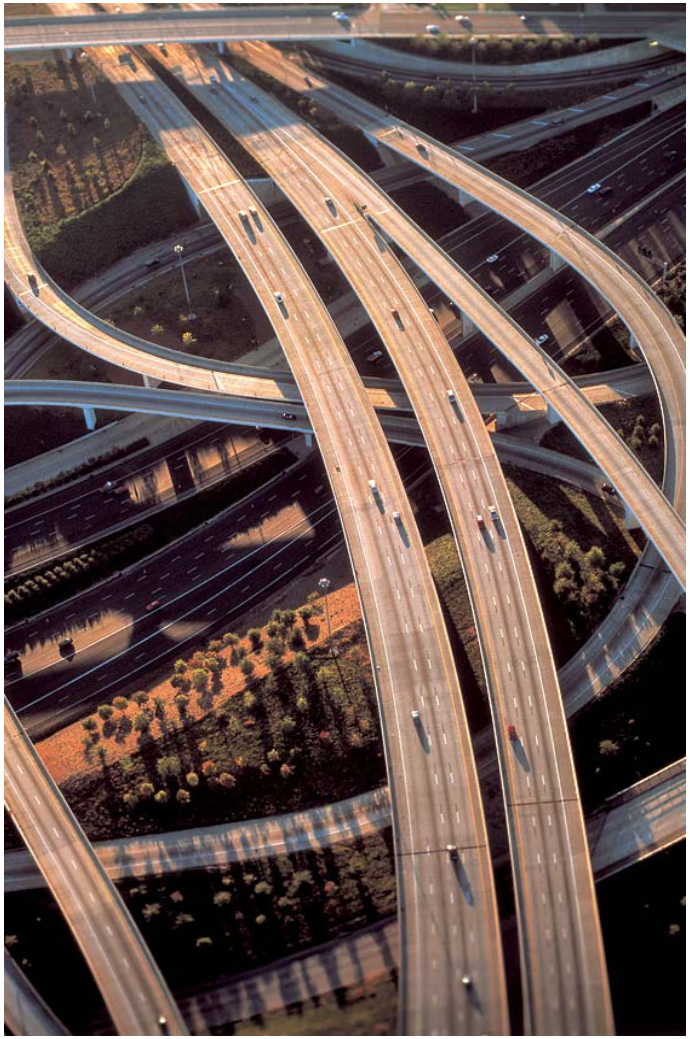
Leichtbau in der Automobiltechnik am Beispiel einer Voll-Kunststoff-Heckklappe

Dipl.-Ing. Jörg Sebastian

IAV GmbH

Schladming, 06. März 2015

IAV at a Glance



- Globally operating development partner to the automotive industry
- More than 5300 members of staff
- 30 years of experience in automotive engineering
- Expertise for the entire vehicle:
  - **Powertrain development**
  - **Electric/ Electronics development**
  - **Vehicle development**
- Our strengths:
  - Optimized processes
  - Greatest possible flexibility
  - Development costs
  - Top Quality

Locations in Germany

Berlin (Headquarters)

Gifhorn

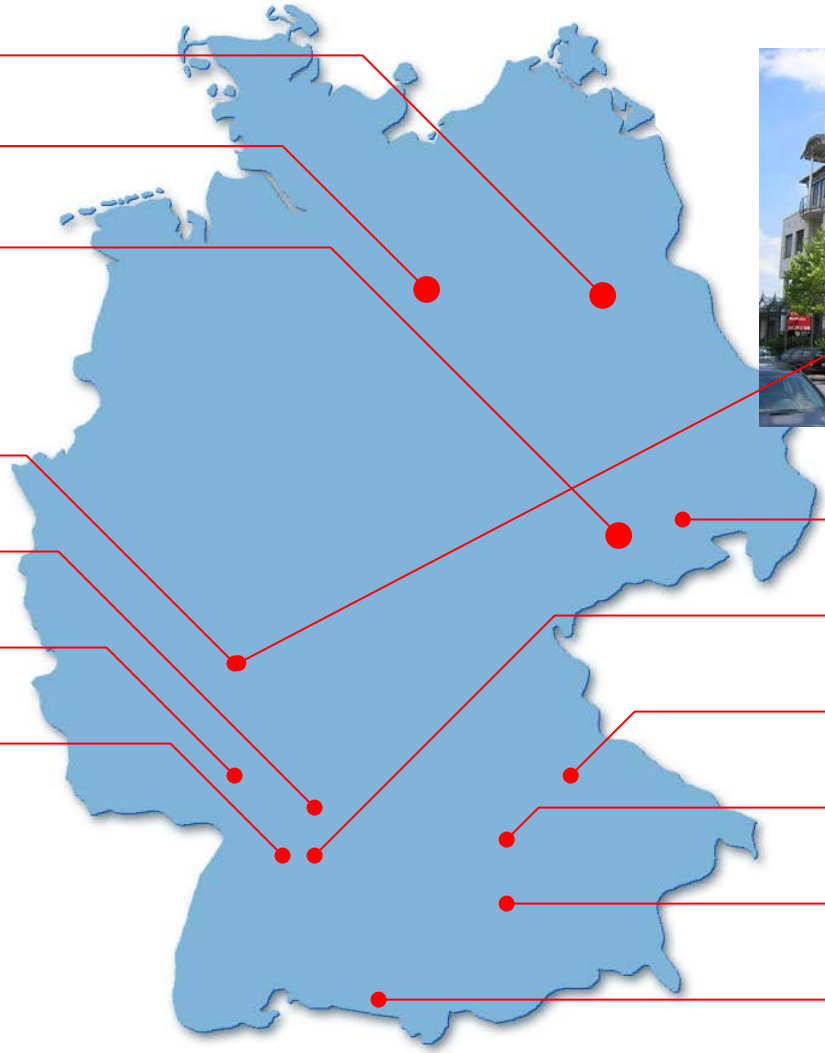
Chemnitz

Ruesselsheim

Neckarsulm

Neustadt/Weinstrasse

Weissach



Dresden

Ludwigsburg/Stuttgart

Regensburg

Lenting/Ingolstadt

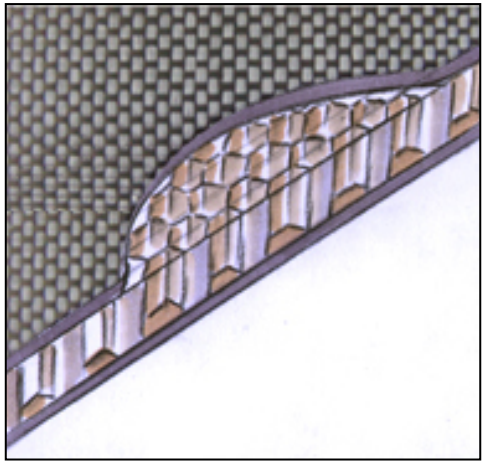
München

Friedrichshafen

Development Centers

Development Offices

Automotive full plastic tailgate –leight-weight-design
Content



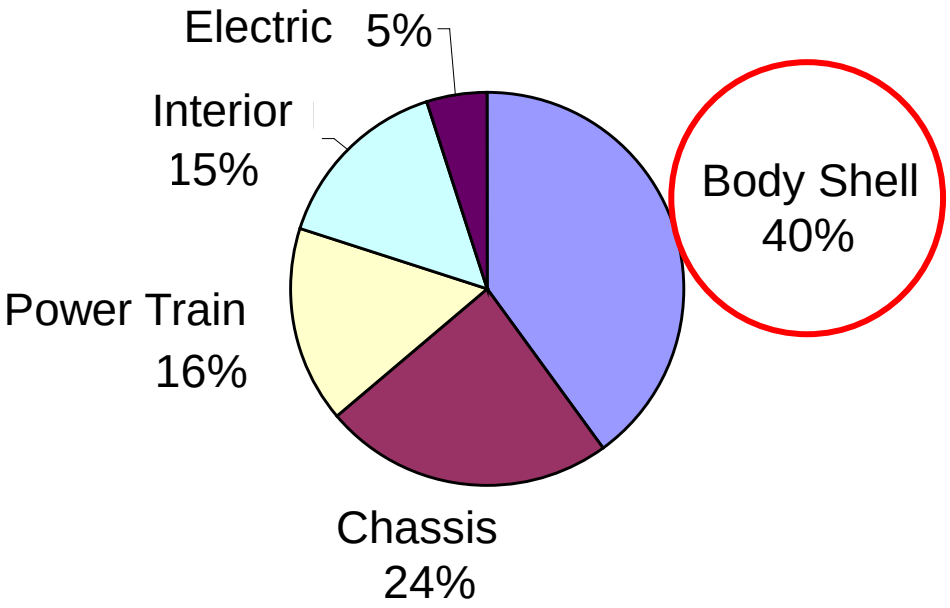
- Definition Leight-Weight Design
- Potentials / Materials / Applications
- Plastics Technology and Components

  IAV Team Ruesselsheim
- Reference Projects – State of the Art
- Full plastic tailgate

LEIGHT-WEIGHT DESIGN
Definition

- Target : → maximum weight reduction while fullfilling all technical requirements
- Reasons: Savings of natural resources and production costs, car-assembly and usage
- Effects: Reduction of running costs resp.increase of payload
- Materials: Metal (e.g.Alu,Magnesium,High-strength-steel,Titan)
  Non-metals: (plastics,fibre reinforced plastics, GFK ,CFK)
- Design Wallthickness-reduction; Honeycomb-structures ;
  sandwich-/ integral design; closed profiles (hollow);
  high inertia values; joining technologies of different materials

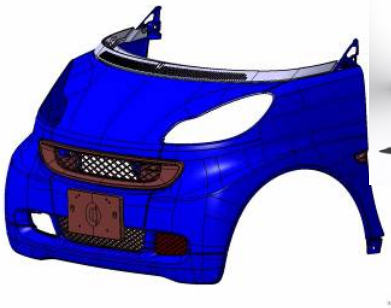
LEIGHT-WEIGHT DESIGN
Vehicle weight proportion (in average)

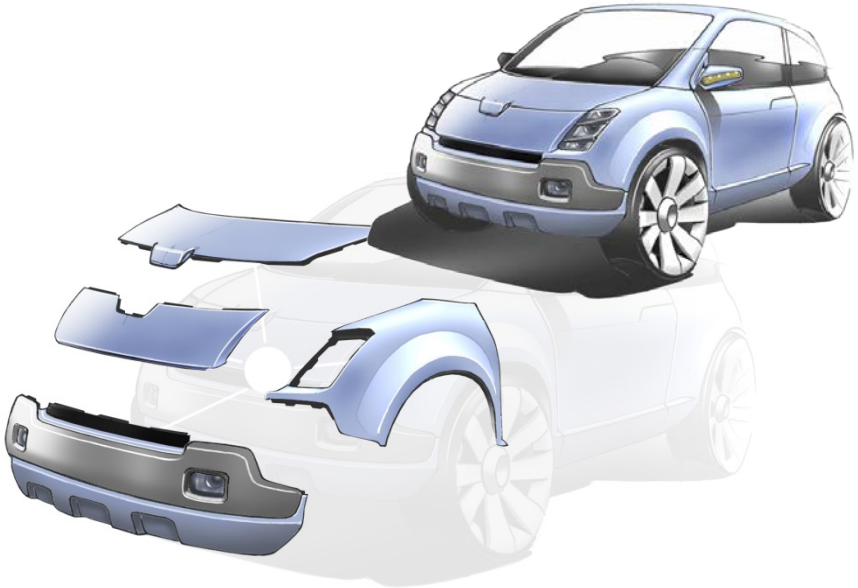


reference: VW AG

Werkstoffe in Karosserieentwicklung
Kompetenz
Zeit
CFK
SMC
Verbund-
werkstoff
GFK
B-FK
Knetlegierung
Gusslegierung
Hybridwst
Aluminium
Magnesium
Gusslegierungen
Knetlegierungen
Warmumgeformte
Stähle
Kunststoffe
Thermoplaste
Hochfeste
Stähle
Stahl

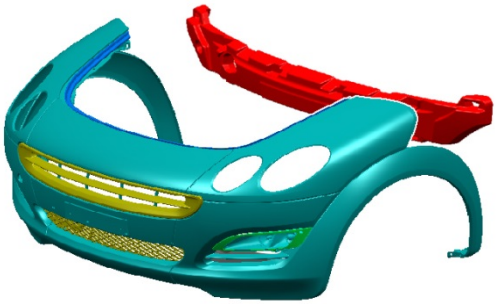
LEIGHT-WEIGHT DESIGN-Plastics
Modular Plastic Front Panels





Reference Projects

smart fortwo / forfour / Roadster

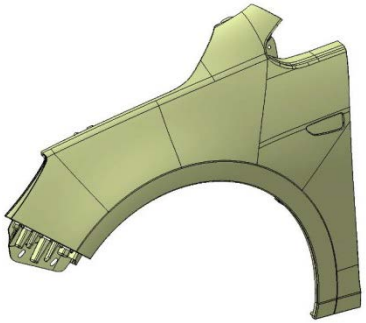


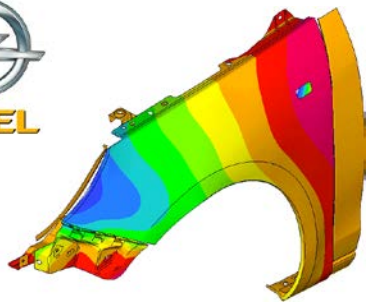
Weight-saving
Plastics vs. steel
~ 20-30 %

LEIGHT-WEIGHT DESIGN-Plastics
Reference projects - Plastic Fenders

Daimler Vito fender

VW New Beetle fender





Astra 3401 OPC
Front fender
Prototype development
2010

Corsa 4500
Front fender
Production development
2012

Weight-saving
Plastic vs. steel
~ 25-35%

Plastic fenders

Automotive Leichtbau
Vollkunststoff-Heckklappe
Entwicklung und Konstruktion zur Serienreife in Zusammenarbeit mit SABIC

Jörg Sebastian

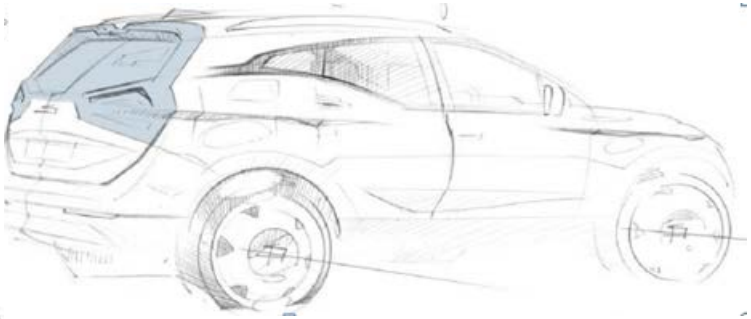
IAV Team Rüsselsheim

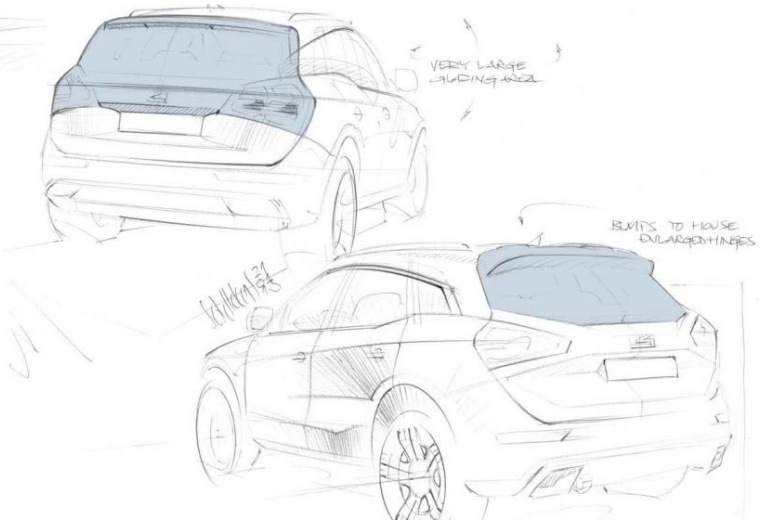
Entwicklungszeitraum Jan-Okt 2013

Vollkunststoff-Hecklappe
Aufgabenstellung

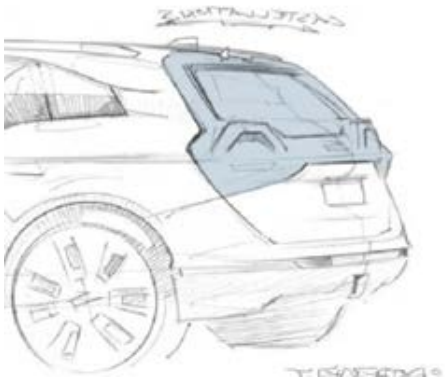
- Identifikation und Auswahl einer aktuellen Serien-Heckklappe
- Styling-Modifikation , Strak- und Flächenerstellung
- Entwicklung und Detailkonstruktion CATIA V5 (Seriendaten)
- Torsions-, Steifigkeits- und Wärmeausdehnungsberechnungen
- Beleuchtungsauslegung und Lichtsimulation aller Leuchten und Lichtleiter
- Toleranzkonzepterstellung und Toleranzberechnungen der Bauteile
- Moldflow-Berechnungen, Prototypenbau
- Animationserstellung und Ergebnisaufbereitung
- Präsentation der Heckklappe auf der Kunststoff Messe 2013 in Düsseldorf

Vollkunststoff-Heckklappe
Auswahl einer aktuellen Serien-Heckklappe



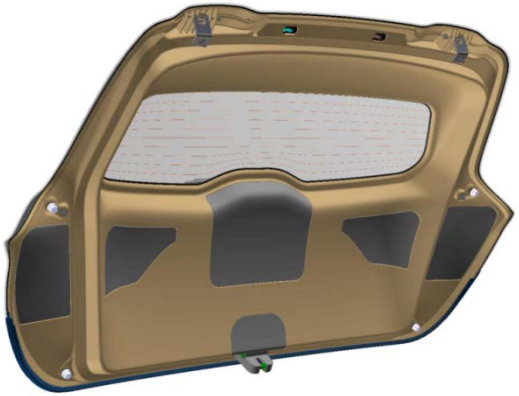


Vollkunststoff-Heckklappe
Strak- und Flächenerstellung



- Styling-Überarbeitung zur Diversifikation
- Erstellung der Designflächen

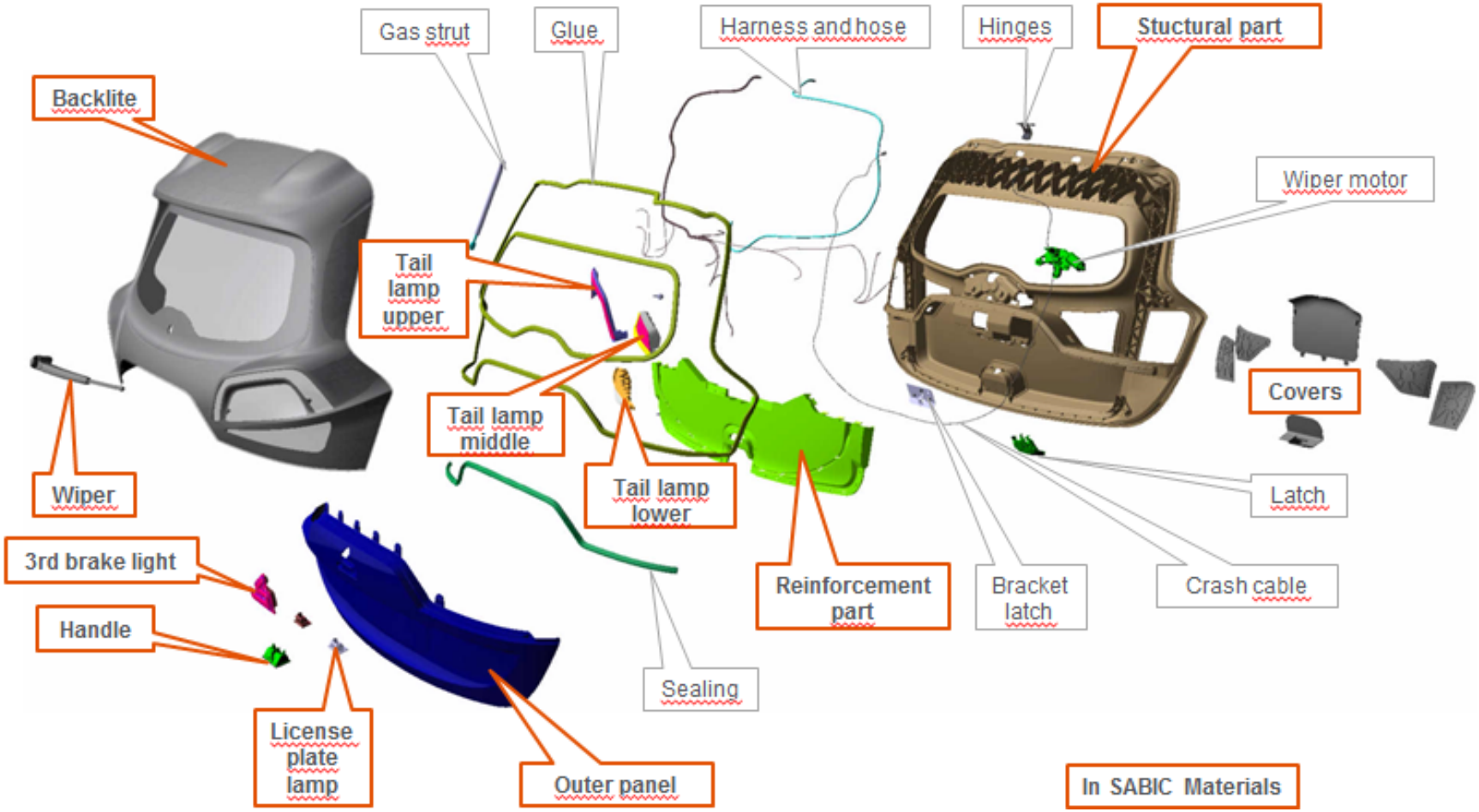
Vollkunststoff-Heckklappe
Entwicklung und Detailkonstruktion in CATIA V5



- Strukturbauteil (STAMAX 40%GF)

- PC-Glazing (Heckscheibe mit Schwarz-rand und Plasma-Coating)
- Blende (NORYL GTX)

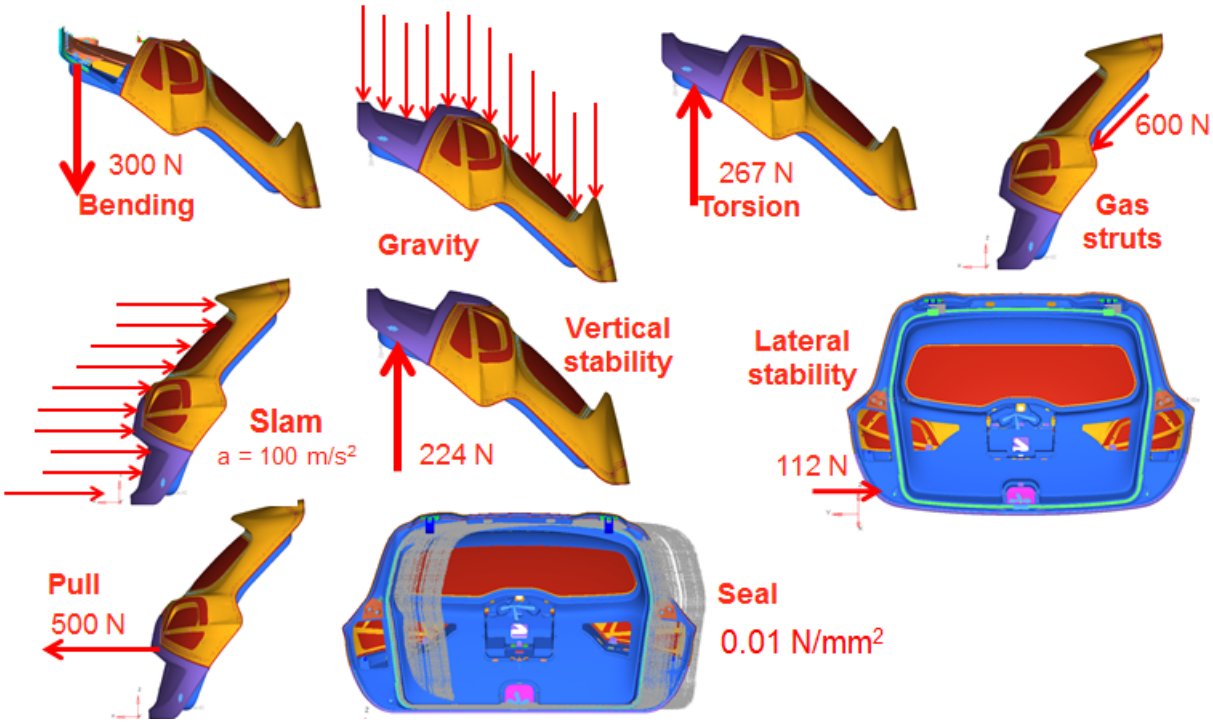
Vollkunststoff-Heckklappe
Entwicklung und Detailkonstruktion in CATIA V5

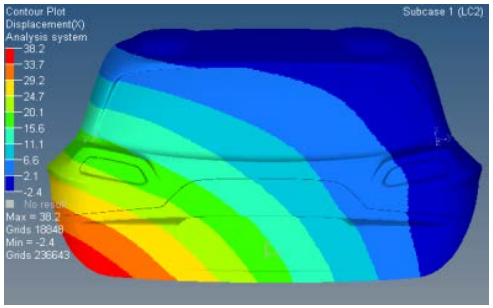


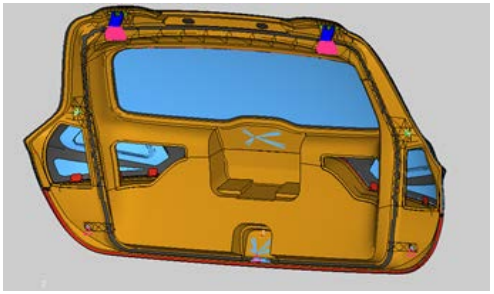
Vollkunststoff-Heckklappe

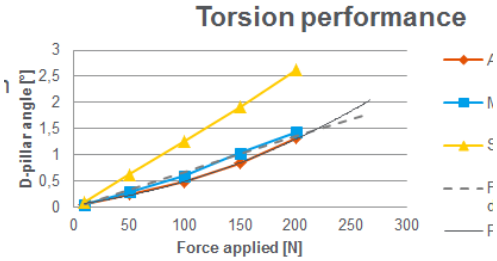
Torsions-,Steifigkeits- und Wärmeausdehnungsberechnungen

- Erfüllung aller gesetzlichen Anforderungen bei 80° C



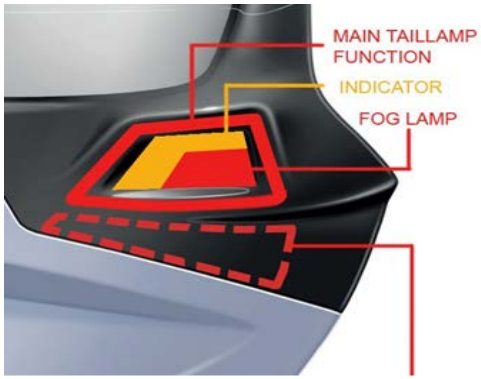




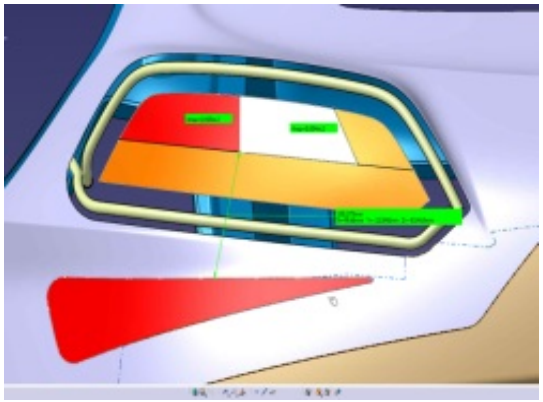


Vollkunststoff-Heckklappe
Lichtsimulation und Auslegung aller Leuchten

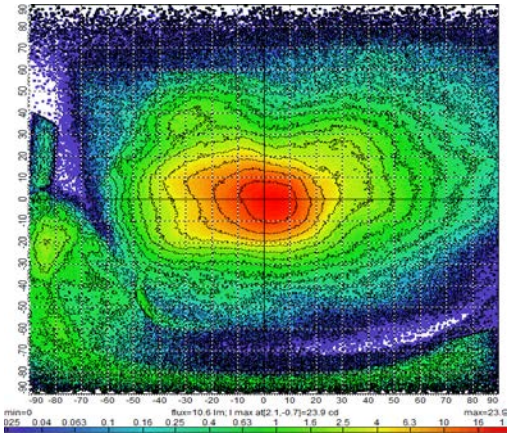
- Leuchten-styling



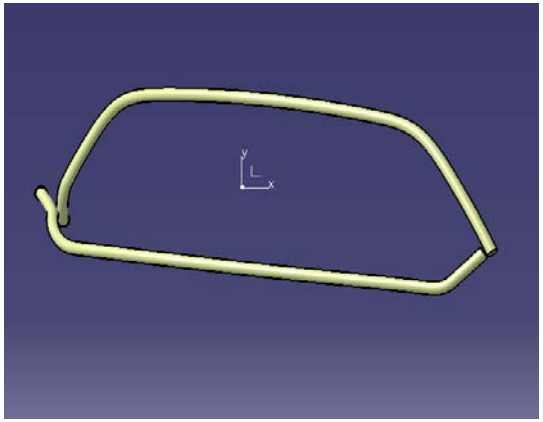
- Packaging check



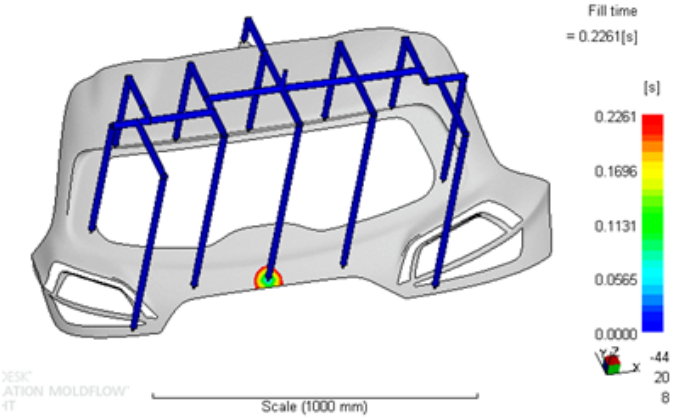
- Lichtstärkeverteilung

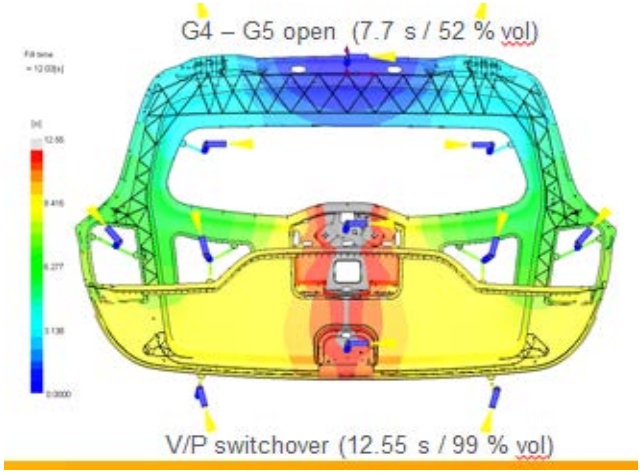


- Lichtleiter mit Reflektoren

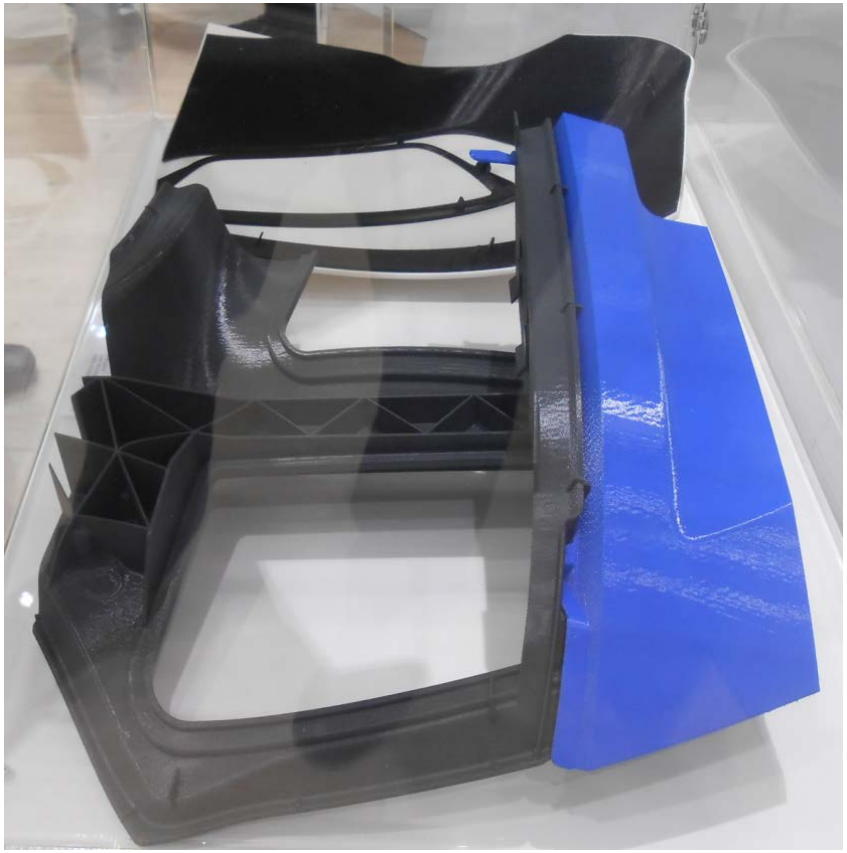


Vollkunststoff-Heckklappe
Moldflow-Berechnungen , Prototypenbau





- STL Modelle 1:1 (Teilbereiche)



Vollkunststoff-Heckklappe
Benefits

- 30% (hier:12,5kg) Gewichtsersparnis gegenüber herkömmlichen Heckklappen
- Gleiche oder bessere Performance vs. Standard tailgate
- Hecklappe als offline Modul montierbar
- Class - A Oberfläche auf der Strukturbauteil - Innenseite
- Integriertes Scharnier im Strukturbauteil
- Heckscheibe, Leuchten und Spoiler im Polycarbonat Bauteil integriert
- Größere stylistische Freiheiten im Vgl. zu einer Blechvariante
- Außenblende mechanisch befestigt, keine Verklebung (Servicefreundlichkeit)
- Verwendung von Standard-Elementen (Gasfeder , Schloss, Wischermotor)

Vollkunststoff-Heckklappe
Design & Engineering by IAV

Leichtbau | Vollkunststoff-Heckklappe führt zu circa 30% Gewichtsreduzierung gegenüber konventionellen Klappen

Vielen Dank

Jörg Sebastian

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