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Analysis of Vibration of Thin-Walled Parts During Milling Made of EN AW-7075 Alloy

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Abstract : Thin-walled components made of aluminum alloys are increasingly found in many fields of industry, and they dominate the aerospace industry. The machining of thinwalled structures encounters many difficulties related to the high susceptibility of the workpiece, which causes vibrations including the most unfavorable ones called chatter. The effect of these phenomena is the difficulty in obtaining the required geometric dimensions and surface quality. The purpose of this study is to analyze vibrations arising during machining of thin-walled workpieces made of aluminum alloy EN AW-7075. Samples representing actual thin-walled workpieces were examined in a different range of dimensions characterizing thin-walled workpieces. The tests were carried out in HSM high-speed machining (cutting speed vc = 1400 m/min) using a monolithic solid carbide endmill. Measurement of vibration was realized using a singlecomponent piezoelectric accelerometer 4508C from Brüel&Kjær which was mounted directly on the sample before machining, the measurement was made in the normal feed direction AfN. In addition, the natural frequency of the tested thin-walled components was investigated using a laser vibrometer for an broader analysis of the tested samples. The effect of vibrations on machining accuracy was presented in the form of surface images taken with an optical measuring device from Alicona. A classification of the vibrations produced during the test was carried out, and were analyzed in both the time and frequency domains. Observed significant influence of the thickness of the thin-walled component on the course of vibrations during machining.

Keywords : high-speed machining, thin-walled elements, thin-walled components, milling, vibrations
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