

# Investigations on performance characteristics of GFRP composites in milling

I. S. N. V. R. Prasanth<sup>1</sup> · D. V. Ravishankar<sup>2</sup> · M. Manzoor Hussain<sup>3</sup> · Chandra Mouli Badiganti<sup>4</sup> · Vinod Kumar Sharma<sup>5</sup> · Sunil Pathak<sup>6</sup>

## Abstract

Milling of *glass fiber reinforced polymer* (GFRP) composites becomes essential in order to enhance its surface quality by improving its dimensional tolerances, and minimizing the surface defects. In present work, investigations were done to optimize the four important milling parameters, namely, spindle speed ( $N$ ), feed rate ( $f$ ), depth of cut ( $t$ ), and type of milling tool on performance characteristics (i.e., machining force ( $F_m$ ) and surface roughness ( $R_a$ )). Taguchi L25 orthogonal array was used for experimental planning, and analysis of variance (ANOVA) has been used to identify the contribution of each considered parameters on performance characteristics of unidirectional (UD) GFRP composites. Optimum combination of parameters, i.e., spindle speed 1950 rpm, feed rate 1 mm/s, depth of cut 1 mm, and type of milling tool as two-fluted brazed carbide tipped end mill tool, were identified to achieve minimum values of machining force and surface roughness. Scanning electron microscope (SEM) was used to study the surface morphology of UD-GFRP composite laminates. Minimized subsurface damages were found, when milled with customized two-fluted brazed carbide tipped end mill tool.

**Keywords** Milling · UD-GFRP · Composites · Machining force · Surface roughness · ANOVA, SEM