Autoneum – making sustainable acoustic and thermal management of cars a reality

The last few years have seen a confluence of events and forces put pressure on vehicle manufacturers to make drastic strategic changes. Countries, especially in Europe, have put in place ever-stricter emission regulations to meet global CO₂ reduction targets. The groundswell of public understanding of and concern about environmental issues is demanding manufacturers act more responsibly in materials sourcing and manufacturing. At the same time, big tech is pushing the vision that the cars of tomorrow will be connected, autonomous, shared, and electric; they’ve even introduced a catchy acronym – CASE. All this has brought to the fore an important component to the design and construction of electrified cars, boasting an extra layer of specialisation: sustainability.

Autoneum is the global market and technology leader in acoustic and thermal management solutions for vehicles. Headquartered in Winterthur, it has a huge international presence with more than fifty plants around the world and works with almost every car manufacturer. The company’s engineers are masters in acoustic and thermal management, which is an increasingly important element for CASE-sensitive vehicle design and construction. However, while Autoneum recognises CASE as a genuinely disruptive concept for innovation in the automotive industry, its in-house experts agree that it omits one critical factor: sustainability. Taking innovation a step further, the company has developed sustainable textile solutions, which are the basis of its wide range of interior and exterior products that deliver tangible sustainable benefits.

**REDUCING NOISE, CONTROLLING TEMPERATURE**

Car interiors contain all manner of noise-reduction and insulation features, typically built into exterior parts such as the underbody and wheel hubs. Hidden from view in paneling around the engine, behind the dashboard, inside the doors and underfoot. Strip all this away, and the cabin would soon become unbearably noisy and hot. As for electric vehicles (EVs), replacing an internal combustion engine (ICE) with a battery pack won’t remove all the noise as long as a vehicle is moving, considerable noise – from the tyres on the road or the air rushing over the body, from heating and ventilation, and the tonal noise of the e-motor itself – can affect the sound quality inside the cabin. Consequently, reducing noise and optimising temperature control are critical goals in vehicle design.

Autoneum has turned this aspect of vehicle design into both a science and an art. Every component the company manufactures – from floor carpet systems to underfloor panels, and engine or e-motor encapsulations, to name but a few – is designed to be not only multifunctional and lightweight, but also more sustainable. Dedicated to sustainable solutions, Autoneum has established the Autoneum Pure label. Setting industry standards, the label determines technologies with especially high standards of environmental performance.

Autoneum’s innovation process is driven by its Advance Sustainability Strategy, which aims to reduce emissions, energy and water consumption and waste, but also outperform international compliance requirements. For example, Autoneum focuses on constantly increasing the recycled content of new products and their recyclability to reclaim production cut-offs. All four phases of a vehicle’s life are taken into account: the procurement and production of the raw materials, the actual manufacturing of the vehicle, its use phase, and end of life. Consequently, Autoneum products are designed to have low environmental impact at source, produce little CO₂ during manufacture, serve multiple functions to avoid redundancy, be lightweight to reduce fuel consumption and save battery power, and be easily recyclable. That’s no easy task: how is it achieved?

**SUSTAINABLE ACOUSTIC AND THERMAL MANAGEMENT**

The floor of a typical vehicle features face carpet visible to the occupants, a backing layer, and a decoupler to fill the gap to the vehicle body. Acoustic components located close to the wheels in the interior, for example in the trunk area, and the car exterior such as textile mud guards, reduce the rolling noise. This is especially important in EVs where there is no running engine to distract from road noise. Additionally, electric cars usually have broader and stiffer tyres which means that occupants experience almost as much exterior noise at a driving speed of between 40 and 50km/h as they would in a car powered by an ICE at city-driving range. While Autoneum engineers therefore place great importance on optimising the acoustic performance of the company’s various noise-reducing products, they give equal attention to their environmental performance.

Autoneum reuses fibres from textile waste, such as cotton clothing or recycled PET, to produce its acoustic-management components. The fibres are converted into felt matting, which are used to create a lightweight acoustic material that can be moulded to customer specifications. The cut-offs are reclaimed, processed, and reused, thereby ensuring a closed material loop. The end product is then integrated as a single unit into the vehicle, significantly facilitating removal and recycling at the end of the vehicle’s life span.
EVs don’t escape the weight dilemma: batteries are heavy and weight affects range – perhaps one of the biggest concerns of potential EV buyers. Every kilogram saved on the weight of a component thus translates to greater efficiency, and therefore extended driving range.

Autoneum uses computer-aided engineering to run simulations when designing and improving products. Because most of the company’s components serve two functions – to minimise noise and manage temperature – thermal and mechanical simulations can identify the optimal material quality and amount. The simulation is then fine-tuned to find the combination that will lead to the lowest weight for each part.

EVALUATING SUSTAINABILITY

Any potential improvement of a current, or innovation of a new product must also pass Autoneum’s Innovation Sustainability Evaluation. This internal assessment and rating process encourages the research and development engineers to evaluate the sustainability improvement potential of the product at early stages of development. The evaluation comprises a series of specific questions that address its impact in the four stages of the vehicle life-cycle. Evaluations are run throughout the product development process so that sustainability is a major design driver. The evaluation encourages the research and development engineers to evaluate the sustainability improvement potential of the product at early stages of development. The evaluation comprises a series of specific questions that address its impact in the four stages of the vehicle life-cycle. Evaluations are run throughout the product development process so that sustainability is a major design driver.

Behind the Research

Philippe Godano

The team at Autoneum are experts in designing acoustic and thermal management systems for vehicles with sustainability built in from the source to end of life.

Research Objectives

The Swiss company Autoneum specialises in sustainable interior applications for the global automotive industry. It develops and produces multifunctional, lightweight components and systems for interior floor and engine bay as well as the underbody. Customers include almost all light vehicle manufacturers in Europe, North and South America, Asia, and Africa.

Collaborators

• Philippe Godano
• James Taylor
• Pascaline Brégion
• Davide Caprioli
• Stefano Schnappenberger
• Laura Gottardo
• Santiago Clara
• Luca Mazzarella
• Philippe Funda

What materials excite you the most when it comes to designing and manufacturing acoustic and thermal management products, and why?

Polyester is the material for the future of interior thermo-acoustic components. It can be used in many forms (fibre, film, foam, powder, adhesive), is available in vast quantities in recycled form, has low volatile organic compounds emissions and odour, and is affordable. Combined with state-of-the-art simulation methods and manufacturing processes, polyester based parts are the benchmark in terms of performance and sustainability today.

Personal Response

By having sustainability in its DNA, Autoneum can fully anticipate the environmental challenges carmakers are facing.