Abstract

This paper investigate a new design model for energy absorption of empty and polyurethane foam-filled circular bitubal tubes. In this study, an experimental technique is used to evaluate crashworthiness parameters and crushing behavior of the bitubal energy absorbers under compressive quasi-static loading. One of the aims of this new and innovative design is to increase the energy dissipation maximally through the tube inversion and the axial collapse, simultaneously. To do so, the inner tube with inversion and the outer tube with the collapse leads to a dissipation of energy in the deformation process. However, the stable collapse in the outer tube is required for a complete inversion of the inner tube. Therefore, by creating outer grooves at some determined areas along tube length, a long tube is divided into small parts to prevent asymmetric folding. In the present work, the effects of shrink-fitting and polyurethane foam are studied to control the sudden force applied to the main part of the structure when the accident occurs The results of experimental tests show that the energy absorption capacity of bitubal specimens are greater than that of monotubal ones. Also, the foam-filled in the bitubal structures and the shrink-fitting of tube leads to increase the energy absorption and the specific energy absorption in comparison with the simple ones. The proposed method would help to reach the improved crashworthiness structure in the hope of reducing the occupant injury in a collision.