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#### **I-4 :**

The straight-4 or inline-4 is an internal combustion engine with four cylinders aligned in one row. This straight engine configuration is the most common in cars with a displacement up to 2.0 litres.

The straight-4 engine is not a balanced configuration and while this is tolerable in a small, low-displacement, low-power configuration the vibrations get worse with increasing size

#### **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.

#### **Inhibitor :**

A substance in a petroleum product which prevents or retards undesirable chemical changes from taking place in the product, or in the condition of the equipment in which the product is used. Commonly used inhibitors are used to prevent or retard oxidation or corrosion.

#### **Internal Combustion Engine :**

Heat engine driven directly by the expansion of combustion gases, rather than by an externally produced medium, such as steam. Basic versions of the internal combustion engine are: gasoline engine and gas engine (spark ignition), diesel engine (compression ignition), and gas turbine (continuous combustion). Diesel compression-ignition engines are more fuel-efficient than gasoline engines because compression ratios are higher, and because the absence of air throttling improves volumetric efficiency. Gasoline, gas (natural gas, propane), and diesel engines operate either on a four-stroke cycle (Otto cycle) or a two-stroke cycle. Most gasoline engines are of the four-stroke type, with operation as follows: intake - piston moves down the cylinder, drawing in a fuel-air mixture through the intake valve compression - all valves closed, piston moves up, compressing the fuel-air mixture, and spark ignites mixture near top of stroke power - rapid expansion of hot combustion gases drives piston down, all valves remain closed exhaust - exhaust valve opens and piston returns, forcing out spent gases The diesel four-stroke cycle differs in that only air is admitted on the intake stroke, fuel is injected at the top of the compression stroke, and the fuel-air mixture is ignited by the heat of compression rather than by an electric spark. The four-stroke-cycle engine has certain advantages over a two-stroke, including higher piston speeds, wider variation in speed and load, cooler pistons, no fuel lost through the exhaust, and lower fuel consumption. The two-stroke cycle eliminates the intake and exhaust strokes of the four-stroke cycle. As the piston ascends, it compresses the charge in the cylinder, while simultaneously drawing a new fuel-air charge into the crankcase, which is air-tight. (In the diesel two-stroke cycle, only air is drawn in; the fuel is injected at the top of the compression stroke.) After ignition, the piston descends on the power stroke, simultaneously compressing the fresh charge in the crankcase. Toward the end of the power stroke, intake ports in the piston skirt admit a new fuel-air charge that sweeps exhaust products from the cylinder through exhaust ports; this means of flushing out exhaust gases is called "scavenging". Because the crankcase is needed to contain the intake charge, it cannot double as an oil reservoir. Therefore, lubrication is generally supplied by oil that is pre-mixed with the fuel. An important advantage of the two-stroke-cycle engine is that it offers twice as many power strokes per cycle and, thus, greater output for the same displacement and speed. Because two-stroke engines are light in relation to their output, they are frequently used where small engines are desirable, as in chain saws, outboard motors, and lawn mowers. Many commercial, industrial, and railroad diesel engines are also of the two-stroke type. Gas turbines differ from conventional internal combustion engines in that a continuous stream of hot gases is directed at the blades of a rotor. A compressor section supplies air to a combustion chamber into which fuel is sprayed, maintaining continuous combustion. The resulting hot gases expand through the turbine unit, turning the rotor and driveshaft.

#### **IP :**

Institute of Petroleum.

#### **ISO :**

International Standards Organization

This organization which is worldwide in scope sets standards and classifications for lubricants. An example is the ISO viscosity grade system.

#### **ISO viscosity classification system :**

International system, approved by the International Standards Organization (ISO), for classifying industrial lubricants according to viscosity.

Each ISO viscosity grade number designation corresponds to the mid-point of a viscosity range expressed in centistokes (cSt) at 40°C.

#### **Isomer :**

Molecule having the same molecular formula as another molecule, but having a different structure and, therefore, different properties. As the carbon atoms in a molecule increase, the number of possible combinations, or isomers, increases sharply.

For example, octane, an 8-carbon-atom molecule, has 18 isomers; decane, a 10-carbon-atom molecule, has 75 isomers.

#### **Isooctane :**

An isomer of octane (C<sub>8</sub>H<sub>18</sub>) having very good antiknock properties. With a designated octane number of 100, isooctane is used as a standard for determining the octane number of gasolines.

#### **Isoparaffin :**

Branched isomer of a straight-chain paraffin molecule. Isothermal :

pertaining to the conduct of a process or operation of equipment under conditions of constant temperature. Heat is neither generated nor absorbed by the process.

## J

### **JAMA :**

The Japan Automobile Manufacturers Association (JAMA) is a trade association that represents automobile manufacturers headquartered in Japan.

### **JASO :**

Japanese Automobile Standards Organization (JASO) is comprised of automobile and truck manufacturers, oil and oil additive companies, and government authorities.

### **JIS :**

Japanese Industrial Standards

## K

### **Kinematic Viscosity :**

absolute viscosity of a fluid divided by its density at the same temperature of measurement. It is the measure of a fluid's resistance to flow under gravity, as determined by test method ASTM D 445. To determine kinematic viscosity, a fixed volume of the test fluid is allowed to flow through a calibrated capillary tube (viscometer) that is held at a closely controlled temperature. The kinematic viscosity, in centistokes (cSt), is the product of the measured flow time in seconds and the calibration constant of the viscometer.

## L

### **Lubricant :**

- a) any substance reducing friction by providing a smooth film as a covering over parts that move against each other; lubricating
- b) a substance for reducing friction in this way, as oil or grease

### **Lubricate, lubricated, lubricating :**

- a) to make slippery or smooth
- b) to apply a lubricant to
- c) to serve as a lubricant

### **Lubricity, lubricities :**

- a) slipperiness; smoothness; esp., effectiveness as a lubricant as indicated by this quality
- b) trickiness; shiftiness

### **Lyophilic :**

Having a strong affinity for, and stabilized by, the liquid dispersing medium: said of a colloidal material. Also lyophile.

### **Lyophobic :**

Having little affinity for the liquid dispersing medium: said of a colloidal material

## M

### **MVMA :**

On December 16, 1992, the Motor Vehicle Manufacturers Association of the United States (MVMA) changed its name to the American Automobile Manufacturers Association (AAMA).

### **Marketer:**

Refers to the marketing organization responsible for the integrity of a brand name and the representation of the branded product in the marketplace.

### **Methane :**

A light, odorless, flammable gas (Ch4); the chief constituent of natural gas.

### **Micron, -microns Or -micra :**

A unit of linear measure equal to one millionth of a meter, or one thousandth of a millimeter

### **Mineral oil :**

Oil derived from mineral sources, notably petroleum.

# N

## **Naphtha :**

Generic, loosely defined term covering a range of light petroleum distillates (see distillation). Included in the naphtha classification are: gasoline blending stocks, mineral spirits, and a broad selection of petroleum solvents. In refining, the term light crude naphtha (LCN) usually refers to the first liquid distillation fraction, boiling range 32° to 100°C (90° to 175°F), while heavy crude naphtha is usually the second distillation fraction, boiling range 163° to 218°C (325° to 425°F).

## **Naphthene:**

One of a group of cyclic hydrocarbons, also termed cycloparaffins or cycloalkanes. The general formula for naphthenes is  $C_nH_{2n}$  Naphthenic lubricating oils have low pour points, owing to their very low wax content, and good solvency properties.

## **Newtonian fluid :**

Fluid, such as a straight mineral oil, whose viscosity does not change with rate of flow.

## **Nitrogen oxides (Nox) :**

Nitric oxide (NO), with minor amounts of nitrogen dioxide (NO<sub>2</sub>). NO<sub>x</sub> is formed whenever fuel is burned at high temperatures in air, from nitrogen in the air as well as in the fuel. Motor vehicles and stationary combustion sources (furnaces and boilers) are the primary man-made sources, although automotive emission controls are reducing the automobile's contribution. Natural emissions of NO<sub>x</sub> arise from bacterial action in the soil. NO<sub>x</sub> can react with hydrocarbons to produce smog.

## **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.

## **NLftI :**

National Lubricating Grease Institute.

## **NLftI Number :**

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

## **Normal paraffin :**

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

## **Octane number :**

Expression of the antiknock properties of a gasoline, relative to that of a standard reference fuel. There are two distinct types of octane number measured in the laboratory: Research Octane Number (RON) and Motor Octane Number (MON), determined in accordance with ASTM D 2699 and D 2700, respectively. Both the RON and MON tests are conducted in the same laboratory engine, but RON is determined under less severe conditions, and is therefore numerically greater than MON for the same fuel. The average of the two numbers —  $(RON + MON)/2$  — is commonly used as the indicator of a gasoline's road antiknock performance. The gasoline being tested is run in a special single-cylinder engine, whose compression ratio can be varied (the higher the compression ratio, the higher the octane requirement). The knock intensity of the test fuel, as measured by a knockmeter, is compared with the knock intensities of blends of isooctane (assigned a knock rating of 100) and heptane (with a knock rating of zero), measured under the same conditions as the test fuel. The percentage, by volume, of the isooctane in the blend that matches the characteristics of the test fuel is designated as the octane number of the fuel. For example, if the matching blend contained 90% isooctane, the octane number of the test fuel would be 90. In addition to the laboratory tests for RON and MON, there is a third method, Road Octane Number, which is conducted in a specially equipped test car by individuals trained to hear trace levels of engine knock..

## **OEM:**

Original Equipment Manufacturer

## **Oiliness agent :**

Polar compound used to increase the lubricity of a lubricating oil and aid in preventing wear and scoring under conditions of boundary lubrication.

## **Olefin :**

Any of a series of unsaturated, relatively unstable hydrocarbons characterized by the presence of a double bond between two carbon atoms in its structure, which is commonly straight-chain or branched. The double bond is chemically active and provides a focal point for the addition of other reactive elements, such as oxygen. Due to their ease of oxidation, olefins are undesirable in petroleum solvents and lube oils. Examples of olefins are: ethylene and propylene.

## **Oxidation :**

The chemical combination of a substance with oxygen. All petroleum products are subject to oxidation, with resultant degradation of their composition and performance. The process is accelerated by heat, light, metal catalysts (e.g., copper, iron), and the presence of water, acids, or solid contaminants. The first reaction products of oxidation are organic peroxides. Continued oxidation catalyzed by peroxides, forms alcohols, aldehydes, ketones, and organic acids, which can be further oxidized to form high-molecular-weight, oil-insoluble polymers; these settle out as sludges, varnishes, and gums that can impair equipment operation. The organic acids formed from oxidation are corrosive to metals. Oxidation resistance of a product can be improved by careful selection of basestocks (paraffins have greater oxidation resistance than naphthenes), special refining methods, and addition of oxidation inhibitors. Also, oxidation can be minimized by good maintenance of oil and equipment to prevent

contamination and excessive heat.

**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 three ways: 1.by combining with and modifying peroxides (initial oxidation products) to render them harmless 2.by decomposing the peroxides 3.by rendering an oxidation catalyst (metal or metal ions) inert.



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