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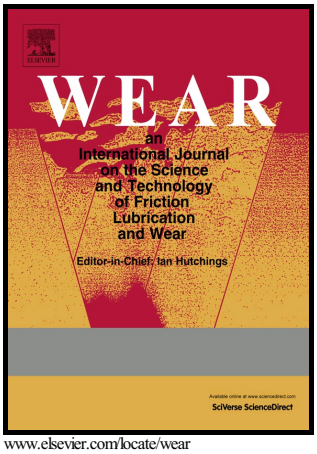

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A new approach for time-space wear modeling applied to machining tool wear

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Abstract

A general methodology is proposed and demonstrated for modeling the progression of crater wear on cutting tools used for steel machining. Dimensional analysis and Finite Element Analysis of metal cutting are the foundations of this new approach. The dimensional analysis resulted in a differential equation which describes wear rate as a function of dimensionless variables. Numerical models of cutting allow one to estimate local variables associated with wear at tool-chip contact. Orthogonal cutting simulations were carried out with commercial code DEFORM - 2D Ver 11.0. AISI 1018 steel was used as the workpiece material for an uncoated carbide cutting tool. Prediction of wear evolution and crater profiles on the tools rake face were in good agreement with experimental data.

Keywords: `wear modeling`, `metal cutting`, `crater wear`, `FEM`, `AISI 1018`, `dimensional analysis`

1. Introduction

Cutting tool wear has an important impact in machining economics. Prevention of tool wear and replacement of worn cutting tools represent about 18-24

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