

Unit-5

Design of Bearings

→ Bearings are machine element which are used to support a rotating member, a shaft.

↳ Ball bearing

⇒ Journal bearing.

① A single row deep groove ball bearing is subjected to radial load of 2500 N and axial thrust of 1500 N. A shaft rotates at 1000 rpm. Expected life of bearing is 10,400 hrs. The minimum accepted dia. of shaft is 50 mm. Select suitable bearing for application.

Given:

Radial load = 2500 N.

Life = 10,400 hrs.

$d = 50 \text{ mm}$.

Soln:

→ Single deep groove ball bearing.

PSG DB 4.12.

SKF 60 Series

$$C_b = 1370 \text{ kN} = 13439.7 \text{ N}$$

$$C = 1700 \text{ kN} = 16671 \text{ N}$$

PSG DB 4.2

$$P_e = [x F_r + y F_a] g$$

$$C_r = (L_{10})^{1/3} P_e$$

$$C_r < C$$

$$g = 1.1 \text{ [PSG DB 4.2]}$$

Rotary machine with no impact

$$F_a / C_b = \frac{1500}{13439.7} = 0.11$$

PSG DB 4.4 → 0.13 → 0.31^e

$$F_a / F_r = \frac{15000}{2500} = 0.6$$

$$F_a / F_r \geq e$$

$$x = 0.56 \quad y = 1.4$$

$$P_e = [(0.56 \times 2500) + (1.4 \times 500)] \cdot 1.1$$

$$= 3850 \text{ N}$$

$$\begin{aligned} \rightarrow L_{10} &= \frac{4 \cdot 10^6 \times 60 \times \eta}{10^6} \\ &= \frac{10,400 \times 60 \times 1000}{10^6} \\ &= 624 \text{ million / rev} \end{aligned}$$

$$C_r = (L_{10})^{1/3} P_e$$

$$C_r L C = 32899.4 N$$

$$C_r > C.$$

PSG P 13 4.15

$$d = 50 \text{ mm}$$

$$C_0 = 5300 \text{ kg } d = 51993 N$$

$$C_1 = 7000 \text{ kg } d = 68670 N$$

$$F_a / C_0 = 1500 / 51993$$

$$= 0.0288$$

$$e = 0.22, \text{ for } 0.025 = F_a / C_0$$

$$F_a / F_r = 0.6$$

$$F_a / F_r > e.$$

$$X = 0.56, \quad Y = 2, \quad S = 11.$$

$$\rightarrow P_e = [(0.5 \times 2500) + (2 \times 1500)] 1.1$$

$$= (1400 \times 3000) 1.1$$

$$= 4840$$

$$40 = 624 \text{ mill / rev}$$

$$C_r = [624]^{1/3} \times 4840$$

$$= 4359.3 \text{ N}$$

$$C_r < C$$

$$4359.3 < 68670$$

\therefore Selection is Correct