

Machining Parameter Optimization of EVA Foam Orthotic Shoe Insoles

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Abstract

In this study, ethylene-vinyl acetate (EVA) foam orthotic shoe insoles with different surface roughnesses (Ra) are investigated in terms of CNC milling strategy. Based on a hybrid Taguchi-response surface methodology (TM-RSM) approach, machining parameters, including tool path strategy, spindle speed, feed rate, and step over, as well as material hardness, are of particular interest. The main aim of this work is to develop mathematical models and determine the optimum machining parameters. Experiments are conducted on a CNC milling machine with a standard milling cutter and run under dry coolants. The optimal conditions are established based on TM and then used to determine the optimum values in the RSM modeling. The main finding of the present work is that there are significant improvements in the Ra, by up 0.24% and 4.13%, and machining time, by up 0.43% and 0.41%, obtained with TM-RSM in comparison to TM analysis.

Keywords: shoe insole, EVA foam, CNC milling, surface roughness (Ra), machining time

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