Important Force Exerted by Fluid Jet on Moving **Curved Vane Formulas PDF**



List of 21

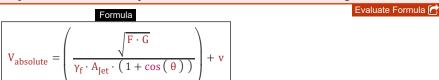
Important Force Exerted by Fluid Jet on Moving **Curved Vane Formulas**

Evaluate Formula

Evaluate Formula C

1) Jet Striking a Symmetrical Moving Curved Vane at Centre Formulas 🕝

1.1) Absolute Velocity for Force Exerted by Jet in Direction of Flow of Incoming Jet Formula 🕝



$$9.9176\,\text{m/s} = \left(\frac{\sqrt{2.5\,\text{N}\cdot 10}}{9.81\,\text{kN/m}^3\,\cdot 1.2\,\text{m}^2\,\cdot \left(1+\cos\left(30^\circ\right)\right)}\right) + 9.69\,\text{m/s}$$

1.2) Absolute Velocity for Mass of Fluid Striking Vane per Second Formula 🕝

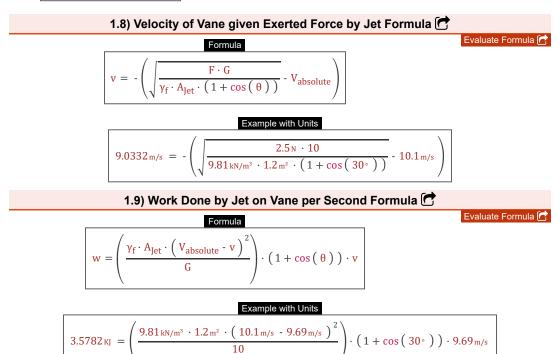
Formula

1.3) Efficiency of Jet Formula C

Formula

$$\eta = \left((2 \cdot v) \cdot \left(V_{absolute} - v \right)^{2} \cdot \left(1 + \cos (\theta) \right) \right) \cdot \frac{100}{V_{absolute}^{3}}$$

$$0.59 = \left((2 \cdot 9.69 \, \text{m/s}) \cdot (10.1 \, \text{m/s} - 9.69 \, \text{m/s})^{2} \cdot (1 + \cos(30^{\circ})) \right) \cdot \frac{100}{10.1 \, \text{m/s}^{3}}$$



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1.4) Kinetic Energy of Jet per Second Formula 🕝

1.5) Mass of Fluid Striking Vane per Seconds Formula 🕝

1.6) Maximum Efficiency Formula

1.7) Velocity of Vane for given Mass of Fluid Formula 🕝

Example with Units

Example with Units

Example with Units

 $KE = \frac{A_{Jet} \cdot v_{jet}^{3}}{2} \left[1036.8j = \frac{1.2 \, m^{2} \cdot 12 \, m/s}{2} \right]$

 $m_f = \frac{\gamma_f \cdot A_{Jet} \cdot \left(\, V_{absolute} - v \, \right)}{G} \, \left| \, \right| \, 0.4827 \, \mathrm{kg} \, = \frac{9.81 \, \mathrm{kN/m^3} \, \cdot 1.2 \, \mathrm{m^2} \, \cdot \left(\, 10.1 \, \mathrm{m/s} \, - 9.69 \, \mathrm{m/s} \, \, \right)}{10}$

 $\eta_{\text{max}} = \left(\frac{1}{2}\right) \cdot \left(1 + \cos\left(\theta\right)\right) \quad \left| \quad 0.933 = \left(\frac{1}{2}\right) \cdot \left(1 + \cos\left(30^{\circ}\right)\right)\right|$

 $v = V_{absolute} - \left(\frac{m_f \cdot G}{\gamma_f \cdot A_{tot}}\right) \left| \quad 9.3355 \, \text{m/s} \right| = 10.1 \, \text{m/s} - \left(\frac{0.9 \, \text{kg} \cdot 10}{9.81 \, \text{kN/m}^2 \cdot 1.2 \, \text{m}^2}\right) \left| \quad 9.3355 \, \text{m/s} \right| = 10.1 \, \text{m/s}$

Formula

Formula

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Evaluate Formula (

Evaluate Formula (

Evaluate Formula [

Evaluate Formula (

1.10) Work Done per Second given Efficiency of Wheel Formula 🕝

Evaluate Formula (

Evaluate Formula (

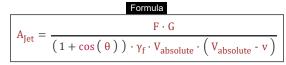
Evaluate Formula (

Evaluate Formula [

Formula Example with Units
$$w = \eta \cdot KE \qquad 0.0096 \, \text{kg} = 0.80 \cdot 12.01 \, \text{J}$$

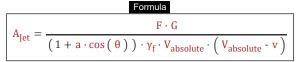
1.11) Area of Cross Section Formulas (

1.11.1) Area of Cross Section for Force Exerted by Jet in Direction of Flow Formula 🕝



$$0.3298 \,\mathrm{m^2} = \frac{2.5 \,\mathrm{N} \cdot 10}{\left(1 + \cos\left(30^{\circ}\right)\right) \cdot 9.81 \,\mathrm{kN/m^3} \cdot 10.1 \,\mathrm{m/s} \cdot \left(10.1 \,\mathrm{m/s} - 9.69 \,\mathrm{m/s}\right)}$$

1.11.2) Area of Cross Section for Force Exerted by Jet with relative velocity Formula 🕝



$$0.3283\,\text{m}^2 \,=\, \frac{2.5\,\text{N}\,\cdot 10}{\left(\,1 +\, 1.01 \cdot \cos\left(\,30^{\,\circ}\,\,\right)\,\,\right) \,\cdot\, 9.81\,\text{kN/m}^3\,\cdot 10.1\,\text{m/s}\,\cdot \left(\,10.1\,\text{m/s}\,-\, 9.69\,\text{m/s}\,\,\right)}$$

1.11.3) Area of Cross Section for Mass of Fluid Striking moving Vane per Second Formula 🕝

$$A_{\text{Jet}} = \frac{m_{\text{f}} \cdot G}{\gamma_{\text{f}} \cdot \left(V_{\text{absolute}} - v \right)} \qquad 2.2376 \, \text{m}^2 = \frac{0.9 \, \text{kg} \cdot 10}{9.81 \, \text{kN/m}^3 \cdot \left(10.1 \, \text{m/s} \, - 9.69 \, \text{m/s} \, \right)}$$

1.11.4) Area of Cross Section for work done by Jet on vane per second Formula 🕝 Evaluate Formula (

 $A_{\text{Jet}} = \frac{w \cdot G}{\gamma_{\text{f}} \cdot (V_{\text{absolute}} - v)^{2} \cdot (1 + \cos(\theta)) \cdot v}$

$$1.3079 \,\mathrm{m^2} \,= \frac{3.9 \,\mathrm{kJ} \cdot 10}{9.81 \,\mathrm{kN/m^3} \cdot \left(\,10.1 \,\mathrm{m/s} \, - 9.69 \,\mathrm{m/s}\,\,\right)^2 \cdot \left(\,1 + \cos\left(\,30^{\,\circ}\,\,\right)\,\right) \cdot 9.69 \,\mathrm{m/s}}$$

1.12) Force Exerted by Jet Formulas

1.12.1) Force Exerted by Jet in Direction of Flow of Incoming Jet with angle at 90 Formula 🕝 Evaluate Formula (

 $Ft = \left(\frac{\gamma_f \cdot A_{Jet} \cdot \left(V_{absolute} - v\right)^2}{G}\right)$

Example with Units
$$0.1979_{\,kN} \,= \left(\frac{9.81_{\,kN/m^3}\,\cdot 1.2_{\,m^2}\,\cdot \left(\,10.1_{\,m/s}\,\,-\,9.69_{\,m/s}\,\,\right)^{\,2}}{10}\right)$$

1.12.2) Force Exerted by Jet in Direction of Flow of Incoming Jet with angle zero Formula 🕝

Evaluate Formula

Evaluate Formula

Formula
$$Ft = \left(\frac{\gamma_f \cdot A_{Jet} \cdot \left(V_{absolute} - v\right)^2}{G}\right)$$

 $0.1979_{kN} = \left(\frac{9.81_{kN/m^3} \cdot 1.2_{m^2} \cdot (10.1_{m/s} - 9.69_{m/s})^2}{10}\right)$

1.12.3) Force Exerted by Jet in direction of Flow of Jet Formula [7] Evaluate Formula

$$F_{s} = \left(\frac{\gamma_{f} \cdot A_{Jet} \cdot V_{absolute} \cdot (V_{absolute} - V)}{G}\right) \cdot (1 + \cos(\theta))$$

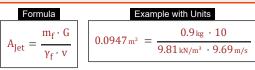
$$9.0965 \, \text{N} \, = \left(\frac{9.81 \, \text{kN/m}^3 \, \cdot \, 1.2 \, \text{m}^2 \, \cdot \, 10.1 \, \text{m/s} \, \cdot \, \left(\, 10.1 \, \text{m/s} \, - \, 9.69 \, \text{m/s} \, \, \right)}{10} \right) \cdot \left(\, 1 + \cos \left(\, 30^{\circ} \, \, \right) \, \right)$$

1.12.4) Force Exerted by jet with relative velocity Formula 🗂

$$F_{S} = \left(\frac{\gamma_{f} \cdot A_{Jet} \cdot V_{absolute} \cdot (V_{absolute} - V)}{G}\right) \cdot (1 + a \cdot \cos(\theta))$$

2) Jet Striking an Unsymmetrical Moving Curved Vane Tangentially at one of the Tips Formulas (**)

2.1) Area of Cross Section for Mass of Fluid Striking Vane per Second Formula 🕝



Evaluate Formula 🕝

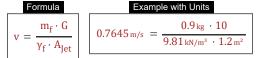
Evaluate Formula (

Evaluate Formula (

2.2) Mass of Fluid Striking Vanes per Second Formula 🕝



2.3) Velocity at Inlet for Mass of Fluid Striking Vane per Second Formula



Variables used in list of Force Exerted by Fluid Jet on Moving Curved Vane Formulas above

- · a Numerical Coefficient a
- A_{Jet} Cross Sectional Area of Jet (Square Meter)
- **F** Force exerted by Jet (Newton)
- **F**_s Force by Stationary Plate (Newton)
- Ft Thrust Force (Kilonewton)
- G Specific Gravity of Fluid
- **KE** Kinetic Energy (Joule)
- m_f Fluid Mass (Kilogram)
- V Velocity of Jet (Meter per Second)
- V_{absolute} Absolute Velocity of Issuing Jet (Meter per Second)
- V_{iet} Fluid Jet Velocity (Meter per Second)
- W Work Done (Kilojoule)
- γ_f Specific Weight of Liquid (Kilonewton per Cubic Meter)
- η Efficiency of Jet
- η_{max} Maximum Efficiency
- θ Theta (Degree)

Constants, Functions, Measurements used in list of Force Exerted by Fluid Jet on Moving Curved Vane Formulas above

- Functions: cos, cos(Angle)
 Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.
- 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: Weight in Kilogram (kg)
 Weight Unit Conversion
- Measurement: Area in Square Meter (m²)
 Area Unit Conversion
- Measurement: Speed in Meter per Second (m/s)
 Speed Unit Conversion
- Measurement: Energy in Joule (J), Kilojoule (KJ)
 Energy Unit Conversion
- Measurement: Force in Newton (N), Kilonewton (kN)
 Force Unit Conversion
- Measurement: Angle in Degree (°)

 Angle Unit Conversion
- Measurement: Specific Weight in Kilonewton per Cubic Meter (kN/m³)
 Specific Weight Unit Conversion

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