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Pipes Formulas

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List of 12 Pipes Formulas

Pipes

1) Barlow's Formula for Pipe

Open Calculator

fx $$P = \frac{2 \cdot \sigma \cdot t}{D_o}$$

ex $$24351.3\text{Pa} = \frac{2 \cdot 93.3\text{Pa} \cdot 7.83\text{m}}{0.06\text{m}}$$

2) Coefficient of Discharge at Venacontracta of Orifice

Open Calculator

fx $$C_d = C_c \cdot C_v$$

ex $$0.315 = 15 \cdot 0.021$$

3) Depth of Centroid given Total Hydrostatic Force

Open Calculator

fx $$h_G = \frac{F_{hs}}{\gamma_1 \cdot SA_{Wetted}}$$

ex $$0.012351\text{m} = \frac{121\text{N}}{1342\text{N/m}^3 \cdot 7.3\text{m}^2}$$

4) Diameter of Pipe given Head Loss due to Laminar Flow

Open Calculator

fx $$D_{pipe} = \left(\frac{128 \cdot \mu \cdot Q \cdot s}{y \cdot \pi \cdot h_f} \right)^{\frac{1}{4}}$$

ex $$1.024934\text{m} = \left(\frac{128 \cdot 94.18672\text{N} \cdot 13.5\text{m}^3/\text{s} \cdot 0.002232\text{m}}{87.32\text{N}/\text{m}^3 \cdot \pi \cdot 1.2\text{m}} \right)^{\frac{1}{4}}$$

5) Frictional Factor of Laminar flow

Open Calculator

fx $$f = \frac{64}{Re}$$

ex $$0.0128 = \frac{64}{5000}$$

6) Head Loss due to Laminar Flow

Open Calculator

fx $$h_f = \frac{128 \cdot \mu \cdot Q \cdot s}{\pi \cdot \gamma \cdot d_{pipe}^4}$$

ex $$1.2\text{m} = \frac{128 \cdot 94.18672\text{N} \cdot 13.5\text{m}^3/\text{s} \cdot 0.002232\text{m}}{\pi \cdot 92.6\text{N}/\text{m}^3 \cdot (1.01\text{m})^4}$$

7) Head Loss using Efficiency of Hydraulic Transmission

Open Calculator

fx $$h_f = H_{ent} - \eta \cdot H_{ent}$$

ex $$1.2\text{m} = 6\text{m} - 0.80 \cdot 6\text{m}$$

8) Heat Loss due to Pipe

Open Calculator

fx $$Qpipeloss = \frac{F_{viscous} \cdot L_{pipe} \cdot u_{Fluid}^2}{2 \cdot d \cdot g}$$

ex $$4.833512J = \frac{2.5N \cdot 3m \cdot (12m/s)^2}{2 \cdot 11.4m \cdot 9.8m/s^2}$$

9) Length of Pipe given Head loss

Open Calculator

fx $$s = h_f \cdot \gamma \cdot \pi \cdot \frac{d_{pipe}^4}{128 \cdot Q \cdot \mu}$$

ex $$0.002232m = 1.2m \cdot 92.6N/m^3 \cdot \pi \cdot \frac{(1.01m)^4}{128 \cdot 13.5m^3/s \cdot 94.18672N}$$

10) Viscous Force Per Unit Area

Open Calculator

fx $$F_v = \frac{F_{viscous}}{A}$$

ex $$0.05Pa = \frac{2.5N}{50m^2}$$

11) Viscous Force using Head loss Due to Laminar Flow

Open Calculator

fx $$\mu = h_f \cdot \gamma \cdot \pi \cdot \frac{d_{pipe}^4}{128 \cdot Q \cdot s}$$

ex $$94.18672\text{N} = 1.2\text{m} \cdot 92.6\text{N/m}^3 \cdot \pi \cdot \frac{(1.01\text{m})^4}{128 \cdot 13.5\text{m}^3/\text{s} \cdot 0.002232\text{m}}$$

12) Viscous Stress

Open Calculator

fx $$V_s = \mu_{viscosity} \cdot \frac{VG}{DL}$$

ex $$3.820225\text{N} = 10.2\text{P} \cdot \frac{20\text{m/s}}{5.34\text{m}}$$

Variables Used

- **A** Area *(Square Meter)*
- C_c Coefficient of Contraction
- C_d Coefficient of Discharge
- C_v Coefficient of Velocity
- **d** Diameter *(Meter)*
- D_o Outside Diameter *(Meter)*
- d_{pipe} Pipe Diameter *(Meter)*
- D_{pipe} Diameter of Pipe *(Meter)*
- **DL** Fluid Thickness *(Meter)*
- **f** Friction Factor
- F_{hs} Hydrostatic Force *(Newton)*
- F_v Viscous Force *(Pascal)*
- $F_{viscous}$ Force *(Newton)*
- **g** Acceleration Due To Gravity *(Meter per Square Second)*
- H_{ent} Total Head at Entrance *(Meter)*
- h_f Head loss *(Meter)*
- h_G Depth of Centroid *(Meter)*
- L_{pipe} Length *(Meter)*
- **P** Pressure *(Pascal)*
- **Q** Rate of Flow *(Cubic Meter per Second)*
- **Qpipeloss** Heat Loss due to Pipe *(Joule)*
- **Re** Reynolds Number

- **s** Change in Drawdown *(Meter)*
- **SA_{Wetted}** Surface Area *(Square Meter)*
- **t** Wall Thickness *(Meter)*
- **u_{Fluid}** Fluid Velocity *(Meter per Second)*
- **V_s** Viscous Stress *(Newton)*
- **VG** Velocity Gradient *(Meter per Second)*
- **y** Specific Weight of Liquid *(Newton per Cubic Meter)*
- **γ** Specific Weight *(Newton per Cubic Meter)*
- **$γ_1$** Specific Weight 1 *(Newton per Cubic Meter)*
- **η** Efficiency
- **μ** Viscous Force head loss *(Newton)*
- **$μ_{viscosity}$** Dynamic Viscosity *(Poise)*
- **σ** Applied Stress *(Pascal)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Area** in Square Meter (m²)
  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/s²)
  Acceleration Unit Conversion
- Measurement: **Energy** in Joule (J)
  Energy Unit Conversion
- Measurement: **Force** in Newton (N)
  Force Unit Conversion
- Measurement: **Volumetric Flow Rate** in Cubic Meter per Second (m³/s)
  Volumetric Flow Rate Unit Conversion
- Measurement: **Dynamic Viscosity** in Poise (P)
  Dynamic Viscosity Unit Conversion
- Measurement: **Specific Weight** in Newton per Cubic Meter (N/m³)
  Specific Weight Unit Conversion

Check other formula lists

- Fluid Force Formulas
- Fluid in Motion Formulas
- Hydrostatic Fluid Formulas
- Liquid Jet Formulas
- Pipes Formulas
- Pressure Relations Formulas
- Specific Weight Formulas

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