

MORTON EFFECT ANALYSIS — THEORY, PROGRAM AND CASE STUDY

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ABSTRACT

A thermal synchronous instability phenomena in rotor-bearing systems, also known as the Morton effect, can be generated by the temperature difference developing across the fluid film journal as a result of the viscous shearing within the lubricant of the bearing. This thermal instability phenomenon has attracted more attention recently both in the rotating machinery industry and research institutes. In this paper, an improved theoretical model has been developed for predicting the occurrence of a synchronous thermal instability of the overhung section of a rotor system. This model employs an unbalance threshold criterion for instability prediction, which is convenient for the analysis and design of this rotor system configuration. The computer program, VT-MAP, which is based on the theoretical model, has been further developed to examine various cases that pertain to this thermal instability. The comparisons between the theoretical results and practical observations are presented in a number of case studies. The influence on the predicted instability by variation of bearing pad preload and width is also discussed.

Keywords: Morton effect, instability, thermal, rotor, overhung