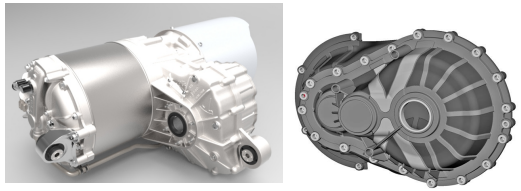
Shoulder to shoulder across borders: Light Vehicle 2025 Demonstrators

1

 # Body module
e.g. bonnet, door

Demo Leader:
Jean-Pierre Heijster, Automotive NL

2



 # e-Powertrain module
e.g. gearbox housing

Demo Leader:
Ioanna Koutla, Université de Liège

3

 # Suspension module
e.g. AM-consolidated parts

Demo Leader:
Jan Stroobants, Flanders Make

4

 # Hydrogen tanks
For fuel cells

Demo Leader:
Dr. Michael Effing, AMAC

✓ **We have chosen four demonstrators**

Project Partners

Co-Financers

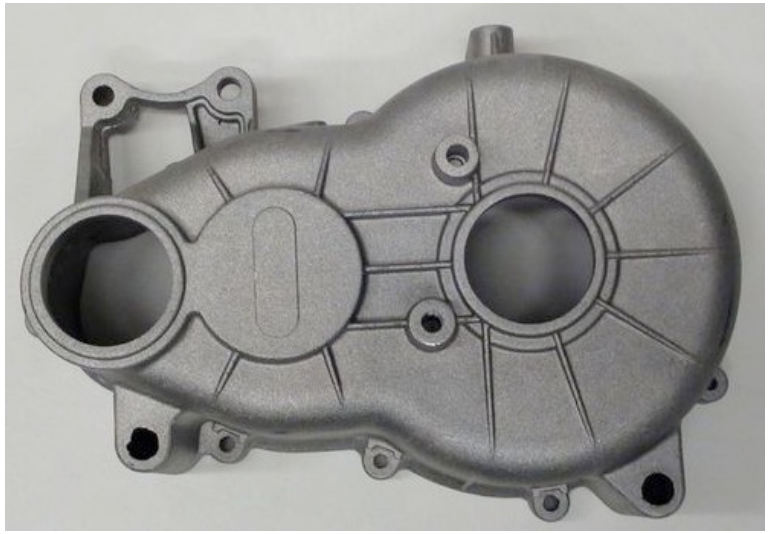
Gearbox housing. Why?

- High demand in reducing weight in EV.
- Excellent opportunity to try and reduce weight in powertrain.
- Excellent opportunity to reduce CO_2 emissions, while the whole Life Cycle Assessment of electric vehicles (from cradle-to-grave) is under research.
- Excellent opportunity to combine the existent capabilities in EMR, throughout the whole value chain.

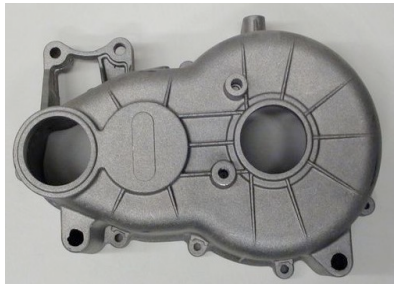
Application example: All types of EV

Characteristics:

- The gearbox housing is generally comprised by two symmetrical halves of molded aluminium.
- Only one half is studied.
- Traditional material : Aluminium
- Proposed application : Aluminium & plastic (PA6 compounded with SMA - styrene maleic anhydride).
- Lifetime comparable to that of a usual gearbox housing.



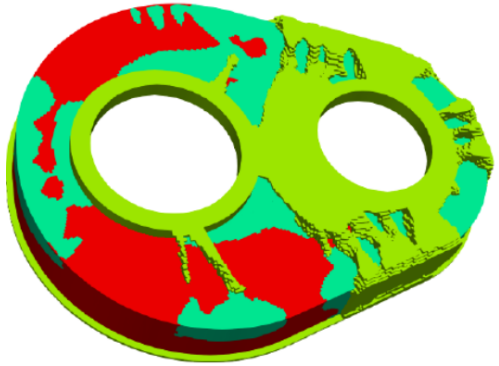
Application example: All types of EV



Simplified version:

- Simplifications are made to eliminate parts that give no additional information.

30%Al / 70%plastic



50%Al / 50%plastic

- *Topology Optimization* is used as a tool to investigate the best allocation of each material in the final design.
- A new design taking into consideration the TO results and manufacturing constraints is the following step.

Objective of the Demo Project

The objective of this demo project is:

- ❑ To create a multi-material gearbox housing which will be lighter than the traditional one made only of aluminium.
- ❑ To reduce the CO_2 emissions during the life cycle.
- ❑ To create a lighter part in powertrain where it is already difficult to reduce weight.
- ❑ To acquire a generic part and showcase that the research behind it's development can be applied for the development of similar parts in several vehicle types.

Partners

- Company Name: GDTech engineering
- Webpage: www.gdtech.eu
- Main Resposibility: Engineering

- Company Name: Polyscope Polymers B.V.
- Webpage: www.polyscope.eu
- Main Resposibility: Material supplier

Partners

- Company Name: Tenco DDM
- Webpage: www.tenco-online.com
- Main Resposibility: Prototyping

- Company Name: PEG GmbH
- Webpage: www.pe-group.de
- Main Resposibility: Plastics simulation

Partners

- Company Name: Flanders Make
- Webpage: www.flandersmake.be
- Main Resposibility: Design & engineering

Partners and External Service Providers

Engineering	Raw Material	Equipment/Tooling	Tier 1/Tier 2	OEM	Others
• GDTech/BE (Wallonia) • PEG GmbH/DE	• Polyscope Polymers/NL	• Tenco DDM/BE (Flanders)		• Toyota/BE	• Flanders Make/BE (Flanders)

Scope of the project

- Simulation of injection overmolding production method.
  - FE-Modelling / Meshing
  - Injection Molding Analysis
  - Determination of a suitable gating concept
  - Evaluation of the general filling behavior
  - Determination of the shrinkage and warpage based deflection behavior
  - Checking of construction issues and (if needed) optimization instructions

- Vacuum casting production method
  - Print master parts in SLA (epoxy resin)
  - Create the metallic part using a sand mold
  - Create a silicon mold using the metallic part in it, cast resin in the mold, simulating the injection overmolding.
  - Result quite close to that of injection overmolding.

Expected deliverables

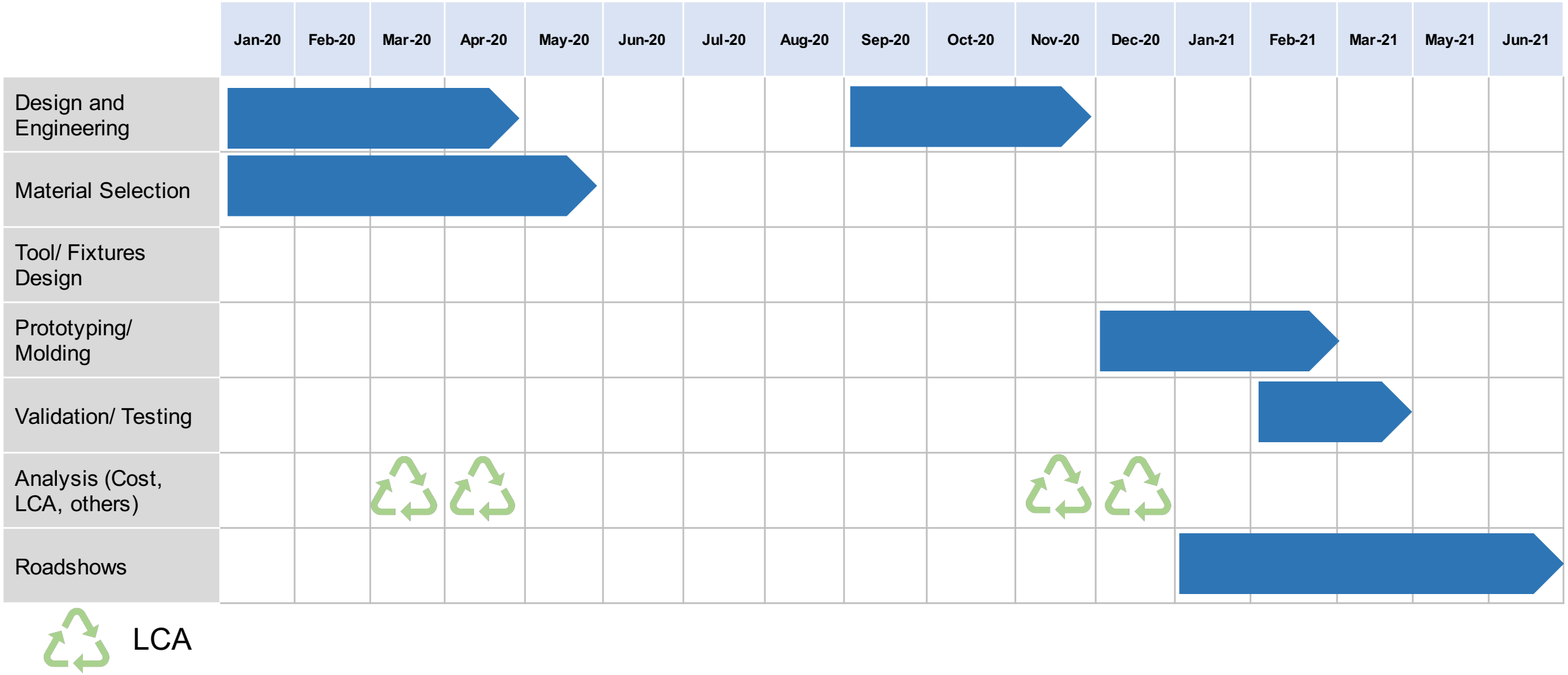
- A virtual prototype using the simulation of injection overmolding production method.
  - Results from a rheological point of view
  - Adhesion between the two materials

- A physical prototype using the vacuum casting production method.
  - Physical representation of the two material gearbox housing
  - Possibility to produce more prototypes and perform testing

- Life Cycle Assesment for the existing part, LCA for the part produced with the injection overmolding method and comparison to showcase the percentage of CO_2 emissions reduction.

Project planning

Define the shedule of your demo Project using the icons below the table:



Bibliography

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