Internal Loading Distribution in Statically Loaded Ball Bearings Subjected To a Combined Radial, Thrust, and Moment Load, Including the Effects of Temperature and Fit

CATEGORY OR KEYWORDS

Machine Elements and Systems

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INTRODUCTION

Ball and roller bearings, generically called *rolling bearings*, are commonly used machine elements. Several works have been descrided methods for internal loading distribution in statically loaded bearings addressing pure radial, pure thrust (centric and eccentric loads), and combined radial and thrust loads [1]. However, few works show the parameters variations results, even under simple static loadings. The author believes that the lack of the results is mainly due to the inherent difficulties of the numerical procedures, which, in general, deal with the resolution of various non-linear algebraic equations, which must to be solved simultaneously. Hence, in this work a numerical procedure for internal loading distribution computation in statically loaded, single-row, angular-contact ball bearings, subjected to a known combined radial, thrust, and moment load, is used to find the load distribution differences between a loaded unfitted bearing at room temperature, and the same loaded bearing with interference fits, which might experience radial temperature gradients between inner and outer rings. For each step of the procedure it is required the iterative solution of Z + 3 simultaneous nonlinear equations – where Z is the number of the balls – to yield exact solution for axial, radial, and angular deflections, and contact angles. Numerical results are shown for a 218 angular-contact ball bearing.

I present here some results obtained at work:

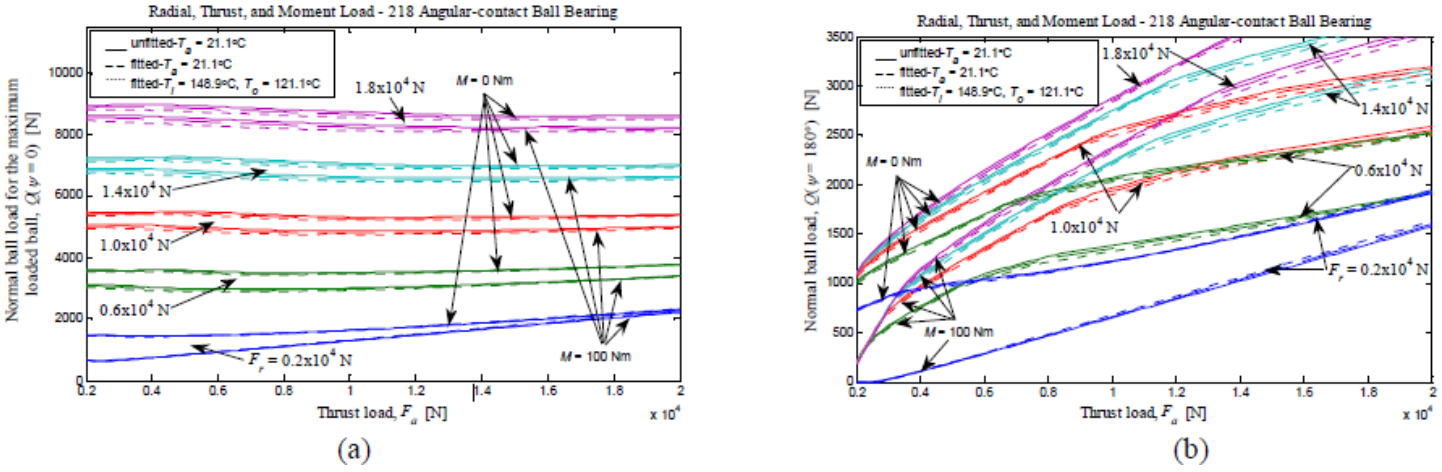

Fig. 1. - Normal ball load as a function of the thrust load, F_a: (a) for the maximum loaded ball, $Q(\psi = 0)$; (b) for the loaded ball located at $\psi = 180^o$, $Q(\psi = 180^o)$.

REFERENCES

[1] Harris, T., (2001), "Rolling Bearing Analysis", 4th ed., John Wiley & Sons Inc., New York.