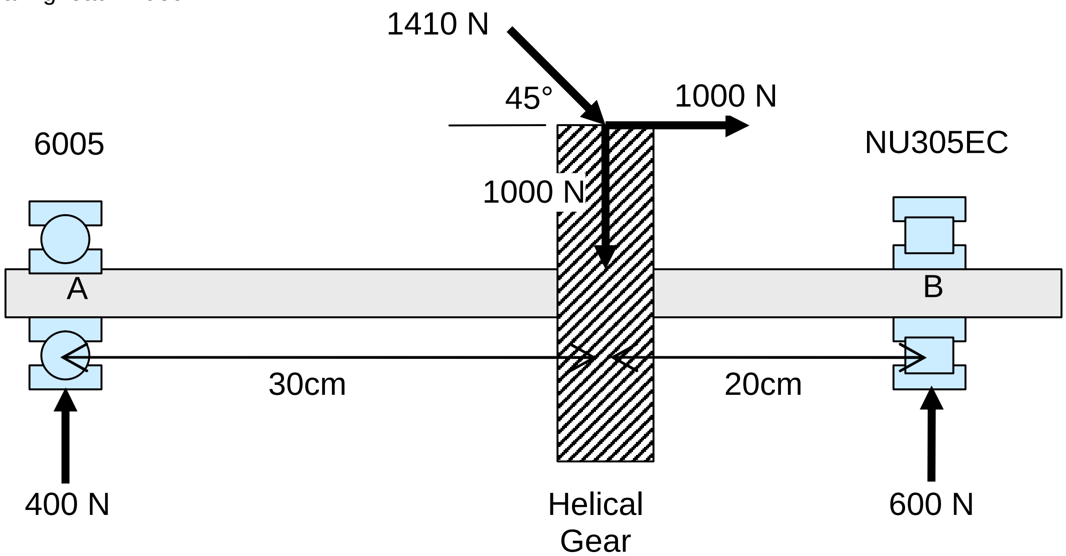

The diagram shows a shaft mounted on bearings supporting a bevel gear that applies a load of 1410N at a 45° angle. We want to know the life of the bearings, whose part numbers are shown.

First, we resolve the 1410N into 1000N Vertical and 1000N Horizontal.
Then we do a Free Body Diagram analysis to get the loads at A and B.

$$\sum M_A: \quad 1000 \times 30 = F_B \times 50$$

$$F_B = (30/50) \times 1000 = 600N$$

$$\sum F: \quad F_A + F_B = 1000N, \;\; F_A = 1000 - F_B = 1000 - 600 = 400N$$

For the <u>Cylindrical Roller Bearing NU305EC</u>, go to Table 13.7 on P. 575.
The static C_0 = 36,500N; the dynamic C = 40,200N

P_{radial} = 600N $$L = \left(\frac{C}{P}\right)^m = \left(\frac{40{,}200}{600}\right)^{10/3} = 67^{3.33} = 1.22 \times 10^6 \; Million\ cycles$$

For the <u>Deep Groove Ball Bearing 6005</u>, go to Table 13.6 on P. 573.
The static C_0 = 6,50N; the dynamic C = 11,200N
P_{radial} = 600N, P_{axial} =1,000N

$$\frac{P_a}{C_0} = \frac{1000}{6550} = 0.153$$ The closest P_a/C_0 value in Table 13.9 on P. 586 is 0.13.

This corresponds to an "e" of 0.31.

$$\frac{P_a}{P_r} = \frac{1000}{400} = 2.5$$

This is > e = 0.31, so use the right-hand column pair under "Single-row bearings" and get X = 0.56 and Y = 1.4. Then can compute the equivalent radial load:

$$P = XP_r + YP_a = 0.56 \times 400 + 1.4 \times 1000 = 1624N$$

$$L = \left(\frac{C}{P}\right)^m = \left(\frac{11{,}200}{1{,}624}\right)^3 = 6.9^3 = 328.0 \; Million\ cycles$$

Note that the exponent is now 3 because this is a ball bearing.
Conclusion: These rollers can take lots more load than these balls.