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Tribological properties of active Screen Plasma treated H13 tool steel, against aluminum and WC-Co.

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H13 (1.2344) tool steel is widely used in metal forming applications. Surface quality of the formed parts requires the tool to be free of defects, such as those due to surface scratches, and material adhesion. Moreover, if forming operations are to be reproducible, tool geometry should be kept into narrow tolerances, i.e. with minimum wear.

Active Screen Plasma (ASP) offers the potential to treat complex tool geometries with minimum edge effects or arcing risk, and the process temperature can be controlled independently of the bias applied to the treated part.

In this work, the authors have explored multiple ASP nitriding and oxi-nitriding treatments of the H13 steel. The tribological studies have comprised the assessment of both the wear rates and coefficients of friction. The performance of the nitrided surfaces has been evaluated both against softer material, prone to adhesive wear (aluminum), and harder material, prone to erosive wear (WC-Co).

Tribological results of the different surfaces have been related to the properties of the nitrided layers (thickness, hardness - HV, composition and phases – XRD), and to the plasma treatment processing parameters.

Results show that ASP treatments do in fact enhance the performance of H13 tool steel, in terms potentially relevant to metal forming applications.

Keywords

Active Screen Plasma

H13

tribology

nitriding

aluminum