Rotordynamics Software with Nonlinear Magnetic Bearings, Flexible Rotor, Flexible Foundation and Catcher Bearing Drop Effects

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Start Date: 2011. Dec

Background (Problem to be Solved):

Rotordynamics codes for magnetic bearing systems may have severe limitations including linear analysis without saturation features, no bandwidth limitations, no electric noise input, no modeling of magnetic bearing actuator and an oversimplified catcher bearing model. Our goals are to develop a stand-alone rotordynamics software which can meet all the requirements listed above and to perform related experiments so as to better assist the magnetic bearing system design. The software include the finite element method, numerical integration and experiment verification.

Currently Deliverables:

The currently deliverables include user friendly simulation software for rotordynamics systems with nonlinear magnetic bearings, flexible rotor, and flexible support; Predictions of stability and response by including nonlinear properties for saturation, 3D thermal “hot spot”, 3D flux field, power loss, and ISO standards check; Automatic magnetic bearing actuator design optimization with genetic algorithms; High fidelity catcher bearing model with drop events simulation, thermal modeling, catcher bearing life prediction, catcher bearing dampers effects.

Future work:

Our proposed works in this year includes catcher bearing model with squeeze film damper, wavy springs; catcher bearing test rig development and rotor drop experiment verification; System identification of plant and controller development based on the identified system;3D Magnetics and thermal solvers to replace commercial solvers; Optimization of isolated MB actuator.