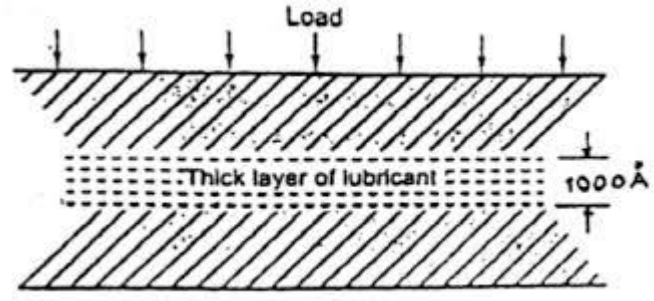
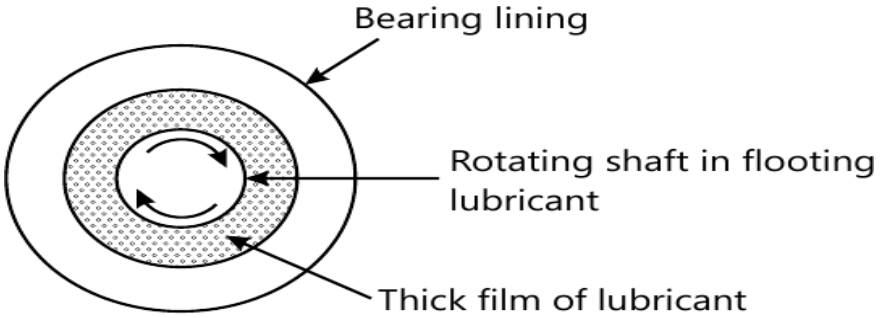
1. Mechanism of Lubrication

a) Thick Film or Fluid Film or Hydrodynamic Lubrication

Under the conditions of low load and high speed, a thick fluid film of lubricant is maintained between the two solid surfaces. It is carried out with the help of liquid lubricants. The thickness of fluid film is about 1000 A. The thick fluid film separates the two solid surfaces Therefore there is no direct contact between the solid surface .This reduces the wear and Tear. The co efficient of friction is as low as 0.001 to 0.03.



In this case fluid is formed by mixing of hydrocarbon oils and anti-oxidants with long chain polymer so as to maintain viscosity.

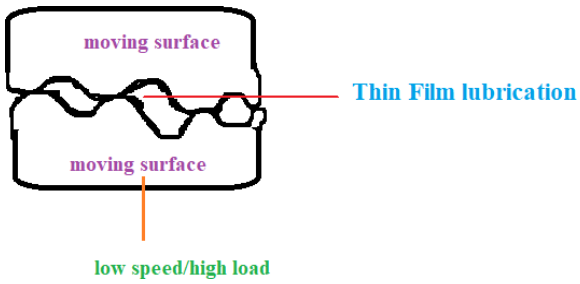


Thick-film/Hydrodynamic lubricants

When the lubricant is added to the system, it occupies the annular space between the shaft and the bearing and forms hydrodynamic wedge so long as the shaft rotates. This hydrodynamic wedge prevents contact between the two solid surfaces. When the load becomes very high,the lubricant will be squeezed out of the wedge and the friction will occur.

B.Thin Film or Boundary Lubrication

Under the condition of high load and slow speed, a continuous fluid flim cannot be maintained between the moving surfaces. Under such condition, the thickness of the fluid flim should be less than 1000A°consist of 2 or 3 molecules thick. To form a thin film the lubricant has to be adsorbed on the metal surface by physical or chemical forces. In some cases, the lubricant will react chemically with the metal surface forming a thin film of metal soap, which will act as a lubricant.This thin film is



known as boundary film. The co-efficient of friction is around 0.05 to 0.15.

The effectiveness of boundary lubrication depends on the oiliness of the lubricant. Oiliness is the ability of a lubricant to stick on to the surface. Vegetable oils and their fatty acids have more oiliness e.g Oleic acid ($C_{17}H_{33}COOH$),Stearic acid ($C_{17}H_{35}COOH$) etc.The polar carbonyl group (-COOH) of these oils react with the metal surface to form a continuous thin film of Lubricant. Hydrocarbon Chain of the fatty acid gets oriented outwords in a perpendicular direction as shown in figure.

a) Extreme Pressure Lubrication

Under the condition of high load and high speed, more heat is generated between the moving surfaces. As a result of this, the liquid lubricant fails to stick and undergoes decomposition or evaporation. Under these conditions, for effective lubrication special additives known as extreme pressure additives are used along with the lubricants.

Important extreme pressure additives are organic compounds having active radicals or groups such as Chlorine (e.g Sulphurized oils) etc. These compounds react with metallic surfaces to form metallic surfaces to form metallic chlorides, sulphides etc.These metallic compounds possess high melting points and serve as good lubricant under extreme pressure conditions.