The Effect of bearing Preload On The Dynamic Performance of a Machining Tool Spindle

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ABSTRACT

Abstract Spindle is a key component that directly affects the machining capability and precision of a machining center. This research studied how the axial preload and the interference fit affect the static stiffness and dynamic performance of the spindle. Several different axial preloads and different radial interference combinations were used to assemble the spindles. Static stiffness of theses spindles was then measured. Comparison was made on these experimental data to identify the effect of radial and axial preloads on the radial and axial stiffness of the spindle. The results showed that the effect of the axial preload is significant both on axial and radial stiffness. The radial interference fit has a great impact on the radial stiffness but only has minor influence on the axial stiffness of the spindle. Experimental results also showed increasing of axial preload and increasing of radial preload both have great impact on the natural frequencies of the system. The experimental error caused by the geometric inaccuracy of components is not negligible.

Keywords: preload, static stiffness, dynamic performance, spindle-bearing system f

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