

MECHATRONICS BOOK SERIES
SELECTED PAPERS FROM
ICOM'01, ICOM'05 AND
ICOM'08

Editors

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IIUM Pres

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011
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Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

ISBN: 978-967-0225-68-5

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :
IIUM PRINTING SDN. BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan

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FINITE ELEMENT STUDY OF COMPOSITE CONES UNDER AXIAL COMPRESSION LOADING

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ABSTRACT

Finite element analysis of Carbon/ epoxy and glass/ epoxy composite cones under axial compression load has been carried out. Cone angles of, 10° and 20° were used. Two fiber orientation angles of 0° and 90° were studied. All the cones studied were selected to have four lamina of equal thickness. The finite element analysis was carried out using LUSAS Finite element software. Fibers of glass and carbon were used throughout this study. While the matrix was kept the same as epoxy resin and hardener mix. Load effects on the top and side nodes displacement of the composite cones were studied. The load-displacement responses were plotted for the elastic region. Results from this investigation show that the load required for carbon/ epoxy cones were higher than that for glass/ epoxy cones for all the cases. It was found that there is a clear increase in the load-bearing capability, when using composite cones of 0° fiber orientation angle instead of 90° for both of carbon and glass/epoxy cones. It has also been observed that with increasing cone angle from 10° to 20° for all the tested specimens, composite cones can withstand stand higher loads with a significant decrease in displacements. The percentage increase in load capacity for carbon/ epoxy cones was 14.5% for 0° fiber orientation angles than glass/ epoxy and 18.2% for 90° fiber orientation angles.

Keywords : Composite materials, Cones, Carbon fiber, Glass fiber, Epoxy matrix.

1.0. INTRODUCTION :

Composite materials are being used for applications in aircraft and automotive structures to meet stringent weight constraints. In automotive and aerospace structures, the composite material still cost more than conventional materials. Composite materials can exhibit crushing modes, which are significantly different from the crushing modes of metallic materials. Provensal et al. [1] shows that axial crushing of fiber reinforced plastic (FRP) composite tubes have significant energy absorption (E_c). Composite structures could withstand high loads and provide a significant increase in the energy absorption when compared to similar metal structures. In addition, composite structures have less weight than the metal ones.