Study of a Driver Airbag Out-Of-Position Using ALE Coupling

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Abstract

The new FMVSS 208 regulation specifies the airbag performances under Out-of-Position conditions. During the past 10 years, the thermodynamic-based airbag models have been successfully used in analyzing the occupant interaction with the airbag under regular crash conditions (in-position). However, these models are not suitable for the airbag OOP applications since they can not accurately predict the flow forces that dominate the occupant-airbag interactions under these conditions.

Recently, new computational fluid dynamic features were developed, validated and implemented into the current version (v970) of LS-DYNA [1,2,3]. These features, such as the MAT_GAS_MIXTURE gas model, and the POINT_SOURCE inlet flow model, enable users to simulate airbag OOP applications using the ALE coupling techniques. Thus, the influence of design changes, such as the inflator orifice direction, vent locations, and the flow diverse straps in the bag can be investigated.

The study of a driver airbag with a 5th%ile dummy under the ISO P2 OOP condition using the ALE coupling techniques is presented here. In this study, the modeling methods for the inflator gas jets, vents, and bag folds are discussed. The results of ALE model are compared with the AIRBAG_HYBRID model and the test data. The ALE simulations show a significant improvement over the HYBRID model. The technical issues associated with OOP simulations, merit & limitations of the current ALE model, and future works are also discussed.

Reference

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