

## Power Screw: Given Data

### Question:

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A double start square thread power screw of nominal dia. 100 mm and pitch 12 mm is to be used to raise load of 300 kN. The coefficient of friction at screw thread is 0.15. Neglect collar friction. Calculate :

- i) Torque
- ii) Efficiency of screw

### Answer:

$D_o = 100 \text{ mm}$  ,  $W = 300 \text{ kN} = 300 \times 10^3 \text{ N}$  ,  $P = 12 \text{ mm}$  ,  $\mu = \mu_1 = 0.15$

Since, Screw is double start, Lead of screw =  $2 p = 2 \times 12 = 24 \text{ mm}$

$d_c = d_o - P = 100 - 12 = 88$

Mean diameter  $d = (d_o + d_c)/2 = (100 + 88)/2 = 94 \text{ mm}$

$$\tan \alpha = \frac{\text{Lead}}{\pi d} = \frac{2p}{\pi d} , \quad \alpha = \tan^{-1} \left( \frac{2p}{\pi d} \right)$$

$$\alpha = \tan^{-1} \frac{24}{\pi \times 94} = 4.64^\circ$$

$$\phi = \tan^{-1} \mu = \tan^{-1} 0.15 = 8.53^\circ$$

Torque Required to lift the load ,  $T_1 = W \cdot \tan \left( \alpha + \phi \right) \frac{d}{2}$

$$T_1 = 300 \times 10^3 \times \tan \left( 4.64^\circ + 8.53^\circ \right) \frac{94}{2} = 3301.15 \times 10^3 \text{ N.mm}$$

Total Torque =  $T_t = T_1 + T_2$

$$= 3301.15 \times 10^3 + 0 = 3301.15 \times 10^3 \text{ N.mm} \quad \dots\dots\dots$$

Efficiency of screw:

$$\eta = \frac{\tan \alpha}{\tan (\alpha + \phi)} = \frac{\tan 4.64}{\tan (4.64 + 8.53)} = 0.347 \text{ i.e } 34.71 \%$$

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