CAPSTONE FESTIVAL KEY RESULTS.

Optimized Design of Crumple Zone on Vehicles

Kenechukwu Ezeifemeelu, Christopher Tagle, Habiba Eldababy

جامعة نيويورك أبوظبي

NYU ABU DHABI

COMPARISON BETWEEN SQUARE AND ENNEAGONAL TUBES

Model	Mass (g)	Peak Crushing Fore (kN)	Total Energy Absorbed (J)	Specific Energy Absorption (J/g)
Square Tube	38.85	60.32	476.97	12.28
Enneagonal Tube	42.60	72.79	967.99	22.72

The enneagonal tube possesses a ***greater SEA and peak crushing force*** than the square tube, making it a better design consideration for the longitudinal beam design.

COMPARISON BETWEEN HONEYCOMB-FILLED SQUARE TUBES

Model	Mass (g)	Peak Crushing Fore (kN)	Total Energy Absorbed (J)	Specific Energy Absorption (J/g)
Constant Thickness	133.04	238.97	1820.84	13.69
3 Layered Honeycomb (Best Design)	133.32	239.37	1849.14	13.87
5 Layered Honeycomb (Best Design)	133.04	238.29	1806.19	13.58

No significant difference in the performance of the honeycomb-filled tubes based on ***number of layers*** or ***difference between the cell wall thickness across layers.***

COMPARISON BETWEEN HONEYCOMB-FILLED SQUARE & ENNEAGONAL TUBES

Model	Mass (g)	Peak Crushing Fore (kN)	Total Energy Absorbed (J)	Specific Energy Absorption (J/g)
5 Layered Honeycomb (Best Design) + Square Tube	133.04	238.29	1806.19	13.58
5 Layered Honeycomb (Best Design) + Enneagonal Tube	173.26	342.72	4788.35	27.63

The honeycomb-filled enneagonal tube possesses ***a greater SEA and peak crushing force***, making it a better design consideration for the longitudinal beam design.

Moreover, in the enneagonal design, the addition of the honeycomb filling increases peak crushing force by 371% and SEA by 22%