Analysis of Dynamical Performance and Contact for a High Speed Thrust Bearing including Slip Effects

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Abstract

Thrust bearing technology comprises a rotor and stator separated by a thin air film used to maintain a face clearance when subjected to external axial forces. The coupled processes of the pressurised flow through the bearing and the axial motion of the rotor and stator is examined for the rotor undergoing prescribed axial motion and stator modelled as a spring mass damping system. Compressible and incompressible flow models for a thin film bearing are derived in the form of modified Reynolds equations incorporating high speed effects, with both a no-slip and Navier slip velocity boundary condition considered. Uncertainty in the model may arise, amongst others, from the lack of knowledge in the bearing geometry or operating conditions, with no precise way for it to be determined. The effect of uncertainty in given input parameters and the disturbances felt by the bearing on the minimum bearing gap are investigated.