

عنوان مقاله:

Modeling of Dynamic Axial Crushing of Thin Walled Structures by LS-DYNA and Genetic Programming

محل انتشار:

سومین کنفرانس بین المللی پژوهش در علوم و مهندسی (سال: 1396)

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خلاصه مقاله:

Energy absorption capability of thin-walled structures with various cross sections has been considered by researchers up to now. These structures as energy absorbers are used widely in different industries such as automotive and aerospace and protect passengers and goods against impact. In this paper, mechanical behavior of subjected thin-walled aluminum tubes with and without polyurethane filler foam under axial impact has been investigated. The tubes are very thin so that $(D/t) \approx 550$ governs for cylindrical specimen. Structure behavior was analyzed through finite element analysis by LS-DYNA. In addition, relations governing energy absorption of thin-walled structures were extracted using genetic programming. These relationships can be used to predict the behavior of structures under investigation. Trying to obtain the relationships it has been attempted to extract functions with the simplest possible form. Circular, hexagonal, and square cross sections with the same length, thickness, and circumference of sections were studied. The results show that circular structure has higher test energy absorption while experiences the lowest change in length compared to hexagonal and square structures. Besides, the effects of stress concentration in hexagonal and square sections can be observed on the corners of walls. Also under the dynamic loading circular structure was crushed more axisymmetric, while hexagonal and square structures tended to the buckling.

کلمات کلیدی:

Thin-Walled Structure, Polyurethane Foam, Energy Absorption, Impact, Mechanical Behavior, Genetic Programming, LS-DYNA

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