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Innovative material design for marine engine non-structural components

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Marine engine industry researches for continuous improvement of efficiency and performance. Currently, all components of marine engines are made in metallic alloys. To reduce costs and weight, new materials for non-structural components must be identified. The new materials, e.g., nano-engineered thermoplastic polymers (NETP), will allow additional benefits due to drastic weight reduction and simplified maintenance and inspection operations.

Advancements in NETP design and application in marine engine industry relies on computer-assisted multi-scale material design (CAMMD). Indeed, by advanced CAMMD techniques, the structure of NETP materials can be tailor-fitted to achieve the expected performances required by specific, advanced applications.

Since the introduction of plastic materials in the construction of non-structural components for marine engines constitutes an element of great innovation, a specific rule framework must be defined yet.

In this paper, starting from the analysis of the regulatory context currently used for metallic alloys a certification procedure is proposed and applied to a case study related to the cylinder head cover of a four-stroke marine engine. In particular, the mechanical properties of a new NETP material designed by CAMMD have been verified through a finite element simulation carried out on the relevant model.

Primary author: Mrs BERTAGNA, Serena (University of Trieste)

Co-authors: Prof. MARINÒ, Alberto (University of Trieste); Dr LAURINI, Erik (University of Trieste); Prof. PRICL, Sabrina (University of Trieste); Prof. BUCCI, Vittorio (University of Trieste)

Presenter: Mrs BERTAGNA, Serena (University of Trieste)

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