Press Release

Materials Data Twin in Automotive Supply Chain Turns Circular Economy into Competitive Advantage

Nine partners from industry and research have demonstrated for the first time in the BMFTR-funded project EDCar how the seamless exchange of standardized materials data within an automotive supply chain – from raw materials manufacturers to recycling facilities – enables faster development decisions, reduced materials usage, and new digital business models. The key lies in combining the PMD materials data infrastructure with the Catena-X data ecosystem.

When an end-of-life vehicle arrives at a recycling facility, the decision on whether a component should be reused, remanufactured, or scrapped is often based on empirical knowledge. In most cases, valuable technical components end up in the shredder because no one in the chain knows exactly what materials they are made of, what types of stress they were subjected to during the vehicle's lifetime, or what quality they still possess. The BMFTR-funded research project EDCar (Automotive End-of-Life Data Exchange for the Circular Economy) has solved this structural problem and demonstrated how companies can increase their pace of innovation in global competition by exchanging materials data without sacrificing their data sovereignty.

At the heart of the project is the technical integration of two previously separate data ecosystems: the PMD materials data infrastructure of the BMFTR platform MaterialDigital and the industrial data space Catena-X, which is used in the automotive industry.

In the PMD data infrastructure, materials are digitally represented with relevant technical, environmental, and economic information in so-called knowledge graphs - standardized for stakeholders in the value chain. Catena-X connects manufacturers (OEMs), suppliers, dealers, and recycling companies in a decentralized network.

Through the intelligent combination of the two systems, materials information from the companies' knowledge graphs ("single source of truth") - such as mechanical properties, recycled materials qualities, or vehicle usage data - can now be automatically transferred between companies under the full control of the respective data owner.

"Those who make their materials data available across companies can assess costs more quickly and tap into digital business models - exactly what we need to keep pace with international competitors, particularly those from China," explains Dr. Thomas Straub of Fraunhofer IWM, who led the project. "It's not just about producing more cost-effectively, but about making faster and more informed decisions with better data."

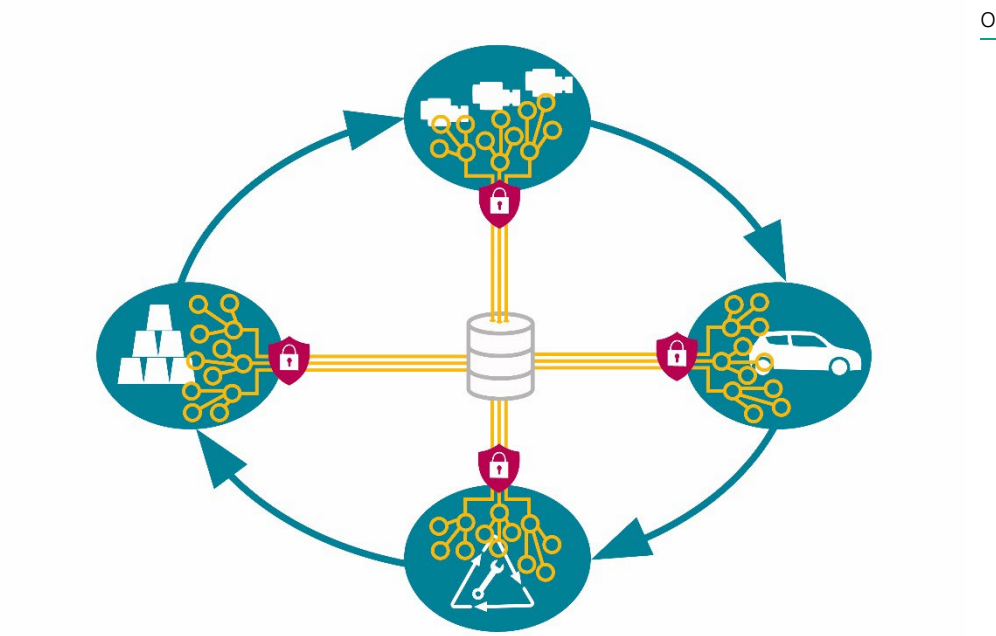
The approach was demonstrated using two use cases: In the first case, a data-driven assistance system helps recycling companies decide whether a disassembled component should be reused, remanufactured, or recycled, based on actual condition and usage data rather than estimates. In the second case, these end-of-life insights are automatically fed back to the development departments of processors and manufacturers, enabling future systems to be designed to be more circular from the outset - a principle the project partners call "Feedback to Design."

For the participating companies, this is far more than just a technical benefit. "Currently, there is simply too little reliable information available about materials, components, and products when it comes to critical decisions along the supply chain," says Prof. Chris Eberl, deputy director of the Fraunhofer IWM. "If we succeed in making this information consistently available, we will not only secure resources but also create new opportunities for innovation and competitiveness in European industry."

At the same time, the project results help meet regulatory requirements: The digital product passport, which will become mandatory for many product categories in the EU starting in 2027, as well as the EU Circular Economy Strategy, require precisely the kind of end-to-end, traceable materials data availability that EDCar has demonstrated.

Funding

The project, funded with approximately 1.06 million euros by the Federal Ministry of Research, Technology, and Space (BMFTR), ran from July 2025 to June 2026. In addition to Fraunhofer IWM as the coordinator, the consortium included Fraunhofer IPK; BASF SE as a materials manufacturer; the BMW Group; Robert Bosch GmbH; Schaeffler Technologies AG & Co. KG as vehicle and component manufacturers; LRP-Autorecycling Leipzig GmbH as a vehicle recycler; and the software companies light ds GmbH and tec4U-Solutions GmbH.



© Fraunhofer IWM

The BMFTR research project EDCar (Automotive End-of-Life Data Exchange for the Circular Economy) developed a solution that enables companies in the automotive supply chain to make faster and more informed decisions through the secure exchange of standardized material data. To this end, materials—along with relevant technical, environmental, and economic information—are digitally mapped into standardized knowledge graphs tailored to each company. This material data infrastructure enables automated data transfer between companies via the Catena-X data ecosystem, with the respective data owner retaining full control.

The **Fraunhofer Institute for Mechanics of Materials IWM** conducts research to promote sustainability in industrial value creation. For industrial companies and public sector clients, the institute opens up new avenues and spaces for innovation aimed at enhancing the durability and safety of components, improving resource efficiency in process chains, and increasing the energy efficiency of machines. To this end, the institute creates digital representations of materials in manufacturing processes, components, and machines, making their behavior and properties calculable. The institute empowers companies to use materials in a data-driven manner as the key to competitiveness and sustainability.

The **Fraunhofer-Gesellschaft**, headquartered in Germany, is one of the world's leading organizations for applied research. It plays a major role in innovation by prioritizing research on cutting-edge technologies and the transfer of results to industry to strengthen Germany's industrial base and for the benefit of society as a whole. Founded in 1949, the Fraunhofer-Gesellschaft currently operates 74 institutes and research units throughout Germany. Its roughly 30,000 employees, predominantly scientists and engineers, work with an annual business volume of 3.6 billion euros; 3.2 billion euros of this stems from contract research.

Contact

Press Contact
Thomas Götz
Fraunhofer Institute for
Materials Mechanics IWM
Corporate Communications
Tel. +49 761 5142-153
thomas.goetz@iwm.fraunhofer.de

Scientific Contact
Dr. Thomas Straub
Fraunhofer Institute for
Mechanics of Materials IWM
Deputy Head of Business Unit
Component Safety and Lightweight
Construction, Group Manager Meso-
and Micromechanics
Tel. +49 761 5142-537
thomas.straub@iwm.fraunhofer.de

www.iwm.fraunhofer.de