World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:15, No:07, 2021

Operational Challenges of Marine Fiber Reinforced Polymer Composite Structures Coupled with Piezoelectric Transducers

Authors : H. Ucar, U. Aridogan

Abstract : Composite structures become intriguing for the design of aerospace, automotive and marine applications due to weight reduction, corrosion resistance and radar signature reduction demands and requirements. Studies on piezoelectric ceramic transducers (PZT) for diagnostics and health monitoring have gained attention for their sensing capabilities, however PZT structures are prone to fail in case of heavy operational loads. In this paper, we develop a piezo-based Glass Fiber Reinforced Polymer (GFRP) composite finite element (FE) model, validate with experimental setup, and identify the applicability and limitations of PZTs for a marine application. A case study is conducted to assess the piezo-based sensing capabilities in a representative marine composite structure. A FE model of the composite structure combined with PZT patches is developed, afterwards the response and functionality are investigated according to the sea conditions. Results of this study clearly indicate the blockers and critical aspects towards industrialization and wide-range use of PZTs for marine composite applications.

Keywords : FRP composite, operational challenges, piezoelectric transducers, FE modeling
Conference Title : ICCEA 2021 : International Conference on Composites for Engineering Applications
Conference Location : Paris, France
Conference Dates : July 19-20, 2021