Declaration

I Rajiv Vashist, student of M.Tech (Computational Design) under roll no. 2K13/CDN/12 of Department of Mechanical Engineering, Delhi Technological University, Bawana Road, Delhi declare that Major-II project report on "Analysis of hydrodynamic lubrication of a misaligned journal bearing" submitted in partial fulfillment of award of Degree of Masters of Technology under specialization in Computational Design is the original work conducted by me.

The information and data given in the report is authentic to the best of my knowledge. This report is not being submitted to any other university for award of any other Degree, Diploma or Fellowship.

Rajiv Vashist

Date: (2K13/CDN/12)

Certificate

This is to certify that the Major-II Project Report entitled “Analysis of hydrodynamic lubrication of a misaligned journal bearing” is a bonafide work carried out by Mr. Rajiv Vashist (2K13/CDN/12) and submitted to Department of Mechanical Engineering, Delhi Technological University, Delhi in the partial fulfilment of the requirement for the award of the Degree of the Masters of Technology under specialization in Computational Design under our supervision. It is further certified that the embodied work has not been submitted to any other institution for the award of other degree or certificate.

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Abstract

Journal bearings are one of the most commonly used types of bearings in rotating machines. Most of the journal bearings operate under misalignment conditions which affects nearly all the bearing common characteristics like minimum oil film thickness, maximum pressure in the lubricant, attitude angle, maximum load etc. Misalignment in journal bearings also affects the vibrational stability characteristics like critical frequency, oil film stiffness and damping. The main point in this study is to provide a comprehensive analysis on the oil film pressure, oil film thickness, load carrying capacity, attitude angle, critical frequency, oil film stiffness, and damping of journal bearing with different misalignment ratios. Computer program for the software Matlab implementing finite difference method to solve Reynolds equation for a finite length journal bearing has been developed taking eccentricity ratio as input. Graphical solutions are obtained for the pressure field over the bearing surface. The variation of bearing operating parameters for different values of misalignment factor is obtained. The results indicate that the misalignment have significant effect on the minimum film thickness and maximum film pressure. The variation in the stiffness and damping coefficients is significant for misaligned journal bearings under large eccentricity ratio. In the present design of the journal bearing, as the load and speed become higher, the eccentricity and misalignment ratio are usually large in the operating conditions. Therefore, it is necessary to take the effects of journal misalignment into account in the design and analysis of journal bearings.

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