# Natural fiber-reinforced composites: Types, development, manufacturing process, and measurement

## ABSTRACT

Natural fiber-reinforced polymer composites offer huge benefits in terms of weight and cost savings, and therefore has been employed in numerous automotive interior and exterior parts. Precision cutting of the composite parts is important to minimize material loss with better surface finish. This paper focuses on the types and manufacturing of composites with machinability characteristics of fiber-reinforced composite. Finally, the study concerns the employment of gray relational analysis to determine the optimized cut characteristics in precision cutting of cocoa pod husk fibers-reinforced thermoplastic polyurethane composites. The cut characteristics, namely kerf width (material loss) and surface roughness (surface finish) are optimized as a function of blade speed, feed rate of the blade, and cocoa fiber loading in the composite. A central composite design method is used to determine the multi-performance characteristics of cut using precision linear saw. The set of the optimized processing parameters is determined based on the highest grade at minimum feed rate (12.1 mm s$^{-1}$), minimum blade speed (2500 rpm), and minimum fiber content (20% by weight). The influence of each parameter on cut quality is also discussed where the effects of feed rate and blade speed were more significant as compared to the fiber content.