

Effect of an Interface Defect in a Patch/Layer Joint under Dynamic Time Harmonic Load

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Abstract : The study is a continuation of the research on the hygrothermal piezoelectric response of a smart patch/layer joint with undesirable interface defect (gap) at dynamic time harmonic mechanical and electrical load and environmental conditions. In order to find the axial displacements, shear stress and interface debond length in a closed analytical form for different positions of the interface gap, the 1D modified shear lag analysis is used. The debond length is represented as a function of many parameters (frequency, magnitude, electric displacement, moisture and temperature, joint geometry, position of the gap along the interface, etc.). Then the Genetic algorithm (GA) is implemented to find this position of the gap along the interface at which a vanishing/minimal debond length is ensured, e.g to find the most harmless position for the safe work of the structure. The illustrative example clearly shows that analytical shear-lag solutions and GA method can be combined successfully to give an effective prognosis of interface shear stress and interface delamination in patch/layer structure at combined loading with existing defects. To show the effect of the position of the interface gap, all obtained results are given in figures and discussed.

Keywords : genetic algorithm, minimal delamination, optimal gap position, shear lag solution

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