Characterisation and full-scale production testing of multifunctional surfaces for deep drawing applications

Full-scale deep drawing tests using tools featuring multifunctional surfaces are carried out in a production environment. Multifunctional tools display regularly spaced, transversal grooves for lubricant retention obtained by hard-turning, separated by smooth bearing plateaus realized by robot assisted polishing. Advanced methods are employed to characterise the tools' surface topographies, detecting the surface features and analysing them separately according to their specific function. Four different multifunctional dies as well as two un-textured references are selected for testing. The tests are run using a non-hazardous, environmentally friendly lubricant, and the forming forces are constantly recorded. Multifunctional dies exhibit very good performances, with no galling occurrence and punch forces generally lower than the two references.

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