DISTORTION OF A THRUST PAD EARING ON ELASTIC SUPPORT

by

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DEDICATED TO

MY PARENTS
MY FAMILY

CERTIFICATE

It is hereby certified that, except where the work of others has been specifically quoted, this thesis is entirely the result of candidate's own investigation under our guidance.

It is also certified that this thesis has not already been accepted in substance for any degree, and is not being concurrently submitted in candidature for any degree.

The results contained in this thesis have not been submitted, in part or in full, to any other university or institute for the award of any degree or diploma.

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ABSTRACT

This investigation pertains to analysis of elastic and thermal distortion effects on thrust bearing having elastic support.

The background on the subject and literature survey are given in Chapter 1. The elastic deflection formulation for rectangular pad geometry for isoviscous fluid is reported in Chapter 2. The same for the sector thrust pad has been given in Chapter 3. The solution procedure and computational aspects, methods employed are contained in Chapter 4. Chapter 5 contains the results obtained for rectangular and sector shaped pad for the stated conditions. The discussion on the results also follows in the same chapter.

The consideration of thermal distortion needed estimation of temperature profile of thrust pad. This required formulation of pressure generating equation for lubricant viscosity varying with temperature, the energy equation and implementation of viscosity-temperature relationship. These are included in Chapter 6.

The results of elastic and thermoelastic distortions alongwith new approach to solution of such problems are given in the chapter 7. The analysis based on thick plate theory has also been attempted by the author and is contained in this chapter. The conclusions and suggestions for future work follow in Chapter 8.

The results of investigation indicates that solution techniques are very important for obtaining theoretical results. It is also observed that thermal effects on the distortion of pad could be overbearing when compared to elastic bending. The results based on thick plate theory indicates the similar trend although the magnitude of maximum deflection is slightly more for the case studied when compared to thin plate results.

NOMENCLATURE

a	Minimum film thickness (m)
B	Width of pad across direction of flow (m)
b	Amount of taper (m)
D	Rigidity of pad material (N.m)
C_v	Specific heat of the lubricant (Joules /kg ^{0}C)
E	Modulus of elasticity (N/m^2)
H,H*	Nondimensional film thickness
H_2,H_0	Nondimensional minimum film thickness
h	Film thickness (m)
h_2,h_0	Minimum film thickness (m)
h_p	Film thickness along pitch line (m)
K	Spring stiffness per area (N/m^3)
K_A	Thermal conductivity of babbit lining (watts/m ^{0}C)
K_B	Thermal conductivity of parent material (watts/m ^{0}C)
L	Length of pad, along direction of flow (m)
M	Number of grid points along direction of flow
N	Number of grid point across direction of flow
P,P*	Nondimensional pressure
p	Pressure (N/m^2)
R	Nondimensional radius (r/r_0)
R_{cp}	Center of pressure across direction of flow
R_I,R_1	Inner radius of the pad (m)
R_0,R_2	Outer radius of the pad (m)
$R_{i,j}$	Nondimensional radius at any point i,j
r_0	Outer radius (m)
$r_{i,j}$	Radius at any point i,j
T	Oil temperature (^{0}C)

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