

Finite element analysis of magnetorheological fluid embedded on journal bearings

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Abstract: In this work, the influence of magnetorheological fluid embedded on journal bearings in the dynamic behavior of rotors is considered. The modified Reynolds equations for Bingham viscoplastic materials are used for determination of the nonlinear hydrodynamic forces. Flexible rotors are modeled by the finite element method. The proper weight of the structure, unbalance and bearing hydrodynamic forces are included in the equation of motion as external excitations. Non-linear hydrodynamic forces calculation depends on the relative position between the shaft and the journal bearing. For this reason, the system response is determined by the modified Newmark method, which contemplates the determination of the equilibrium at any time step by the incorporation of the Newton-Raphson method. The whole model was developed in the Matlab® programming environment. The results of the case studies are presented as orbital graphs, displacements versus time and frequency responses.

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