Important Fluid Mechanics Basics Formulas PDF

Formulas
Examples
with Units

List of 14
Important Fluid Mechanics Basics Formulas

1) Bulk Modulus given Volume Stress and Strain Formula

Evaluate Formula

Formula

$$k_v = \frac{VS}{\varepsilon_v}$$

Example with Units

$$0.3667\,\text{Pa} = \frac{11\,\text{Pa}}{30}$$

2) Cavitation Number Formula

Evaluate Formula

Formula

$$\sigma_c = \frac{p - P_v}{\rho_m \cdot \frac{u_f^2}{2}}$$

Example with Units

$$0.0111 = \frac{800\,\text{Pa} - 6.01\,\text{Pa}}{997\,\text{kg/m}^3 \cdot \frac{12\,\text{m/s}^2}{2}}$$

3) Equation of Continuity for Compressible Fluids Formula

Evaluate Formula

Formula

$$V_1 = \frac{A_2 \cdot V_2 \cdot \rho_2}{A_1 \cdot \rho_1}$$

Example with Units

$$2.1739\,\text{m/s} = \frac{6\,\text{m}^2 \cdot 5\,\text{m/s} \cdot 700\,\text{kg/m}^3}{14\,\text{m}^2 \cdot 690\,\text{kg/m}^3}$$

4) Equation of Continuity for Incompressible Fluids Formula

Evaluate Formula

Formula

$$V_1 = \frac{A_2 \cdot V_2}{A_1}$$

Example with Units

$$2.1429\,\text{m/s} = \frac{6\,\text{m}^2 \cdot 5\,\text{m/s}}{14\,\text{m}^2}$$

5) Kinematic Viscosity Formula

Evaluate Formula

Formula

$$\nu_f = \frac{\mu_{viscosity}}{\rho_m}$$

Example with Units

$$0.001\,\text{m}^2\text{/s} = \frac{10.2\,\text{P}}{997\,\text{kg/m}^3}$$

6) Knudsen Number Formula

Evaluate Formula

Formula

$$Kn = \frac{\lambda}{L}$$

Example with Units

$$0.0018 = \frac{0.0002\,\text{m}}{110\,\text{mm}}$$

7) Sensitivity of Inclined Manometer Formula

Evaluate Formula

Formula

$$S = \frac{1}{\sin(\Theta)}$$

Example with Units

$$1.7434\,\text{VA} = \frac{1}{\sin(35°)}$$

8) Specific Volume Formula

Evaluate Formula

Formula

$$v = \frac{V}{m}$$

Example with Units

$$1.9091\,\text{m}^3/\text{kg} = \frac{63\,\text{m}^3}{33\,\text{kg}}$$

9) Stagnation Pressure Head Formula

Evaluate Formula

Formula

$$h_o = h_s + h_d$$

Example with Units

$$117\,\text{mm} = 52\,\text{mm} + 65\,\text{mm}$$

10) Turbulence Formula

Evaluate Formula

Formula

$$Tstress = \rho_2 \cdot \mu_{viscosity} \cdot u_f$$

Example with Units

$$8568\,\text{Pa} = 700\,\text{kg/m}^3 \cdot 10.2\,\text{P} \cdot 12\,\text{m/s}$$

11) Unstable Equilibrium of Floating Body Formula

Evaluate Formula

Formula

$$GM = BG - BM$$

Example with Units

$$-27.1\,\text{mm} = 25\,\text{mm} - 52.1\,\text{mm}$$

12) Vorticity Formula

Evaluate Formula

Formula

$$\Omega = \frac{\Gamma}{A}$$

Example with Units

$$0.1636\,1/\text{s} = \frac{9\,\text{m}^2/\text{s}}{55\,\text{m}^2}$$

13) Weight Formula

Evaluate Formula

Formula

$$W_{body} = m \cdot g$$

Example with Units

$$323.4\,\text{N} = 33\,\text{kg} \cdot 9.8\,\text{m/s}^2$$

14) Weight Density given Specific Weight Formula

Evaluate Formula

Formula

$$\omega = \frac{SW}{g}$$

Example with Units

$$76.5306\,\text{kg/m}^3 = \frac{0.75\,\text{kN/m}^3}{9.8\,\text{m/s}^2}$$

Variables used in list of Fluid Mechanics Basics Formulas above

- **A** Area of Fluid *(Square Meter)*
- **A_1** Cross-Sectional Area at Point 1 *(Square Meter)*
- **A_2** Cross-Sectional Area at Point 2 *(Square Meter)*
- **BG** Distance between COB and GOG *(Millimeter)*
- **BM** Distance between COB and COM *(Millimeter)*
- **g** Acceleration due to Gravity *(Meter per Square Second)*
- **GM** Metacentric Height *(Millimeter)*
- **h_d** Dynamic Pressure Head *(Millimeter)*
- **h_o** Stagnation Pressure Head *(Millimeter)*
- **h_s** Static Pressure Head *(Millimeter)*
- **k_v** Bulk Modulus given Volume Stress and Strain *(Pascal)*
- **Kn** Knudsen Number
- **L** Characteristic Length of Flow *(Millimeter)*
- **m** Mass *(Kilogram)*
- **p** Pressure *(Pascal)*
- **P_v** Vapour Pressure *(Pascal)*
- **S** Manometer Sensitivity *(Volt Ampere)*
- **SW** Specific Weight *(Kilonewton per Cubic Meter)*
- **Tstress** Turbulence *(Pascal)*
- **u_f** Fluid Velocity *(Meter per Second)*
- **v** Specific Volume *(Cubic Meter per Kilogram)*
- **V** Volume *(Cubic Meter)*
- **V_1** Velocity of the fluid at 1 *(Meter per Second)*
- **V_2** Velocity of the fluid at 2 *(Meter per Second)*
- **VS** Volume Stress *(Pascal)*
- **W_{body}** Weight of Body *(Newton)*
- **Γ** Circulation *(Square Meter per Second)*
- **ε_v** Volumetric Strain

Constants, Functions, Measurements used in list of Fluid Mechanics Basics Formulas above

- Functions: **sin**, sin(Angle)
  Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.
- Measurement: **Length** in Millimeter (mm)
  Length Unit Conversion
- Measurement: **Weight** in Kilogram (kg)
  Weight Unit Conversion
- Measurement: **Volume** in Cubic Meter (m^3)
  Volume Unit Conversion
- Measurement: **Area** in Square Meter (m^2)
  Area Unit Conversion
- Measurement: **Pressure** in Pascal (Pa)
  Pressure Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Acceleration** in Meter per Square Second (m/s^2)
  Acceleration Unit Conversion
- Measurement: **Power** in Volt Ampere (VA)
  Power Unit Conversion
- Measurement: **Force** in Newton (N)
  Force Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion
- Measurement: **Wavelength** in Meter (m)
  Wavelength Unit Conversion
- Measurement: **Dynamic Viscosity** in Poise (P)
  Dynamic Viscosity Unit Conversion
- Measurement: **Mass Concentration** in Kilogram per Cubic Meter (kg/m^3)
  Mass Concentration Unit Conversion
- Measurement: **Kinematic Viscosity** in Square Meter per Second (m^2/s)
  Kinematic Viscosity Unit Conversion
- Measurement: **Density** in Kilogram per Cubic Meter (kg/m^3)
  Density Unit Conversion

- Θ Angle between Manometer and Surface *(Degree)*
- λ Mean Free Path of Molecule *(Meter)*
- $\mu_{viscosity}$ Dynamic Viscosity *(Poise)*
- v_f Kinematic Viscosity of Liquid *(Square Meter per Second)*
- ρ_1 Density at Point 1 *(Kilogram per Cubic Meter)*
- ρ_2 Density at Point 2 *(Kilogram per Cubic Meter)*
- ρ_m Mass Density *(Kilogram per Cubic Meter)*
- σ_c Cavitation Number
- ω Weight Density *(Kilogram per Cubic Meter)*
- Ω Vorticity *(1 per Second)*

- Measurement: **Specific Volume** in Cubic Meter per Kilogram (m^3/kg)
  Specific Volume Unit Conversion
- Measurement: **Momentum Diffusivity** in Square Meter per Second (m^2/s)
  Momentum Diffusivity Unit Conversion
- Measurement: **Specific Weight** in Kilonewton per Cubic Meter (kN/m^3)
  Specific Weight Unit Conversion
- Measurement: **Vorticity** in 1 per Second (1/s)
  Vorticity Unit Conversion
- Measurement: **Stress** in Pascal (Pa)
  Stress Unit Conversion

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