NOTES FOR LUBRICANTS

❖ Types of lubricants

(a) Animal oils: These are generally obtained from animal fat. But they are not good lubricants because they are easily oxidized and become gummy after sometime of use.

(b) Vegetables oils: These are generally obtained from vegetables like seeds, plants and trees etc. It has same problem like animal oil but has very good Lubricant proportion.

(c) Mineral oil: It is generally derived from the petrochemical and it is most widely used in automobile sector because of following properties.

- **(i) Greater chemical stability at higher temperature**
- **(ii) Less reactive with water.**
- **(iii) More plentiful and cheaper.**

(d) Synthetic lubricants: These are made from silicon fluids, polyglycol ethers and aliphatic diester.

❖ Basic requirements for Good lubricants

There are following major requirement for good lubricants.

(1) Viscosity: It should ensure, hydrodynamic lubrication action should take place.

(ii) Chemical stability: It should be chemically stable under different temperature conditions.

(iii) Resistance against corrosion: It should be good corrosion resistance agent.

(iv)Pour point Pour point of the oil should be less so than lowest temperature occurred in the engine.

(v) Physical stability: It should be able to stable under different condition of temperature.

(vi) Flash point: It should be high to avoid flashing of oil vapours.

❖ Functions(applications) of lubricants

A lubricating oil performs the following functions:

(a) Lubricating oil reduce friction between the moving parts. This saves energy, i.e. reduces losses.

(b) It functions like a cooling medium. The engine piston is cooled by the lubricant.

(c) It reduces noise between the striking surfaces. A highly viscous lubricant is more effective in reducing noise.

(d) Lubricating oil seal a joint to make it gas-leak proof. Gas leakage is stopped by the film of the lubricant in between the piston and cylinder.

❖ Properties of lubricating oil

Lubricating oils are obtained by refining crude petroleum. The properties of the lubricants are dependent upon the crude oil from which they are derived, and the extent of refining. Some additives are added to improve the properties of lubricants. The important properties are:

(a) *Viscosity* Viscosity is the measure of the internal resistance of the lubricant and it is regarded as lubricant friction. Highly viscous oils offer more resistance between the layers of the oil while sliding. Such highly viscous lubricants can maintain a film of the lubricant even under thrust. For rating the viscosity of lubricants, SAE (Society of Automotive Engineers) has adopted a process under the specified standard conditions and allotted SAE numbers. These SAE numbers are related to fluid friction. For example, SAE 60 oil is more viscous and offers more resistance than SAE 30 oil. As a test of viscosity, the lubricant which flows more slowly on the same inclined surface has more viscosity. The highly viscous lubricant absorbs more energy to move the engine parts whereas the low viscous lubricant fails to maintain the film of the lubricant between the moving parts and the parts run dry. This means that a highly viscous lubricant offers more viscous resistance (viscous friction) which absorbs energy, whereas a low viscous lubricant offers dry resistance (dry friction). Therefore proper selection of a lubricant is essential.

(b) *Viscosity Index* The viscosity index indicates the change in viscosity with the change in temperature. Normally, viscosity of a lubricant decreases (becomes thin oil) as the temperature of the lubricant increases. This shows that an engine having such lubricant has viscous friction during starting when the engine temperature is low, but the same lubricant offers dry friction when the engine temperature is high. This quality of a lubricant is not desirable. In general, the viscosity index is a number which indicates the relative resistance of a given lubricant to changes in viscosity with changes in temperature. A lubricant having viscosity index equal to 30 has a lower resistance and its viscosity readily changes with an increase in temperature than the lubricant having a viscosity index equal to 50. Therefore a high viscosity index lubricant is preferred for an engine.

To improve the viscosity index, high molecule polymers are added to the lubricant. A high viscosity index lubricant will have good starting characteristics and satisfactory operation at high speed and heavy load conditions.

(c) *Pour Point* Pour point is an important property of lubricants which are used in cold countries where atmospheric temperatures reach subzero levels. The temperature at which the lubricant stops flowing or loses its fluidity under test conditions is known as the pour point. To improve the pour

point of the lubricant, i.e. to retain fluidity of the lubricant at low temperatures, some chemicals are added which are known as *pour point depressants*. Two pour point depressants (i) Santopour, and (ii) Acryloid are commonly used. These pour point depressants tend to prevent the formation of wax at lower temperatures and provide easy starting of the engine. Mechanical agitation lowers the pour point.

(d) *Flash Point* Flash point is the temperature at which a lubricant gives off sufficient vapours to form a combustible mixture with air. The flash point of a lubricant in an auto engine varies from 175°C to 250°C. Any lubricant which has a lower flash point must not be used in the auto engine.

The term *flash point* must not be confused with *fire point*. The temperature at which an oil continues to burn after the flammable vapour-air mixture is ignited, is termed as the fire point. Flash point is at a lower temperature than the fire point.

(e) *Carbon Residue* Generally, low grade lubricants decompose at high temperatures and leave carbon as a residue. The lubricant must not leave carbon in the engine parts even at high temperatures. This can be determined in a laboratory by heating, igniting and burning 10 gm of the sample under specified conditions. The percentage of oil in carbon is determined. This carbon residue test indicates the type of crude oil from which the lubricant was refined and the refining process used to obtain the lubricant.

(f) *Stability* Some lubricants tend to break down at high temperatures and form gummy deposits which stick on piston rings and bearings. Other lubricants tend to form sludge in the presence of water. Sludge changes the viscosity of the lubricant and tends to clog the oil passages. Stability of a lubricant can be improved by refining methods and the ventilation of the crankcase.

(g) *Oiliness* The property of a lubricant in adhering to the bearing surface is called oiliness. For oiliness, no quantitative scale or unit has been adopted. It should be clear that oiliness and viscosity are in no way related. Therefore the property of oiliness becomes ineffective if the engine parts are loaded with the lubricant.

Some lubricants have the property of clinging to a metal surface due to molecular attraction. This means that a thin layer of lubricant will be present even under extreme conditions. Oiliness helps to protect bearings' surfaces during the starting of the engine before the build up of hydrostatic pressure in bearings.

(h) *Corrosiveness* The lubricating oil should not be corrosive and it should protect the surface against corrosion. This means that the lubricant should not retain any mineral acid or alkali that are employed in the refining process.

(i) *Detergency* Detergency means the act of cleaning. Therefore a lubricant which has the property of detergency acts to clean the engine deposits. The term *detergent* is used for cleaning and dispersing the small particles of dirt. A detergent is not used to clean and purge a dirty engine, but it is used to keep a clean engine free from sludge and other deposits. Certain additives like aluminium naphthenate, calcium phenyl stearates, etc. are added in a lubricant to improve the property of detergency.

(j) *Foaming* When minute bubbles of air are trapped in a lubricant, then it is known as foaming. All lubricants foam to some extent due to the violent mechanical agitation that occurs in a running engine. The action of foaming accelerates oxidation and reduces the mass flow of the lubricant to the bearings, thereby reducing the oil pressure. In addition to this, foaming may cause abnormal loss of oil through the breather. Silicon polymers are the most effective anti-foam agents to reduce the foaming tendencies of lubricants.