

# Application of Hot Forming High Strength Steel Parts on Car Body in Side Impact

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**Abstract:** Lightweight structure is an important method to increase vehicle fuel efficiency. High strength steel is applied for replacing mild steel in automotive structures to decrease thickness of parts for lightweight. However, the lightweight structures must show the improved capability for structural rigidity and crash energy absorption. Advanced high strength steels are attractive materials to achieve higher strength for energy absorption and reduce weight of vehicles. Currently, many research works focus on component level axial crash testing and simulation of high strength steels. However, the effects of high strength steel parts to the impact of auto body are not considered. The goal of this research is to study the application of hot forming high strength steel(HFHSS) in order to evaluate the potential using in vehicle design for lightweight and passive safety. The performance of HFHSS is investigated by using both experimental and analytical techniques. In particular, the focus is on HFHSS which may have potential to enhance the passive safety for lightweight auto body. Automotive components made of HFHSS and general high strength steel(GHSS) are considered in this study. The material characterization of HFHSS is carried out through material experiments. The finite element method, in conjunction with the validated model is used to simulate the side impact of a car with GHSS and HFHSS parts according to China New Car Assessment Programme(C-NCAP) crash test. The deformation and acceleration characteristics of car body are analyzed and the injuries of an occupant are calculated. The results from the simulation analyses of HFHSS are compared with those of GHSS. The comparison indicates that the HFHSS parts on car body enhance the passive safety for the lightweight car body in side impact. Parts of HFHSS reduce weight of vehicle through thinner thickness offering higher strength of parts. Passive safety of lightweight car body is improved through reduction of crash deformation on car body by the application of HFHSS parts. The experiments and simulation are conducted to the HFHSS parts on auto body. The results demonstrate the feasibility of the application of HFHSS materials on automotive components for improved capability of passive safety and lightweight.

**Key words:** hot forming, high strength steel, lightweight, side impact, car body

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