

ESTIMATING BEARING STATIC LOAD DISTRIBUTION IN MULTI-BEARING MACHINES

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ABSTRACT

The alignment of a multi-bearing rotor system is of over-riding importance for the stability of the system, yet relatively little is known (quantitatively) about the configuration of machines under operational conditions. The salient point in this is the static load in each of the bearings and a method of inferring this from measured vibration data has been outlined in a recent publication. The method is based on the non-linear optimisation of the fit between the measured and model behaviour is extended to evaluate the steady load in oil film bearings. The next step is a laboratory verification of this approach and in this paper a description of the laboratory rig is given.

After briefly outlining the mathematical method, the features of the rig are described. Data from early commissioning runs under a range of alignment conditions are presented and in each case, the measured bearing stiffness and forces are presented. The dynamics loads on the rotor are estimated using a validated model of the rotor and hence an assessment of effective bearing stiffness is obtained. The static load on the bearing is a critical parameter determining the stiffness, implying that an estimate of this load can be obtained from the dynamic stiffness.

Finally a comparison is shown of the measured and predicted values of the static loads on each bearing.

Keywords: Bearing Load, System Identification, Alignment