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Analytical Modelling of Surface Roughness during Compacted Graphite Iron Milling Using Ceramic Inserts

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Abstract : This study investigates the effects of the lead angle and chip thickness variation on surface roughness during the machining of compacted graphite iron using ceramic cutting tools under dry cutting conditions. Analytical models were developed for predicting the surface roughness values of the specimens after the face milling process. Experimental data was collected and imported to the artificial neural network model. A multilayer perceptron model was used with the back propagation algorithm employing the input parameters of lead angle, cutting speed and feed rate in connection with chip thickness. Furthermore, analysis of variance was employed to determine the effects of the cutting parameters on surface roughness. Artificial neural network and regression analysis were used to predict surface roughness. The values thus predicted were compared with the collected experimental data, and the corresponding percentage error was computed. Analysis results revealed that the lead angle is the dominant factor affecting surface roughness. Experimental results indicated an improvement in the surface roughness value with decreasing lead angle value from 88° to 45°.

Keywords : CGI, milling, surface roughness, ANN, regression, modeling, analysis
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