STUDY OF ADHESIVE BOND EFFECT ON ELECTRO-MECHANICAL BEHAVIOUR OF COUPLED PIEZO STRUCTURAL SYSTEM

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Abstract

Electro-mechanical Impedance technique is a recently developed non-destructive method for structural health monitoring. This system comprises of Piezo electric patch, bonded to the structure using an adhesive/epoxy and electrically excited to determine the health of the component. The subjected electric field actuates the PZT patch harmonically and imparts a force on the host structure. The structural response thus produced by the host component is in the form of peaks and valleys which further shows the admittance signatures of the structure for the given excitation frequency. Adhesives have the capability to change the structural signatures, in EMI technique, by transforming conductance and susceptance signatures. The static approximation provide a justifiable results where adhesive bond lines are thin and stiff.

The epoxy adhesive bonds limits design flexibility due to poor bond strengths, hence, to enhance the performance of the joints, a new technique is developed for joining PZT i.e., the Alloy Bonding technique. It is a metallic joining compound which contains many active elements including Titanium, that reacts with the tenacious surface films of the ceramic and composites to create excellent bonds. This alloy based bonding technique will be used for better strain interaction and rigorous stress transfer between PZT patch and the host structure.

Keywords: EMI technique, conductance, susceptance, admittance, alloy bonding.