INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: Modelling, Analysis and Identification of Misalignment in Rotor Systems Integrated with Active Magnetic Bearings

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SHORT ABSTRACT

In this work model-based identification of misalignment in coupled rotors with integrated active magnetic bearings is studied. The stiffness of the coupling is modelled as the sum of static stiffness and time-varying additive stiffness. The additive coupling stiffness model is developed based on weight dominance criteria and a suitable steering function. The steering function is used to mimic the multi-harmonic nature misalignment forces as noticed in various experiments.

The first model of the coupling considers angular misalignment and is suitable for Jeffcott rotors connected by flexible coupling. The second model considers both parallel and angular misalignment and is suitable for rotors with multiple discs connected by either rigid or flexible coupling. The third and final model considers angular misalignment and is suitable for spline joints found in gas turbine rotors.

The model of the coupling is integrated with the global equations of motion of the coupled rotor. The vibration responses at various rotor locations and current responses in AMBs are passed through full spectrum fft algorithm to estimate the amplitude and phase of the integer harmonics of rotor vibration and AMB current. An identification algorithm to estimate the static and additive stiffness of coupling, displacement and current stiffness of AMBs, unbalance and phase of the discs, stiffness of bearings has been developed.