Flank Wear Modeling in High Speed Hard End Milling Using Integrated Approach of Monte Carlo Simulation Method and Taguchi Design

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Abstract

In high speed cutting of hard materials, the wear rate will be very difficult to predict due to the fast and sever changing in the cutting zone. Therefore, using the traditional methods in predicting the output responses will be not the correct options. One of the effective alternatives is by using artificial intelligent approach. The current work presents the simulation of flank wear rate in high-speed hard end milling of AISI H13 hardened steel using an integrated approach of using: Monte Carlo (MC) simulation method based on Taguchi design. An experimental investigation was carried out using coated carbide tools to run a set of experiments using Taguchi design (L9) with three input factors at three levels in the following design boundary: cutting speeds (352-452 m/min), feed rate (0.01-0.05 m/rev), and depth of cut of (0.2-0.5) mm. Each experiment was repeated twice using three inserts. The results was used to create 1000 run simulated from 135 experimental reading. A new model was developed using JMP software. The results were analyzed statistically and indicate that even with the complexity of the process, the neural network technique was found to be adequate in predicting and simulating the flank wear length.

Keywords

Author Keywords: High speed end milling; hard materials; Taguchi; Monte Carlo simulation
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