Free Vibrational Responses of GRP Composite Plates: Experimental and Numerical Studies

Avinash V Borgaonkar

National Institute of Technology Warangal, Telangana, India

Abstract

In the recent years the composite materials aggrandize attention of researchers since metals have been replaced with these composites. The properties such as high strength to weight ratio, high modulus, excellent resistance to fatigue, creep, corrosion and wear as well as economical. Most of the studies done so for related to composite materials analytical, numerical or experimental focused on the strength evaluation. In the present study the vibro-acoustic analysis of the composite specimen has been carried out, since in case of structural application it plays a significant role. The vibro- acoustic analysis of the fabricated composite specimens is carried out numerically employing different boundary conditions. The glass fiber reinforced epoxy matrix composite specimens are manufactured by the vacuum-bag moulding technique. The elastic properties of the fabricated specimens are determined experimentally. The properties such as modal density and damping loss factor which deals with the vibration response of the system investigated. The numerical results validated with the experimental results. The experimental analysis is carried out using modal analysis technique with Fast- Fourier-Transform (FFT) analyzer, data acquisition system, impact hammer and accelerometer to obtain the frequency response functions. The effects of different geometrical parameters such as fiber orientation and different boundary conditions are studied in detail. It is observed that numerical predictions and experimental tests have a good correlation..

Biography:

Avinash V. Borgaonkar is currently working towards his doctorate degree in the Department of Mechanical Engineering in National Institute of Technology Warangal, Telangana, India. His main research interests are in Composite materials; Noise and Vibration: Statistical Energy Analysis of structural components; Lubrication; Nano-lubricant; Tribology; Surface Coatings. He received his Master's degree in Mechanical Engineering from Shivaji University Kolhapur, Maharashtra, India in 2014 and also his Bachelor's degree in Mechanical Engineering from Shivaji University Kolhapur, Maharashtra, India in 2010.

References

1. Mishra I, Sahu SK (2012) An experimental approach to free vibration response of woven fiber composite plates under free-free boundary condition. Int J Adv Technol Civ Eng 1(2):67–72

2. Xing YF, Liu B (2009) New exact solutions for free vibrations of thin orthotropic rectangular plates. Compos Struct 89:567–574

3. Talha M, Singh BN (2010) Static response and free vibration analysis of FGM plates using higher order shear deformation theory. Appl Math Model 34(17):3991–4011

4. Kumar JS, Raju TD, Reddy KVK (2011) Vibration analysis of composite laminated plates using higher-order shear deformation theory with zig- zag function. Indian J Sci Technol 4(8):960–966

5. Thai CH, Tran LV, Tran DT, Thoi TN, Xuan HN (2012) Analysis of laminated composite plates using higher-order shear deformation plate theory and node-based smoothed discrete shear gap method. Appl Math Model 36:5657–5677

Citation: Avinash V. Borgaonkar, Free Vibrational Responses of GRP Composite Plates: Experimental and Numerical Studies; Materials Research & Technology; May 22, 2021; Osaka, Japan.