Load adapted surface modifications for hot forming operations

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The tribological conditions between forming tool surface, intermediate media as coolant or lubricant and work piece material are directly related to the process results and resulting wear of tool-surfaces. There are different approaches for an optimization with reference to a modification of the subsurface region with diffusion treatments and surface coatings with appropriate hard layers. The potential of both treatments solely and combined in duplex treatments for the wear reduction in the field of hot forming is a key aspect in various collaborative scientific activities of IST and IFUM. Beside the material properties in the contact zone, the surface of a forging tool is also determined by its topography which is defined by the manufacturing method or applied finishing technology. There do exist several interdependencies between morphology, topography and microstructure of tools and achievable treatment results concerning hardness depth, adhesion and so forth. Thus, additional conditioning methods like abrasive finishing or severe shot peening seem to represent enhanced tools for a further wear reduction. During analysis of running-in processes the Abbott-Firestone graph was used in order to obtain suitable describing parameters for the topographical development such as the roughness-parameter $s_k$. It could be shown, that the development of $s_k$ has a strong influence on the tool life. Thus, a stabilisation of the topographical conditions can enhance the service life of the tools.

The definition of distinct tool topographies in addition with a stabilization of the initial state of the tool surface achieved with hard coatings and / or additional diffusion treatment is a very promising approach to enhance the wear resistance of forming tools. Recent results of research projects accompanied by industrial partners will show the potential of these combined technologies.

**Keywords**
wear reduction
hot forming
duplex treatment
topography