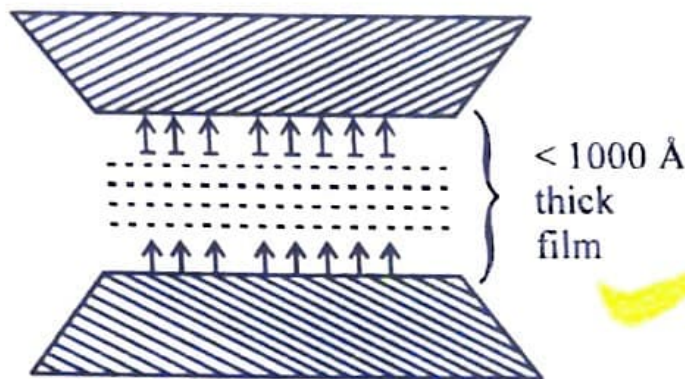
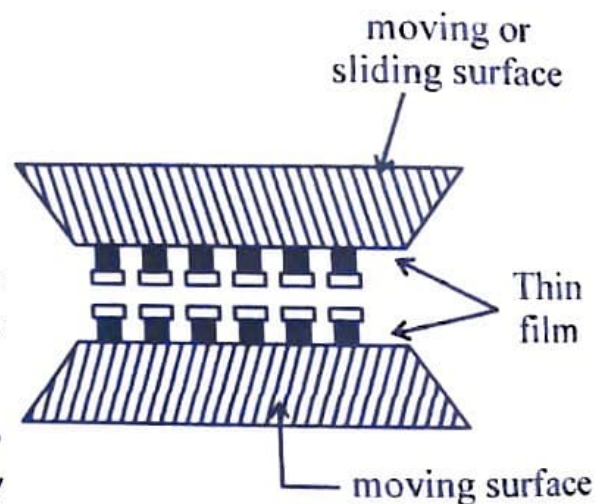


- **Application:** Wrist watches, Wall clock, Sewing machines and other light machineries



ii) **Thin film or Boundry Lubrication:**

- This type of lubrication is operated when :
 - shaft is moving from rest
 - speed is very low
 - load is very high
 - viscosity is very low.
- Under these condition, thick film unable to persist between the moving surface rather a thin film is formed.
- Vegetable oils, animals oil and their soaps, Graphite and MoS_2 are used in boundry Lubrication.



iii) **Extreme pressure Lubrication:**

- This type of mechanism is operated when : both speed and load (pressure) is high.
- Under these condition the lubricants unable to stick on the sliding surfaces or decomposes.
- Special additives are added to mineral acids to meet above conditions.
- Additive are : organic compounds containing active radicals or groups such as chloride, S or P.
- The metal chloride, sulphide or phosphide formed on metal surfaces are capable of withstanding high temperature and extreme pressure conditions

It is the time required in seconds for an emulsion of an oil & water to separate into two distinct layers at 90°C .

Significance:

A good lubricating oil should have low SEN value. 209

ii) Cloud Point and Pour Point:

- The minimum temperature at which lubricant's vapour give cloudy appearance, called "Cloud Point".
- The minimum temperature at which lubricant ceases to flow, called "Pour point".

Significance: It tells about the minimum temperature of operation. For a good lubricant "Cloud & pour point" should be low.

iii) Viscosity and viscosity index:

Viscosity: It is the property of a liquid which resist its flow.

- It tells about the ability of lubricant to resist internal deformation due to mechanical stress.
- It is measure of lubricant film to carry a load. Too low viscosity or too high viscosity is not suitable.

Viscosity Index:

- It is measure of rate of change of viscosity with temperature.
- Lesser the change in viscosity with temperature, higher is the viscosity index.

iv) Neutralization Number / Acid Value

- It is the mg of KOH required to neutralize the acid present in 1g of a Lubricant.
- Greater the free acid present in Lubricant, greater is risk of corrosion.
- A good lubricant should have low neutralization number.

v) Saponification Number: It is mg of KOH required to saponify fatty acid glyceride present in 1g of a Lubricant.

vi) Iodine value: It is measure of unsaturation present in oil. It is defined as amount of I_2 (in centigram) required by the fatty acid present in 1g of a Lubricant.

- Greater the unsaturation, greater is the oiliness hence for a good lubricant **Iodine value** must be high.

vii) Antiline point: It is the minimum temperature at which oil gets completely miscible in equal volume of aniline.

- Greater the hydrocarbon content Lesser is the **Aniline** and vice-versa.

Theories of Lubrication:

i) Thick film or Fluid film or Hydrodynamic Lubricant:

- This type of mechanism operated when:
 - speed of moving parts is high
 - load is low
 - viscosity is minimum under working condition.
- In this case a thick film or fluid film with thick $< 1000\text{\AA}$ is formed between the sliding or moving surface.

UNIT 6

ADDITIONAL TOPICS

PART-I: LUBRICANTS

- **Lubricants** are the substances used to minimise the friction between moving or sliding surfaces.
- The process of minimising or reducing the friction between moving surfaces is called 'Lubrication'.

Functions of Lubricants:

- To avoid the direct contact between moving surfaces.
- To reduce friction.
- To reduce wear and tear.
- To keep away the contaminants and dust.
- To seal the machinery parts in order to prevent from leakage.
- To prevent from corrosion.

Types of Lubricants:

Base on State:

- i) **Solid:** Graphite, **Molybdenum disulphide** (MoS_2), Boron nitride and talcum powder etc. *↑ It can tolerate high Temp.* *Graphite*
- ii) **Liquids:** Oil (vegetable oil, crude oil, diesel, petrol), fatty acid.
- iii) **Gases:** Due to low viscosity and high compressibility act as Lubricants eg: Argon, CO_2 , O_2 , N_2 , He, etc.
- iv) **Semi Solid:** Grease, butter etc. *(saponification process)*

Properties of Lubricants:

i) **Flash point and Fire point:**

The minimum temperature at which lubricant provide enough vapours so that when a burning matchstick bring near the vapours, it burn for about 2 seconds *→ a moment* is called "Flash Point". The minimum temperature at which Lubricant provide enough vapours so that when a burning match stick bring near to it, it burn continuously for about 5 seconds, called "Fire point".

Significance of Flash point & fire point:

- Flash point and fire point tells about the maximum temperature of operation of a Lubricant.
- A good Lubricant must have high "flash and fire point".