Section - I

2. dynamic load rating for Rolling contact bearing under variable loads.

1. consider the work cycle acted upon bearing. consist of the number of load $W_1, W_2 \ldots W_n$ and

$N_1, N_2, \ldots N_n$ be the speeds during these loads.

2. during the first element the life L_1 corresponding to load W_1 is given as.

$$L_1 = \left(\frac{C}{W_1}\right)^3 \times 10^6 \text{ revolution.}$$

3. In one revolution the life consumed is $\frac{1}{L_1}$

or $$\frac{1}{L_1} = \left(\frac{W_1}{C}\right)^3 \times \frac{1}{10^6}$$

4. Assume the first element consist of N_1 revolution so life consumed by first element is given as.

$$= \frac{N_1 W_1^3}{10^6 C^3}$$

5. Similarly for second element

$$= \frac{N_2 W_2^3}{10^6 C^3}$$

6. The life consumed by the complete work cycle is given by.

$$\frac{N_1 W_1^3}{10^6 C^3} + \frac{N_2 W_2^3}{10^6 C^3} + \cdots \frac{N_x W_x^3}{10^6 C^3} \quad \text{—(1)}$$

7. if W is the equivalent load for the complete work cycle the life consumed by the work cycle.

$$= \frac{N W^3}{10^6 C^3} \quad \text{—(2)}$$

$$N = N_1 + N_2 + \cdots N_x$$

8. equating eq —(1) and (2) we get

$$W = \sqrt[3]{\frac{N_1 W_1^3 + N_2 W_2^3 + \cdots N_x W_x^3}{N}}$$

$$= \sqrt[3]{\frac{N_1 W_1^3 + N_2 W_2^3 + \cdots N_x W_x^3}{N_1 + N_2 + \cdots N_x}}$$

$$\boxed{W = \sqrt[3]{\frac{\Sigma N W^3}{\Sigma N}}}$$

This eqn is used for calculating dynamic load capacity when bearing is subjected to a variable load.

Advantage.

1. The design of the bearing and housing is simple.
2. They occupy less radial space and are more compact.
3. They cost less.
4. The design of shaft is simple.
5. They operate more silently.
6. They have good shock load capacity.

Disadvantage.

1. The frictional power loss is more
2. They required good attention to lubrication,
3. They are normally designed to carry radial load or axial load only.