RESEARCH GAP

Dynamic crashing behavior of new extrudable multi-cell tubes with a functionally graded thickness

- Manufacturing Complexity and Feasibility
- Experimental Validation of FGT Multi-Cell Tubes ; relies heavily on numerical modeling (LS-DYNA)
- Specific energy absorption (SEA) and peak impact force (Fmax) under idealized axial dynamic impact conditions <-> oblique impacts or multi-directional forces
- The study focuses on aluminum alloys (AA6063-T5) for FGT structures, but the use of other advanced materials is not explored.
- The paper does not consider the thermal effects on FGT tubes
- Analyze the crashworthiness of FGT structures under temperature fluctuations impact their performance and material properties
- The study isolates FGT multi-cell tubes in its crashworthiness evaluation and does not consider their interaction with other automotive safety mechanisms (e.g., airbags, crumple zones).

On design of multi-cell tubes under axial and oblique impact loads

- Effect of cell number and oblique loads; The influence of cell number and oblique impacts on crash behavior has not been extensively studied

Energy Absorption of a Novel Lattice Structure-Filled Multicell Thin-Walled Tubes Under Axial and Oblique Loadings

- Very useful in aiding our research, understanding the interaction between lattice and tube

Dynamical bending analysis and optimization design for functionally graded thickness (FGT) tube

- Failure Mechanism Post-impact Analysis; fracture, delamination, structural integrity aft crashes
- The analysis did not consider the impact of thermal stresses on the crashworthiness of tubes
- The current study neglected the strain rate effect due to the material choice
- 3D Geometrical Variations: circular columns with variable thickness along the axial direction, exploring other geometrical shapes (e.g., rectangular or elliptical tubes) or introducing 3D thickness variation may yield better crash performance in certain scenarios
- Multi-material Functionally Graded Tubes

Functionally graded material via L-PBF: characterization of multi-material junction between steels (AISI 316L/16MnCr5), copper (CuCrZr) and aluminium alloys (Al-Sc/AlSi10Mg)

- New material, can be used for our research