Development and Analysis of Frontal Airbag Numerical Model

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ABSTRACT

Frontal airbag is one of the system of passive safety for occupants, and the major function is to cushion the motion of head of occupant during frontal impact to prevent the occupant from impacting the interior structure of vehicle and dissipate the impact force on chest of passenger. In order to make the frontal airbag protect the passenger during vehicle impact, some safety test must be implemented according to many regulations in general design of airbag, and the injury of human body during sled test or full-scale vehicle impact test is analyzed to be the reference of improving the design of frontal airbag. To apply CAE technique to establish the numerical tool of frontal airbag and save the cost of developing, the non-linear dynamic software LS-DYNA 3D was used to construct the finite element model of frontal airbag in this study. Three test, including the test of static deployment of airbag, head impact test and body block impact test were implemented. At last, a module of frontal airbag was designed according to design procedure of CAE airbag, and the frontal sled impact test was used to estimate the safety and efficiency of designed module of frontal airbag to occupants. The energy of numerical analysis of domestic vehicle impact test could be established in this study. Meanwhile, the results of construction of airbag and numerical validation procedure could provide reference to domestic vehicle manufacturers for research and development of frontal airbag to minimize the extent of injury of human head and chest during vehicle frontal impact.

Keywords : Frontal airbag, test of static deployment of airbag, head impact test, body block impact test, sled impact test, LS-DYNA

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