Torsional behaviour of filament wound kenaf yarn fibre reinforced unsaturated polyester composite hollow shafts

ABSTRACT

Synthetic fibre is of higher strength in composites and is a low cost material, but the problem is that it does not degrade in the environment. Studies on single yarn natural fibre have been reported, especially those concerned with improving its mechanical properties. This can be used for lower end applications such as furniture and automotive dash board to reduce the utilization of synthetic fibre. Continuous yarn fibres are required to increase the strength for engineering applications and filament winding is a method to produce aligned technical composites which have high fibre content. This paper presents an experimental and simulation studies to investigate the behaviour of composite hollow shafts, with a specific focus on the maximum torsion capacity of the composite hollow shaft for different winding angles and aluminum reinforcement. The conventional filament winding machine was modified and added to a new resin bath mechanism in order to produce a new natural fibre composite hollow shaft using kenaf yarn fibre reinforced with unsaturated polyester resin. The results show that the torsion capacity is significantly affected by changing the winding angle and the presence of aluminum in the static torque test capacity properties. The maximum static torsion capacity of kenaf yarn fibre reinforces unsaturated polyester composite shaft at a winding angle of 45° was higher strength than 90° orientation while the presence of aluminum enhanced the torsion property significantly. Finite element analysis (FEA) using Abaqus software was carried out and showed a good agreement with the experimental results.