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Question:

Power Screw: Given Data

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:

Do= 100 mm , W =300 KN = 300 X 10 3 N, P=12 mm , μ = μ 1= 0.15 Since,Screw is double start, Lead of screw = 2 p =2 x12 =24 mm dc= do-P =100-12 =88

Mean diameter d =(do+dc)/2 =(100+88)/2 =94 mm

$$Tan \alpha = \frac{Lead}{\pi d} = \frac{2p}{\pi d}$$
 , $\alpha = tan^{-1} \left(\frac{2p}{\pi d}\right)$
 $\alpha = tan^{-1} \frac{24}{\pi x^{94}} = 4.64^{\circ}$
 $\emptyset = tan^{-1} \mu = tan^{-1} x \ 0.15 = 8.53^{\circ}$

Torque Required to lift the load , T1= W.tan ($\alpha + \emptyset$) $\frac{d}{2}$

T1= 300 x 10
3
x tan (4.64° + 8.53°) $\frac{94}{2}$ = 3301.15 x 10 3 N.mm

Total Torque =Tt=T1+T2
=3301.15 x
$$10^3 + 0 = 3301.15 x 10^3$$
 N.mm

Efficiency of screw:

$$n = \frac{\tan \alpha}{\tan (\alpha + \emptyset)} = \frac{\tan 4.64}{\tan (4.64 + 8.53)} = 0.347$$
 i.e 34.71 %