

## DEFINITIONS

### Lesson 1: Fluid Mechanics

#### Fluids

- undergo continuous deformation
- always keep flowing
- a substance that does not possess a definite shape and easily yields to external pressure
- any liquid or gas or any material that is unable to withstand a shearing or tangential force, when at rest (when the said forces are applied to the fluid, it goes through a continuous change in shape)
- are substances with zero shear modulus, they cannot resist the shear force applied to them

#### Classification of Fluids

##### Steady Fluid

- whose density remains constant at each and every point while flowing

##### Unsteady Fluid

- whose density differs between any two points while flowing

##### Compressible Fluid

- has a Mach Number between 0.3 and 1

##### Incompressible Fluid

- has a Mach Number less than 0.3

##### Viscous

- fluids with more thickness or viscosity are known as viscous fluids, they are generally very gloppy fluids (i.e., shampoo and motor oil)

##### Non-viscous

- fluids with comparatively less thickness or viscosity are known as non-viscous fluids
- fluids with no resistance or negligible resistance to internal friction
- flow without any loss of kinetic energy (i.e., superfluid and liquid helium)

#### Rotational

- if the angle between the two intersecting lines of the boundary of the fluid element changes while moving in the flow, it is a rotational flow

#### Irrotational

- if the fluid rotates as a whole with no change in angles between the boundary lines, the flow of the fluid is classified as irrotational flow

#### Properties of Fluids

##### 1. Specific Weight / Unit Weight ( $\gamma$ )

- the specific weight of a fluid is defined as the weight per unit volume.

##### 2. Mass Density ( $\rho$ )

- density is defined as the mass per unit volume of a fluid
- the density of a substance varies as per the volume of a substance

##### 3. Specific Volume ( $v$ )

- defined as the ratio of the volume of the material to its mass
- the reciprocal of the density of the material
- inversely proportional to density

##### 4. Specific Gravity ( $s.g.$ )

- the ratio of the specific weight of the given fluid to the specific weight of the standard fluid
- also known as relative density

## Lesson 2: Pressure

### Pressure

- fluid pressure is the pressure at a point within a fluid that arises because of the fluid's weight
  - the amplification of the fluid pressure can take place through hydraulic mechanisms and changes in the fluid's velocity
  - fluid pressure refers to a measurement of the force per unit area that acts on an object in the fluid or on a closed container's surface.
  - the cause of this pressure is due to acceleration, gravity, or by forces that are outside the closed container
  - the application of the pressure is in all directions because the fluid has no definite shape
- in 1653, Pascal law was stated by French mathematician Blaise Pascal
  - used in the making of hydraulic pumps used by automobile industries
  - widely applied in pressing oils such as olive oil and hazelnut oil, calibration of pressure gauges, and also in devices like jackhammers, paint sprayers, and on brakes of trucks

## Lesson 3: Pascal's Law

### Pascal's Principle

- also known as Pascal's law
- states that when a change in pressure is applied to an enclosed fluid, it is transmitted undiminished to all portions of the fluid and to the walls of its container
- in an enclosed fluid, since atoms of the fluid are free to move about, they transmit pressure to all parts of the fluid and to the walls of the container
- any change in pressure is transmitted undiminished
- the static pressure acts at right angles to any surface in contact with the fluid
- Pascal also found that the pressure at a point for a static fluid would be the same across all planes passing through that point in that fluid
- Pascal's law is also known as the principle of transmission of fluid-pressure

