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(पहला पुनरीक्षण)

Lubrication — Glossary of Terms

(First Revision)

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FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Lubricating Equipment Sectional Committee had been approved by the Production and General Engineering Divisional Council.

This standard was first published in 1977. In this revision, new terms and definitions have been included and existing provisions have been updated.

Major changes in this revision involve introducing new terms such as air release time, automatic particle counter, civil enclosure for oil piping, flushing, oil cleanliness level, oil mist eliminator, oil purification unit, oil room, pipe-in-pipe, and strainer.

The composition of the Committee, responsible for the formulation of this standard is given in Annex A.

Indian Standard

LUBRICATION — GLOSSARY OF TERMS

(First Revision)

1 SCOPE

This standard defines the terms commonly used in lubrication practices.

2 TERMINOLOGY

2.1 General

2.1.1 *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 breaking down of the material (such as the tooth surfaces of gears). Lack of proper lubrication may result in abrasion.

2.1.2 *Acidity* — Milligrams of potassium hydroxide required to neutralize the acidity of 1 g of a petroleum product. The value obtained may be 'organic acidity', 'inorganic acidity', 'total acidity' or 'strong acid number' according to test conditions.

2.1.3 *Additive* — A suitable substance which when added to a petroleum product confers on it special properties or enhances its natural properties.

2.1.4 *Adhesion* — The property of a lubricant that causes it to cling or adhere to a solid surface.

2.1.5 *Adsorption* — The taking up of one substance at the surface of another.

2.1.6 *Air Release Time* — Air release time is the time taken by oil to release air entrained into oil during its presence in components of lube oil system. Air gets entrained in oil as it travels in piping, enters bearings, falls in return oil line etc. Entrained air can affect load bearing capacity of oil, hence its removal is necessary. The design of the oil tank is done in such a way that it provides sufficient dwell time for oil inside the oil tank for air release.

2.1.7 *Alkalinity* — The quantity of acid, expressed in terms of equivalent number of milligrams of potassium hydroxide that is required to neutralize the strong base constituents present in 1 g of the petroleum product.

2.1.8 *Aniline Point* — The lowest temperature at which equal volume of aniline and of the product under test are completely miscible, under specified conditions of test.

2.1.9 *API Gravity* — An arbitrary scale adopted by the American Petroleum Institute related to the specific gravity of oils as follows:

$$\text{API, degrees} = 141.5/(\text{sp gr } 60\ °F/60\ °F) - 131.5$$

2.1.10 *Asphaltic* — Essentially composed of or similar to asphalt. Frequently applied to lubricating oils derived from crudes which contain asphalt.

2.1.11 *Automatic Particle Counter* — Automatic particle counter is a machine used to measure the size and quantity of particles in a specified volume of oil. A particle counter is used at sites during oil flushing to check the degree of contamination of oil.

2.1.12 *Bitumen* — A viscous liquid or a solid consisting essentially of hydrocarbons and their derivatives, which is soluble in carbon disulphide; it is substantially non-volatile and softens gradually when heated. It is black or brown and possesses waterproofing and adhesive properties. It is obtained by refinery process from petroleum and is also found as a natural deposit or as a component of naturally occurring asphalt, in which it is associated with mineral matter.

2.1.13 *Bleeding* — The tendency of a liquid component to separate from a liquid, solid or semi-solid mixture, for example, oil from lubricating grease in storage.

2.1.14 *Blocking Point* — Temperature, pressure, or any physical condition at which liquid becomes a solid or a semi-solid mixture.

2.1.15 *Bomb* — In lubrication terminology, a closed container used for conducting tests under elevated pressure.

2.1.16 *Bromine Number* — The weight, in grams, of bromine, which will combine under prescribed conditions with 100 g of the petroleum product under test. It is used as an indication of the degree of unsaturation.

2.1.17 *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 small bore (capillary) tube.

2.1.18 *Carbon Residue* — Residue formed during pyrolysis of an oil carried out according to standard method of test.

2.1.19 *Chemical Stability* — The tendency of a substance or mixture to resist chemical change.

2.1.20 *Civil Enclosure for Oil Piping* — Civil enclosure for oil piping, also known as oil canal, is given in steam turbine power plant. In a steam turbine power plant, the turbine-generator train, to which lube oil is supplied, may extend upto 30 m to 40 m. Lube oil supply header pipe, return oil header pipe and lifting oil header pipe are also approx 30 m to 40 m long. Hence, oil canal is provided as an enclosure to this piping so as to contain oil in case of leakage. Another way to prevent oil spillage in event of leakage is pipe-in-pipe concept.

2.1.21 *Cloud Point* — The temperature at which a cloud or haze begins to appear when an oil, which has been previously dried, is cooled under prescribed conditions. Such cloud or haze is usually due to the separation of paraffin wax.

2.1.22 *Congealing Point* — Solidification point of a liquid by cooling or freezing.

2.1.23 *Consistency* — The degree to which a semi-solid material such as grease, resists deformation (*see* 2.1.57).

2.1.24 *Deleterious Particles* — Harmful destructive particles.

2.1.25 *Detergent* — In lubrication, either an additive or a compounded lubricant has 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.

2.1.26 *Dispersant* — In lubrication, a term usually used interchangeably with detergent.

2.1.27 *Drop Point* (*of Grease*) — The temperature at which grease passes from a semi-solid to a liquid state under specified test conditions.

2.1.28 *Emulsion* — A mechanical mixture of a petroleum product with water.

2.1.28.1 *Demulsibility* — The ability of an emulsion of a petroleum product with water to separate into its two constituents under prescribed conditions.

2.1.28.2 *Emulsibility* — The ability of a petroleum product to form an emulsion with water.

2.1.28.3 *Emulsion stability* — The property of an emulsion to stay in emulsified form without separating into constituents mixtures.

2.1.29 *Evaporation Loss* — The loss of liquid due to vaporization from its surface.

2.1.30 *Extreme Pressure Properties* — The higher load carting capacity of lubricants due to the incorporation of EP additives.

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

Filter is a device used to clean the oil by removing fine particles as the oil flows through it. A major difference between a filter and a strainer is the size of the particles they both remove. Filters are usually used to separate finer particles (typically of size < 40 microns as a thumb-rule) and strainers remove coarse particles (size > 40 micros as a thumb-rule). Also, during choking, there is an appreciable pressure drop across a filter. But across a strainer, there is no appreciable pressure drop. In a lubrication circuit, a filter is installed as close as possible to the circuit element being protected (for example bearings).

Filter differs from oil purification units because filters are installed in the main oil circuit line, whereas oil purification units are generally not used in the main oil circuit line. Oil purification units are separately connected to the oil tank (separate from the main oil circuit line).

2.1.32 *Fire Point* — The lowest temperature at which a petroleum product takes fire and burns continuously when a small flame is applied to its surface under prescribed conditions.

2.1.33 *Flash Point* — The lowest temperature at which the vapours emitted by a product ignite momentarily in the presence of a flame when operating according to a specified test method.

2.1.34 *Fluidity* — The inverse of viscosity; flowability.

2.1.35 *Flushing* — Flushing is a process or a combination of processes to ensure operational readiness of the lube oil system by cleaning of oil tank, piping etc through use of pumps, filters, oil purifiers etc.

2.1.36 *Foaming* — The property of a lubricant to form foam when air is blown through lubricant at a specified temperature.

2.1.37 *Freezing Point* — The temperature at which a liquid solidifies under normal atmospheric

pressure. This term should not be used for 'cold test temperature'.

2.1.38 *Fretting* — Wear phenomenon taking place between two surfaces having relative oscillatory motion of small amplitude

2.1.39 *Fretting Corrosion* — Corrosion that results from fretting. Sometimes also called friction oxidation.

2.1.40 *Functional Life* — The effective life in service without breakdown or deterioration in performance.

2.1.41 *Galling* — A form of wear in which seizing or tearing of the gear or bearing surface occurs

2.1.42 *Gum* — A rubber-like, sticky deposit, black or dark brown, resulting from the oxidation of lubricating oils or from unstable constituents in gasoline which deposit during storage or use.

2.1.43 *Hydrometer* — A graduated instrument with an internal float for determining the specific gravity of petroleum and other liquids. The instruments used in measuring the gravity of petroleum oils usually read API degrees or specific gravity directly.

2.1.44 *Hydrolytic Stability* — The property of a fluid to resist chemical reaction with water. It identifies effects on lubricants through changes in colour, viscosity, appearance and amount of insoluble sludge formed in the oil after the oil has been subjected to certain specific conditions.

2.1.45 *Inhibitor* — A substance naturally occurring or added (*see* **2.1.3**), whose presence in small amounts in a petroleum product prevents or retards the occurrence of certain phenomena considered undesirable.

2.1.46 *Insoluble* — Incapable of being dissolved.

2.1.47 *Interfacial Tension* — The force measured in dynes per centimetre with which the interface between two non-miscible liquids, such as oil and water, resists enlargement of its area.

2.1.48 *Kinetic* (*Dynamic*) *Friction* — The friction between two surfaces in relative motion., sometimes called sliding friction or the friction of motion.

2.1.49 *Leakage Characteristics* — The tendency of grease to leak from the point of application thus creating insufficient lubrication at the point of application.

2.1.50 *Load Carrying Capacity* — The maximum load which a lubricant will carry without causing insufficient lubrication.

2.1.51 *Low-Temperature Torque* — Torque produced at the starting friction in bearing, also called as 'starting friction torque'.

2.1.52 *Lubricant* — Any substance interposed between two surfaces in relative motion to reduce friction and/or wear between them.

2.1.53 *Lubricant Carrier* — A coating with phosphate or slaked lime base used to increase the quantity of lubricant available on an area under load in the working of metals.

2.1.54 *Lubricity* (*Oiliness*) — The property of a lubricant of forming a very adherent film on the surface to be lubricated, thus preventing direct contact between them, and enabling them to slide over one another more easily.

2.1.55 *Neutralization Number* — A term still used in the petroleum industry but rapidly becoming obsolete in the lubrication field (*see* **2.1.2** and **2.1.7**).

2.1.56 *Oiler* — A device for taking the lubricant to the bearing surface; it can be manual, semi-automatic or automatic.

2.1.57 *Oil Cleanliness Level* — Oil cleanliness level is the degree of cleanliness/purity of oil in a system. Several systems require a designated oil cleanliness for proper working of pumps, bearings etc. Not maintaining this cleanliness shall adversely affect the system. Many standards are available in the industry to codify the oil cleanliness level.

2.1.58 *Oil Mist or Fog* — An oil atomized with the aid of compressed air and then conveyed by the air in a low-pressure distribution system to multiple points of lubricant application.

2.1.59 *Oil Mist Eliminator* — Oil mist eliminator or oil vapor exhauster is a machine used to remove oil vapors from oil tank, return oil pipe, bearing pedestals etc. Of lube oil system. Oil has tendency to release vapors even at room temperature. This tendency is more at higher temperatures. If oil vapors are not removed then they may be a cause of fire during motor startup. Hence, whenever lube oil system is put into operation, before starting any other pump the oil mist eliminator is started to suck out oil vapors. Since the motor of oil mist eliminator is the first one to start, it is flame proof to avoid fire. It consists of a fan which creates vacuum and pulls out oil vapour. Oil vapor then passes through a coalescence type oil separator which traps oil and releases oil free air to atmosphere.

2.1.60 *Oil Purification Unit* — Oil purification unit is used to remove particles and moisture from oil through various techniques like centrifugal action, dehydration, coalescence etc. These are used to keep the oil cleanliness level in the oil circuit up to the desired level. They are generally part of the oil circuit which is separate from the main oil circuit (*see* **2.1.31**).

2.1.61 *Oil Ring* — A ring which resting on a shaft, dips into an oil tank through its lower portion, and, when driven by the rotation of the shaft, carries oil to the bearings. Brushes are often installed to direct the oil to the bearing.

2.1.62 *Oil Room* — Oil room is a civil enclosure in which lubrication oil equipment, including oil tank, are contained. this is to ensure that oil is contained within this oil room in the event of leakage. For recommendations on the containment of oil.

2.1.63 *Oil Separation — see* **2.1.13**.

2.1.64 *Oxidation* — A chemical action between oxygen and oil-producing reaction products, acid and sludge.

2.1.64.1 *Oxidation rate* — The rate of oxygen absorption by a lubricant.

2.1.64.2 *Oxidation stability* — Property of lubricating oil to resist oxidation.

2.1.65 *Penetration* — A measure of the consistency of bitumen and lubricating grease. In the case of bitumen, it is the depth to which a standard needle and in the case of grease a standard cone penetrates the sample under prescribed conditions.

2.1.65.1 *Block penetration* — The penetration at 25.0 °C ± 0.5 °C of a sample of lubricating grease which is sufficiently hard to hold its shape.

2.1.65.2 *Penetrometer* — An instrument for measuring the penetration of semi-solid substances,

2.1.65.3 *Prolonged worked penetration* — Penetration of a sample of lubricating grease after being worked more than 60 double strokes. The sample initially at a temperature of 15 °C to 30 °C is subjected to a prescribed number of strokes in a standard grease worker, brought to 25.0 °C ± 0.5 °C in one hour and 30 min, worked an additional 60 double strokes and penetrated.

2.1.65.4 *Undisturbed penetration* — Penetration at 25.0 °C ± 0.5 °C of a sample of lubricating grease in its container as originally received with no disturbance.

2.1.65.5 *Unworked penetration* — The penetration at 25.0 °C ± 0.5 °C of a sample of lubricating grease which has received only the minimum disturbance in transfer from the sample can to a grease worker cup or dimensionally equivalent container.

2.1.65.6 *Worked penetration* — The penetration of a sample of lubricating grease immediately after it has been brought to 25.0 °C ± 0.5 °C and then subjected to 60 double strokes in a standard grease worker.

2.1.66 *Petroleum* — Mineral oil, normally a liquid mixture consisting essentially of many different hydrocarbons, occurring naturally, and having a wide range of colours from yellow to black and a characteristic odour. It is the raw material from which gasoline, kerosene, lubricating oil, fuel oil, paraffin wax, bitumen and other products are obtained. In modern technical usage, the term includes gaseous, solid as well as liquid hydrocarbons.

2.1.67 *pH Value* — Term used to express the degree of acidity or alkalinity of aqueous solutions; it denotes the negative logarithm of the concentration of the hydrogen ion in gram atoms per litre. Values of p^H run from 0-14, 7 indicating neutrality, numbers less than 7 representing increasing acidity, and numbers greater than 7 increasing alkalinity. Thus, a *p*H of 6 means a concentration of 10^{-6} or 0.000 001, indicating a slight acidity.

2.1.68 *Pipe-in-Pipe* — Pipe-in-pipe is a concept in which oil spillage in the event of leakage is prevented by erecting lube oil supply pipes fully enclosed inside an outer pipe all along its length from oil tank to bearings. The outer pipe is usually a return pipe, in which oil returns to the tank.

2.1.69 *Poise* — The standard unit of absolute viscosity in the cgs system. Expressed in dyne sec/cm^2.

2.1.70 *Polar Molecule* — In a lubricant, this is a molecule with an acid radical at one end which reacts with the bearing metal and attaches the molecule firmly to it. Polar molecular oil films are extremely difficult to remove.

2.1.71 *Polymerization* — The combination, usually under controlled conditions of temperature and pressure in the presence of catalysts, of identical molecules to form more complex molecules. Such combination of molecules of similar type but different structure is called co-polymerization. The

products obtained by the two processes are known as polymers and co-polymers respectively. Typical polymers range from light liquids to rubber-like materials.

2.1.72 *Pour Point* —Lowest temperature at which an oil will continue to flow when it is cooled under standard conditions of tests.

2.1.73 *Precipitation Number* — Millilitres of precipitate formed when 10 ml of a lubricating oil is mixed with 90 ml of ASTM precipitation naphtha and centrifuged under prescribed conditions.

2.1.74 *Reyn* — The standard unit of absolute viscosity in the English system expressed in lb sec/in.

2.1.75 *Roll Stability* — A measure of mechanical stability of grease in terms of charges in the consistency of the grease when worked under specified conditions of test.

2.1.76 *Rust Prevention Test* (*Turbine Oils*) — A test to measure the effectiveness of an oil in preventing the rusting of ferrous parts in the presence of water.

2.1.77 *Saponification* — A process in which a fat (or other compound of an acid with an alcohol) reacts with an alkali to form a soap and glycerine or other alcohol.

2.1.77.1 *Saponification number* — Milligrams of potassium hydroxide consumed in neutralizing and saponifying 1 g of the material according to a standard.

2.1.78 *Sediment* — A deposit or residue which separates from a liquid and settles.

2.1.79 *Sludge* — Agglomerate of solid and liquid materials with a tendency to be deposited.

2.1.80 *Smoke Point* — Maximum flame height (millimetres) at which kerosene will burn in a lamp under prescribed conditions without producing smoke.

2.1.81 *Softening Point* — The temperature at which a substance attains a particular degree of softness under prescribed conditions of test.

2.1.82 *Sonic Shear Stability* — The ability of lubricant to stay effectively viscous underload fluctuations in high-speed machinery.

2.1.83 *Stoke* —The standard unit of kinematic viscosity in the cgs system expressed in cm^3/s.

2.1.84 *Strainer* — **A** Strainer is a device used to clean the oil by removing coarse particles as the oil flows through it. (*see* **2.1.31**).

2.1.85 *Surface Tension* — The force (dynes per centimetre) with which the surface of a liquid resists enlargement of its area. This surface is usually the interface between the liquid and its vapour or air.

2.1.86 *Sulphated Ash* — The ash that remains after the sample has been carbonized and the residue subsequently treated with sulphuric acid and heated to constant mass.

2.1.87 *Tacky* — A descriptive term applied to greases and oils that are particularly sticky or adhesive to metal surfaces.

2.1.88 *Thermal Shock Sensitivity* — Response to a sudden fluctuation in temperature or impulse of thermal energy.

2.1.89 *Thermal Stability* — The ability of grease to resist changes in appearance, consistency and oil separation when heated under specified conditions of the test.

2.1.90 *Thixotropy* — That property of a lubricating grease which is manifested by a decrease in consistency or softening because of shearing followed by an increase in consistency or hardening beginning after the shearing is stopped. This term is used in lubricating grease and other similar materials.

2.1.91 *Unsulphated Residue* — That portion of an oil which is not acted upon when agitated with a definite amount of sulphuric acid under specified conditions.

2.1.92 *Viscosity* — Property of a fluid characterized by the resistance which it offers when it is flowing, to the relative movement to molecules (*see* **2.1.92.1** and **2.1.92.2**).

2.1.92.1 *Absolute dynamic viscosity* — The force in dynes which a stationary flat plate with a surface area of 1 cm^2 exerts on a similar parallel plate 1 cm away and moving in its plane with a velocity of 1 cm/s, the space between the plates being filled with the fluid in question. It is a measure of the resistance that the fluid offers to shear. This resistance can be felt in slow stirring and observed during flow through a capillary tube. When the force is 1 dyne, the absolute dynamic viscosity of the fluid is unity or 1 poise. For practical purposes, a smaller unit, the centipoise, which equals one-hundredth of a poise, is found more convenient.

2.1.92.2 *Absolute kinematic viscosity* — The value obtained when the absolute dynamic viscosity

is divided by the density (expressed in grams per millilitre) of the fluid at the temperature concerned.

The unit of absolute kinematic viscosity is a stoke (corresponding to the poise for absolute dynamic viscosity), but for practical purposes, a smaller unit, the centistoke, which equals one-hundredth of a stoke, is found more convenient.

2.1.92.3 *Apparent viscosity* — A term used in referring to the resistance to flow of fluids the viscosity of which varies with the rate of shear. It can be evaluated in a capillary-type instrument where it is defined as the shear stress at the capillary wall divided by the mean rate of shear as computed from the poiseuille equation. It is expressed in fundamental viscosity units at a given rate of shear.

2.1.92.4 *Pressure viscometer* (*or viscosimeter*) — As applied to grease, a capillary-type instrument is used for determining apparent viscosity.

2.1.92.5 *SAE numbers* — SAE oil viscosity classification — Numbers applied to the crankcase, transmission and driving axle lubricants to indicate their viscosity range.

2.1.92.6 *Saybolt universal viscosity* (*SW*) *or Say bolt universal seconds* (*SUS*) —The time in seconds required for 60 cm^3 of a fluid to flow through the orifice of the standard say bolt/universal viscometer at a given temperature under specified conditions.

2.1.92.7 *Saybolt furol viscosity* — The time in seconds required for 60 cm^3 of a fluid to flow through the orifice of a saybolt furol viscometer at a given temperature under specified conditions. The orifice of the furol viscometer is larger than that of the universal viscometer and is used for more viscous fluids.

2.1.92.8 *Viscometer or viscosimeter* — An apparatus for determining the viscosity of a fluid.

2.1.92.9 *Viscosity index* — Number used conventionally to characterize the variation 0; the viscosity of an oil with temperature. A low viscosity index Indicates a relatively large change of viscosity with temperature and vice versa.

2.1.93 *Water Washout Stability* — The property of lubricating greases to stay in position, for example, in a bearing, in the presence of a jet or flood of water.

2.1.94 *Wear Resistance* — Resistance to unwanted removal of material by various causes such as abrasion, corrosion, adhesion, and friction.

2.1.95 *Wiping* — In wear, the smearing or removal of material from one point, often followed by the redisposition of the material at another point, on the surfaces of two bodies in sliding contact.

2.2 Types of Lubrication

2.2.1 *Aerosol Lubrication* — Lubrication with an oil atomized into very minute particles with the aid of compressed air and conveyed by compressed air in pipes at very low pressures to the points of application where the oil mist is discharged through a special restrictor of small orifice, at high velocity making the lubricant to wet the rubbing surfaces, such as bearings, slides, etc. This has low flows and low pressures of compressed air but high concentration of oil mist in air.

2.2.2 *Aerostatic Lubrication* — A system of lubrication in which a gaseous lubricant is introduced under a sufficiently high external pressure to separate the rubbing surfaces by a gaseous film.

2.2.3 *Bath Lubrication* — Lubrication of surfaces by partial or total immersion in a bath of the lubricant.

2.2.4 *Boundary Lubrication* — A system of lubrication in which the friction and wear between two surfaces in relative movement are determined by the properties of the surfaces and by the properties other than the viscosity of the lubricant.

NOTE — Several conditions which were previously attributed to boundary lubrication may be elasto-hydrodynamic.

2.2.5 *Circulating Lubrication* — A system of lubrication in which the lubricant after passing through the gears, bearings, etc, is put again in circulation by a pump.

2.2.6 *Contact Lubrication* — A term which is used for lubrication conditions achieved with solid lubricant powders that are rubbed against the surface.

2.2.7 *Drip-feed Lubrication* — A system of lubrication which distributes the lubricant to the bearing surfaces in the form of drops at regular intervals.

2.2.8 *Elasto-Hydrodynamic Lubrication* — A type of lubrication in which the friction and film thickness between two bodies in the relative movement is determined by the combination of the elastic properties of these bodies and the viscous properties of the lubricant, under the existing conditions of temperature, pressure and velocity gradient.

2.2.9 *Extreme-Pressure Lubrication* — A type of lubrication in which the friction and wear between two surfaces in relative movement depends upon the reaction of the lubricant with a rubbing surface at high temperatures.

2.2.10 *Flood Lubrication* — Lubrication system in which the lubricant is brought in abundance under low pressure to flow out afterwards.

NOTE — This term is also used to denote bath lubrication.

2.2.11 *Force Feed Lubrication* (*Pressure Lubrication*) — A system of lubrication in which the lubricant is distributed to the bearing under pressure.

2.2.12 *Gas Lubrication* — A system of lubrication in which the form and relative movement of the sliding surfaces causes the formation of a gaseous film under a pressure sufficient to separate the surfaces.

2.2.13 *Hydrodynamic Lubrication* — A type of lubrication in which the form and relative movement of the sliding surfaces cause the formation of a liquid film with sufficient pressure to separate the surfaces.

2.2.14 *Hydrostatic Lubrication* — A type of lubrication in which the lubricant is distributed under a sufficiently high external pressure to separate the opposite surfaces by a fluid film.

2.2.15 *Melt Lubrication* — Lubrication using a solid lubricant maintained in the state of a molten substance.

2.2.16 *Mist Lubrication* — Lubrication with an oil, atomized with the aid of compressed air, which acts as a conveyor of lubricant and also as a power-source for air-operated devices such as tools, cylinders, valves, etc. This has high flows and high pressure of compressed air but a low concentration of oil fog in air.

2.2.17 *Oil Fog Lubrication — see* **2.2.16**

2.2.18 *Oil Mist Lubrication — see* **2.2.1**

2.2.19 *Oil-Ring Lubrication* — A system of lubrication for horizontal shafts. A ring of large diameter rotates with the shaft and carries the oil in reserve.

2.2.20 *Pad Lubrication* — A system of lubrication in which the lubricant is brought to the bearing area by a pad of felt or similar material.

2.2.21 *Partial Hydrodynamic Lubrication* — A vague term for a type of lubrication, especially in metalworking, in which lubrication by a thin film is predominant.

2.2.22 *Plasto-Hydrodynamic Lubrication* — A lubrication condition in which the friction and the film thickness between two bodies in relative movement are determined by a combination of plastic deformation of the bodies and the viscous properties of the lubricant under existing conditions of pressure, temperature and velocity gradient. As opposed to elasto-hydrodynamic lubrication.

2.2.23 *Rheodynamic Fabrication* — A system of lubrication in which the rheological properties (new Newtonian) of the lubricant are predominant.

NOTE — This term is especially applicable to lubrication with plastic lubricants.

2.2.24 *Solid-film Lubrication* — Lubrication by application of solid lubricants.

2.2.25 *Splash Lubrication* — A system of lubrication in which the lubricant is splashed against the parts in motion.

2.2.26 *Thick Film Lubrication* — Lubrication condition in which the thickness of the lubricant film is clearly larger than that required to cover the surface asperities when the working load is applied so that the effect of the surface asperities is not appreciable.

2.3 Lubricating Oils and Greases

2.3.1 *Apiezon Oil* — Oil with very low vapour tension used in vacuum technology.

2.3.2 *AT Fluid* — Oil suitable to be used in automatic transmission of automobiles

2.3.3 *Block Grease, Brick Grease* — A grease of high melting point which, under normal temperatures, can be handled in block or stick form. It is used for journal bearings, and melts slowly under high temperature.

2.3.4 *Blown Oil* —Vegetable or animal oil oxidized by heating and blowing with air, particularly to increase its viscosity. It is used as an additive in compounded oil.

2.3.5 *Bone Oil* — Fatty oil obtained by dry distillation of bones.

2.3.6 *Bounded Solid Lubricant* — Solid lubricant dispersed in the continuous mass of a binder or fixed to the surface by means of an adhesive product.

2.3.7 *Bright Stock* — Lubricating oil of high viscosity prepared from a cylinder stock by further refining processes, such as solvent extraction, dewaxing, treatment with acid or acid clay, or some combination of these. They are used for compounding motor oils.

2.3.8 *Bubbly Oil* — Oil containing gas bubbles.

NOTES

1 A distinction has to be made between these bubbles dispersed in the oil and foam with superficial bubbles.

2 Anti-foaming agents do not prevent the formation of air bubbles within the liquid.

2.3.9 *Calendar Grease* — Grease with high drop point used in calendar bearings.

2.3.10 *Castor Oil* — Fatty oil obtained from castor seeds.

2.3.11 *Chlorinated Lubricant* — A lubricant containing a chlorine compound which reacts with a rubbing surface at high temperatures to protect it against any damage due to sliding.

2.3.12 *Coastal Oil* — Naphthene type mineral oil obtained from refining of gulf coast or pacific coast crude oil.

2.3.13 *Compounded Oil* — Mineral oil containing animal or vegetable oil or other additives.

2.3.14 *Crankcase Oil* —Lubricating oil used in the crankcase of an internal combustion engine.

2.3.15 *Cutting Fluid* — Fluid is used in machining operations mainly for lubricating and cooling the cutting tool, and also for flushing swarf from the work.

2.3.16 *Cut-back Oil* — Heavy oil mixed with more fluid oils to obtain the desired viscosity.

2.3.17 *Cylinder Stock* — Dark-coloured lubricating oil of high viscosity usually obtained as a residue of distillation and used as the basis of steam cylinder oil.

2.3.18 *Detergent Oil* — Lubricating oil, particularly used in internal combustion engines, has the property of maintaining suspension products of deterioration which may be formed during use. This Property results from the presence of suitable additives.

2.3.19 *Drawing Lubricant* — Lubricant used for wire or sheet drawing.

2.3.20 *Dry Lubricant* — Any solid compound used in the form of powder or thin film which is applied to a surface to protect it against any damage during the relative movement and to reduce friction and wear.

NOTES

1 Numerous dry lubricants have a laminar structure, for example, graphite and molybdenum disulphide.

2 Certain solid materials lubricate only in the molten state at the interface, for example, glass and ice; these are not solid lubricants.

2.3.21 *Extender Oil* — Oil which is added to the basic composition to modify the physical properties of the composition; a dilatant oil.

2.3.22 *Extreme Pressure Lubricant* — Lubricating oil or grease containing additives to increase its film strength.

2.3.23 *Fatty Oil* — A grease (glycerol ester) liquid at room temperature.

2.3.24 *Fibre Grease* — Type of grease with a marked fibrous structure.

2.3.25 *Fixed Oil* — A vague term to characterize an oil which is difficult to distil without decomposition

2.3.26 *Graphited Grease* — A moderately soft grease containing a suspension of graphite particles suitable for such applications as leaf spring s, mechanical brake cables, speedometer cables and mechanical fuel pumps.

2.3.27 *Gear Oil* — Oil suitable for the lubrication of gear.

2.3.28 *Grease* — A solid to semi-liquid product of or dispersion of a thickening agent in a liquid lubricant usually mineral oil; but can be of any type of recognized lubricant, such as a synthetic oil or fatty oil with or without fillers and additives.

2.3.29 *Hair Grease* — Grease containing hair or wool fibre.

2.3.30 *Heavy Duty* (*HD*) *Oil* — Lubricating oil for use in certain types of high-speed diesel engines and spark-ignition engines subject to high piston and crankcase temperatures. It normally contains special additives to increase detergency and resistance to oxidation and to minimize corrosive action.

2.3.31 *Hydraulic Oil* — Oil used for transmitting power in a hydraulic system. It may be of petroleum or other origin.

2.3.32 *Hypoid Lubricant* — An extreme pressure lubricant designed for use with hypoid gears.

2.3.33 *Inhibited Oils* — Oils having a naturally occurring or added substance whose presence in small quantities in oil prevents or retard the occurrence of the undesirable phenomenon in oils.

2.3.34 *Kerosene* — Refined petroleum distillate intermediate in volatility between gasoline and gas oil. Its distillation range normally falls within the limits of 150 °C and 300 °C. Its main uses are for lighting and heating and as a fuel for certain types of internal combustion engines.

2.3.35 *Lubricating Oil* — Oil usually refined, primarily intended to reduce friction between moving surfaces.

2.3.36 *Mineral Oil* — A mixture of hydrocarbons obtained by the treatment of materials of mineral origin.

2.3.37 *Motor Oil* — Refined lubricating oil, with or without additives, suitable for use as a lubricant in internal combustion engines.

2.3.38 *Mould Oil* — Oil or emulsion used to minimize the sticking of concrete to moulds.

2.3.39 *Multi-Grade Oil* — Oil showing a relatively low change of viscosity in a specified temperature range.

2.3.40 *Neatsfoot Oil* — An oil obtained either by solvent extraction or by boiling in water the shin bones and feet (deprived of hoofs) of cattle.

2.3.41 *Neutral Oil* — Trade term originally covering distillates from Pennsylvania crude refined by clay filtration only but now applied to any finished solvent or clay-treated distillate or lubricating oil.

2.3.42 *Non-Soap Grease* — Grease manufactured with a thickening agent other than soap, for example, clay or asbestos.

2.3.43 *Pure Mineral Oil* — Hydrocarbon oil, refined with or without additive, used without dilution.

NOTE — Term is especially applicable to metal cutting for differentiating these oils from soluble oils.

2.3.44 *Rheopectic Grease* — Lubricating grease which has the property of increasing in consistency (hardening appreciably) upon being subjected to shear.

2.3.45 *Sea/Oil* — A straw-coloured fatty oil closely resembling white oil, used in soap making, having a specific gravity of 0.924 to 0.926 and a saponification number of 189 to 196.

2.3.46 *Solid Lubricant* — A class of lubricants wherein the reduction of friction and wear during sliding is caused by making the shearing take place within the crystal structure of a material of low shear strength in one particular plane.

2.3.47 *Solid Film Lubricant* — Laminar compounds which can be used for lubrication either by precoating the surfaces or by applying through solvents. They can also be suspended in lubricating oil or grease from which they eventually, form films on the surface.

2.3.48 *Soluble Oil* — Oil capable of forming stable emulsions or colloidal suspensions in water, used particularly for the lubrication and cooling of cutting tools.

2.3.49 *Turbine Oil* — Petroleum oil used for the lubrication of steam and other turbines.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Lubricating Equipment Sectional Committee, PGD 19

Organization	*Representatives*(*s*)
CSIR - Indian Institute of Petroleum, Dehradun	DR G. D THAKRE **(*Chairperson*)**
AFMC Lubrication Private Limited, Kolkata	SHRI ANANDA SWARUP
Allweiler India Private Limited, Daman	SHRI SHAHIDAHMAD SHAIKH SHRI RISHAB GHAI (*Alternate* I) MS PUJA SAINI (*Alternate* II)
Balmer Lawrie and Company Limited, Kolkata	SHRI SHIVA KUMAR G. SHRI SAMIT BERA (*Alternate*)
Bharat Heavy Electrical Limited, New Delhi	SHRI ANUJ JAIN SHRI HARDEEP SINGH DOGRA (*Alternate*)
Bharat Petroleum Corporation Limited, Mumbai	SHRI TRUNENDR SINGH
Cenlub Industries Limited, Faridabad	SHRI PRAVEEN ARORA SHRI V. K. MITTAL (*Alternate*)
CSIR - Central Mechanical Engineering Research Institute, Durgapur	DR NARESH CHANDRA MURMU DR PRANAB SAMANTA (*Alternate*)
CSIR - Indian Institute of Petroleum, Dehradun	DR SAILESH K. SINGH DR MRITUNJAY KUMAR SHUKLA (*Alternate*)
ELGI Equipments Limited, Coimbatore	SHRI MAHESH KUMAR SHRI KATHIR VELAN (*Alternate*)
Groz Engineering Tools Private Limited, Gurugram	SHRI SUNIL VERMA SHRI ABHAYANAD (*Alternate*)
Heavy Engineering Corporation Limited, Ranchi	SHRI BIPUL KUMAR SINGH SHRI TOUSIF AHMED (*Alternate*)
Hindustan Petroleum Corporation Limited (HP Green R and D Center), Bengaluru	SHRI C. MADHUSUDAN
Indian Oil Corporation Limited, Mumbai	SHRI H. S. NEGI
Lincoln Helios India Limited, Bengaluru	SHRI RAMAKANT PATIL SHRI SHANKAR NUNNA (*Alternate*)
Steel Authority Of India Limited (SAIL), Research & Development Centre for Iron & Steel, Ranchi	SHRI P. PATHAK SHRI P. SAHANA (*Alternate*)
Steel Authority of India Limited (SAIL), Durgapur Steel Plant, Durgapur	SHRI VINOD KUMAR SHRI GULSHAN KUMAR (*Alternate*)
Tata Steel Limited, Jamshedpur	SHRI MANJUNATH ASHU

Organization	*Representatives*(*s*)
BIS Directorate General	SHRI RAJEEV RANJAN SINGH, SCIENTIST 'F' SENIOR DIRECTOR AND HEAD (PRODUCTION AND GENERAL ENGINEERING) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)]

Member Secretary
SHRI MOHIT KUMAR SWAMI
SCIENTIST 'C'/DEPUTY DIRECTOR
(PRODUCTION AND GENERAL ENGINEERING), BIS

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