



Flow of Liquids inside Packed Beds Formulas

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Examples!

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List of 12 Flow of Liquids inside Packed Beds Formulas

Flow of Liquids inside Packed Beds

1) Absolute Viscosity of Fluid by Ergun

$$\mu = rac{\mathrm{D} \cdot \mathrm{U_b} \cdot \mathrm{
ho}}{\mathrm{Re_{pb}} \cdot (1 - \in)}$$

Open Calculator

ex
$$24.925$$
Pa*s = $\frac{25\text{m} \cdot 0.05\text{m/s} \cdot 997\text{kg/m}^3}{200 \cdot (1 - 0.75)}$

2) Density of Fluid by Ergun

$$ho = rac{ ext{Re}_{ ext{pb}} \cdot \mu \cdot (1-\in)}{ ext{D}_{ ext{eff}} \cdot ext{U}_{ ext{b}}}$$

Open Calculator 🚰

$$\boxed{ 997.399 \text{kg/m}^3 = \frac{200 \cdot 24.925 \text{Pa*s} \cdot (1 - 0.75)}{24.99 \text{m} \cdot 0.05 \text{m/s}} }$$

3) Effective Particle Diameter by Ergun given Frication Factor

$$\mathbf{D}_{\mathrm{eff}} = rac{\mathbf{f} \cdot \mathbf{L} \cdot \mathbf{U}_{\mathrm{b}}^2 \cdot (1 - \in)}{\mathbf{g} \cdot \mathbf{H}_{\mathrm{f}} \cdot \in^3}$$

Open Calculator 🗗





4) Effective Particle Diameter by Ergun given Reynolds Number 🗗

 $\mathbf{E} \mathbf{D}_{\mathrm{eff}} = rac{\mathrm{Re}_{\mathrm{pb}} \cdot \mu \cdot (1 - \in)}{\mathrm{U}_{\mathrm{b}} \cdot
ho}$

Open Calculator 🚰

$$= \frac{200 \cdot 24.925 Pa^*s \cdot (1 - 0.75)}{0.05 m/s \cdot 997 kg/m^3}$$

5) Friction Factor by Beek

 $\mathbf{f} = rac{1-\epsilon}{\epsilon^3} \cdot \left(1.75 + 150 \cdot \left(rac{1-\epsilon}{\mathrm{Re_{pb}}}
ight)
ight)$

Open Calculator 🗗

$$oxed{ex} 1.148148 = rac{1-0.75}{\left(0.75
ight)^3} \cdot \left(1.75 + 150 \cdot \left(rac{1-0.75}{200}
ight)
ight)$$

6) Friction Factor by Ergun

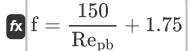
$$f = rac{\mathbf{g} \cdot \mathbf{D}_{\mathrm{eff}} \cdot \mathbf{H}_{\mathrm{f}} \cdot \in^{3}}{\mathbf{L} \cdot \mathbf{U}_{\mathrm{b}}^{2} \cdot (1 - \in)}$$

Open Calculator 🗗

$$= 1.157162 = \frac{9.8 \text{m/s}^2 \cdot 24.99 \text{m} \cdot 0.0077 \text{m} \cdot (0.75)^3}{1100 \text{m} \cdot (0.05 \text{m/s})^2 \cdot (1 - 0.75)}$$



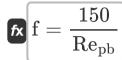
7) Friction Factor by Ergun for Rep Value between 1 and 2500



Open Calculator

 $\boxed{\textbf{ex}} \ 2.5 = \frac{150}{200} + 1.75$

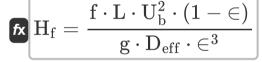
8) Friction Factor by Kozeny-Carman



Open Calculator

 $\boxed{0.75 = \frac{150}{200}}$

9) Head of Fluid Lost Due to Friction



Open Calculator 🗗

 $= \frac{0.007639 \text{m} = \frac{1.148 \cdot 1100 \text{m} \cdot (0.05 \text{m/s})^2 \cdot (1 - 0.75)}{9.8 \text{m/s}^2 \cdot 24.99 \text{m} \cdot (0.75)^3}$

10) Mean Effective Diameter

$$extbf{D} = rac{6}{ ext{S}_{ ext{vm}}}$$

Open Calculator

 $\boxed{25\mathrm{m} = \frac{6}{0.24}}$





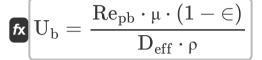


11) Reynolds Number of Packed Beds by Ergun 🗗

 $\operatorname{Re}_{\mathrm{pb}} = rac{\mathrm{D}_{\mathrm{eff}} \cdot \mathrm{U}_{\mathrm{b}} \cdot \mathrm{
ho}}{\mu \cdot (1 - \in)}$

Open Calculator 🖸

12) Superficial Velocity by Ergun given Reynolds Number 🗗



Open Calculator

 $= \frac{0.05002 \text{m/s} = \frac{200 \cdot 24.925 \text{Pa*s} \cdot (1 - 0.75)}{24.99 \text{m} \cdot 997 \text{kg/m}^3}$



Variables Used

- ∈ Void Fraction
- D Diameter (Meter)
- D_{eff} Diameter(eff) (Meter)
- f Friction Factor
- g Acceleration due to Gravity (Meter per Square Second)
- H_f Head of Fluid (Meter)
- L Length of Packaged Bed (Meter)
- Repb Reynolds Number(pb)
- S_{vm} Mean Specific Surface
- **U**_b Superficial Velocity (Meter per Second)
- µ Absolute Viscosity (Pascal Second)
- p Density (Kilogram per Cubic Meter)





Constants, Functions, Measurements used

- Measurement: Length in Meter (m)
 Length 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: Dynamic Viscosity in Pascal Second (Pa*s)
 Dynamic Viscosity Unit Conversion
- Measurement: Density in Kilogram per Cubic Meter (kg/m³)

 Density Unit Conversion





Check other formula lists

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