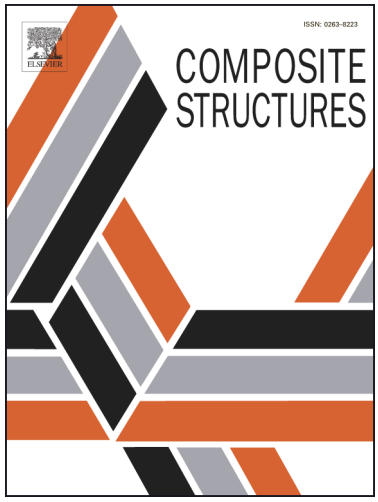

Experimental and numerical investigation on the dynamic response of sandwich composite panels under hydrodynamic slamming loads

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Experimental and numerical investigation on the dynamic response of sandwich composite panels under hydrodynamic slamming loads

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Abstract

Sandwich structures have been widely used in marine applications due to their properties such as high weight/strength ratio. In contrast, the failure mechanism of these structures has a significant effect on the local and global dynamic responses. In the present study, sandwich panels with polymeric skins and PVC foam cores subjected to slamming impact are investigated experimentally and numerically. A high speed shock machine is used to keep approximately a constant velocity during the impact event. The dynamic resistance was analysed in terms of hydrodynamic loads, dynamic deformation and failure mechanisms for different impact velocities. On the other hand, the slamming model was implemented in Abaqus/ Explicit software based on Coupled Eulerian Lagrangian model approach. In addition, different damage modes are incorporated in the numerical model, including the intralaminar, debonding in skin/core interface, and core shear to cover all possible damage modes throughout structures. Two failure criteria (Hashin criteria for the laminate composite and Christensen criteria for the core in sandwich structure) are defined and integrated into VUMAT sub-routine. In addition, the cohesive zone model is used to predict the debonding skin/core. A good agreement in both hydrodynamic loads and damage prediction were found between numerical and experimental results.

Keyword: Sandwich panels; Hull Slamming; Impact; Experimental and numerical investigation; Fluid-Structure Interaction; Fracture mechanics.

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