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The influence of tool texture on friction and lubrication in strip reduction testing (Article) (Open Access)

Sulaiman, M.H.[a,b], Christiansen, P.[a], Bay, N.[a]

[a]Department of Mechanical Engineering, Technical University of Denmark, Kgs. Lyngby, DK-2800, Denmark
[b]Mechanical Engineering Programme, Universiti Malaysia Perlis, Arau, Perlis, 02600, Malaysia

Abstract

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While texturing of workpiece surfaces to promote lubrication in metal forming has been applied for several decades, tool surface texturing is rather new. In the present paper, tool texturing is studied as a method to prevent galling. A strip reduction test was conducted with tools provided with shallow, longitudinal pockets oriented perpendicular to the sliding direction. The pockets had small angles to the workpiece surface and the distance between them were varied. The experiments reveal that the distance between pockets should be larger than the pocket width, thereby creating a topography similar to flat table mountains to avoid mechanical interlocking in the valleys; otherwise, an increase in drawing load and pick-up on the tools are observed. The textured tool surface lowers friction and improves lubrication performance, provided that the distance between pockets is 2-4 times larger than the pocket width. Larger drawing speed facilitates escape of the entrapped lubricant in the pockets. Testing with low-to-medium viscosity oils leads to a low sheet roughness on the plateaus, but also local workpiece material pick-up on the tool plateaus. Large lubricant viscosity results in higher sheet plateau roughness, but also prevents pick-up and galling. © 2017 by the authors.

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Sulaiman, M.H.; Department of Mechanical Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark; email:mhafsul@mek.dtu.dk