

Detection of Feedback Related Faults in Magnetic Bearing/Rotor Systems Using Synchronous Control Techniques

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ABSTRACT

An adaptive open loop control approach for the synchronous vibration control of flexible rotor bearing systems has been extended to detect and identify changes in the system, and to diagnose faults in the measurements and input force channels. The results indicate that perturbations in the feedback gains for magnetic bearings cannot always be distinguished from changes in the external forces acting directly on the rotor. It is important to identify this type of fault distinctly for a number of reasons; the most important is that significant changes in the feedback gains affect system stability. Theoretical analysis is used to develop a method for the correct identification of this type of fault, which uses a dual frequency identification routine. The additional frequency is selected such that the dynamics are sensitive to changes in feedback gains. Experimental investigations are carried out on a flexible rotor supported by two magnetic bearings.

Keywords: fault detection, vibration control, stability, magnetic bearings, flexible rotor