

CRASH SIMULATION: CHALLENGES AND FUTURE PROSPECTS

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ABSTRACT – Over the last decades, numerical simulation has evolved into a powerful tool for the design and development of products. Crash simulation was extensively used by the automobile industry for the development of vehicles with regard to their passive safety – known as crashworthiness. In order to asses vehicle's crashworthiness prospectively, engineers shifted their focus on : its deformation patterns (global and local), the acceleration experienced by the vehicle structure during an impact, and the probability of injury predicted by human body models.

In this way the occupant's compartment intrusions, vehicle's deceleration and occupant's HIC values could be accurate predicted.

The rapidly increasing computational resources and the development of reliable and robust simulation software, with the aid of powerful Pre- and Post-processors, open up a new path in the evaluation of structures using two additional variables: damage and failure.

For this, the knowledge of manufacturing and production history is essential. History which can be comprised either with the aid of simulation or the use of adequate high accuracy measurement techniques in experimental procedures.

This presentation, will at first place emphasis on the variation of crash simulation with regard to geometrical and technological discretization. The geometrical discretization implies the grade of description detail and the completeness of the models regarding the “package”. The technological discretization will be exhibited by the experimental acquisition of material data to the point of numerical material model, taking also into consideration the manufacturing process.

Subsequently we shall present you examples for the validation of experiment- and simulation results upon material test specimens, component- and full vehicle tests.

Concluding we shall exhibit

1. the limits of simulation concerning the conclusion efficiency, the expense and the gain, and
2. the perspective for further development of simulation software, including the pre- and post-processors, aiming to the increase of evaluation power.