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Mathematical Modeling and Optimization of Burnishing Parameters for 15NiCr6 Steel

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Abstract : The present paper is an investigation of the effect of burnishing on the surface integrity of a component made of 15NiCr6 steel. This work shows a statistical study based on regression, and Taguchi's design has allowed the development of mathematical models to predict the output responses as a function of the technological parameters studied. The response surface methodology (RSM) showed a simultaneous influence of the burnishing parameters and observe the optimal processing parameters. ANOVA analysis of the results resulted in the validation of the prediction model with a determination coefficient R=90.60% and 92.41% for roughness and hardness, respectively. Furthermore, a multi-objective optimization allowed to identify a regime characterized by P=10kgf, i=3passes, and f=0.074mm/rev, which favours minimum roughness and maximum hardness. The result was validated by the desirability of D= (0.99 and 0.95) for roughness and hardness, respectively.

Keywords : 15NiCr6 steel, burnishing, surface integrity, Taguchi, RSM, ANOVA
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