FLUID PROPERTIES

Basic units

Basic unit	SI Units	Imperial Units (Traditional units)
Mass	Kg	Slug, Pound mass 1 slug = 32.2 Ibm
Length	M	foot
Time	sec	sec
Weight	N	Ibf
Work	Nm (joule)	ft.1bf
Power	Watt	hp

FLUID PROPERTIES

Basic units

$$1.0 \; \text{lbm} = \frac{1}{2.2} \; \text{kg} = \frac{1}{32.2} \; \text{slug}$$

$$1 \; \text{m} = 3.281 \; \text{ft} = 1.094 \; \text{yd} = 39.37 \; \text{in} = \frac{\text{km}}{1000} = 10^6 \; \mu\text{m}$$

$$(1.0 \; \text{N}) \equiv (1.0 \; \text{kg})(1.0 \; \text{m}/s^2)$$

$$(1.0 \; \text{lbf}) \equiv (1.0 \; \text{lbm})(32.2 \; \text{ft}/s^2)$$

FLUID PROPERTIES

System

Is defined as a given quantity of matter.

Extensive Property

Can be identified when it is **Dependent** on the total mass of the system such as Mass-(M) & Weight- (W).

Intensive Property

Can be identified when it is **Independent** of the total mass of the system such as Pressure (p), density (ρ)

FLUID PROPERTIES

Specific Weight =

$$\frac{Weight}{volume} = \frac{mg}{V} = \rho g = \gamma$$

Specific Gravity=S

$$\frac{specific\ weight\ of\ fluid}{specific\ weight\ of\ water} = \frac{\gamma_f}{\gamma_w} = \frac{(\rho g)_{fluid}}{(\rho g)_{water}} = \frac{\rho_f}{\rho_w}$$

FLUID PROPERTIES

Ideal Gas Law: (Equation of State)

$$PV = nR_uT$$

$$PV = (nR_uT)\frac{m}{m}$$

$$P = \left(\frac{nm}{V}\right)\left(\frac{R_u}{m}\right)T$$

$$P = \rho RT$$

Where: n = Number of moles
m = Molecular mass
(nm)=M=Mass of the gas
R_u = Universal gas constant
R = Gas Constant

FLUID PROPERTIES

Specific Heat Capacity

The term originated primarily through the work of Scottish physicist Joseph Black

Specific Heat at Constant Volume= C_V

Is defined as the **Amount of Heat** required to raise the unit mass of a given substance by one degree **at constant volume**.

Specific Heat at Constant Pressure= C_p

Is defined as the **Amount of Heat** required to raise the unit mass of a given substance by one degree **at constant pressure**.