A Simple Analytical Model for Predicting Frequency Response Function of a Spindle

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Abstract: This article presents an analytical receptance coupling method for estimating the frequency response of a spindle with thermal effect. The analytical method features high efficiency in obtaining the dynamic stiffness of the spindle. First, the temperature distribution in the spindle is found out based on the thermal model. The spindle shaft is divided into several sub-uniforms Euler-Bernoulli beams to analyze its dynamic behaviors, the receptance coupling method is then used to couple all sub-uniform beams to obtain the frequency response function of the spindle. Analysis results showed that the thermal influenced significantly on the frequency response function. The results are also validated by experimental measurements. These results indicate that the proposed method has a strong potential for estimating the frequency response function of spindles.

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