Evaluation of Interlaminar Shear Stress by Strain Measurements on Laminate Surface

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ABSTRACT

The interlaminar shear stresses of composite laminate have been the keys to the delamination of laminated structures. In most cases, because of the uncertainty in the loading on a structure, it is not possible to predict precisely the stresses during design stage. Therefore, monitoring the structural responses during service becomes crucial for structure with concerns, e.g. the composite panels on an airplane, etc.. However, the strain on a preformed structure can only be measured on surfaces by strain gages or other experimental techniques. In this study, the strains on surfaces of the laminate, along with the classical lamination theory and the higher order shear deformation theory, were used to predict the interlaminar shear stresses in the laminate. Several numerical examples using the simulated surface strains were employed to assess the accuracy of proposed models. It is found that the model using higher order shear deformation theory has improved accuracy for the analysis of thick symmetric laminate（S＞4） over the model using the classical lamination theory. However, the simplicity and good accuracy of the model using classical lamination theory for thin laminates（S＞20）still makes it an attractive technique.

Keywords : Composite laminate ; Interlaminar shear stresses ; Delamination ; Strain gages

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