

(IV)

(I)

(V)

unit II

## LUBRICANTS

Qs Define lubricants & lubrication?

Ans The substance which is introduced (placed) between two moving surfaces in order to reduce or decrease the frictional resistance between the surfaces is known as the lubricant.

The process of reducing or decreasing the frictional resistance between the two moving surfaces by introducing or placing the lubricant in between them is called lubrication.

Qs Write at least 7 functions of a lubricant?

Ans Functions of lubricant are:-

- (1) Lubricant avoid the direct contact between the two moving surfaces, thus it decrease surface deformation of moving surface
- (2) Lubricant

2

Qs Discuss the various mechanism of lubrication?

OR

Qs Discuss in detail → Fluid film or thick film or hydrodynamic lubrication

→ Boundary lubrication or thin film lubrication

→ Extreme pressure lubrications.

Ans fluid film or thick film or hydrodynamic lubrication:-

In this type of lubrication thick film of fluid (lubricant) is been introduced (kept) between the two moving or sliding surfaces of metal. The lubricant fill up the irregularities of moving surfaces and also forms a thick layer in between them, thus there is no contact between the two moving surfaces.

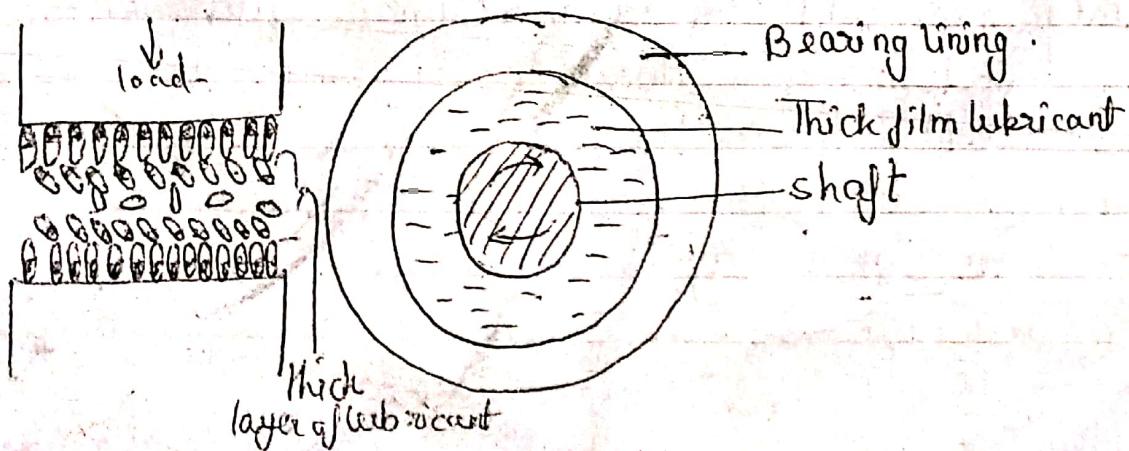
3

- Lubricants thus decrease the wear and tear of moving surfaces.

After the introduction of fluid film or thick film lubricant between the two moving surfaces, the resistance to movement of moving or sliding surface is due to the internal resistance between the particles of the lubricant, moving over each other. So highly viscous lubricant will result in high resistance to movement of surfaces. So the lubricant chosen for fluid film lubrication should have minimum viscosity and it should remain in place and separate the surfaces.

Hydrodynamic frictional resistance occurs in case of shaft running journal bearing, in case of shaft bearing and journal bearing lubricating oil covers the irregularities of shaft as well as bearing surface.

Delicate instruments, light machines like watches, gun, sewing machine are provided with this type of lubrication. The efficiency of this type of lubrication depends upon the bearing, applied load, rate of rotating shaft & viscosity of lubricant.



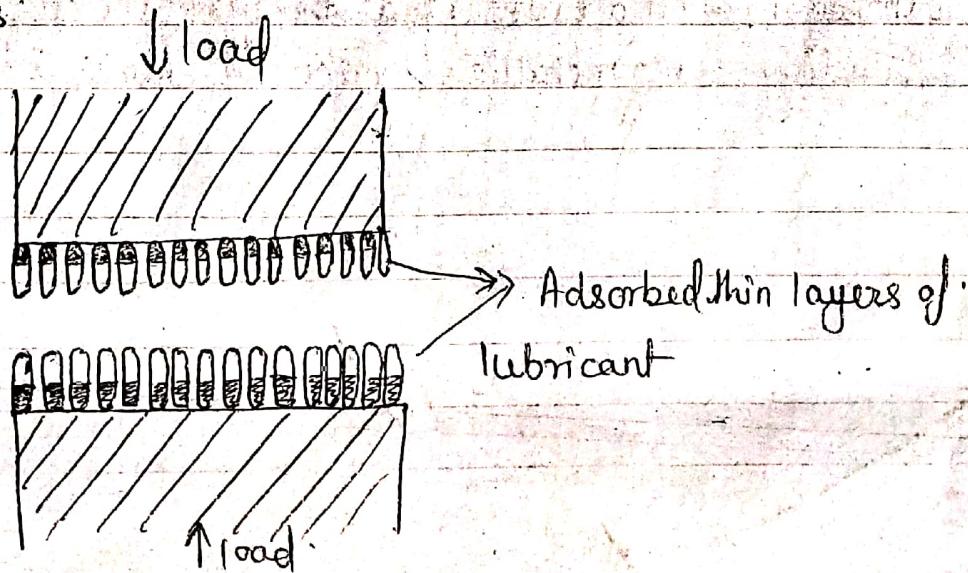
(4)

The oils which are used for fluid film lubrication are hydrocarbon oils; it is mixed with the particular polymers so that its viscosity is maintained in all seasons.

### Boundary lubrication or thin film lubrication :-

In this type of lubrication a thin film of fluid (lubricant) is been introduced between the 2 moving or sliding surfaces of metal. Basically boundary lubrication is done when a continuous film cannot be maintained between 2 moving surfaces and it occurs when viscosity of oil is very low, short start or stops immediately etc.

In between the 2 moving surface some part of thin film get adsorbed, due to physical or chemical forces. Further these adsorbed layer of lubricant prevent the contact between the two moving metal surface and the load is also been taken up by the layers of the lubricants adsorbed on the both moving metal surfaces.



(5')

The oils which are used for Boundary or thin film lubrication are Vegetable and animal oils and their soaps. The above oils get physically adsorbed to metal surfaces or react chemically with metal surface and form a thin layer of metallic soap on it.

In order to increase the sticking property of a lubricant oil, small amount of fatty oils or fatty acids are added to it.

Graphite and molybdenum disulphide are also used in the form of the suspension in oil for Boundary or thin film lubrication.

Lubricant which are used for Boundary or thin film lubrication should have following properties.

- (1) Lubricant should have active groups or atoms which can form chemical linkages with the metal surfaces.
- (2) Lubricant should have good oiliness (sticking property)
- (3) " " " low pour point
- (4) Lubricant should have polar groups which promote spreading over metallic surfaces at high pressure.

## Extreme pressure lubrication:-

(In this type of lubrication)

When the moving or sliding surface are under very high pressure and speed then, high temp. is developed and under this condition liquid lubricant can't stick, and may evaporize.

so such additives are added to oil or mineral oil, called as extreme-pressure additive, these additive form more durable film on metal surface which can withstand high loads, & high temp.

These additive are organic compounds, having active radicals or groups such as chlorine as in chlorinated ester sulphur as in sulphurized oils or 'P' as in tricresyl phosphate.

These compd. react with metallic surface at high temp. to form metallic chloride, sulphide or phosphides. These metallic compound have high M.P. & so act as good lubricant under extreme pressure & extreme temp. cond.