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Novel micro-lubrication coatings for metal forming tools

Jari Koskinen¹, Jukka Paro², Peter Andersson³, Jukka Kolehmainen⁴, Sanna Tervakangas⁴, Wolfgang Buss⁵, Margarita Tchomakova-Haefke⁶, Franco Rabezzana⁷, Yvonne Gerbig⁸

¹Aalto University School of Sci & Eng, Espoo, Finland ²VTT, , Finland ³VTT, Espoo, Finland ⁴Diarc Technology Oy, Espoo, Finland ⁵Fuchs Europe Schmierstoffe GmbH, , Germany ⁶, , Bulgaria ⁷Metec Innovation Consulting SRL, , Italy ⁸CSEM, , Switzerland

jari.koskinen@tkk.fi

Tribological thin films are widely applied in metal forming tools in order to extend the tool life time and surface finish of the work piece. Only recently, the optimization of thin coatings for lubricated conditions has been reported. Metal forming processes involve the transfer of high tractions across the tool/workpiece interface while deforming the work piece plastically. This process requires extensive use of lubricants and coolants. Due to constantly increasing pressure to avoid the use of environmentally harmful additives new lubricant and tool concepts have been introduced. Previously innovative coated surface texturing where the nm and micrometer size pores are processed by various methods has been reported. In laboratory tests texturing has reduced the coefficient of friction and allowed to use of lubricants with less additives. In this paper field test results of the in-process structured CrN and Diamond-like carbon (DLC) coated tools are reported. Fine stamping, punching, deep drawing and shear cutting tests have been carried out in production conditions in industry. The use of the CrN and DLC coatings extended the lifetime of tools in several cases by factor of two when compared to uncoated tools. The surface texturing enhanced the coated tool lifetime consistently by about 10 to 50%.

Keywords

DLC

CrN

Surface Texturing

Lubrication

Metal forming