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Selected Aspects of Efficient Forging in a Press With Three Moving Tools

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Abstract

The paper presents a prototype design of a three-slide forging press (TSFP), which differs from typical presses in that it has three moving working tools instead of one. The developed press enables the realization of forging processes that cannot be performed with typical forging machines. The technological processes implemented in the TSFP are part of the field of green technology, as the use of three movable working tools results in a reduction of material, energy and time consumption in the forming processes of metal and alloy products compared to typical manufacturing technologies.

The purpose of the research presented in this paper was to determine the optimal parameters of the processes carried out in TSFP and to develop efficient forging technologies for selected forgings. The main research method was experiment, which was supported by the results of numerical simulations based on the finite element method.

On the basis of the work carried out, the forgings were divided into groups, taking as a criterion the method of implementation of the technological process and the design of the tool assemblies used. The range of the most important technological parameters, which are the basis for the design of forging processes in TSFP, which include the limiting upsetting factor and the reciprocal relationship of forces exerted by individual tools, was also determined. Effective processes for the manufacture of selected forgings, i.e. the forging of a tee, a bicycle hub and a rocker arm, were developed and presented. Based on the developed technological processes, the advantages of using TSFP were demonstrated, which include the possibility of shaping forgings with complex shapes, as well as lower material and time consumption compared to other manufacturing processes.

Keywords: three-slide forging press, new machine, forging, process parameters, material consumption