Accepted Manuscript

Influences of anisotropic fiber-reinforced composite media properties on fundamental guided wave mode behavior: a Legendre polynomial approach

Cherif Othmani, Anouar Njeh, Mohamed Hédi Ben Ghozlen

PII: S1270-9638(16)30995-6
DOI: https://doi.org/10.1016/j.ast.2018.04.041
Reference: AESCTE 4546

To appear in: *Aerospace Science and Technology*

Received date: 2 November 2016
Revised date: 18 February 2018
Accepted date: 23 April 2018

Please cite this article in press as: C. Othmani et al., Influences of anisotropic fiber-reinforced composite media properties on fundamental guided wave mode behavior: a Legendre polynomial approach, *Aerosp. Sci. Technol.* (2018), https://doi.org/10.1016/j.ast.2018.04.041

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Influences of anisotropic fiber-reinforced composite media properties on fundamental guided wave mode behavior: a Legendre polynomial approach

Cherif Othmani, Anouar Njeh, Mohamed Hédi Ben Ghozlen

Laboratory of Physics of Materials, Faculty of Sciences of Sfax, University of Sfax, PB 815, 3018 Sfax, Tunisia.

E-mail address: othmanicheriffss@gmail.com

ABSTRACT

The guided wave technique has been widely used for evaluating different structures. Recently, these acoustic waves have been implemented in non-destructive testing (NDT). Accordingly, these waves make up a set of motivated means for detecting defects because of their effectiveness for quickly testing a long series of specimens. On that account, the present article introduces a Legendre polynomial approach, for modeling guided dispersion curves solutions in anisotropic fiber-reinforced composite media. This polynomial approach offers a higher computational efficiency and simplicity in comparison to traditional methods. The validity of the proposed Legendre polynomial approach is illustrated by comparison with available data. The convergence of this method is discussed. Consequently, the computation time of the Legendre polynomial approach increases linearly when the number of truncation order M increases. In the same context, the computation time of this polynomial approach is compared to the ordinary differential equation (ODE) approach in terms of efficiency. In addition, the influence on the fundamental guided wave dispersion curves due to reductions in the material properties such as C_{11}, C_{12}, C_{13}, C_{22}, C_{23}, C_{33}, C_{44}, C_{55}, C_{66} and mass density were analyzed for anisotropic fiber-reinforced single-layered composite media with different propagation angles. The studies were performed by obtaining the behavior guided wave dispersion curves for each single-layered type. This was done by reducing the material properties mentioned above by 50% from the original value. Since the guided wave dispersion curves in a single-layered composite media varies with the propagation direction, the layers were analyzed at 0°, 45° and 90° propagation angles, with all the aforementioned variations. The computer programs in this work are written by using Matlab software.

Keywords: Fundamental guided wave; Fiber-reinforced composite media; Dispersion curves; Legendre polynomial approach

Download English Version:

https://daneshyari.com/en/article/8057525

Download Persian Version:

https://daneshyari.com/article/8057525

Daneshyari.com