The Influence of the Structure Disposition on the Static and Dynamic Characteristics of A Machining Center

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ABSTRACT

BSTRACT The development speed of Taiwan machine tools industry increased a lot in the past few years. Its gross output value of 2003 is NT 71 billion, which is the 5th production country in the world. The estimated growth rate of this year is about 30 to 40%, and the gross output value will be NT90 billion then. In the international machining center ’ s domain, the overall production of vertical machine tools is about 80,000 to 90,000 sets per year, and Taiwan produces 15,000 sets. Taiwan only produces 200 to 300 sets of horizontal machine tools per year, which have high added value. On the other hand, the production of Japan is 6,000 to 7,000 sets per year. The development of machining center ’ s cutting technology has two major objectives, one is seeking high production efficiency, and the other is the increase of cutting accuracy. Therefore, we have to develop high class horizontal machining centers to raise the technology level in Taiwan, and increase the gross output value by its high added value in order to survive in the competitive environment. The disposition of overall structure and its design are the key elements to determine the characteristics of a machine tool. The approach to develop a machining center in the past was mainly duplication and the experience accumulation from mistake. Nowadays the designers can know the characteristics of mechanical structure well to shorten the development schedule and reduce the development cost by the integration of inspection instruments, new technology, and the design analysis software. The objective of this paper is to figure out the influences on static and dynamic characteristics between different structure disposition of horizontal machining centers by the ANSYS FEA and the comparison of practical testing cases. Then find a new structure disposition characteristic by such an analysis approach. In this way, we can know the characteristics of a machine tool very well in the design phase and decrease the risk of failure.

Keywords : Machining Center ; Finite Element Method

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