Fluid Mechanics and Machineries- Compressibility -Vapour pressure – Surface tension

Compressibility and Bulk Modulus

(1)

Compressibility of a fluid then characterises its ability to change its volume under Pressure.

The relative change of volume per unit Pressure is given by the Coefficient of Compressibility

$$\beta_c = \frac{-1}{V}\left(\frac{dV}{dp}\right)$$

dp - Small change in Pressure.
dV - Incremental Volume change

The Compressibility of fluid is expressed by its bulk modulus of elasticity k which is the inverse of the Coefficient of Compressibility

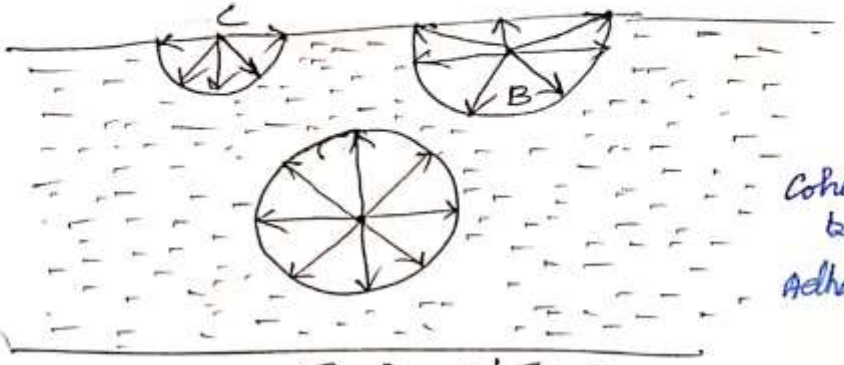
$$k = \frac{1}{\beta_c} = -\left(\frac{dp}{\frac{dV}{V}}\right)$$

VISCOSITY:

SURFACE TENSION (σ) = SI: N/m (or) MKS: Kgf/m

Surface tension is defined as the tensile force acting on the surface of a liquid in contact with a gas or on the surface between two immiscible liquids such that the contact surface behaves like a membrane under tension.

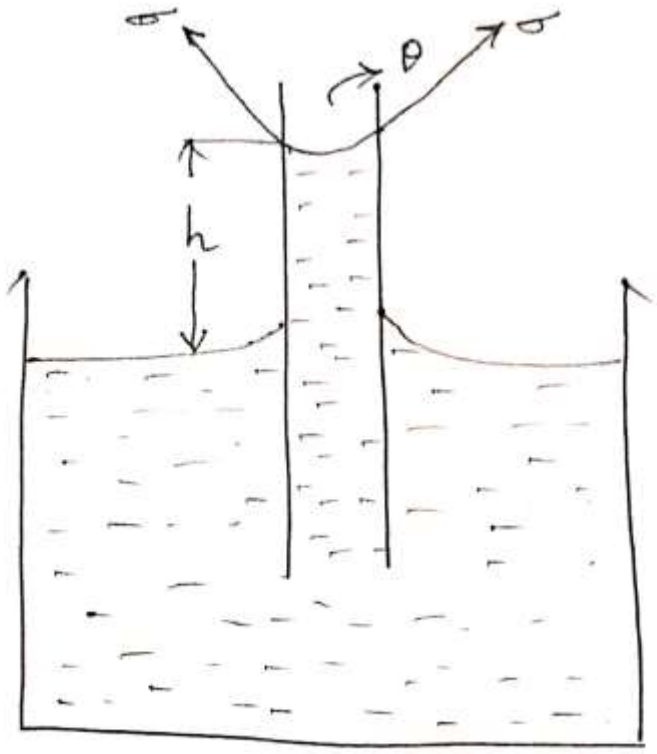
The magnitude of this force per unit length of the free surface will have the same value as the surface energy per unit area.

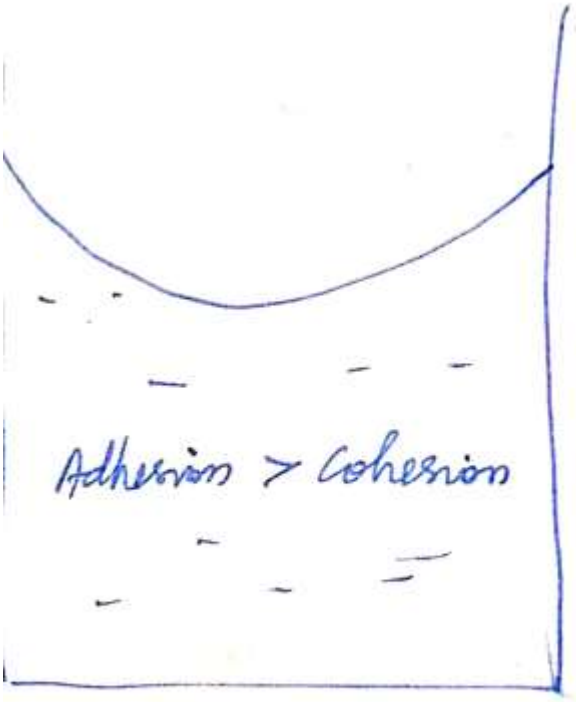


Surface tension.

Capillarity:

Capillarity is defined as a phenomenon of rise or fall of a liquid surface in a small tube relative to the adjacent general level of liquid when the tube is held vertically in the liquid. The rise of liquid surface is known as Capillary rise while the fall of the liquid surface is known as Capillary depression.





water

Mercury