

عنوان مقاله:

An investigation on dynamic stability of chatter vibration in cylindrical traverse grinding operation

محل انتشار:

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خلاصه مقاله:

Chatter is a result of self-excited vibration in machine tools, in which leads to dimensional errors, poor quality of surface finish in the work piece as well as possible damage to the machine tool. It is arising from the machine tool instability. Machining system instability depends on both structural and cutting process parameters. This article focuses on the use of a dynamic structural model in the stability analysis of cylindrical traverse grinding operation. For this purpose the dynamic of cylindrical grinding operation has been modeled and the natural frequencies and consequently its stability lobes were derived. Furthermore for estimation of the natural frequencies and mode shapes of the structure a three dimensional model of the cylindrical grinding machine is developed in CATIA environment and imported to ANSYS software for the FEM modal analysis. Experimental modal testing of a cylindrical grinding machine has also been performed to obtain the mode shapes and modal frequencies of the grinding machine structure. Frequency Response Functions and subsequent extraction of modal data was performed using ME'scope modal analysis software. The results obtained by the theoretical modeling of vibration and FEM modeling, are further verified through experimental modal test which were found to comply with the experimental results. Finally on-line experimental testing on structure verified the validity of stability lobe that obtained with use of dynamic model of structure and response frequency of modal testing through a program in MATLAB software.

کلمات کلیدی:

chatter; modal analysis; cylindrical grinding machine; stability lobe

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