

"EPSolutely" Develops a Circular Economy Concept for EPS in Austria

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Expanded polystyrene, also known as Styrofoam or EPS, is recyclable and conserves valuable resources. Now, EPS is becoming even more sustainable: In the research project "EPSolutely," led by Fraunhofer Austria, twelve partners from all areas of the value chain are developing concepts for a functioning EPS circular economy. The project is being supported by the Plastics Cluster.



EPS Packaging Waste



Working Group on EPS Demolition



Mechanical Deconstruction of EPS Facade 1

EPS is frequently used as thermal insulation and packaging material. It is not only practical, cost-effective, and suitable for mass production, but also recyclable. Since it consists of 98% air, EPS not only provides excellent insulation but also requires very little energy during manufacturing and transport, thus conserving valuable resources.

Increasing Waste Volumes Expected

According to current studies, the Austrian EPS industry achieves recycling rates of 26% for construction materials and 56% for packaging. A significant portion still goes to energy recovery, removing EPS from the value chain. The growing volumes of EPS waste from demolition, which contain Hexabromocyclododecane (HBCD), pose an additional challenge for construction materials. Recycling without the separation of HBCD, a flame retardant used until 2016, is not permitted due to the destruction requirement.

Enhancing Sustainability

The goal of the EPSolutely research project is to increase the recycling rate of EPS waste (construction materials and packaging), thereby drastically reducing the demand for primary raw materials in new EPS products. The initiative for this research project came from GPH – the Polystyrene Hard Foam Quality Protection Association, the interest group and association for Styrofoam manufacturers and raw material suppliers in Austria. Five of the project partners are also members of GPH. EPSolutely aims to increase the acceptance and sustainability of EPS, particularly by highlighting the potential of private consumers to contribute to environmental protection. EPS is ideally suited for a circular economy when processed in a homogeneous manner, which also applies to packaging material, such

as electronics. The potential for CO2 reduction compared to using primary raw materials is a remarkable 80%.

All Stakeholders on Board for the First Time

In a comprehensive collaboration of all relevant stakeholders in the value chain, cross-company and interdisciplinary concepts, technologies, and methods for an EPS circular economy are being developed. This includes all elements of the value chain, such as deconstruction, collection, sorting, cleaning, and processing. Karl Ott, Group Leader of Intralogistics and Materials Management at Fraunhofer Austria, highlights what makes EPSolutely so unique: *"For the first time, we have succeeded in bringing together all stakeholders within the value chain for expanded polystyrene, along with research and other relevant partners. This unprecedented constellation allows us to develop joint solutions."*

Reliable Data on Recycling

A particular focus is on quantifying the amounts of EPS waste and recycling. *"With this newly launched project, we hope to obtain reliable data on the current recycling rate in Austria for the first time,"* emphasizes GPH Managing Director Clemens Demacsek. Subsequently, the focus will be on increasing the recycling rate, which will be significantly influenced and controlled by technical, organizational, and regulatory measures. Through the tracking of waste flows, the construction of prototypes, component and system-level tests, and recycling trials, valuable practical insights are expected to be gained.

Implementation Plan for EPS Circular Economy

Various concepts, technologies, and methods will be combined into innovative overall concepts. The project consortium will evaluate these both ecologically and economically. A crucial factor in deciding which concepts should be prototypically implemented is the assessment of technical and organizational feasibility. The result will be a roadmap outlining the necessary measures required for an optimized EPS circular economy in Austria.

The entire Value Chain in the Cycle

"Often, sustainability efforts only tweak certain aspects, changing certain elements," explains Ott. *"But in this project, we can find true circular economy concepts with maximum benefits for the entire value chain."* In a final analysis, the concepts, technologies, methods, and insights gained from demonstrations will be applied to other countries and industries. Initial workshops with industry experts from other EU countries have already taken place. *"By 2025, we aim to increase recycling rates to up to 80% using the solutions developed, thereby contributing to a circular economy,"* says Ott.

Background: Material Flows

The companies in the EPSolutely project consortium cover all areas of material flow. There is a distinction between EPS packaging and EPS construction materials. Packaging waste arises, for example, from white goods, electronics, and food items. These can be recycled in a variety of ways. For EPS construction materials, there are demolition waste and construction site offcuts. The latter have contained the new polymeric flame retardant (pFR) for several years. Therefore, there are also several recycling options for this EPS waste.

Background: Recycling Old EPS Insulation Materials

EPS demolition waste from buildings currently contains almost exclusively HBCD. Since EPS was only used in significant quantities starting in the 1970s and has a long lifespan, the current waste volumes are still relatively low. However, they are expected to increase significantly in the future. To ensure that this waste can be included in the circular economy, HBCD must be separated. Currently, this is only effectively possible with the CreaSolv® process developed by the Fraunhofer Institute for Process Engineering and Packaging.

About EPSolutely

The project name is a play on words. It contains EPS, the material's abbreviation, as well as the English term for a solution, and also hints at the English adverb "absolutely," addressing the absolute or complete circular economy for EPS.

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Mechanical Deconstruction of EPS Facade



EPS Demolition Waste (External Thermal Insulation Composite System)