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INCREASING OF TOOL LIFE FOR HOT FORGING USING SURFACE MODIFICATION

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Abstract: *Techno-economic indicators in the hot forging of steel and other materials are highly dependent on the total life of forging tools, that is, the number of forged parts requires accuracy of regeneration after etching. Key influences on the life of tools, like in every tribo-system are: the pieces of material, geometry and material tools and machines for forging and environmental conditions. Characteristics of hot forging high temperatures are in contact materials and tools, and local high working pressures, the dynamic character of the load tools etc. Tool life is usually limited to the complex mechanisms of wear and tear, as a consequence of cyclic loading, such as abrasive and adhesive wear and, thermal and mechanical fatigue, and plastic deformation. This paper presents an overview of opportunities for increasing the life of forging tools by modern techniques for modifying the working surfaces of tools, according to comparative results of different methods, and gives appropriate recommendations.*

Keywords: *Hot forging, tool life, wear, coatings*

1. INTRODUCTION

In general, forging entails the sequential deformation of the workpiece material through a number of different processes. Furthermore, each forging operation comprises all the input variables such as billet material, dies, the conditions at the die-workpiece interface, the mechanics of shape change in the workzone, and the characteristics of the processing equipment, as illustrated in Fig. 1 [1]

Thus, in designing and developing bulk metal forming processes, key technical problem areas that must be addressed include:

- workipiece material-shape and size, chemical composition and microstructure, flow properties under processing conditions (flow stress in function of strain, strain rate and temperature), thermal and physical properties
- dies or tools-geometry, surface conditions, material and hardness, surface coating, temperature, stiffness and accuracy
- interface conditions -surface finish, lubrication, friction, heat transfer
- workzone - mechanics of plastic deformation, material flow, stresses, velocities, temperatures
- equipment used -speed, production rate, force and energy capabilities, rigidity and accuracy .

The understanding of these variables allows the prediction of the characteristics of the formed product, i.e., geometry and tolerances, surface finish, microstructure and properties.

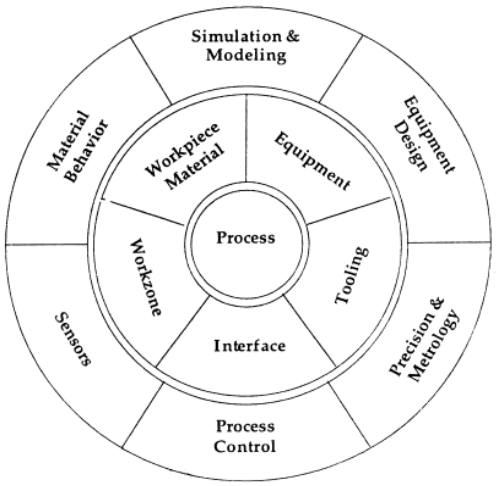

Figure 1. Variables of a bulk forming process [1]