The Effects of Oil Supply Pressure and Groove Position on Temperature and Pressure Profile in Journal Bearing Lubrication

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Abstract

A single axial groove for plain journal bearings is common in industrial applications. The groove is used to distribute oil over the length of journal and improve the temperature field. Oil enters the groove through an oil supply hole and flows either by gravity or under pressure.In hydrodynamic analysis, the oil supply was assumed available to flow into the bearing at least as fast as it leaks out. In this study, thermo-hydrodynamic performances of single groove journal bearing were investigated for various oil supply pressure values at different groove positions.Previous studies on analytical solution and instability analysis [1, 2] conclude that oil inlet pressure and oil inlet position have a pronounced effects on the oil film configuration, pressure distribution andinstability threshold speed. Experimental studies on pressure and temperature[3, 4] were reported earlier for a single value oil pressure supply at 0 degree position. The journal bearing test rig used in this study to characterize the profiles is shown in Fig. 1.A journal diameter of 100mm with a ½ length-to-diameter ratio was used. The oil supply pressure was set at 0.2, 0.5 and 0.7MPa. The groove was positioned at 6 different locations namely of -15^0, -30^0, 0^0, $+15^0$, $+30^0$ and $+45^0$.The bearing part was modified to fix 12 temperature sensors and 12 pressure transducers around the journal bearing circumference at every 30 degrees interval (Fig. 2).Measurements of temperature and pressure profileswere obtained for speed values of 300, 500 and 800 RPM at 10 and 15 kNradial loads.

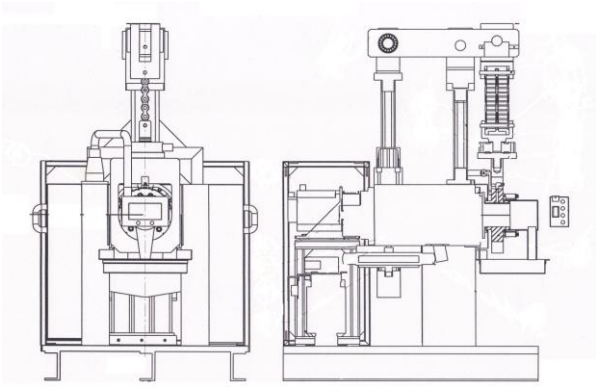

Fig. 1 Assembly drawing of journal bearing test rig

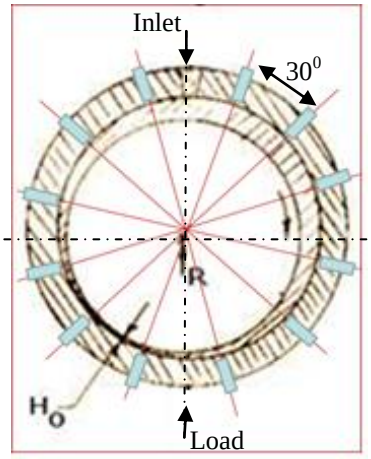

Fig. 2 Temperature and pressure sensor location

References

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