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# COMPARISON OF SOME MECHANICAL PROPERTIES AND MICRO-TOPOGRAPHY OF A COMPONENT WITH NON-AXISYMMETRIC GEOMETRY MANUFACTURED BY COLD ORBITAL AND HOT FORGING

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## ABSTRACT

Orbital forging is an incremental bulk metal forming process which makes possible to produce complex parts for different applications, mostly in automobile, electrical and machine tools industries. Compared to conventional forging methods this technology offers many techno-economical advantages.

Present paper is aimed at analyzing and comparing mechanical properties in terms of hardness and tensile strength, as well as microstructure of a non-axisymmetric steel component (U-cross joint) manufactured by two different technologies: cold orbital forging and conventional hot forging.

The Vickers test method was employed for hardness testing of both types of forgings. Hardness was measured at different points and relevant cross sections with the goal to obtain fine distribution of this parameter. In the next step, based on the measured hardness values, tensile strength was calculated using the hardness-strength correlation.

Metallographic examinations of the surface structure as well as micro-hardness measurement of the ferrite phase were also carried out at the different cross sections of the components. Observed microstructure was analyzed and associated with the results of mechanical testing. Furthermore, a numerical analysis of the investigated cold orbital forging process was performed using commercial software package Simufact.forming and Finite Element (FE) approach.

**Key words:** cold orbital forging, hot forging, hardness, tensile strength, microstructure, FE.

## 1. INTRODUCTION

Forging technology dates back a long time in human history and is still used extensively for processing of metal materials. The main reasons for this are excellent mechanical properties of forgings and possibility for fast and cheap

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