

Numerical study on evaluation of fatigue damage for an adhesive joint

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Nondestructive characterization for quality control and remaining life prediction has been a key enabling technology for the effective use of adhesive joints. In this paper, analytical model with different compression and tension stiffness is proposed to interpret the degradation of adhesive joint. During in-service conditions, damage will appear in the adhesive layer due to loading, environmental attack or other reasons. This will thus lead to the decrease of the effective cross-section area of the adhesive layer. Considering of the fact that the adhesive layer is very thin, it is reasonable to assume that the damage will decrease the tension modulus of the adhesive layer while the compression modulus will keep unchanged. This is a nonlinear boundary condition. A purely sine harmonic wave will be distorted when passing through the adhesive layer, and higher order harmonics will be generated. The degree of harmonic generation provides information about the damage.

Keywords: Nonlinear waves, Fatigue damage, Adhesive joint