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Residual strength properties of GFRP composites, using in SARI 250kW wind turbine blade: A practical approach to predict fatigue damages

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One of the applications of glass fiber reinforced polymers are in wind turbine blades. These blades are subjected to cyclical loading consequently suffering fatigue damage. In this study, the residual strength in E-glass fiber reinforced epoxy composite with the sequence of [90/0/±45]' made by vacuum infusion process (VIP) has been investigated. By determining the ultimate tensile strength and S-N curve, the residual strength test was performed at a maximum stress level of 163 MPa for three different ratios of nominal fatigue lifetime namely, 20, 50 and 80 percent of nominal fatigue lifetime. The experimental results of residual strength were analysed by linear (BR), nonlinear (REI) and modified (OM) proposed models. The reduction in the residual strength was observed in the experimental and predicted results of the OM model representing a preliminary loss of residual strength, a subsequent decrease with low slope and a sudden drop at later stages of its life. These changes may be attributed to the rapid accumulation of the damage in the first stage, damping at energy in the second stage and delamination in the third stage. The results represent the conservative function of the linear model (BR) and the adaptation of the modified model (OM) to the experimental results.

Speaker Biography

Pouya Valizadeh is a dynamic industrial PhD candidate with more than 7 years of experience in design, manufacturing and testing of wind turbine blade; familiar with related cost analysis and raw materials market. Some of his academic research works are a fatigue and failure mechanisms of GFRP composites and adhesives in wind turbine blades, and industrial projects such as design and implementation of T-Bolts in root joint of wind turbine blades.

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