

# Important Flow Measurement Formulas PDF



## Formulas Examples with Units

### List of 16 Important Flow Measurement Formulas

#### 1) Absolute Viscosity Formula

Formula

$$\mu_a = \frac{V \cdot D \cdot \rho}{R}$$

Example with Units

$$3 \text{ Pa}\cdot\text{s} = \frac{300 \text{ m/s} \cdot 0.05 \text{ m} \cdot 1000 \text{ kg/m}^3}{5000}$$

Evaluate Formula

#### 2) Average Velocity of Fluid Formula

Formula

$$V_{\text{avg}} = \frac{F_v}{A}$$

Example with Units

$$3.3333 \text{ m/s} = \frac{1.2 \text{ m}^3/\text{s}}{0.36 \text{ m}^2}$$

Evaluate Formula

#### 3) Density of Liquid Formula

Formula

$$\rho = \frac{R \cdot \mu_a}{V \cdot D}$$

Example with Units

$$1000 \text{ kg/m}^3 = \frac{5000 \cdot 3 \text{ Pa}\cdot\text{s}}{300 \text{ m/s} \cdot 0.05 \text{ m}}$$

Evaluate Formula

#### 4) Drag Coefficient of Pipe Formula

Formula

$$C_D = \frac{F \cdot 2 \cdot [g]}{\gamma \cdot A \cdot V}$$

Example with Units

$$1.2107 = \frac{600 \text{ N} \cdot 2 \cdot 9.8066 \text{ m/s}^2}{0.09 \text{ kN/m}^3 \cdot 0.36 \text{ m}^2 \cdot 300 \text{ m/s}}$$

Evaluate Formula

#### 5) Flow Rate Formula

Formula

$$F_v = A \cdot V_{\text{avg}}$$

Example with Units

$$1.1916 \text{ m}^3/\text{s} = 0.36 \text{ m}^2 \cdot 3.31 \text{ m/s}$$

Evaluate Formula

#### 6) Head Loss Formula

Formula

$$H_f = \frac{f \cdot L_p \cdot V_{\text{avg}}^2}{2 \cdot D \cdot [g]}$$

Example with Units

$$12.3173 \text{ m} = \frac{0.03 \cdot 36.75 \text{ m} \cdot 3.31 \text{ m/s}^2}{2 \cdot 0.05 \text{ m} \cdot 9.8066 \text{ m/s}^2}$$

Evaluate Formula



## 7) Head Loss Due to Fitting Formula

Formula

$$H_f = \frac{K \cdot V_{\text{avg}}^2}{2 \cdot [g]}$$

Example with Units

$$12.5686\text{m} = \frac{22.5 \cdot 3.31\text{m/s}^2}{2 \cdot 9.8066\text{m/s}^2}$$

Evaluate Formula 

## 8) Length of Pipe Formula

Formula

$$L_p = \frac{2 \cdot D \cdot H_f \cdot [g]}{f \cdot V_{\text{avg}}^2}$$

Example with Units

$$36.9074\text{m} = \frac{2 \cdot 0.05\text{m} \cdot 12.37\text{m} \cdot 9.8066\text{m/s}^2}{0.03 \cdot 3.31\text{m/s}^2}$$

Evaluate Formula 

## 9) Length of weighing platform Formula

Formula

$$L = \frac{W_m \cdot S}{Q}$$

Example with Units

$$36.54\text{m} = \frac{29\text{kg} \cdot 0.252\text{m/s}}{0.2\text{kg/s}}$$

Evaluate Formula 

## 10) Loss Coefficient for Various Fitting Formula

Formula

$$K = \frac{H_f \cdot 2 \cdot [g]}{V_{\text{avg}}^2}$$

Example with Units

$$22.1444 = \frac{12.37\text{m} \cdot 2 \cdot 9.8066\text{m/s}^2}{3.31\text{m/s}^2}$$

Evaluate Formula 

## 11) Mass Flow Rate Formula

Formula

$$Q = \rho_m \cdot F_v$$

Example with Units

$$0.192\text{kg/s} = 0.16\text{kg/m}^3 \cdot 1.2\text{m}^3/\text{s}$$

Evaluate Formula 

## 12) Pipe Diameter Formula

Formula

$$D = \frac{f \cdot L_p \cdot V_{\text{avg}}^2}{2 \cdot H_f \cdot [g]}$$

Example with Units

$$0.0498\text{m} = \frac{0.03 \cdot 36.75\text{m} \cdot 3.31\text{m/s}^2}{2 \cdot 12.37\text{m} \cdot 9.8066\text{m/s}^2}$$

Evaluate Formula 

## 13) Reynolds number of fluid flowing in Pipe Formula

Formula

$$R = \frac{V \cdot D \cdot \rho}{\mu_a}$$

Example with Units

$$5000 = \frac{300\text{m/s} \cdot 0.05\text{m} \cdot 1000\text{kg/m}^3}{3\text{Pa}\cdot\text{s}}$$

Evaluate Formula 



#### 14) Speed of Conveyor Belt Formula

Formula

$$S = \frac{L \cdot Q}{W_m}$$

Example with Units

$$0.2517 \text{ m/s} = \frac{36.5 \text{ m} \cdot 0.2 \text{ kg/s}}{29 \text{ kg}}$$

Evaluate Formula 

#### 15) Volume Flow Rate Formula

Formula

$$F_v = \frac{Q}{\rho_m}$$

Example with Units

$$1.25 \text{ m}^3/\text{s} = \frac{0.2 \text{ kg/s}}{0.16 \text{ kg/m}^3}$$

Evaluate Formula 

#### 16) Weight of Material on Length of Weighing Platform Formula

Formula

$$W_m = \frac{Q \cdot L}{S}$$

Example with Units

$$28.9683 \text{ kg} = \frac{0.2 \text{ kg/s} \cdot 36.5 \text{ m}}{0.252 \text{ m/s}}$$











Evaluate Formula 



## Variables used in list of Flow Measurement Formulas above


- $\mu_a$  Absolute Fluid Viscosity (Pascal Second)
- **A** Pipe Cross Sectional Area (Square Meter)
- $C_D$  Drag Coefficient
- **D** Pipe Diameter (Meter)
- **f** Friction Factor
- **F** Force Flow (Newton)
- $F_V$  Volume Flow Rate (Cubic Meter per Second)
- $H_f$  Head Loss due to Friction (Meter)
- **K** Head Loss Coefficient
- **L** Weighing Platform Length (Meter)
- $L_p$  Pipe Length (Meter)
- **Q** Mass Flow Rate (Kilogram per Second)
- **R** Reynolds Number
- **S** Conveyor Belt Speed (Meter per Second)
- **V** Fluid Velocity (Meter per Second)
- $V_{avg}$  Fluid Average Velocity (Meter per Second)
- $W_m$  Material Weight Flow (Kilogram)
- $\gamma$  Specific Weight Fluid Flow (Kilonewton per Cubic Meter)
- $\rho$  Fluid Density (Kilogram per Cubic Meter)
- $\rho_m$  Material Density (Kilogram per Cubic Meter)

## Constants, Functions, Measurements used in list of Flow Measurement Formulas above

- **constant(s):** [g], 9.80665  
Gravitational acceleration on Earth
- **Measurement: Length** in Meter (m)  
Length Unit Conversion 
- **Measurement: Weight** in Kilogram (kg)  
Weight Unit Conversion 
- **Measurement: Area** in Square Meter (m<sup>2</sup>)  
Area Unit Conversion 
- **Measurement: Speed** in Meter per Second (m/s)  
Speed Unit Conversion 
- **Measurement: Force** in Newton (N)  
Force Unit Conversion 
- **Measurement: Volumetric Flow Rate** in Cubic Meter per Second (m<sup>3</sup>/s)  
Volumetric Flow Rate Unit Conversion 
- **Measurement: Mass Flow Rate** in Kilogram per Second (kg/s)  
Mass Flow Rate Unit Conversion 
- **Measurement: Dynamic Viscosity** in Pascal Second (Pa\*s)  
Dynamic Viscosity Unit Conversion 
- **Measurement: Density** in Kilogram per Cubic Meter (kg/m<sup>3</sup>)  
Density Unit Conversion 
- **Measurement: Specific Weight** in Kilonewton per Cubic Meter (kN/m<sup>3</sup>)  
Specific Weight Unit Conversion 



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