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Fluid Pressure and Its Measurement Formulas

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List of 15 Fluid Pressure and Its Measurement Formulas

Fluid Pressure and Its Measurement

1) Pressure at Point in Liquid given Pressure Head

Open Calculator

fx $p = h \cdot S$

ex $825\text{Pa} = 1.1\text{m} \cdot 0.75\text{kN/m}^3$

2) Pressure Difference between Two Points in Liquid

Open Calculator

fx $\Delta P = S \cdot (D - D_2)$

ex $750\text{N/m}^2 = 0.75\text{kN/m}^3 \cdot (16\text{m} - 15\text{m})$

3) Pressure Head of Liquid

Open Calculator

fx $h = \frac{p}{S}$

ex $1.1\text{m} = \frac{825\text{Pa}}{0.75\text{kN/m}^3}$

4) Pressure Head of Liquid given Pressure Head of another Liquid having same Pressure

Open Calculator

$$h_1 = \frac{h_2 \cdot w_2}{SW_1}$$

$$13.84286\text{m} = \frac{10.2\text{m} \cdot 19\text{kN/m}^3}{14\text{kN/m}^3}$$

Equilibrium of Compressible Fluid Atmospheric Equilibrium

5) Adiabatic Exponent or Adiabatic Index

Open Calculator

$$k = \frac{C_p}{C_v}$$

$$12.63158 = \frac{24\text{J/kg*°C}}{1.9\text{J/kg*°C}}$$

6) Atmospheric Pressure According to Polytropic Process

Open Calculator

$$P_{atm} = \frac{P_i \cdot \rho_0^a}{\rho_1^a}$$

$$349.9863\text{Pa} = \frac{66.31\text{Pa} \cdot (1000\text{kg/m}^3)^{2.4}}{(500\text{kg/m}^3)^{2.4}}$$

7) Density According to Polytropic Process

Open Calculator

fx $$\rho_0 = \rho_1 \cdot \left(\frac{P_{atm}}{P_i} \right)^{\frac{1}{a}}$$

ex $$1000.016\text{kg/m}^3 = 500\text{kg/m}^3 \cdot \left(\frac{350\text{Pa}}{66.31\text{Pa}} \right)^{\frac{1}{2.4}}$$

8) Height of Fluid Column of Constant Specific Weight

Open Calculator

fx $$h_c = \frac{P_0}{d_0 \cdot g}$$

ex $$20.40816\text{mm} = \frac{10\text{N/m}^2}{50\text{kg/m}^3 \cdot 9.8\text{m/s}^2}$$

9) Initial Density According to Polytropic Process

Open Calculator

fx $$P_i = P_{atm} \cdot \left(\frac{\rho_1}{\rho_0} \right)^{a}$$

ex $$66.3126\text{Pa} = 350\text{Pa} \cdot \left(\frac{500\text{kg/m}^3}{1000\text{kg/m}^3} \right)^{2.4}$$

10) Initial Pressure according to Polytropic Process

Open Calculator

$$P_i = \frac{P_{atm} \cdot \rho_1^a}{\rho_0^a}$$

$$66.3126\text{Pa} = \frac{350\text{Pa} \cdot (500\text{kg/m}^3)^{2.4}}{(1000\text{kg/m}^3)^{2.4}}$$

11) Positive Constant

Open Calculator

$$a = \frac{1}{1 - K_h \cdot \frac{\lambda}{G}}$$

$$1.000006 = \frac{1}{1 - 0.000001\text{Hz} \cdot \frac{58}{10}}$$

12) Temperature Lapse Rate

Open Calculator

$$\lambda = \frac{G}{b} \cdot \left(\frac{a-1}{a}\right)$$

$$58.33333 = \frac{10}{0.1} \cdot \left(\frac{2.4-1}{2.4}\right)$$

Measurement of Pressure

13) Pressure at Point m in Pizometer

Open Calculator

$$p = S \cdot h$$

$$825\text{Pa} = 0.75\text{kN/m}^3 \cdot 1.1\text{m}$$

14) Pressure Head at Point in Piezometer

Open Calculator

$$h = \frac{p}{S}$$

$$1.1\text{m} = \frac{825\text{Pa}}{0.75\text{kN/m}^3}$$

15) Specific Weight of Liquid in Peizometer

Open Calculator

$$S = \frac{p}{h}$$

$$0.75\text{kN/m}^3 = \frac{825\text{Pa}}{1.1\text{m}}$$

Variables Used

- **a** Constant a
- **b** Constant b
- **C_p** Specific Heat at Constant Pressure *(Joule per Kilogram per Celcius)*
- **C_v** Specific Heat at Constant Volume *(Joule per Kilogram per Celcius)*
- **D** Depth of Point 1 *(Meter)*
- **d_0** Density of Gas *(Kilogram per Cubic Meter)*
- **D_2** Depth of Point 2 *(Meter)*
- **g** Acceleration due to Gravity *(Meter per Square Second)*
- **G** Specific Gravity of Fluid
- **h** Pressure Head *(Meter)*
- **h_1** Pressure Head of Liquid 1 *(Meter)*
- **h_2** Pressure Head of Liquid 2 *(Meter)*
- **h_c** Height of Fluid Column *(Millimeter)*
- **k** Adiabatic Index
- **K_h** Rate Constant *(Hertz)*
- **p** Pressure *(Pascal)*
- **P_0** Pressure of Gas *(Newton per Square Meter)*
- **P_{atm}** Atmospheric Pressure *(Pascal)*
- **P_i** Initial Pressure of System *(Pascal)*
- **S** Specific Weight of Liquid in Piezometer *(Kilonewton per Cubic Meter)*
- **SW_1** Specific Weight 1 *(Kilonewton per Cubic Meter)*
- **w_2** Specific Weight of Liquid 2 *(Kilonewton per Cubic Meter)*

- **ΔP** Pressure Difference *(Newton per Square Meter)*
- **λ** Temperature Lapse Rate
- **ρ_0** Density of Fluid *(Kilogram per Cubic Meter)*
- **ρ_1** Density 1 *(Kilogram per Cubic Meter)*

Constants, Functions, Measurements used

- Measurement: **Length** in Meter (m), Millimeter (mm)
  Length Unit Conversion
- Measurement: **Pressure** in Pascal (Pa), Newton per Square Meter (N/m²)
  Pressure Unit Conversion
- Measurement: **Acceleration** in Meter per Square Second (m/s²)
  Acceleration Unit Conversion
- Measurement: **Frequency** in Hertz (Hz)
  Frequency Unit Conversion
- Measurement: **Specific Heat Capacity** in Joule per Kilogram per Celcius (J/kg*°C)
  Specific Heat Capacity Unit Conversion
- Measurement: **Density** in Kilogram per Cubic Meter (kg/m³)
  Density Unit Conversion
- Measurement: **Specific Weight** in Kilonewton per Cubic Meter (kN/m³)
  Specific Weight Unit Conversion

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- Culverts Formulas
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- Equations of Motion and Energy Equation Formulas
- Flow of Compressible Fluids Formulas
- Flow Over Notches and Weirs Formulas
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