Assessment of cutting tool wear using a numerical FEM simulation model

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The advancement of computational modeling techniques, such as FEM, has enabled to simulate complex machining processes with improved accuracy. Wear prediction is a crucial aspect in understanding and optimizing machining processes, as it directly impacts tool life, surface quality, and overall machining efficiency. This work focuses on the FEM simulation, specially utilizing the DEFORM software, in conjunction with the Usui wear model, for wear prediction in machining operations. The Usui wear model, a well-established and widely used wear prediction approach, accounts for multiple wear mechanisms including adhesion, abrasion, and diffusion. By incorporating the Usui wear model into the FEM simulation framework within DEFORM software, it is possible to understanding wear phenomena in machining processes. The integration of Usui wear model algorithms into DEFORM, the simulation enables the accurate prediction of wear rates, distribution patterns, and progression of tool deterioration. This predictive capability facilitates the identification of critical wear zones and guides proactive measures to enhance tool life, reduce production costs, and optimize machining productivity. This work presents a research focused on wear prediction in cutting processes, utilizing finite element simulation with DEFORM software and incorporating the Usui wear model. Through the comprehensive analysis of wear phenomena, this research aims to optimize cutting parameters, enhance tool life, and contribute to the advancement of machining and manufacturing technologies.

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