Combination of frustra shapes with cross sections and trigger circles for crash box design to absorb energy

Ahmad Yunus Nasution [a] [b], Mohd Ruzaimi Mat Rejab [b], Januar Parlaungan Siregar [b], Quanjin Ma [b]

[a] Mechanical Engineering Department, Engineering Faculty, Universitas Sumatera Utara , Jl.Dr.T. Mansur, 20155 Medan, Sumatera Utara, Indonesia

[b] Faculty of Mechanical and Automotive Engineering Technology, University Malaysia Pahang, 26600 Pekan, Pahang, Malaysia

ABSTRACT

Crash box that has not been maximal in absorbing energy during collisions are the basis for researchers to redesign crash box. There are three designs of crash box that combined frustra, cross section with three holes. This is a novel design that is expected to absorb more energy and minimize deformation and also buckling. The finite element simulation shows that the square model can absorb higher energy than the other two models, that is 142.66 KJ at 0.005 s, a force of 5728 KN, and displacement of 57 mm. Therefore, the recommended shape from this research is the square model.

KEYWORDS

Abaqus; Combination; Crash box; Frusta shape

ACKNOWLEDGEMENTS

The authors are grateful to the Universiti Malaysia Pahang for funding this research with PGRS210340. This research work is strongly supported by SUPREME Focus Group, which provided the research materials and equipment.