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REPurpose concludes: local waste turned into safe, circular plastics for everyday products

After four years of research and innovation, the Horizon Europe project REPurpose has come to an end. Coordinated by Bio Base Europe Pilot Plant, 12 partners from 9 European countries showed that paper and cardboard waste, lignin and used plastics can become the raw material for a new family of additive-free polymers, the REP polymers, turning them into prototypes for the automotive, sports and consumer goods, and building and construction sectors. The results were presented on 25 September 2026 in a final webinar, now available on the project website.

Rethinking plastics, from waste to product

Officially concluded on 31 August 2026, **REPurpose** was funded by the European Union under Horizon Europe (Grant Agreement No. 101057971) with a total budget of €6 million. The project tackled three problems of today's plastics at once: most are still made from fossil resources, many contain additives that can harm people and the environment, and at the end of their life they are often difficult to sort and recycle, ending up incinerated or in landfill.

To address these issues, the consortium applied **Safe and Sustainable by Design (SSbD) principles** to develop a value chain in which local post-consumer waste is upcycled into new polymers for the high-value thermoplastics market, with each partner contributing its expertise at a specific stage of the value chain.

Final webinar: results shared with stakeholders

On 25 September 2026, the REPurpose consortium presented its results in a final webinar that reached around 80 people, including live participants and viewers of the recording in the first week. Partners shared the main outcomes along the value chain, discussed the technical and market challenges still ahead, and presented recommendations to support the transition towards safer and more circular plastics in Europe.

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The event opened with remarks from REPurpose project officer **Cristian Iacob (European Health and Digital Executive Agency)**, who highlighted the strategic relevance of projects like REPurpose within Horizon Europe and their alignment with EU policies such as the Safe and Sustainable by Design framework, the Advanced Materials Act and the European Innovation Act.

Project coordinator Lena Decuyper (Bio Base Europe Pilot Plant) then introduced the project, before partners presented their results in three thematic spotlight sessions:

- From Waste to Safe Building Blocks
- From Building Blocks to Safe, Functional Polymers
- Closing the Loop: Economics, Policy and End-of-Life

Going beyond individual results, the sessions opened a discussion on the main challenges, the lessons learned and what still needs to happen for safe, sustainable and circular polymers to move from innovation to industrial and market reality.

Main project results

- **Waste becomes a resource.** Paper and cardboard from municipal waste, sorted and pretreated by Renasci (now BlueAlp Ostend), were turned into second-generation sugars at cubic-metre scale by Bio Base Europe Pilot Plant. Saarland University and Bio Base Europe Pilot Plant fermented them into new building blocks for plastics, from lab to pilot scale. Lignin, a by-product of the paper industry, was also converted into a building block that offers a more sustainable route to nylon. Enzymes developed by BOKU University and Epoch Biodesign, and scaled up at Bio Base Europe Pilot Plant, broke down polyester and polyamide waste, recovering building blocks up to the scale of hundreds of kilograms.
- **A new family of polymers.** AIMPLAS and B4Plastics combined these waste- and bio-based building blocks into polyester-based REP polymers. More than 20 formulations were designed in the lab, and the best 3 were produced at 10 kg scale.
- **Prototypes for three sectors.** REP was processed with equipment already widely used in industry, such as compounding with natural fibres, injection molding, thermoforming, foaming, heat pressing and 3D printing. With prospective end users including FAIR Bicycle, ATMAT and Werner Sobek, Aalborg University and AIMPLAS developed prototypes ranging from a car door handle, an airbag cover and a footrest to bicycle grips and pedals, wall and ceiling panels, partitions and a robotically 3D-printed planted wall module.

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- **Designed for a second life.** REP polymers contain built-in breaking points that the project's enzymes can recognise, paving the way for enzymatic recycling, and they can also be reprocessed mechanically. Photon Mission showed that REP can be detected with the near-infrared imaging technology already used in sorting plants. Aalborg University applied Design for Disassembly principles, with modular products that are easier to repair, and reused production offcuts in new components.

Safe and Sustainable by Design in practice

REPurpose was among the first projects to apply the European Commission's SSbD framework to the development of new polymers. **No additives were used in the REP polymers**, whose properties come from the structure of the polymer itself, and all building blocks used in the scaled-up materials are already registered for safe use. Research by the Hungarian University of Agriculture and Life Sciences (MATE) found no harmful effects on human skin cells, very low toxicity for aquatic organisms and no hormone-disrupting effects, with REP polymers performing better than widely used commercial counterparts in long-term tests on fish; while AIMPLAS has also demonstrated that the REP polymers are safe in terms because they showed to be non-cytotoxic, non-skin-irritant and REACH compliance (non SVHC or restricted substance was detected).

Sustainability was assessed as well: Italbiotec evaluated the value chain through life cycle assessment, social life cycle assessment and techno-economic analysis, demonstrating the value of integrating these assessments during development, well before market entry, to set research priorities and support scale-up decisions.

Open knowledge for industry, researchers and policymakers

Practical guidance on SSbD is still much needed. According to two surveys carried out by AVEP, in collaboration with AIMPLAS, **only 2% of the 177 participating companies fully apply SSbD principles today**.

To help bridge this gap and ensure that the project's results remain useful beyond its lifetime, the consortium has developed several resources and initiatives to support industry stakeholders:

- **Knowledge book on best practices for SSbD polymer and product development**, a practical guide based on the consortium's experience, covering the challenges met when applying SSbD from polymer design to final product and the solutions developed (soon available on our website).
- **Inventory and roadmap of hazardous plastic additives**, which complements ECHA and other sources and helps stakeholders identify emerging concerns, anticipate

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restrictions and prioritise substances for substitution (preliminary version already available on our website, final version will be published soon).

- **Proposal for a new standard on solvolysis-based chemical recycling**, developed by AIMPLAS following an analysis of existing standardisation gaps. The proposal is currently under evaluation and aims to contribute to more harmonised practices in chemical recycling.

Impact and legacy

REPurpose has shown that waste-based materials can meet the processing requirements of conventional manufacturing, offering European manufacturers an alternative to virgin fossil resins in markets as diverse as automotive, construction and consumer goods. In the longer term, the approach can help divert hard-to-recycle waste from incineration and landfill towards durable, high-value products, support the growth of secondary raw-material markets and help industry meet increasingly demanding EU circular economy and ecodesign rules.

Bringing these materials to market will require further work to make the processes more efficient and affordable, together with clear rules and incentives that reward safe and sustainable choices. The knowledge, tools and partnerships built by REPurpose provide a solid basis for this next step.

The full recording of the webinar is available on the REPurpose website:
www.repurposeproject.eu/en/project-outcomes



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