

Influence of cold upsetting dies microstructure on their durability.

Stepankin Igor¹

Microstructure of third run dies for cold upsetting of railway bolts M22×70, M22×140 was investigated. Complex profile surface of dies (Fig.1) from tungsten-molybdenum steel was made by electroerosion process or by hot extrusion with preliminary triple reforging of metal and and by hot extrusion without preliminary reforging of metal.

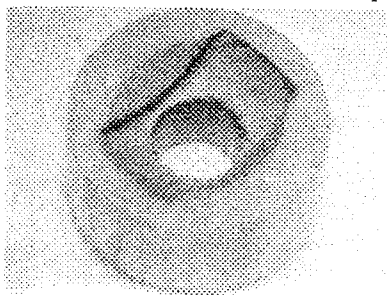


Fig.1 Cold upsetting die

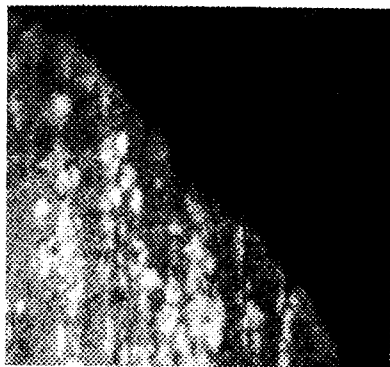


Fig.2 Microstructure of a die made by electroerosion method (x100).

Metal structure of shaping surface of a die after electroerosion process retains orientation of excess carbides chains characteristic for the blank and this results in crumbling of carbides on the working surface (Fig.2) and appearing instead of them concentrators of stresses and intensive cracking of die metal. Durability of such dies is 10-15 thousand strokes.

Grinding and mixing of carbide particles can be achieved by triple reforging of a blank followed by hot extrusion process for making die working surface. To optimize die production technology the process of hot extrusion was chosen for shaping of a working surface. For additional investigation of influence of triple reforging on tool metal microstructure the dies were divided into two batches. The first of them was made by hot extrusion from forged blanks.

Resulting microstructure of metal is characterized by grinding of carbides and elimination of sharply defined carbide chains

1. Doctoral student, Stepankin Igor, Gomel Polytechnical Institute named after P.O.Sukhoi.

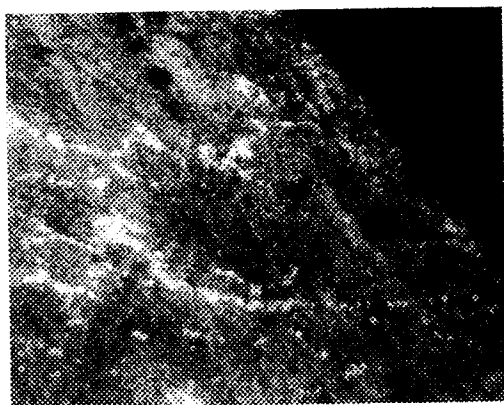


Fig.3 Microstructure of a die made from reformed blank by hot extrusion ($\times 100$).

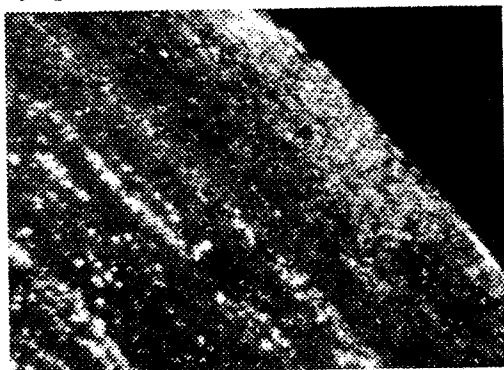


Fig.4 Microstructure of a die made by hot extrusion without preliminary reforging of a blank ($\times 100$).

(Fig.3). However it was impossible to ensure their uniform distribution through the whole body of metal and to avoid getting the carbides on the working surface. Durability of the dies produced by this process grew to 20 thousand strokes.

The second batch of dies was made by hot extrusion process without preliminary reforging. This method allowed to get the microstructure of steel with grounded carbides of globular shape parallelly oriented against working surface (Fig.4) and the probability of getting carbides on the working surface was reduced to minimum. Durability of the dies grew to 90-100 thousand stores.

Thus, using hot extrusion for producing working surface of dies for cold upsetting makes it possible to drastically improve their durability without preliminary reforging.

Summary

The paper describes the influence of cold upsetting dies production technology on their microstructure and durability.