

## Documents

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### **Finite element analysis and statistical optimization of end-burr in turning AA2024**

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#### **Abstract**

This contribution presents three-dimensional turning operation simulations exploiting the capabilities of finite element (FE) based software Abaqus/Explicit. Coupled temperature-displacement simulations for orthogonal cutting on an aerospace grade aluminum alloy AA2024-T351 with the conceived numerical model have been performed. Numerically computed results of cutting forces have been substantiated with the experimental data. Research work aims to contribute in comprehension of the end-burr formation process in orthogonal cutting. Multi-physical phenomena like crack propagation, evolution of shear zones (positive and negative), pivot-point appearance, thermal softening, etc., effecting burr formation for varying cutting parameters have been highlighted. Additionally, quantitative predictions of end burr lengths with foot type chip formation on the exit edge of the machined workpiece for various cutting parameters including cutting speed, feed rate, and tool rake angles have been made. Onwards, to investigate the influence of each cutting parameter on burr lengths and to find optimum values of cutting parameters statistical analyses using Taguchi's design of experiment (DOE) technique and response surface methodology (RSM) have been performed. Investigations show that feed has a major impact, while cutting speed has the least impact in burr formation. Furthermore, it has been found that the early appearance of the pivot-point on the exit edge of the workpiece surface results in larger end-burr lengths. Results of statistical analyses have been successfully correlated with experimental findings in published literature. © 2019 by the authors. Licensee MDPI, Basel, Switzerland.

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