

Finite Element Modeling of the End Milling Process for Cutting and Impulsive Force Prediction

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This research utilizes Finite Element Modeling (FEM) to predict cutting forces in end milling operations. Simulations were performed using Abaqus, with models developed in SolidWorks, across different cutting parameters including feed rate, spindle speed, and depth of cut. Two models—one with and one without temperature effects—were examined to evaluate cutting force dynamics in the X, Y, and Z directions. The results indicate that temperature significantly influences force predictions, and varying cutting parameters result in corresponding ranges of force oscillations, consistent with findings from existing literature. The proposed simulations demonstrate the potential of FEM to enhance machining efficiency, extend tool life, and improve surface quality, supporting its future use in end mill process optimization and adaptive CNC control.

Keywords: *Abaqus, Cutting Forces, End milling, FEM, SolidWorks*