

THE ROLE OF CAE MODELLING IN VOLVO SAFETY ENGINEERING

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Safety has been a Volvo cornerstone from its founding in 1927, and has remained a fundamental core value since. Within the Ford Motor Company, Volvo Cars has been appointed Centre of Excellence for safety. Continuous development and expansion of the concept of automotive safety involve visionary ideas build on earlier innovative passive and active safety approaches to deliver new "intelligent" solutions designed to neutralize risks of driver error while enhancing motoring enjoyment.

The basis for the safety development is a solid understanding of what happens in the real world. Since 1970, Volvo Cars' Accident Research Team has investigated accidents with Volvo cars in Sweden and today we have a database containing more than 36.000 accidents – resulting in valuable in-depth studies as well as comprehensive accident statistics. This knowledge plays an important role when Volvo Cars sets its targets and it is also used as a basis for developing in-house test methods that are similar to real-life accidents, product development and new car projects.

Examples of safety systems that have been pioneered as a result of the accumulated experience include the world first systems SIPS (Side Impact Protection System) and WHIPS (Whiplash Protection System), as well as a patented frontal collision structure.

Testing, both physical and virtual, and analysis are essential parts in the development of a new car. The Volvo Cars Safety Centre has state-of-the art facilities for car testing, verification and innovative technology that enables us to recreate real traffic situations.

Developing a new car model has traditionally been a very test intensive activity. As hardware and software were developed, full car crash simulation and other advanced CAE methods became available, and the product development has become more and more CAE-driven. The ultimate goal - analytical sign off -where production tools are ordered without full scale physical testing, seems to be within reach. To some extent we are already there.

When the new large platform for Volvo was developed, a few test mules were used in the first car project - the all new S80 - primarily to validate new CAE modelling methods. In the second car project on this platform - the all new V70 - no physical crashes were performed in the development phase. A number of V70s has been crashed, but only for verification purposes and these cars were all produced in hard production tools.

A cornerstone of the Ford group's new Global Product Development System is to front load the development process by using more, and improved CAE.

In order to make analytical sign-off possible there are several areas where method development is needed: Material modelling for new materials (ultra high strength steel, lightweight alloys, polymers, composites etc.), material data dispersion, mapping of forming data, failure of materials and joints, coupled structural/interior models, fluid/structure interaction etc.

In the last few decades, the development of CAE tools for crashworthiness and safety has been tremendous. There are no signs of a lower pace in the future. It is important for all car companies to make use of this development - for Volvo Cars with the aim to remain leading in safety, it is crucial.