Center for Precision Forming (CPF)

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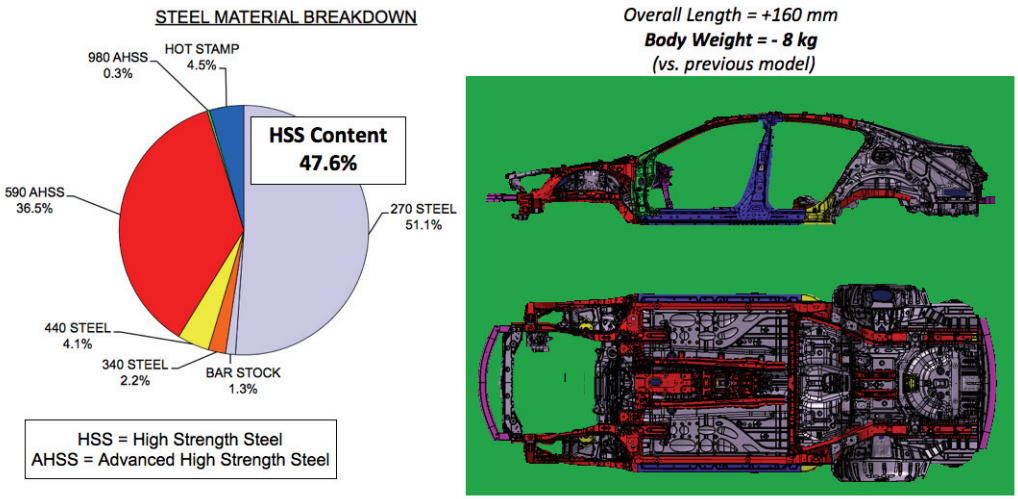
Forming Advanced High Strength Steels (AHSS)

Research at the Center for Precision Forming focuses on aspects of forming behavior of high strength steels including: stamping, bending, edge cracking, die wear, lubrication, and hot stamping, etc. Knowledge gained from this research assists further implementation of advanced high strength steel (AHSS) manufacturing in the automotive industry with the obvious benefit of lighter weight vehicles with resulting improvements in fuel economy and decreased carbon emissions.



Use of AHSS in automotive industry (left) approximate percent use of various steels in auto chassis production, (right) example weight reduction when using AHSS.

Mild steel has traditionally been used for vehicle structures and closure panels because of its low cost and good formability. Implementation of AHSS can enable the use of thinner gage sheet (less volume and less mass) for comparable structural performance. The challenge is that AHSSs are much more difficult to form and assemble. This breakthrough research advances forming technology. Due to their higher strength, the automotive parts made from these steels exhibit considerable springback. Maintaining the part shape and tolerances requires a deeper understanding of the mechanical characteristics of these materials.

CPF is further developing widely accepted tests of and is developing new methods for predicting springback and for forming these materials to defect-free components for use in automotive manufacturing. For this purpose FEM (Finite Element Method) based-computer programs are being developed and applied to forming processes. Furthermore, the scientific basis for using innovative machines and tooling, such as servo or electro AC motor driven presses and multiple-point press cushion systems, are being developed. The use of servo presses, already accepted by automotive and supplier industry, has shown 30-40% productivity increases. The direct result is cost and mass reduction without sacrificing performance and safety.

> **Economic Impact:** The advances in the scientific basis for using AHSS and high strength materials in manufacturing automotive components results in: a) mass/weight reduction leading to reduction in fuel consumption; and, b) weight resistant structures that improve vehicle safety. Thus, CPF's research contributes to the automotive industry's R&D efforts and attainment of its objectives related to meeting the government regulations for reducing fuel consumption and increasing safety. Furthermore, this research assists US-based companies to be competitive in the world market, especially with Japanese and German vehicle manufacturers. Though difficult to quantify precisely, this work is clearly contributing to increases in productivity and reductions in manufacturing costs, which results in annual savings of multi billions of dollars for the industry as a whole. These savings result in increased global competitiveness of the US automotive industry and also contributes to the maintenance and expansion of the US automotive industry work force.

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