



ULTRALIGHT STEEL AUTO CLOSURES FACT SHEET

AMERICAN IRON AND STEEL INSTITUTE

Overview:

Like the ULSAB study, the UltraLight Steel Auto Closure (ULSAC) program was commissioned by an international consortium of 31 sheet steel producers to assist their automotive customers with viable lightweighting solutions. The ULSAC Consortium contracted Porsche Engineering Services, Inc. (PES), Troy, Michigan USA, to provide design and engineering management for both the Concept and Validation Phases of the program.

The Concept Phase was a study of automotive closures, which includes: doors, hoods, decklids and hatches. This Phase encompassed benchmarking, target setting and conceptual design, which include FEA calculation and cost analysis. The result of this phase was the selection of a frameless door as the design example for validation.

The Validation Phase includes additional benchmarking, additional design, and the building of demonstration hardware to validate the design concepts.

Benefits:

The ULSAC door meets or exceeds all project objectives for **Mass Reduction**:

- 33 percent lighter than a wide range of door structures benchmarked in the Concept Phase
- 42 percent lighter than an average of frameless doors benchmarked during the Validation Phase
- 22 percent lighter than the lightest unit, a framed door structure
- No compromise to safety or structural performance

No cost penalty: Manufacturable in production volumes of 225,000

Performance: Meets or exceeds targets for:

- Dent resistance
- Oil canning
- Upper and lower lateral stiffness
- Quasi-static intrusion
- Longitudinal door crush

Technology Transfer:

ULSAC achieved important results with a combination of high- and ultra high-strength steel and manufacturing technologies such as tailor welded blanks, stamping and hydroforming. Specifics follow:

- Steel gauges range from .07 mm to 1.2 mm, and yield strengths range from 140 MPa to 800 MPa, a unique material combination for closures.
- The structure comprises high-strength steel tube hydroformed latch and hinge parts and two straight ultra high-strength steel tubes.
- The door inner front is a tailor welded blank which incorporates the mirror flag inner and provides the structural attachment points at the hinge area.

Designers used a Functional Consolidation approach, which is a concept in automotive design leading to fewer parts. In the case of ULSAC the tubular upper and lower components of the door inner also serve as door intrusion beams – a dual function.

During the design and development of the ULSAC frameless door, the ULSAC Consortium evaluated further mass reduction, using sheet hydroforming for the door outer. Door structures were successfully manufactured with 0.6 mm Dual Phase (DP) 600 hydroformed steel outer panels achieving additional weight savings.

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