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FACTSHEET

REDUCING CARBON
FOOTPRINT OF PU IN VEHICLES

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Introduction

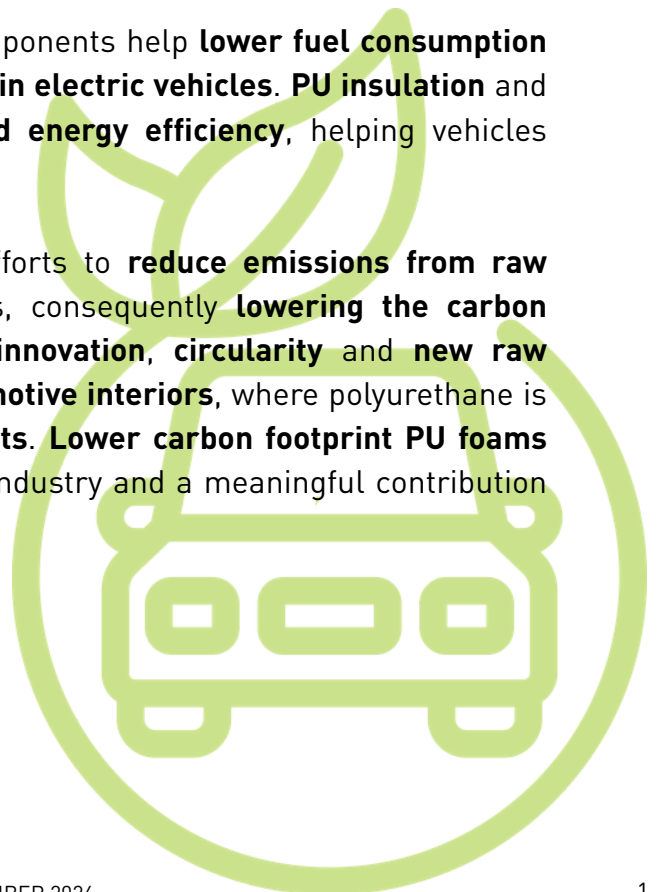
Polyurethanes are the **second most used plastic** in vehicles. Beyond providing exceptional performance for **comfort, acoustics, insulation, and vibration control**, polyurethanes combine this remarkable **versatility** with **lightweight properties**. This allows **improving energy efficiency** and ultimately **reduces greenhouse gases** from vehicle use.



Supporting Low-Carbon Emission Mobility

When it comes to **carbon emissions**, polyurethanes contribute in two different ways:

- By **reducing vehicle weight**, polyurethane components help **lower fuel consumption** in conventional cars and **extend driving range in electric vehicles**. **PU insulation and acoustic solutions** also improve **thermal and energy efficiency**, helping vehicles **consume less energy** throughout their lifetime.
- Second, the industry is doing tremendous efforts to **reduce emissions from raw materials**, including Scope 1 & 2 emissions, consequently **lowering the carbon footprint of PU parts themselves** through **innovation, circularity and new raw materials**. This is especially relevant for **automotive interiors**, where polyurethane is used in many **comfort and safety-related parts**. **Lower carbon footprint PU foams** are therefore an important step for the foam industry and a meaningful contribution to **lower-carbon-emission interiors**.



The Solutions

Today, **more than 90%** of the carbon footprint of polyurethanes comes from the **chemical raw materials used**. Transitioning away from fossil-based materials to **new alternative types of raw materials** is the clear way forward. Beyond fulfilling the automotive sector's performance needs, **polyurethanes actively contribute to lower carbon emissions** while **unlocking further possibilities**, such as:

Bio-based polyols

Bio-based polyols are typically produced through the **chemical modification of natural fats and oils**. Common feedstocks include **vegetable oils**. They **significantly reduce the carbon footprint** compared to petroleum-based polyols, with some applications achieving **reductions of around 50%**. In terms of **performance**, they offer **comparable thermal and mechanical properties** to their fossil-fuel counterparts.

Recycled polyols

Instead of drawing from virgin, fossil-fuel feedstock, chemical companies **recover these molecules from PU foam that has reached its end of life**, effectively introducing them back into a **circular manufacturing loop**. Manufacturing polyols from waste uses considerably **less energy** and **reduces greenhouse gas emissions significantly** compared to extracting and refining crude oil to make virgin polyols. Typical repolyols on the market made **from end-of-life polyurethane foam mattresses** have a **recycled content percentage of 40-45% by weight**.

Incorporating recycled content or bio-circular content from various waste

Integrating **recycled or bio-circular waste** (i.e. wood waste, agricultural residues, used cooking oils) into polyurethane foam radically improves its **environmental profile** by **redirecting waste into the production cycle**. This transition is **economically and environmentally optimized** through a **mass balance approach**, where **circular or bio-circular feedstocks** are blended directly into **existing chemical infrastructure** alongside virgin fossil inputs. This ensures **lower carbon footprint for PU foam parts** without sacrificing **material performance** or **manufacturing efficiency**.

Developing new types of polyurethanes with a thermoplastic nature

The transition to a **thermoplastic nature** relies on **reimagining the material's molecular architecture** to allow the polymer to **melt and flow when heated** and **reform when cooled**. Meltable PU parts at the **end of a vehicle's life** can be **ground up, melted down**, and after a mechanical recycling-step **re-moulded into new high-value components**. This heavily **reduces the carbon footprint** by **enabling a circular loop**.

These developments are **fully aligned with Europe's ambition for zero-emission vehicles** and the **circularity objectives of the End-of-Life Vehicles Regulation**. Reducing the carbon footprint of vehicle parts must go **hand in hand with increasing circularity, improving recyclability and integrating more recycled content**. Designing car parts for a circular journey will matter just as much, which is exactly where **eco-design** comes into play. For instance, if components such as car seats are designed for **easy disassembly**, more polyurethane can be **recovered and transformed** into **new raw materials**, creating a **strong and mature circular system**.

Looking Ahead

Achieving this is a **multi-front process**, demanding **enhanced design for car parts, high-quality chemicals**, and a **stronger collaboration across the entire value chain with new players** in the ecosystem, such as **recyclers and dismantlers**. A great deal can already be done today to **integrate polyurethanes with a lower carbon footprint into vehicles**, and even more progress is on the horizon.

