling points (ASTM Method D 86).

**ASTM Gum Test** - An analytical method for determining the amount of existing gum in a gasoline; by evaporating a sample from a glass dish on an elevated-temperature change; also known as the English melting point.

**ASTM Melting Point** - The temperature at which wax first shows a minimum rate of temperature change; also known as the English melting point.

**ASTM Viscosity Classification** - A method of specifying viscosity levels for industrial lubricants; does not denote quality.

**ATC** - Technical Committee of the Petroleum Additive Manufacturers.

**ATIEL** - Association Technique de l'Industrie Europeene des Lubrifiants.

**Auto-ignition** - The spontaneous ignition, and the resulting very rapid reaction, of a portion or all of the fuel-air mixture in an engine. The flame speed is many times greater than that which follow normal spark ignition. The noise associated with it is called knock.

**Aviation Method** - A method for determining the knock-limited power, under lean-mixture condition, of fuels for use in spark-ignition aircraft engines (ASTM Method D 614).

**Axial Load Bearing** - A bearing in which the load acts in the direction of the axis of rotation.

## -B

**Babbitt** - A soft, white, non-ferrous alloy bearing material composed principally of copper, antimony, tin and lead.

**Ball Bearing** - An anti-friction bearing comprising rolling elements in the form of balls.

**Barrel** - A unit of liquid measure comprised of 42 gallons. Used to measure quantities of crude oil, gasoline and fuel oils.

**Batch** - Any quantity of material handled or considered as a unit in processing.

**Base Stock** - A fully refined lube oil, which is a component of lubricant formulations.

Group I base stocks contain less than 90 percent saturates and/or greater than 0.03 percent sulfur and have a viscosity index greater than or equal to 80 and less than 120.

Group II base stocks contain greater than or equal to 90 percent saturates and less than or equal to 0.03 percent sulfur and have a viscosity index greater than or equal to 80 and less than 120.

Group III base stocks contain greater than or equal to 90 percent saturates and less than or equal to 0.03 percent sulfur and have a viscosity index greater than or equal to 120.

Group IV base stocks are polyalphaolefins (PAO).

Group V base stocks include all other base stocks not included in Group I, II, III, or IV.

**Bearing** - A support or guide by means of which a moving part such as a shaft or axle is positioned with respect to the other parts of a mechanism.

**Bentonite** - The mineral montmorillonite, a magnesium-aluminum silicate. Used as a treating agent, also, as a component of drilling mud, and in greases.

**Benzene** - Colorless liquid hydrocarbon,  $C_6H_6$ , with one ring of carbon atoms. Made from coal tar and by catalytic reforming of naphthenes, it is used in the manufacture of phenol, styrene, nylon, detergents, aniline, phthalic anhydride, biphenyl, nitrobenzene, chlorbenzene; as a solvent; and as a component of high-octane gasoline.

**Benzene Insoluble** - That portion of the normal pentane insoluble in used lubricating oils which is not soluble in benzene, and which may include the insoluble contaminants from external sources, some matter produced by oxidation and thermal decomposition of the oil, the oil additives, or the fuel. (ASTM Method D 893).

**Bleeding** - The tendency of a liquid component to separate from a solid or semi-solid mixture as an oil from a grease.

**Blending** - The process of mixing lubricants or components for the purpose of obtaining the desired physical and/or chemical properties (see compounding).

**Block Grease** - Generally, a grease of high soap content, which, under normal temperatures is firm to the touch and can be handled in block or stick form.

**Bloom** - A sheen or fluorescence evident in some petroleum oils when viewed by reflected light.

**Boiling Point** - The temperature at which a substance boils, or is converted into vapor by bubbles forming with the liquid; it varies with pressure.

**Bottoms** - The liquid which collects in the bottom of a vessel (tower bottoms, tank bottoms), either during a fractionating process or while in storage.

**Boundary Lubrication** - A condition of lubrication in which the bulk viscosity characteristics of the lubricant do not apply or in which conditions do not permit the formation of a lubricant film capable of completely separating the moving parts and partial contact takes place between the mating surfaces.  
Also refers to a thin film, imperfect, or non-viscous lubrication.

**Bright Stock** - Refined, high viscosity base oils usually made from residual stocks by suitable treatment, such as a combination of solvent extraction, propane de-asphalting or catalytic dewaxing.

**British Thermal Unit (BTU)** - The quantity of heat required to raise, by 1°F, the temperature of one pound of water at its maximum density (39.2°F).

**BS&W** - The material that collects in the bottom of storage tanks, usually composed of oil, water, and foreign matter. Also called bottoms, or bottom settling and water.  
BTC - British Technical Council.

**Bunker "C" Fuel Oil** - A heavy residual fuel oil used by ships and large-scale heating installations. The United States Navy calls it "Navy heavy"; in industry, it is often referred to as No.6 fuel.

**Butane** - Either of two isomeric, flammable, gaseous hydrocarbons,  $C_4H_{10}$ , of the paraffin series: n-butane or isobutane.

**By-Pass Filtration** - A system of filtration in which only a portion of the total flow of a circulating fluid system passes through a filter or in which a filter, having its own circulating pump, operates in parallel to the main flow.

## -C

**CAFE** - Corporate Average Fuel Economy.

**Calorie** - 1. The amount of heat required to raise the temperature of 1 g of water 1°C, at or near the temperature of maximum density. This unit is called a "small calorie", or "gram calorie". 2. The amount of heat required to raise the temperature of 1 kg of water 1°C. This unit is called a "large calorie" or "kilogram-calorie".

**Capillary Viscometer** - A viscometer in which the oil flows through a capillary tube.

**CARB** - California Air Resources Board.

**Carbon Residue** - The residue remaining after the evaporation of a sample of mineral oil under specified conditions, i.e., Ramsbottom and Conradson.

**CCMC** - Comite des Constructeurs d'Automobile du Marche Commun (Common Market Automobile Manufacturer Association).

**CEC** - Coordinating European Council.

**Centipoise (cP.)** - A unit of absolute viscosity. 1 centipoise = 0.01 poise.

**Centistoke (cSt.)** - A standard unit of kinematic viscosity = 0.01 stoke.

**Cetane Number** - A number that expresses the ignition quality of diesel fuel and equal to the percentage by volume of cetane ( $C_{16}H_{34}$ ) in a blend with methyl naphthalene, which blend has the same ignition performance as the test fuel.

**Cetane Number Improver** - A substance which, when added to a diesel fuel, has the effect of increasing its cetane number. In this class are nitro alkanes, nitrates, nitro carbonates, and peroxides.

**Cetane Index** - An approximation of cetane number based on API gravity and mid-boiling point of a fuel.

**CFR** - Coordinating Fuel and Equipment Research Committee, composed of engine-manufacturers, petroleum-refiners, petroleum-consumers, universities, government, and other technical people who supervise cooperative testing and study engine fuels for the Coordinating Research Council Inc.



**Channeling** - 1. The phenomenon observed among gear lubricants and greases when they thicken, due to cold weather or other causes, to such an extent that a groove is formed through which the part to be lubricated moves without actually coming in full contact with the lubricant. 2. A term used in percolation filtration; may be defined as a preponderance of flow through certain portions of the clay bed.

**Channel Point** - Lowest safe temperature that a gear lubricant can be used.

**Chromatography** - A method of separation based on selective adsorption. A solution of the substance is allowed to flow slowly through a column of adsorbent. Different substances will pass with different speeds down the column and will eventually be separated into zones. The column core can then be pushed out and the zones of material cut apart, or the zones can be eluted by passing more solvent down the column and collecting it in small fractions.

1. Partition Chromatography involves the selective solution of the desired material between two solvents. The final solvent, usually water, is used to wet the solid material packed in the column, and the first solvent containing the desired material is poured into the column as described.

2. Paper Chromatography is a micro-method. A drop of the liquid to be investigated is placed near one end of a strip of paper. This end is immersed in solvent that travels down the paper and distributes the materials present in the original drop selectively. Comparison with known substances makes identification possible.

3. Gas chromatography is an analytical technique for separating mixtures of volatile substances. The procedure consists of introducing the mixture to be examined into the chromatographic column and washing it down with an inert gas. The column is packed with adsorbent materials that selectively retard the components of the sample.

**CID** - Commercial Item Description used in many cases in lieu of military specification.

**Circulating Lubrication** - A system of lubrication in which the lubricant, after having passed through a bearing or group of bearings, is recirculated by means of a pump.

**Cleveland Open Cup (COC) tester** – Apparatus used for the determination of flash and fire point of petroleum products flashing above 175 °F, with the exception of fuel oils (ASTM Method D 92). See Flash Point, Fire Point.

**Cloud Point** - The temperature at which paraffin wax or the solid substances begin to crystallize or separate from the solution, imparting a cloudy appearance to the oils when chilled (ASTM Method D 97).

**CMA** - Chemical Manufacturers Association.

**COC** – See Cleveland Open-Cup tester.

**Color** - A factor in the identification, rather than in the quality rating of a petroleum product-except where staining or appearance are considerations. See specific type of color under alphabetic listing.

**Coefficient of Friction** - The ratio of the friction force between two bodies to the normal, or perpendicular, force between them.

**Complex Grease** - A lubricating grease thickened by a complex soap consisting of a normal soap and a complexing agent.

**Compounding** - The addition of fatty oils and similar materials to lubricants to impart special properties. Lubricating oils to which such materials have been added are known as compounded oils.

**Compounded Oil** - A petroleum oil to which has been added other chemical substances.

**CONCAWE** - Conservation of Clean Air and Water in Europe.

**Consistency** - A term used synonymously with the term Penetration Number of a grease. See Penetration Number.

**Coordinating Research Council, Inc.** - An organization supported jointly the American Petroleum Institute (API) and the Society of Automotive Engineers (SAE), which administers the work of the Coordinating Fuel and Equipment Research Committee (CFR) and the committees pertaining to correlation of test work on fuels, lubricants, engines, etc.

**Copper Dish Gum** - The milligrams of gum found in 100 ml of gasoline when evaporated under controlled conditions in a polished copper dish; indicates the potential gum content of a material.

**Copper Strip Corrosion** - The gradual eating away of copper surfaces as the result of oxidation or other chemical action. Acids or other corrosive agents cause it.

**Corrosion** - The attrition or wearing away of a metallic surface by acid or electrochemical action.

**CRC** - Coordinating Research Council.

**CUNA** - Commissione Tecnica de Unificazione nel'Autoveicolo.

**Cup Grease** - An early term for a calcium or lime base grease, practically obsolete now but meant originally to designate a degree of quality suitable for grease cup application, etc.

**Cutting Fluid or Oil** - Any fluid applied to a cutting tool to assist in the cutting operation by cooling, lubricating or other means.

## -D

**DAP** - Detroit Advisory Panel.

**Degree-Day** - A unit of temperature. Experience has shown that, for buildings requiring an inside temperature of approximately 70°F, the amount of fuel or heat used per day is proportional to the number of degrees the average outside temperature falls below 65°F. The degree-day is based upon this principle. The number of degree-day (65°F base) for a given period is the difference between 65°F and the United States Weather Bureau daily mean temperature, when the latter is less than 65°F, multiplied by the number of days.

**Degree Engler** - A measure of viscosity. The ratio of the time of flow of 200 ml of the liquid tested, through the viscometer devised by Engler, to the time required for the flow of the same volume of water gives the number of degrees Engler.

**Demulsibility** - The ability of a non-water-miscible fluid to separate from water with which it may be mixed. The higher the demulsibility rating, the more rapidly the fluid separates from water. Demulsibility is sometimes expressed as the rate, in cubic centimeters per hour, or settling out of a fluid from an emulsion under specified conditions. See Steam Emulsion Number.

**Density** - The mass of a unit volume of a substance. Its numerical value varies with the units used.

**DEO** - Diesel Engine Oil

**Detergent** - In lubrication, either an additive or a compounded lubricant having the property of keeping insoluble matter in suspension thus preventing its deposition where it would be harmful. A detergent may also redisperse deposits already formed.

**Dewaxing** - Process which removes wax from a lube distillate by solvent means (physical separation) or catalytic means (conversion).

**Dielectric Strength** - A measure of the ability of an insulating fluid to withstand electric stress (voltage) without failure. Fluids with high dielectric strength (usually expressed in volts or kilovolts) are good electrical insulators. (ASTM Method D 877)

**Diesel Index** - An expression for the ignitability of a fuel relative to its aniline point:

$$\text{Diesel index} = \frac{\text{Aniline point}(\text{°F}) \times \text{API gravity}}{100}$$

**Diester Oil** - A synthetic lubricating liquid made from esters; also called ester oil.

**DIN** - Deutsche Industrie Norm.

**Dispersant** - A dispersing agent, which holds a very finely divided substance in a dispersed state in the carrier fluid.

**Dispersing** - In lubrication, usually used interchangeably with detergent. An additive that keeps fine particles of insoluble materials in a homogeneous solution. Hence, particles are not permitted to settle out and accumulate.

**Distillate** - A term applied to a liquid collected when condensing distilled vapors such as naphtha, kerosene, fuel oil and light lubricating oils.

**DKA** - Deutscher Koordinierungsausschuss.

**Drop Feed Lubrication** - A system of lubrication in which the lubricant is applied to the bearing surfaces in the form of drops at regular intervals.

**Dropping Point of Grease** - The temperature at which the grease passes from a semisolid to a liquid state under specified test conditions.

**Dry-Film Lubricant** - Solid material left between two moving surfaces to prevent metal-to-metal contact, thus reducing friction and wear. Such materials are especially useful in the region of boundary lubrication, and for lubrication under special conditions of extremely high or low temperature where usual lubricants are inadequate. They may be applied in the form of a paste or solid stick, or by spraying, dipping, or brushing in an air-drying carrier that evaporates leaving a dry film. Some examples are graphite, molybdenum disulfide, boron nitride, and certain plastics such as tetrafluorethylene resins.

**Dual-fuel Engine** - A diesel engine which may be operated as an oil diesel, a gas diesel, or a combination of both, as it is equipped with controls or parts to permit operating as one or the other.

**Dynamic Viscosity** - See Absolute Viscosity.

## -E

**EC & EC II** - Energy conserving and Energy Conserving II.

**EFTC** - Engine Fuels Technical Committee.

**Elastohydrodynamic Lubrication** - Lubrication modified to take into consideration the elastic properties of the bearing material and the viscosity increase of the lubricant under concentrated load.

**ELTC** - Engine Lubricants Technical Committee.

**EMA** - Engine Manufacturers Association

**Emulsibility** - The ability of a non-water miscible fluid to form an emulsion with water.

**Emulsifier** - A substance used to promote or aid the emulsification of two liquids and to enhance the stability of the emulsion.

**Emulsion** - A mechanical mixture of two immiscible liquids as oil and water. Water-in-oil emulsions have water as the internal phase and oil as the external. Oil-in-water emulsions have water as the external phase and oil as the internal.

**EOLCS** - Engine Oil Licensing and Certification System.

**EPA** - Environmental Protection Agency.

**EP Agent** - An extreme pressure additive introduced into a lubricant to improve the load-carrying or anti-weld qualities.

**EP Lubricants** - Lubricants that have been fortified with additives that appreciably increase the load carrying properties of the base lubricant, thus reducing excessive wear.

## -F

**Fat** - An animal or vegetable oil that will combine with an alkali to saponify and form a soap.

**Fatty Acid** - An organic acid of aliphatic structure originally derived from fats and fatty oils.

**FFV** - Flexible-Fuel Vehicle.

**Fiber Grease** - A grease with a distinctly fibrous structure, which is noticeable when portions of the grease are pulled apart.

**Filler** - Any solid substance such as talc, mica, or various powders, etc., which is added to a grease to increase its weight or consistency.

**Film Strength** - The property of an oil which enables it to maintain an unbroken film on lubricated surfaces under operating conditions, where otherwise there would be scuffing or scoring of the surfaces.

**Filter** - Any device or porous substance used as a strainer for cleaning fluids by removing suspended matter.

**Fire Point (Cleveland Open-Cup)** - The fire point of an oil is the temperature to which it must be heated to give off sufficient vapor to form momentarily a flammable mixture with air that burns continuously when a small flame is applied under specified conditions.

**Flash Point** - The lowest temperature at which vapors arising from the oil will ignite momentarily (i.e., flash) when exposed to a flame.

**Flash Point Test (COC)** - (See Cleveland Open-Cup Tester).

**Flash Point Test (Pensky-Martens Closed Tester)** - A method of test for the determination of the flash point of liquid fuels flashing below 175°F, with the exception of fuel oils.

**Flash Point Test (Tag Closed-Cup Tester)** - A method of test for the determination of the flash point of liquid fuels flashing below 175°F, with the exception of fuel oils.

**Floc Point** - The temperature at which wax or solids separate in an oil.

**Foam** - An agglomeration of gas bubbles separated from each other by a thin liquid film that is observed as a persistent phenomenon on the surface of a liquid. It most often occurs by whipping air into a lubricant.

**Force Feed Lubrication** - A system of lubrication in which the lubricant is supplied to the bearing surface under pressure.

**Form Oil** - A compound or oil used to lubricate wooden or metal concrete forms in order to keep cement from sticking to them.

**Four-Ball Tester** - This name is frequently used to describe either of two similar laboratory machines, the Four-Ball Wear Tester and the Four-Ball EP Tester. These machines are used to evaluate a lubricant's anti-wear qualities, frictional characteristics or load carrying capabilities. It derives its name from the four-1/2 inch steel balls used as test specimens. Three of the balls are held together in a cup filled with lubricant while the fourth ball is rotated against them.

**Fretting Corrosion** – A process of mechanical attrition combined with chemical reaction in which one or more of the surfaces, or the wear particles thereof, react with their environment. Mechanical wear initiates fretting, and then chemical action or “corrosion” results from the exposure of virgin metal surface to the air. It commonly takes place at the common boundary of loaded contact surfaces having small oscillatory relative motion.

**Friction** - The resisting force encountered at the common boundary between two bodies when, under the action of an external force, one body moves or tends to move over the surface of the other.

**Front-end Volatility** - A term applied to the volatility of the lower boiling fractions of gasoline.

**Fuel Sensitivity** - The response of a motor fuel to the change in engine severity between the operating conditions of the ASTM Research Method (D 908) and ASTM Motor Method (D 357); numerically equal to the difference between the Research and Motor octane numbers.

**FZG Test** - A German gear test for evaluating EP properties. Forschungsstelle für Zahnrad und Getriebebau; Technische Hochschule München (Research Institute for Gears and Gear Design, Technical University Munich).

**Full Flow Filtration** - A system of filtration in which the total flow of a circulating fluid system passes through a filter.

## **-G**

**Gasohol**- Fuel mixture of gasoline and methly alcohol (methanol).

**GATT** - General Agreement on Tariffs and Trade.

**Graphite** - A crystalline form of carbon either natural or synthetic in origin, which is used as a lubricant.

**Gravity** - See Specific Gravity, API Gravity.

**Grease** - A lubricant composed of an oil or oils thickened with a soap, or other thickener to a solid or semisolid consistency.

**Gum** - A rubber-like, sticky deposit black or dark brown in color, which results from the oxidation of lubricating oils in service.



## -H

**Heat Transfer Oil** - A medium used for the transfer of heat.

**Herschel Demulsibility Number** - A number that indicates the ability of an oil to separate from water under conditions specified by the Herschel Demulsibility Test.

**Humidity Cabinet Test** - A test used to evaluate the rust-preventing properties of metal preservatives under conditions of high humidity (ASTM Method D 1748).

**Hydraulic Oil** - An oil specially suited for use as a power transmission medium in hydraulically operated equipment.

**Hydrocarbon** - A compound containing only hydrogen and carbon. The simplest hydrocarbons are gases at ordinary temperatures; but with increasing molecular weight, they change to the liquid form and, finally, to the solid state. They form the principal constituents of petroleum.

**Hydrodynamic Lubrication** - A system of lubrication in which the shape and relative motion of the sliding surfaces causes the formation of a fluid film having sufficient pressure to separate the surfaces.

**Hydrogenation** - The chemical addition of hydrogen to a material. In nondestructive hydrogenation, hydrogen is added to a molecule only if, and where, unsaturation with respect to hydrogen exists. In destruction hydrogenation, the operation is carried out under conditions that result in rupture of some of the hydrocarbon chains (cracking); hydrogen is added where the chain breaks have occurred.

**Hydrotreating** - A process that converts and removes undesirable components with the use of a catalyst.

**Hypoid Gear Lubricant** - A gear lubricant having extreme pressure characteristics for use with a hypoid type of gear as in the differential of an automobile.

HVI - High Viscosity Index, typically from 80 to 110 VI units.

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**ILMA** - Independent Lubricant Manufacturers Association.

**ILSAC** - International Lubricants Standardization and Approval Committee.

**Inhibitor** - Any substance that slows or prevents chemical reaction or corrosion.

**Initial Boiling Point** - According to ASTM Method D 86, the recorded temperature when the first drop of liquid falls from the end of the condenser.

**Ink Oil** - Any of the petroleum oils used as carriers for the pigment used in making printing inks.

**Insulating Oil** - An oil used in circuit breakers, switches, transformers, and other electrical apparatus for insulating, and/or cooling. In general, such oils are well-refined petroleum distillates of low volatility, with high resistance to oxidation and sludging.

**Interfacial Tension (I.F.T)** - The energy per unit area present at the boundary of two immiscible liquids. It is commonly measured as the force per unit length necessary to draw a thin wire or ring through the interface.

**IP** - Institute of Petroleum

**International Standards Organization (ISO)** - This organization, which is worldwide in scope, sets standards and classifications for lubricants. An example is the ISO viscosity grade system.

**ISO Viscosity Grade System** - A classification for industrial lubricants based on centistoke viscosity at 40°C. Covers eighteen grades from 2 to 1500 centistokes.

## -J/K

### -J

**JAMA** - Japanese Automobile Manufacturers Association.

**JASO** - Japanese Automobile Standards Organization.

**JIS** - Japanese Industrial Standards.

**JSAE** - Society of Automotive Engineers, Japan.

**Journal Bearing** - A sliding type of bearing in conjunction with which a journal operates. In a full or sleeve type journal bearing, the bearing surface is 360° in extent. In a partial bearing, the bearing surface is less than 360° in extent.

### -K

**Kinematic Viscosity** - The absolute viscosity of a fluid divided by its density. In a c.g.s. system, the standard unit of kinematic viscosity is the stoke and is expressed in sq. cm. per. sec. In the English system, the standard unit of kinematic viscosity is the newt and is expressed in sq. in. per sec.

## -L

**Lacquer** - A deposit resulting from the oxidation and polymerization of fuels and lubricants when exposed to high temperatures. Similar to but harder than varnish.

**Lard Oil** - An animal oil prepared from chilled lard or from the fat of swine. Such oils are compounded with mineral oils to yield lubricants of special wetting properties. These are especially used in cutting oils to improve the finish on the machined parts.

**Lead Naphthanate** - A lead soap of naphthenic acid. Lead naphthanate were previously used in mineral lubricants to give them high film strength (EP).

**Liquefied Petroleum Gas (LPG)** - Light hydrocarbon material, gaseous at atmospheric temperature and pressure, held in the liquid state by pressure to facilitate storage, transport, and handling. Commercial liquefied gas consists essentially of propane, butane, or mixtures thereof

**Liquefied Natural Gas (LNG)** - Similar to LPG but consisting of lighter hydrocarbons, such as methane and ethane.

**Liter/Litre** - The primary standard of capacity in the metric system, equal to the volume of one kilogram of pure water at maximum density, at approximately 4°C, and under normal atmospheric pressure.

**Load Wear Index (LWI)** - See Four-Ball Test; a measure of the relative ability of a lubricant to prevent wear under applied loads; calculated from the loads applied and corrected for elastic deformation of the balls under static loading and for the size of the wear scar. Formerly called Mean Hertz Load.

**LRI** - Lubricants Review Institute.

**LTMS** - Lubricant Test Monitoring System.

**Lubricant** - Any substance interposed between two surfaces in relative motion for the purpose of reducing the friction between them. Less exactly, any substance interposed between two surfaces in relative motion to facilitate their action.

**Lubricating Grease** - A solid to semifluid product consisting of dispersion of a thickening agent in a liquid lubricant. Other ingredients for imparting special properties may be included.

**LVI** - Low Viscosity Index, typically below 40 VI units.

## -M

**Mean Hertz load** - (See load wear index (LWI)).

**Metal Deactivator** - A fuel or lubricant additive, which converts into an inactive form, the traces of metal (such as copper in fuels) and metal surfaces (such as copper in fuel lines) which, in the absence of the deactivator would catalyze gum formation and other oxidation.

**Mid-Continental crude** - Petroleum oil obtained from the central regions of the United States (principally Oklahoma, Kansas, and North Texas), usually having characteristics between those of Pennsylvania and coastal oils.

**Middle Distillate** - One of the distillates obtained between kerosene and lubricating oil fractions in the refining processes. These include light fuel oils and diesel fuel.

**MIL Spec** - Military specification; a guide in determining the quality requirements of products used by the military services, published by the United States Department of Defense.

**Mineral Oil** - Oils derived from a mineral source, such as petroleum, as opposed to oils derived from plants and animals.

**Motor Method** - Motor Octane Number (MON) - A test for determining the knock rating, in terms of ASTM Motor Octane Numbers, of fuels for use in spark-ignition engines. The knocking tendency of the fuel is compared with those for blends of reference fuels of known octane number when run in the ASTM-CFR engine at 900 rpm, under standard operating conditions as prescribed in ASTM Method D 357.

**MSDS** - Material Safety Data Sheet.

**MTAC** - Multiple Test Acceptance Criteria.

**Multigrade Oil** - An oil that meets the low temperature viscosity limits of one of the SAE W numbers as well as the 100°C viscosity limits of one of the non-W numbers.  
**Multipurpose Grease** - A lubricating grease suitable to meet the individual requirements for chassis lubricant, bearing lubricant, joint lubricant, water-pump lubricant, and cup grease.

**MVMA** - Motor Vehicle Manufacturers Association.

## -N

**NAFTA** - North American Free Trade Agreement.

**Naphthene** - One of a group of cyclic hydrocarbons, also termed cycloparaffins or cycloalkanes. Polycyclic members are also found in the highest boiling fractions. The general formula for naphthenes is  $C_nH_{2n}$ .

**Naphthenic Base Oils** - A characterization of certain petroleum products prepared from naphthenic type crudes (crudes containing a high percentage of ring type hydrocarbon molecules).

**Neatsfoot Oil** - A pale yellow animal oil made from the feet and shinbones of cattle.

**Needle Bearing** - A bearing comprising rolling elements in the form of rollers, which are relatively long compared to their diameter.

**Neutralization Number** - A term still used in the petroleum industry, but rapidly becoming obsolete in the lubrication field. See Acid, Strong Acid, Strong Base, Total Acid, and Total Base Numbers.

**Neutral Oil** - Light overhead cuts of lubricants stocks. Neutral oils are the basis for most commonly used automotive lubricants.

**NLGI** - An abbreviation for "National Lubricating Grease Institute," a technical organization serving the grease industry.

**NMMA** - National Marine Manufacturers Association.

**NVMA** - National Vehicle Manufacturers Association.

## -O

**Octane Number** - A term numerically indicating the relative antiknock value of a gasoline. For octane numbers 100 or below, it is based upon a comparison with the reference fuels isooctane (100 octane number) and n-heptane (0 octane number). The octane number of an unknown fuel is the percent by volume of isooctane with n-heptane which matches the unknown fuel in knocking tendencies under a specified set of conditions. Above 100, the octane number of a fuel is based on the engine rating, in terms of milliliters of tetraethyllead in isooctane which matches that of the unknown fuel.

**OECD** - Organization Economic Cooperation and Development.

**OEM** - Original Equipment Manufacturer.

**Oil Groove** - One of the shallow grooves cut into the rubbing faces of a bearing shell to improve the distribution of oil over the shaft and bearings. The grooves are connected with an oil supply hole or cup and act like ducts in conveying the oil to the various parts of the bearings.

**Oil Ring** - A loose ring, the inner surface of which rides a shaft or journal and dips into a reservoir of lubricant from which it carries the lubricant to the top of a bearing by its rotation with the shaft.

**Oiliness** - 1. That characteristic of a liquid which is responsible for the degree of friction between two surfaces which cannot be accounted for on the basis of viscosity alone. 2. The ability of a lubricating oil to orient itself on bearing surfaces so as to form new surfaces with a low coefficient of static friction.

**OLAP** - Oil Labeling Assessment Program.

**ORI** - Octane Requirement Increase.

**Oxidation Stability** - Ability of a lubricant to resist natural degradation upon contact with oxygen.

## -P

**Pad Lubrication** - A system of lubrication in which the lubricant is delivered to a bearing surface by a pad of felt or similar material.

**Pale Oil** - A base or process oil refined until its color, by transmitted light, is straw to pale yellow.

**PAN** - Phenyl-Alpha-Naphthylamine, a commonly used antioxidant.

**PAPTG** - Product Approval Protocol Task Group.

**Paraffin Base Oil** - A characterization of certain petroleum products prepared from paraffinic type crudes (crudes containing a high percentage of straight chain aliphatic hydrocarbon molecules). Lubricating oils made from these crudes are normally distinguished from similar oils from other crudes (both oils equally well refined) by higher API gravity and higher viscosity index.

**Penetration or Penetration Number** - The depth, in tenths of a millimeter, which a standard cone penetrates a solid or semisolid sample under specified conditions. This test is used for comparative evaluation of grease and grease-like materials. (See Worked Penetration.)

**Petrolatum** - A jelly-like product obtained from petroleum and having a microcrystalline structure. Often used in rust preventives.

**Plain Bearing** - Any simple sliding type bearing as distinguished from tapered land, tilting pad, or anti-friction bearings, etc.

**Poise** - The standard unit of absolute viscosity in the c.g.s. system expressed in dyne sec. per sq. cm.

**Pour Point** - The pour point of a lubricant is the lowest temperature at which the lubricant will pour or flow when it is chilled without disturbance under specified conditions.

**Pour Point Depressant** - An additive that retards wax crystallization, and lowers the pour point.

**Pour Stability** - The ability of a pour depressed oil to maintain its original ASTM pour point when subjected to storage at low temperature approximating winter conditions.

**Precipitation Number** - The number of milliliters of precipitate formed within 10 ml of lubricating oil is mixed with 90 ml of petroleum naphtha and centrifuged under definitely prescribed conditions. The precipitation number should indicate the amount of the asphaltic bodies dissolved in the lubricating oil, although a certain amount of paraffin bodies may separate with the asphaltic bodies (ASTM Method D 91).



**Power Factor** - A measure of the dielectric loss, or ability to perform as an electrical insulating oil.

**Process Oils** - A lube base stock that receives additional processing to impart a very specific hydrocarbon composition in addition to viscometrics. Process oils are not used as lubricants; they are used as chemical components in the manufacture of rubber, plastics, and other polymeric materials.

**Pumpability (Lubricating Grease)** - The ability of a lubricating grease to flow under pressure through the line, nozzle, and fitting of a grease dispensing system.

## -Q/R

### -Q

**QPL** - Qualified Product List (military listing).

### -R

**Ring Lubrication** - A system of lubrication in which the lubricant is supplied to the bearing surfaces by an oil ring.

**(R+M)/2** - Research Octane Number plus Motor Octane Number, divided by 2. Used now as general measure of road octanes of gasoline.

**R&O** - An additive inhibitor package that contains Rust and Oxidation Inhibitors.

**Reclaimed Oil** - A lubricating oil that, after undergoing a period of service is collected, reprocessed, and sold for reuse.

**Red Oil** - The term is now used to describe any oil of red color, regardless of refining process.

**Redwood Viscometer** - Standard British viscometer. The number of seconds required for 50 ml of an oil to flow out of a standard Redwood viscometer at the definite temperature (IP Method 70). Instrument is available in two sizes: Redwood No.1 and No. II. When the flow time exceeds 2,000 sec, the No. II must be used.

**Reid Vapor Pressure** - An important test for gasolines. It is a measure of the vapor pressure of a sample at 100°F, and the test is commonly made in a bomb. The results are reported in pounds (ASTM Method D 323).

**Research Method-Research Octane Number (RON)** - A test for determining the knock rating, in terms of ASTM Research octane numbers, of fuels for use in spark-ignition engines. The knocking tendency of the fuel is compared with those for blends of reference fuels of known octane number when run in the ASTM-CFR engine at 600 rpm under standard operating conditions (ASTM Methods D 908 and D1656).

**Road Octane Number** - A numerical value based upon the relative antiknock performance in an automobile of a test gasoline as compared with specified reference fuels. Road octanes are determined by operating a car over a stretch of road or on a chassis dynamometer under conditions simulating those encountered on the highway.

**Roller Bearing** - An ant-friction bearing comprising rolling elements in the form of rollers.

**RSI** - Registrations Systems, Inc.

**Rust Prevention Test (Turbine Oils)** - A test for determining the ability of an oil to aid in preventing the rusting of ferrous parts in the presence of water.

## -S

**SAE** - Society of Automotive Engineers, an organization serving the automotive industry.

**SAE EP Lubricant Tester** - A machine designed to test the extreme-pressure properties of a lubricant under a combine rolling and sliding action. The revolving members are two bearing cups that rotate at different speeds.

**SAE Viscosity Number** - System for classifying crankcase, transmission, and differential lubricants, according to their viscosities, established by the Society of Automotive Engineers. SAE numbers are used in connection with recommendations for crankcase oils to meet various design, service and temperature requirements affecting viscosity only; they do not denote quality.

**Saybolt Furol Viscosity** - The time in seconds required for 60 cubic centimeters of a fluid to flow through the orifice of a Saybolt Furol Viscometer at a given temperature under specified conditions. The orifice of the furol viscometer is larger than that of the universal viscometer, the former instrument being used for more viscous fluids.

**Saybolt Universal Viscosity** - The time in seconds required for 60 cubic centimeters of a fluid to flow through the orifice of the Standard Saybolt Universal Viscometer at a given temperature under specified conditions.

**SCL** - A sulfur, chlorine and lead component extreme pressure additive package once commonly used for automotive type gear lubricants. Has been largely replaced by sulfur/phosphorous materials.

**Semi-fluid** - Any substance having the attributes of both a solid and a liquid. More generally, any substance in which the force required to produce a deformation depends both on the magnitude and on the rate of deformation.

**Separate Test** - A test to determine the tendency of oil to separate from a lubricating grease under conditions prescribed in ASTM Method D 1742.

**Shear Stress** - The force per unit area acting tangent to the surface of an element of a fluid or a solid.

**Sleeve Bearing** - A journal bearing, usually a full journal bearing.

**Sludge** - Insoluble material formed as a result either of deterioration reactions in an oil or by contamination of an oil, or both.

**Slushing Oil** - An oil or grease-like material used on metals to form a temporary protective coating against rust, corrosion, etc.

**Soap** - General term denoting the salt of a fatty acid. The ordinary soaps are those of sodium and potassium. The soaps of lithium, calcium, sodium, and aluminum are the principal thickeners used in grease making.

**"Soluble" Cutting Oil** - A mineral oil containing an emulsifier that makes it capable of mixing easily with water to form a cutting fluid.

Solvency - Ability of a fluid to dissolve organic materials and polymers, which is a function of aromaticity.

**Specific Gravity** - The ratio of the weight in air of a given volume of a material to the weight in air of an equal volume of water at a stated temperature.

**Sperm Oil** - A fixed, nondrying pale yellow oil obtained from the head cavities and blubber of the sperm whale. Formerly used as an oil additive but now prohibited from use by law in the United States.

**Spindle Oil** - A light-bodied oil used principally for lubricating textile spindles and for light, high-speed machinery.

**Splash Lubrication** - A system of lubrication in which parts of a mechanism dip into and splash lubricant onto themselves and/or other parts of the mechanism.

**Stability** - Ability of a lubricant to resist natural degradation reactions upon exposure to UV radiation, heat, at oxygen.

**Starting Fluid (diesel)** - A fluid, such as diethyl ether, which has a wide flammability range; used to start diesel engines at extremely low temperatures.

Static Friction - The friction between two surfaces not in relative motion but tending to slide over one another. The value of the static friction at the instant relative motion begins is termed breakaway friction.

**STLE** - The Society of Tribologists and Lubrication Engineers.

**Strong Acid Number (S.A.N.)** - The quantity of base, expressed in milligrams of potassium hydroxide, required to titrate the strong acid constituents present in 1 gram of sample.

**Strong Base Number (S.B.N.)** - The quantity of acid, expressed in terms of equivalent number of milligrams of potassium hydroxide, required to titrate the strong base constituents present in 1 gram of sample.

**Sulfurized Oil** - Oil to which sulfur or sulfur compounds have been added.

Surface Tension - The tension exhibited at the free surface of liquids, measured in force per unit length.

**SUS (SSU)** - An abbreviation for Saybolt Seconds Universal used to indicate viscosity, e.g., SSU @ 100°F. Also SUS.

**Synergism** - A situation where a mixture of two or more separate additive materials results in a total effect greater than that of the sum of them.

**Synthetic Ester** - Oil molecule prepared by reacting an organic acid with an organic alcohol and possessing some lubricant properties.

**Synthetic Hydrocarbon** - Oil molecule prepared by reacting paraffinic materials.

**Synthetic Lubricant** - A lubricant produced from materials not naturally occurring in crude oil by either chemical synthesis or refining processes.

## -T

**Tacky** - A descriptive term applied to greases and oils which are particularly sticky or cohesive.

**Tag Closed-Cup Tester** - An instrument used to determine the flash point of volatile flammable materials flashing below 200 °F, as described in ASTM Method D 56.

**Tallow** - Animal fat prepared from beef and mutton.

**Thermal Conductivity** - Measure of the ability of a solid or liquid to transfer heat.

**Thixotropy** - The property of a grease or some gels to decrease in consistency when subjected to a shear stress and return to original consistency when the stress is removed.

**Timken EP Test** - The Timken Extreme Pressure Test is one of many laboratory machines used in determining the load carrying capacities of oils and greases. In this test, a Timken bearing cup is rotated against a steel block. The highest load under which a lubricant prevents scoring of the steel block by the rotating cup is the reported value.

**TOST** - Turbine Oil Oxidation Stability Test, ASTM D-943.

**Total Acid Number (TAN)** - The quantity of base, expressed in terms of the equivalent number of milligrams of potassium hydroxide, that is required to titrate the strong base constituents present in 1g of sample (ASTM Method D 664 or D 974).

**Total Base Number (TBN)** - The quantity of base, expressed in terms of the equivalent number of milligrams of potassium hydroxide, that is required to titrate the strong base constituents present in 1g of sample (ASTM Method D 664 or D 974).

**Turbine Quality** - Lube base stocks suitable for turbine applications, finished with severe hydrotreating. TQ base stocks exhibit improved oxidation stability over normal base stocks.

-U/V

-U

**Unworked Penetration** - The penetration at 77°F of a sample of grease that has received only the minimum handling in transfer from a sample can to the test apparatus and which has not been subjected to the action of a grease worker.

-V

**Varnish** - When applied to lubrication, a deposit resulting from the oxidation and polymerization of fuels and lubricants. Similar to but softer than lacquer.

**Viscometer** - Viscosimeter - An apparatus for determining the viscosity of a fluid.

**Viscosity** - That property of a fluid or semi-solid substance characterized by resistance to flow and defined as the ratio of the shear stress to the rate of shear of a fluid element. The standard unit of viscosity in the c.g.s. system is the poise and is expressed in dyne sec. per square centimeter. The standard unit of viscosity in the English system is the reyn and is expressed in lb. sec. per square in.

$1 \text{ reyn} = 6.9 \times 10^4 \text{ poise}$

**Viscosity Grade** - Any of a number of systems that characterize lubricants according to viscosity for particular applications, such as industrial oils, gear oils, automotive engine oils, automotive gear oils, and aircraft piston engine oils.

**Viscosity Index (VI)** - A measure of a fluid's change of viscosity with temperature. The higher the viscosity index the smaller the change in viscosity with temperature.

**Viscosity Index Improver** - Additive that increases lubricant viscosity index, necessary for formulation of multi-grade engine oils.



## -W

**White Oils** - Light-colored and usually highly refined mineral oils usually employed in medicinal and pharmaceutical preparations, and as a base for creams, salves, and ointments, but also used as lubricants.

**Worked Penetration** - The penetration of a sample of lubricating grease immediately after it has been brought to 77°F +/- 1°F and then subject to 60 strokes in the ASTM standard grease worker.