Published on *Mechanical Engg Simple Notes ,Solved problems and Videos* (https://mechdiploma.com)

Find the width of the belt, necessary to transmit 7.5 kW.....

Question:
Find the width of the belt, necessary to transmit 7.5 kW to a pulley 300 mm diameter, if the pulley makes 1600 rpm and the co-efficient of friction between the belt and pulley is 0.3. Assume the angle of contact as 180o and the maximum tension in the belt is not to exceed 8 N/mm width.

Answer:

Given

$P = 7.5\ kW = 7500\ W$ $d = 300\ mm = 0.3\ m$

$N = 1600\ rpm$. $\theta = 180^\circ \times \pi/180 = \pi\ rad$, $\mu = 0.3$

$T_{max} = 8\ N/mm$ width.

velocity of belt

$$V = \frac{\pi d N}{60} = \frac{\pi \times 0.3 \times 1600}{60}$$

$$= 25.13\ m/s$$

Power transmitted

$$P = (T_1 - T_2) V$$

$$7500 = (T_1 - T_2) \times 25.13$$

$$\therefore T_1 - T_2 = 298.45 \quad \text{——} (1)$$

we know that;

$$2.3 \log\left(\frac{T_1}{T_2}\right) = \mu\theta$$

$$\log\left(\frac{T_1}{T_2}\right) = \frac{0.3 \times 3.142}{2.3}$$

$$= 0.4098$$

$$\therefore \frac{T_1}{T_2} = 2.569 \quad \text{——} (2)$$

from eqn (1) & (2)

$T_1 = 488.67\ N$, $T_2 = 190.21\ N$

$\therefore$ Maxi Tension in belt

$$= 488.67$$

$$\therefore \text{width of belt} = \frac{T_{max}}{T_{max}/mm \text{ of width}}$$

$$= \frac{488.67}{8}$$

width $b = 61.08\ mm$ — Ans.