calculatoratoz.com

unitsconverters.com

Force Exerted by Fluid Jet on Moving Flat Plate Formulas

Calculators! Examples! Conversions!

Bookmark **calculatoratoz.com**, **unitsconverters.com**

Widest Coverage of Calculators and Growing - **30,000+ Calculators!**
Calculate With a Different Unit for Each Variable - **In built Unit Conversion!**
Widest Collection of Measurements and Units - **250+ Measurements!**

Feel free to SHARE this document with your friends!

Please leave your feedback here...

List of 23 Force Exerted by Fluid Jet on Moving Flat Plate Formulas

Force Exerted by Fluid Jet on Moving Flat Plate

Flat Plate Inclined at an Angle to the Jet

1) Dynamic Thrust Exerted by Jet on Plate

Open Calculator

fx $$\mathrm{Ft} = \left(\frac{\gamma_f \cdot A_{Jet} \cdot (V_{absolute} - v)^2}{G}\right) \cdot \left(\angle D \cdot \left(\frac{180}{\pi}\right)\right)$$

ex $$2.176761\mathrm{kN} = \left(\frac{9.81\mathrm{kN/m^3} \cdot 1.2\mathrm{m^2} \cdot (10.1\mathrm{m/s} - 9.69\mathrm{m/s})^2}{10}\right) \cdot \left(11^\circ \cdot \left(\frac{180}{\pi}\right)\right)$$

2) Normal Thrust Normal to Direction of Jet

Open Calculator

fx $$\mathrm{Ft} = \left(\frac{\gamma_f \cdot A_{Jet} \cdot (V_{absolute} - v)^2}{G}\right) \cdot \left(\angle D \cdot \left(\frac{180}{\pi}\right)\right) \cdot \cos(\theta)$$

ex $$1.88513\mathrm{kN} = \left(\frac{9.81\mathrm{kN/m^3} \cdot 1.2\mathrm{m^2} \cdot (10.1\mathrm{m/s} - 9.69\mathrm{m/s})^2}{10}\right) \cdot \left(11^\circ \cdot \left(\frac{180}{\pi}\right)\right) \cdot \cos(30^\circ)$$

3) Normal Thrust Parallel to Direction of Jet

Open Calculator

fx $$\mathrm{Ft} = \left(\frac{\gamma_f \cdot A_{Jet} \cdot (V_{absolute} - v)^2}{G}\right) \cdot \left(\angle D \cdot \left(\frac{180}{\pi}\right)\right)$$

ex $$2.176761\mathrm{kN} = \left(\frac{9.81\mathrm{kN/m^3} \cdot 1.2\mathrm{m^2} \cdot (10.1\mathrm{m/s} - 9.69\mathrm{m/s})^2}{10}\right) \cdot \left(11^\circ \cdot \left(\frac{180}{\pi}\right)\right)$$

Absolute Velocity

4) Absolute velocity for dynamic thrust exerted by jet on plate

Open Calculator

fx $$V_{absolute} = \left(\sqrt{\frac{m_f \cdot G}{\gamma_f \cdot A_{Jet} \cdot \left(\angle D \cdot \left(\frac{180}{\pi}\right)\right)}}\right) + v$$

ex $$9.698337\text{m/s} = \left(\sqrt{\frac{0.9\text{kg} \cdot 10}{9.81\text{kN/m}^3 \cdot 1.2\text{m}^2 \cdot \left(11^\circ \cdot \left(\frac{180}{\pi}\right)\right)}}\right) + 9.69\text{m/s}$$

5) Absolute Velocity for given Normal Thrust Normal to Direction of Jet

Open Calculator

fx $$V_{absolute} = \left(\sqrt{\frac{Ft \cdot G}{\gamma_f \cdot A_{Jet} \cdot \left(\angle D \cdot \left(\frac{180}{\pi}\right)\right) \cdot \cos(\theta)}}\right) + v$$

ex $$16.36726\text{m/s} = \left(\sqrt{\frac{0.5\text{kN} \cdot 10}{9.81\text{kN/m}^3 \cdot 1.2\text{m}^2 \cdot \left(11^\circ \cdot \left(\frac{180}{\pi}\right)\right) \cdot \cos(30^\circ)}}\right) + 9.69\text{m/s}$$

6) Absolute Velocity for given Normal Thrust Parallel to Direction of Jet

Open Calculator

fx $$V_{absolute} = \sqrt{\frac{Ft \cdot G}{\gamma_f \cdot A_{Jet} \cdot \left(\angle D \cdot \left(\frac{180}{\pi}\right)\right)^2}} + v$$

ex $$9.749247\text{m/s} = \sqrt{\frac{0.5\text{kN} \cdot 10}{9.81\text{kN/m}^3 \cdot 1.2\text{m}^2 \cdot \left(11^\circ \cdot \left(\frac{180}{\pi}\right)\right)^2}} + 9.69\text{m/s}$$

7) Absolute Velocity for Mass of Fluid Striking Plate

Open Calculator

fx $$V_{absolute} = \left(\frac{m_f \cdot G}{\gamma_f \cdot A_{Jet}}\right) + v$$

ex $$9.690765\text{m/s} = \left(\frac{0.9\text{kg} \cdot 10}{9.81\text{kN/m}^3 \cdot 1.2\text{m}^2}\right) + 9.69\text{m/s}$$

Cross Sectional Area

8) Cross Section Area for Mass of Fluid Striking Plate

Open Calculator

$$A_{Jet} = \frac{m_f \cdot G}{\gamma_f \cdot (V_{absolute} - v)}$$

$$2.237637\text{m}^2 = \frac{0.9\text{kg} \cdot 10}{9.81\text{kN/m}^3 \cdot (10.1\text{m/s} - 9.69\text{m/s})}$$

9) Cross Sectional Area for given Dynamic Thrust Exerted by Jet on Plate

Open Calculator

$$A_{Jet} = \frac{m_f \cdot G}{\gamma_f \cdot \left(\angle D \cdot \left(\frac{180}{\pi}\right)\right) \cdot (V_{absolute} - v_{jet})^2}$$

$$0.023103\text{m}^2 = \frac{0.9\text{kg} \cdot 10}{9.81\text{kN/m}^3 \cdot \left(11^\circ \cdot \left(\frac{180}{\pi}\right)\right) \cdot (10.1\text{m/s} - 12\text{m/s})^2}$$

10) Cross Sectional Area for given Normal Thrust Normal to Direction of Jet

Open Calculator

$$A_{Jet} = \frac{Ft \cdot G}{\gamma_f \cdot (V_{absolute} - v)^2 \cdot \left(\angle D \cdot \left(\frac{180}{\pi}\right)\right) \cdot \cos(\theta)}$$

$$0.31828\text{m}^2 = \frac{0.5\text{kN} \cdot 10}{9.81\text{kN/m}^3 \cdot (10.1\text{m/s} - 9.69\text{m/s})^2 \cdot \left(11^\circ \cdot \left(\frac{180}{\pi}\right)\right) \cdot \cos(30^\circ)}$$

11) Cross Sectional Area for given Work Done by Jet per Second

Open Calculator

$$A_{Jet} = \frac{Ft \cdot G}{\gamma_f \cdot (V_{absolute} - v_{jet})^2 \cdot V_j \cdot \angle D^2}$$

$$0.425609\text{m}^2 = \frac{0.5\text{kN} \cdot 10}{9.81\text{kN/m}^3 \cdot (10.1\text{m/s} - 12\text{m/s})^2 \cdot 9\text{m/s} \cdot (11^\circ)^2}$$

Velocity of Jet

12) Velocity of jet for dynamic thrust exerted by jet on plate

Open Calculator

fx $$v = -\left(\sqrt{\frac{m_f \cdot G}{\gamma_f \cdot A_{Jet} \cdot \left(\angle D \cdot \left(\frac{180}{\pi}\right)\right)}} - V_{absolute}\right)$$

ex $$10.09166\text{m/s} = -\left(\sqrt{\frac{0.9\text{kg} \cdot 10}{9.81\text{kN/m}^3 \cdot 1.2\text{m}^2 \cdot \left(11^\circ \cdot \left(\frac{180}{\pi}\right)\right)}} - 10.1\text{m/s}\right)$$

13) Velocity of Jet given Normal Thrust Normal to Direction of Jet

Open Calculator

fx $$v = -\left(\sqrt{\frac{Ft \cdot G}{\gamma_f \cdot A_{Jet} \cdot \left(\angle D \cdot \left(\frac{180}{\pi}\right)\right) \cdot \cos(\theta)}}\right) + V_{absolute}$$

ex $$9.888847\text{m/s} = -\left(\sqrt{\frac{0.5\text{kN} \cdot 10}{9.81\text{kN/m}^3 \cdot 1.2\text{m}^2 \cdot \left(11^\circ \cdot \left(\frac{180}{\pi}\right)\right) \cdot \cos(30^\circ)}}\right) + 10.1\text{m/s}$$

14) Velocity of Jet given Normal Thrust Parallel to Direction of Jet

Open Calculator

fx $$v = -\left(\sqrt{\frac{Ft \cdot G}{\gamma_f \cdot A_{Jet} \cdot \left(\angle D \cdot \left(\frac{180}{\pi}\right)\right)^2}} - V_{absolute}\right)$$

ex $$10.04075\text{m/s} = -\left(\sqrt{\frac{0.5\text{kN} \cdot 10}{9.81\text{kN/m}^3 \cdot 1.2\text{m}^2 \cdot \left(11^\circ \cdot \left(\frac{180}{\pi}\right)\right)^2}} - 10.1\text{m/s}\right)$$

Flat Plate Normal to the Jet

15) Absolute Velocity given Thrust Exerted by Jet on Plate

Open Calculator

fx $$V_{absolute} = \left(\sqrt{\frac{m_f \cdot G}{\gamma_f \cdot A_{Jet}}}\right) + v$$

ex $$9.71765\text{m/s} = \left(\sqrt{\frac{0.9\text{kg} \cdot 10}{9.81\text{kN/m}^3 \cdot 1.2\text{m}^2}}\right) + 9.69\text{m/s}$$

16) Dynamic Thrust Exerted on Plate by Jet

Open Calculator

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

ex $$0.197887\text{kN} = \frac{9.81\text{kN/m}^3 \cdot 1.2\text{m}^2 \cdot (10.1\text{m/s} - 9.69\text{m/s})^2}{10}$$

17) Efficiency of Wheel

Open Calculator

fx $$\eta = \frac{2 \cdot v \cdot (V_{absolute} - v)}{V_{absolute}^2}$$

ex $$0.077892 = \frac{2 \cdot 9.69\text{m/s} \cdot (10.1\text{m/s} - 9.69\text{m/s})}{(10.1\text{m/s})^2}$$

18) Velocity of jet for mass of fluid striking plate

Open Calculator

fx $$v = -\left(\left(\frac{m_f \cdot G}{\gamma_f \cdot A_{Jet}}\right) - V_{absolute}\right)$$

ex $$10.09924\text{m/s} = -\left(\left(\frac{0.9\text{kg} \cdot 10}{9.81\text{kN/m}^3 \cdot 1.2\text{m}^2}\right) - 10.1\text{m/s}\right)$$

19) Velocity of jet given dynamic thrust exerted by jet on plate

Open Calculator

fx $$v = -\left(\sqrt{\frac{m_f \cdot G}{\gamma_f \cdot A_{Jet}}} - V_{absolute}\right)$$

ex $$10.07235\text{m/s} = -\left(\sqrt{\frac{0.9\text{kg} \cdot 10}{9.81\text{kN/m}^3 \cdot 1.2\text{m}^2}} - 10.1\text{m/s}\right)$$

20) Work Done by Jet on Plate per Second

Open Calculator

fx $$w = \frac{\gamma_f \cdot A_{Jet} \cdot (V_{absolute} - v)^2 \cdot v}{G}$$

ex $$1.917528\text{KJ} = \frac{9.81\text{kN/m}^3 \cdot 1.2\text{m}^2 \cdot (10.1\text{m/s} - 9.69\text{m/s})^2 \cdot 9.69\text{m/s}}{10}$$

Cross Sectional Area

21) Cross Sectional Area given Dynamic Thrust Exerted by Jet on Plate

Open Calculator

fx $$A_{Jet} = \frac{m_f \cdot G}{\gamma_f \cdot (V_{absolute} - v)^2}$$

ex $$5.457651\text{m}^2 = \frac{0.9\text{kg} \cdot 10}{9.81\text{kN/m}^3 \cdot (10.1\text{m/s} - 9.69\text{m/s})^2}$$

22) Cross Sectional Area given Mass of Fluid Striking Plate

Open Calculator

fx $$A_{Jet} = \frac{m_f \cdot G}{\gamma_f \cdot (V_{absolute} - v)}$$

ex $$2.237637\text{m}^2 = \frac{0.9\text{kg} \cdot 10}{9.81\text{kN/m}^3 \cdot (10.1\text{m/s} - 9.69\text{m/s})}$$

23) Cross Sectional Area given Work Done by Jet on Plate per Second

Open Calculator

fx $$A_{Jet} = \frac{w \cdot G}{\gamma_f \cdot (V_{absolute} - v)^2 \cdot v}$$

ex $$2.440642\text{m}^2 = \frac{3.9\text{KJ} \cdot 10}{9.81\text{kN/m}^3 \cdot (10.1\text{m/s} - 9.69\text{m/s})^2 \cdot 9.69\text{m/s}}$$

Variables Used

- ∠**D** Angle between Jet and Plate *(Degree)*
- A_{Jet} Cross Sectional Area of Jet *(Square Meter)*
- **Ft** Thrust Force *(Kilonewton)*
- **G** Specific Gravity of Fluid
- m_f Fluid Mass *(Kilogram)*
- **v** Velocity of Jet *(Meter per Second)*
- $V_{absolute}$ Absolute Velocity of Issuing Jet *(Meter per Second)*
- V_j Jet Velocity *(Meter per Second)*
- v_{jet} Fluid Jet Velocity *(Meter per Second)*
- **w** Work Done *(Kilojoule)*
- γ_f Specific Weight of Liquid *(Kilonewton per Cubic Meter)*
- **η** Efficiency of Jet
- **θ** Theta *(Degree)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Function: **cos**, cos(Angle)
  Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.
- Function: **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 Kilojoule (KJ)
  Energy Unit Conversion
- Measurement: **Force** in 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

Check other formula lists

- **Force Exerted by Fluid Jet on Moving Curved Vane Formulas**
- **Force Exerted by Fluid Jet on Moving Flat Plate Formulas**
- **Force Exerted by Fluid Jet on Stationary Flat Plate Formulas**

Feel free to SHARE this document with your friends!

PDF Available in

English Spanish French German Russian Italian Portuguese Polish Dutch

8/9/2024 | 7:11:24 AM UTC

Please leave your feedback here...