

Analysis of the Dynamic Characteristics of Lab-Centrifuges and Its Application

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ABSTRACT

Theoretical analysis and experimental research on the dynamic characteristics of the lab-centrifuges were performed in this paper. Considering the stiffness and damping of the support, the drive system of the lab-centrifuge was modeled into a complex rotor-support system. The impedance matching method, cooperating with Riccati transfer matrix method and modal analysis method were used to set up the motion equation of the drive system and its dynamic characteristics was analyzed. The method was proved to be correct and effective by tests. Besides, the paper put forward a method named “real number inference” to help set the initial eigenvalues properly, thus accelerates the converging process.

By using the method, the paper calculated the dynamic characteristics of one low-speed lab-centrifuge. The influences of the main parts on the dynamic characteristics were cleared and a critical speed in operating speed range was tuned successfully, thus the dynamic characteristics of the lab-centrifuge were much improved. Furthermore, the stability of the drive system of a typical lab-ultracentrifuges was analyzed as well. It was found that the stability of the higher eigen-modes were commonly insufficient, and some improving measures were put forward.

Keywords: Lab-centrifuge, Dynamic characteristics, Impedance matching method, Riccati transfer matrix method