



How Sustainability is Transforming Materials and Design in Automotive and Motorsport Engineering

Bethan Lane

Andrew Harrison

Wales Institute for Science & Art

BEng Foundation Motorsport Engineering



Figure 2:
Application of
Hemp
Composites
(Pollitt, 2011)

Introduction

Sustainability is transforming automotive and motorsport engineering as global emissions rise and resources become limited. Engineers must now design vehicles with reduced environmental impact by working with advanced materials whilst aligning with the strict Euro 7 Standards.

Key Concepts

- Exhaust emissions are only a small part of **total vehicle emissions**.
- Vehicles' raw materials, manufacturing, and disposal also contribute.
- Designing vehicles so they are easy to disassemble and recycle.
- Using **recycled materials** from disassembled vehicles to manufacture new vehicles.
- Euro 7 is stricter than ever.** Applying exhaust, brake dust, and tyre wear emissions standards. And introducing battery durability requirements.

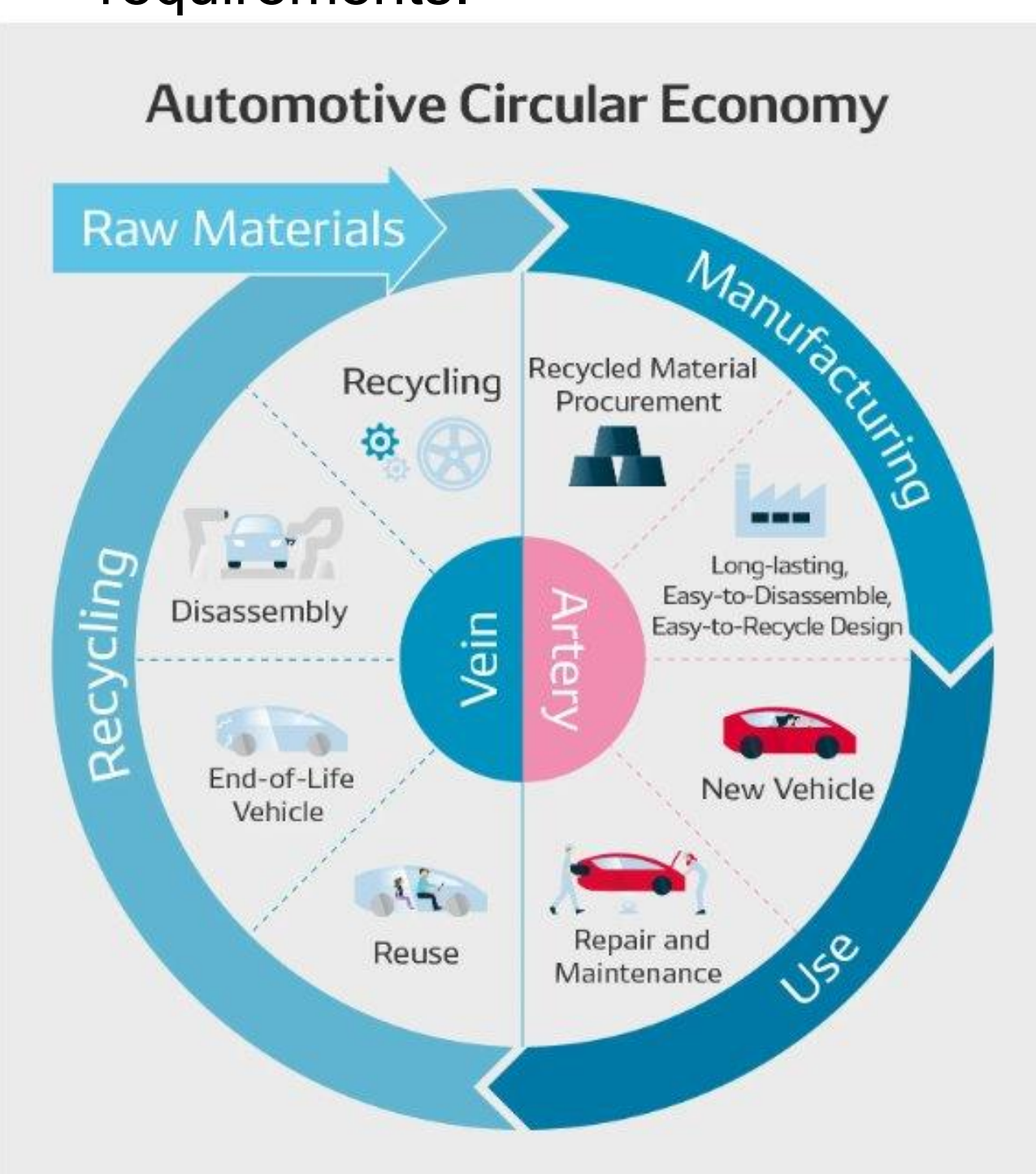


Figure I: Automotive Circular Economy model

Tudor, K. (2026) Sustainability & Materials in Engineering Lecture Slides. [PowerPoint]

Innovations & Materials

Fossil-free steel (SSAB, 2023):

- Steel is produced using hydrogen instead of coal.
- It significantly reduces CO₂ emissions during vehicle manufacturing.

Natural fibre reinforced composites:

- Lightweight materials made from plant-based fibres.
- Reduces vehicle weight and negative environmental impact.
- Made to replace carbon fibre or plastics in the mechanical industry.

(Banea, 2023)

Bio-materials

- Materials made from renewable sources like algae-based polymers.
- Reduces dependence on petroleum-derived materials.

(Peças, 2018)

Applications

F1 aims for Net Zero by 2030 using advanced sustainable e-fuels (Formula 1, 2023).

E-fuels allow existing engine technology to continue while emitting lower lifecycle emissions.

However, e-fuels being high in cost and energy causes larger scale impact to be difficult.

Porsche has invested over \$100 million in the development and production of e-fuels aiming to produce e-fuels to the automotive industry as well as their motorsport championships. (Porsche, 2024)

BMW Group uses natural fibre composites for roof panels to reduce production emissions.

They will continue using these composites in their new vehicles as the composites reduce vehicle weight which improves efficiency. (BMW Group, 2025)

In October 2021 **Volvo Group** and **SSAB** released world's first fossil-free steel vehicle, a hauler truck.

Production of steel releases large amounts of CO₂ emissions by burning fossil fuels.

Fossil-free steel has the same properties as steel but with lower emissions. (SSAB, 2021)

Conclusion

Sustainability affects regulations.

Motorsport championships are a testbed for sustainable fuels.

The automotive industry is implementing biomaterials and natural composites into future productions.

Porsche is investing money and building plants to produce more e-fuels to lower the environmental impact of everyday vehicles.

Overall, the entire lifecycle of a vehicle is important in a vehicle's emissions.

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