Tribology Formulas...





Tribology Formulas

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List of 13 Tribology Formulas

Tribology 🕑

1) Absolute Viscosity from Petroff's Equation

$$f_{\mathbf{x}} \mu_{\text{viscosity}} = \frac{\mu_{\text{friction}} \cdot \Psi}{2 \cdot \pi^2 \cdot \left(\frac{N}{P}\right)}$$
$$e_{\mathbf{x}} 15.19818P = \frac{0.4 \cdot 0.005}{2 \cdot \pi^2 \cdot \left(\frac{10 \text{rev/s}}{0.15 \text{MPa}}\right)}$$

2) Diametrical Clearance Ratio or Relative Clearance from Petroff's Equaiton

$$f_{\mathbf{X}} \Psi = 2 \cdot \pi^2 \cdot \left(\frac{\mu_{\text{viscosity}}}{\mu_{\text{friction}}}\right) \cdot \left(\frac{N}{P}\right)$$
$$e_{\mathbf{X}} 0.003356 = 2 \cdot \pi^2 \cdot \left(\frac{10.2P}{0.4}\right) \cdot \left(\frac{10 \text{rev/s}}{0.15 \text{MPa}}\right)$$

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3) Load per Projected Area of Bearing from Petroff's Equation

$$fx P = 2 \cdot \pi^{2} \cdot \left(\frac{\mu_{viscosity}}{\mu_{friction}}\right) \cdot \left(\frac{N}{\psi}\right)$$

$$ex 0.10067MPa = 2 \cdot \pi^{2} \cdot \left(\frac{10.2P}{0.4}\right) \cdot \left(\frac{10rev/s}{0.005}\right)$$

$$fx \mu_{friction} = 2 \cdot \pi^{2} \cdot \mu_{viscosity} \cdot \left(\frac{N}{P}\right) \cdot \left(\frac{1}{\psi}\right)$$

$$fx 0.268453 = 2 \cdot \pi^{2} \cdot 10.2P \cdot \left(\frac{10rev/s}{0.15MPa}\right) \cdot \left(\frac{1}{0.005}\right)$$

$$Vertical Shaft Rotating in Guide Bearing C
$$fx = 5$$$$

fx
$$\beta = \frac{2 \cdot B}{D}$$

ex $16.66667 \text{rad} = \frac{2 \cdot 30 \text{m}}{3.600 \text{m}}$



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6) Diameter of Shaft given Shaft Speed and Surface Velocity of Shaft 🕑

fx
$$D = \frac{U}{\pi \cdot N}$$
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ex
$$0.210085 \mathrm{m} = rac{6.6 \mathrm{m/s}}{\pi \cdot 10 \mathrm{rev/s}}$$

7) Eccentricity Ratio given Radial Clearance and Film Thickness at any Position

fx
$$\varepsilon = \frac{\frac{h}{c} - 1}{\cos(\theta)}$$

ex $5.87399 = \frac{\frac{0.5m}{0.082m} - 1}{\cos(0.52rad)}$

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8) Journal Diameter given Angular Length of Bearing and Length of Bearing in Direction of Motion

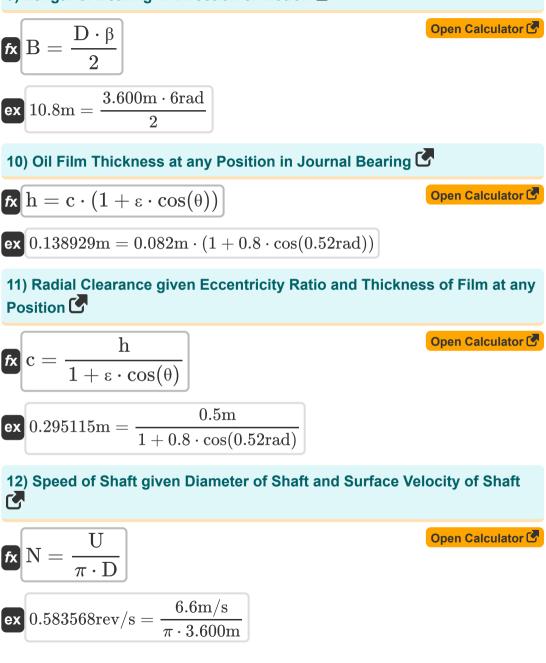




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9) Length of Bearing in Direction of Motion 🕑





13) Surface Velocity of Shaft given Shaft Speed and Diameter 🕑

fx
$$\mathbf{U} = \pi \cdot \mathbf{D} \cdot \mathbf{N}$$

ex $113.0973 \text{m/s} = \pi \cdot 3.600 \text{m} \cdot 10 \text{rev/s}$



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Variables Used

- **B** Length of Bearing in Direction of Motion (Meter)
- C Radial Clearance (Meter)
- D Shaft Diameter (Meter)
- **h** Oil Film Thickness at any Position θ (*Meter*)
- N Shaft Speed (Revolution per Second)
- P Load per Projected Area of Bearing (Megapascal)
- U Surface Velocity of Shaft (Meter per Second)
- β Angular or Circumferential Length of Bearing (Radian)
- ε Eccentricity Ratio
- **θ** Angle Measured from Point of Minimum of Oil Film (*Radian*)
- **µ**friction Coefficient of Friction
- **µ**viscosity Dynamic Viscosity (Poise)
- ψ Diametrical Clearance Ratio or Relative Clearance



Constants, Functions, Measurements used

- Constant: pi, 3.14159265358979323846264338327950288 Archimedes' constant
- Function: cos, cos(Angle) Trigonometric cosine function
- Measurement: Length in Meter (m) Length Unit Conversion
- Measurement: Pressure in Megapascal (MPa)
 Pressure Unit Conversion
- Measurement: Speed in Meter per Second (m/s) Speed Unit Conversion
- Measurement: Angle in Radian (rad) Angle Unit Conversion
- Measurement: Frequency in Revolution per Second (rev/s) Frequency Unit Conversion
- Measurement: Dynamic Viscosity in Poise (P)
 Dynamic Viscosity Unit Conversion



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