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Aeroelastic analysis of the air foil bearings in steady state

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Abstract: In recent decades, turbomachinery has known a special development with the aim of lightening rotating components of machinery and preserving the environment all for improving operating performances. The key elements in the turbomachinery are the air foil bearings that support rotors rotating at high speeds. In this paper, we are interested in the aero-elastic study of air foil bearing in stationary régime. The deformable structure contains a corrugated foils (bumps) fixed on a top-foil rigid which forms with rotor and air an elasto-aerodynamic contact. Numerical modeling was developed based on the Reynolds equation and an elastic deformation model of the bump depending on aerodynamic pressure, bump geometry and its mechanical proprieties. This problem non-linear is resolved using finite difference discretization and Newton-Raphson method. Finally, the calculations show the pressure distribution and field of film thickness as well as other fluid-structure interaction characteristics due to the functional conditions.

Keywords : air bearing, aero-elastic, foil structure, film thickness, charge capacity