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Measurement and optimisation of residual tensile strength and delamination damage of drilled flax fibre reinforced composites

Abstract

The advent of natural fibre as reinforcement material for polymer composites has gained much attention in recent years. Since composite materials made of natural fibres exhibited good and comparable mechanical properties, they are being applied in automotive, packaging and general appliances. These applications would inevitably require the natural fibre composites to be drilled, if not machined. However, open hole in the composites induces discontinuity and strength reduction in the composite structure. Results from literature search showed that experimental study on evaluating the effect of hole on the drilled natural fibre composites, namely, flax fibre, has not been attempted or reported. Therefore, the objective of this study is to experimentally evaluate and measure the residual tensile strength and delamination factor of the drilled flax fibre composites. In particular, a series of drilling experiments were performed for collection and measurement of the aforementioned outputs through Taguchi design of experiment. The results suggest that both residual strength and delamination factor were more sensitive to the change in feed rate, followed by spindle speed and tool geometry. Indication from this study is that flax fibre composites could be a potential substitute of their synthetic fibres counterpart in the load-bearing as well as non-structural applications.

Keywords; Fibres (flax natural fibres); Machining (drilling); Mechanical/tensile testing; Residual strength