



Mercedes-Benz

Press Information

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Tomorrow XX: Mercedes-Benz unveils a new dimension of sustainability

- New pioneering technology program focused on decarbonizing all vehicle components and materials
- More than 40 new component and material concepts undergoing research and development show enormous potential to significantly reduce a vehicle's carbon footprint and substantially increase share of secondary materials
- Rethinking component design: headlight engineered for circularity and new joining technology
- Innovative thinking accelerates mono-materials and increased use of recycled materials
- Focus on fossil-free through evaluation and development of bio-based and bio-circular alternatives
- Ensuring the today's vehicles are a valuable source of raw materials for future vehicles

Stuttgart. Mercedes-Benz unveils the Tomorrow XX technology program as a driver of innovation in support of the company's sustainability objectives. It leverages the same holistic, multi-disciplinary approach successfully demonstrated with VISION EQXX and CONCEPT AMG GT XX. Now, for the first time, an XX technology program extends across the entire product portfolio. Dynamic and far-reaching, Tomorrow XX focuses on decarbonization, resource use and circularity from the start of the design phase to the end of a vehicle's lifecycle. It aims to maximize the benefits of the brand's Design for Environment and Design for Circularity principles, regardless of model line or drivetrain.

In partnership with suppliers, institutions and start-ups, Mercedes-Benz is pushing the limits of what is technically achievable to develop new solutions and bring these to series production. The exhibit unveiled today showcases more than 40 components and materials that serve as examples of what is already being achieved or demonstrating enormous potential. The Tomorrow XX technology program will continue to grow and expand as further innovations demonstrate real-world potential in line with the brand's strict standards.

“There can be no doubt that the overriding goal for all our products is to excite our customers while decarbonizing the automobile, driving down resource use and growing the circular economy. Innovation is a key route to achieving this and Tomorrow XX makes clear the huge strides we are taking. Together with our suppliers and partners, we are leading the way and embedding sustainability deep into our operational business and along the entire supply chain.”

Olaf Schick, Member of the Board of Management Mercedes-Benz Group AG,
Integrity, Governance & Sustainability

“Mercedes-Benz has always been an innovation powerhouse. With our ‘Design for Environment’ and ‘Design for Circularity’ approaches, we are rethinking literally every single component from scratch. The Tomorrow XX technology program pushes this holistically across our entire product portfolio and value chain to the limits of what is possible. More than 40 new and more sustainable component and material concepts in just two years is a phenomenal result and a taste of the enormous potential we are unlocking.”

Jörg Burzer, Member of the Board of Management of Mercedes-Benz Group AG,
Chief Technology Officer, Development & Procurement

Tomorrow XX: reduce carbon emissions, increase recycled content, build a circular economy

The Tomorrow XX technology program pursues a collaborative and interdisciplinary approach. Mercedes-Benz development experts work closely with partners along the entire value chain, including recycling companies and start-ups. The aim is to put all components and materials under the microscope – from the battery to the bodyside and from interior equipment to trim elements. Even materials hidden from view such as insulation are closely examined. Every kilogram of CO₂ is scrutinized and questioned: Which components need to be redesigned to be easily dismantled, repair and recycle? Which materials need to be changed, recombined or replaced to reduce CO₂ emissions, use fewer resources and be recyclable? Which primary materials can already be replaced today by recycled materials? In Kuppenheim (southern Germany), Mercedes-Benz is accelerating the construction of its own in-house pilot recycling plant for batteries to completely close the material loop. The facility is currently in the research and development phase, with the target of establishing a forward-looking and sustainable solution for battery recycling.

With Tomorrow XX, Mercedes-Benz has already identified more than 40 new, more sustainable components and materials in approximately two years. Together, these have the potential to further significantly reduce the carbon footprint of a future series-production vehicle relative to the current portfolio and to substantially increase recycled content. Measures include new and optimized material cycles, which were developed to the brand's strict standards for quality, design and comfort. The consistent goal is to implement sustainability. The spectrum ranges from disruptive ideas at an early stage of development to concepts that are close to series production and innovations already in series production.

Rethinking component design and material combinations

Tomorrow XX represents the holistic Mercedes-Benz “Design for Environment” approach aimed at reducing both carbon footprint and consumption of primary resources. From the earliest stages of product development, experts are rethinking the use and composition of all materials. The goal is to embed requirements concerning environmental and climate protection into vehicles from the very start.

Within this, Mercedes-Benz is pursuing the principles of the circular economy (Design for Circularity). The company is developing vehicles in a way that minimizes the consumption of finite resources, maximizes the proportion of recycled materials and reduces waste. At the end of a vehicle's lifecycle, Mercedes-Benz wants to close the loop and return as many recyclable materials as possible to the system. The prerequisite for material recycling is ensuring components are easy to dismantle and that different materials can be separated by type. Mono-materials are advantageous because these do not require separation prior to recycling, making them a valuable resource for new products. Material mixtures, on the other hand, are much more difficult to recycle, meaning some are only thermally recycled.

Making the inseparable separable: the headlight re-engineered for circularity and a new joining technology

Mercedes-Benz is working to change the design of highly complex components to make these quick and easy to disassemble into individual parts. A promising Tomorrow XX research project is a recyclable headlight. The various components such as the lens, cover trim and frame, housing and electronics are joined with fasteners rather than glue (today's standard practice). As a result, the headlight can be separated into individual

components with ease and without damage. This means individual components can be replaced, making a modern headlight repairable for the first time. Following a stone chip, for instance, there is no need to replace the entire headlight, just the lens. For customers, this could make repairs more efficient in future. The longer service life of headlights could also help conserve resources and minimize carbon emissions.

The headlight concept is also designed to be better for recycling. Individual modules are each made of only one material to ease sorting and to be highly efficient to recycle. Looking to the future, this mono-material design should make it possible to use more recycled material and source a large part of this from old headlights. The proportion of secondary materials could potentially be almost doubled compared to today's headlights, while carbon emissions could be reduced by nearly 50 percent.

A similarly complex component are interior door panels, which consist of different parts joined by ultrasonic welding. Mercedes-Benz has developed a new joining technology to better and more easily separate individual materials. The adapted thermoplastic rivet is now easy to undo, allowing faster separation of individual components without damage. Optimizing dismantling in this way both simplifies repair and improves recyclability. The new technology could potentially replace a large number of thermoplastic joints in vehicle interiors.

Accelerating use of mono-materials and recycled materials

On average, a modern Mercedes-Benz vehicle contains approximately 550 pounds of plastic. Many of these components consist of mixed plastics, which can only be mechanically recycled to a limited extent and are therefore often thermally recycled. Recovering these for use in high-quality products is usually not possible. The Tomorrow XX technology program focuses on accelerating the use of mono-materials, while also replacing primary resources with secondary materials.

Innovative PET mono-sandwich halves carbon footprint of a door pocket

For a number of interior components, Mercedes-Benz has developed a sandwich composite system that consists of only one plastic: recycled PET. The basis is a foam core with a bone-like structure. This reduces the weight of a door pocket by more than 40 percent compared to the previous material system made of primary plastic. The performance of the part remains the same. The outer layers consist of an innovative mixture of PET fibers, giving the composite system the necessary rigidity. The innovative PET mono-sandwich combines lightweight design, recycled materials and circularity with cost-effective process technology. In 2024, it was awarded the internationally renowned [Materialica Award](#) in the "CO₂ Efficiency" category and will soon enter series production.

Because PET is highly suitable for recycling, it offers great potential to replace primary materials in vehicles. Mercedes-Benz has used seat covers and wheel arch liners made from 100-percent recycled PET bottles for many years. Currently, the brand is also working on carpet and floor mats made entirely from PET with a high recycled content. This could reduce the carbon footprint of carpet and floor mats by up to 75 percent.

Mercedes-Benz wants to increase its use of pre- and post-consumer recyclates (PCR) available on the market. For example, the windshield washer fluid reservoir on the new CLA is made from 100-percent recycled instead of primary polypropylene. Components such as front and rear bumpers could also contain up to 25 percent PCR.

New approaches in aluminum production with up to 86-percent secondary material

Aluminum plays a central role in vehicle architecture. However, the production of this material is one of the most energy-intensive industries in the world. To significantly reduce its emissions in the long term, Mercedes-Benz is working with technology partners to pursue multi-stage transformation across the entire

value chain. The company promotes the use of intelligent solutions and technologies through multi-year purchase agreements as well as close collaboration in material research and development.

Mercedes-Benz is working with all partners to keep driving down carbon emissions and is making the switch to alternative energy sources part of its procurement criteria. 40 percent of the aluminum for the new CLA is already produced in electrolysis plants using renewable energy. This delivers a reduction of approximately 400 kilograms of CO₂ per vehicle in comparison to the preceding non-electric model. In addition, Mercedes-Benz already uses low-carbon aluminum in series production. Sourced from strategic partner Hydro, it has 70-percent fewer CO₂ emissions than the European average. By 2030, the partners want to reduce the carbon footprint even further – by approximately 90 percent. In addition, Mercedes-Benz is injecting crucial momentum into the transformation of aluminum production. In close collaboration with its partners, the company is driving the introduction of innovative technologies. In the future, these will replace the carbon-based anodes currently used in the electrolysis process, which are a source of emissions.

The use of high-quality recycled material also reduces the need for energy-intensive primary aluminum. This is an important factor in the circular economy for materials. A promising example is an aluminum side wall containing up to 86-percent post-consumer scrap from sources such as old wheels, window frames and scrap vehicles. The material properties and surface finish remain the same.

On the road to almost zero-carbon steel

Steel production is also carbon-intensive process. That's why Mercedes-Benz is targeting innovative technologies and partnerships with leading steel manufacturers. The focus is on processes that eliminate greenhouse gas emissions almost completely. The core of this development is the replacement of the traditional blast-furnace process. The alternative combines hydrogen-based direct reduction with the use of electric-arc furnaces and a higher scrap content. If this process is powered entirely by renewable energy, CO₂ emissions can be reduced to a minimum, resulting in virtually zero-carbon steel. Mercedes-Benz has already concluded agreements with various partners.

Mercedes-Benz already uses steel products in series production that have a scrap content of 100 percent and are manufactured in electric arc furnaces. This reduces the CO₂ footprint by more than 60 percent compared to the traditional blast furnace process. Mercedes-Benz is working to consistently increase scrap content, even for more complex components.

Steel used for components that are visible to customers has the most demanding surface-finish requirements. Currently, this is produced primarily using 16- to 25-percent pre-consumer scrap content. Tests with material containing a proportion of post-consumer scrap are currently delivering promising results. This specially processed post-consumer scrap comes exclusively from scrap vehicles.

Urban mining turns today's vehicles into a valuable source of materials for tomorrow's vehicles

Mercedes-Benz wants to use vehicles at the end of their lifecycle as a strategic source of raw materials. The company wants to close value chains and recover secondary raw materials for use in new Mercedes-Benz vehicles. Together with its partner TSR Group GmbH & Co. KG, Mercedes-Benz launched a pilot project for urban mining in summer 2025. An innovative collection site for scrap vehicles is being built in northwestern Germany. The pilot project provides important insights for the scaling and integration of post-consumer materials in future models. It can make a significant contribution to securing recycled raw materials for reintegration into the product cycle.

As part of the Tomorrow XX technology program, Mercedes-Benz and its partner companies are already working on a large number of new concepts. Together, they seek to replace existing materials with post-consumer recycled materials from scrap vehicles – and thus close the company's own material loops.

New life for old tires with high-quality leather alternative and acoustic insulation

Scrap tires also offer great potential. First, a chemical recycling process converts them into pyrolysis oil, which can be combined with certified biomethane from agricultural waste. Both raw materials are then processed into plastic according to the mass balance method¹. This innovative recycled plastic has the same properties as virgin plastic made from fossil-based raw materials. This makes it suitable for use as a short-term drop-in solution for current series production. It also meets Mercedes-Benz's strict quality requirements – especially for finish and safety. Mercedes-Benz has already introduced the first component made from this innovative recycled plastic (a flush-fitting door handle) in several models.

With the help of biotechnology, the plastic recyclate based on scrap tires can also be used to produce a high-quality leather alternative. Combining it with bio-based proteins creates an innovative material that resembles real leather in both composition and structure. It can also be processed using conventional retanning methods. This enables a high-quality look and feel as well as excellent technical properties. Its maximum tensile strength is twice that of genuine leather, it is extremely temperature-resistant and at the same time breathable, waterproof and significantly lighter. Its carbon footprint is approximately 40 percent lower than real leather. Furthermore, the content based on plastic recyclate can be recycled again.

Used tires can also be mechanically recycled. Mercedes-Benz is developing NVH measures using acoustic insulation fibers made from shredded scrap tires. These absorbers are welded directly to the underbody cladding as vibration dampers. A small proportion of BiCo fibers (multi-component polymer fibers) gives the fiber composite its necessary stability. The rubber particles from the scrap tires in the absorber matting enhances the insulation performance.

Valve casing and engine mounts made from recycled airbags

Airbags are made of fiberglass-reinforced polyamide, which can be easily recycled. The Tomorrow XX technology program has already identified and tested two components that could be made from recycled airbags. These include engine mounts and the sophisticated valve housing in the thermal management system. It must withstand high pressures of 0.01 to 5 bar (0.15 to 75 psi) and extreme temperatures from -40 to +266 degrees Fahrenheit. This shows how it is possible to turn high-quality materials into new high-tech vehicle components.

Underbody cladding made from recycled mixed plastics from scrap vehicles

Another innovative solution is underbody cladding made with plastics from scrap vehicles that are completely recycled. These mixed plastics come from the shredder residue produced when scrap vehicles are recycled. Currently, this material stream is predominantly thermally recycled. Mercedes-Benz wants to bring it back into the material loop as a substitute for virgin plastics, which could reduce the carbon footprint of the underbody trim by up to 40 percent.

This recycled material could potentially be used for black plastic parts subject to low loads. The use of recycled glass fiber here is also being explored. With 100-percent post-consumer plastic recyclate based on scrap vehicles, the innovative underbody cladding perfectly embodies the concept of the closed material loop. It was awarded the prestigious [Materialica Award](#) in the "Process" category in 2025 – and is about to go into series production.

¹ In the mass balance method, independent certification confirms that the quantities of fossil resources required for the end product have been replaced by renewable raw materials, recycled materials, or bio-based materials.

Recycled brake pads could cut CO₂ emissions by up to 85 percent

Mercedes-Benz has been operating its own collection system for friction components (MeRSy) for many years and is thus able to recycle parts from its network. As part of Tomorrow XX, Mercedes-Benz R&D has developed a brake pad concept in collaboration with suppliers. The new brake pads contain approximately 40-percent recycled content from scrap brake pads. At up to 85 percent, the CO₂ savings for this highly complex material mixture are particularly interesting. The component is paired with a back plate made of CO₂-reduced steel. This is just one example of how Mercedes-Benz is reducing CO₂ emissions for individual components through the optimization of material composites.

Lower carbon emissions in the battery cell value chain by more than 70 percent and significantly increase recycled content in the supply chain

The battery is the central component of an electric vehicle – and also the one with the highest carbon footprint. Mercedes-Benz is pursuing a holistic, multi-stage transformation approach to decarbonizing the battery cell supply chain. The first measure is with the direct suppliers who produce battery cells. Cell manufacturers contracted by Mercedes-Benz are committed to using green electricity in their production facilities to implement energy-efficient processes and continuous emission reduction. Mercedes-Benz is also working with specialist partners to convert electrode production processes to green electricity and to integrate innovative technologies.

To actively accelerate the decarbonization of cell production, Mercedes-Benz is applying further specific measures. For example, it is researching dry coating as a forward-looking technology. This replaces energy-intensive drying with hot air and offers considerable potential for carbon reduction, especially in electrode production (cathodes in particular). These cell components are crucial for battery performance and for its carbon footprint. This pioneering technology dispenses entirely without the need for environmentally sensitive additives such as NMP (*N*-methyl-2-pyrrolidone).

Mercedes-Benz is also working with its partners on battery cells made with maximum recycled content in anode and cathode materials. In addition, the company is testing a pilot battery recycling plant in Kuppenheim, setting new standards for sustainable battery recycling solutions. The brand aims to close the entire material loop, thereby making the future of electric mobility even more sustainable.

To reduce emissions at battery cell level, Mercedes-Benz is also developing concepts that support decarbonization and the use of recycled materials in housing and cell module components. The innovative battery system of the new Mercedes-Benz MMA platform already incorporates aspects of “Design for Circularity.” Using recyclable materials with existing circular economies – such as steel – can significantly reduce the carbon footprint. To improve recycling efficiency, the components are designed according to the “Design for Circularity” approach. This means not using composite components or permanent (non-separable) joining techniques. Being able to disassemble and sort individual parts of a component can improve the quality of the recovered materials.

New ways of addressing biodiversity

Closed loops and resource conservation can also support biodiversity, water quality and safeguarding human rights in the supply chain. Mercedes-Benz has carried out specific biodiversity analyses on select components such as headlights, floor mats and door panels to better understand and reduce the impact of material selection and the value chain on ecosystems and natural resources. Increasing the use of secondary materials and closing material loops can reduce the risks of environmental pollution and land use – two key measures for promoting biodiversity. The knowledge gained is flowing into the development of sustainable vehicle concepts and strengthening Mercedes-Benz’s pioneering spirit in this increasingly important field.

Innovative selection of primary materials and material combinations

Mercedes-Benz continues to explore new solutions to reduce carbon footprint and conserve resources in the selection of primary materials and material combinations. An innovative material combination for the support connecting the center console to the bodyshell is close to series production. It is a demanding component that must withstand high forces (in a side impact collision, for instance). And it must fit into a very confined space. The current component is a magnesium die casting offers weight saving but has a high carbon footprint and is cost intensive.

As part of the Tomorrow XX technology program, Mercedes-Benz R&D has developed a center console support made from glass fiber-reinforced polypropylene with steel inserts. This material combination has already proven itself in components subject to less stress. Extensive computer simulations helped establish the ideal mixture to meet the technical requirements for the support. The new material combination has the potential to reduce the carbon footprint of this part by over 90 percent. It also lowers the material and manufacturing costs and offers raw material independence compared to magnesium. Final testing prior to series production is currently underway.

The Tomorrow XX team has also found a new material combination for the upper and lower sections of the dashboard. Instead of different types of plastics, the component can be made entirely using plastics from the polyolefin family. The focus on one plastic family enables mechanical recycling of the entire structure – without separating the individual layers.

A similar approach is taken to material substitution for the underbody trim at the rear. The use of expanded polypropylene (EPP) was developed and validated in an earlier project. This innovation has been part of the portfolio ever since and can be used in new vehicle projects. EPP is a common material used for items like bicycle helmets and coolers. It is significantly lighter than the polypropylene used previously and reduces component weight approximately 50 percent. The lower weight reduces energy consumption over the entire vehicle lifecycle, which further improves the carbon footprint. EPP can be recycled up to eight times. It can then be transferred to the shredder residue used to make cladding.

The future of fossil-free plastics: a door module made from bio-based materials

The development of an innovative door module is a good example of how fossil-based raw materials can be avoided in future. The body and cable-drive housing are made from bio-based polypropylene (PP) reinforced with recycled glass fiber. Bio-based PP is produced from renewable raw materials such as vegetable oils and used fats. In addition, the chemical industry is increasingly working on new production methods. These include replacing fossil-based raw materials with green methanol or green hydrogen. Bio-based PP offers similar properties to petrochemical-based PP but has a lower carbon footprint. The module's guide rails are made from an aluminum alloy with a high scrap content, while its sliders are made from mechanically recycled polyamide (PA). The pulleys are made from the high-molecular-weight thermoplastic polyoxymethylene, which is produced from stored CO₂ using the mass balance process² (CO₂-to-plastic). The carbon footprint of the innovative door module is approximately 30 percent lower compared to current components.

This multi-part module demonstrates the importance of comparing and evaluating competing sustainability technologies. Fossil-free plastics will become increasingly important in the future. Many types of plastic are possible without fossil raw materials. Alternative sources include CO₂, biomethane or biomass. However, the supply chain and economic viability of these alternatives are not yet ready for large-scale automotive production in many respects. To drive this transformation and accelerate the use of renewable carbon sources,

² In the mass balance process, independent certification confirms that the quantities of fossil resources required for the end product have been replaced by renewable raw materials, recyclates or bio-based materials.

Mercedes-Benz became the first automaker to join the Renewable Carbon Initiative (RCI) in 2025. The membership specifically supports the development and implementation of new sustainable plastic solutions – including those for components such as the door module.

BIONICAST® enables efficient use of material

The VISION EQXX marked the first use by Mercedes-Benz of cast components developed using an innovative, bionic optimization approach. It ensures material is used only where it is needed. This makes a component lighter and more resource efficient. The method enables efficient component design for series development by taking into account production requirements at an early stage. The first components made with the BIONICAST® process are already in use in production vehicles, with more to follow. Compared to conventional components, the process can deliver up to a 25-percent savings in weight and material.

Tomorrow XX delivers sustainability benefits to production at Mercedes-Benz

Rethinking components and materials from scratch can help reduce the company's consumption of raw materials at its own production facilities. Likewise, it can improve the efficiency of its processes, thus reducing energy consumption and contributing to decarbonization. Mercedes-Benz engineers consider all of this from the very start of the development process. These advances complement the huge strides already made in production. This includes the ongoing ramp-up in the use of renewable energies at the company's own production facilities. When it comes to circularity, Mercedes-Benz also achieves an almost 100-percent recycling rate in production. Having already closed the loop for steel scrap, the company will do the same for aluminum scrap.

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About Mercedes-Benz USA

Mercedes-Benz USA (MBUSA), headquartered in Atlanta, is responsible for the distribution, marketing and customer service for all Mercedes-Benz products in the United States. MBUSA offers drivers the most diverse lineup in the luxury segment with 18 model lines ranging from the sporty GLA SUV to the flagship S-Class and the dynamic all-electric vehicles from Mercedes-Benz. MBUSA is also responsible for Mercedes-Benz Vans in the U.S. More information on MBUSA and its products can be found at www.mbusa.com and www.mbvans.com. To learn more about all Mercedes-Benz entities in North America, visit group.mercedes-benz.com/northamerica.

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