

Control of Over-Hung Rotor Supported by Active Magnetic Bearings

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ABSTRACT

When designing an active magnetic bearings (AMB) control system, it is necessary to provide sufficient damping for the natural frequency within the range of the rated speed and, at the same time, to achieve stability suppressing vibration in a high-frequency bending mode (Spill-Over) in the high-frequency area outside the range of the rated speed. We have proposed a method for designing a control system using mode control for long rotor supported by AMBs, and succeeded in passing the 2nd bending critical speed during a rotational test. This paper deals with the designing of a controller for an over-hung rotor and the Q-factor evaluation of the critical speed by unbalance vibration. In this design, mode separation control is employed as the control method. Furthermore, to prevent Spill-Over, a Phase Shifting Filter (PSF) and a 2nd Low-Pass Filter (2nd LPF) are added to the PID control circuit, and the controller is designed to be robust at a high-order bending mode. The effectiveness is confirmed through theoretical analysis.