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Title :

A Study on The Post Impact and Open Hole Tensile Strength of Kenaf and Kenaf/Fibreglass Hybrid Reinforced Composite

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Natural fibres have emerged as the potential reinforcement material for composite structures and have gained interest by many researchers. Due to their light weight and low costs when compared with synthetic fibre. Kenaf fibres recently have been considered as a substitute material in many weight-critical applications such as marine, automotive and other industries. Attempts to hybrid the kenaf fibre with the synthetic fibre such as fibreglass were carried out in this study to investigate the tensile properties of fibreglass reinforced kenaf composite. In this study, polyester natural fibre kenaf composites and kenaf/fibreglass hybrid composites were fabricated by using combination of hand lay-up and cold-press methods. The effect of different fibre types (powder, short fibres and unidirectional long fibres) on the tensile properties of the composites was investigated. The effect of volume fraction on the tensile strength of kenaf composites was also studied. The post impact tensile tests and open hole tensile tests of long kenaf fibre composites with and without the addition of fibreglass were carried out. The optimum tensile strength of kenaf composites was obtained at 25% volume fraction of long kenaf. Significant improvements in tensile strength and modulus were observed by the introduction of long kenaf/woven fibreglass hybrid composite. The composites with long kenaf/woven fibreglass hybrid had the highest strain to failure. Long kenaf and woven fibreglass improved the interfacial bonding between the fibres and matrix if compared with kenaf powders, kenaf short fibres and chopped strand mat (CSM) fibreglass. The effect of moisture content on tensile strength of kenaf and kenaf hybrid composites was investigated. Studies on the tensile and low velocity impact of kenaf composites and kenaf/fibreglass reinforced polyester resin composites revealed that the composites were seriously impaired when low energy impact load was applied. The tensile strength of open hole long kenaf composites was more sensitive to notch than long kenaf/woven glass hybrid composite. It was noticed that the long kenaf/woven glass hybrid composites had greater residual strength and modulus than long kenaf composites. The hybrid composites were more resistance to crack growth. Fibre matrix debonding followed by fibre fibre ruptures or pull-outs finally caused the composites to fail. The woven fibreglass structure created a strong interlamina bond with kenaf and matrix and hence improved the tensile strength and modulus of the final hybrid product. The severity of matrix failure was therefore lesser as compared with the matrix damage in long kenaf composite. The damage areas measured from impacted specimens and open hole tensile specimens showed similar trend in the strength degradation rate. The correlation between impact and open hole tensile thus can be used as a tool to predict the strength degradation rate based on the fracture mechanic concepts. The possible approach on this correlation will be proposed for prediction of composite damage in future work.