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Critical Analysis in Milling of GFRP Composites by Various End Mill Tools

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Abstract

Glass Fiber Reinforced Plastic (GFRP) composites are widely used in various industrial applications due to their higher strength to weight ratio. During the machining process the stress concentration may lead to catastrophic failure of the structure while in service. Need to minimize these surface defects in machining; the research is still going on some what extent, which is important aspect in engineering production. Hence, the importance of this study to evaluate the machinability of uni-directional Glass Fiber reinforced Polyester (UD-GFRP) composites by four different end mill tools with 10mm diameter: two number of customized two fluted brazed carbide tipped toolswith different tool angles; commercially availed one number four fluted High Speed Steel (HSS) end mill tool and one number four fluted solid carbide end mill tool. The milling operations were conducted with help of Taguchi L25 Design of Experiments (DOE) to optimize the process parameters of spindle speeds from 690RPM to 2500 RPM and the feed rates 0.6mm/Sec to 1.4mm/Sec at constant depth of cut is 3mm. These effects definitely influenced on the output responses such as machining force and surface roughness. From the results of the Analysis of Variance (ANOVA), the feed rate is highly influenced factor on the machining force and the spindle speed is significant factor for the surface roughness. And from the experimental evaluation it is showed that the performance of customized end mill tool-2issuperior in terms of better surface quality. Finally,the machined surface texture was thoroughly examined with Scanning Electron Microscope (SEM), and found that the surface defects were low, when machined with customized end mill tool among the other tools.

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*Keywords:*Four number of end mill tools; GFRP;Machining force; SEM; Surface roughness;Taguchi's technique; ANOVA.

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