

Frictional Properties of Foil Bearings Under Start/Stop Conditions – Teflon vs. PVD-Based Coatings

Azzedine Dadouche^{1*}, Qi Yang¹, Martin J. Conlon¹, Daejong Kim²

¹ Aerospace, National Research Council, Ottawa, Canada

² Mechanical and Aerospace Engineering, University of Texas at Arlington, Texas, USA

Abstract

The main objective of the present work is to study and compare the performance of foil bearings for a typical turbo-blower during start/stop conditions. Test bearings feature three-segment bump foils and a full smooth top foil with a nominal diameter of 70 mm and an aspect ratio of 1. Three coatings, applied to the top foil, have been evaluated during the test campaign: Teflon, Molybdenum-Titanium Nitride (MoTiN) and Molybdenum-Aluminum-Titanium Nitride (MoAlTiN). Each bearing was instrumented with sixteen thermocouples located in the bearing sleeve 1 mm away from its inner diameter. Thermocouples allow the measurement of the bearing temperature field in the axial and circumferential directions. Bearing displacement was measured using 8 proximity probes located at each end of the bearing (four per side). Bearing overall vibrations were measured via two accelerometers located on top of the bearing housing in the vertical and horizontal directions. In addition, a torque arm mechanism was used to measure the bearing shear force; hence deduce the friction coefficient, friction torque and total power loss. The paper discusses friction and wear results obtained after one hundred start-stop tests for each bearing.

^{1*} Corresponding author: Azzedine.Dadouche@nrc-cnrc.gc.ca