Abstract

Unbalance-induced vibration of rotating machineries is an essential factor in lowering the efficiency and performance of a rotating system. Particularly, the severe resonant vibration of a rotor while passing critical speeds has harmful effect on the rotor system. To minimize this vibration effect, this paper shows the active balancing approach using the active balancing device of an electromagnetic type and the balancing control program with a gain scheduling control for real spindle system. The designed active balancing device features a simple structure, fast response, accurate control, and non-contact driving in order to resolve major problems of existing balancing system. In addition, the balancing control method using influence coefficient matrix of a reference model as the gain matrix is proved to be effective in balancing by experiments even though rotating system's characteristics are changed suddenly. The stability of reference influence coefficient is verified by frequency response functions. The active balancing experiment for spindle system with our balancing device and program is well performed during operation, and then controlled unbalance responses are also below the vibration limit at all rotating speed ranges including critical speeds.