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Measurement of Viscosity Viscometers Formulas

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List of 30 Measurement of Viscosity Viscometers Formulas

Measurement of Viscosity Viscometers

Capillary Tube Viscometer

1) Cross-Sectional Area of Tube using Dynamic Viscosity

Open Calculator

fx $$A = \frac{\mu}{\frac{t_{sec} \cdot \gamma_f \cdot D_{pipe}}{32 \cdot A_R \cdot L_p \cdot \ln\left(\frac{h_1}{h_2}\right)}}$$

ex $$0.261836\text{m}^2 = \frac{10.2\text{P}}{\frac{110\text{s} \cdot 9.81\text{kN/m}^3 \cdot 1.01\text{m}}{32 \cdot 10\text{m}^2 \cdot 0.10\text{m} \cdot \ln\left(\frac{12.01\text{cm}}{5.01\text{cm}}\right)}}$$

2) Diameter of Pipe given Dynamic Viscosity with Length

Open Calculator

fx $$D_{pipe} = \left(\frac{Q}{(\pi \cdot \gamma_f \cdot H)} / (128 \cdot L_p \cdot \mu)\right)^{\frac{1}{4}}$$

ex $$0.019597\text{m} = \left(\frac{55\text{m}^3/\text{s}}{(\pi \cdot 9.81\text{kN/m}^3 \cdot 926.7\text{m})} / (128 \cdot 0.10\text{m} \cdot 10.2\text{P})\right)^{\frac{1}{4}}$$

3) Diameter of Pipe given Kinematic Viscosity

Open Calculator

$$D_{pipe} = \frac{\left(\left(\frac{\upsilon}{([g]\cdot H_t\cdot\pi\cdot t_{sec})}/(128\cdot L_p\cdot V_T)\right)\right)^{1}}{4}$$

$$0.000177\text{m} = \frac{\left(\left(\frac{15.1\text{m}^2/\text{s}}{([g]\cdot 12.02\text{cm}\cdot\pi\cdot 110\text{s})}/(128\cdot 0.10\text{m}\cdot 4.1\text{m}^3)\right)\right)^{1}}{4}$$

4) Diameter of Pipe using Dynamic Viscosity with Time

Open Calculator

$$D_{pipe} = \sqrt{\frac{\mu}{\frac{t_{sec}\cdot\gamma_f\cdot A}{32\cdot A_R\cdot L_p\cdot\ln\left(\frac{h_1}{h_2}\right)}}}$$

$$1.004673\text{m} = \sqrt{\frac{10.2\text{P}}{\frac{110\text{s}\cdot 9.81\text{kN/m}^3\cdot 0.262\text{m}^2}{32\cdot 10\text{m}^2\cdot 0.10\text{m}\cdot\ln\left(\frac{12.01\text{cm}}{5.01\text{cm}}\right)}}}$$

5) Dynamic Viscosity of Fluids in Flow

Open Calculator

$$\mu = \left(\frac{t_{sec}\cdot A\cdot\gamma_f\cdot D_{pipe}}{32\cdot A_R\cdot L_p\cdot\ln\left(\frac{h_1}{h_2}\right)}\right)$$

$$10.20639\text{P} = \left(\frac{110\text{s}\cdot 0.262\text{m}^2\cdot 9.81\text{kN/m}^3\cdot 1.01\text{m}}{32\cdot 10\text{m}^2\cdot 0.10\text{m}\cdot\ln\left(\frac{12.01\text{cm}}{5.01\text{cm}}\right)}\right)$$

6) Length of Pipe given Kinematic Viscosity

Open Calculator

$$L_p = \frac{[g] \cdot H_t \cdot \pi \cdot t_{sec} \cdot \left(d_{pipe}^4\right)}{128 \cdot V_T \cdot \upsilon}$$

$$0.053491\text{m} = \frac{[g] \cdot 12.02\text{cm} \cdot \pi \cdot 110\text{s} \cdot \left((1.01\text{m})^4\right)}{128 \cdot 4.1\text{m}^3 \cdot 15.1\text{m}^2/\text{s}}$$

7) Length of Reservoir using Dynamic Viscosity

Open Calculator

$$L_p = \frac{t_{sec} \cdot A \cdot \gamma_f \cdot D_{pipe}}{32 \cdot \mu \cdot A_R \cdot \ln\left(\frac{h_1}{h_2}\right)}$$

$$0.100063\text{m} = \frac{110\text{s} \cdot 0.262\text{m}^2 \cdot 9.81\text{kN/m}^3 \cdot 1.01\text{m}}{32 \cdot 10.2\text{P} \cdot 10\text{m}^2 \cdot \ln\left(\frac{12.01\text{cm}}{5.01\text{cm}}\right)}$$

Redwood Viscometer

8) Dynamic Viscosity given Velocity

Open Calculator

$$\mu = \left(\frac{D_S^2}{18 \cdot V_{mean}}\right)$$

$$10.21242\text{P} = \left(\frac{(10\text{m})^2}{18 \cdot 5.44\text{m/s}}\right)$$

9) Mean Velocity of Sphere given Dynamic Viscosity

Open Calculator

fx $$V_{mean} = \left(\frac{D_S^2}{18 \cdot \mu} \right)$$

ex $$5.446623 \text{m/s} = \left(\frac{(10 \text{m})^2}{18 \cdot 10.2 \text{P}} \right)$$

SayBolt Universal Viscometer

10) Kinematic Viscosity given Time

Open Calculator

fx $$\upsilon = 0.0022 \cdot \Delta t - \left(\frac{1.80}{\Delta t} \right)$$

ex $$15.04774 \text{m}^2\text{/s} = 0.0022 \cdot 1.9 \text{h} - \left(\frac{1.80}{1.9 \text{h}} \right)$$

Coaxial Cylinder Viscometers

11) Clearance given Torque exerted on Outer Cylinder

Open Calculator

fx $$C = \mu \cdot \pi \cdot \pi \cdot \Omega \cdot \frac{r_1^4}{60 \cdot T_o}$$

ex $$15.61441 \text{mm} = 10.2 \text{P} \cdot \pi \cdot \pi \cdot 5 \text{rev/s} \cdot \frac{(12 \text{m})^4}{60 \cdot 7000 \text{kN*m}}$$

12) Dynamic Viscosity given Torque exerted on Outer Cylinder

Open Calculator

$$\mu = \frac{T_o}{\pi \cdot \pi \cdot \Omega \cdot \frac{r_1^4}{60 \cdot C}}$$

$$10.12526\text{P} = \frac{7000\text{kN*m}}{\pi \cdot \pi \cdot 5\text{rev/s} \cdot \frac{(12\text{m})^4}{60 \cdot 15.5\text{mm}}}$$

13) Dynamic Viscosity given Total Torque

Open Calculator

$$\mu = \frac{T_{Torque}}{V_c \cdot \Omega}$$

$$10.08507\text{P} = \frac{320\text{N*m}}{10.1 \cdot 5\text{rev/s}}$$

14) Dynamic Viscosity of Fluid Flow given Torque

Open Calculator

$$\mu = \frac{15 \cdot T \cdot (r_2 - r_1)}{\pi \cdot \pi \cdot r_1 \cdot r_1 \cdot r_2 \cdot h \cdot \Omega}$$

$$10.85823\text{P} = \frac{15 \cdot 500\text{kN*m} \cdot (13\text{m} - 12\text{m})}{\pi \cdot \pi \cdot 12\text{m} \cdot 12\text{m} \cdot 13\text{m} \cdot 11.9\text{m} \cdot 5\text{rev/s}}$$

15) Height of Cylinder given Dynamic Viscosity of Fluid

Open Calculator

$$h = \frac{15 \cdot T \cdot (r_2 - r_1)}{\pi \cdot \pi \cdot r_1 \cdot r_1 \cdot r_2 \cdot \mu \cdot \Omega}$$

$$12.66793\text{m} = \frac{15 \cdot 500\text{kN*m} \cdot (13\text{m} - 12\text{m})}{\pi \cdot \pi \cdot 12\text{m} \cdot 12\text{m} \cdot 13\text{m} \cdot 10.2\text{P} \cdot 5\text{rev/s}}$$

16) Height of Cylinder given Torque exerted on Inner Cylinder

Open Calculator

$$h = \frac{T}{2 \cdot \pi \cdot \left((r_1)^2 \right) \cdot \tau}$$

$$5.935782\text{m} = \frac{500\text{kN*m}}{2 \cdot \pi \cdot \left((12\text{m})^2 \right) \cdot 93.1\text{Pa}}$$

17) Radius of Inner Cylinder given Torque exerted on Inner Cylinder

Open Calculator

$$r_1 = \sqrt{\frac{T}{2 \cdot \pi \cdot h \cdot \tau}}$$

$$8.475137\text{m} = \sqrt{\frac{500\text{kN*m}}{2 \cdot \pi \cdot 11.9\text{m} \cdot 93.1\text{Pa}}}$$

18) Radius of Inner Cylinder given Torque exerted on Outer Cylinder

Open Calculator

fx $$r_1 = \left(\frac{T_o}{\mu \cdot \pi \cdot \pi \cdot \frac{\Omega}{60 \cdot C}} \right)^{\frac{1}{4}}$$

ex $$11.97796\text{m} = \left(\frac{7000\text{kN*m}}{10.2\text{P} \cdot \pi \cdot \pi \cdot \frac{5\text{rev/s}}{60 \cdot 15.5\text{mm}}} \right)^{\frac{1}{4}}$$

19) Radius of Inner Cylinder given Velocity Gradient

Open Calculator

fx $$r_1 = \frac{30 \cdot V_G \cdot r_2 - \pi \cdot r_2 \cdot \Omega}{30 \cdot V_G}$$

ex $$12.44167\text{m} = \frac{30 \cdot 76.6\text{m/s} \cdot 13\text{m} - \pi \cdot 13\text{m} \cdot 5\text{rev/s}}{30 \cdot 76.6\text{m/s}}$$

20) Radius of Outer Cylinder given Velocity Gradient

Open Calculator

fx $$r_2 = \frac{30 \cdot V_G \cdot r_1}{30 \cdot V_G - \pi \cdot \Omega}$$

ex $$12.53851\text{m} = \frac{30 \cdot 76.6\text{m/s} \cdot 12\text{m}}{30 \cdot 76.6\text{m/s} - \pi \cdot 5\text{rev/s}}$$

21) Shear Stress on Cylinder given Torque exerted on Inner Cylinder

Open Calculator

fx $$\tau = \frac{T}{2 \cdot \pi \cdot \left((r_1)^2 \right) \cdot h}$$

ex $$46.43877\text{Pa} = \frac{500\text{kN*m}}{2 \cdot \pi \cdot \left((12\text{m})^2 \right) \cdot 11.9\text{m}}$$

22) Speed of Outer Cylinder given Dynamic Viscosity of Fluid

Open Calculator

fx $$\Omega = \frac{15 \cdot T \cdot (r_2 - r_1)}{\pi \cdot \pi \cdot r_1 \cdot r_1 \cdot r_2 \cdot h \cdot \mu}$$

ex $$5.322659\text{rev/s} = \frac{15 \cdot 500\text{kN*m} \cdot (13\text{m} - 12\text{m})}{\pi \cdot \pi \cdot 12\text{m} \cdot 12\text{m} \cdot 13\text{m} \cdot 11.9\text{m} \cdot 10.2\text{P}}$$

23) Speed of Outer Cylinder given Torque exerted on Outer Cylinder

Open Calculator

fx $$\Omega = \frac{T_o}{\pi \cdot \pi \cdot \mu \cdot \frac{r_1^4}{60 \cdot C}}$$

ex $$4.963365\text{rev/s} = \frac{7000\text{kN*m}}{\pi \cdot \pi \cdot 10.2\text{P} \cdot \frac{(12\text{m})^4}{60 \cdot 15.5\text{mm}}}$$

24) Speed of Outer Cylinder given Total Torque

Open Calculator

fx $$\Omega = \frac{T_{Torque}}{V_c \cdot \mu}$$

ex $$4.94366\text{rev/s} = \frac{320\text{N*m}}{10.1 \cdot 10.2\text{P}}$$

25) Speed of Outer Cylinder given Velocity Gradient

Open Calculator

fx $$\Omega = \frac{V_G}{\frac{\pi \cdot r_2}{30 \cdot (r_2 - r_1)}}$$

ex $$8.955234\text{rev/s} = \frac{76.6\text{m/s}}{\frac{\pi \cdot 13\text{m}}{30 \cdot (13\text{m} - 12\text{m})}}$$

26) Torque exerted on Inner Cylinder

Open Calculator

fx $$T_{Torque} = 2 \cdot \left((r_1)^2 \right) \cdot h \cdot \tau$$

ex $$319.0723\text{N*m} = 2 \cdot \left((12\text{m})^2 \right) \cdot 11.9\text{m} \cdot 93.1\text{Pa}$$

27) Torque exerted on Inner Cylinder given Dynamic Viscosity of Fluid

Open Calculator

fx $$T = \frac{\mu}{\frac{15 \cdot (r_2 - r_1)}{\pi \cdot \pi \cdot r_1 \cdot r_1 \cdot r_2 \cdot h \cdot \Omega}}$$

ex $$469.69\text{kN*m} = \frac{10.2\text{P}}{\frac{15 \cdot (13\text{m} - 12\text{m})}{\pi \cdot \pi \cdot 12\text{m} \cdot 12\text{m} \cdot 13\text{m} \cdot 11.9\text{m} \cdot 5\text{rev/s}}}$$

28) Torque Exerted on Outer Cylinder

Open Calculator

fx $$T_o = \mu \cdot \pi \cdot \pi \cdot \Omega \cdot \frac{r_1^4}{60 \cdot C}$$

ex $$7051.667\text{kN*m} = 10.2\text{P} \cdot \pi \cdot \pi \cdot 5\text{rev/s} \cdot \frac{(12\text{m})^4}{60 \cdot 15.5\text{mm}}$$

29) Total Torque

Open Calculator

fx $$T_{Torque} = V_c \cdot \mu \cdot \Omega$$

ex $$323.6469\text{N*m} = 10.1 \cdot 10.2\text{P} \cdot 5\text{rev/s}$$

30) Velocity Gradients

Open Calculator

fx $$V_G = \pi \cdot r_2 \cdot \frac{\Omega}{30 \cdot (r_2 - r_1)}$$

ex $$42.76829\text{m/s} = \pi \cdot 13\text{m} \cdot \frac{5\text{rev/s}}{30 \cdot (13\text{m} - 12\text{m})}$$

Variables Used

- **A** Cross Sectional Area of Pipe *(Square Meter)*
- **A_R** Average Reservoir Area *(Square Meter)*
- **C** Clearance *(Millimeter)*
- **d_{pipe}** Pipe Diameter *(Meter)*
- **D_{pipe}** Diameter of Pipe *(Meter)*
- **D_S** Diameter of Sphere *(Meter)*
- **h** Height of Cylinder *(Meter)*
- **H** Head of the Liquid *(Meter)*
- **h_1** Height of Column 1 *(Centimeter)*
- **h_2** Height of Column 2 *(Centimeter)*
- **H_t** Total Head *(Centimeter)*
- **L_p** Length of Pipe *(Meter)*
- **Q** Discharge in Laminar Flow *(Cubic Meter per Second)*
- **r_1** Radius of Inner Cylinder *(Meter)*
- **r_2** Radius of Outer Cylinder *(Meter)*
- **T** Torque on Inner Cylinder *(Kilonewton Meter)*
- **T_o** Torque on Outer Cylinder *(Kilonewton Meter)*
- **t_{sec}** Time in Seconds *(Second)*
- **V_c** Viscometer Constant
- **V_G** Velocity Gradient *(Meter per Second)*
- **V_{mean}** Mean Velocity *(Meter per Second)*

- V_T Volume of Liquid *(Cubic Meter)*
- γ_f Specific Weight of Liquid *(Kilonewton per Cubic Meter)*
- Δt Time Interval or Time Period *(Hour)*
- μ Dynamic Viscosity *(Poise)*
- T_{Torque} Total Torque *(Newton Meter)*
- υ Kinematic Viscosity *(Square Meter per Second)*
- Ω Angular Speed *(Revolution per Second)*
- τ Shear Stress *(Pascal)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Constant: **[g]**, 9.80665
  Gravitational acceleration on Earth
- Function: **ln**, ln(Number)
  The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.
- 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), Centimeter (cm), Millimeter (mm)
  Length Unit Conversion
- Measurement: **Time** in Second (s), Hour (h)
  Time Unit Conversion
- Measurement: **Volume** in Cubic Meter (m^3)
  Volume Unit Conversion
- Measurement: **Area** in Square Meter (m^2)
  Area Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Volumetric Flow Rate** in Cubic Meter per Second (m^3/s)
  Volumetric Flow Rate Unit Conversion
- Measurement: **Dynamic Viscosity** in Poise (P)
  Dynamic Viscosity Unit Conversion
- Measurement: **Kinematic Viscosity** in Square Meter per Second (m^2/s)
  Kinematic Viscosity Unit Conversion

- Measurement: **Angular Velocity** in Revolution per Second (rev/s)
  Angular Velocity Unit Conversion
- Measurement: **Torque** in Kilonewton Meter (kN*m), Newton Meter (N*m)
  Torque Unit Conversion
- Measurement: **Specific Weight** in Kilonewton per Cubic Meter (kN/m³)
  Specific Weight Unit Conversion
- Measurement: **Stress** in Pascal (Pa)
  Stress Unit Conversion

Check other formula lists

- **Dash Pot Mechanism Formulas**
- **Laminar Flow around a Sphere Stokes' Law Formulas**
- **Laminar Flow between Parallel Flat Plates, one plate moving and other at rest, Couette Flow Formulas**
- **Laminar Flow between Parallel Plates, both Plates at Rest Formulas**
- **Laminar Flow of Fluid in an Open Channel Formulas**
- **Measurement of Viscosity Viscometers Formulas**
- **Steady Laminar Flow in Circular Pipes Formulas**

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