Deflection analysis of the thin-web workpiece structure using similarity concept

ABSTRACT

The thin-web structure component is widely used in aviation and aerospace industries with the reason of light weight and high performance. However, the thin-web components are tending to deflect because of their poor rigidity and the effect of cutting force during cutting process. It is required to perform of high-speed machining that can remove the large number of material in a shorter time in order to allow machining of such structure. The performance of high-speed machining operation is restricted by the static and dynamic stiffness of the tool and part that can cause some problems such as regenerative chatter and ₌push-off₀ The tool path plays an important function to avoid the problem occurs as it assists to reduce the workpiece vibration during machining. The optimization of tool path is done by determining the element removal sequences and the materials removal are implemented using milling cutter. The maximum deflection for each element removed is recorded in order to define the optimum solution of element removal sequences. The analysis shows that there are significant effects of workpiece stiffness with relation to the cutting parameters setting.

Keyword: Machining operation; Thin-web structure; Workpiece deflection; Workpiece stiffness