Natural fiber composites subjected to low velocity impacts: experimental and analytical approach

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Abstract

Natural fiber composites have the potential to be widely applied as an alternative to or in combination with fiberglass composites in sustainable energy impact absorption structures.
In this study, the behavior of hemp fiber reinforced vinylester composites subjected to low-velocity impact loading, using an instrumented falling weight impact equipment, is presented. Different stacking sequences were tested, also using a hybrid approach combining the natural fibers with traditional glass fabric. Both penetration and indentation tests were performed.
In the light of an increase in safety of green composite components and systems subjected to low-velocity impacts, next to the numerical models, the development of theoretical models is also useful and low time-consuming. Therefore, analytical models, available in the literature for traditional fiber reinforced plastics and aimed at predicting the critical load of delamination onset, the indentation as a function of absorbed energy as well as the approximation of the load-displacement curve, were used and implemented in such characterization. Good agreement was found between the theoretical predictions and experimental results.