# The Art And Science Of Thermoset Composites

# Liftgate Outer Panel

ALLURALITE™
Lightweight Aesthetic Composites

IDI Composites® International
Ideas For Meaningful Results.
idicomposites.com

# Case Study

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# Liftgate Outer Panel

## inquiry

The liftgate of an SUV is one of the most utilized features of the vehicle and an important part of the overall design. It needs to be both functional and capable of withstanding minor bumps and scrapes without sacrificing appearance. It must hold up to the high stresses involved in a collision and the vibrations which occur during daily use. Additionally, it is a highly visible part and as such needs to be able meet and maintain high aesthetic standards. Because the part is exposed to the elements, it must be resistant to temperature fluctuations and corrosive elements as well. Coupled with all of these needs is an inherent push by the auto industry toward light weighting to affect greater mileage.

## idea

Traditionally liftgates have been made of stamped steel because it met many of the criteria required for safety and durability. However, Volkswagen realized that steel has drawbacks compared to thermoset composites. Most notably, steel is significantly heavier than thermoset composites and  more susceptible to corrosion. It is also more likely to show damage from minor bumps whereas composites don't dent or deform. When IDI and VW reviewed materials options while designing the prototype liftgate for the VW Atlas, they determined IDI's Alluralite™ material was the ideal solution.

## innovation

The resulting part not only achieved a high aesthetic surface finish that Volkswagen required for the project, but it also reduced approximately 35% of the weight compared to the steel part. The lighter liftgate affords easier usability by the consumer and offers VW the opportunity for parts consolidation. The aesthetic finish, strength and inherent performance characteristics that thermoset composites offer truly make this a superior solution in the auto industry.

# IACMI 3.7 – Reduction of CO2 Emissions Through Lightweight Body Panels

## Development of a full SMC Class A capable Liftgate

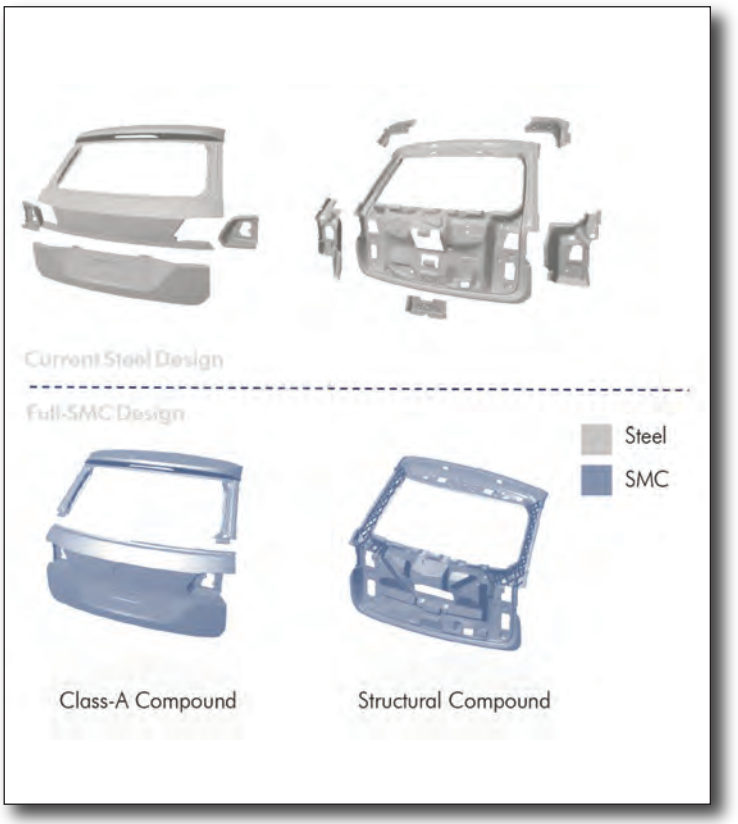
## Goal / Motivation

- Weight reduction of > 30%
- Complexity reduction (part consolidation)
- Successful demonstration e-coat + Class-A surface finish
- Demonstration of tool investment reduction
- Establishing and qualifying of regional supplier base

## Solution

- Full-SMC Design (for manufacturing-informed performance) – Structural SMC compound for inner part
- Class A SMC Compound for outer part

| | Steel | | Composite | |
|---|---|---|---|---|
| Part Count | 10 | → | 3 | -7 |
| Weight | 21.1 kg | → | 13.6 kg | - 36% |




## Status

- Material development finished and material cards created for manufacturing-informed performance design
- Part design and simulation completed
- Tool design, tool build and successful tool tryout finished
- Production process evaluated and prototype parts molded
- Business case created and evaluated
- LCA started

Project phase: SCOUTING → EXPLORATION → FEASIBILITY → TRANSFER

Contact: Dr. Hendrik Mainka, Thomas Laduch - Volkswagen Group of America Inc. - North American Engineering & Planning Center - 7000 Discovery Drive, Chattanooga, TN 37416

Source: Volkswagen 2019

- **Low density**
- **Paintable: e-coat system compatible**
- **Lightweighting without sacrificing performance or aspect**

ALLURALITE™
Lightweight Aesthetic Composites

**Series:** **ALLURALITE™ CLASS A SMC**
**Product Description:** **MINIMAL EXPANSION CLASS A SMC**
Lightweight, paint and e-coat compatible, bondable, SMC available in a range of densities, for high-grade aesthetic applications.

| | A219 | A215 | A213 |
|---|---|---|---|
| Glass Content | 30% | 35% | 40% |
| Flexural Strength<br>Test Method: ASTM D790 | 231 MPa | 212 MPa | 201 MPa |
| Flexural Modulus<br>Test Method: ASTM D790 | 11.0 GPa | 10.2 GPa | 8.8 GPa |
| Tensile Strength<br>Test Method: ASTM D638 | 105 MPa | 88 MPa | 90 MPa |
| Tensile Modulus<br>Test Method: ASTM D638 | 11.0 GPa | 9.3 GPa | 9.9 GPa |
| Appearance | Grey | Grey | Natural |
| Shrinkage<br>Test Method: ASTM D955 | -0.11% (nominal) | | |
| Specific Gravity<br>Test Method: ASTM D792 | 1.9 | 1.5 | 1.3 |

**The information on this sheet is a guide.** The stated values reflect an average of several tests conducted on Composites International's (CI's) goods. These values were obtained under ideal conditions and may not be replicated in any particular test, part, or application. Because the values achieved in actual parts depend considerably on part design, molding conditions, and testing methods, no guarantee is made or implied regarding values to be obtained in any specific test, part, or application. CI makes no warranty or representation as to the suitability of any of its goods for use in any application. CI relies on customer to conduct its own tests and judge for itself the suitability of CI's goods.

8/2022