Edited by: A. Öchsner, L. Silva and H. Altenbach

.....

## **ABSTRACT BOOK**

## ACE-X 2009 · ROME - ITALY

22-23 JUNE, 2009 www.acex-2009.com



Young Scientist Awards Sponsored by:





Affiliated Institution:



ACE-X 2009

ABSTRACT BOOK

PAGE-1

ACEX223 Dr. Masoud Tahani Masoud Tahani, Ph.D., Associate Professor Department of Mechanical Engineering, Faculty of Engineering Ferdowsi University of Mashhad P.O.Box 91775-1111, Mashhad, Iran

## Through Thickness Stress Analysis of Composite Adhesively Thick Bonded Joints Using Energy and Variational Methods

M. Tahani, E. Selahi

Department of Mechanical Engineering, Faculty of Engineering, Ferdowsi University of Mashhad, Mashhad, Iran

Adhesive joints due to having low stress concentration, capability of joining and sealing simultaneously, etc., are the most suitable joints for composite structures. In the most previous analytical methods, adhesive layer is assumed to be very thin and through thickness stress distributions are ignored [1, 2]. Experimental results have shown that the load carrying capability decreases when the bondline becomes thicker [3] and design of thick layer adhesive joint, with the previous methods may cause to failure due to incorrect design.

In this paper, a mathematical model is presented based on energy and variational methods for through thickness stress analysis of adhesively thick bonded joints. In this model adherends are orthotropic laminates with general stacking sequences that modeled as Timoshenko beams. It is considered adhesive layer is homogenous and isotropic material and displacement components of each point of adhesive layer are determined as functions of displacements and slops of upper and lower adherends in that horizontal position. In this method by considering constitutive, kinematics and equilibrium equations, sets of differential equations for each zone of the joint are derived. The governing equilibrium equations (in each zone) are solved analytically and shear and peel stresses in each point of adhesive layer and deflections, stress and moment resultants in the adherends are determined. An example of adhesive joint is solved by this method and the results are compared with the previous researches considered thin adhesive layer assumption.

 R.D. Adams, J. Comyn and W.C. Wake, Structural adhesive joints in engineering, Chapman & Hall, London (1997).
E. Selahi, Stress analysis of adhesive joints in composite structures, M.Sc. thesis, Shiraz University, Iran (2004).
J.S. Tomblin, C. Yang and P. Harter, Investigation of thick bondline adhesive joints. F.A.A. Technical Report, DOT/FAA/AR-01/33 (2001).

ACEX236 Prof. Fardad Azarmi North Dakota State University, Fargo, ND, 58108, USA

## A Computational Approach for Thermo-mechanical Characterization of Thermal Spray Coatings

F. Azarmi, G. Karami North Dakota State University, Fargo, ND, 58108, USA