

Small-overlap Crash Simulation Challenges and Solutions

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Abstract

Insurance Institute of Highway Safety, USA, has introduced the small overlap crash test in 2012. As usual this new regulation saw many cars failing to pass the proposed rating. The main reason for failure is no definite crush zone and less protection along outer edge of the car body. Different car companies have come up with several solutions. As it's a new regulation, the simulations face issue of time for identifying the intrusions and IIHS rating. As the regulation calls for more and more simulations there exists always a need of pre and post processors to quickly identifying the IIHS ratings.

LS-DYNA solver is used for the studies. ESI Group has developed tools to handle this challenge. The studies are made on a public domain car model 'Taurus'. A template in Visual-Process Executive sets up a frontal crash model, a macro in Visual-Crash DYNA places different overlap barriers, shapes and offsets and finally a Visual-Viewer template plots all the intrusions and shows the IIHS ratings.

There are several approaches to handle the challenges of the small overlap crash tests. The traditional approach of introducing crush zone may not work always as there is no definite load path. To demonstrate the tools and its capabilities, the current study chose to vary the steel properties of load bearing members. Tools will identify the components that are having higher internal energy and boost up the properties of the components based on pre-set material schemes. Visual-Crash DYNA macros create the required LS-DYNA input. After LS-DYNA solves the problem, results are automatically plotted and reported by Visual-Viewer templates. These reports provide the direction and allow a comparison study.

The study ends up in preparing a summary report of different studies carried out on the car model. The report consists of the changes done in terms of the material, its intrusion plots and the IIHS rating chart.