

Important Displacement and Drag Formulas PDF



Formulas
Examples
with Units

List of 10 Important Displacement and Drag Formulas

1) Displacement Efficiency Formulas

1.1) Displacement Efficiency of Sedimentation Tank Formula

Formula

$$D^e = \frac{F_t}{T_d}$$

Example with Units

$$0.0111 = \frac{2_s}{3_{\min}}$$

Evaluate Formula 

1.2) Flow through Period given Displacement Efficiency of Sedimentation Tank Formula

Formula

$$F_t = T_d \cdot D^e$$

Example with Units

$$1.8_s = 3_{\min} \cdot 0.01$$

Evaluate Formula 

2) Displacement Velocity Formulas

2.1) Displacement Velocity for Fine Particles Formula

Formula

$$v_d = V_s \cdot \sqrt{\frac{8}{f}}$$

Example with Units

$$6_{\text{m/s}} = 1.5_{\text{m/s}} \cdot \sqrt{\frac{8}{0.5}}$$

Evaluate Formula 

2.2) Displacement Velocity given Settling Velocity Formula

Formula

$$v_d = 18 \cdot V_s$$

Example with Units

$$27_{\text{m/s}} = 18 \cdot 1.5_{\text{m/s}}$$

Evaluate Formula 

2.3) Displacement Velocity when friction factor is 0.025 Formula

Formula

$$v_d = V_s \cdot \sqrt{\frac{8}{0.025}}$$

Example with Units

$$26.8328_{\text{m/s}} = 1.5_{\text{m/s}} \cdot \sqrt{\frac{8}{0.025}}$$

Evaluate Formula 



3) Drag Coefficient Formulas

3.1) Drag Coefficient given Settling Velocity with respect to Specific Gravity Formula

Formula

$$C_D = 4 \cdot [g] \cdot (a - 1) \cdot \frac{D}{3 \cdot V_s^2}$$

Example with Units

$$32.5435 = 4 \cdot 9.8066 \text{ m/s}^2 \cdot (2.4 - 1) \cdot \frac{4 \text{ m}}{3 \cdot 1.5 \text{ m/s}^2}$$

Evaluate Formula

3.2) Drag Coefficient with respect to Reynold's Number Formula

Formula

$$C_D = \left(\frac{24}{\text{Re}} \right) + \left(\frac{3}{\sqrt{\text{Re}}} \right) + 0.34$$

Example

$$1221.5532 = \left(\frac{24}{0.02} \right) + \left(\frac{3}{\sqrt{0.02}} \right) + 0.34$$

Evaluate Formula

3.3) General form of Drag Coefficient Formula

Formula

$$C_D = \frac{24}{\text{Re}}$$

Example

$$1200 = \frac{24}{0.02}$$

Evaluate Formula

4) Drag Force Formulas

4.1) Diameter given Drag Force as per Stokes Law Formula

Formula

$$D_S = \frac{F_D}{3} \cdot \pi \cdot V_s \cdot \mu_{\text{viscosity}}$$

Example with Units

$$128.177 \text{ m} = \frac{80 \text{ N}}{3} \cdot 3.1416 \cdot 1.5 \text{ m/s} \cdot 10.2 \text{ P}$$

Evaluate Formula

4.2) Drag Force as per Stokes Law Formula

Formula

$$F_D = 3 \cdot \frac{D_S}{\pi \cdot \mu_{\text{viscosity}} \cdot V_s}$$

Example with Units

$$79.8895 \text{ N} = 3 \cdot \frac{128 \text{ m}}{3.1416 \cdot 10.2 \text{ P} \cdot 1.5 \text{ m/s}}$$

Evaluate Formula



Variables used in list of Displacement and Drag Formulas above

- **a** Constant a
- **C_D** Drag Coefficient
- **D** Diameter (Meter)
- **D_S** Diameter of Spherical particle (Meter)
- **D^e** Displacement Efficiency
- **f** Darcy Friction Factor
- **F_D** Drag Force (Newton)
- **F_t** Flowing through Period (Second)
- **Re** Reynold Number
- **T_d** Detention Time (Minute)
- **v_d** Displacement Velocity (Meter per Second)
- **V_s** Settling Velocity (Meter per Second)
- **μ_{viscosity}** Dynamic Viscosity (Poise)

Constants, Functions, Measurements used in list of Displacement and Drag Formulas above

- **constant(s):** pi, 3.14159265358979323846264338327950288
Archimedes' constant
- **constant(s):** [g], 9.80665
Gravitational acceleration on Earth
- **Functions:** **sqrt**, sqrt(Number)
A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- **Measurement: Length** in Meter (m)
Length Unit Conversion 
- **Measurement: Time** in Second (s), Minute (min)
Time Unit Conversion 
- **Measurement: Speed** in Meter per Second (m/s)
Speed Unit Conversion 
- **Measurement: Force** in Newton (N)
Force Unit Conversion 
- **Measurement: Dynamic Viscosity** in Poise (P)
Dynamic Viscosity Unit Conversion 



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