

Development of a Test Rig for the Measurement of Squeeze-Film Damper Force Coefficients

Jawaid Iqbal Inayat-Hussain

*Department of Mechanical Engineering
Kobe University, Japan*

Hiroshi Kanki

*Department of Mechanical Engineering
Kobe University, Japan*

Yoshikazu Senno

*Department of Mechanical Engineering
Kobe University, Japan*

ABSTRACT

In this paper, the design and commissioning of a test rig for the measurement of squeeze-film damper force coefficients is described. The test rig utilizes an active magnetic bearing to provide the static preload and dynamic force excitation. Experimental results on the performance of the active magnetic bearing confirmed that the rig had a static load capacity of approximately 4500 N in the X and Y -directions. It is also capable of generating a dynamic force that is sufficient to provide the required dynamic amplitude for the force coefficients identification of the dampers up to a maximum frequency of 50 Hz. It is further shown that the dynamic test could be carried out with open-loop control of the active magnetic bearing up to a rotor static eccentric position of 0.2 mm. A frequency-domain technique is used to identify the force coefficients of the damper. This technique requires the simultaneous measurements of force and displacement, and their phase difference over a range of frequencies. The capability of the test rig is demonstrated by carrying out measurements on a test damper to identify its force coefficients.

Keywords: Squeeze-Film Damper, Force Coefficients, Active Magnetic Bearing, Experimental Rig, Parameter Identification.