A Glossary of terms used in LUBRICANT INDUSTRY

A

Abrasion

General wearing of a surface by constant scratching, due to the presence of foreign matter such as metallic particles, grit or dirt in the lubricant. It may also cause a break down of material (such as gear teeth surfaces). Lack of lubrication may result in abrasion.

Abrasive wear

(Cutting wear) comes when hard surface roughness/ uneveness or hard particles that have embedded themselves into a soft surface plough grooves into the opposing harder surface.

Absolute filtration rating

Largest diameter of hard spherical particles that will pass through a filter under specified test conditions. Indicator of largest opening in the filter elements.

Absolute Viscosity

Term used interchangeably with viscosity to distinguish it from either commercial or kinematic viscosity. Is the ratio of shear stress to shear rate. It is a property of, a fluid's internal resistance to flow. Its common unit is 'poise'. Absolute viscosity divided by the fluid density equals kinematic viscosity, occasionally referred to as dynamic viscosity. Absolute viscosity and kinematic viscosity are expressed in fundamental units. Commercial viscosity such as Saybolt viscosity is expressed in arbitrary units of time, usually seconds.

Absorber Filter

A filter medium that holds contaminant by mechanical means.

Absorption

The assimilation of one material into another; in petroleum refining, the use of an absorptive liquid to selectively remove components from a process stream.

Accumulator

A container in which a fluid is stored under pressure as a source of fluid power.

Acid

In a restricted sense, any substance containing hydrogen in combination with a nonmetal or nonmetallic radical and capable of producing hydrogen ions in a solution.

Acid Number

A measure of the amount of KOH (an alkali) needed to neutralise acidity present in petroleum product.

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 etc. are contacted with sulfuric acid to improve their colour, odour, and other properties.

Acidity

In lubricants, acidity denotes the presence of acid-type constituents whose concentration is usually defined in terms of total acid number. The constituents vary in nature and may or may not markedly influence the behavior of the lubricant.

Additive

A compound that enhances some property of, or imparts some new property to, the base fluid. In some hydraulic fluid formulations, the additive volume may constitute as much as 20 percent of the final composition. The more important types of additives include anti-oxidants, anti-wear additives, corrosion inhibitors, viscosity index improvers, and foam suppressants.

Additive Level

The total percentage of all additives in an oil.

Additive stability

The ability of additives in the fluid to resist changes in their performance during storage or use.

Adhesion

The property of a lubricant that causes it to cling or adhere to a solid surface.

Adhesive wear

Is often referred to as galling, scuffing, scouring, or seizing. It happens when sliding surfacescontact one anothe r, causing fragments to be pulled from the surfaces.

Aeration

The state of air being suspended in a liquid such as a lubricant or a hydraulic fluid.

Agglomeration

The potential of the system for particle attraction and adhesion.

Alkali

Any substance having basic (as opposed to acidic) properties. In a restricted sense it is applied to the hydroxides of ammonium, lithium, potassium and sodium. Alkaline materials in lubricating oils neutralize acids to prevent acidic and corrosive wear in internal combustion engines.

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).

Analytical Ferrography

The magnetic precipitation and subsequent analysis of wear debris from a fluid sample This approach involves passing a volume of fluid over a chemically treated microscope slide which is supported over a magnetic field. Permanent magnets are arranged in such a way as to create a varying field strength over the length of the substrate. This varying strength causes wear debris to precipitate in a distribution with respect to size and mass over the Ferrogram.

Once rinsed and fixed to the substrate, this debris deposit serves as an excellent media for optical analysis of the composite wear particulates.

Anhydrous

Free of water, especially of crystallization.

Aniline Point

The minimum temperature for complete miscibility of equal volumes of aniline and the sample under test ASTM Method D 611. A product of high aniline point will be low in aromatics and naphthenes and, therefore, high in paraffins. Aniline point is often specified for spray oils, cleaning solvents, and thinners, where effectiveness depends upon aromatic content. In conjunction with API gravity, the aniline point may be used calculate the net heat of combustion for aviation fuels.

Anti-foam Agent

One of two types of additives used to reduce foaming in petroleum products: silicone oil to break up large surface bubbles, and various kinds of polymers that decrease the amount of small bubbles entrained in the oils.

Anti-freeze Solution

A fluid, such as ethylene or propylene glycol, which is added to or used to replace 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.

Antiknock

Resistance to detonation or pinging in spark-ignition engines.

Anti-oxidants

Prolong the induction period of a base oil in the presence of oxidizing conditions and catalyst metals at elevated temperatures. The additive is consumed and degradation products increase not only with increasing and sustained temperature, but also with increases in mechanical agitation or turbulence and contamination by air, water, metallic particles and dust.

Antistatic Additive

An additive that increases the conductivity of a hydrocarbon fuel to hasten the dissipation of electrostatic charges during high- speed dispensing, thereby reducing the fire/explosion hazard.

Antiwear Agents

Improve the service life of tribological elements operating in the

boundary lubrication regime. Antiwear compounds (for example, ZDDP and TCP) start decomposing at 90° to 100°C and even at a lower temperature if water (25 to 50 ppm) is present.

These form thin tenacious films on highly loaded parts to prevent metal to metal contact.

API Gravity

A gravity scale established by the American Petroleum Institute and in general use in the petroleum industry, the unit being called "the A.P.I. degree." This unit is defined in terms of specific gravity as follows:

Deg. API = (141.5/sp.gr.) - 131.5

Apparent Viscosity

The ratio of shear stress to rate of shear of a non-Newtonian fluid such as lubricating grease, calculated fromPoiseuille's equation and measured in poises. The apparent viscosity changes with changing rates of shear and temperature and must therefore, be reported as the value at a given shear rate and temperature (ASTM Method D 1092).

Aromatic

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

Ash

A measure of the amount of inorganic material in lubricating oil. It is determined by burning the oil and weighing the residue. Results are expressed as percent by weight. Ash represents the metallic deposits formed in the combustion chamber or other engine parts during high temperature opertaion.

Ash Content

The percent by weight of residue left after combustion of an oil sample (ASTM Method D 482).

Ash (Sulfated)

The ash content of an oil, determined by charring the oil, treating the residue with sulfuric acid, and evaporating to dryness. Expressed as % by mass.

Asperities

Microscopic projections on metal surfaces resulting from normal surface-finishing processes. Interference between opposing asperities in sliding or rolling applications is a source of friction, and can lead to metal welding and scouring. Ideally, the lubricating film between two moving surfaces should be thicker than the combined height of the opposing asperities.

Asphalt

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

Asphaltic

Essentially composed of, or similar to, asphalt; frequently used to describe lubricating oils derived from crude oils which contain asphalt.

ASTM Colorimeter

Apparatus widely used for determining the color of lubricating oils (ASTM Method D 1500). The color so determined in 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 bath (ASTM Method D 381 and ASTM Method D 525).

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.

Automatic Transmission Fluid (ATF)

Fluid for automatic, hydraulic transmissions in motor vehicles.

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 follows 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).

Atomic absorption spectroscopy

Measures the radiation absorbed by chemically unbound atoms by analyzing the transmitted energy relative to the incident energy at each frequency. The procedure consists of diluting the fluid sample with methyl isobutyl ketone (MIBK) and directly aspirating the solution. The actual process of atomization involves reducing the solution to a fine spray, dissolving it, and finally vaporizing it with a flame. The vaporization of the metal particles depends upon their time in the flame, the flame temperature, and the composition of the flame gas. The spectrum occurs because atoms in the vapor state can absorb radiation at certain well-defined characteristic wave lengths. The wave length bands absorbed are very narrow and differ for each element. In addition, the absorption of radiant energy by electronic transitions from ground to excited state is essentially an absolute measure of the number of atoms in the flame and is, therefore, the concentration of the element in a sample.Axial-load Bearing

A bearing in which the load acts in the direction of the axis of rotation.

B

Bactericide

Additive included in the formulations of water-mixed cutting fluids to inhibit the growth of bacteria promoted by the presence of water, thus preventing odors that can result from bacterial action.

Barrel

A unit of liquid volume of petroleum oils equal to 42 U.S. gallons or approximately 35 Imperial gallons.

Base

A material which neutralizes acids. An oil additive containing colloidally dispersed metal carbonate, used to reduce corrosive wear.

Base Number

The amount of acid (perchloric or hydrochloric) needed to neutralize all or a part of a lubricant's basicity, expressed as KOH equivalents.

Base stock

The base fluid, usually a refined petroleum fraction or a selected synthetic material, into which additives are blended to produce finished lubricants.

Bentonite

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

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).

Beta Rating

The method of comparing filter performance based on efficiency. This is done using the Multi-Pass Test which counts the number of particles of a given size before and after fluid passes through a filter.

Beta-Ratio

The ratio of the number of particles greater than a given size in the influent fluid to the number of particles greater than the same size in the effluent fluid, under specified test conditions (see "Multi-Pass Test").

Bitumen

Also called asphalt or tar, bitumen is the brown or black viscous residue from the vacuum distillation of crude petroleum. It also occurs in nature as asphalt "lakes" and "tar sands." It consists of high molecular weight hydro-carbons and minor amounts of sulfur and nitrogen compounds.

Black oils

Lubricants containing asphaltic materials, which impart extra adhesiveness, that are used for open gears and steel cables.

Blending

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

Bloom

Fluorescence; the color of an oil by reflected light which could differ

from its color by transmitted light.

Blow-by

Passage of unburned fuel and combustion gases past the piston rings of internal combustion engines, resulting in fuel dilution and contamination of the crankcase oil.

Boiling Point

The temperature at which a substance boils, or is converted into vapor by bubbles forming within the liquid; it varies 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

Form of lubrication between two rubbing surfaces without development of a full-fluid lubricating film. Boundary lubrication can be made more effective by including additives in the lubricating oil that provide a stronger oil film, thus preventing excessive friction and possible scouring. There are varying degrees of boundary lubrication, depending on the severity of service. For mild conditions, oiliness agents may be used; by plating out on metal surfaces in a thin but durable film, oiliness agents prevent scouring under some conditions that are too severe for a straight mineral oil. Compounded oils, which are formulated with polar fatty oils, are sometimes used for this purpose. Anti-wear additives are commonly used in more severe boundary lubrication applications. The more severe cases of boundary lubrication are defined as extreme pressure conditions; they are met with lubricants containing EP additives that prevent sliding surfaces from fusing together at high local temperatures and pressures.

Bright Stock

A heavy residual lubricant stock with low pour point, used in finished blends to provide good bearing film strength, prevent scuffing, and reduce oil consumption. Usually identified by its viscosity, SUS at 210°F or cSt at 100°C.

Brinelling

Permanent deformation of the bearing surfaces where the rollers (or balls) contact the surfaces. Brinelling results from excessive load or impact on stationary bearings. It is a form of mechanical damage in which metal is displaced or upset without attrition.

Brookfield Viscosity

Apparent viscosity in cP determined by Brookfield viscometer, which measures the torque required to rotate a spindle at constant speed in oil of a given temperature. Basis for ASTM Method D 2983; used for measuring low temperature viscosity of lubricants.

Burst Pressure

Burst pressure rating the maximum specified inside-out differential pressure that can be applied to a filter element without outward structural or filter- medium failure.

C

Cams

Eccentric shafts used in most internal combustion engines to open and close valves.

Capillary Viscometer

A viscometer in which the oil flows through a capillary tube.

Carbon

A non-metallic element - No. 6 in the periodic table. Diamonds and graphite are pure forms of carbon. Carbon is a constituent of all organic compounds. It also occurs in combined form in many inorganic substances; i.e., carbon dioxide, limestone, etc.

Carbon Residue

Coked material remaining after an oil has been exposed to high temperatures under controlled conditions.

Catalytic converter

An integral part of vehicle emission control systems since 1975. Oxidizing converters remove hydrocarbons and carbon monoxide (CO) from exhaust gases, while reducing converters control nitrogen oxide (NOx) emissions. Both use noble metal (platinum, palladium or rhodium) catalysts that can be "poisoned" by lead compounds in the fuel or lubricant.

Cavitation

Formation of an air or vapor bubble due to lowering of pressure in a liquid, often as a result of a solid body, such as a propeller or piston, moving through the liquid; also, the pitting or wearing away of a solid surface as a result of the collapse of a vapor bubble. Cavitation can occur in a hydraulic system as a result of low fluid levels that draw air into the system, producing tiny bubbles that expand

explosively at the pump outlet, causing metal erosion and eventual pump destruction.

Cavitation Erosion

A material-damaging process which occurs as a result of vaporous cavitation. "Cavitation" refers to the occurrence or formation of gas - or vapor - filled pockets in flowing liquids due to the hydrodynamic generation of low pressure (below atmospheric pressure). This damage results from the hammering action when cavitation bubbles implode in the flow stream. Ultra-high pressures caused by the collapse of the vapor bubbles produce deformation and finally, material failure.

Centipoise (cp)

A unit of absolute viscosity.
1 centipoise = 0.01 poise.
Centistoke (cSt)
A unit of kinematic viscosity.
1 centistoke = 0.01 stoke.

Centralized Lubrication

A system of lubrication in which a metered amount of lubricant or lubricants for the bearing surfaces of a machine or group of machines are supplied from a central location.

Centrifugal Separator

A separator that removes immiscible fluid and solid contaminants that have a different specific gravity than the fluid being purified by accelerating the fluid mechanically in a circular path and using the radial acceleration component to isolate these contaminants.

Cetane Number

A measure of the ignition quality of a diesel fuel, as determined in a standard single cylinder test engine, which measures ignitiondelay, compared to primary reference fuels. The higher the Cetane Number, the easier a high speed, direct-injection engine will start and the less "white smoking" and "diesel knock" after startup.

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.

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.

Chemical Stability

The tendency of a substance or mixture to resist chemical change.

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. 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. Paper chromatography is a micromethod. A drop of the liquid to be investigated is placed near one end of a strip of paper. This end is immersed in solvent which travels down the paper and distributes the materials present in the original drop selectively. Comparison with known substances makes identification possible. 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 (eluting it) with an inert gas. The column is packed with adsorbent material which selectively retard the components of the sample.

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 points of petroleum products flashing above 175°F, with the exception of fuel oils (ASTM Method D 92)

Cloud Point

The temperature at which waxy crystals in an oil or fuel form a cloudy appearance.

Coalescor

A separator that divides a mixture or emulsion of two immiscible liquids using the interfacial tension between the two liquids and the difference in wetting of the two liquids on a particular porous medium.

Coefficient of Friction

The number obtained by dividing the friction force resisting motion between two bodies by the normal force pressing the bodies together.

Cohesion

That property of a substance that causes it to resist being pulled apart by mechanical means.

Cold Cranking Simulator (CCS)

An intermediate shear rate viscometer that predicts the ability of oil to permit a satisfactory cranking speeds to be developed in cold engine.

Cold Sludge

The name given to the accumulated deposits of oil-insoluble materials formed as a result of low temperature engine operation over a long period.

Complex Grease

A lubricating grease thickened by a complex soap and a complexing agent.

Compound

1. Chemically speaking, a distinct substance formed by the combination of two or more elements in definite proportions by weight and possessing physical and chemical properties different from those of the combining elements.

2. In petroleum processing, generally connotes fatty oils and similar materials foreign to petroleum, added to lubricants to impart special properties.

Compounded Oil

A petroleum oil to other chemical substances have been added.

Compression Ratio

In an internal combustion engine, the ratio of the volume of combustion space at bottom dead center to that at top dead center.

Consistency

The degree to which a semisolid material such as grease resists deformation.(See ASTM D 217) Sometimes used qualitatively to denote viscosity of liquids.

Contaminant

Any foreign or unwanted substance that can have a negative effect on system operation, life or reliability.

Contaminant (Dirt) Capacity

The weight of a specified artificial contaminant that must be added to the influent to produce a given differential pressure across a filter at specified conditions. Used as an indication of relative service life.

Contaminant Failure

Any loss of performance due to the presence of contamination. Two basic types of contamination failure are Perceptible - gradual loss of efficiency or performance, and Catastrophic - dramatic, unexpected failure.

Contamination control

A broad subject which applies to all types of material systems (including both biological and engineering). It is concerned with planning, organizing, managing, and implementing all activities required to determine, achieve and maintain a specified contamination level.

Coolant

A fluid used to remove heat. Also see Cutting fluid.

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

A qualitative measure of the tendency of a petroleum product to corrode pure copper.

It is also gradual eating away of copper surfaces as a result of oxidation or other chemical action. It is caused by acids or other corrosive agents.

% Correl

The percentage of peaks in the used oil infrared spectrum which match those in the reference oil. A sudden decrease in this value usually means that the oil was mixed.

Corrosion

The decay and loss of a metal due to a chemical reaction between the metal and its environment. It is a transformation process in which the metal passes from its elemental form to a combined (or compound) form.

Corrosion Inhibitor

Additive for protecting lubricated metal surfaces against chemical attack by water or other contaminants. There are several types of corrosion inhibitors. Polar compounds wet the metal surface preferentially, protecting it with a film of oil. Other compounds may absorb water by incorporating it in a water- in-oil emulsion so that only the oil touches the metal surface. Another type of corrosion inhibitor combines chemically with the metal to present a non-reactive surface.

Cracking

The process whereby large molecules are broken down by the application of heat and pressure to form smaller molecules. This can also be achieved by the process of catalysis.

Crown

The top of the piston in an internal combustion engine above the fire ring, exposed to direct flame impingement.

Cryogenics

The branch of physics relating to the production and effects of very low temperatures.

Cutting fluid

Any fluid applied to a cutting tool to assist in the cutting operation by cooling, lubricating or other means.

Cylinder

A device which converts fluid power into linear mechanical force and motion. It usually consists of a moveable element such as a piston and piston rod, plunger rod, plunger arm, operating with in a cylindrical bore.

D

Deaerator

A separator that removes air from the system fluid through the application of bubble dynamics.

Defoamant (Foam Inhibitor)

Additive used in lubricating oils to assist the collapse of surface layers of foam caused by agitation or release of entrained or entrapped air.

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 ofthe same volume of water gives the number of degrees Engler.

DEO

Diesel Engine Oil

Dehydrator

A separator that removes water from the system fluid.

D-lamination Wear

A complex wear process where a machine surface is peeled away or otherwise removed by forces of another surface acting on it in a sliding motion.

Demulsibility

The ability of a fluid that is insoluble in water to separate from water with which it may be mixed in the form of an emulsion.

Density

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

Deposits

Oil-insoluble materials that result from oxidation and decomposition of lube oil and contamination from external sources and engine blow- b y. These can settle out on machine or engine parts. Examples are sludge, varnish, lacquer and carbon.

Desorption

Opposite of absorption or adsorption. In filtration, it relates to the downstream release of particles previously retained by the filter.

Detergent

A substance added to a fuel or lubricant to keep engine parts clean. In motor oil formulations, the most commonly used detergents are metallic soaps with a reserve of basicity to neutralise acids formed during combustion.

Detonation

Uncontrolled burning of the last portion (end gas) of the air/fuel

mixture in the cylinder of a spark- ignition engine. Also known as "knock" or "ping".

Dielectric Strength

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

Diesel Index

An expression for the ignitability of a fuel relative to its aniline point: Diesel index = aniline point (°F) x API gravity , 100

Diester Oil

A synthetic lubricating fluid made from esters; also called ester oil.

Differential Pressure Indicator

An indicator which signals the difference in pressure between any two points of a system or a component.

Dilution of Engine Oil

Contamination of crankcase oil by unburned fuel, leading to reduced viscosity and flash point. May indicate component wear or fuel system maladjustment.

Discolouration

A blackish colour of the oil. A sign that the oil is doing the cleansing job properly.

Dispersant

In lubrication, a term usually used interchangeably with detergent. An additive, usually nonmetallic ("ashless"), which keeps fine particles of insoluble materials in a homogeneous solution. Hence, particles are not permitted to settle out and accumulate.

Distillate

Wide range of products produced by distillation.

Distilate Fuel

Fuel composed mainly of materials evaporated during the distillation of crude oil.

Distillation method (ASTM D-95)

A method involving distilling the fluid sample in the presence of a solvent that is miscible in the sample but immiscible in water. The water distilled from the fluid is condensed and segregated in a specially-designed receiving tube or tray graduated to directly indicate the volume of water distilled.

Drum

A container with a capacity of 55 U.S. gallons.

Dropping Point

In general, the dropping point is the temperature at which a grease passes from a semisolid to a liquid state. This change in state is typical of greases containing conventional soap thickeners. Greases containing thickeners other than conventional soaps may, without change in state, separate oil.

Dry-Film Lubricant

Solid material left between two moving surfaces to prevent metal-to-metal contact, thus reducing frictionand 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 which 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.

E

Elastohydrodynamic Lubrication (EHD)

A lubricant regime characterized by high unit loads and high speeds in rolling elements where the mating parts deform elastically due to the incompressibility of the lubricnt film under very high pressure.

Electrostatic separator

A separator that removes contaminant from dielectric fluids by applying an electrical charge to the contaminant that is then attracted to a collection device of different electrical charge.

Emissions

Fuel composiotion can influence emissions of sulfur oxides and particulates from power stations. Local authorities control the sulfur content of heavy fuel oils used in such applications.

Emissions (Mobile Sources)

The combustion of fuels leads to the emission of exhaust gases that may be regarded as pollutants. Water and CO are not included in this category but CO, NOx and hydrocarbons are subject to legislative control.

Emission spectrometer

Works on the basis that atoms of metallic and other particular elements emit light at characteristic wavelengths when they are excited in a flame, arc, or spark. Excited light is directed through an entrance slit in the spectrometer. This light penetrates the slit, falls on a grate, and is dispersed and reflected. The spectrometer is calibrated by a series of standard samples containing known amounts of the elements of interest. By exciting these standard samples, an analytical curve can be established which gives the relationship between the light intensity and its concentration in the fluid.

Emulsibility

The ability of a non-water-soluble fluid to form an emulsion with water.

Emulsifier

Additive that promotes the formation of a stable mixture, or emulsion, of oil and wate r. Common emulsifiers are: metallic soaps, certain animal and vegetable oils, and various polar compounds.

Emulsion

Intimate mixture of oil and water, generally of a milky or cloudy appearance. Emulsions may be of two types: oil-in water (where water is the continuous phase) and water-in-oil (where water is the discontinuous phase).

End Point

Highest vapour temperature recorded during a distillation test of a petroleum stock.

Engine Deposits

Hard or persistent accumulation of sludge, varnish and carbonaceous residues due to blow-by of unburned and partially burned fuel, or the partial breakdown of the crankcase lubricant. Water from the condensation of combustion products, carbon, residues from fuel or lubricating oil additives, dust and metal particles also contribute.

EOLCS

Engine Oil Licensing and Certification System.

Erosion

The progressive removal of a machine surface by cavitation or by particle impingement at high velocities.

Extreme Pressure Additive (agent)

Lubricant additive that prevents sliding metal surfaces from seizing under conditions of extreme pressure. 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 scouring that is destructive to sliding surfaces under high loads. Reactive compounds of sulfur, chlorine, or phosphorus are used to form these inorganic films.

Extreme Pressure Lubricants

Lubricants that impart to rubbing surfaces the ability to carry appreciably greater loads than would be possible with ordinary lubricants without excessive wear or damage.

F

False Brinelling

False brinelling of needle roller bearings is actually a fretting corrosion of the surface since the rollers are the internal diameter of the bearing. Although its appearance is similar to that of brinelling, false brinelling is characterized by attrition of the steel, and the load on the bearing is less than that required to produce the resulting impression. It is the result of a combination of mechanical and chemical action that is not completely understood, and occurs when a small relative motion or vibration is accompanied by some loading, in the presence of oxygen.

Fatigue chunks

Thick three-dimensional particles exceeding 50 microns indicating severe wear of gear teeth.

Fatigue platelets

Normal particles between 20 and 40 microns found in gear box and rolling element bearing oil samples observed by analytical ferrography. A sudden increase in the size and quantity of these particles indicates excessive wear.

Ferrography

An analytical method of assessing machine health by quantifying and examining ferrous wear particles suspended in the lubricant or hydraulic fluid.

Fiber Grease

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

Fillers

Any substance, such as talc, mica, or various powders, which may be added to a grease to make it heavier in weight or consistency, but which serves no useful function in making the grease a better lubricant. Such fillers may also be added to certain lubricating oils or other lubricants.

Film Strength

Ability of a film of lubricant to resist, rupture due to load, speed and temperature. The pressure which an oil film can stand without rupturing.

Fire point (Clevelend Open Cup)

The temperature to which a combustible liquid must be heated so that the released vapor will burn continuously when ignited under specified conditions.

Fire-resistant fluid

Lubricant used especially in high- temperature or hazardous hydraulic applications. Three common types of fire-resistant fluids are(1) water-petroleum oil emulsions, in which the water prevents burning of the petroleum constituent; (2) water-glycol fluids; and (3) non-aqueous fluids of low volatility, such as phosphate esters, silicones, and halogenated hydrocarbon-type fluids.

Flash Point

Minimum temperature at which a fluid will support instantaneous combustion (a flash) but before it will burn continuously (fire Point). Flash Point is an important indicator of the fire and explosion hazards associated with a petroleum product.

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.

Floc point

The temperature at which wax or solids separate in an oil.

Flow, laminar

A flow situation in which fluid moves in parallel lamina or layers.

Flow, turbulent

A flow situation in which the fluid particles move in a random manner.

Fluid compatibility

The suitability of filtration medium and seal materials for service with the fluid involved.

Fluid power

Energy transmitted and controlled through use of a pressurized fluid.

Flushing

A fluid circulation process designed to remove contamination from the wetted surfaces of a fluid system.

Force feed lubrication

A system of lubrication in which the lubricant is supplied to the bearing surface under pressure.

Four Ball Tester

This name is frequently used to describe either of two similar laboratory machines, the Four-Ball Wear Tester and Four-Ball 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

Can take place when two metals are held in contact and subjected to repeated small sliding, relative motions. Other names for this type of corrosion include wear oxidation, friction oxidation, chafing, and brinelling.

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 relative to the surface of the other.

Front-end Volatily

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.

Full-fluid-film lubrication

Presence of a continuous lubricating film sufficient to completely separate two surfaces, as distinct from boundary lubrication. Full-fluid-film lubrication is normally hydrodynamic lubrication, whereby the oil adheres to the moving part and is drawn into the area between the sliding surfaces, where it forms a pressure - or hydrodynamic - wedge.

G

Galling

A form of wear in which seizing or tearing of the gear or bearing surface occurs.
Gasohol

A blend of upto 10% anhydrous ethanol (ethyl alcohol) and balance gasoline, by volume. Used as a motor fuel.

Graphite

A crystalline form of carbon having a laminar structure, which is used as a lubricant. It may be of natural or synthetic origin.

Gravity

See Specific Gravity; API Gravity.

Grease

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

H

Heat Transfer Oil

A medium used for the transfer of heat.

Herschel Demulsibility Number

A number which 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 Fluid

Fluid serving as the power transmission medium in a hydraulic system. The most commonly used fluids are petroleum oils, synthetic lubricants, oil-water emulsions, and water-glycol mixtures. The principal requirements of a premium hydraulic fluid are proper viscosity, high viscosity index, anti-wear protection (if needed), good oxidation stability, adequate pour point, good demulsibilit y, rust inhibition, resistance to foaming, and compatibility with seal materials. Anti-wear oils are frequently used in compact, high-pressure, and capacity pumps that require extra lubrication protection.

Hydraulics

Engineering science pertaining to liquid pressure and flow.

Hydrocarbons

Compounds containing only carbon and hydrogen. Petroleum products consist chiefly of hydrocarbons.

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.

Hydrofinishing

A process for treating raw extracted base stocks with hydrogen to saturate them for improved stability.

Hydrogenation

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

Hydrolysis

Breakdown process that occurs in anhydrous hydraulic fluids as a result of heat, water, and metal catalysts (iron, steel, copper, etc.)

Hydrolytic Stability

Ability of additives and certainsynthetic lubricants to resist chemical decomposition (hydrolysis) in the presence of water.

Hydrometer

An instrument for determining the specific gravity of a liquid.

Hydrostatic Lubrication

A system of lubrication in which the lubricant is supplied under

sufficient external pressure to separate the opposing surfaces by a fluid film.

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.

I

Image Analyzer

A sophisticated microscopic system involving a microscope, a television camera, a dedicated computer, and a viewing monitor similar to a television screen.

Immiscible

Incapable of being mixed without separation of phases. Water and petroleum oil are immiscible under most conditions, although they can be made miscible with the addition of an emulsifier.

Infrared Spectroscopy

An analytical method using infrared absorption for assessing the properties of used oil and certain contaminants suspended therein.

Infrared Spectra

A graph of infrared energy absorbed at various frequencies in the additive region of the infrared spectrum. The current sample, the reference oil and the previous samples are usually compared.

Ingression Level

Particles added per unit of circulating fluid volume.

Inhibitor

Additive that improves the performance of a petroleum product by controling undesirable chemical reactions i.e oxidation inhibitor, rust inhibitor, etc.

Initial Boiling Point

According to ASTM Method D86, the recorded temperature when the first drop of liquid falls from the end of the condenser.

Insolubles

Particles of carbon or agglomerates of carbon and other material. Indicates deposition or dispersant drop-out in an engine. Not serious in a compressor or gearbox unless there has been a rapid increase in these particles.

Intensifier

A device which converts low pressure fluid power into higher pressure fluid power.

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.

J

Journal

That part of a shaft or axle that rotates or angularly oscillates in or against a bearing.

Journal Bearing

A sliding type of bearing having either rotating or oscillatory motion and 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, i.e., 150°, 120°, etc.

K

Karl Fischer Reagent Method (ASTM D-1744-64)

The standard laboratory test to measure the water content of mineral base fluids. In this method, water reacts quantitatively with the Karl Fischer reagent. This reagent is a mixture of iodine, sulfur dioxide, pyridine, and methanol. When excess iodine exists, electric current can pass between two platinum electrodes or plates. The water in the sample reacts with the iodine. When the water is no longer free to react with iodine, an excess of iodine depolarizes the electrodes, signaling the end of the test.

Kinematic viscosity

Measure of fluid's resistance to flow under gravity at a specific temperature (usually 40°C or 100°C)

Knock

Noise associated with the premature ignition of the fuel air mixture in a combustion chamber.

L

Lacquer

A deposit resulting from the oxidation and polymerization of fuels andlubricants when exposed to high temperatures. Similar to, but

harder, than varnish.

Lard Oil

An animal oil prepared 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 Naphthenate

A lead soap of naphthenic acids, the latter occurring naturally in petroleum.

Liquefield 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.

Liquefield Natural Gas (LNG)

Similar to LPG but consisting of lighter hydrocarbons, mostly methane.

Load-carrying Capacity

Property of a lubricant to form a film on the lubricated surface, which resists rupture under given load conditions. Expressed as the maximum load a lubricated system can support without failure or excessive wear.

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.

Lubricant

Any substance interposed between two surfaces in relative motion for the purpose of reducing the friction and/ or the wear between them.

Lubricity

Ability of an oil or grease to lubricate; also called film strength.

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.

M

Magnetic Filter

A filter element that, in addition to its filter medium, has a magnet or magnets incorporated into its structure to attract and hold ferromagnetic particles.

Magnetic Separator

A separator that uses a magnetic field to attract and hold ferromagnetic particles.

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.

Metal Oxides

Oxidized ferrous particles which are very old or have been recently produced by conditions of inadequate lubrication. Trend is important.

Micrometre (μm)

See Micron.

Micron

A unit of length.
One Micron = one thousandth of a millimeter (0.001mm). Contaminant size is usually described in microns. Relatively speaking, a grain of salt is about 60 microns and naked eye can see particles above 40 microns. Many hydraulic filters are required to be efficient in capturing a substantial percentage of contaminant particles as small as 5 microns. A micron is also known as a micrometre, and exhibited as μm.

Microscope method

A method of particle counting which measures or sizes particles using an optical microscope.

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 crudes.

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 specifications; a guide in determining the quality requirements of products used by the military services, published by the United States Department of Defense.

Mineral Oil

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

Miscible

Capable of being mixed in any concentration without separation of phases; e.g., water and ethyl alcohol are miscible.

Moly

Molybdenum disulfide, a solid lubricant and friction reducer, colloidally dispersed in some oils and greases.

Monograde

A term used to describe an oil whose viscosity falls within the limits specified for a single SAE Number.

Motor

A device which converts fluid power into mechanical force and motion. It usually provides rotary mechanical motion.

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.

Multigrade oil

An oil meeting the requirements of more than one SAE viscosity grade classification, and may therefore be suitable for use over a wider temperature range than a single- grade oil.

Multipass or Recirculation Test

Filter performance tests in which the contaminated fluid is allowed to recirculate through the filter for the duration of the test. Contaminant is usually added to the test fluid during the test. The test is used to determine the Beta-Ratio (q.v.) of an element.

Multipurpose Grease

A lubricating grease suitable to meet the individual requirements for chassis lubricant, bearing lubricant, joint lubricant, water-pump lubricant, and cup grease.

N

Naphthenic

A type of petroleum fluid derived from naphthenic crude oil, containing a high proportion of closed-ring methylene groups.

Neutralization Number

A measure of the total acidity or basicity of an oil; this includes organic or inorganic acids or bases or a combination thereof (ASTM D974 - 58T)

Neutral Oil

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

NLGI Number

One of a series of numbers classifying the consistency range of lubricating greases, based on the ASTM cone penetration number. The National Lubricating Grease Institute (NLGI) grades are in order of increasing consistency (hardness).

Newtonian Fluid

A fluid with a constant viscosity at a given temperature regardless of the rate of shear. Single-grade oils are Newtonian fluids. Multigrade oils are NON-Newtonian fluids because viscosity varies with shear rate.

Nitration

The process whereby nitrogen oxides attack petroleum fluids at high temperatures, often resulting in viscosity increase and deposit formation.

Non-Newtonian fluid

Fluid, such as a grease or a polymer- containing oil (e.g., multi-grade oil), in which shear stress is not proportional to shear rate.

O

Obliteration

A synergistic phenomenon of both particle silting and polar adhesion. When water and silt particles co-exist in a fluid containing long-chain molecules, the tendency for valves to undergo obliteration increases.

Octane Number

A term numerically indicating the relative antiknock value of a

gasoline engine. 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.

Oil Grove

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.

Oiliness

Property of a lubricant that produces low friction under conditions of boundary lubrication. The lower the friction, the greater the oiliness.

OLAP

Oil Labeling Assessment Program.

Octane Requirement (OR)

The lowest octane number reference fuel that will allow an engine to run knock free under standard conditions of service. OR is a characteristic of each individual vehicle.

Octane Requirement Increase (ORI)

As deposits accumulate in the combustion chamber the ORI of an engine increases usually reaching an equillibrium of 10,000 to 30,000 kms. ORI is the measure of the increase which may be in the range of 3 to 10 numbers.

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.

Oxidation

Occurs when oxygen attacks petroleum fluids. The process is accelerated by heat, light, metal catalysts and the presence of water, acids, or solid contaminants. It leads
to increased viscosity and deposit formation.

Oxidation inhibitor

A substance added in small quantities to a petroleum product to increase its oxidation resistance, thereby lengthening its service or storage life; also called anti-oxidant. An oxidation inhibitor may work in one of these ways:

(1) by combining with and modifying peroxides (initial oxidation products) to render them harmless,

(2) by decomposing the peroxides, or

(3) by rendering an oxidation catalyst inert.

Oxidation Stability

Ability of a lubricant to resist natural degradation upon contact with oxygen.

Oxygenate

An oxygen containing, ashless organic compound such as alcohol or ether, that can be used as the fuel or fuel supplement.

Oxygenated Fuels

Fuels for internal combustion engines that contain oxygen combined in the molecule, eg. Alcohols, ethers and esters. The term also applies to blends of gasoline with oxygenates, eg. Gasohol, which contains upto 10% by volume anhydrous ethanol in unleaded gasoline.

P

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.

Paraffin Series

A homologous series of open- chain saturated hydrocarbons of the general formula CnH2n+2 of which methane (CH4) is the first member; sometimes referred to as the methane series.

PCMO

Passenger Car Motor Oil

Paraffinic

A type of petroleum fluid derived from paraffinic crude oil and containing a high proportion of straight chain saturated hydro-carbons. Often susceptible to cold flow problems.

Particle Count

The number of particles present greater than a particular micron size per unit volume of fluid often stated as particles > 10 microns per milliliter.

Particle Erosion

Occurs when fluid-entrained particles moving at high velocity pass through orifices or impinge on metering surfaces or sharp angle turns.

Particle Impingement Erosion

A particulate wear process where high velocit y, fluid-entrained particles are directed at target surfaces.

Patch Test

A method by which a specified volume of fluid is filtered through a membrane filter of known pore structure. All particulate matter in excess of an "average size," determined by the membrane characteristics, is retained on its surface. Thus, the membrane is discolored by an amount proportional to the particulate level of the fluid sample. Visually comparing the test filter with standard patches of known contamination levels determines acceptability for a given fluid.

Penetration

Consistency, expressed as the distance in millimeters that a standard needle or cone penetrates vertically into a sample of the material under known conditions of loading, time, and temperature.

Pentane Insolubles

Usually called normal pentane insolubles; the insoluble matter which can be separated from a solution of used lubricating oil in normal pentane and, in addition to the benzene insolubles, may include resinous bitumens produced from the oxidation of oil and fuel (ASTM Method D 893).

Permeability

The relationship of flow per unit area to differential pressure across a filter medium.

pH

Measure of alkalinity or acidity in water and water-containing fluids. pH can be used to determine the corrosion-inhibiting characteristic in water-based fluids. Typically, pH > 8.0 is required to inhibit corrosion of iron and ferrous alloys in water- based fluids.

Pinion

The smaller of the two mating or meshing gears; can be either the driving or the driven gear.

Pitting

A form of extremely localized attack characterized by holes in the metal. Pitting is one of the most destructive and insidious forms of corrosion. Depending on the environment and the material, a pit may take months, or even years, to become visible.

Poise (absolute viscosity)

A measure of viscosity numerically equal to the force required to move a plane surface of one square centimeter per second when the surfaces are separated by a layer of fluid one centimeter in thickness. It is the ratio of the shearing stress to the shear rate of a fluid and is expressed in dyne seconds per square centimeter (dynesec/cm2); 1 centipoise equals .01 poise.

Polar Compound

A chemical compound whose molecules exhibit electrically positive characteristics at one extremity and negative characteristics at the other. Polar compounds are used as additives in many petroleum products. Polarity gives certain molecules a strong affinity for solid surfaces; as lubricant additives (oiliness agents), such molecules plate out to form a tenacious, friction- reducing film. Some polar molecules are oil-soluble at one end and water- soluble at the other end; in lubricants, they act as emulsifiers, helping to form stable oil-water emulsions. Such lubricants are said to have good metal-wetting properties. Polar compounds with a strong attraction for solid contaminants act as detergents in engine oils by keeping contaminants finely dispersed.

Polishing (bore)

Excessive smoothing of the surface finish of the cylinder bore or cylinder liner in an engine to a mirror-like appearance, resulting in depreciation of ring sealing and oil consumption performance.

Polymerization

The chemical combination of similar- type molecules to form larger molecules.

Positive Crankcase Ventilation (PCV)

System for removing blow-by gases from the crankcase and returning them through the carburetor intake manifold to the combustion chamber where the recirculated hydrocarbons are burned. A PC valve controls the flow of gases from the crankcase to reduce hydrocarbon emissions.

Pour point

Lowest temperature at which an oil or distillate fuel is observed to flow, when cooled under conditions prescribed by test method ASTM D 97. The pour point is 3°C (5°F) above

the temperature at which the oil in a test vessel shows no movement when the container is held horizontally for five seconds.

Pour point Depressant

An additive which retards the adverse effects of 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 precipitate formed when 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).

Preignition

Ignition of the fuel/air mixture in a gasoline engine before the spark plug fires. Often caused by incandescent fuel or lubricant deposits in the combustion chamber, it wastes power and may damage the engine.

Pressure, absolute

The sum of atmospheric and gage pressures.

Pressure, atmospheric

Pressure exerted by the atmosphere at any specific location. (Sea level pressure is approximately 1.03 kg/cm2 absolute.)

Pressure, back

The pressure encountered on the return side of a system.

Pressure, cracking

The pressure at which a pressure operated valve begins to pass fluid.

Pressure, rated

The qualified operating pressure which is recommended for a component or a system by the manufacturer.

Pressure, system

The pressure which overcomes the total resistances in a system. It includes all losses as well as useful work.

Pressure Drop

Resistance to flow created by the element (media) in a filte r. Defined as the difference in upstream pressure (inlet side of the filter) and downstream pressure (outlet side of the filter).

Pressure Gauge

An instrument to measure pressure above atmospheric pressure.

Process Oil

An oil used for lubrication but as a component of another material, or as a carrier of other products.

Pumpability

The low temperature, low shear stress-shear rate viscosity characteristics of an oil that permit satisfactory flow to and from the engine oil pump and subsequent lubrication of moving components.

Q

QPL

Qualified Product List (military listing)

R

Rate of shear

The difference between the velocities along the parallel faces of a fluid element divided by the distance between the faces.

Reclaimed Oil

A lubricating oil which, 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 a definite temperature (IP Method 70). Instrument is available in two sizes: Redwood No. I 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).

Rerefining

A process of reclaiming used lubricant oils and restoring them to a condition similar to that of virgin stocks by filtration, clay adsorption or more elaborate methods.

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-CRF engine at 600 rpm under standard operating conditions (ASTM Methods D908 and D 1656).

Residual Dirt Capacity

The dirt capacity remaining in a service loaded filter element after use, but before cleaning, measured under the same conditions as the dirt capacity of a new filter element.

Ring Lubrication

A system of lubrication in which the lubricant is supplied to the bearing by an oil ring.

Rings

Circular metallic elements that ride in the grooves of a piston and provide compression sealing during combustion. Also used to spread oil for lubrication.

Ring sticking

Freezing of a piston ring in its groove in a piston engine or reciprocating compressor due to heavy deposits in the piston ring zone.

Road Octane Number

It is the arithmetic mean of Research Octane Number (RON) and Motor Octane Number (MON). Road Octane number = (RON+MON)/2.

A numerical value based upon the relative anti-knock 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 dynamometerunder conditions simulating those encountered on the highway.

Roll-off cleanliness

The fluid system contamination level at the time of release from an assembly or overhaul line. Fluid system life can be shortened significantly by full-load operation under a high fluid contamination condition for just a few hours. Contaminant implanted and generated during the break-in period can devastate critical components unless removed under controlled operating and high performance filtering conditions.

Rust and Oxidation (R & O)

Additives used to enhance the rust and oxidation resistance of oils and greases.

Rust Preventive

Compound for coating metal surfaces with a film that protects against rust. Commonly used to preserve equipment in storage.

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 EP Lubricant Tester

A machine designed to test the extreme-pressure properties of a lubricant under a combined rolling and sliding action. The revolving members are two bearing cups which 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 recom- mendations for crankcase oils to meet various design, service, and temperature requirements affecting viscosity only; they do not denote quality.

Saybolt Color

A color standard for petroleum products. The procedure for determining Saybolt color and description of the Saybolt chronometer are given in ASTM Method D 156.

Saybolt Furol Viscosity

The time, in seconds, for 60 ml of fluid to flow through a capillary tube in a Saybolt Furol viscometer at specified temperatures between 70°F and 210°F. This Method is appropriate for high- viscosity oils such as transmission, gear, and heavy fuel oils. ASTM Method D 88 describes the equipment and procedure.

Saybolt Universal Viscosity (SUV) or Saybolt Universal Seconds, (SUS)

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. (ASTM Designation D 88.)

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.

Scuffing

Abnormal engine wear due to localized welding and fracture. It can be prevented through the use of antiwear, extreme-pressure and friction modifier additives.

Scuffing Particles

Large twisted and discolored metallic particles resulting from adhesive wear due to complete lubricant film breakdown.

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 Rate

Rate at which adjacent layers of fluid move with respect to each other, usually expressed as reciprocal seconds.

Shear Stability Index (SSI)

The measure of a viscosity modifier's contribution to an oils percentage kinamatic viscosity loss, when the oil is subjected to engine operation or special test conditions.

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 of a Newtonian fluid. In a non-Newtonian fluid such as a grease or a polymer containing oil (e.g. multi-grade oil) - shear stress is not proportional to the rate of shear. A non-Newtonian fluid may be said to have an apparent viscosity, a viscosity that holds only for the shear rate (and temperature) at which the viscosity is determined.

Silt

Contaminant particles 5 micron and less in size.

Silting

A failure generally associated with a valve in which movements are restricted due to small particles that have wedged in between critical clearances (e.g., the spool and bore.)

Sintered medium

A metallic or a nonmetallic filter medium processed to cause diffusion bonds at all contacting points.

Sludge

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

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.

Solvency

Ability of a fluid to dissolve inorganic materials and polymers, which is a function of aromaticity.

Solvent Extraction

A refining process used to separate reactive components (unsaturtated hydrocarbons) from lubricant distillates in order to improve the oil's oxidation stability, viscosity index and additive responsive.

Solvent Refining

A process for retrieving lubricant base stocks from stripped heavy gas oil, or other heavy crude streams using selective solvents such as furfural, phenol, and increasingly N-Methyl pyrrolidone (NMP).

Specific gravity

The ratio of the weight of a given volume of liquid to the weight of an equal volume of water.

Spectrographic analysis

Determines the concentration of elements represented in the entrained fluid contaminant.

Spectrographic Oil Analysis Program (SOAP)

Procedures for extracting fluid samples from operating systems and analyzing them spectro-graphically for the presence of key elements.

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 the lubricant onto themselves and/or other parts of the mechanism.

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 force just sufficient to initiate relative motion between two bodies under load. The value of the static friction at the instant relative motion begins, is termed break-away friction.

Stoke (St)

Kinematic measurement of a fluid's resistance to flow defined by the ratio of the fluid's dynamic viscosity to its density.

Strainer

A coarse filter element (pore size over approximately 40 micron)

Suction filter

An on-line filter on the pump suction line.

Sulfated Ash

See Ash (Sulfated)

Sulfurized Oil

Oil to which sulfur or sulfur compounds have been added.

Surface Fatigue Wear

The formation of surface or subsurface cracks and fatigue crack propagation. It results from cyclic loading of a surface.

Surface Filtration

Filtration which primarily retains contaminant on the influent surface.

Surface Tension

The contractile surface force of a liquid by which it tends to assume a spherical form and to present the least possible surface. It is expressed in dynes/cm or ergs/cm2.

Surfactant

Surface-active agent that reduces interfacial tension of a liquid. A surfactant used in a petroleum oil may increase the oil's affinity for metals and other materials.

SUS (SSU)

Saybolt Universal Seconds. A measure of lubricating oil viscosity used in the oil industry.

Swarf

The cuttings, and grinding fines that result from metal working operations.

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 Hydrocarbon

Oil molecule with superior oxidation quality tailored primarily out of paraffinic materials.

Synthetic Lubricant

A lubricant produced by chemical synthesis rather than by extraction or refinement of petroleum to produce a compound with planned and predictable properties.

Synthetic Oils

Oil produced by synthesis rather than by extraction or refinement.

T

Tacky

A descriptive term applied to lubricating oils and greases which appear particularly sticky or adhesive.

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.

Thermography

The use of infrared thermography whereby temperatures of a wide variety of targets can be measured remotely and without contact. This is accomplished by measuring the infrared energy radiating from the surface of the target and converting this measurement to an equivalent surface temperature.

Thermal Conductivity

Measure of the ability of a solid or fluid to transfer heat.

Thermal Stability

Ability of a fuel or lubricant to resist oxidation under high temperature operating conditions.

Thin film Lubrication

A condition of lubrication in which the film thickness of the lubricant is such that the friction between the surfaces is determined by the properties of the surfaces as well as by the viscosity of the lubricant.

Thixotropy

That property of a lubricating grease which is manifested by a softening in consistency as a result of shearing followed by a hardening in consistency starting immediately after the shearing is stopped.

Three-body abrasion

A particulate wear process by which particles are pressed between two sliding surfaces.

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.

Timken OK Load

The heaviest load that a test lubricant will sustain without scouring the test block in the Timken Test procedures, ASTM Methods D 2509 (greases) and D 2782 (oils).

Tribology

The science and technology of interacting surfaces in relative motion, including the study of lubrication, friction and wear. Tribological wear is wear that occurs as a result of relative motion at the surface.

Turbidity

The degree of opacity of a fluid.

Turbulent Flow Sampler

A sampler that contains a flow path in which turbulence is induced in the main stream by abruptly changing the direction of the fluid.

U

USP

Abbreviation for U. S. Pharmacopoeia, usually used in reference to purity standards for medicinal white oils that will come in contact with food.

V

Vapor pressure

Pressure of a confined vapor in equilibrium with its liquid at specified temperature thus, a measure of a liquid's volatility.

Vapor Pressure-Reid (RVP) - See Reid Vapour Pressure

Varnish

When applied to lubrication, a thin, insoluble, nonwipeable film deposit occurring on interior parts, resulting from the oxidation and polymerization of fuels and lubricants. Can cause sticking and malfunction of close- clearance moving parts. Similar to, but softer, than lacquer.

Viscometer or Viscosimeter

An apparatus for determining the viscosity of a fluid.

Viscosity

Measurement of a fluid's resistance to flow. The common metric unit of absolute viscosity is the poise.There are other methods for determining viscosity, including Saybolt Universal Viscosity (SUV), Saybolt Furol viscosity, Engier viscosit y, and Redwood viscosity. Since viscosity varies inversely with temperature, its value is meaningless until the temperature at which it is determined is reported.

Viscosity, absolute

The ratio of the shearing stress to the shear rate of a fluid. It is usually expressed in centipoise.

Viscosity, kinematic

The absolute viscosity divided by the density of the fluid. It is usually expressed in centistokes.

Viscosity, SUS

Saybolt Universal Seconds (SUS), which is the time in seconds for 60 milliliters of oil to flow through a standard orifice at a given temperature. (ASTM D 88-56.)

Viscosity Grade

Any of a number of systems which 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 commonly used measure of a fluid's change of viscosity with temperature. The higher the viscosity index, the smaller the relative change in viscosity with temperature.

Viscosity Index Improvers

Additives that increase the viscosity of the fluid throughout its useful temperature range. Such additives are polymers that possess thickening power as a result of their high molecular weight and are necessary for formulation of multi-grade engine oils.

Viscosity Modifier

Lubricant additive, usually a high molecular weight polymer, that reduces the tendency of an oil's viscosity to change with temperature.

Viscous

Possessing viscosity. Frequently used to imply high viscosity.

Volatility

This property describes the degree and rate at which a liquid will vaporize under given conditions of temperature and pressure. When liquid stability changes, this property is often reduced in value.

W

Wear

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

Wear Inhibitor

An additive which protects rubbing surfaces against wear, particularly if hydrodynamics film is ruptured.

Wetting Agent

A compound having the property of modifying the characteristics of the contact between a liquid and a solid surface to promote more rapid and complete wetting of the surface.

White Oil

A highly refined lubricant stock used for specialty application such as cosmetics and medicines.

Wicking

The vertical absorption of a liquid into a porous material by capillary forces.

Worked Penetration

The penetration of a sample of lubricating grease immediately after it has been brought to 25°C and then subjected to 60 strokes in a standard grease worker. This procedure and the standard grease worker are described in ASTM Method D 217.

DO YOU KNOW

BEARING FAILURES

90 % of bearing failures due to "Poor Lubrication"

Other reasons:

- Deteriorated lubricant
- Polluted bearings due to dust, dirt, moisture
- Corrosive surroundings
- Overload
- Faulty design
- Wear
- Over lubrication etc.