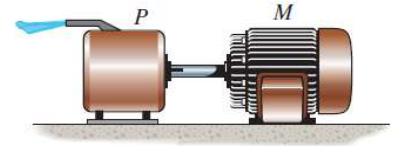


Torsion in Shafts. Question 5-42 Solution

Tuesday, 11 March, 2025 08:57 AM

5-42. The A-36 solid tubular steel shaft is 2 m long and has an outer diameter of 60 mm. It is required to transmit 60 kW of power from the motor *M* to the pump *P*. Determine the smallest angular velocity the shaft can have if the allowable shear stress is $\tau_{\text{allow}} = 80 \text{ MPa}$.

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Solution:-

$$\frac{\tau}{R} = \frac{T}{J} \Rightarrow \left[\frac{80 \times 10^6}{\frac{0.06}{2}} = \frac{60 \times 10^3 / \omega}{\frac{\pi}{2} \left(\frac{0.06}{2} \right)^4} \right] \rightarrow \text{Solving for } \omega \text{ gives:}$$

$$\omega = 17.68 \text{ rad/s} \quad \text{ANS. } \checkmark$$

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