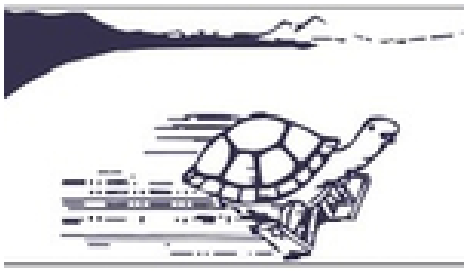

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LIGHTWEIGHT ALUMINIUM SANDWICH STRUCTURES FOR MARINE VEHICLES

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One of the most important design strategies for increasing the speed and/or efficiency of marine vehicles is that of weight reduction. This can be achieved by optimising structural design via judicious distribution of the most apt materials and via the application of innovative lightweight structures.
Sandwich structures are ideal candidates for structural lightening since they provide excellent mechanical properties at low densities, and a wide range of properties via intelligent selection of face-sheet and core materials, and configurations. Further, sandwich structures selection for marine vehicles needs to consider manufacturing feasibility for large structures, sustainability issues and materials compatibility with the aggressive marine environment.
As a possible alternative to the ubiquitous glass reinforced plastic (GRP) fibre composite sandwich materials used for marine vehicles, all-aluminium sandwich structures have several attractive properties such as light weight, high mechanical properties, sustainability, and corrosion resistance. Common architectures for metallic cores include; honeycomb, foam, corrugated and lattice. Mainly due to economical and manufacturing restrictions, a corrugated core could be most applicable for marine structures.
Hence, this work aims to investigate the mechanical response of aluminium corrugated sandwich structures, with particular attention to bending and low-velocity impact response. Bending stiffness was used as the criteria to select corrugated panels allowing valid comparisons with typical marine GRP sandwich panels. These corrugated structures were first subjected to quasi-static indentation tests to predict the impact response. Low-velocity impact tests were then performed and the corrugated sandwich response was compared with that of other lightweight sandwich structures to assess their energy-absorption efficiency. Corrugated panels were also tested under bending conditions to evaluate collapse mechanisms and the effect of corrugation direction on bending response. The acquired information can be applied to support the design of lightweight corrugated panels to be used for decks, floors, ceilings and other structural elements of marine vehicles.

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