Scopus

Vol. 41, No. 2 (2019) 220-236, DOI: 10.24874/ti.2019.41.02.08

Tribology in Industry

www.tribology.rs

RESEARCH

Experimental Study on an Influence of Bearing Geometry and TiO_2 Nanoparticle Additives on the Performance Characteristics of Fluid Film Lubricated Journal Bearing

S.R. Suryawanshi[a], J.T. Pattiwar[b]

[a]*Mechanical Engineering Department, MET's IOE, BKC, Nasik, SPPU, Pune, India,*
[b]*SMES SCOE, Nashik, SPPU, Pune, India.*

Keywords:

Experimental test rig
Pressure distribution
Temperature rise
Tribology
Journal bearing

Corresponding author:

Shubham R. Suryawanshi
Mechanical Engineering Department, MET's IOE, BKC, Nasik, SPPU, Pune, India.
E-mail:
shubhamsuryawanshi255@gmail.com

ABSTRACT

The objective of this article is to study the performance characteristics of the journal bearing experimentally having different geometries operating with commercial Mobil grade lubricants that are used in power plant. Three grades of Mobil lubricants (DTE 24, DTE 25, and DTE 26) have been considered during the study. TiO_2 nanoparticle additives have also been considered during the study as a lubricant additive to examine the performance of journal bearings. An analytical approach was presented in the author's earlier work to obtain pressure and temperature profile. The dynamic characteristics such as stiffness and damping properties of journal bearings are represented in this paper. An experimental test rig is developed to accommodate any geometrical type of bearing. An elliptical journal bearing shows the superior performance than that of a plain bearing. The obtained experimental results are in a very good agreement with theoretical results for pressure and temperature profile.

1. INTRODUCTION

The rotating types of machinery are operating with an integral part known as hydrodynamic journal bearing of fluid film journal bearing. These journal bearings consist of stationery cylindrical bearing in which the journal rotates at a certain speed. The lubricating oil is supplied in the clearance space between the journal and bearing surface. The whirl instability phenomenon occurs during the operation of the journal bearing system that changes the properties of lubricating oil. This is due to the heat generation in the system that eventually causes the temperature rise in the oil film of lubricating oil. This phenomenon tends to cause the metal to metal contact during running condition. Hence the action of whirl instability may lead to the damage of the system. It decreases the performance of the bearing and affects the lubricant viscosity as it depends on the temperature [9]. Many researchers are