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3D Numerical investigation of pressure field of an Orifice Compensated Hydrostatic Bearing

F Ghezali[1], A. Bouzidane[1] and M. Thomas[2]
[1] Department of Mechanical Engineering, Univ. Tiaret,
BP 78 City / Province: Tiaret, (14000), ALGERIA
faiza.ghezali4@gmail.com; ahmed.bouzidane@gmail.com
[2] Department of Mechanical Engineering, École de technologie supérieure, 1100, Notre-Dame Street West, Montreal, Quebec, (H3C 1K3), CANADA
marc.thomas@etsmtl.ca

ABSTRACT

In recent years there has been much attention given to hydrostatic/hybrid journal bearings in research due to their wide spread engineering applications such as high speed turbomachinery, machine tools spindles, cryogenic equipment, and precision grinding spindles. However, with this attention, the activity toward improved understanding the flow regimes and the associated pressure pattern in the recess flow phenomena is still essential, in order to evaluate the performance characteristics of hydrostatic/hybrid journal bearings. The objective of this work is to provide an understanding of the influences of regime flow in recess on the pressure field of hydrostatic bearing flat pad fed by orifice restrictor and orifice inertia. 3D Reynolds Averaged Navier Stokes equations with the SST-kω turbulence model were applied in order to investigate the effects of pressure supply, dynamic viscosity and recess depths on the pressure profile of hydrostatic bearing flat pad. The finite volume method implemented in the ANSYS-CFX software is used. To prove the robustness of CFD code, a comparison of the numerical result and the Reynolds equation is performed at very deep recess. The results show good agreements between CFD and Reynolds equation methods. On the other hand, the several cases treated in this work contribute also to analyze and to explain the main reasons providing the inertia and the Rayleigh effect in **recess** flow.

Keywords: Pressure field / ANSYS-CFX / Finite volume method / 3D- Reynolds Averaged Navier Stokes / SST k-ω / Reynolds equation.
damping