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Experimental and numerical analysis of foam-filled aluminum conical tubes subjected to oblique impact loading

Abstract

This study aims to investigate the response of AA6061-T6 conical tubes under oblique impact loading, for variations in filler density and tube material by using experimentally validated model. Good correlations between the numerical and experimental results were observed. The initial peak force and dynamic force increase from AA6061-T6 to carbon steel tubes and further increase with increasing filler density, leading to increased energy absorption capacity. Conversely, the initial peak force and dynamic force of empty and foam-filled AA6061-T6 conical tubes decrease with the introduction of oblique loading as the load angle increases from 0° to 20°, leading to reduced energy absorption capacity. Carbon steel is relatively more advantageous compared with AA6061-T6 in terms of energy absorption, whereas AA6061-T6 is comparable with carbon steel because of its lower initial peak force.

Keywords; Conical tube, Finite element, Materials testing, Oblique impact loading