Tribological behavior of four types of filler metals for hard facing under dry conditions

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Abstract
Purpose – The purpose of this study is to show which filler metal is the best for hard facing. Because the quality of the surface layer has a great influence on the working life of parts, the purpose was to extend the working life of parts exposed to intensive wear. The tested hard-faced models were made of low carbon steel to save the expensive base metal and to analyze the possibilities of extending the service life of existing structural parts.
Design/methodology/approach – Samples were prepared from plates hard faced with various filler metals. Samples were then subjected to experimental testing – testing of tribological properties and hardness and microstructure. Testing was done in conditions similar to real ones – with a sliding speed of 0.25, 0.5 and 1 m/s and with a load of 50, 75 and 100 N and in most rigorous dry conditions. Research was done by using a combination of experimental and theoretical approaches.
Findings – The paper shows the results of the experimental testing of four different filler metals aimed for hard facing of parts exposed to highly intensive wear. Results shown that CrWC 600 alloy is the most favorable filler metal for hard facing of parts such as those of construction mechanization and those subjected to intensive abrasive wear at stone mines.
Practical implications – All obtained results are real and fully applicable, as there is a huge industrial need for these types of technologies. With the application of these technologies, beside money savings, the working life of parts can be significantly extended.
Originality/value – The research presented in this paper was conducted because of the lack of results from this area in Serbia and because of the necessity for application of obtained results in companies for road maintenance and stone excavation in the region of Šumadija, Serbia.

Keywords Wear resistance, Friction coefficient, Filler metals, Hard facing, Hardness and microstructure, Wear volume, Microstructure

Paper type Research paper

1. Introduction

Numerous working parts during exploitation are exposed to various types of complex tribological processes and wear. It is hard to determine which of the wear mechanisms are dominant and which lead to the biggest damages. Usually, damages are consequences of coupled actions of several wear mechanisms. Therefore, it is necessary to use higher-quality materials, which are resistant to wear and can produce more working hours for the concrete machine part. Because the manufacturing of large parts or the whole structures of high-quality materials would be too expensive, the problem could be solved by the application of hard facing. It enables reparation of damaged parts or manufacturing of new parts by depositing high-quality materials on cheaper ones. In that way, one saves not only material and money but also the time needed for revitalizing damaged parts, shortening the downtimes, etc.

Truhan *et al.* (2007) dealt with problems of hard-face claddings for deep-hole drilling. Results have shown that there is an excellent correlation between friction coefficient and wear, by weight loss, of both the cladding and the casing alloys. There was also a good direct correlation between the wear of both the cladding and the casing. In addition, Kang *et al.* (2014) have shown that hard facing could successfully be used for reparation of parts in agricultural mechanization – rotary tiller for soil preparation. Tiller blades are subjected to

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