

## **An experimental and numerical analysis of empty and foam-filled aluminium conical tubes under oblique impact loading**

### **Abstract**

This paper presents the crushing behaviour of empty and foam-filled conical aluminium alloy (AA6061-T6) tubes under oblique impact loading using a validated nonlinear finite element (FE) code, LS-DYNA. The study aims to assess the beneficial of foam filling on the energy absorption in terms of mass reduction, for variations in filler density and geometrical parameters of AA6061-T6 tubes. The results obtained successfully identified the critical tube mass and critical foam density. It is evident that foam filling successfully induced high Specific Energy Absorption (SEA) value of foam-filled tubes thus proving that the assessment of critical total tube mass and critical foam density point is vital in identifying proper combination of tube-filler to the effectiveness of foam-filled tubes. The combination of AA6061-T6 tube and aluminium foam demonstrates pronounced SEA increase as high as 72.3% compared to the empty tube.

**Keywords;** Conical Tube, Energy Absorption, Finite Element, Oblique Impact