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### Paraffin :

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 (see naphthene) oils, paraffinic lube oils have relatively high wax content and pour point, and generally have a high viscosity index (V.I.).

Paraffinic solvents are generally lower in solvency than naphthenic or aromatic solvents.

### Particulates :

Pollutants (e.g., smoke particles, metallic ash); in sufficient concentrations, particulates can be a respiratory irritant. Primary sources of man-made particulate emissions are industrial process losses (e.g., from cement plants) and stationary combustion sources. Motor vehicles contribute a relatively minor amount of particulates however Diesel Engines generate much more particulates in comparison to Gasoline fueled engines.

### PCMO :

Passenger Car Motor Oils (PCMOs) refer to engine oils for passenger cars, light-duty trucks, and similar vehicles.

### Penetration :

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

### Petrochemical :

Any chemical derived from crude oil, crude products, or natural gas.

A petrochemical is basically a compound of carbon and hydrogen, but may incorporate many other elements. Petrochemicals are used in the manufacture of numerous products such as synthetic rubber, synthetic fibers (such as nylon and polyester), plastics, fertilizers, paints, detergents, and pesticides.

### Petroleum :

From Latin Petra (Rock) and Oleum (Oil) therefore meaning "Rock Oil " the term is applied to crude oil and commonly used to describe products made from "Crude Oil".

### Piston Engine :

A reciprocating engine, also often known as a piston engine, is an engine that utilizes one or more pistons in order to convert pressure into a rotating motion.

The most common form of reciprocating engines use the burning of gasoline or diesel fuel to provide pressure. There may be one or more pistons. Each piston is located inside a cylinder, into which a fuel and air mixture is introduced, and then ignited. As the Air-Fuel mixture burns, the now hot gases expand, pushing the piston away. The linear movement of the piston is converted to a circular movement via a connecting rod and a crankshaft. These engines are known collectively as internal-combustion engines, although internal-combustion engines do not necessarily contain pistons.

### 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 known to be carcinogenic (cancer causing). PNA's are formed in fossil fuel combustion and other heat processes, such as catalytic cracking. They can also form when foods or other organic substances are charred. PNA's occur naturally in many foods, including leafy vegetables, grain cereals, fruits, and meats.

### 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.

### Polymer :

Product of polymerization (very large molecule). substance formed by the linkage (polymerization) of two or more simple, unsaturated molecules (see unsaturated hydrocarbon), called monomers, to form a single heavier molecule having the same elements in the same proportions as the original monomers; i.e. each monomer retains its structural identity. Polymer may be liquid or solid; solid polymers may consist of millions of repeated linked units. Polymer made from two or more dissimilar monomers is called a copolymer.

Copolymer composed of three different types of monomers is a terpolymer. Natural rubber and synthetic rubbers are examples of polymers.

### Polymerisation :

The combination, usually under controlled conditions of temperature and pressure in the presence of a catalyst, of two or more unsaturated organic molecules to form a more complex molecule. The products obtained are known as polymers. Typical polymers range from light liquids to rubber like materials. In petroleum refining, polymerization refers to the combination of light, gaseous hydrocarbons, usually olefins, into high-molecular-weight hydrocarbons that are used in manufacturing motor gasoline and aviation fuel. The product formed by combining two identical olefin molecules is called a dimer, and by three such molecules, a trimer.

### Polyol ester :

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 :

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

**Positive Crankcase Ventilation (PCV) :**

System for removing blow-by gases from the crankcase and returning them, through the carburetor intake manifold, to the combustion chamber, where the recirculated hydrocarbons are burned, thus reducing hydrocarbon emissions to the atmosphere. A PCV valve, operated by engine vacuum, controls the flow of gases from the crankcase. PCV systems have been standard equipment in all U.S. cars since 1963, replacing the simpler vent, or breather, that allowed crankcase vapors to be emitted to the atmosphere.

**Pour Point :**

The lowest temperature at which oil will pour or flow when it is chilled without disturbance under definite conditions (ASTM Method D 97). It gives an indication of the lowest operating temperature for which particular oil is suitable.

**Pour Point Depressant :**

A lubricating oil additive which lowers the pour point of an oil by reducing the tendency of the wax, suspended in the oil, to form crystals or a solid mass in the oil, thus preventing flow. Also called pour depressor or pour point depressor.

**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.

**Process oil :**

Oil not used for lubrication, but as a component of another material, or as a carrier of other products, such as additives.

**Process Stream :**

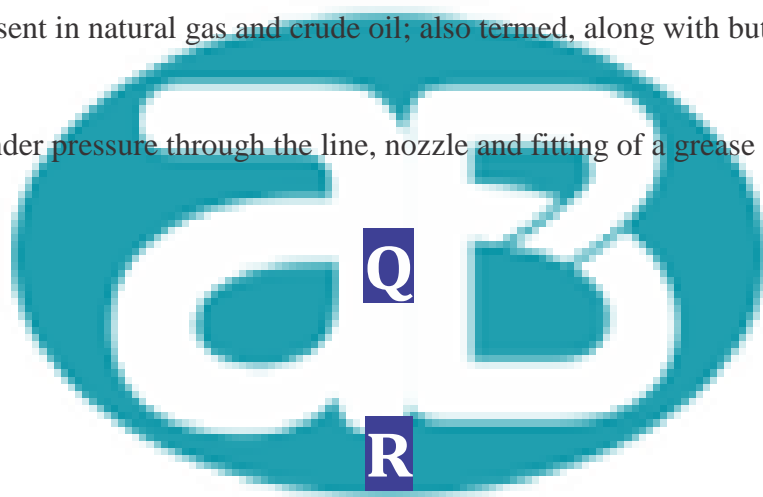
General term applied to a partially finished petroleum product moving from one refining stage to another; less commonly applied to a finished petroleum product.

**Propane :**

Gaseous paraffinic hydrocarbon (C<sub>3</sub>H<sub>8</sub>) present in natural gas and crude oil; also termed, along with butane, liquefied petroleum gas (LPG).

**Pumpability (lubricating grease) :**

The ability of a lubricating grease to flow under pressure through the line, nozzle and fitting of a grease dispensing system.

**Radical :**

atom or group of atoms with one or more unpaired electrons. A group of atoms functioning as a radical acts as a single atom, remaining intact during a chemical reaction.

**Rapeseed oil (blown rapeseed oil) :**

Fatty oil used for compounding petroleum oil.

**Redwood viscosity :**

Method for determining the viscosity of petroleum products; it is widely used in Europe, but has limited use in the U.S. The method is similar to Saybolt Universal viscosity; viscosity values are reported as "Redwood seconds."

**R&O :**

Rust & 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.

**Refining :**

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:

1. thermal cracking
2. catalytic cracking
3. polymerization
4. alkylation
5. reforming
6. hydrocracking
7. hydroforming
8. hydrogenation
9. hydrogen treating
10. Hydrofining
11. solvent extraction
12. dewaxing
13. de-oiling
14. acid treating

15. clay filtration

deasphalting Refined lube oils may be blended with other lube stocks, and additives may be incorporated, to impart special properties; refined naphthas may be blended with alkylates, cracked stock or reformates to improve octane number and other properties of gasolines.

**Resins :**

solid or semi-solid materials, light yellow to dark brown, composed of carbon, hydrogen, and oxygen. Resins occur naturally in plants, and are common in pines and firs, often appearing as globules on the bark. Synthetic resins, such as polystyrene, polyesters, and acrylics, are derived primarily from petroleum. Resins are widely used in the manufacture of inks, lacquers, varnishes, plastics, adhesives, and rubber.

**Rust Inhibitor :**

Type of corrosion inhibitor used in lubricants to protect the lubricated surfaces against rusting.

**Rust Preventive :**

Compound for coating metal surfaces with a film that protects against rust; commonly used for the preservation of equipment in storage. The base material of a rust preventive may be a petroleum oil, solvent, wax, or asphalt, to which a rust inhibitor is added. A formulation consisting largely of a solvent and additives is commonly called a thin-film rust preventive because of the thin coating that remains after evaporation of the solvent. Rust preventives are formulated for a variety of conditions of exposure, e.g., short-time "in-process" protection, indoor storage, exposed outdoor storage, etc.



**SAE :**

The Society of Automotive Engineers (SAE) is an engineering society founded to develop, collect, and disseminate knowledge of mobility technology.

**Saturated Hydrocarbon:**

Hydrocarbon with the basic formula  $C_nH_{2n+2}$ ; it is saturated with respect to hydrogen and cannot combine with the atoms of other elements without giving up hydrogen. Saturates are more chemically stable than unsaturated hydrocarbons.

**Saybolt Furol Viscosity :**

The efflux time in seconds required for 60 milliliters of a petroleum product to flow through the calibrated orifice of a Saybolt Furol viscometer, under carefully controlled temperature, as prescribed by test method ASTM D 88. The method differs from Saybolt Universal viscosity only in that the viscometer has a larger orifice to facilitate testing of very viscous oils, such as fuel oil (the word "Furol" is a contraction of "fuel and road oils").

The Saybolt Furol method has largely been supplanted by the kinematic viscosity method.

**Service Category :**

A Service Category is an alphanumeric code developed by API to specify a level of performance defined by ASTM D 4485 and SAE Standard J183. As new Service Categories are developed, new alphanumeric codes may be assigned.

**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 :**

Localized distress marks on sliding metallic surfaces, appearing as a matt-finished area rather than as individual score marks.

**Shear rate :**

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

**Sludge :**

In gasoline engines, a black emulsion of water, other combustion by-products, and oil formed primarily during low-temperature engine operation. Sludge is typically soft, but can polymerize to very hard substance. It plugs oil lines and screens, and accelerates wear of engine parts. Sludge deposits can be controlled with a dispersant additive that keeps the sludge constituents finely suspended in the oil.

**Sol :**

A colloidal dispersion in a liquid

**Solvent :**

Compound 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: rubber cements often require a fast-drying solvent, whereas rubber goods that must remain tacky during processing require a

slower-drying solvent. Solvents have a wide variety of industrial applications, including the manufacture of paints, inks, cleaning products, adhesives, and petrochemicals. Other types of solvents have important applications in refining.

**Solvent Extraction :**

Refining process used to separate reactive components (unsaturated hydrocarbons) from lube distillates in order to improve the oil's oxidation stability, viscosity index (V.I.), and response to additives. Commonly used extraction media (solvents) are: phenol, N-methylpyrrolidone (NMP), furfural, liquid sulfur dioxide, and nitrobenzene. The oil and solvent are mixed in an extraction tower, resulting in the formation of two liquid phases: a heavy phase consisting of the

undesirable unsaturates (see unsaturated hydrocarbon) dissolved in the solvent, and a light phase consisting of high quality oil with some solvent dissolved in it. The phases are separated and the solvent recovered from each by distillation. The unsaturates portion, or extract, while undesirable in lubricating oils, is useful in other applications, such as rubber extender oils (rubber oil) and plasticizer oils.

**Sour Crude :**

Crude oil containing appreciable quantities of hydrogen sulfide or other sulfur compounds, as contrasted to sweet crude.



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**Sulfonate :**

Hydrocarbon in which a hydrogen atom has been replaced with the highly polar (SO<sub>2</sub>OX) 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. Synthetic sulfonates can be manufactured from special feedstocks rather than from white oil basestocks.

**Sulfur :**

Common natural constituent of petroleum and petroleum products. While certain sulfur compounds are commonly used to improve the EP, or load- carrying, properties of an oil (see EP oil), high sulfur content in a petroleum product may be undesirable as it can be corrosive and create an environmental hazard when burned (see sulfur oxide). For these reasons, sulfur limitations are specified in the quality control of fuels, solvents, etc. Sulfur content can be determined by ASTM tests.

**Sulfur oxide :**

Major atmospheric pollutant, predominantly sulfur dioxide (SO<sub>2</sub>) with some sulfur trioxide (SO<sub>3</sub>), primarily emitted from stationary combustion sources (furnaces and boilers). Sulfur oxides are formed whenever fuels containing sulfur are burned. SO<sub>2</sub> is also present in the air from natural land and marine fermentation processes.

**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.

**Sweet Crude :**

Crude oil containing little or no sulfur.

**Synergism :**

- a) the simultaneous action of separate agencies which, together, have greater total effect than the sum of their individual effects.
- b) the combined or correlated action of different parts working together.
- c) In relation to lubricants the beneficial reaction between base oil and additive or between two or more additives.

**Synergy :**

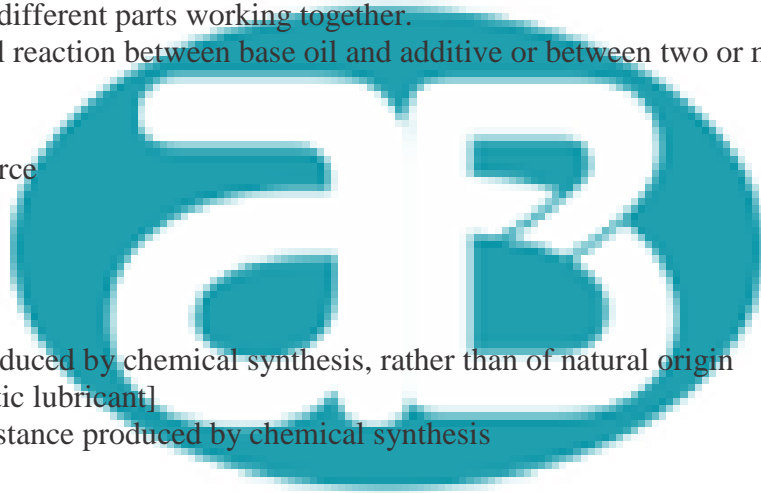
- a) combined or cooperative action or force
- b) synergism

**Synthetic :**

- a) of, involving, or using synthesis
- b) produced by synthesis; specially: produced by chemical synthesis, rather than of natural origin
- c) not real or genuine; artificial [synthetic lubricant]
- d) something synthetic; specially, a substance produced by chemical synthesis
- e) Man-made, not occuring in nature

**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 their chemical uniformity.



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