

02-30 - angular contact

wkb
win99
P1/Pg1

$$\omega = 1800$$

$$C_R = 20.3 \text{ kN}$$

$$L_R = 1 \times 10^6$$

$$\sum \frac{l_i}{L_i} = \frac{l_1}{L_1} + \frac{l_2}{L_2} + \frac{l_3}{L_3} = 1 \sim \text{for failure}$$

Miners Rule

$$l_1 = 25 \text{ min} \times 1800 \text{ rpm} = 45,000 \text{ cycles}$$

$$l_2 = 30 \text{ min} \times 1800 \text{ rpm} = 36,000 \text{ cycles}$$

$$l_3 = ?$$

$$F_1 = 18 \text{ kN}$$

$$F_2 = 30 \text{ kN}$$

$$F_3 = 45 \text{ kN}$$

$$F_1^3 L_1 = F_2^3 L_2 = F_3^3 L_3 = K$$

$$K = C_R^3 L_R = (20.3)^3 (1 \times 10^6)$$

$$K = 8.37 \times 10^9$$

Shigley
Chart
PS RB-9
of notes

$$F_1^3 L_1 = K$$

$$(18)^3 (L_1) \Rightarrow L_1 = 1.44 \times 10^6$$

$$(30)^3 (L_2) \Rightarrow L_2 = 0.31 \times 10^6$$

$$(45)^3 (L_3) \Rightarrow L_3 = 0.091 \times 10^6$$

WK 6
Win 22
PI / P82

$$\frac{45,000}{1.44 \times 10^6} + \frac{36,000}{231 \times 10^6} + \frac{l_3}{21,125} = 1$$

$$l_3 = 77,700 \text{ cycles}$$

$$(\text{min}) = (\text{cycles}) \cdot \frac{1 \text{ rev}}{\text{cycle}} ; \text{rev/min}$$

$$(\text{min}) = (77,700)(\text{rev}) \left(\frac{1 \text{ min}}{1800 \text{ rev}} \right)$$

$$l_3 = 43 \text{ min}$$

76,716

$$F_r = 8 \text{ kN}$$

$$F_t = 4 \text{ kN}$$

$$\frac{F_t}{F_r} = \frac{4}{8} = 0.5$$

$$F_e = F_r \left[1 + 1.115 \left(\frac{F_t}{F_r} - 0.35 \right) \right]$$

$$F_e = 8 \left[1 + 1.115 (0.5 - 0.35) \right]$$

$$F_e = 9.34 \text{ kN}$$

$$C_{reg} = C_{min} = K_a F_e \left[\frac{L}{K_R L_R} \right]^{0.3}$$

$$K_a = 1.5 \sim \text{mid range (pg RB-15)}$$

$$L = (5000 \text{ hr}) \left(60 \frac{\text{min}}{\text{hr}} \right) \left(300 \frac{\text{rev}}{\text{min}} \right) \left(1 \frac{\text{cycle}}{\text{rev}} \right)$$

$$L = 270 \times 10^6 \text{ cycles}$$

$$K_R = 1$$

$$C_{reg} = (1.5)(9.34) \left[\frac{270 \times 10^6}{(1)(90 \times 10^6)} \right]^{0.3}$$

$$C_{reg} = 19.5 \text{ kN} \Rightarrow \left[\begin{array}{c} L21 \\ 211 \\ 312 \end{array} \text{ brgs' } P2 \text{ RB14} \right]$$

$$R = 99\%$$

$$K_R = 0.21$$

WK6
WIN 99
PRZ1P82

$$C_{req} = (1.5)(9.34)\left(\frac{3}{0.21}\right)^3$$

$$C_{REQ} = 31.1 \text{ kN}$$

L30
22† Bearings
318