

"Tandem bearings - load sharing and life - compare 2 approaches

Ptot = total axial load generated by pump plus weight.
(Neglect radial load in vert application)

Part 1 - Assume each bearing takes half the load Ptot. Calculate individual lives...
.. then combine lives using formula $1/(1/L1+1/L2)$

Pbrg:= 0.5·Ptot (here we simply assumed identical bearings share the load equally)

$$L10brg1 := \frac{10^6 \cdot \left(\frac{Cbrg}{Pbrg}\right)^3}{60 \cdot \text{SpeedInRPM}} \quad \text{(normal life formula for a single bearing using value Pbrg from previous statement)}$$

$$L10tot1 := \frac{1}{\left(\frac{1}{L10brg1}\right)^{1.0} + \left(\frac{1}{L10brg1}\right)^{1.0}} \quad \text{(combine lives statistically)}$$

$$L10tot1 \rightarrow \frac{200000 \cdot Cbrg^3}{3 \cdot \text{SpeedInRPM} \cdot Ptot^3} \quad \text{(display results with all variables plugged in)}$$

Part 2 - Assume the two bearings act as one, with a combined rating of $2^{0.7}$ of Cbrg

Pbrg:= Ptot "This approach assumes the two bearings act as single unit
the single unit takes the whole load

$$Ctot := 2^{0.7} \cdot Cbrg$$

$$L10tot2 := \left(10^6\right) \cdot \frac{\left(\frac{Ctot}{Ptot}\right)^3}{60 \cdot \text{SpeedInRPM}} \quad \text{(normal life formula for a single bearing using value Cbrg from previous statement)}$$

$$L10tot2 \rightarrow \frac{50000 \cdot Cbrg^{3.2} \cdot 2^{10}}{3 \cdot \text{SpeedInRPM} \cdot Ptot^3}$$

Part 3 - Compare results of Part 1 and 2 by taking ratio of lives...
.. to see how close the results are

$$\text{Ratio} := \frac{L10tot1}{L10tot2} \quad \text{If ratio is 1, then the approaches of part 1 and part 2 would be identical}$$

$$\text{Ratio} \rightarrow \frac{4}{2^{10} \cdot 21} \quad \text{Display results}$$

$$\text{Ratio} = 0.933 \quad \text{Evaluate ratio... it ends up fairly close to 1.0}$$

Isn't it possible that the life combining formula of part 1 and the rating formula of part 2 really are equivalent?
i.e. each bearing carries half the load (under assumption of tandem identical bearings), and we calculate the combined life of individual bearings statistically as per part 1. The part 2 rating ($2^{0.7}$) just represents the combined rating of the two bearings, with that rating selected to give the proper combined life as calculated in part 1.

This goes with "Recreating Back-to-back bearing life calculation"
eng-tips thread <http://www.eng-tips.com/viewthread.cfm?qid=303580&page=1>