An Assessment of the Robustness of the European Pedestrian Leg Impact Test Using LS-OPT and LS-DYNA

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Abstract

The automotive safety community is currently facing the challenge of new pedestrian impact requirements, introduced in Europe in 2005. These requirements necessitate considerable changes to the vehicle front end (bumper system, hood and fenders). LS-DYNA models of the pedestrian impactors (head, upper leg and leg) are an important tool for analysis of the various tests that comprise the new requirements.

One of the criticisms of the current tests concerns repeatability. Physical testing with the leg impactor, in particular, shows considerable scatter of results. This lack of repeatability can cause the system to be over-designed to give sufficient confidence that the vehicle will meet the pedestrian safety requirements during compliance testing.

Lack of repeatability in the results from physical leg impact tests can be caused by three main groups of factors:
- variations in the vehicle (e.g. build tolerances)
- variations in the legform impactor (e.g. properties of the Confor foam "skin")
- variations in the test set-up (e.g. impact velocity)

This paper describes an LS-OPT study designed to assess these issues. An LS-OPT Monte Carlo simulation was used to perform a series of LS-DYNA analyses and to assess the relative importance of the different factors in these groups. The results give insight into the parameters which should be controlled most tightly in order to improve the repeatability of leg impact testing.

The paper concludes with a discussion of the benefits of this approach and the potential for further application.