

OR0908

Duplex treatments are preserving adapted topographies to enhance tool life time of forging dies

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One of the dominating conditions determining the occurring wear in forging operations are tribological loads in the contact zone between die and billet during the forming process.

Thus, a key aspect of the latest collaborative scientific work of IST and IFUM in this application field is the analysis of the influence of different topographies depending on the manufacturing method and additionally applied finishing procedures by peening the surface with varying intensities of the structures on occurring wear. While the structures are vanishing quite soon during the first forging cycles, there is a need of preserving them to overcome the running-in stage of the production process. This was accomplished by combining a plasma nitriding treatment with hard pecvd coatings based on ternary systems Ti-B-N in a multilayered structure. Additionally, there are positive effects due to existing interdependencies between morphology, topography and microstructure of tools on one side and achievable treatment results concerning hardness depth, adhesion of hard coatings on the other hand.

Testing tools were investigated under forced tribological load conditions in several industrial process near testing series showing promising properties compared to standard tools. Besides the detection of the direct influence of the manufacturing route, it is possible to improve the wear resistance in reference to negative geometrical deviations expressing plastic deformation and abrasive wear. Additionally the crack sensitivity of the treated surfaces decreases dramatically and thus the amount of initial damages of the edge zone.

Results gained with treated production tools used in industrial operation show the high potential of these combined technologies for a stabilization of the service life time and higher efficiency of forging dies.

Keywords

topography
duplex treatment
wear reduction
hot forging