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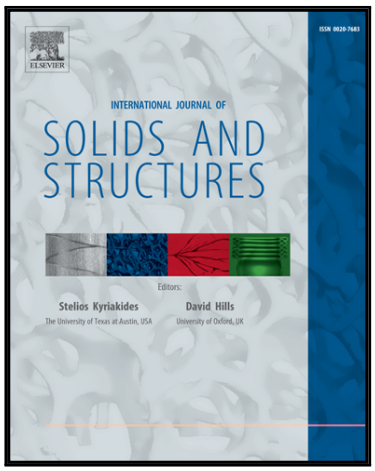

Coupled thermo-mechanical analysis of a vibration isolator made of shape memory alloy

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PII: S0020-7683(17)30099-9
DOI: 10.1016/j.ijsolstr.2017.03.001
Reference: SAS 9487

To appear in: *International Journal of Solids and Structures*

Received date: 15 June 2016
Revised date: 24 October 2016
Accepted date: 1 March 2017

Please cite this article as: S. Jose, G. Chakraborty, R. Bhattacharyya, Coupled thermo-mechanical analysis of a vibration isolator made of shape memory alloy, *International Journal of Solids and Structures* (2017), doi: 10.1016/j.ijsolstr.2017.03.001

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Coupled thermo-mechanical analysis of a vibration isolator made of shape memory alloy.

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Abstract

Performance of a shape memory alloy(SMA) bar as a vibration isolator is examined under isothermal and non-isothermal operating conditions. A novel state space formulation of thermomechanical model is presented. The displacement transmissibility of an isothermal isolator shows both single and double jump under high amplitude excitation. The coupled thermomechanical behavior of the isolator operating under non-isothermal condition are quite complicated. Simulation results suggest that the performance of the SMA bar as vibration isolator, undergoing uniaxial deformation, is seriously affected unless proper cooling is done.

Keywords: Shape memory alloy, Pseudoelasticity, Vibration isolator, Isothermal, Non-isothermal

1. Introduction

Shape memory alloy(SMA) is a smart material that has found wide applications in controlled systems, operating mainly in the low frequency range. This is due to better actuation property compared to other actuators as reviewed by Birman [1997], Seelecke and Muller [2004] and Jani et al. [2014]. The shape memory effect, shown by the material especially at low temperature, is advantageously used to generate high excitation force (Stoeckel [1990], Hartl

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