



New Project 2015

NOVEL CARBON-GRAPHITE GAS BEARINGS AND SEALS FOR TURBOMACHINERY

Gas film bearings are attractive means to support rotating equipment while dispensing of complicated lubrication systems. In particular, tilting pad journal bearings with external pressurization permit operation with minute clearances and offer high stiffness for accurate positioning while operating with little shear drag and providing enhanced stability due to the absence of cross-coupled stiffnesses induced by hydrodynamic effects.

Porous type gas bearings, different from other hydrostatic bearing types that use orifices or grooves, include sub-micron sized holes distributed in their material matrix, like a sponge, that allow for an even distribution of gas flow over the entire surface of the bearing. The project aims to quantify the performance of porous Carbon-Graphite gas bearings for applications in highly loaded turbomachinery. To this end, the following tasks will be conducted:

- (a) Install test rig in laboratory cell, install air supply lines and instrumentation (eddy current sensors and accelerometers, flow meters).
- (b) Devise mechanism to calibrate static loader (air bearing), impact rotor and identify its free-free mode natural shapes and frequencies
- (c) Install test bearings, cylindrical bushing or tilting pads. Supply pressurized air into bearings, apply impact loads and record rotor displacements to get the system fundamental natural frequency and damping ratio.
- (d) Add mass imbalances on the rotor and perform rotordynamic measurements during shaft speed run up and coast down to 18 krpm (surface speed=90 m/s) for various increasing amplitudes of static load.
- (e) Begin analysis for prediction of gas porous bearings. Measurements of supplied flow vs pressure on various available pads will deliver a bulk-permeability. This parameter is needed for predictive analyses.