AZL Aachen GmbH
Excellence in Lightweight Production

In cooperation with:

AZL Aachen Center for Integrative Lightweight Production | RWTH AACHEN UNIVERSITY

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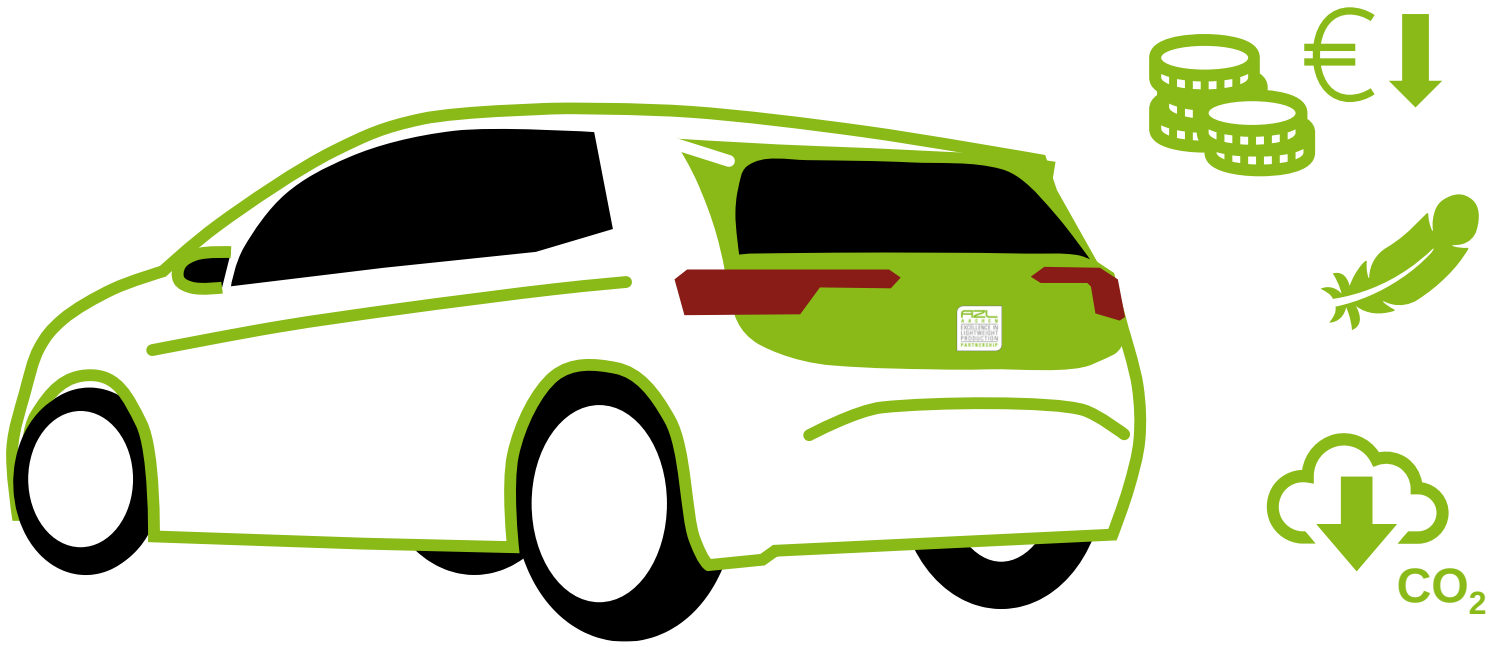


AZL Joint Partner Project:
Cost and CO_2 saving Lightweight Tailgate Concept Study

Cost and CO_2 saving Lightweight Tailgate Concept Study

Introduction and Aim of the Project

New lightweight designs and production concepts for automotive tailgates to reduce CO_2 emissions and costs are developed

Sustainability in combination with cost efficiency are increasingly important arguments for lightweight design in the automotive industry. Economic factors such as fuel and raw material consumption are the focus of new developments for ICEVs alongside performance. For BEVs the driving range is a key performance indicator for OEMs.

CO_2, cost and weight saving potentials for different materials and production technologies are identified

The experts at the AZL deal intensively with the issues of sustainability and cost reduction through lightweight design. The AZL engineering team combines know-how about different materials, design, technologies and processes to develop new component concepts. Together with the partners of Conbility GmbH, we analyze production process chains with regard to costs and eco KPIs. The required background information comes from our databases and is identified and discussed through expert meetings in our industrial and campus network.

Aim of this Project

- Identification of material, design and technology solutions to reduce CO_2 emissions
- Development of concepts for CO_2, cost and weight reduction by use of composites
- Derivation of manufacturable designs and production concepts
- Benchmark of concepts regarding CO_2 emission, cost and weight

Cost and CO_2 saving Lightweight Tailgate Concept Study

State of the Art & Questions to be answered

Peugeot 308

Sabic thermoplastic LFT structure

Citroën C4 Picasso

IDI SMC Concept study

VW ID.3 Liftgate

Magna thermoplastic concept

VW Golf VIII

Ford Mustang Mach E

Chery EQ1

Plastic Omnium Higate concepts

Fraunhofer WKI natural fiber concept (flax)

There is a large number of different concepts and series components that use fiber reinforced thermoplastic or thermoset materials for the structural frame, locally reinforced with metals or other composite materials (e.g. continuous fibers).

- What approaches exist to cost-effectively achieve the CO_2 reductions mandated in the future?
- Which potential for CO_2 emission reduction exists?
- Which lightweight solutions contribute to higher efficiency and to reaching eco-targets in future mobility?
- How does a smart part design enable CO_2 footprint reduction and sustainability?
- What are possible new technologies or how can actual technologies evolve?
- How can a lower CO_2 emission be achieved with lower costs of the tailgate?

Cost and CO_2 saving Lightweight Tailgate Concept Study

Objectives

- **General understanding of market, trends and challenges for different tailgate solutions**
  - Identification of different classes and exemplary concepts
  - The future of automotive lightweight design and the role of the tailgate in reducing the CO_2 emissions
- **Scope of investigations**
  - Currently employed concepts and their CO_2 emissions and design driving load cases
  - High volume segments for the tailgate market
  - Production processes and materials used
  - Comparison of alternative concepts and designs to a reference in terms of CO_2 emission, weight, costs and same functional specification

Results:

- Neutral AZL evaluation of CO_2 reducing potential for different tailgate concepts
- Specific advantages of different materials and structural layouts
- Cost, CO_2 footprint and weight comparisons of different material and structural layout solutions
- Opportunities to lower CO_2 footprint by material selection and design

Cost and CO_2 saving Lightweight Tailgate Concept Study

Your Benefits

This study provides a comprehensive overview and evaluation of CO_2-efficient lightweight tailgate concepts. The results and intermediate results will be presented and discussed in the report meetings to cross-check with experienced branch insiders. The project provides identification and evaluation of innovative approaches. Different building blocks offer benefits on your roadmap for realizing innovative ideas:

Cost performance benchmark

- Weight & Cost analysis for multiple concepts
- Sensitivity analysis of production-related KPIs, scalability
- CO_2 footprint analysis

Knowing the CO_2 saving potential and effectiveness of material selection in reducing CO_2

Component and production concepts

- Derivation of composite concepts
- CAD visualization

New designs and ideas as basis for improvement and developments

Visualized concepts for discussion with project partners and customers

Standards and Requirements

- Overview on standards and requirements
- Structured overview on subcomponents incl. requirements for material, design and function (e.g. mechanical, thermal, chemical)
- Definition of reference component
- Identification of common design characteristics
- Design space definition

Understand the component and its requirements to identify opportunities for your products

Market and Technology Overview

- Overview on state of the art applications, series components as well as prototypes under development
- Major players
- Patent screening

Understand benefits of different materials, designs and processes for the CO_2 emissions

Mechanical analysis of different production and material concepts

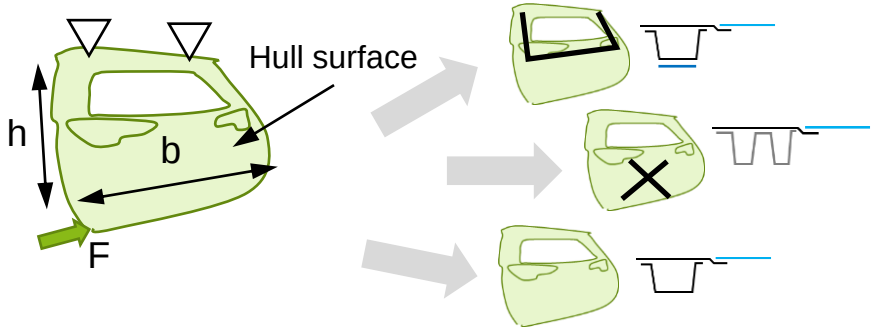
- CAE optimized CAD models (STEP) of selected concepts
- Feasible and manufacturable design
- Detailed validation of composite design

Predesign of multiple solutions for own development and evaluation

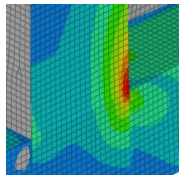
Cost and CO_2 saving Lightweight Tailgate Concept Study

Project Procedure & Scope of Work

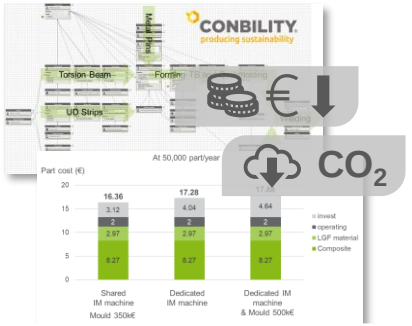
Norm	Type of norm
ISO 12405	ISO
ISO 6469	ISO
IEC 62660	IEC
IEC 60086	IEC
IEC 62281	IEC
UN ECE R100/2	UN ECE
UN ECE R136	UN ECE
UN 38.3	UN
SAE J2464	SAE
SAE J2929	SAE
SAE J2380	SAE
Sand 3123	Andere
UL 2580	UL
UL 2271	UL
GB/T 36276	GB/T
GB/T 34570	GB/T



Strength & Stiffness



Forming simulation, process simulation, mechanical simulation and composite optimization



WP1

Market and Technology Screening

Results:
- Overview on established concepts incl. similarities and differences
- Concepts and prototypes under development
- Patent screening

WP2

Inquiry of Standards & Requirements

Results:
- Overview on main standards and requirements
- Functions to be integrated
- Potential benefits that could be achieved by different material approaches for reducing CO_2 emissions

WP3

Definition of Specification Sheet for generic reference components

Results:
- Structured overview on subcomponents incl. requirements for material, design and function (e.g. mechanical, thermal, chemical)
- Definition of reference CO_2 footprints
- Identification of common design characteristics
- Design space definition

WP4

Sketch design & Simple dimensioning of multiple concepts

Results:
- Overview of potential materials and production technologies and their CO_2 emissions (e.g. metal, plastic and composites based on glass, carbon or natural fibers)
- Derivation of composite concepts
- Simplified design & CAD models for multiple selected concepts, allowing dimensioning.

WP5

CAE optimizations and feasible design study

Results:
- CAE optimized CAD models of selected concepts
- CAD visualization
- Feasible and manufacturable design
- Detailed validation of composite design

WP6

Process Chain Definition & Business Case Analysis

Results
- Weight & Cost analysis for multiple concepts
- Sensitivity analysis of production-related KPIs, scalability
- Benchmarking against cell-to-module-to-pack reference.

Cost and CO_2 saving Lightweight Tailgate Concept Study

Estimated Time-Planning & Costs

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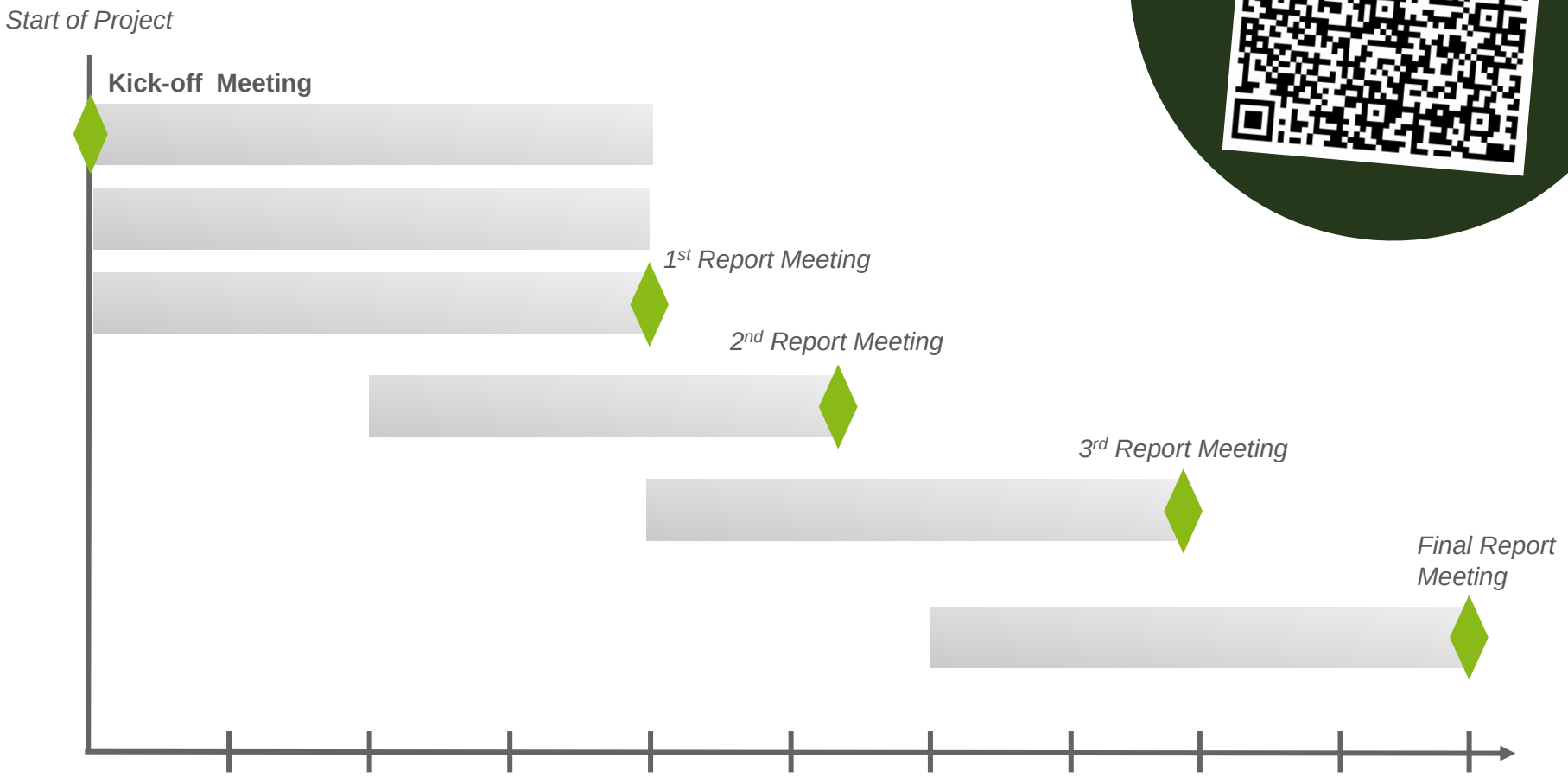
Duration 10 months



WP1:
Market and Technology Screening

WP2:
Inquiry of Standards & Requirements

WP3:
Definition of Specification Sheet for generic reference components

WP4:
Sketch design & Simple dimensioning of multiple concepts

WP5:
CAE optimizations and feasible design study

WP5:
Process Chain Definition & Business Case Analysis

Your Contacts

Lightweight Center and One-stop Shop for Business and Technology Development

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Excellence in Lightweight Production







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