Potentiality of MWCNT fillers on the lateral crashworthiness behaviour of polymer composite cylindrical tubes under quasi-static loading

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ABSTRACT
In recent years, light-weight nano composite materials have been progressively employed in the aviation, defense, naval and automotive manufacturing applications owing to their outstanding mechanical and crashworthiness characteristics. In this regard, nano composite cylindrical tubes could be significantly utilized as energy absorbing elements for dissipating the impact energy during vehicle collisions. The present research study aimed to examine the lateral crashworthiness response of Multi-Walled Carbon Nano Tubes (MWCNT) filled epoxy composite (basalt fabric and glass fabric) tubes of three different inner diameters using quasi-static crushing experiments. Crushing profiles and crush force–deformation curves of all the recommended typical tube samples are computed and discussed elaborately. The results obtained revealed that better crashworthiness characteristics of MWCNT reinforced epoxy composite tubes with a larger diameter, were owing to more promising crushing modes occurring during lateral compression. It is also found that the lateral crashworthiness response of the MWCNT filled glass fabric epoxy composite tubes was marginally superior to that of the MWCNT filled basalt fabric epoxy composite tubes. However, both the recommended composite cylindrical tubes with nano-fillers might be employed as energy dissipating elements in modern vehicles.

KEYWORDS
Basalt fabric; Carbon nano tubes; Composite tubes; Energy absorption; Lateral load; Quasi-static force

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