

Damage Identification of Delaminated Composite Structure Using PCA

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As one of the major failure mechanisms for laminated composite structures, the delamination decreases system stiffness and shifts down natural frequencies of the laminated structures. In this study, effects of delamination in laminated composite structure are investigated using improved layerwise theory. Also, numerical models of piezoelectric actuators and sensors are developed for validation. The transient response of piezoelectric sensor output includes the information of delaminations in laminated composite structures, but it is nontrivial to figure out the effect of damage directly from sensor output. In order to identify the effect of damage in delaminated composite structure, this study incorporates principal component analysis (PCA) along with the proposed computational modeling of the delaminated composite structure. Finally, a damage identification map is constructed from the analysis of the proposed modeling scheme.

Keywords: Damage Identification, Delamination, Piezoelectric sensor, PCA