On The Effect of Different Ratio of Perforation's Diameters on Crashworthiness of Steel Cans

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Abstract

In this paper, Structures are investigated by collapse test and loading will be quasi-static. As is evident, doing an experiment always containing cost and time. So by designing the experiment can be spending the minimum cost and time،get the most information about the process. This structure was investigated by two parameters side's ratio and slot location. The results showed that the maximum value of energy absorption parameters were achieved in side's ratio 2 and perforation's diameter 0.5. The reported results are 1.47 KJ for absorbed energy, 19.61 KN for mean crushing load, 15.05 KJ/Kg for specific energy absorption and 37.5 KN for peak load.

Keywords: Energy absorption capability, Thin-walled structure, Perforation.

Introduction

It has been over decades that focus has been on the study of structures under severe blows. Energy must be absorbed into a fully controlled state of affairs in impact collisions. On the one hand, the complexity of this issue and its applicability on the other hand has led many researchers to specially focus on thin-wall structures and design tools to absorb energy during impact and support their desired structures. The greatest amount of energy absorption occurs in these impact absorbers; in the region of their plastic shape change [1-3]. Energy absorbers are used in utility structures such as cars, highway fences, sub-elevators, planes, ships, and so on. It is possible to examine the tube and beams of thin walls under transverse and axial load, simple, and so on; supports for the modeling of energy adsorbents. Hansen et al. [4] designed a car bumper by aluminum foam filler and placed it under laboratory loading. They also used the LS-DYNA software to simulate the collision process that predicted shield behavior during collision by simulation Software was obtained with acceptable accuracy compared to laboratory samples. Alghalib et al. [5] showed that deformation may take place in three ways during axial loading of cylindrical jaw structures: axisymmetric concertina symmetry, non-axisymmetric diamond, and hybrid. The type of deformation in structures depends on the diameter, the thickness and the diameter of the structure. Sitzberger et al. [6] performed their experiments on thin-walled structures with circular and square sections. The studied structures were made of aluminum foam softened steel. They showed that the interaction between the foam and the structural wall reduces the folding distance, so the absorbed force increases by the structure. Arabzadeh and Zaynuddini [7] examined the dynamic response of submersible pressure tubes exposed to transverse impact loads. They showed that the characteristics of the seabed may have very significant effects on the diameter of the pipe, especially in relatively low internal pressure, , the maximum impact load and the maximum depth of the indentation increase with increasing the depth of the tube placement in the bed. In this research, the amount of energy absorption and the shape of the hollow tubes with square and circular sections filled with foam under transverse impact load were investigated by experimentally and numerically. Finally, the amount of energy absorption and their deformation mechanism were compared. Gupta and Volvergan [8] studied composite cone thin-walled structures. The results showed that the absorption energy is significantly increased in cone-filled constructions with foam compared to hollow structures. Gamiro and Siren [9] also examined the behavior of thin aluminum cylinders with cork fillers under dynamic loading. Jones [10] has compared energy absorption systems with respect to the factors affecting energy absorption. Nia and Hamedani [11], were achieved that the adsorbents with the circular cross-section had the highest capacity Absorb energy after studying the energy absorption capacity of adsorbents of various cross sections (circular, rectangular, hexagonal, triangular, pyramidal and conical). Zarei and Kruger [12] studied the flexural behavior of empty and filled foam tubes. They state that the beams filled with foam have higher energy absorption ratios than hollow beams. Zhang et al. [13] optimized the cross sectional design of a thin-walled reinforced beam configuration. The results of their numerical analysis showed that the beams filled with foam have a smaller impact compared to empty beams with the same weight, more energy absorption and initial force. Arabzadeh and Zainuddini [14] investigated the dynamic response of submersible under-pressure pipes exposed to transverse impact loads. They showed that the characteristics of the seabed may have very significant effects on the amount of tube indentation, especially at relatively low internal pressure, and with increasing depth of pipe