Tribological potentials of PVD hard-coated micromilled microtextures

P. Azizabadi Farahani[2], O. Riemer[1,2], A. Mehner[1]

[1]Leibniz Institute for Materials Engineering – IWT, Germany

[2]MAPEX Center for Materials and Processes, University of Bremen, Germany

farahani@iwt.uni-bremen@.com

Abstract

This study investigates the tribological behavior of microtextured and PVD-coated tool surfaces in dry forming applications. Prior research has demonstrated that these surfaces can decrease friction and wear as well as enhance the quality of formed workpieces.

As microstructures become increasingly significant in diverse applications, precise prediction of topography and tribology is becoming more important. Although the fundamental mechanisms of milling are well understood, the accurate prediction of the influence of milling parameters on these properties and microtexture generation particularly is a challenge.

In this study, various parameters, including milling strategy, line spacing, feed rate, rotational speed, tool inclination (angle, orientation) and tool angle direction, are systematically varied to produce a wide range of different microtextures.The resulting dataset will be used to build an artificial neural network that allows accurate prediction of topography properties as a function of milling parameters.

Future work will include a CNN that can predict orientation-dependent friction and run-in behavior as a function of 3D topography and material pairing. Combining both models will provide the ability to predict friction as a function of milling parameters. A final step would be to invert the linked models to predict the milling parameters needed to achieve a desired friction.

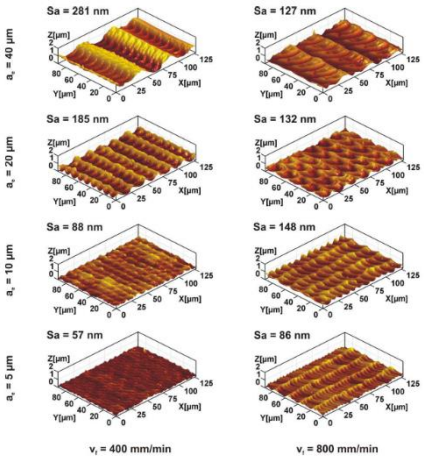

Fig. 1: Influence of feed rate on topography of micromilled steel surfaces