OPTIMIZATION OF ABRASIVE MACHINING OF DUCTILE CAST IRON USING TiO_2 NANOPARTICLES: A MULTILAYER PERCEPTRON APPROACH

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ABSTRACT

This study was carried out to study the effects of using nanofluids as abrasive machining coolants. The objective of this study is to investigate the performance of grinding of ductile iron based on response surface method and to develop optimization model for grinding parameters using artificial neural network technique. The abrasive machining process selected was surface grinding and it was carried out two different coolants which are conventional coolant and titanium dioxide nanocoolant. The selected inputs variables are table speed, depth of cut and type of grinding pattern which are single pass and multiple pass. The selected output parameters are temperature rise, surface roughness and material removal rate. The ANOVA test has been carried out to check the adequacy of the developed mathematical model. The second order mathematical model for MRR, surface roughness and temperature rise are developed based on response surface method. The artificial neural network model has been developed and analysis the performance parameters of grinding processes using two different types of coolant including the conventional as well as TiO_2 nanocoolant.. The obtained results shows that nanofluids as grinding coolants produces the better surface finish, good value of material removal rate and acts effectively on minimizing grinding temperature. The developed ANN model can be used as a basis of grinding processes.

Keywords: Grinding • Multilayer perceptron Approach • TiO_2 Nanofluid • Ductile Cast Iron •