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Optimization of process parameters for machining of Al 7075 thin-walled structures

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ABSTRACT

The aim of this paper was focused on research in order to improve the manufacturing of aluminium alloy thin-walled components through the optimization of milling process parameters. The methodology for optimization of milling parameters is developed and presented. The influence of the tool path strategy, wall thickness and feed rate on the machining time, dimensional accuracy deviation, shape and position accuracy deviation, and surface roughness in the case of line-type thin-walled parts machining were analysed. Based on the analysis of experimental results, the corresponding empirical models of responses were identified. Optimization of results was conducted using response surface methodology. Verification of optimization results was executed using two additional experiments. The results from experimental verification show a satisfactory matching with calculated optimal values. The basic scientific contribution of the paper relates to the development of a methodology for optimization of machining parameters for milling of thin-walled structures of aluminium alloy using an ANOVA method, Central Composite Design experiment and empirical modelling. Practical implications are related to the correct selection of the tool path strategy and feed rate value for machining of thin-walled aluminium components in order to achieve the required output techno-economic effects.

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