

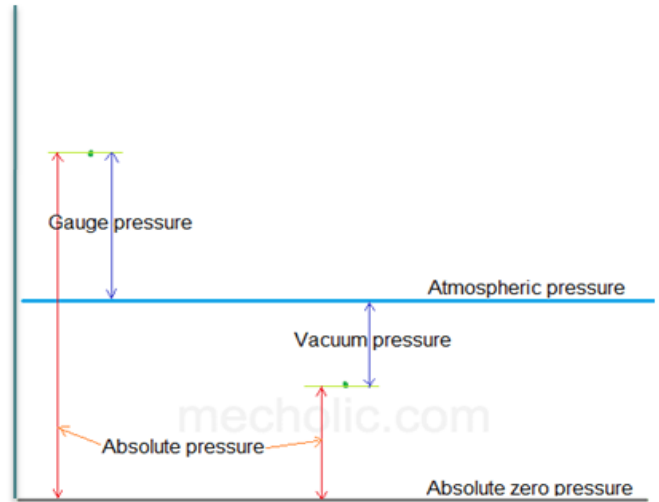
## Unit – I

# Pressure and Pressure Measurement

## Session – V

### □ Pressure Measuring System

- The pressure on a fluid is measured in two different systems.
- In one system, it is measured above the absolute zero or complete vacuum and it is called the Absolute pressure.
- In other system, pressure is measured above the atmospheric pressure and is called Gauge pressure.



### □ Definitions

- **Absolute Pressure :** It is defined as the pressure which is measured with reference to absolute vacuum pressure.
- **Atmospheric Pressure :** It is the pressure exerted atmospheric air normally upon the surface of the earth.
- **Gauge Pressure :** It is defined as the pressure, which is measured with the help of a pressure measuring instrument, in which the atmospheric pressure is taken as datum. The atmospheric on the scale is marked as zero.
- **Vacuum Pressure :** It is defined as the pressure below the atmospheric pressure .

### Relation between Absolute Pressure, Atmospheric Pressure and Gauge Pressure

**Absolute pressure = Atmospheric pressure ± gauge pressure**

$$\text{i.e. } P_{ab} = P_{atm} \pm P_{gauge}$$

### □ Concept of Atmospheric Pressure

- The atmospheric pressure at sea level at 15°C is 10.1325N/cm<sup>2</sup> or 101.325 KN/m<sup>2</sup> in S I Units

pressure intensity,  $p = sw h$

$$P_{at} = P_w$$

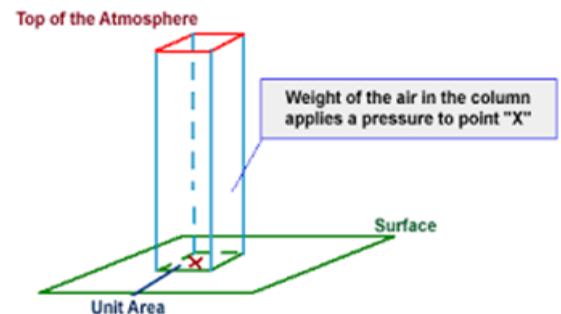
$$101.325 \times 10^3 = 1 \times 9810 \times h_w$$

$$h_w = 10.33\text{m}$$

$$P_{at} = P_m$$

$$101.325 \times 10^3 = 13.6 \times 9810 \times h_m$$

$$h_m = 0.76 \text{ m} = 76 \text{ cm} = 760 \text{ mm}$$



- The atmospheric pressure head is 10.33m of water or 760mm of mercury
- Atmospheric Pressure is measured by Barometer.

## Problems

1. Express 6 m water (absolute) pressure head to gauge pressure head

**Sol<sup>n</sup>**

Absolute pressure ,  $h_{ab} = 6$  m water

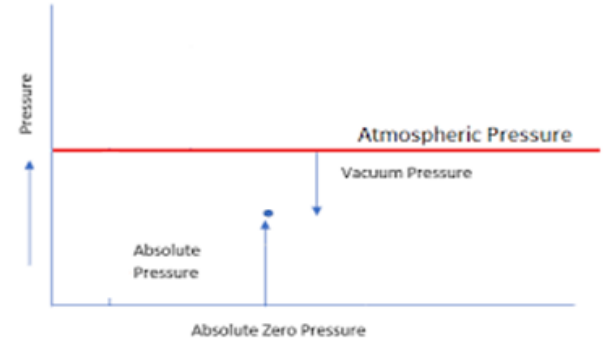
Atmospheric pressure ,  $h_{air} = 10.33$  m of water

Gauge pressure,  $h_{gau} = h_{air} - h_{ab}$

$$h_{gau} = 10.33 - 6$$

$$h_{gau} = 4.33 \text{ m of water vacuum}$$

$$h_{gau} = - 4.33 \text{ m of water}$$



2. Express 13.6 cm of mercury into meter of water absolute

**Sol<sup>n</sup>**

Gauge pressure,  $h_{gau} = 13.6$  cm of mercury

Atmospheric pressure,  $h_{at} = 76$  cm mercury

Absolute pressure,  $h_{ab} = 76 + 13.6$

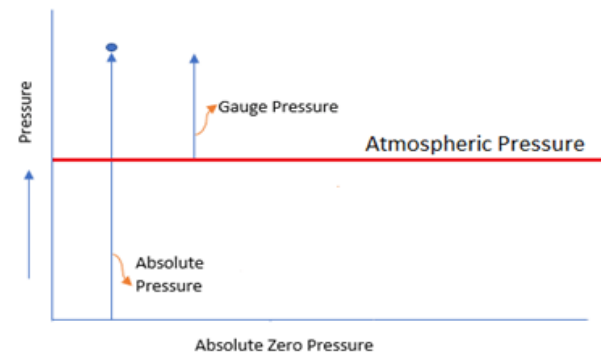
$$h_{ab} = 89.6 \text{ cm of mercury}$$

$$h_{ab} = \frac{13.6 \times 89.6}{1}$$

$$1$$

$$h_{ab} = 1218.56 \text{ cm of water}$$

$$h_{ab} = 1.218 \text{ m of water}$$



**Note -**  $p_m = p_w$

$$s_m \times h_m = s_w \times h_w$$

$$h_w = \frac{s_m \times h_m}{s_w}$$