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VACMT - Project introduction

The project is responding to the ongoing mega trends in society that effect the manufacturing ecosystem. The trends specifically include reduction of CO2 emissions, reduction of waste, good job creations i.e healthy, high skill jobs etc.

The project focus is concerned with light sustainable materials that can facilitate the transformation of automotive transportation from internal combustion engine to electrically powered vehicles.



The proposed solution is to utilise polymer composite materials which can be used to reduce weight, increase functionality and design space. These future components need to be manufactured in a local, automated highvolume environment. However, the composite material solution also needs to be compatible with surrounding metallic components / interfaces in a synergistic multimaterial design.









VACMT - Project introduction

This project looks at the current supply chain for existing automotive vehicles. Investigating how the companies could become suppliers for electrically powered systems, while meeting the overriding societal challenges of good jobs and environmentally sustainable solutions.

The consortium consists of three partners:

- **Research Institutes of Sweden (RISE)** Lead partner and responsible for delivering technology concerning high-volume composite materials manufacturing.
- Slovak University of Technology (STU) Provides knowledge, innovation and technology of industrial automation and robotics, collaborative robotics, data processing from sensors, visual systems, additive manufacturing, and digital twin.
- University of Applied Sciences and Arts of Southern Switzerland (SUPSI) Provides technical input in the field of sustainable production systems, creating business models supporting circular economy and sustainable ecosystems, decision support systems for sustainable design.











Present at 35 locations across Sweden. And beyond.

2,800 employees

Turnover approx. SEK 3,6 billion (2019).

Small and medium sized enterprises account for approx. 26 % industry turnover.

Department of Polymer Materials and Composites

- 4 locations across Sweden
- 90 engineers, researchers, technicians and project managers
- National and international projects, delivering research for over 30 years
- Education & training











Consortium introduction - STU

- The Slovak University of Technology in Bratislava (STU) is a modern research and higher education institution. At international level, STU has closed hundreds of collaboration agreements with foreign universities, faculties and research institutes.
- Research teams at the University are involved in international projects and annually deal with about 500 research projects funded through grants and hundreds of research contracts commissioned by businesses.
- Two faculties are contributing to the project:
 - Faculty of Electrical Engineering and Information Technology
 - Faculty of Material Science main competences
- Material, manufacturing and automation trials
- Services and expertise: production process design including key parameters, layout of production, material flow analysis etc.















Consortium introduction - SUPSI



Sustainable Production Systems LAB

- Responsible of bachelor and master in Industrial Engineering
- 21 Active research project (national and EU)
- 34 persons: professors, (senior) researchers, assistants and PhD students
- 2M CHF/year research volume
- Main expertise:
 - Digital Factory for Industrial Leadership
 - Supply chain management for sustainable and global manufacturing
 - Personalized products for a value adding manufacturing









Project overview – Long term view

The overall project has the concept to support technology change for the automotive supply chain. Not just to change the material type to save vehicle weight but also to develop sustainable circular economy-based business models. The long term view is split into three phases, this project is the first phase.

- VACMT phase one
 - Delivers:
 - Virtual case studies
 - Background technology review
 - Understanding the challenges
 - Aligning with supply chain needs
 - Material, manufacturing and automation trials
- VACMT phase two
 - Delivers:
 - Practical demonstration and feasibility
 - Development of the ecosystem
 - Works across more European Companies
- VACMT phase three
 - Delivers models ready to industry
 - Supports industry adoption

This project

Possible continuation







EIT Manufacturing is supported by the EIT, a body of the European Union



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Project overview – Work plan

The project is split into 7 work packages

- WP 1: Project coordination
- WP 2: Identifying companies, search through and find suitable companies that have potential need for transformation to new technology with the support of a steering board from industry.
- WP 3: Technology mapping will review the technology options for producing lightweight circular economy based composite material structures.
- WP 4: Product identification, work with automotive OEMS and scope which are the key product changes they see
- WP 5: Feasibility concept study, will combine WP 2,3 and 4 to work select which companies follow a selection criteria based on innovation and impact of transformation.
- WP 6: Business Cases Development: VACMT will address barriers to circular economy by working on customised business model development
- WP 7: Material, manufacturing and automation trials













Project progress - Contacting companies

The focus was to contact companies and conduct meetings with the aim to understand their interest of producing sustainable automotive composite components.

Summary as follows:

- Over 75 companies have been contacted
- More than 20 company meetings specifically concerning this project
- An overview was carried out presenting the ideas to the interested companies.
- From this work five case study projects have been selected.
- The task has been challenging with respect to the current pandemic situation











Project progress - Contacting companies

The following 5 case studies were selected:

- Konvegas: CNG and H2 tanks
- AIPS: Structural battery pack
- Freno Air: Pivot arm
- Volvo Cars: Subframe
- SSAC: Bipolar plates

These were selected based on industrial relevance in the context of facilitating the transition away from internal combustion propulsion











Project progress - Technology mapping

As part of the project a technology map was developed, investigating the relevant technology's, this is used to support the case studies. And provide background information for the business cases.

The key areas of focus were:

- Composite material processing technologies for high volume applications
- Sustainability: an environmental view
- Sustainability: an economic view
- Composites and carbon footprint from the material selected











Case study AIPS: Structural battery pack

- AIPS has together with RISE developed a material and a method for producing cost competitive battery modules for the use in battery packs in EVs
- It turns out that the material has some interesting mechanical properties too
- Idea: Is it possible to utilise the properties of the modules to make the entire battery pack structurally stiff and transfer loads normally taken by surrounding structures in the vehicle? If so, this would transform the battery pack from being dead weight to contribute to overall performance and rigidity, reducing the needs for extra stiffened structures around the battery.











Case study AIPS: Structural battery pack

- The potential of the idea is evaluated by subjecting the structural battery pack to various loading conditions, e.g. bending and twisting loads
- The response is then compared to the response of the non-structural battery pack
- If a significant improvement can be shown, the next step is to investigate indentation performance, crash and durability of the concept









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Case study Freno Air: Pivot arm

Overview of work case

- This case is made around an aftermarket vehicle for person transportation mostly used in city traffic
- The vehicle needs to be lighter to make an EV conversion possible
- The rear suspension, that can lower the vehicle for easy boarding and disembarkation, with a casted part holding is targeted for weight saving

New concept – material and design

- The new concept will be a composite / steel tubes solution
- Calculations shows that the 46 kg casted part can be replaced with the composite/ steel solution saving almost 30 kg per side, i.e. ca 60 kg















The main objective was to define circular business models to support the selected companies in the EV transition considering the production of new or upgraded composite components. Activities performed:

- Identification of the EV manufacturing value networks stakeholders, their relations, information flows, current business models adopted
- Identification of circular business models and their allocation to suitable stakeholders
- Identification and application of a set of criteria meant to assess the different BM adoption under the circular perspective









Summary

- Contacted over 75 companies
- Meeting with over 20 companies to discuss industrial focus
- Develop a technology map of the relevant technology
- Developed five industrial based case studies to understand the viability of the technology
- Analysis of possible circular economy based business models for tier-2 companies
- The initiative has been of interest to industry and if you would like to be involved or have more questions please contact us.













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The manufacturing industry is a global base for **prosperity** and key to Europe's **economic**, **social** and **environmental** sustainability. Manufacturing is a main driver of **industrial innovation**, **job creation** and growth for the European society



Over **2.1 million** manufacturing enterprises



32 million jobs (16% of the total EU working population)



Approx. **13 million** jobs in the growing hightech manufacturing industry¹



16.1% of the share of EU-28 GDP² (2016)



Total turnover of EUR **7.11** trillion³





