Glossary of Lubrication Terms

A

Abrasion

A general wearing away of a surface by constant scratching, usually due to the presence of foreign matter such as dirt, grit, or metallic particles in the lubricant. It may also cause a break down of the material (such as the tooth surfaces of gears). Lack of proper lubrication may result in abrasion.

Abrasive Wear

(Or cutting wear) Comes about when hard surface asperities or hard particles that have embedded themselves into a soft surface and plough grooves into the opposing harder surface, e.g., a journal.

Absolute Filtration Rating

The diameter of the largest hard spherical particle that will pass through a filter under specified test conditions. This is an indication of the largest opening in the filter elements.

Absolute Pressure

The sum of atmospheric and gage pressure.

Absolute Viscosity

A term used interchangeably with viscosity to distinguish it from either kinematic viscosity or commercial viscosity. Absolute viscosity is the ratio of shear stress to shear rate. It is a fluid's internal resistance to flow. The common unit of absolute viscosity is the poise. Absolute viscosity divided by fluid density equals kinematic viscosity. It is 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.

Absorbent 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.

AC Fine Test Dust (ACFTD)

A test contaminant used to assess both filters and the contaminant sensitivity of all types of tribological mechanisms.

Accumulator

A container in which 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 solution.

Acid Number

The quantity of base, expressed in milligrams of potassium hydroxide, that is required to neutralize the acidic constituents in 1 g of sample.

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 total acid number. The constituents vary in nature and may or may not markedly influence the behavior of the lubricant.

Activated Alumina

A highly porous material produced from dehydroxylated aluminium hydroxide. Is used as a desiccant and as a filtering medium.

Actuator

A device used to convert fluid energy into mechanical motion.

Additive

A chemical substance added to a petroleum product to impart or improve certain properties. Common petroleum product additives are: antifoam agent, anti-wear additive, corrosion inhibitor, demulsifier, detergent, dispersant, emulsifier, EP additive, oiliness agent, oxidation inhibitor, pour point depressant, rust inhibitor, tackiness agent, viscosity index (VI.) improver.

Additive Level

The total percentage of all additives in an oil. (Expressed in % of mass (weight) or % of volume)

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, scoring, or seizing. It happens when sliding surfaces contact one another, causing fragments to be pulled from one surface and to adhere to the other.

Adsorbent Filter

A filter medium primarily intended to hold soluble and insoluble contaminants on its surface by molecular adhesion.

Adsorption

Adhesion of the molecules of gases, liquids, or dissolved substances to a solid surface, resulting in relatively high concentration of the molecules at the place of contact; e.g. the plating out of an anti-wear additive on metal surfaces.

Adsorptive Filtration

The attraction to, and retention of particles in, a filter medium by electrostatic forces, or by molecular attraction between the particles and the medium.

Aeration

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

Agglomeration

The potential of the system for particle attraction and adhesion.

AGMA

An acronym for "American Gear Manufacturers Associations," an organization serving the gear industry.

AGMA Lubricant Numbers

AGMA specification covering gear lubricants. The viscosity ranges of the AGMA numbers (or grades) conform to the International Standards Organization (ISO) viscosity classification system (see ISO viscosity classification system).

Air Bleeder

A device for removal of air from a hydraulic fluid line.

Air Breather

A device permitting air movement between atmosphere and the component in/on which it is installed.

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 analysts.

Air Motor

A device which converts compressed gas into mechanical force and motion. It usually provides rotary mechanical motion.

Air/Oil Systems

A lubrication system in which small measured quantities of oil are introduced into an air/oil mixing device which is connected to a lube line that terminates at a bearing, or other lubrication point. The air velocity transports the oil along the interior walls of the lube line to the point of application. These systems provide positive air pressure within the bearing housing to prevent the ingress of contaminants, provide cooling air flow to the bearing, and perform the lubrication function with a continuous flow of minute amounts of oil.

Air-Gap Solenoid

A solenoid that is sealed to prevent leakage of the liquid indo the plunger cavity

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 (EP) of gear lubricants.

Aluminum Alloy

White particles which indicate wear of aluminum component such as a casing wall.

Ambient Temperature

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

Amp

Ampere

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

Devoid of water.

Aniline Point

The minimum temperature for complete miscibility of equal volumes of aniline and the sample under test ASTM Method D611. 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 to calculate the net heat of combustion for aviation fuels.

ANSI

American National Standards Institute

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-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.

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

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 Additives

Improve the service life of tribological elements operating in the boundary lubrication regime. Antiwear compounds (for example, ZDDP and TCP) start decomposing at 90 degrees to 100 degrees C and even at a lower temperature if water (25 to 50 ppm) is present.

API

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

API Engine Service Categories

Gasoline and diesel engine oil quality levels established jointly by API, SAE, and ASTM, and sometimes called SAE or API/SAE categories; formerly called API Engine Service Classifications.

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:

Apparent Viscosity

The ratio of shear stress to rate of shear of a non-Newtonian fluid such as lubricating grease, or a multi-grade oil, calculated from Poiseuille’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).

Aqueous Decontamination

Removal of a chemical or biological hazard with a water-base solution

Aromatic

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

ARP

An acronym for Aeronautical Recommended Practice

Ash

A measure of the amount of inorganic material in lubricating oil. Determined by burning the oil and weighing the residue. Results expressed as percent by weight.

ASLE

American Society of Lubrication Engineers. Changed now to Society of Tribologist and Lubrication Engineers (STLE).

ASME

American Society of Mechanical Engineers

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 scoring. Ideally, the lubricating film between two moving surfaces should be thicker than the combined height of the opposing asperities.

ASTM

Acronym for "American Society for Testing Materials." A society for developing standards for materials and test methods.

ASTM D2670 Pin and V-Block Test

ASTM Test Method D2670 is for measuring the antiwear properties of liquid lubricants. The load is applied to the jaws and maintained by a toothed wheel. The wear is a function of the number of the tooth which needs to be engaged to keep the load constant for a fixed time.

ASTM D5302 Sequence VE

ASTM Test Method D 5302, the Sequence VE gasoline engine test, has been correlated with vehicles used in stop-and-go service prior to 1988, particularly with regard to sludge and valve train wear.

ASTM D5533 Sequence IIIF

ASTM Test Method D 5533, the Sequence IIIE gasoline engine test, has been correlated with vehicles used in high-temperature service prior to 1988, particularly with regard to oil thickening and valve train wear.

Atmospheric Pressure

Pressure exerted by the atmosphere at any specific location. (Sea level pressure is approximately 14.7 pounds per square inch absolute.)

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 and absolute measure of the number of atoms in the flame and is, therefore, the concentration of the element in a sample.

Atomization

The conversion of a liquid into a spray of very fine droplets.

Automatic Transmission Fluid (ATF)

Fluid for automatic, hydraulic transmissions in motor vehicles.

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.

Back Pressure

The pressure encountered on the return side of a system.

Background Contamination

The total of the extraneous particles which are introduced in the process of obtaining, storing, moving, transferring and analyzing a fluid sample.

Bacteria

Microorganisms often composed of a single cell.

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.

Baffle

A device to prevent direct fluid flow or impingement on a surface.

Ball Bearing

An antifriction rolling type bearing containing rolling elements in the form of balls.

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, expressed in terms of the equivalent number of milligrams of potassium hydroxide, required to neutralize all basic constituents present in 1 g of sample

Base Oil

A base oil is a base stock or blend of base stocks used in an API-licensed engine oil.

Base Stock

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

Batch

Any quantity of material handled or considered as a "unit" in processing. i.e., any sample taken from the same ‘batch’ will have the same properties and/or qualities.

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.

Bellows Seal

A type of mechanical seal which utilizes bellows for providing secondary sealing and spring-type loading.

Bernouilli’s Theory

If no work is done on or by a flowing, frictionless liquid, its energy, due to pressure and velocity, remains constant at all points along the streamline.

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").

Bevel Gear

A straight-toothed gear with the teeth cut on sloping faces and the gear shafts at an angle (normally a right angle)

Biocides

Additive designed to inhibit the growth of microorganisms in liquids

Biodegradation

The chemical breakdown of materials by living organisms in the environment. The process depends on certain microorganisms, such as bacteria, yeast, and fungi, which break down molecules for sustenance. Certain chemical structures are more susceptible to microbial breakdown than others; vegetable oils, for example, will biodegrade more rapidly than petroleum oils. Most petroleum products typically will completely biodegrade in the environment within two months to two years.

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 hydrocarbons 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.

Bleeding

The separation of some of the liquid phase 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)

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 with pressure

Boiling Range

For a mixture of substances, such as a petroleum fraction, the temperature interval between the initial and final boiling points.

Bomb Oxidation

A test for the oxidation stability of a product obtained by sealing it in a closed container with oxygen under pressure. The drop in pressure of the oxygen is a measure of the amount of oxidation that has occurred.

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 scoring. 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 scoring 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.

Boyle's Law

The absolute pressure of a fixed mass of gas varies inversely as the volume, provided the temperature remains constant.

Breakdown Maintenance

Maintenance performed after a machine has failed to return it to an operating state.

Bridging

A condition of filter element loading in which contaminant spans the space between adjacent sections of a filter element, thus blocking a portion of the useful filtration.

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 degrees F or cSt at 100 degrees C.

Brinelling

Permanent deformation of the bearing surfaces where the rollers (or balls) contact the races. 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.

BTU

British thermal unit. The amount of heat required to raise the temperature of 1 pound of water 1 degree Fahrenheit.

Bubble Point

The differential gas pressure at which the first steady stream of gas bubbles is emitted from a wetted filter element under specified test conditions.

Built-in-dirt

Material passed into the effluent stream composed of foreign materials incorporated into the filter medium.

Bulk Modulus (of elasticity)

A ratio of normal stress to a change in volume. A term used in determining the compressibility of a fluid. Data for petroleum products can be found in the International Critical Tables.

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.

Bushing

A short, externally threaded connector with a smaller size internal thread.

Bypass Filtration

A system of filtration in which only a portion of the total flow of a circulating fluid system passes through a filter at any instant or in which a filter having its own circulating pump operates in parallel to the main flow.

Bypass Valve (Relief valve)

A valve mechanism that assures system fluid flow when a preselected differential pressure across the filter element is exceeded; the valve allows all or part of the flow to bypass the filter element.

C

C or cent.

Centigrade

CAFÉ

Corporate Average Fuel Economy

Cams

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

Capacity

The amount of contaminants a filter will hold before an excessive pressure drop is caused. Most filters have bypass valves which open when a filter reaches its rated capacity.

Capillarity

A property of a solid-liquid system manifested by the tendency of the liquid in contact with the solid to rise above or fall below the level of the surrounding liquid; this phenomenon is seen in a smallbore (capillary) tube.

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 (deposit)

Solid black residue in piston grooves which can interfere with piston ring movement leading to wear and/or loss of power.

Carbon Residue

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

Carbon Type

The distinction between paraffinic, naphthenic, and aromatic molecules. In relation to lubricant base stocks, the predominant type present.

Carbonyl Iron Powder

A contaminant which consists of up to 99.5% pure iron spheres.

Carcinogen

A cancer-causing substance. Certain petroleum products are classified as potential carcinogens OSHA criteria. Suppliers are required to identify such products as potential carcinogens on package labels and Material Safety Data Sheets.

Cartridge Seal

A completely self-contained assembly including seal, gland, sleeve, mating ring, etc., usually needing no installation measurement.

Case Drain Filter

A filter located in a line conducting fluid from a pump or motor housing to reservoir.

Case Drain Line

A line conducting fluid from a component housing to the reservoir.

Catalyst

A substance that initiates or increases the rate of a chemical reaction, without itself being used up in the process.

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.

Catastrophic Failure

Sudden, unexpected failure of a machine resulting in considerable cost and downtime.

Caustic

A highly alkaline substance such as sodium hydroxide.

Cavitation

Formation of an air or vapor pocket (or 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 violent collapse of a vapor bubble. Cavitation can occur in a hydraulic system as a result of low fluid levels that draw air into the fluid, producing tiny bubbles that expand followed by rapid implosion, 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, material failure and, finally, erosion of the surfaces.

Cellulose Media

A filter material made from plant fibers. Because cellulose is a natural material, its fibers are rough in texture and vary in size and shape. Compared to synthetic media, these characteristics create a higher restriction to the flow of fluids.

Centi

Hundredth

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.

Channeling

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. 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.

Chip Control (grit control, last-chance) filter

A filter intended to prevent only large particles from entering a component immediately downstream.

Chlorinated Wax

Certain solid hydrocarbons treated with chlorine gas to form straight-chain hydrocarbons with a relatively high chlorine component. Chlorinated waxes are used primarily as polyvinyl chloride plasticizers, extreme-pressure additives for lubricants, and formulation components for many cutting fluids

Chromatography

An analytical technique whereby a complex substance is adsorbed on a solid or liquid substrate and progressively eluted by a flow of a substance (the eluant) in which the components of the substance under investigation are differentially soluble. The eluant can be a liquid or a gas. When the substrate is filter paper and the eluant a liquid, a chromatogram of colored bands can be developed by use of indicators. For gas chromatography, electronic detectors are normally used to indicate passage of the various components from the system.

Circulating Header System

A lubrication system having isolated lube zones wherein the lube pump runs continuously and circulates oil through the header, a return filter and back to tank during the idle period. When lubrication is required, a normal open solenoid valve in the return loop is actuated, allowing pump pressure to build. The zone valves are then sequentially opened to provide lubricant to the individual zones. Oil dispensed to the friction points is not reused, therefore, the system is a terminating type.

Circulating Oil

A lubrication system wherein the oil pump runs continuously and circulates oil to the friction points on a continuous basis. The oil is drained back to tank, filtered, cooled as required and reused.

Circulating System

A lubricating system in which oil is recirculated from a central sump to the parts requiring lubrication and then returned to the sump.

Clay Filtration

A refining process using fuller's earth (activated clay), bauxite or other mineral to absorb minute solids from lubricating oil, as well as remove traces of water, acids, and polar compounds.

Clean

100 particles >10 micron per milliliter - in regards to an oil sample bottle cleanliness

Clean Room

A facility or enclosure in which air content and other conditions (such as temperature, humidity, and pressure) are controlled and maintained at a specific level by special facilities and operating processes and by trained personnel.

Cleanable Filter

A filter element which, when loaded, can be restored by a suitable process, to an acceptable percentage of its original dirt capacity.

Cleanliness Level

A measure of relative freedom from contaminants.

Clearance Bearing

A journal bearing in which the radius of the bearing surface is greater than the radius of the journal surface.

Cleveland Open Cup

A flash point test in which the surface of the sample is completely open to the atmosphere, and which is therefore relatively insensitive to small traces of volatile contaminants.

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.

Coking

The undesirable accumulation of carbon (coke) deposits in the internal combustion engine or in a refinery plant. The process of distilling a petroleum product to dryness

Cold Cranking Simulator

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

Collapse

An inward structural failure of a filter element which can occur due to abnormally high pressure drop (differential pressure) or resistance to flow.

Collapse Pressure

The minimum differential pressure that an element is designed to withstand without permanent deformation.

Complex Grease

A lubricating grease thickened by a complex soap consisting of a normal 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 which has been added other chemical substances.

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.

Compressed Air

Air at any pressure greater than atmospheric pressure.

Compressibility

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.

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.

Compressor

A device which converts mechanical force and motion into pneumatic fluid power.

Consistency

The degree to which a semisolid material such as grease resists deformation. (See ASTM designation 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 Capacity (Dirt, ACFTD)

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 Capacity

The weight of a specified artificial contaminant which 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

Contaminant Lock

A particle or fiber-induced jam caused by solid contaminants.

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. See Cutting fluid.

Copper Strip Corrosion

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

Core

The internal duct and filter media support.

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.

Coupling

A straight connector for fluid lines.

Cracking

The process whereby large molecules are broken down by the application of heat and pressure to form smaller molecules.

Cracking Pressure

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

Crankcase Oil

Lubricant used in the crankcase of the internal combustion engine.

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.

Cutting Oil

A lubricant used in machining operations for lubricating the tool in contact with the workpiece, and to remove heat. The fluid can be petroleum based, water based, or an emulsion of the two. The term “emulsifiable cutting oil” normally indicates a petroleum-based concentrate to which water is added to form an emulsion which is the actual cutting fluid.

Cycle

A single complete operation consisting of progressive phases starting and ending at the neutral position.

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 or ram, operating with in a cylindrical bore.

Cylinder Oil

A lubricant for independently lubricated cylinders, such as those of steam engines and air compressors; also for lubrication of valves and other elements in the cylinder area. Steam cylinder oils are available in a range of grades with high viscosities to compensate for the thinning effect of

high temperatures; of these, the heavier grades are formulated for super-heated and high-pressure steam, and the less heavy grades for wet, saturated, or low-pressure steam. Some grades are compounded for service in excessive moisture; see compounded oil. Cylinder oils lubricate on a once-through basis.

D

Deaerator

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

Degas

Removing air from a liquid, usually by ultrasonic and/or vacuum methods.

Degradation

The progressive failure of a machine or lubricant.

Dehydrator

A separator that removes water from the system fluid.

Delamination 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.

Demulsifier

An additive that promotes oil-water separation in lubricants that are exposed to water or steam

Density

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

Deplete

The depletion of additives expressed as an approximate percentage.

Deposits

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

Depth Filter

A filter medium that retains contaminants primarily within tortuous passages.

Depth Filter Media

Porous materials which primarily retain contaminants within a tortuous path, performing the actual process of filtration.

Dermatitis

Inflammation of the skin. Repeated contact with petroleum products can be a cause.

Desorption

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

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.

Detergent Oil

Is a lubricating oil possessing special sludge-dispersing properties usually conferred on the oil by the incorporation of special additives. Detergent oils hold formed sludge particles in suspension and thus promote cleanliness especially in internal-combustion engines. However detergent oils do not contain “detergents” such as those used for cleaning of laundry or dishes. Also detergent oils do not clean already “dirty” engines, but rather keep in suspension the sludge that petroleum oil forms so that the engine remains cleaner for longer period. The formed sludge particles are either filtered out by Oil Filters or drained out when oil is changed.

Dewaxing

Removal of wax from a base oil in order to reduce the pour point.

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 Designation D 877.)

Differential Pressure Indicator

An indicator which signals the difference in pressure between two points, typically between the upstream and downstream sides of a filter element.

Differential Pressure Valve

A valve whose primary function is to limit differential pressure.

Directional Control Servo Valve

A directional control valve which modulates flow or pressure as a function of its input signal.

Directional Control Valve

A valve whose primary function is to direct or prevent flow through selected passages.

Dirt Capacity

The weight of a specified artificial contaminant which 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.

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.

Disposable

A filter element intended to be discarded and replaced after one service cycle.

Dissolved Air

Air which is dispersed in a fluid to form a mixture.

Dissolved Gases

Those gases that enter into solution with a fluid and are neither free nor entrained gases.

Dissolved Water

Water which is dispersed in the fluid to form a mixture.

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.

Double Seal

Two mechanical seals designed to permit a liquid or gas barrier fluid between the seals mounted back-to-back or face-to-face.

Drag

The resistance to movement caused by oil viscosity.

Dropping Point

In general, the dropping point is the temperature at which the 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.

Drum

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

Dry Lubrication

The situation when moving surfaces have no liquid lubricant between them.

Dry Sump

An engine design in which oil is not retained in a pan beneath the crankshaft thus permitting splash lubrication. There may be a remote sump from which oil is recirculated, or there may be a total loss system.

Dual-Line System

A positive displacement terminating (oil, or grease) lubrication system that employs two main lines supplied from a pump connected to a 4-way (reverser) valve. Pressure in one main line (while the other is open to tank) causes the measuring piston(s) in the dual-line valve(s) to stroke in one direction dispensing lubricant to one group of lube points. Switching the 4-way (reverser) valve directs pump flow to the second main line and opens the first main line to tank. This allows pressure to build in the second main line causing the dual-line valve(s) measuring piston(s) to stroke back to their original position dispensing lubricant to a second group of lube points. The system is a parallel type and each dual-line valves operates independently of any other in the system.

Duplex Filter

An assembly of two filters with valving for selection of either or both filters.

Dust Capacity

The weight of a specified artificial contaminant which 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.

Dynamic Seal

A seal that moves due to axial or radial movement of the unit.

E

Effluent

The fluid leaving a component.

Elastohydrodynamic Lubrication

In rolling element bearings, the elastic deformation of the bearing (flattening) as it rolls, under load, in the bearing race. This momentary flattening improves the hydrodynamic lubrication properties by converting point or line contact to surface-to-surface contact.

Elastomer

A rubber or rubber-like material, both natural and synthetic, used in making a wide variety of products, such as seals and hoses. In oil seals, an elastomer's chemical composition is a factor in determining its compatibility with a lubricant.

Electrical Insulating Oil

A high-quality oxidation-resistant oil refined to give long service as a dielectric and coolant for electrical equipment, most commonly transformers. An insulating oil must resist the effects of elevated temperatures, electrical stress, and contact with air, which can lead to sludge formation and loss of insulation properties. It must be kept dry, as water is detrimental to dielectric strength –

the minimum voltage required to produce an electric arc through an oil sample, as measured by test method ASTM D 877.

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.

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 water. 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 Cap

A ported or closed cover for the end of a filter element.

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.

Entrained Air

A mechanical mixture of air bubbles having a tendency to separate from the liquid phase.

Environmental Contaminant

All material and energy present in and around an operating system, such as dust, air moisture, chemicals, and thermal energy.

EP (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.

Erosion

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

Externally Pressurized Seal

A seal that has pressure acting on the seal parts from an external independent source of supply.

Extreme Pressure (EP) Additive

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 scoring that is destructive to sliding surfaces under high loads. Reactive compounds of sulfur, chlorine, or phosphorus are used to form these inorganic films.

F

Fabrication Integrity Point

The differential gas pressure at which the first stream of gas bubbles are emitted from a wetted filter element under standard test conditions.

Face Seal

A device that prevents leakage of fluids along rotating shafts. Sealing is accomplished by a stationary primary seal ring bearing against the face of a mating ring mounted on a shaft. Axial pressure maintains the contact between the seal ring and the mating ring.

False Brinelling

False brinelling of needle roller bearings is actually a fretting corrosion of the surface since the rollers are the I.D. 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.

Fat

An animal or vegetable oil which will combine with an alkali to saponify and form a soap.

Fatigue Chunks

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

Fatigue Life

The theoretical number of revolutions (or hours of operation) a bearing will last under a given constant load and speed before the first evidence of fatigue develops on one or more of the components.

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.

Fatigued

A structural failure of the filter medium due to flexing caused by cyclic differential pressure.

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.

Film Strength

Property of a lubricant that acts to prevent scuffing or scoring of metal parts.

Filter

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

Filter Efficiency

Method of expressing a filter's ability to trap and retain contaminants of a given size.

Filter Element

The porous device which performs the actual process of filtration.

Filter Head

An end closure for the filter case or bowl that contains one or more ports.

Filter Housing

A ported enclosure that directs the flow of fluid through the filter element.

Filter Life Test

A type of filter capacity test in which a clogging contaminant is added to the influent of a filter, under specified test conditions, to produce a given rise in pressure drop across the filter or until a specified reduction of flow is reached. Filter life may be expressed as test time required to reach terminal conditions at a specified contaminant addition rate.

Filtration

The physical or mechanical process of separating insoluble particulate matter from a fluid, such as air or liquid, by passing the fluid through a filter medium that will not allow the particulates to pass through it.

Filtration (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.

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

A fluid difficult to ignite which shows little tendency to propagate flame.

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.

Fixed Displacement Pump

A pump in which the displacement per cycle cannot be varied.

Flash Point (Cleveland Open Cup)

The temperature to which a combustible liquid must be heated to give off sufficient vapor to form momentarily a flammable mixture with air when a small flame is applied under specified conditions. (ASTM Designation D 92.)

Floc Point

The temperature at which wax or solids separate in an oil

Flow Control Valve

A valve whose primary function is to control flow rate.

Flow Fatigue Rating

The ability of a filter element to resist a structural failure of the filter medium due to flexing caused by cyclic differential pressure.

Flow Rate

The volume, mass, or weight of a fluid passing through any conductor per unit of time.

Flowmeter

A device which indicates either flow rate, total flow, or a combination of both.

Fluid

A general classification including liquids and gases.

Fluid Compatibility

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

Fluid Friction

Friction due to the viscosity of fluids.

Fluid Opacity

Related to the ability of a fluid to pass light.

Fluid Power

Energy transmitted and controlled through use of a pressurized fluid.

Fluid Velocity

The measured speed at which a fluid moves through the inside of a tube.

Flushing

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

Foam

An agglomeration of gas bubbles separated from each other by a thin liquid film which is observed as a persistent phenomenon on the surface of a liquid.

Foam Inhibitor

A substance introduced in a very small proportion to a lubricant or a coolant to prevent the formation of foam due to aeration of the liquid, and to accelerate the dissipation of any foam that may form

Foaming

A frothy mixture of air and a petroleum product (e.g., lubricant, fuel oil) that can reduce the effectiveness of the product, and cause sluggish hydraulic operation, air binding of oil pumps, and overflow of tanks or sumps. Foaming can result from excessive agitation, improper fluid levels, air leaks, cavitation, or contamination with water or other foreign materials. Foaming can be inhibited with an antifoam agent. The foaming characteristics of a lubricating oil can be determined by blowing air through a sample at a specified temperature and measuring the volume of foam, as described in test method ASTM D 892.

Food Grade Lubricants

Lubricants acceptable for use in meat, poultry and other food processing equipment, applications and plants. The lubricant types in food-grade applications are broken into categories based on the likelihood they will contact food. The USDA created the original food-grade designations H1, H2 and H3, which is the current terminology used. The approval and registration of a new lubricant into one of these categories depends on the ingredients used in the formulation.

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 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.

Free Air

Air at ambient temperature, pressure, relative humidity, and density.

Free Water

Water droplets or globules in the system fluid that tend to accumulate at the bottom or top of the system fluid depending on the fluid's specific gravity.

Fretting

Wear phenomena taking place between two surfaces having oscillatory relative motion of small amplitude.

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.

FTIR

Fourier Transform Infrared Spectroscopy. A test where infrared light absorption is used for assessing levels of soot, sulfates, oxidation, nitro-oxidation, glycol, fuel, and water contaminants.

Fuel Dilution

The amount of raw, unburned fuel that ends up in the crankcase of an engine. It lowers an oil's viscosity and flash point, creating friction-related wear almost immediately by reducing film strength.

Fuel Economy

The amount of fuel required to move a machine over a given distance.

Full Flow Filter

A filter that, under specified conditions, filters all influent flow.

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

Full-flow Filtration

A system of filtration in which the total flow of a circulating fluid system passes through a filter.

FZG Four Square Gear Oil Test

Used in developing industrial gear lubricants to meet equipment manufacturer's specifications. The FZG test equipment consists of two gear sets, arranged in a four square configuration, driven by an electric motor. The test gear set is run in the lubricant at gradually increased load stages until failure, which is the point at which a 10 milligram weight loss by the gear set is recorded. Also called Niemann Four Square Gear Oil Test.

G

Gage

An instrument or device for measuring, indicating or comparing a physical characteristic.

Galling

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

Gas Turbine

An engine that uses the energy of expanding gases passing through a multi-stage turbine to create rotating power.

Gasohol

A blend of 10% anhydrous ethanol (ethyl alcohol) and 90% gasoline, by volume. Used as a motor fuel.

Gear

A machine part which transmits motion and force by means of successively engaging projections, called teeth. The smaller gear of a pair is called the pinion; the larger, the gear. When the pinion is on the driving shaft, the gear set acts as a speed reducer; when the gear drives, the set acts as a speed multiplier. The basic gear type is the spur gear, or straight-tooth gear, with teethe cut parallel to the gear axis. Spur gears transmit power in applications utilizing parallel shafts. In this type of gear, the teeth mesh along their full length, creating a sudden shift in load from one tooth to the next, with consequent noise and vibration. This problem is overcome by the helical gear, which has teeth cut at an angle to the center of rotation, so that the load is transferred progressively along the length of the tooth from one edge of the gear to the other. When the shafts are not parallel, the most common gear type used is the bevel gear, with teeth cut on a sloping gear face, rather than parallel to the shaft. The spiral bevel gear has teeth cut at an angle to the plane of rotation, which, like the helical gear, reduces vibration and noise. A hypoid gear resembles a spiral bevel gear, except that the pinion is offset so that its axis does not intersect the gear axis; it is widely used in automobiles between the engine driveshaft and the rear axle. Offset of the axes of hypoid gears introduces additional sliding between the teeth, which, when combined with high loads, requires a high-quality EP oil. A worm gear consists of a spirally grooved screw moving against a tooth wheel; in this type of gear, where the load is transmitted across sliding, rather than rolling surfaces, compounded oils or EP oils are usually necessary to maintain effective lubrication.

Gear Oil

A high-quality oil with good oxidation stability, load-carrying capacity, rust protection, and resistance to foaming, for service in gear housings and enclosed chain drives. Specially formulated industrial EP

gear oils are used where highly loaded gear sets or excessive sliding action (as in worm gears) is encountered.

Gearbox (gear housing)

A casing for gear sets that transmit power from one rotating shaft to another. A gear box has a number of functions: it is precisely bored to control gear and shaft alignment, it contains the gear oil, and it protects the gears and lubricant from water, dust, and other environmental contaminants. Gear boxes are used in a wide range of industrial, automotive, and home machinery. Not all gears are enclosed in gear boxes; some are open to the environment and are commonly lubricated by highly adhesive greases.

Generated Contaminant

Caused by a deterioration of critical wetted surfaces and materials or by a breakdown of the fluid itself.

GPM

Gallons per minute

Graphite

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

Gravimetric Analysis

A method of analysis whereby the dry weight of contaminant per unit volume of fluid can be measured showing the degree of contamination in terms of milligrams of contaminant per litre of fluid.

Gravity

See Specific Gravity; API Gravity.

Gravity Separation

A method of separating two components from a mixture. Under the influence of gravity, separation of immiscible phases (gas-solid, liquid-solid, liquid-liquid, solid-solid) allows the denser phase to settle out.

Grease

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

Grease Fitting

A small fitting which connects a grease gun and the component to be lubricated. The fitting is installed by a threaded connection, leaving a nipple to which the grease gun attaches.

Grease Gun

A tool (normally hand-powered) which is used for lubrication tasks. By squeezing the trigger of the gun, grease is applied through an aperture to a specific point.

H

H1 Lubricant

Food-grade lubricants used in food processing environments where there is some possibility of incidental food contact. Lubricant formulations may only be composed of one or more approved basestocks, additives and thickeners (if grease) listed in Guidelines of Security Code of Federal Regulations (CFR) Title 21, §178.3570.

H2 Lubricant

Lubricants used on equipment and machine parts in locations where there is no possibility that the lubricant or lubricated surface contacts food. Because there is not the risk of contacting food, these lubricants do not have a defined list of acceptable ingredients. They cannot, however, contain intentionally heavy metals such as antimony, arsenic, cadmium, lead, mercury or selenium. Also, the ingredients must not include substances that are carcinogens, mutagens, teratogens or mineral acids.

H3 Lubricant

Also known as soluble or edible oil. These are used to clean and prevent rust on hooks, trolleys and similar equipment.

Hardness

The resistance of a substance to surface abrasion.

Head

An end closure for the filter case or bowl which contains one or more ports.

Heat Exchanger

A device which transfers heat through a conducting wall from one fluid to another.

Heavy Ends

The portions of a petroleum distillate fraction which are highest boiling, and therefore distill over last if the temperature is raised progressively.

Helical Gear

A cylindrical gear wheel which has slanted teeth that follow the pitch surface in a helical manner.

Housing

A ported enclosure which directs the flow of fluid through the filter element.

HVI

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

Hybrid Bearing

A bearing that consists of metal rings and ceramic balls.

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 demulsibility, 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.

Hydraulic Motor

A device which converts hydraulic fluid power into mechanical force and motion by transfer of flow under pressure. It usually provided rotary mechanical motion.

Hydraulic Oil

An oil specially suited for use as either the specific gravity or the API gravity of a liquid.

Hydraulic Pump

A device which converts mechanical force and motion into hydraulic fluid power by means of producing flow.

Hydraulic System

A system designed to transmit power through a liquid medium, permitting multiplication of force in accordance with Pascal's law, which stated that "a pressure exerted on a confined liquid is transmitted undiminished in all directions and acts with equal force on all equal areas." Hydraulic systems have six basic components: (1) a reservoir to hold the fluid supply; (2) a fluid to transmit the power; (3) a pump to move the fluid; (4) a valve to regulate pressure; (5) a directional valve to control the flow, and (6) a working component – such as a cylinder and piston or a shaft rotated by pressurized fluid – to turn hydraulic power into mechanical motion. Hydraulic systems offer several advantages over mechanical systems: They eliminate complicated mechanisms such as cams, gears, and levers; are less subject to wear; are usually more easily adjusted for control of speed and force; are easily adaptable to both rotary and liner transmission of power; and can transmit power over long distances and in any direction with small losses.

Hydraulics

Engineering science pertaining to liquid pressure and flow.

Hydro Turbine

A rotary engine whose energy is generated from moving water.

Hydrocarbons

Compounds containing only carbon and hydrogen. Petroleum consists 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

In refining, the chemical addition of hydrogen to a hydrocarbon in the presence of a catalyst; a severe form of hydrogen treating. Hydrogenation may be either destructive or non-destructive. In the former case, hydrocarbon chains are ruptured (cracked) and hydrogen is added where the breaks have occurred. In the latter, hydrogen is added to a molecule that is unsaturated with respect ot hydrogen. In either case, the resulting products are highly stable. Temperatures and pressures in the hydrogenation process are usually greater than in hydrofining.

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 certain synthetic lubricants to resist chemical decomposition (hydrolysis) in the presence of water.

Hydrometer

An instrument for determining either the specific gravity of a liquid or the API gravity.

Hydrophilic

Compounds with an affinity for water.

Hydrophobic

Compounds that repel water.

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.

Hypoid Gears

Gears in which the pinion axis intersects the plane of the ring gear at a point below the ring-gear axle and above the outer edge of the ring gear, or above the ring-gear axle and below the outer edge of the ring gear.

Hz

Hertz (cycles per second)

I

ILMA

The Independent Lubricant Manufacturers Association (ILMA) is a trade association of businesses engaged in compounding, blending, formulating, packaging, marketing, and distributing lubricants.

ILSAC

The International Lubricant Standardization and Approval Committee (ILSAC) is a joint committee of AAMA and JAMA members that assists in the development of new minimum oil performance standards.

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.

Incompatible Fluids

Fluids which when mixed in a system, will have a deleterious effect on that system, its components or its operation.

Indicator

A device which provides external evidence of sensed phenomena.

Industrial Lubricant

Any petroleum or synthetic-base fluid or grease commonly used in lubricating industrial equipment, such as gears, turbines, and compressors.

Influent

The fluid entering a component.

Infrared Analysis

A form of absorption spectroscopy that identifies organic functional groups present in a used oil sample by measuring their light absorption at specific infrared wavelengths; absorbance is proportional to concentration. The test can indicate additive depletion, the presence of water, hydrocarbon contamination of a synthetic lubricant, oxidation, nitration, and glycol contamination from coolant. Fourier Transform Infrared (FTIR) permits the generation of complex curves from digitally represented data.

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.

Infrared Spectroscopy

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

Ingested Contaminants

Environmental contaminant that ingresses due to the action of the system or machine.

Ingression Level

Particles added per unit of circulating fluid volume.

Inhibitor

Any substance that slows or prevents such chemical reactions as corrosion or oxidation.

In-line Filter

A filter assembly in which the inlet, outlet and filter element axes are in a straight line.

Inside-mounted Seal

A mechanical seal located inside the seal chamber with the pumped product's pressure at its O.D.

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.

Intercooler

A device which cools a gas between the compressive steps of a multiple stage compressor.

Interfacial Tension (IFT)

The energy per unit area present at the boundary of two immiscible liquids. It is usually expressed in dynes/cm (ASTM Designation D 971.)

Ion Exchange

A transfer of ions between two electrolytes or between an electrolyte solution and a complex. The term normally denotes the processes of purification, separation and decontamination of aqueous and other ion-containing solutions with an insoluble (usually resinous) solid.

ISO

International Standards Organization, sets viscosity reference scales.

ISO Solid Contaminant Code (ISO 4406)

A code assigned on the basis of the number of particles per unit volume greater than 5 and 15 micrometers in size. Range numbers identify each increment in the particle population throughout the spectrum of levels.

ISO Standard 4021

The accepted procedure for extracting samples from dynamic fluid lines.

ISO viscosity grade

A number indicating the nominal viscosity of an industrial fluid lubricant at 40 degrees C (104 degrees F) as defined by ASTM Standard Viscosity System for Industrial Fluid Lubricants D 2422. Essentially identical to ISO Standard 3448.

J

JIC

Joint Industry Conference

Joule

A unit of work, energy, or heat. 1J (joule)=1 Nm) (Newton meter).

Journal

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

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

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

The time required for a fixed amount of an oil to flow through a capillary tube under the force of gravity. The unit of kinematic viscosity is the stoke or centistoke (1/100 of a stoke). Kinematic viscosity may be defined as the quotient of the absolute viscosity in centipoises divided by the specific gravity of a fluid, both at the same temperature--

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.

Laminar Flow

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

Laminar Particles

Particles generated in rolling element bearings which have been flattened out by a rolling contact.

Lead Naphthenate

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

Light Ends

Low-boiling volatile materials in a petroleum fraction. They are often unwanted and undesirable, but in gasoline the proportion of light ends deliberately included are used to assist low-temperature starting.

Light Obscuration

The degree of light blockage as reflected in the transmitted light impinging on the photodiode.

Lip Seal

An elastomeric or metallic seal that prevents leakage in dynamic and static applications by a scraping or wiping action at a controlled interference between itself and the mating surface.

Liquid

Any substance that flows readily or changes in response to the smallest influence. More generally, any substance in which the force required to produce a deformation depends on the rate of deformation rather than on the magnitude of the deformation.

Lithium Grease

The most common type of grease today, based on lithium soaps.

Load-carrying Capacity

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

Load-wear Index (LWI)

Measure of the relative ability of a lubricant to prevent wear under applied loads; it is calculated from data obtained from the Four Ball EP Method. Formerly called mean Hertz load.

Log

Logarithm (common)

Lubricant

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

Lubrication

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

Lubricator

A device which adds controlled or metered amounts of lubricant into a pneumatic system.

Lubricity

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

LVI

Low Viscosity Index, typically below 40 VI units.

M

M

Meter

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 Plug

Strategically located in the flow stream to collect a representative sample of wear debris circulating in the system: for example, engine swarf, bearing flakes, and fatigue chunks. The rate of buildup of wear debris reflects degradation of critical surfaces.

Magnetic Seal

A seal that uses magnetic material (instead of springs or a bellows) to provide the closing force that keeps the seal faces together.

Magnetic Separator

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

Manifold

A filter assembly containing multiple ports and integral relating components which services more than one fluid circuit.

Manifold Filter

A filter in which the inlet and outlet port axes are at right angles, and the filter element axis is parallel to either port axis.

Material Safety Data Sheet (MSDS)

A publication containing health and safety information on a hazardous product (including petroleum). The OSHA Hazard Communication Standard requires that an MSDS be provided by manufacturers to distributors or purchasers prior to or at the time of product shipment. An MSDS must include the chemical and common names of all ingredients that have been determined to be

health hazards if they constitute 1% or greater of the product's composition (0.1% for carcinogens). An MSDS also included precautionary guidelines and emergency procedures.

Mechanical Seal

A device which works to join together systems or mechanisms in order to prevent leakage, contain pressure or exclude contamination.

Media Migration

Material passed into the effluent stream composed of the materials making up the filter medium.

Medium

The porous material that performs the actual process of filtration. The plural of this word is "media".

Metal Oxides

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

Metalworking Lubricant

Any lubricant, usually petroleum-based, that facilitates the cutting or shaping of metal. Basic types of metalworking lubricants are: cutting and tapping fluids, drawing compounds, etc.

Micrometre

See Micron.

Micron

A unit of length. One Micron = 39 millionths of an inch (.000039"). Contaminant size is usually described in microns. Relatively speaking, a grain of salt is about 60 microns and the eye can see particles to about 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 ¦m

Microscope Method

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

MIL

Military

Mineral Oil

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

Mineral Seal Oil

A distillation fraction between kerosene and gas oil, widely used as a solvent oil in gas adsorption processes, as a lubricant for the rolling of metal foil, and as a base oil in many specialty formulations. Mineral seal oil takes its name – not from any sealing function – but from the fact that it originally replaced oil derived from seal blubber for use as an illuminant for signal lamps and lighthouses.

Miscible

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

Mixed Film

A type of lubrication that features a combination of full-film and thin-film elements.

Mold (release) Lubricant

A compound, often of petroleum origin, for coating the interiors of molds for glass and ceramic products. The mold lubricant facilitates removal of the molded object from the mold, protects the surface of the mold, and reduces or eliminates the need for cleaning it.

Moly

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

Molybdenum Disulfide

A black, lustrous powder (MoS_2) that serves as a dry-film lubricant in certain high-temperature and high-vacuum applications. It is also used in the form of pastes to prevent scoring when assembling press-fit parts, and as an additive to impart residual lubrication properties to oils and greases. Molybdenum disulfide is often called moly or molysulfide.

Motor

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

Motor Bearing

A bearing which supports the crankshaft in an internal-combustion engine. It is a support or guide by means of which a moving part is positioned with respect to the other parts of a mechanism.

Motor Oil

Oil that is used to lubricate the moving components of an internal-combustion engine.

MTBF

Mean Time Between Failures.

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 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.

N

Naphthenic

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

NAS

National Aerospace Standard

NASA

National Aeronautics and Space Administration

NEC

National Electrical Code

Needle Bearing

A rolling type of bearing containing rolling elements that are relatively long compared to their diameter.

NEMA

National Electrical Manufacturers Association

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 Designation D974-58T)

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.

NFPA

National Fluid Power Association

Nitration

Nitration products are formed during the fuel combustion process in internal combustion engines. Most nitration products are formed when an excess of oxygen is present. These products are highly acidic, form deposits in combustion areas and rapidly accelerate oxidation.

Nitrous Oxide

A chemical compound made up of nitrogen and oxygen, N2O. It is a liquid that turns into a gas when injected into an engine.

NLGI

National Lubricating Grease Institute. A trade association whose main interest is grease and grease technology. NLGI is best known for its system of rating greases by penetration.

NLGI Automotive Grease Classifications

Automotive lubricating grease quality levels established jointly by SAE, ASTM and NLGI. There are several categories in two classifications: Chassis Lubricants and Wheel bearing Lubricants. Quality or performance levels within each category are defined by ASTM tests.

NLGI Consistency Grades

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

Nominal Filtration Rating

An arbitrary micrometer value indicated by a filter manufacturer. Due to lack of reproducibility this rating is deprecated.

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.

Nonwoven Medium

A filter medium composed of a mat of fibers.

Normal Paraffin

A hydrocarbon consisting of molecules in which any carbon atom is attached to no more than two other carbon atoms; also called straight chain paraffin and linear paraffin.

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.

Oil

A greasy, unctuous liquid of vegetable, animal, mineral or synthetic origin.

Oil Analysis

The routine activity of analyzing lubricant properties and suspended contaminants for the purpose of monitoring and reporting timely, meaningful and accurate information on lubricant and machine condition.

Oil Change

The act of replacing dirty oil with clean oil.

Oil Consumption

The amount of lubricating fluid that is consumed by a machine, production line, plant or company over a given period of time.

Oil Consumption Ratio

Annual oil purchases divided by machine charge volume. For example, if you purchased 10,000 gallons of oil in one year and the total amount of oil that all of your machine holds is 4,200 gallons, your consumption ratio is 2.4.

Oil Drain

A large bolt or plug that secures the drain hole in the oil pan. It is generally fitted with a gasket or O-ring to prevent leakage.

Oil Filter

A device which removes the inherent or introduced impurities from the oil that lubricates an internal-combustion engine.

Oil Flushing

A fluid circulation process that is designed to remove contamination and decomposition from a lubrication-based system.

Oil Mist Lubrication

A method of lubricant delivery in which oil is piped throughout the machine to desired locations and dispensed with a spray nozzle. Oil mist systems are employed to cool and lubricate many machine parts at once.

Oil Mist System

A device which delivers lubricant to multiple machine parts at once via a setup that includes piping and a spray nozzle.

Oil 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.

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.

Oil Sampling

A procedure which involves the collection of a volume of fluid from lubricated or hydraulic machinery for the purpose of performing oil analysis. Samples are typically drawn into a clean bottle which is sealed and sent to a laboratory for analytical work.

Oiler

A device for once-through lubrication. Three common types of oilers are: drop-feed, wick-feed, and bottle-feed; all depend on gravity to induce a metered flow of oil to the bearing. The drop-feed oiler delivers oil from the bottom of a reservoir to a bearing one drop at a time; flow rate is controlled by a needle valve at the top of the reservoir. In a wick-feed oiler, the oil flows through a wick and drops from the end of the wick into the bearing; feed is regulated by chaining the number of strands, by raising or lowering the oil level, or by applying pressure to the wick. In a bottle-feed oiler, a vacuum at the top of the jar keeps the fluid from running out; as tiny bubbles of air enter, the vacuum is

reduced and a small amount of oil enters the bearing or is added to a reservoir from wick the bearing is lubricated.

Oiliness

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

Oiliness Agent

An additive, usually polar in nature, used to improve the lubricity of a mineral oil. Now usually called a boundary lubrication additive.

Open bubble point (boil point)

The differential gas pressure at which gas bubbles are profusely emitted from the entire surface of a wetted filter element under specified test conditions.

Open Gear

A gear that is exposed to the environment, rather than being housed in a protective gear box. Open gears are generally large, heavily loaded, and slow moving. They are found in such applications as mining and construction machinery, punch presses, plastic and rubber mills, tube mills, and rotary kilns. Open gears require viscous, adhesive lubricants that bond to the metal surfaces and resist run-off. Such lubricants are often called gear shields. Top-quality lubricants for such applications are specially formulated to protect the gears against the effects of water and other contaminants.

OSHA

Occupational Safety and Health Administration

Outside-mounted Seal

A mechanical seal with its seal head mounted outside the seal chamber that holds the fluid to be sealed. Outside seals have the pumped fluid's pressure at their I.D.

Oxidation Inhibitor

Substance added in small quantities to a petroleum product to increase its oxidation resistance, thereby lengthening its service or storage life; also called 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.

P

P

Pressure - psi

PAG Synthetic Fluid

Polyalkaline glycol have excellent oxidative and thermal stability, very high VI, excellent film strength and an extremely low tendency to leave deposits on machine surfaces. The low deposit-forming tendency is really due to two properties – the oil's ability to dissolve deposits and the fact that the oil burns clean. So when they are exposed to a very hot surface or subjected to micro-dieseling by entrained air, PAGs are less likely to leave residue that will form deposits. PAGs may also be the only type of base oil with significantly lower fluid friction, which may allow for energy savings. The other unique property of PAGs is the ability to absorb a great deal of water and maintain lubricity. There are actually two different types of PAGs – one demulisifies and the other absorbs water. The most common applications for PAGs are compressors and critical gearing applications. The negatives of PAGs are their very high cost and the potential to be somewhat hydrolytically unstable.

PAO Synthetic Fluid

Polyalphaolefins, often called synthetic hydrocarbons, are probably the most common type of synthetic base oil used today. They are moderately priced, provide excellent performance and have few negative attributes. PAO base oil is similar to mineral oil. The advantage comes from the fact that it is built, rather than extracted and modified, making it more pure. Practically all of the oil molecules are the same shape and size and are completely saturated. The potential benefits of PAOs are improved oxidative and thermal stability, excellent demulsibility and hydrolytic stability, a high VI, and very low pour point. Most of the properties make PAOs a good selection for temperature extremes – both high operating temperatures and low start-up temperatures. Typical applications for PAOs are engine oils, gear oils and compressor oils. The negative attributes of PAOs are the price and poor solubility. The low inherent solubility of PAOs creates problems for formulators when it comes to dissolving additives. Likewise, PAOs cannot suspend potential varnish-forming degradation by-products, although they are less prone to create such material.

Paper Chromatography

A method which involves placing a drop of fluid on a permeable piece of paper and noting the development and nature of the halos, or rings, surrounding the drop through time. The roots of this test can be traced to the 1940s, when railroads used the "blotter spot" tests.

Paraffin

Any hydrocarbon identified by saturated straight (normal) or branched (iso) carbon chains; also called an alkane. The generalized paraffinic molecule can be symbolized by the formula C_nH_{2n+2}. Paraffins are relatively non-reactive and have excellent oxidation stability. In contrast to naphthenic oils, paraffinic lubricating oils have relatively high wax content and pour point, and generally have a high viscosity index (VI.). Paraffinic solvents are generally lower in solvency than naphthenic or aromatic solvents.

Paraffinic

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

Parallel Systems

Lubrication systems where the dispensing devices are connected to the main line in parallel. Each dispensing device operates independent of any other in the system.

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 Counter

An instrument that detects and counts particles found in a fluid such as oil.

Particle Counting

A microscopic technique that enables the visual counting of particles in a known quantity of fliud. The count identifies 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 Density

An important parameter in establishing an entrained particle's potential to impinge on control surfaces and cause erosion.

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 velocity, fluid-entrained particles are directed at target surfaces.

Particulates

Particles made up of a wide range of natural materials (e.g., pollen, dust, resins), combined with man-made pollutant (e.g., smoke particles, metallic ash); in sufficient concentrations, particulates can be a respiratory irritant.

Pascal

Unit of pressure in the metric (SI) system.

Pascal's Law

A pressure applied to a confined fluid at rest is transmitted with equal intensity throughout the liquid and that pressure is considered to act at right angles to each surface contacted by the fluid.

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.

PCB

Polychlorinated biphenyl, a class of synthetic chemicals consisting of a homologous series of compounds beginning with monochlorobiphenyl and ending with decachlorobiphenyl. PCBs do not occur naturally in petroleum, but have been found as contaminants in used oil. PCBs have been

legally designated as a health hazard, and any oil so contaminated bust be handled in strict accordance with state and federal regulations.

PCV System

An abbreviation for "positive crankcase ventilation system". This is a system which prevents the vapors of a crankcase from being directly discharged into the atmosphere.

PCV Valve

A Positive Crankcase Ventilation (PCV) valve is a one-way valve that ensures the continual flow and evacuation of gases from the crankcase into the engine.

Permeability

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

Petrochemical

Any chemical substance derived from crude oil or its products, or from natural gas. Some petrochemical products may be identical to others produced from other raw materials such as coal and producer gas.

Phenol

A white, crystalline compound (C6H5OH) derived from benzene, used in the manufacture of phenolic resins, weed killers, plastics, disinfectants; also used in solvent extraction, a petroleum refining process. Phenol is a toxic material; skin contact must be avoided.

Phosphate Ester

Any of a group of synthetic lubricants having superior fire resistance. A phosphate ester generally has poor hydrolytic stability, poor compatibility with mineral oil, and a relatively low viscosity index (VI). It is used as a fire-resistant hydraulic fluid in high-temperature applications.

Pinion

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

Pitch Line

An imaginary line that divides the upper and lower halves of gear teeth while in the contact area.

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.

Plain Bearing

A relatively simple and inexpensive bearing typically made of two parts. A rotary plain bearing can be just a shaft running through a hole. A simple linear bearing can be a pair of flat surfaces designed to allow motion.

Pleated Filter

A filter element whose medium consists of a series of uniform folds and has the geometric form of a cylinder, cone, disc, plate, etc. Synonymous with "convoluted" and "corrugated".

PNA (polynuclear aromatic)

Any of numerous complex hydrocarbon compounds consisting of three or more benzene rings in a compact molecular arrangement. Some types of PNA's are formed in fossil fuel combustion and other heat processes, such as catalytic cracking.

Pneumatics

Engineering science pertaining to gaseous pressure and flow.

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 (DYNE SEC/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.

Polyalkylene Glycol

Mixtures of condensation polymers of ethylene oxide and water. They are any of a family of colorless liquids with high molecular weight that are soluble in water and in many organic solvents. They are used in detergents and as emulsifiers and plasticizers. PAG-based lubricants are used in diverse applications where petroleum oil-based products do not provide the desired performance – and because they are fire-resistant and will not harm workers or the environment.

Polyglycols

Polymers of ethylene or propylene oxides used as a synthetic lubricant base. Properties include very good hydrolytic stability, high viscosity index (VI), and low volatility. Used particularly in water emulsion fluids.

Polymer

A substance formed by the linkage (polymerization) of two or more simple, molecules, called monomers, to form a single larger molecule having the same elements in the same proportions as the original monomers; i.e. each monomer retains its structural identity. A polymer may be liquid or

solid; solid polymers may consist of millions of repeated linked units. A polymer made from two or more similar monomers is called a copolymer; a copolymer composed of three different types of monomers is a terpolymer. Natural rubber and synthetic rubbers are examples of polymers. Polymers are commonly used as viscosity index improvers in multi-grade oils and tackifiers in lubricating greases.

Polymerization

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

Polyol Ester

A synthetic lubricant base, formed by reacting fatty acids with a polyol (such as a glycol) derived from petroleum. Properties include good oxidation stability at high temperatures and low volatility. Used in formulating lubricants for turbines, compressors, jet engines, and automotive engines.

Polyolefin

A polymer derived by polymerization of relatively simple olefins. Polyethylene and polyisoprene are important polyolefins.

Pore

A small channel or opening in a filter medium which allows passage of fluid.

Pore Size Distribution

The ratio of the number of effective holes of a given size to the total number of effective holes per unit area expressed as a percent and as a function of hole size.

Porosity

The ratio of pore volume to total volume of a filter medium expressed as a percent.

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 long-term storage at low temperature approximating winter conditions.

Power Unit

A combination of pump, pump drive, reservoir, controls and conditioning components which may be required for its application.

PPM

Parts per million (1/ppm = 0.000001). Generally by weight. 100 ppm = 0.01%; 10,000 ppm = 1%

Predictive Maintenance

A type of condition-based maintenance emphasizing early prediction of failure using non-destructive techniques such as vibration analysis, thermography, and wear debris analysis.

Pressure

Force per unit area, usually expressed in pounds per square inch.

Pressure Control Valve

A pressure control valve whose primary function is to limit system pressure.

Pressure Drop

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

Pressure Gage

Pressure differential above or below atmospheric pressure.

Pressure Indicator

An indicator that signals pressure conditions.

Pressure Line Filter

A filter located in a line conducting working fluid to a working device or devices.

Pressure Switch

An electric switch operated by fluid pressure.

Pressure, absolute

The sum of atmospheric and gage pressures.

Preventive Maintenance

Maintenance performed according to a fixed schedule involving the routine repair and replacement of machine parts and components.

Proactive Maintenance

A maintenance strategy for stabilizing the reliability of machines or equipment. Its central theme involves directing corrective actions aimed at failure root causes, not active failure symptoms, faults, or machine wear conditions. A typical proactive maintenance regiment involves three steps: (1) setting a quantifiable target or standard relating to a root cause of concern (e.g., a target fluid cleanliness level for a lubricant), (2) implementing a maintenance program to control the root cause property to within the target level (e.g., routine exclusion or removal of contaminants), and (3) routine monitoring of the root cause property using a measurement technique (e.g., particle counting) to verify the current level is within the target.

Process Oil

An oil that serves as a temporary or permanent component of a manufactured products. Aromatic process oils have good solvency characteristics; their applications include proprietary chemical

formulations, ink oils, and extenders in synthetic rubbers. Naphthenic process oils are characterized by low pour points and good solvency properties. Paraffinic process oils are characterized by low aromatic content and light color.

PSI

Pounds per square inch

PSIA

Pounds per square inch absolute. (PSIG + 14.696)

PSID

Pounds per square inch differential.

PSIG

Pounds per square inch gauge (PSIA - 14.696)

Pump

A device which converts mechanical force and motion into hydraulic fluid power.

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.

Pusher seal

A mechanical seal in which the secondary seal is pushed along the shaft or sleeve to compensate for misalignment and face wear.

Q

Quenching Oil

(Also called heat treating oil) a high-quality, oxidation-resistant petroleum oil used to cool metal parts during their manufacture, and is often preferred to water because the oil's slower heat transfer lessens the possibility of cracking or warping of the metal. A quenching oil must have excellent oxidation and thermal stability, and should yield clean parts, essentially free of residue. In refining terms, a quenching oil is an oil introduced into high temperature vapors of cracked (see cracking) petroleum fractions to cool them.

Quick Disconnect Coupling

A coupling which can quickly join or separate a fluid line without the use of tools or special devices.

R

R & O (Rust and Oxidation Inhibited)

A term applied to highly refined industrial lubricating oils formulated for long service in circulating lubrication systems, compressors, hydraulic systems, bearing housing, gear boxes, etc. The finest R&O oils are often referred to as turbine oils.

Rate of Shear

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

Rated Flow

The maximum flow that the power supply system is capable of maintaining at a specific operating pressure.

Rated Pressure

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

Reducer

A connector having a smaller line size at one end than the other.

Refining

A series of processes for converting crude oil and its fractions to finished petroleum products. Following distillation, a petroleum fraction may undergo one or more additional steps to purify or modify it. These refining steps include; thermal cracking, catalytic cracking, polymerization, alkylation, reforming, hydrocracking, hydroforming, hydrogenation, hydrogen treating, hydrofining, solvent extraction, dewaxing, deoiling, acid treating, clay filtration, and deasphalting. Refined lubricating oils may be blended with other lube stocks, and additives may be incorporated, to impart special properties.

Refraction

The change of direction or speed of light as it passes from one medium to another.

Refrigeration Compressor

A special type of compressor typically used for refrigeration, heat pumping and air conditioning. They are made to turn low-pressure gases into high-pressure and high-temperature gases. The three main types of refrigeration compressors are screw compressors, scroll compressors and piston compressors.

Refrigerator Oil

The lubricant added to the working fluid in an expansion-type cooling unit which serves to lubricate the pump mechanism.

Remaining Useful Life

An opinion (based on data, observations, history, records, exposure, etc.) of the number of years before a fluid, system or component will require replacement or reconditioning.

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.

Reservoir

A container for storage of liquid in a fluid power system.

Reservoir Filter

A filter installed in a reservoir in series with a suction or return line. Also known as sump filter.

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.

Return Line

A location in a line conducting fluid from working device to reservoir.

Return Line Filtration

Filters located upstream of the reservoir but after fluid has passed through the system's output components (cylinders, motors, etc.).

Reynold'sNumber

A numerical ratio of the dynamic forces of mass flow to the shear stress due to viscosity. Flow usually changes from laminar to turbulent between Reynold's Number 2,000 and 4,000.

Rheology

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

Ring Lubrication

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

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.

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.

Roller Bearing

An antifriction bearing comprising rolling elements in the form of rollers.

Rolling Element Bearing

A friction-reducing bearing that consists of a ring-shaped track that contains free-revolving metal balls. A rotating shaft or other part turns against such a bearing.

Rolling Oil

An oil used in hot- or cold-rolling of ferrous and non-ferrous metals to Facilitate feed of the metal between the work rolls, improve the plastic deformation of the metal, conduct heat from the metal, and extend the life of the work rolls. Because of the pressures involved, a rolling oil may be compounded or contain EP additives. In hot rolling, the oil may also be emulsifieable.

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.

Rotary Seal

A mechanical seal which rotates with a shaft and is used with a stationary mating ring.

Rotating Equipment

Equipment that moves liquids, solids or gases through a system of drivers (turbines, motors, engines), driven components (compressors, pumps), transmission devices (gears, clutches, couplings) and auxiliary equipment (lube and seal systems, cooling systems, buffer gas systems).

Rotating Pressure Vessel Oxidation Test (RPVOT)

The Rotating Pressure Vessel Oxidation Test measures an oil's oxidation stability. The oil sample is placed in a vessel containing a polished copper coil. The vessel is then charged with oxygen and placed in a bath at a constant temperature of 150 degrees Celsius. Stability is expressed in terms of the time it takes to achieve a pressure drop of 25.4 pounds per square inch (psig) pressure drop from maximum pressure.

Rust Inhibitor

A type of corrosion inhibitor used in lubricants to protect surfaces against rusting.

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 Port

A straight thread port used to attach tube and hose fittings. It employs an “O” ring compressed in a wedge-shaped cavity. A standard of the Society of Automotive Engineers J514 and ANSI/B116.1

SAE Viscosity

The viscosity classification of a motor oil according to the system developed by the Society of Automotive Engineers and now in general use. “Winter” grades are defined by viscosity measurements at low temperatures and have “W” as a suffix, while “Summer” grades are defined by viscosity at 100°C and have no suffix. Multigrade oils meet both a winter and a summer definition and have designations such as SAE 10W-30, etc.

Sample Preparation

Fluid factors that can enhance the accuracy of the particulate analysis. Such factors include particle dispersion, particle settling, and sample dilution.

Saponification Number

The number of milligrams of potassium hydroxide (KOH) that combine with one gram of oil under conditions specified by test method ASTM D 94. Saponification number is an indication of the amount of fatty saponifiable material in compounded oil. Caution must be used in interpreting test results if certain substances - such as sulfur compounds or halogens - are present in the oil, since these also react with KOH, thereby increasing the apparent Saponification number.

Saturation Level

The amount of water that can dissolve in a fluid.

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.)

Scoring

Distress marks on sliding metallic surfaces in the form of long, distinct scratches in the direction of motion. Scoring is an advanced stage of scuffing.

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.

Seal

A device designed to prevent the movement of fluid from one area to another, or to exclude contaminants.

Seal Assembly

A group of parts, or a unitized assembly, that includes sealing surfaces, provisions for initial loading, and a secondary sealing mechanism that accommodates the radial and axial movement necessary for installation and operation.

Seal Chamber

The area between the seal chamber bore and a shaft in which a mechanical seal is installed.

Seal Face

It is either of the two lapped surfaces in a mechanical seal assembly forming the primary seal.

Seal Face Width

The radial distance from the inside edge to the outside edge of the sealing face.

Seal Swell (rubber swell)

The swelling of rubber (or other elastomers) gaskets, or seals when exposed to petroleum, synthetic lubricants, or hydraulic fluids. Seal materials vary widely in their resistance to the effect of such fluids. Some seals are designed so that a moderate amount of swelling improves sealing action.

Sealed Motor Bearing

These bearings have rubbing seals that seal against recesses in the inner ring shoulder. They are lubricated for life. Under extreme conditions, their life can be short.

Semisolid

Any substance having the attributes of both a solid and a liquid. Similar to semiliquid but being more closely related to a solid than 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 the deformation.

Servovalve

A valve which modulates output as a function of an input command.

Settling Tank

A tank in which liquid is stored until particles suspended in the liquid sink to the bottom.

Severe Sliding

Large ferrous particles which are produced by sliding contacts. Trend is important to determine whether abnormal wear is taking place.

Shear Rate

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

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, the greater the shear stress as a function of rate of shear. In a non-Newtonian fluid

Silt

Contaminant particles 5 ¦m and less in size.

Silting

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

Single-pass Test

Filter performance tests in which contaminant which passes through a test filter is not allowed to recirculate back to the test filter.

Sintered Medium

A metallic or non-metallic filter medium processed to cause diffusion bonds at all contacting points.

Sleeve Bearing

A journal bearing, usually a full journal bearing.

Sloughing Off

The release of contaminant from the upstream side of a filter element to the upstream side of the filter enclosure.

Sludge

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

Solid

Any substance having a definite shape which it does not readily relinquish. More generally, any substance in which the force required to produce a deformation depends upon the magnitude of the deformation rather than upon the rate of deformation.

Solvency

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

Solvent

A material with a strong capability to dissolve a given substance. The most common petroleum solvents are mineral spirits, xylene, toluene, hexane, heptane, and naphthas. Aromatic-type solvents have the highest solvency for organic chemical materials, followed by naphthenes and paraffins. In most applications, the solvent disappears, usually by evaporation, after it has served its purpose. The evaporation rate of a solvent is very important in manufacture.

Solvent Extraction

A refining process used to separate components (unsaturated hydrocarbons) from lube distillates in order to improve the oil's oxidation stability, viscosity index, and response to additives. The oil and the solvent extraction media are mixed in an extraction tower, resulting in the formation of two phases: a heavy phase consisting of the undesirable unsaturates dissolved in the solvent. And a lighter phase consisting of a high quality oil with some solvent dissolved in it. The phases are separated and the solvent recovered from each by distillation.

Specific Gravity

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

Specific Gravity (liquid)

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 spectrographically for the presence of key elements.

Spindle Oil

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

Spin-on Filter

A throw-away type bowl and element assembly that mates with a permanently installed head.

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.

Spur Gear

This is the simplest variation of gear. It consists of a cylinder or disk, with the teeth projecting radially. Each tooth edge is straight and aligned parallel to the axis of rotation. Such gears can be meshed together correctly only if they are fitted to parallel axles.

SSU

Saybolt Universal Seconds (or SUS), a unit of measure used to indicate viscosity, e.g., SSU @ 100¦ F

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.

Static Seal

A seal between two surfaces which have no relative motion.

Stationary Seal

A mechanical seal in which the flexible members do not rotate with the shaft.

Statistical Process Control (SPC)

The use of control charts to track and eliminate variables in repetitive manufacturing processes, in order to ensure that the product is of consistent and predictable quality. If a chart reveals only chance variations that are inherent in the system, the process is said to be in a state of “statistical control’. If the chart reveals variations traceable to changes in equipment, procedures or workers, the process is said to be “ out of control”. Statistical process control differs from statistical quality control in that the former monitors manufacturing process parameters and the latter monitors product quality parameters.

Steam Turbine

A mechanical device that extracts thermal energy from pressurized steam. The energy is converted into a rotary motion that drives a device.

Stick-slip Motion

Erratic, noisy motion characteristic of some machine ways, due to the starting friction encountered by a machine part at each end of its back-and-form (reciprocating) movement. This undesirable effect can be overcome with a way lubricant, which reduces starting friction.

STLE

Society of Tribologist and Lubrication Engineers, formerly ASLE, American Society of Lubrication Engineers.

Stoke (St)

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

Straight Mineral Oil

Petroleum oil containing no additives. Straight mineral oils include such diverse products as low-cost once-through lubricants and thoroughly refined white oils. Most high-quality lubricants, however, contain additives.

Straight oil

A mineral oil containing no additives.

Strainer

A coarse filter element (pore size over approximately 40 ¦m)

Suction Filter

A pump intake-line filter in which the fluid is below atmospheric pressure.

Sulfated Ash

The ash content of fresh, compounded lubricating oil as determined by ASTM Method D 874. Indicates level of metallic additives in the oil.

Sulfonate

A hydrocarbon in which a hydrogen atom has been replaced with the highly polar (SO2OX) group, where X is a metallic ion or alkyl radical. Petroleum sulfonates are refinery by-products of the sulfuric acid treatment of white oils. Sulfonates have important applications as emulsifiers and chemical intermediates in petrochemical manufacture, and substituted sulfonates are widely used as corrosion inhibitors. Synthetic sulfonates can be manufactured from special feedstocks rather than from white oil base stocks.

Sulfur

A common natural constituent of petroleum products. While certain sulfur compounds are commonly used to improve the EP, or load-carrying, properties of an oil, high sulfur content in a

petroleum product may be undesirable as it can be corrosive and create an environmental hazard when burned. For these reasons, sulfur limitations are specified in the quality control of fuels, solvents, etc.

Sulfurized Oil

Oil to which sulfur or sulfur compounds have been added.

Superclean

10 particles >10 micron per milliliter

Surface Fatigue Wear

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

Surface Filter Media

Porous materials which primarily retain contaminants on the influent face, performing the actual process of filtration.

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.

Surge

A momentary rise of pressure in a circuit.

SUS (SSU)

Saybolt Universal Seconds. A measure of lubricating oil viscosity in the oil industry. The measuring apparatus is filled with specific quantity of oil or other Fluid and its flow time through standatized offrice is measured in Seconds. Fast flowing fluids (low viscosity) will have low value; Slow flowing fluids (high viscosity) will have high value.

Swarf

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

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

Oils produced by synthesis (chemical reaction) rather than by extraction or refinement. Many (but not all) synthetic oils offer immense advantages in terms of high temperature stability and low temperature fluidity, but are more costly than mineral oils. Major advantage of all synthetic oils is their chemical uniformity.

System Pressure

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

T

T

Temperature change, Fahrenheit

Tacky

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

TAN

(Total) acid number

TBN

(Total) base number

Thermal Conductivity

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

Thermal Stability

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

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.

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.

Thrust Bearing

An axial-load bearing.

Timken EP Test

Measure of the extreme-pressure properties of a lubricating oil. The test utilizes a Timken machine, which consists of a stationary block pushed upward, by means of a lever arm system, against the rotating outer race of a roller bearing, which is lubricated by the product under test. The test continues under increasing load (pressure) until a measurable wear scar is formed on the block.

Timken OK Load

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

Total Acid Number (TAN)

The quantity of base, expressed in milligrams of potassium hydroxide, that is required to neutralize all acidic constituents present in 1 gram of sample. (ASTM Designation D 974.) See Acid Number.

Total Base Number (TBN)

The quantity of acid, expressed in terms of the equivalent number of milligrams of potassium hydroxide that is required to neutralize all basic constituents present in 1 gram of sample. (ASTM Designation D 974.) See Base Number.

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.

Turbine Oil

A top-quality rust- and oxidation-inhibited (R&O) oil that meets the rigid requirements traditionally imposed on steam-turbine lubrication. Quality turbine oils are also distinguished by good demulsibility, a requisite of effective oil-water separation. Turbine oils are widely used in other exacting applications for which long service life and dependable lubrication are mandatory. Such compressors, hydraulic systems, gear drives, and other equipment. Turbine oils can also be used as heat transfer fluids in open systems, where oxidation stability is of primary importance.

Turbulent Flow

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

Turbulent Flow

Flow in which the velocity at any point varies on an erratic basic. It occurs when flow velocity exceeds a limiting value or when tube configuration irregularities preclude laminar flow.

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

Ultraclean

1 particle >10 micron per milliliter

Unbalanced Seal

A mechanical seal arrangement wherein the full hydraulic pressure of the seal chamber acts to close the seal faces.

Unloading

The release of contaminant that was initially captured by the filter medium.

V

Vacuum Dehydration

A method which involves drying or freeing of moisture through a vacuum process.

Vacuum Distillation

A distillation method which involved reducing the pressure above a liquid mixture to be distilled to less than its vapor pressure (usually less than atmospheric pressure). This causes evaporation of the most volatile liquid(s) - those with the lowest boiling points. This method works on the principle that boiling occurs when a liquid's vapor pressure exceeds the ambient pressure. It can be used with or without heating the solution.

Vacuum Pump

A device that is used to extract gas or vapor from an enclosed space, leaving behind a partial vacuum in the container.

Vacuum Separator

A separator that utilizes subatmospheric pressure to remove certain gases and liquids from another liquid because of their difference in vapor pressure.

Valve

A device which controls fluid flow direction, pressure, or flow rate.

Valve Lifter

Sometimes called a "cam follower," a component in engine designs that use a linkage system between a cam and the valve it operates. The lifter typically translates the rotational motion of the cam to a reciprocating linear motion in the linkage system.

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)

Measure of the pressure of vapor accumulated above a sample of gasoline or other volatile fuel in a standard bomb at 100¦F (37.8¦C). Used to predict the vapor locking tendencies of the fuel in a vehicle's fuel system. Controlled by law in some areas to limit air pollution from hydrocarbon evaporation while dispensing.

Variable Displacement Pump

A pump in which the displacement per cycle can be varied.

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, which is defined as the force in dynes required to move a surface one square centimeter in area past a parallel surface at a speed of one centimeter per second, with the surfaces separated by a fluid film one centimeter thick. In addition to kinematic viscosity, there are other methods for determining viscosity, including Saybolt Universal Viscosity (SUV), Saybolt Furol viscosity, Engier viscosity, and Redwood viscosity. Since viscosity varies in inversely with temperature, its value is meaningless until the temperature at which it is determined is reported.

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.

Viscosity-temperature Relationship

The manner in which the viscosity of a given fluid varies inversely with temperature. Because of the mathematical relationship that exists between these two variables, it is possible to predict graphically the viscosity of a petroleum fluid at any temperature within a limited range if the viscosities at two other temperatures are known. The charts used for this purpose are the ASTM Standard Viscosity-Temperature Charts for liquid Petroleum Products, available in 6 ranges. If two know viscosity-temperature points of a fluid are located on the chart and a straight line drawn through them, other viscosity-temperature values of the fluid will fall on this line; however, values near or below the cloud point of the oil may deviate from the straight-line relationship.

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

Water-Glycol Fluid

A fluid whose major constituents are water and one or more glycols or polyglycols.

Way

Longitudinal surface that guides the reciprocal movement of a machine part.

Way Lubricant

Lubricant for the sliding ways of machine tools such as planers, grinders, horizontal boring machines, shapers, jig borers, and milling machines. A good way lubricant is formulated with special frictional characteristics designed to overcome the stick-slip motion associated with slow-moving machine parts.

Wear

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

Wear Debris

Particles that are detached from machine surfaces as a result of wear and corrosion. Also known as wear particles.

Wear Inhibitor

An additive which protects the rubbing surfaces against wear, particularly from scuffing, if the hydrodynamic film is ruptured.

Weld Point

The lowest applied load in kilograms at which the rotating ball in the Four Ball EP test either seizes and welds to the three stationary balls, or at which extreme scoring of the three balls results

Wicking

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

Work Penetration

The penetration of a sample of lubricating grease immediately after it has been brought to 77F and then subjected to 60 stokes in a standard grease worker. This procedure and the standard grease worker are described in ASTM Method D 217.

Worm Gear

A gear that is in the form of a screw. The screw thread engages the teeth on a worm wheel. When rotated, the worm pulls or pushes the wheel, causing rotation.

Z

ZDDP

An antiwear additive found in many types of hydraulic and lubricating fluids. Zinc dialkyldithiophosphate.