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Fluid Mechanics Basics Formulas

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List of 14 Fluid Mechanics Basics Formulas

Fluid Mechanics Basics

1) Bulk Modulus given Volume Stress and Strain

Open Calculator

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

ex $$0.366667\text{Pa} = \frac{11\text{Pa}}{30}$$

2) Cavitation Number

Open Calculator

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

ex $$0.011061 = \frac{800\text{Pa} - 6.01\text{Pa}}{997\text{kg/m}^3 \cdot \frac{(12\text{m/s})^2}{2}}$$

3) Equation of Continuity for Compressible Fluids

Open Calculator

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

ex $$2.173913\text{m/s} = \frac{6\text{m}^2 \cdot 5\text{m/s} \cdot 700\text{kg/m}^3}{14\text{m}^2 \cdot 690\text{kg/m}^3}$$

4) Equation of Continuity for Incompressible Fluids

Open Calculator

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

ex $$2.142857\text{m/s} = \frac{6\text{m}^2 \cdot 5\text{m/s}}{14\text{m}^2}$$

5) Kinematic Viscosity

Open Calculator

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

ex $$0.001023\text{m}^2\text{/s} = \frac{10.2\text{P}}{997\text{kg/m}^3}$$

6) Knudsen Number

Open Calculator

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

ex $$0.001818 = \frac{0.0002\text{m}}{110\text{mm}}$$

7) Sensitivity of Inclined Manometer

Open Calculator

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

ex $$1.743447\text{VA} = \frac{1}{\sin(35^\circ)}$$

8) Specific Volume

Open Calculator

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

ex $$1.909091\text{m}^3/\text{kg} = \frac{63\text{m}^3}{33\text{kg}}$$

9) Stagnation Pressure Head

Open Calculator

fx $$h_o = h_s + h_d$$

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

10) Turbulence

Open Calculator

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

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

11) Unstable Equilibrium of Floating Body

Open Calculator

fx $$GM = BG - BM$$

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

12) Vorticity

Open Calculator

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

ex $$0.163636/\text{s} = \frac{9\text{m}^2/\text{s}}{55\text{m}^2}$$

13) Weight

Open Calculator

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

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

14) Weight Density given Specific Weight

Open Calculator

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

ex $76.53061\text{kg/m}^3 = \frac{0.75\text{kN/m}^3}{9.8\text{m/s}^2}$

Variables Used

- **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
- **Θ** Angle between Manometer and Surface *(Degree)*
- **λ** Mean Free Path of Molecule *(Meter)*
- $\mu_{viscosity}$ Dynamic Viscosity *(Poise)*
- ν_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)*

Constants, Functions, Measurements used

- Function: **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/m³)
  Mass Concentration Unit Conversion
- Measurement: **Kinematic Viscosity** in Square Meter per Second (m²/s)
  Kinematic Viscosity Unit Conversion
- Measurement: **Density** in Kilogram per Cubic Meter (kg/m³)
  Density Unit Conversion
- Measurement: **Specific Volume** in Cubic Meter per Kilogram (m³/kg)
  Specific Volume Unit Conversion
- Measurement: **Momentum Diffusivity** in Square Meter per Second (m²/s)
  Momentum Diffusivity Unit Conversion
- Measurement: **Specific Weight** in Kilonewton per Cubic Meter (kN/m³)
  Specific Weight Unit Conversion
- Measurement: **Vorticity** in 1 per Second (1/s)
  Vorticity Unit Conversion
- Measurement: **Stress** in Pascal (Pa)
  Stress Unit Conversion

Check other formula lists

- **Fluid Mechanics Basics Formulas**
- **Turbine Formulas**

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