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TECHNO-ECONOMIC JUSTIFICATION FOR REPARATORY HARD-FACING OF MACHINE SYSTEMS' WORKING PARTS

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Abstract: Research in the field of hard-facing of various parts of mechanical systems is being done for technical and techno-economic reasons. The reasons for introducing the new reparation technologies by hard-facing are numerous: three quarters of all the mechanical parts of engineering systems could be regenerated or manufactured by hard-facing; the working life of the repaired part reaches or even exceeds the working life of a new part, while the working life of the hard-faced manufactured part surpasses several times the working life of the new part manufactured by some other technology. Large number of damaged and, frequently even broken parts causes terminations of the working process. Thus, due to difficulties in procurement of new, mainly imported parts, the alternative solution must be applied and that is regeneration by hard-facing.

It is shown that the a proper choice of the hard-facing technology is related to the complex procedure of checking the quality of the hard-faced layer, what indicates that the reparatory operations could be performed only in specialized regeneration workshops, which are furnished with adequate equipment and corresponding expert and skilled staff. The estimated net benefit for the analysed parts is exceptionally high, regardless of the fact that the additional external and internal effects have not been quantified. After the successful application of these new manufacturing hard-facing technologies it would be possible to create the knowledge base and apply it in maintaining the parts of civil engineering machinery, forging equipment and other similar mechanical parts.

Key words: regeneration, wear, hard-facing, costs, techno-economic analysis.

1. INTRODUCTION

The reasons for the introduction of technology for manufacturing and reparatory hard-facing are numerous: research indicates that three-quarters of all the mechanical parts can be regenerated and manufacturing hard-faced, service life of repaired part reaches or exceeds the service life of the new part, service life of new in production hard-faced part exceeds several times that of the new part, which was not hard faced, repair costs are reduced as well as the downtime due to purchasing a new part, which increases productivity, financing costs and cost of storage are also reduced [1- 4]. A large number of damaged, and often broken, parts cause termination of the process, and the difficulties in the procurement of new, mostly imported parts, must use an alternative such as hard-facing-regeneration. In addition, the maintenance of the technical system should take in consideration manufacturing of new parts by hard-facing, what is

expected to extend their service life with respect to the new working parts.

To perform the modelling of hard-facing of working parts, i.e., to prescribe general regeneration procedures, it is necessary to perform previous studies on a number of models and real working parts made of various types of steel and cast iron. While the surfacing almost every time is a unique job, because it requires the technology customized to each working part, it is possible to establish general procedure for groups of similar parts and then to apply it [2,5-6].

2. SELECTION OF THE OPTIMAL HARD-FACING TECHNOLOGY

In examining the state of the damaged parts one should first determine: whether the wear occurred during the normal exploitation or it appeared due to some mechanical damage; what is the degree of the part's wear is crucial for the decision whether it is cost-effective and

