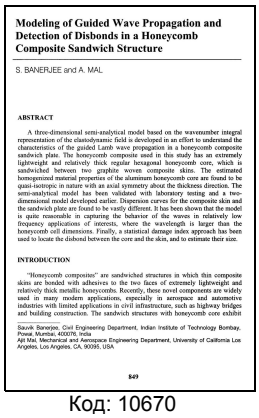

Modeling of Guided Wave Propagation and Detection of Disbonds in a Honeycomb Composite Sandwich Structure

S. BANERJEE and A. MAL

ABSTRACT

A three-dimensional semi-analytical model based on the wavenumber integral representation of the elastodynamic field is developed in an effort to understand the characteristics of the guided Lamb wave propagation in a honeycomb composite sandwich plate. The honeycomb composite used in this study has an extremely lightweight and relatively thick regular hexagonal honeycomb core, which is sandwiched between two graphite woven composite skins. The estimated homogenized material properties of the aluminum honeycomb core are found to be quasi-isotropic in nature with an axial symmetry about the thickness direction. The semi-analytical model has been validated with laboratory testing and a two-dimensional model developed earlier. Dispersion curves for the composite skin and the sandwich plate are found to be vastly different. It has been shown that the model is quite reasonable in capturing the behavior of the waves in relatively low frequency applications of interests, where the wavelength is larger than the honeycomb cell dimensions. Finally, a statistical damage index approach has been used to locate the disbond between the core and the skin, and to estimate their size.

INTRODUCTION

"Honeycomb composites" are sandwiched structures in which thin composite skins are bonded with adhesives to the two faces of extremely lightweight and relatively thick metallic honeycombs. Recently, these novel components are widely used in many modern applications, especially in aerospace and automotive industries with limited applications in civil infrastructure, such as highway bridges and building construction. The sandwich structures with honeycomb core exhibit

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Ключевые слова:

Содержание.