



Darcy Weisbach Equation Formulas

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List of 26 Darcy Weisbach Equation Formulas

Darcy Weisbach Equation **2**

1) Area of Pipe given Total Required Power

$$\mathbf{K} = rac{P}{\mathrm{L_p \cdot dp} |\mathrm{dr \cdot V_{mean}}|}$$

Open Calculator

$$2 {
m m}^2 = rac{34.34 {
m W}}{0.10 {
m m} \cdot 17 {
m N/m}^3 \cdot 10.1 {
m m/s}}$$

2) Density of Fluid given Friction Factor

$$\boxed{ \rho_{Fluid} = \mu \cdot \frac{64}{f \cdot D_{pipe} \cdot V_{mean} } }$$

Open Calculator

$$ext{ex} \ 1.279875 ext{kg/m}^{_3} = 10.2 ext{P} \cdot rac{64}{5 \cdot 1.01 ext{m} \cdot 10.1 ext{m/s}}$$

3) Density of Liquid given Shear Stress and Darcy Friction Factor

$$ho_{
m Fluid} = 8 \cdot rac{ au}{{
m f} \cdot {
m V}_{
m mean} \cdot {
m V}_{
m mean}}$$

$$ext{ex} 1.460249 ext{kg/m}^{_3} = 8 \cdot rac{93.1 ext{Pa}}{5 \cdot 10.1 ext{m/s} \cdot 10.1 ext{m/s}}$$



4) Density of Liquid using Mean Velocity given Shear Stress with Friction Factor

 $ho_{
m Fluid} = 8 \cdot rac{ au}{{
m f} \cdot \left({
m V}_{
m mean}^2
ight)}$

Open Calculator 🗗

ex $1.460249 ext{kg/m}^3 = 8 \cdot rac{93.1 ext{Pa}}{5 \cdot \left((10.1 ext{m/s})^2
ight)}$

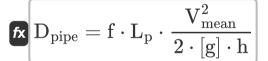
5) Diameter of Pipe given Friction Factor

 $extbf{D}_{ ext{pipe}} = rac{64 \cdot \mu}{ ext{f} \cdot ext{V}_{ ext{mean}} \cdot
ho_{ ext{Fluid}}}$

Open Calculator

ex $1.055243 \mathrm{m} = rac{64 \cdot 10.2 \mathrm{P}}{5 \cdot 10.1 \mathrm{m/s} \cdot 1.225 \mathrm{kg/m^3}}$

6) Diameter of Pipe given Head Loss due to Frictional Resistance



Open Calculator

 $oxed{ex} 1.040213 \mathrm{m} = 5 \cdot 0.10 \mathrm{m} \cdot rac{(10.1 \mathrm{m/s})^2}{2 \cdot [\mathrm{g}] \cdot 2.5 \mathrm{m}}$



7) Dynamic Viscosity given Friction Factor

$$\mu = rac{\mathbf{f} \cdot \mathbf{V}_{\mathrm{mean}} \cdot \mathbf{D}_{\mathrm{pipe}} \cdot \mathbf{
ho}_{\mathrm{Fluid}}}{64}$$

Open Calculator 🗗

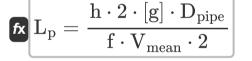
8) Head Loss due to Frictional Resistance

$$\mathbf{h} = \mathbf{f} \cdot \mathbf{L}_{\mathrm{p}} \cdot rac{V_{\mathrm{mean}}^2}{2 \cdot [\mathrm{g}] \cdot \mathrm{D}_{\mathrm{pipe}}}$$

Open Calculator

 $\mathbf{ex} \ 2.574783 \mathrm{m} = 5 \cdot 0.10 \mathrm{m} \cdot rac{(10.1 \mathrm{m/s})^2}{2 \cdot [\mathrm{g}] \cdot 1.01 \mathrm{m}}$

9) Length of Pipe given Head Loss due to Frictional Resistance



Open Calculator 🗗

10) Pressure Gradient given Total Required Power

$$|\mathbf{d}\mathbf{p}| \mathrm{d}\mathbf{r} = rac{P}{\mathrm{L_p \cdot A \cdot V_{mean}}}$$

Open Calculator

 $ext{ex} 17 ext{N/m}^{_3} = rac{34.34 ext{W}}{0.10 ext{m} \cdot 2 ext{m}^2 \cdot 10.1 ext{m/s}}$



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11) Reynolds Number given Friction Factor 🚰

 $\operatorname{Re} = \frac{64}{f}$

Open Calculator 🖸

 $12.8 = \frac{64}{5}$

12) Shear Stress given Friction Factor and Density

 $au =
ho_{ ext{Fluid}} \cdot ext{f} \cdot ext{V}_{ ext{mean}} \cdot rac{ ext{V}_{ ext{mean}}}{ ext{8}}$

Open Calculator

 $ext{ex} 78.10141 ext{Pa} = 1.225 ext{kg/m}^3 \cdot 5 \cdot 10.1 ext{m/s} \cdot rac{10.1 ext{m/s}}{8}$

13) Shear Velocity

 $V_{
m shear} = V_{
m mean} \cdot \sqrt{rac{f}{8}}$ ex $7.984751
m m/s = 10.1
m m/s \cdot \sqrt{rac{5}{8}}$

Open Calculator 🖸

14) Total Required Power

fx
$$P = dp | dr \cdot A \cdot V_{mean} \cdot L_p |$$

 $\mathbf{ex} \ 34.34 \mathrm{W} = 17 \mathrm{N/m^3 \cdot 2m^2 \cdot 10.1m/s \cdot 0.10m}$





Friction Factor

15) Friction Factor

$$f$$
 $f = 64 \cdot rac{\mu}{
ho_{Fluid} \cdot V_{mean} \cdot D_{pipe}}$

Open Calculator 🗗

 $= 5.223978 = 64 \cdot rac{10.2 ext{P}}{1.225 ext{kg/m}^3 \cdot 10.1 ext{m/s} \cdot 1.01 ext{m}}$

16) Friction Factor given Reynolds Number

 \mathbf{f} $\mathbf{f} = \frac{64}{\mathrm{Re}}$

Open Calculator

 $= \frac{5}{12.8}$

17) Friction Factor given Shear Stress and Density

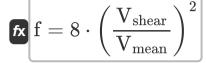
 $au = rac{8 \cdot au}{
m V_{mean} \cdot
m V_{mean} \cdot
ho_{Fluid}}$

Open Calculator

 $= 1.9602 = rac{8 \cdot 93.1 \mathrm{Pa}}{10.1 \mathrm{m/s} \cdot 10.1 \mathrm{m/s} \cdot 1.225 \mathrm{kg/m^3}}$



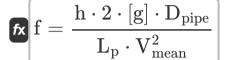
18) Friction Factor given Shear Velocity 🚰



Open Calculator 🗗

ex
$$6.352318 = 8 \cdot \left(\frac{9 \text{m/s}}{10.1 \text{m/s}} \right)^2$$

19) Friction Factor when Head Loss is due to Frictional Resistance

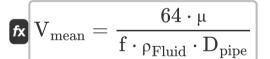


Open Calculator

$$= \boxed{ 4.854777 = \frac{2.5 \mathrm{m} \cdot 2 \cdot \mathrm{[g]} \cdot 1.01 \mathrm{m}}{0.10 \mathrm{m} \cdot \left(10.1 \mathrm{m/s}\right)^2} }$$

Mean Velocity of Flow

20) Mean Velocity of Flow given Friction Factor



$$ext{ex} 10.55243 ext{m/s} = rac{64 \cdot 10.2 ext{P}}{5 \cdot 1.225 ext{kg/m}^3 \cdot 1.01 ext{m}}$$



21) Mean Velocity of Flow given Head Loss due to Frictional Resistance 🖒

 $V_{mean} = \sqrt{rac{ \mathbf{h} \cdot 2 \cdot [\mathbf{g}] \cdot \mathbf{D}_{pipe}}{\mathbf{f} \cdot \mathbf{L}_{p}}}$

Open Calculator 🗗

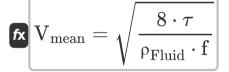
22) Mean Velocity of Flow given Maximum Velocity at Axis of Cylindrical Element

fx $V_{mean} = 0.5 \cdot V_{max}$

Open Calculator

 $\textbf{ex} \ 10.1 \text{m/s} = 0.5 \cdot 20.2 \text{m/s}$

23) Mean Velocity of Flow given Shear Stress and Density



ex
$$11.02724 \mathrm{m/s} = \sqrt{\frac{8 \cdot 93.1 \mathrm{Pa}}{1.225 \mathrm{kg/m^3 \cdot 5}}}$$



24) Mean Velocity of Flow given Shear Velocity

 $ag{V_{
m mean}} = rac{{
m V_{
m shear}}}{\sqrt{rac{{
m f}}{8}}}$

Open Calculator

ex $11.3842 ext{m/s} = rac{9 ext{m/s}}{\sqrt{rac{5}{8}}}$

25) Mean Velocity of Flow given Total Required Power

 $extbf{K} V_{ ext{mean}} = rac{ ext{P}}{ ext{L}_{ ext{p}} \cdot ext{dp} | ext{dr} \cdot ext{A}}$

Open Calculator

ex $10.1 \mathrm{m/s} = rac{34.34 \mathrm{W}}{0.10 \mathrm{m} \cdot 17 \mathrm{N/m^3} \cdot 2 \mathrm{m^2}}$

26) Mean Velocity of Fluid Flow

 $\mathbf{K} V_{\mathrm{mean}} = \left(rac{1}{8 \cdot \mu}
ight) \cdot \mathrm{d}p |\mathrm{d}r \cdot R^2|$

Open Calculator 🗗

 $oxed{ex} 8.333333 {
m m/s} = \left(rac{1}{8 \cdot 10.2 {
m P}}
ight) \cdot 17 {
m N/m^3} \cdot {
m (2m)}^2$



Variables Used

- A Cross Sectional Area of Pipe (Square Meter)
- Dpipe Diameter of Pipe (Meter)
- dp|dr Pressure Gradient (Newton per Cubic Meter)
- f Darcy Friction Factor
- **h** Head Loss due to Friction (Meter)
- L_p Length of Pipe (Meter)
- P Power (Watt)
- R Radius of pipe (Meter)
- Re Reynolds Number
- V_{max} Maximum Velocity (Meter per Second)
- V_{mean} Mean Velocity (Meter per Second)
- V_{shear} Shear Velocity (Meter per Second)
- µ Dynamic Viscosity (Poise)
- ρ_{Fluid} Density of Fluid (Kilogram per Cubic Meter)
- τ Shear Stress (Pascal)





Constants, Functions, Measurements used

- Constant: [g], 9.80665

 Gravitational acceleration on Farth
- 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: Length in Meter (m)
 Length Unit Conversion
- Measurement: Area in Square Meter (m²)

 Area Unit Conversion
- Measurement: Speed in Meter per Second (m/s)
 Speed Unit Conversion
- Measurement: Power in Watt (W)
 Power Unit Conversion
- Measurement: Dynamic Viscosity in Poise (P)
 Dynamic Viscosity Unit Conversion
- Measurement: Density in Kilogram per Cubic Meter (kg/m³)
 Density Unit Conversion
- Measurement: Pressure Gradient in Newton per Cubic Meter (N/m³)
 Pressure Gradient Unit Conversion
- Measurement: Stress in Pascal (Pa)
 Stress Unit Conversion





Check other formula lists

Darcy Weisbach Equation
 Formulas

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