ABSTRACT

Every year, thousands of deaths are recorded worldwide due to crashes of small cars with heavy trucks. The highest risk during collision of passengers’ car with a truck is the intrusion of passengers’ compartment under the heavy truck rear underride leading to cause fatal injuries to passengers. Design of robust underride guard of truck is one of the significant factors that should be taken into consideration within design and enhancement of truck chassis. In this study, a new rear underride protection device (RUPD) based on FMVSS 223/224 regulations is developed to enhance the crashworthiness and reduce passenger compartment intrusion under heavy trucks during accident. Finite element simulation is utilised for performance analysis of the
RUPD in LS-DYNA. The results showed that the new RUPD design enhanced the energy absorption by 68.87% and reduced the occupant's car deceleration by 66.116%. The new guard is able to avoid underride of Toyota Yaris (2010) colliding at 45, 54 and 63 km/h compared with the normal guard that failed under the same test conditions.

KEYWORDS: Rear underride protection device (RUPD), energy absorption, finite element
A precise method of vehicle velocity determination based on measurements of car body deformation – non-linear method for the ‘Luxury’ vehicle class

P. Kubiak et al.
International Journal of Crashworthiness
Volume 23, 2018 - Issue 1
Published online: 18 May 2017

Improvement of Q0 dummy restraint in lateral sled impacts regarding R129 criteria

B. Le Tellier et al.
International Journal of Crashworthiness
Volume 23, 2018 - Issue 1
Published online: 17 Apr 2017

A review on rear under-ride protection devices for trucks

Zeid Fadel Albashash et al.
International Journal of Crashworthiness
Volume 22, 2017 - Issue 1
Published online: 16 Nov 2016

A novel aircraft energy absorption strut system with corrugated composite plate to improve crashworthiness

Yiru Ren et al.
International Journal of Crashworthiness
Volume 23, 2018 - Issue 1
Published online: 27 Mar 2017

Thin-walled structural configurations for enhanced crashworthiness

T. J. Reddy et al.
International Journal of Crashworthiness
Volume 23, 2018 - Issue 1
Published online: 3 Apr 2017

Crashworthiness study for multi-cell composite filling structures

Yong Zhang et al.
International Journal of Crashworthiness
Volume 23, 2018 - Issue 1
Published online: 31 Mar 2017

Related articles

Transient dynamic impact suppression of a Baja chassis using frontal and rear shock absorbers
K. M. Goher et al., International Journal of Crashworthiness

Improving automotive crashworthiness using advanced high strength steels
Hamid Safari et al., International Journal of Crashworthiness

Development of a regulation for testing the effectiveness of a rigid side underride protection device (SUPD)
Patrick Galipeau-Bélair et al., International Journal of Crashworthiness

Underride Safety Protection: Benefit-Cost Assessment of Rear-Impact Guards for the North Dakota Farm Truck Fleet
Kimberly Vachal et al., Traffic Injury Prevention

Performance limit analysis for common roadside and median barriers using LS-DYNA
M. R. Ferdous et al., International Journal of Crashworthiness

Crashworthiness optimisation of A-pillar in passenger car in rear-end collision with truck
Na Yang et al., International Journal of Crashworthiness

Structural crashworthiness analysis of a ladder frame chassis subjected to full frontal and pole side impacts
Semih Dagdeviren et al., International Journal of Crashworthiness

Non-linear finite element analyses of automobiles and their elements in crashes