Important Specific Gravity and Density Formulas PDF

Formulas
Examples
with Units

List of 16
Important Specific Gravity and Density Formulas

1) Density of Fluid Formulas

1.1) Mass Density of Fluid given Frictional Drag Formula

Evaluate Formula

Formula

$$\rho_{liquid} = \frac{2 \cdot F_D}{C_d \cdot A_{cs} \cdot V_s^2}$$

Example with Units

$$49.728\,\text{kg/m}^3 = \frac{2 \cdot 80\,\text{N}}{0.11 \cdot 13\,\text{m}^2 \cdot 1.5\,\text{m/s}^2}$$

2) Density of Particle Formulas

2.1) Mass Density of Particle given Impelling Force Formula

Evaluate Formula

Formula

$$\rho_p = \left(\frac{F}{[g] \cdot V_p}\right) + \rho_{liquid}$$

Example with Units

$$7E\text{-}5\,\text{g/mm}^3 = \left(\frac{2E\text{-}6\,\text{kgf}}{9.8066\,\text{m/s}^2 \cdot 90\,\text{mm}^3}\right) + 48\,\text{kg/m}^3$$

2.2) Mass Density of Particle given Settling Velocity with respect to Dynamic Viscosity Formula

Evaluate Formula

Formula

$$\rho_m = \left(18 \cdot V_s \cdot \frac{\mu_{viscosity}}{D^2} \cdot [g]\right) + \rho_{liquid}$$

Example with Units

$$51.2435\,\text{kg/m}^3 = \left(18 \cdot 1.5\,\text{m/s} \cdot \frac{49\,\text{P}}{20\,\text{m}^2} \cdot 9.8066\,\text{m/s}^2\right) + 48\,\text{kg/m}^3$$

3) Specific Gravity of Fluid Formulas

3.1) Specific Gravity of Fluid for Temperature given Fahrenheit and Diameter greater than 0.1mm Formula

Evaluate Formula

Formula

$$G_f = G - \left(V_s \cdot \frac{60}{418} \cdot d \cdot \left(T_F + 10 \right) \right)$$

Example with Units

$$12.4928 = 16 - \left(1.5\,\text{m/s} \cdot \frac{60}{418} \cdot 0.06\,\text{m} \cdot \left(11\,°\text{F} + 10 \right) \right)$$

3.2) Specific Gravity of Fluid given Settling Velocity at 10 Degree Celsius Formula

Evaluate Formula

Formula

$$G_f = G - \left(\frac{V_s}{418} \cdot d^2 \right)$$

Example with Units

$$16 = 16 - \left(\frac{1.5\,\text{m/s}}{418} \cdot 0.06\,\text{m}^2 \right)$$

3.3) Specific Gravity of Fluid given Settling Velocity calculated in Fahrenheit Formula

Evaluate Formula

Formula

$$G_f = G - \left(\frac{V_s}{418} \cdot d^2 \cdot \left(\frac{t_o + 10}{60} \right) \right)$$

Example with Units

$$15.9999 = 16 - \left(\frac{1.5\,\text{m/s}}{418} \cdot 0.06\,\text{m}^2 \cdot \left(\frac{273\,\text{K} + 10}{60} \right) \right)$$

3.4) Specific Gravity of Fluid given Settling Velocity given Celsius Formula

Evaluate Formula

Formula

$$G_f = G - \left(V_s \cdot \frac{100}{418} \cdot d^2 \cdot \left(3 \cdot t + 70 \right) \right)$$

Example with Units

$$15.5298 = 16 - \left(1.5\,\text{m/s} \cdot \frac{100}{418} \cdot 0.06\,\text{m}^2 \cdot \left(3 \cdot 98 + 70 \right) \right)$$

3.5) Specific Gravity of Fluid given Settling Velocity with respect to Kinematic Viscosity Formula

Evaluate Formula

Formula

$$G_f = G - \left(V_s \cdot 18 \cdot \frac{\nu}{[g]} \cdot d^2 \right)$$

Example with Units

$$16 = 16 - \left(1.5\,\text{m/s} \cdot 18 \cdot \frac{7.25\,\text{St}}{9.8066\,\text{m/s}^2} \cdot 0.06\,\text{m}^2 \right)$$

4) Specific Gravity of Particle Formulas

4.1) Specific Gravity of Particle for Temperature given Celsius and diameter greater than 0.1mm Formula

Evaluate Formula

Formula

$$G = G_f + \left(V_s \cdot \frac{100}{418} \cdot D_{particle} \cdot \left(3 \cdot T_F + 70 \right) \right)$$

Example with Units

$$19.5443 = 14 + \left(1.5\,\text{m/s} \cdot \frac{100}{418} \cdot 0.15 \cdot \left(3 \cdot 11\,^{\circ}\text{F} + 70 \right) \right)$$

4.2) Specific Gravity of Particle for temperature given Fahrenheit and diameter greater than 0.1mm Formula

Evaluate Formula

Formula

$$G = G_f + \left(V_s \cdot \frac{60}{418} \cdot D_{particle} \cdot \left(T_F + 10 \right) \right)$$

Example with Units

$$22.768 = 14 + \left(1.5\,\text{m/s} \cdot \frac{60}{418} \cdot 0.15 \cdot \left(11\,^{\circ}\text{F} + 10 \right) \right)$$

4.3) Specific Gravity of Particle given Displacement Velocity by Camp Formula

Evaluate Formula

Formula

$$\rho_p = \left({v_d}^2 \cdot \frac{f}{8 \cdot [g] \cdot \beta \cdot d} \right) + 1$$

Example with Units

$$0.0003\,\text{g/mm}^3 = \left({0.0288\,\text{m/s}}^2 \cdot \frac{0.5}{8 \cdot 9.8066\,\text{m/s}^2 \cdot 10 \cdot 0.06\,\text{m}} \right) + 1$$

4.4) Specific Gravity of Particle given Settling Velocity at 10 degree Celsius Formula

Evaluate Formula

Formula

$$G = G_f + \left(\frac{V_s}{418} \cdot d^2 \right)$$

Example with Units

$$14 = 14 + \left(\frac{1.5\,\text{m/s}}{418} \cdot {0.06\,\text{m}}^2 \right)$$

4.5) Specific Gravity of Particle given Settling Velocity calculated in Fahrenheit Formula

Evaluate Formula

Formula

$$G = G_f + \left(\frac{V_s}{418} \cdot d^2 \cdot \left(\frac{t_o + 10}{60} \right) \right)$$

Example with Units

$$14.0001 = 14 + \left(\frac{1.5\,\text{m/s}}{418} \cdot 0.06\,\text{m}^2 \cdot \left(\frac{273\,\text{K} + 10}{60} \right) \right)$$

4.6) Specific Gravity of Particle given Settling Velocity given Celsius Formula

Evaluate Formula

Formula

$$G = G_f + \left(V_s \cdot \frac{100}{418} \cdot D_{particle}^2 \cdot (3 \cdot t + 70) \right)$$

Example with Units

$$16.939 = 14 + \left(1.5\,\text{m/s} \cdot \frac{100}{418} \cdot 0.15^2 \cdot (3 \cdot 98 + 70) \right)$$

4.7) Specific Gravity of Particle given Settling Velocity with respect to Kinematic Viscosity Formula

Evaluate Formula

Formula

$$G = \left(18 \cdot V_s \cdot \frac{\nu}{[g]} \cdot d^2 \right) + G_f$$

Example with Units

$$14 = \left(18 \cdot 1.5\,\text{m/s} \cdot \frac{7.25\,\text{St}}{9.8066\,\text{m/s}^2} \cdot 0.06\,\text{m}^2 \right) + 14$$

4.8) Specific Gravity of Particle given Settling Velocity with respect to Specific Gravity Formula

Evaluate Formula

Formula

$$SG = \left(\frac{3 \cdot C_D \cdot V_s^2}{4 \cdot [g] \cdot d} \right) + 1$$

Example with Units

$$3442.5422 = \left(\frac{3 \cdot 1200 \cdot 1.5\,\text{m/s}^2}{4 \cdot 9.8066\,\text{m/s}^2 \cdot 0.06\,\text{m}} \right) + 1$$

Variables used in list of Specific Gravity and Density Formulas above

- A_{cs} Cross-Sectional Area *(Square Meter)*
- C_d Coefficient of Drag
- C_D Drag Coefficient
- **d** Diameter D *(Meter)*
- **D** Diameter *(Meter)*
- $D_{particle}$ Diameter of particle
- **f** Darcy Friction Factor
- **F** Impelling Force *(Kilogram-Force)*
- F_D Drag Force *(Newton)*
- **G** Specific Gravity of Particle
- G_f Specific Gravity of Fluid
- **SG** Specific Gravity of Material
- **t** Temperature
- T_F Temperature in Fahrenheit *(Fahrenheit)*
- t_o Outside Temperature *(Kelvin)*
- v_d Displacement Velocity *(Meter per Second)*
- V_p Volume of One Particle *(Cubic Millimeter)*
- V_s Settling Velocity *(Meter per Second)*
- **β** Beta Constant
- $\mu_{viscosity}$ Dynamic Viscosity *(Poise)*
- **v** Kinematic Viscosity *(Stokes)*
- ρ_{liquid} Liquid Density *(Kilogram per Cubic Meter)*
- ρ_m Mass Density of Particles *(Kilogram per Cubic Meter)*
- ρ_p Density of Particle *(Gram per Cubic Millimeter)*

Constants, Functions, Measurements used in list of Specific Gravity and Density Formulas above

- constant(s): **[g]**, 9.80665
  Gravitational acceleration on Earth
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Temperature** in Fahrenheit (°F), Kelvin (K)
  Temperature Unit Conversion
- Measurement: **Volume** in Cubic Millimeter (mm^3)
  Volume Unit Conversion
- Measurement: **Area** in Square Meter (m^2)
  Area Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Force** in Newton (N), Kilogram-Force (kgf)
  Force Unit Conversion
- Measurement: **Dynamic Viscosity** in Poise (P)
  Dynamic Viscosity Unit Conversion
- Measurement: **Mass Concentration** in Kilogram per Cubic Meter (kg/m^3)
  Mass Concentration Unit Conversion
- Measurement: **Kinematic Viscosity** in Stokes (St)
  Kinematic Viscosity Unit Conversion
- Measurement: **Density** in Kilogram per Cubic Meter (kg/m^3), Gram per Cubic Millimeter (g/mm^3)
  Density Unit Conversion

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