Important Liquid Jet Formulas PDF

Formulas
Examples
with Units

List of 12
Important Liquid Jet Formulas

1) Angle of Jet given Maximum Vertical Elevation Formula

Evaluate Formula

Formula

$$\Theta = a\sin\left(\sqrt{\frac{H \cdot 2 \cdot g}{V_o^2}}\right)$$

Example with Units

$$24.4997° = a\sin\left(\sqrt{\frac{23\,\text{m} \cdot 2 \cdot 9.8\,\text{m/s}^2}{51.2\,\text{m/s}^2}}\right)$$

2) Angle of Jet given Time of Flight of Liquid Jet Formula

Evaluate Formula

Formula

$$\Theta = a\sin\left(T \cdot \frac{g}{2 \cdot V_o}\right)$$

Example with Units

$$25.5097° = a\sin\left(4.5\,\text{s} \cdot \frac{9.8\,\text{m/s}^2}{2 \cdot 51.2\,\text{m/s}}\right)$$

3) Angle of Jet given Time to Reach Highest Point Formula

Evaluate Formula

Formula

$$\Theta = a\sin\left(T \cdot \frac{g}{V_o}\right)$$

Example with Units

$$59.466° = a\sin\left(4.5\,\text{s} \cdot \frac{9.8\,\text{m/s}^2}{51.2\,\text{m/s}}\right)$$

4) Friction Velocity Formula

Evaluate Formula

Formula

$$V_f = V \cdot \sqrt{\frac{f}{8}}$$

Example with Units

$$9.8993\,\text{m/s} = 17.2\,\text{m/s} \cdot \sqrt{\frac{2.65}{8}}$$

5) Horizontal Range of Jet Formula

Evaluate Formula

Formula

$$L = V_o^2 \cdot \frac{\sin(2 \cdot \Theta)}{g}$$

Example with Units

$$267.4939\,\text{m} = 51.2\,\text{m/s}^2 \cdot \frac{\sin(2 \cdot 45°)}{9.8\,\text{m/s}^2}$$

6) Initial Velocity given Time of Flight of Liquid Jet Formula

Evaluate Formula

Formula

$$V_o = T \cdot \frac{g}{\sin(\Theta)}$$

Example with Units

$$62.3668\,\text{m/s} = 4.5\,\text{s} \cdot \frac{9.8\,\text{m/s}^2}{\sin(45°)}$$

7) Initial Velocity given Time to Reach Highest Point of Liquid Formula

Evaluate Formula

Formula

$$V_o = T' \cdot \frac{g}{\sin(\Theta)}$$

Example with Units

$$207.8894\,\text{m/s} = 15\,\text{s} \cdot \frac{9.8\,\text{m/s}^2}{\sin(45°)}$$

8) Initial Velocity of Liquid Jet given Maximum Vertical Elevation Formula

Evaluate Formula

Formula

$$V_o = \sqrt{H \cdot 2 \cdot \frac{g}{\sin(\Theta) \cdot \sin(\Theta)}}$$

Example with Units

$$30.0267\,\text{m/s} = \sqrt{23\,\text{m} \cdot 2 \cdot \frac{9.8\,\text{m/s}^2}{\sin(45°) \cdot \sin(45°)}}$$

9) Maximum Vertical Elevation of Jet Profile Formula

Evaluate Formula

Formula

$$H = \frac{V_o^2 \cdot \sin(\Theta) \cdot \sin(\Theta)}{2 \cdot g}$$

Example with Units

$$66.8735\,\text{m} = \frac{51.2\,\text{m/s}^2 \cdot \sin(45°) \cdot \sin(45°)}{2 \cdot 9.8\,\text{m/s}^2}$$

10) Mean Velocity given Frictional Velocity Formula

Evaluate Formula

Formula

$$V = \frac{V_f}{\sqrt{\frac{f}{8}}}$$

Example with Units

$$10.4249\,\text{m/s} = \frac{6\,\text{m/s}}{\sqrt{\frac{2.65}{8}}}$$

11) Time of Flight of Jet Formula

Evaluate Formula

Formula

$$T = \frac{2 \cdot V_o \cdot \sin(\Theta)}{g}$$

Example with Units

$$7.3885\,\text{s} = \frac{2 \cdot 51.2\,\text{m/s} \cdot \sin(45°)}{9.8\,\text{m/s}^2}$$

12) Variation of y with x in Free Liquid Jet Formula

Evaluate Formula

Formula

$$y = x \cdot \tan(\theta) - \frac{g \cdot x^2 \cdot \sec(\theta)}{2 \cdot V_o^2}$$

Example with Units

$$0.1999\,\text{m} = 0.2\,\text{m} \cdot \tan(45°) - \frac{9.8\,\text{m/s}^2 \cdot 0.2\,\text{m}^2 \cdot \sec(45°)}{2 \cdot 51.2\,\text{m/s}^2}$$

Variables used in list of Liquid Jet Formulas above

- **f** Friction Factor
- **g** Acceleration due to Gravity *(Meter per Square Second)*
- **H** Maximum Vertical Elevation *(Meter)*
- **L** Range *(Meter)*
- **T** Time of Flight *(Second)*
- **T'** Time to Reach Highest Point *(Second)*
- **V** Mean Velocity *(Meter per Second)*
- V_f Friction Velocity *(Meter per Second)*
- V_o Initial Velocity of Liquid Jet *(Meter per Second)*
- **x** Length x *(Meter)*
- **y** Length y *(Meter)*
- **Θ** Angle of Liquid Jet *(Degree)*

Constants, Functions, Measurements used in list of Liquid Jet Formulas above

- Functions: **asin**, asin(Number)
  The inverse sine function, is a trigonometric function that takes a ratio of two sides of a right triangle and outputs the angle opposite the side with the given ratio.
- Functions: **sec**, sec(Angle)
  Secant is a trigonometric function that is defined ratio of the hypotenuse to the shorter side adjacent to an acute angle (in a right-angled triangle); the reciprocal of a cosine.
- Functions: **sin**, sin(Angle)
  Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.
- 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.
- Functions: **tan**, tan(Angle)
  The tangent of an angle is a trigonometric ratio of the length of the side opposite an angle to the length of the side adjacent to an angle in a right triangle.
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Time** in Second (s)
  Time 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: **Angle** in Degree (°)
  Angle Unit Conversion

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