

GLOSSARY OF PETROCHEMICAL TERMS

Acid Number: A measure of the amount of potassium hydroxide (KOH) needed to neutralize all or part of the acidity of a petroleum product. Also specified as neutralization number (NN) or value (NV) and total acid number (TAN)

Additive: A chemical substance which, when blended with a petroleum product, has the effect of improving one or more of its properties or performance characteristics.

Aliphatic Hydrocarbon: Hydrocarbons in which the carbon atoms are arranged in open chains which may be straight or branched.

Aniline Point: The minimum temperature for complete miscibility of equal volumes of aniline and the sample under test. Products with high aromatic or naphthenic contents have lower aniline points than products with high paraffinic content.

Anti-knock: Resistance of a gasoline (petrol) to detonation in a combustion chamber.

API Gravity: A special function of relative density represented by:

$$\text{API Gravity, degrees} = 141.5/\text{rel.density at } 15.6^{\circ}\text{C}$$

– 131.5

API Service Classification: A system of letter designations agreed by API, SAE and ASTM to define broad classes of engine service. Also used for service classification of automotive gear lubricants.

Aromatic: A hydrocarbon derived from, or characterized by, the presence of a benzene ring, or a polymeric (multiple) ring structure.

Ash: Non-combustible residue of lubricating oil or fuel; lubricating oil detergent additives containing metallic derivatives are a common source of ash (see also sulphated ash).

Bactericide: An additive to inhibit bacterial growth in aqueous component or phase of fluids, preventing bacterial degradation of the fluid and the resulting foul odours.

Base Number: The amount of acid required to neutralize all or part of a lubricant's basicity, expressed as potassium hydroxide (KOH) equivalents.

Bitumen: A non-crystalline solid or viscous mixture of complex hydrocarbons that possesses characteristic agglomerating properties, softens gradually when heated, is substantially soluble in trichloroethylene, and is obtained from crude petroleum by refining processes.

Blown Bitumen: A bitumen for uses other than road making prepared by blowing air through a base feed-stock under controlled conditions.

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

Carbon Residue: Standard tests which measure the amount of carbon left behind after combustion under controlled conditions. Two methods are available, the Conradson and the Ramsbottom Carbon Residue tests.

Centipoise: A centipoises (cP) is $1/100^{\text{th}}$ of a poise (P) which is the fundamental unit of dynamic viscosity in the CGS system of units. In the SI unit of systems, the fundamental unit of dynamic viscosity is the pascal second (Pas), where 1 Pas is equivalent to 10P.

Centistokes: The centistoke (cSt) is $1/100^{\text{th}}$ of a stoke (St) which is the fundamental unit of kinematic viscosity in the CGS system of units. In the SI system of units, the fundamental unit of kinematic viscosity is the millimeter squared per second (mm^2/s), which is equivalent to the centistokes.

Cetane Number: A measure of the ignition quality of a diesel fuel, expressed as a percentage of cetane that must be mixed with methyl naphthalene to produce the same ignition performance as the diesel fuel being rated.

Cleveland Open Cup (COC): A test for determining the open flash point and fire point of all petroleum products except fuel oil and products with open flash points below 79°C .

Cloud Point: The temperature at which a noticeable cloud of crystals or other solid materials appears when a sample is cooled under prescribed conditions.

Compounded Oil: A mineral oil to which has been added vegetable oil, animal oil or a similar chemical substance to impart special properties.

Co-gellant: A substance which acts in conjunction with a conventional soap to thicken a grease.

Complex Grease: A composition in which the thickener is a combination of a conventional metallic soap (salt of a metallic element and a fatty acid having a particular type of structure) and a complexing agent. The complexing agent may be either organic, and may or may not involve another metallic constituent.

Copper Strip Corrosion: A method of testing petroleum products for their corrosive effect on copper and its alloys. Also used as a method of indicating the amount of free or un-reacted sulphur in a product.

Crude Wax: Also called petroleum wax or slack wax, crude wax is an unrefined mixture of high melting hydrocarbons, of the normal straight chain type, still containing a fairly high percentage of oil.

Cutback Bitumen: A bitumen in which the viscosity has been reduced by the addition of volatile diluents such as white spirits or kerosene.

Demulsibility: The ability of an oil to separate from or shed water as determined by a standard test method. Demulsibility is an important consideration in lubricant maintenance in many circulating lubrication systems.

Detergency: The property of a lubricating oil to reduce or prevent deposits formed under high temperature conditions or as a result of the action on the oil of acidic contaminants.

Di-electric Strength: A measure of the insulating value of an electrical insulating medium. The value depends on the extent of the test method used.

Dispersant: An engine oil additive that helps prevent the formation of sludge, varnish and other engine deposits by keeping particles suspended in colloidal state (suspension of finely divided particles).

Distillate: The liquid obtained by condensing the vapour given off by a boiling liquid.

Dropping Point: The lowest temperature at which a grease is sufficiently fluid to drip as determined by a standard test method; hence an

indication of whether a grease will flow from a bearing at operating temperatures.

Emulsifier: An additive that promotes the formation of a stable mixture, or emulsion, of oil and water.

Emulsion: Intimate mixture of two or more materials which are immiscible or partially miscible with each other. In most emulsions one material is aqueous and the other is an oil.

Extreme Pressure Additive: A chemical compound imparting extreme pressure characteristics to a lubricant with the objective of reducing wear under conditions where rubbing or sliding accompanies high contact pressures, as in heavily loaded gears, particularly of the hypoid type.

Film Strength: The ability of a film of lubricant to resist rupture due to load, speed and temperature (also called lubricity).

Flash Point: The lowest temperature under closely specified conditions at which a combustible material will give off sufficient vapour to form a flammable mixture with air in a standardized vessel. Flash point tests are used to assess the volatility of petroleum products.

Floc Point: The temperature at which a flocculant collection of wax crystals first appear when a solution of Freon in oil is cooled under prescribed conditions.

Foaming: The occurrence of a frothy mixture of air and a petroleum product (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.

Four Ball Method: Either of two lubricant test procedures – the four ball wear method and the four ball extreme pressure method. The test methods evaluate the anti-wear properties of lubricants under different test conditions.

Gas Oil (Diesel): A distillate, intermediate in character between kerosene and the light lubricating oils. It is used as a heating oil and as a fuel in diesel engines.

Gasoline (Petrol): A light petroleum product with a boiling range between the approximate limits of 30°C and 200°C. Used as a fuel in spark ignition engines. It is also known as Mogas.

Graphite: A soft form of elemental carbon, grey to black in colour. It occurs naturally or is synthesized from coal or other carbon sources; widely used as a lubricant alone or added to conventional lubricants.

Grease: A lubricating oil thickened with a metallic soap or a specially treated clay to yield a lubricant in solid form. The action of the thickening agent may be likened to that of a sponge which holds the lubricating agent in its interstices.

Hydro-cracking: A refining process in which a heavy oil fraction or wax is treated with hydrogen over a catalyst under relatively high pressure and temperature to give products of lower molecular mass.

Hydro-desulphurisation: The removal of sulphur from sulphur containing hydrocarbon molecules in petroleum distillates and residues by the action of hydrogen under elevated temperature and pressure over a catalyst.

Hydro-finishing: Catalytic hydro-finishing has replaced the acid treating of LVI and MVI base oils to a large extent. Improved colour, oxidation and colour stability and a reduction in polycyclic aromatic content are achieved by the process which involves the contacting of hydrogen over a catalyst at elevated temperatures and pressure. Also applied to paraffin and micro-crystalline waxes.

Hydrotreating: This is a term for a process by which product streams may be purified and otherwise be brought up to marketing specifications as to odour, colour, stability, etc. Hydrotreating, for the removal of sulphur, is the major treating process in refineries. Cracked streams could be saturated and stabilized by converting olefins, albeit under more severe treating conditions. The process involves hydrogen under suitable temperature, pressure and a catalyst.

Hydrolytic Stability: The ability of additives and certain synthetic lubricants to resist chemical decomposition in the presence of water.

ISO Viscosity Grade: The ISO viscosity classification system, is an international system approved by the International Standards Organization, for classifying industrial lubricants according to viscosity. Each ISO viscosity grade number designation corresponds to the mid-point of a viscosity range expressed in mm^2/s at 40°C . This system is detailed in the ISO Specification 3448.

Knock: The noise associated with premature ignition of the fuel-air mixture in the combustion chamber; also known as detonation or pinking.

Kerosine: Any petroleum product with a boiling range between the approximate limits of 140°C and 270°C . which satisfies specific quality requirements.

Lead Naphthenate: The lead soap of naphthenic acid that is soluble in mineral oils, used mainly to impart extreme pressure properties to lubricating oils and greases.

Liquefied Petroleum Gas (LPG): Of the gaseous hydrocarbons, propanes and butanes can be liquefied under relatively low pressure and at ambient temperature. Mixtures of these are known as LPG.

Load Carrying Capacity: A qualitative term used to describe the ability of a lubricant to resist film rupture and protect against wear and surface destruction under conditions of high speeds, loads and temperatures, and combinations thereof.

Load Wear Index (formally called Mean Hertz Load): An index of the ability of a lubricant to prevent wear under applied loads as determined by the Four-Ball EP tester.

Metal Deactivator: An organic type of additive having the property of suppressing the catalytic action of metal and traces of metallic materials exposed to petroleum products. The most important catalytic action is the promotion of oxidation.

Molybdenum Disulphide: A chemical compound of molybdenum and sulphur which has excellent properties as a solid lubricant due to the molecular structure of the particles.

Motor Octane Number (MON): The octane number of a motor gasoline determined in a special laboratory test engine under high "engine

severity” conditions, giving a measure of the high-speed knock properties of the fuel.

Multigrade Oil: Engine oil that meets 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. Multigrade oils have 2 viscosity numbers indicating their low temperature and high temperature classification.

Multipurpose Grease: A lubricating grease suitable for a variety of applications such as chassis, wheel bearings, universal joints and water pumps on automotive equipment; usually lithium- based.

Naphthenic: Having the characteristics of naphthenes, saturated hydrocarbons whose molecules contain at least one closed ring of carbon atoms.

Octane Number: A term numerically indicating the relative anti-knock value of a gasoline. The octane number of a gasoline depends on its hydrocarbon composition, and is improved by the addition of anti-knock compounds.

Neutralization Value: An indication of the acidity of an oil; the number is the mass in milligrams of base expressed as potassium hydroxide (KOH) required to neutralize one gram of oil,

Oxidation Inhibitor: A substance added in small quantities to a petroleum product to increase its oxidation resistance, thereby lengthening its service or storage life; also called an anti-oxidant.

Oxidation Stability: The resistance of a petroleum product to oxidation, hence a measure of its potential service or storage life. The available tests all simulate service conditions on an accelerated basis.

Paraffinic: Having the characteristics of paraffins, ie saturated hydrocarbons of open chain structure.

Paraffin Wax: Hydrocarbons of solid consistency having a relatively pronounced crystalline structure, extracted from certain petroleum distillates. Refined paraffin wax has a very low oil content, is white in colour, with some degree of translucency, almost tasteless and odourless and slightly greasy to the touch.

Penetration: A measure of the hardness and consistency of bitumen and lubricating greases in terms of the distance in $1/10^{\text{th}}$ of a millimeter by

which a weighted special needle or cone will penetrate the sample in five seconds, the temperature, unless otherwise stated being 25°C.

Pensky-Martens Closed Cup (PMCC): The apparatus for determining the closed flash point of fuel oils, lubricating oils and other petroleum products.

Petrolatum: A semi-solid substance obtained from petroleum and consisting essentially of micro-crystalline waxes in specially refined oil. Also called petroleum jelly.

Pour Point Depressant: An additive which lowers the pour point of petroleum products by reducing the tendency of waxes present to coagulate into a solid mass.

Pour Point: The lowest temperature at which a liquid petroleum product will flow when it is cooled under the conditions of the standard test method.

Reid Vapour Pressure (RVP): Usually used in reference to gasoline, it is the vapour pressure of a sample at 37.8°C, determined by a prescribed method.

Research Octane Number (RON): The octane number of a motor gasoline determined in a special laboratory test engine under mild “engine-severity” conditions, giving a measure of the low-speed knock properties of a gasoline.

Residual Fuel: A fuel composed mainly of un-evaporated materials after the atmospheric distillation of crude oil.

Ring Sticking: The “freezing” of a piston ring in its groove, in a piston engine or reciprocating compressor, due to heavy deposits in the piston ring zone.

SAE Number: An arbitrary number indicating the viscosity range of crankcase, transmission, or rear axle lubricants, according to systems designed by the SAE (Society of Automotive Engineers).

Shear Stability: The ability of a lubricant such as a grease or VI improved oil to withstand mechanical shearing without being degraded in consistency or viscosity.

Smoke Point: The maximum height of flame measured in millimeters at which a kerosene will burn without smoking, when tested under specified conditions.

Soap: A general term for the salt of a metal and a fatty acid. The soaps of lithium, calcium, barium and aluminium are the principle thickeners used in grease making.

Softening Point: The temperature at which bitumen reaches an arbitrary degree of softness, usually determined by the ring and ball test method.

Solvent Dewaxing: A refining process by means of which wax is removed from lubricating base oil. The waxy oil is mixed with a solvent mixture (usually methyl-ethyl-ketone and toluene) and heated to ensure complete solution. The mixture is chilled and the precipitated wax removed by a rotary filter, before the solvents are striped from both oil and wax fractions and re-used.

Solvent Refining: A refining technique to improve the quality of base oils using selective extraction of undesirable components by means of a solvent, usually furfural.

Slack Wax: The waxy by-product removed in the solvent dewaxing process.

Sludge: The soft deposits, usually dark coloured, formed in lubrication systems, mainly consisting of oxidized lubricating oil components, water and in internal combustion engines, carbonaceous residues from fuel combustion.

Spindle Oil: A low viscosity oil intended for the lubrication of high speed spindles such as those used in textile mills.

Straight Mineral Oils: Oils which do not contain compounds or additives.

Sulphated Ash: The residue that remains after a sample of oil and sulphuric acid has been ashed to constant mass under prescribed conditions. It is used as a measure of the amount of metallo-organic additives present in new oils. In used oils, the determination may be affected by the presence of incombustible contaminants, dust and wear metals.

Sulphurised Oil: An oil in which elemental sulphur is either loosely combined with the oil, or is combined with a fatty oil and added to the

base oil. Used in applications where reactive sulphur is desired to provide extreme pressure characteristics, such as is gear oils and cutting oils.

Thermal Stability: The property of a fuel or lubricant which indicates its ability to resist cracking and decomposition on prolonged exposure to elevated temperatures.

Thickener: A solid matrix which is uniformly dispersed to form the structure of a lubricating grease in which the liquid fluid is held.

Timken OK Load: The maximum load a lubricant will withstand without failure due to breakdown of the lubricant film, as determined on the Timken EP Tester.

Total Base Number: The quantity of acid expressed in terms of the equivalent number of milligrams of potassium hydroxide (KOH) that is required to neutralize all basic constituents present in 1g of sample.

Vapour Pressure: The lowest pressure at which a liquid contained in a closed vessel at a given temperature, can remain in the liquid state without evaporation, ie the pressure exerted when the substance is in equilibrium with its own vapour. Vapour pressure is a function of the substance and of temperature.

Viscosity: In the common engineering sense, viscosity is the resistance to flow or “thickness” of a liquid. The viscosity of liquids decrease with an increase in temperature, hence the temperature at which a viscosity is measured must always be specified.

Some commonly used viscosity units include:

Centipoise (cP)

Derived unit of dynamic viscosity

where $1\text{cP} = 1\text{mPas}$

Centistoke (cSt)

Derived unit of kinematic viscosity

where $1\text{cSt} = 1\text{mm}^2/\text{s}$

Engler Degrees (°E)	Empirical unit popular in parts of Europe and normally measured at 50°C
Redwood Seconds	Historically used in the UK and measured at 70, 140 and 200°F
Saybold Universal Seconds (SUS)	Popular in the USA and measured at 100, 130 or 210°F
Kinematic (mm ² /s)	Sub-multiple of SI unit

Viscosity Index (VI): An arbitrary number, usually between 0 and 200, which is a measure of the temperature dependence of an oil's viscosity.

Low viscosity index (LVI) oils reduce viscosity rapidly as temperature increases. These oils have typical Vis in the range 0-30.

Medium viscosity index (MVI) oils reduce viscosity less than LVI oils as temperature increases and have typical Vis in the range 30-85.

High viscosity index (HVI) oils have VIs in the range 85-110 and have the best viscosity/temperature coefficients of conventional base oils. Modern refining techniques such as selective hydrocracking can produce base oils with natural Vis in excess of 140.

Viscosity Index Improver: A lubricant additive, usually a high molecular mass polymer, that reduces the tendency of an oil's viscosity to change with temperature.

White Oils: Oils produced by more drastic refining to remove nitrogen and sulphur, unsaturated compounds and aromatic material.

White Spirits: The functions intermediate between gasoline and kerosene with a boiling range of approximately 150°C - 200°C. Mainly used in paints and dry cleaning.

Worked Penetration: The penetration of a sample of lubricating grease immediately after it has been brought to 25°C and "worked" 60 strokes in the ASTM grease worker.

