World Academy of Science, Engineering and Technology
International Journal of Aerospace and Mechanical Engineering
Vol:13, No:02, 2019

Modeling of Tool Flank Wear in Finish Hard Turning of AISI D2 Using Genetic Programming

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Abstract : Efficiency and productivity of the finish hard turning can be enhanced impressively by utilizing accurate predictive models for cutting tool wear. However, the ability of genetic programming in presenting an accurate analytical model is a notable characteristic which makes it more applicable than other predictive modeling methods. In this paper, the genetic equation for modeling of tool flank wear is developed with the use of the experimentally measured flank wear values and genetic programming during finish turning of hardened AISI D2. Series of tests were conducted over a range of cutting parameters and the values of tool flank wear were measured. On the basis of obtained results, genetic model presenting connection between cutting parameters and tool flank wear were extracted. The accuracy of the genetically obtained model was assessed by using two statistical measures, which were root mean square error (RMSE) and coefficient of determination (R^2). Evaluation results revealed that presented genetic model predicted flank wear over the study area accurately (R^2 = 0.9902 and RMSE = 0.0102). These results allow concluding that the proposed genetic equation corresponds well with experimental data and can be implemented in real industrial applications.

Keywords : cutting parameters, flank wear, genetic programming, hard turning
Conference Title : ICMAME 2019 : International Conference on Mechanical, Aeronautical and Manufacturing Engineering
Conference Location : Paris, France
Conference Dates : February 21-22, 2019

Open Science Index, Aerospace and Mechanical Engineering Vol:13, No:02, 2019 publications.waset.org/abstracts/96967.pdf