Recent Investigations of Side Curtain Airbag Deployment Simulation using CPM

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Recently, Honda has shifted to a virtual development process to shorten the development term. In addition, the virtual development process has also been applied in the crash safety one. For this reason, it is necessary to build more accurate simulation modelling method. There are some reports, in which, airbag modelling Methods about gas flow has several technical issues [1] [2] [3], in the crash safety components. Therefore, this research focuses on simulating the airbag folding properties and deployment behaviour. This study introduces the modelling method of the side curtain airbag (SCAB) with its complicated structure, leading to the accurate deployment simulation.

Objectives

The objectives of this study are as follows;

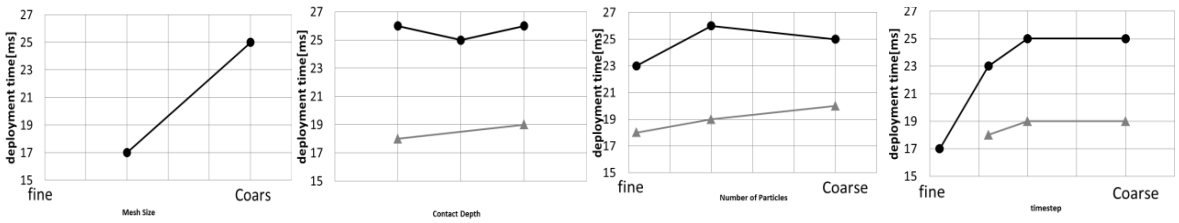
(1) To clarify and determine the dominant modelling parameters in the deployment process and pressure-time history of SCAB.
(2) To build SCAB modelling method applicable to the virtual development with respect to the impact deceleration history of the component test.

Study Approach

Step1:Determination of the input properties of the inflator(INF) and the fabric
Step2:Survey and clarification of the dominant modeling parameters using the simple SCAB model which consits of simple cells with smooth gas flow.
Step3:Determination of the parameters in the deployment time as well as the internal pressure time history
Step4:Comparison and validation with the deceleration stroke history of the impactor in the component test with the SCAB of mass production

Results

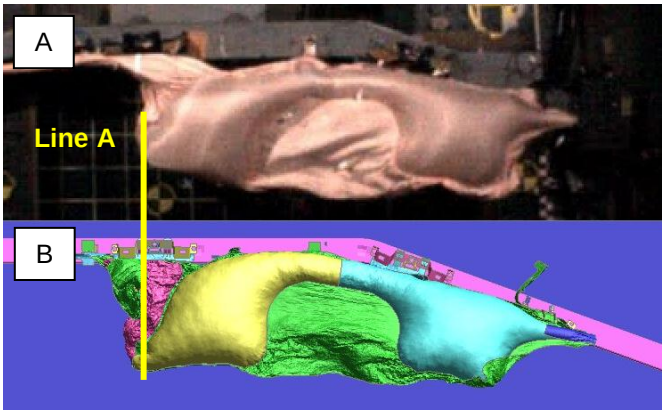
The modelling parameter survey clarifies that “Mesh Size” and “Time Step” are dominant to the deployment time since their slopes are steep compared to those of the contact depth and the number of particles as shown in Figs. 1. These parameters lead to the clear difference of the deployment time in the simple SCAB.



(a)*Mesh Size* (b)*Contact Depth* (c)*Number of Particles* (d)*Time Step*
Figs. 1: Effects of each paramer on the deployment time (Circle:coarse mesh size,Triangle:fine one)

Figs. 2 show the snapshots of the shape of the simple SCAB deployed at 18 ms. As shown in Table 1, the time to pass Line A is the same between the test and the simulation. In addition, the simulated deployment shape is quite similar to the tested one.

Table. 1: the time to pass Line A



	Time to pass Line A(ms)
Test	18
Simulation	18
Gap	0

Figs. 2: the shape of the simple SCAB deployed at 18 ms (A: The test, B: The simulation)

In Fig. 3, the deceleration stroke history of the impactor in the component test with SCAB of mass production is similar to the simulation result with the parameters determined in STEP3. In addition to the deceleration stroke history, the simulated deployment shape coinside with the impactor test.

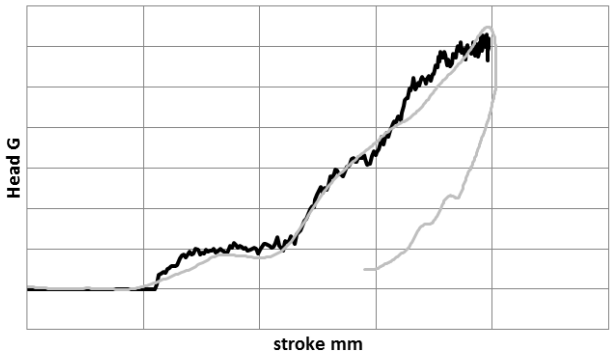


Fig. 3: The deceleration stroke history of impactor (Black line:Simulation,Glay:Test)

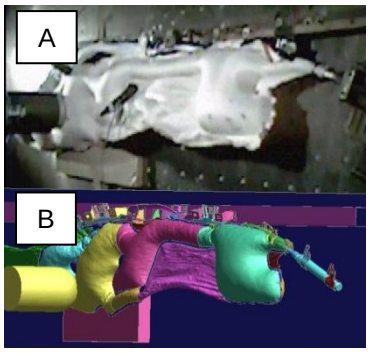


Fig 4. Impactor in mass-productive-SCAB (A: The test, B: The simulation)

Conclusion

The mesh size and the time step of modelling parameters have quite large influence on the deployment time and the pressure. The deceleration stroke history of the mass productive SCAB was quite similar between the test and the simulation, using the input parameters identified by the simple SCAB test.

References

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