Testing,Analysis & Structure Improvement of the Structure of a Machining Center

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ABSTRACT

The structure of a machining center is one of the most important parts of the whole machine. It must not support the heavy weight but also sustain the reaction due to cutting. Therefore, it is required in design that a machine be stiff enough to avoid the inallowable deflection and the undesirable vibration. In additoon, the structure body also has to provide sufficient space and room so that accessary parts can be properly installed. To meet these conditions, a machine center generlly has a box-like body with ribs to increase stiffness and reduce vibration. In this study, the finite element program NASTRAN is employed to analyzethe structure dynamic response of the VICTOR VC-80 machining center. The analysis result are compared to those obtained from actual modal testing to assure the validity of the finite element model constructed using the pre-processor MSC/XL V3A. With the valid model, improvement on the structure of the machine unit is performed to increase the stiffness and hence the natual frequencies while not significantly increasing This reasearch uses a system of sixty six linear equations the weight of the machine unit.to describe the dynamic behavior of the Stewart Platform-type Mechanism. By means of these equations we can calculate the conditions of forces which are applied at each joint, including the values of actuator forces. By virtue of these equations, wi investigate two cases. One is to study the influence of actuator forces on ball and socket joints in the base and the platform, respectively, for different position arrangements of the joints. The other is to use the method of searching minimum value, which is one of optimization design methods,to find out the singularities of the platformtype mechanism.

Keywords : Modal Testing ; Modal Analysis ; Machining Center ; Structure

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