

Thin-walled features high speed machining simulation

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Abstract

Nowadays Metal Machining is one of the most important manufacturing processes. Therefore, the control and improvement of this process means significant industrial benefits mainly in aeronautic structures, where monolithic components with low rigidity and thin walled features are common. The optimisation of this process comes from the use of high removal rates to increase the process performance, however, these components with low stiffness show static and dynamic problems during machining, poor surface quality and lack of accuracy. The modelling and simulation of manufacturing processes are emerging as key technologies to improve design, optimise process, reduce lead time and minimize the manufacturing cost.

The technical objective of this work is to improve the manufacturing of aluminium thin walled low rigidity components by using simulation tools to optimise the process conditions in order to get the required precision and quality of the final component.

The milling process has been modelled in time domain using a mechanistic model. The dynamic properties of the thin walled components are obtained from a FEM model, allowing the calculation of the changing dynamic properties along the manufacturing process due to the material removal.