The Study of Structural Performance Analysis and Improvement of High-speed Machine Tools

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ABSTRACT

Product accuracy improvement plays an important role in advancing the mechanical industry into a high value-added field. Emphasis should be placed on the efficiency, reliability and machining accuracy. The structure of a Vertical Machine Center must not only support the heavy weight but also withstand the cutting action. Therefore, a precision machine has to be carefully designed to avoid the undesirable deflection or vibration. The study is conducted through a static and dynamic structural analysis and undergoes the experiment on the basis of the Finite Element Analysis to construct the interface parameters. The results will be used to modify and assure its validity of the Finite Element Model. With the valid model, improvements on the structure of the machine unit can be performed to increase the stiffness and hence the natural frequencies, while not significantly increasing the weight of the machine unit. This error prediction model can be used to comprehend the structural error compensation later and improve the machining accuracy of a machine tool. This research also adopts the Super -Element Method to analyze the structural characteristics of the whole machine.

Keywords : Machine Tool ; Finite Element Analysis ; Modal Testing ; Modal Analysis

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