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Mechanical Behavior of Sandwiches with Various Glass Fiber/Epoxy Skins under Bending Load

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Abstract : While the polymeric foam cored sandwiches have been realized for many years, recently there is a growing and outstanding interest on the use of sandwiches consisting of aluminum foam core because of their some of the distinct mechanical properties such as high bending stiffness, high load carrying and energy absorption capacities. These properties make them very useful in the transportation industry (automotive, aerospace, shipbuilding industry), where the "lightweight design" philosophy and the safety of vehicles are very important aspects. Therefore, in this study, the sandwich panels with aluminum alloy foam core and various types and thicknesses of glass fiber reinforced polymer (GFRP) skins produced via Vacuum Assisted Resin Transfer Molding (VARTM) technique were obtained by using a commercial toughened epoxy based adhesive with two components. The aim of this contribution was the analysis of the bending response of sandwiches with various glass fiber reinforced polymer skins. The three point bending tests were performed on sandwich panels at different values of support span distance using a universal static testing machine in order to clarify the effects of the type and thickness of the GFRP skins in terms of peak load, energy efficiency and absorbed energy values. The GFRP skins were easily bonded to the aluminum alloy foam core under press machine with a very low pressure. The main results of the bending tests are: force-displacement curves, peak force values, absorbed energy, collapse mechanisms and the influence of the support span length and GFRP skins. The obtained results of the experimental investigation presented that the sandwich with the skin made of thicker S-Glass fabric failed at the highest load and absorbed the highest amount of energy compared to the other sandwich specimens. The increment of the support span distance made the decrease of the peak force and absorbed energy values for each type of panels. The common collapse mechanism of the panels was obtained as core shear failure which was not affected by the skin materials and the support span distance.

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