

## M/C DESIGN

- Length of open belt drive (O.B.D)

$$= 2C + \frac{\pi}{2}(D_1 + D_2) + \frac{(D_2 - D_1)^2}{4C}$$

- Length of cross belt driven (C.B.D)

$$= 2C + \frac{\pi}{2}(D_1 + D_2) + \frac{(D_2 + D_1)^2}{4C}$$

- Velocity ratio

$$V.R = \frac{N_2}{N_1} = \left( \frac{D_1 + t}{D_2 + t} \right) \left( 1 - \frac{S}{100} \right)$$

- Ratio of belt tension

$$\frac{T_1}{T_2} = e^{\mu \theta}$$

- Maximum tensile strength of belt

$$T_{max} = b.t.\sigma_{per}$$

- Power transmission capacity of belt drive

$$P.T.C = (T_1 - T_2)v$$

- Centrifugal tension

$$T_c = \frac{T_{max}}{3}$$

- Initial tension

$$T_0 = \frac{T_1 + T_2 + 2T_c}{2}$$

- Number of 'V' belts

$$n = \frac{P_{total}}{P_{each}} \times K_q$$

- Buckingham dynamic load

$$F_d = F_1 + \frac{20.67v[bc + F_1]}{20.67v + \sqrt{bc + F_1}}$$

$$c = \frac{a}{K \left( \frac{1}{E_1} + \frac{1}{E_2} \right)}$$

- Soderberg equation

$$\frac{1}{FOS} = \frac{\sigma_m}{\sigma_y} + \frac{K_f \sigma_v}{\sigma_s}$$

- Goodman equation

$$\frac{1}{FOS} = \frac{K_1 \sigma_m}{\sigma_{ut}} + \frac{K_f \sigma_v}{\sigma_e}$$

- Notch sensitivity index

$$q = \frac{K_f - 1}{K_t - 1}$$

- Unwin's formula

$$d = 6\sqrt{t}$$

- Area of transverse fillet weld

$$A_{TFW} = h\ell_w, \quad h = \frac{t}{\cos \theta + \sin \theta}$$

- Strength of T.F.W =  $0.832t\ell_w\tau_{per}$

- Strength of parallel fillet weld

$$= 0.707t\ell_w\tau_{per}$$

- Strength of Butt weld =  $h\ell(\sigma_t)_{per}$

- Frictional torque of thrust bearing by uniform pressure theory

$$(T_f)_{UPT} = \frac{2}{3}\mu\omega \left( \frac{R_o^3 - R_i^3}{R_o^2 - R_i^2} \right)$$

- Frictional torque of thrust bearing by uniform wear theory

$$(T_f)_{UWT} = \mu\omega \left( \frac{R_o + R_i}{2} \right)$$

- Power loss  $P_{loss} = T_f.\omega$

 $T_f$  equations for flat pivot bearing

$$(T_f)_{UPT} = \frac{2}{3}\mu WR$$

$$(T_f)_{UWT} = \frac{1}{2}\mu WR$$

- Bearing pressure

$$p_{ind} = \frac{W}{LD}$$

- Strength of bearing =  $p_{per} \times L \times D$

- Bearing characteristic number =  $\frac{zn}{p}$

- Mc-Kee's equation

$$\mu = \frac{33}{10^8} \left[ \left( \frac{zn'}{p'} \right) \left( \frac{D}{C} \right) \right] + K$$

- Somer field No.

$$S = \left( \frac{zn}{p} \right) \left( \frac{D}{C} \right)^2$$

- Petroff's equation for  $\mu$

$$\mu = \frac{2\pi^2}{p} \left( \frac{zn}{p} \right) \left( \frac{D}{C} \right)$$

- Life of bearing

$$L_{50} = \left( \frac{C}{P_e} \right)^k \quad (\text{Million rev.})$$

$K_q$  = service or overload factor.

# Mechanical Engineering All Formulas Machine Design

**F Rizvi**



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