**PRESS RELEASE**

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# EU Project CIRCULAR FoodPack shows ways to make flexible food packaging circular

**Freising, Germany – After three and a half years of intensive research, the EU project CIRCULAR FoodPack has developed new processes to effectively recycle flexible polyethylene food packaging, blazing the trail for a sustainable circular economy in this sector. The project partners have applied and validated a tracer-based sorting technology that can separate food and non-food packaging waste. A combination of novel pre- and post-treatments with mechanical or solvent-based recycling processes is used to remove printing inks, odours and other impurities from the food packaging waste. The resulting post-consumer recyclates fulfil the quality requirements for their further processing in new flexible packaging. They can be integrated in new home and personal care packaging and in future, together with a newly developed barrier concept, post-consumer recyclates may also be feasible in food packaging. The project was coordinated by the Fraunhofer Institute for Process Engineering and Packaging IVV, based in Freising. A total of 15 companies and research institutes were involved in the project. Funded by the European Union, CIRCULAR FoodPack received around 5.4 million euros from the Horizon 2020 framework programme.**

The packaging industry has so far used flexible plastic multilayer composites (MLC) containing a mixture of materials to pack home and personal care products and food. These composites possess barrier characteristics to fulfil high requirements in terms of safety and hygiene, protecting the packed goods against oxidation and humidity for example. Until now, however, it has been impossible to separate the plastic layers again, making them difficult to recycle. In Europe, they have generally been incinerated or ended up in landfill. In addition, EU law[1] prevents recycled materials from non-food packaging being used to produce new food packaging. Until now, no sorting system has been able to distinguish between and separate food and non-food packaging in a mixed packaging waste stream. Furthermore, there has been no advanced physical recycling processes capable of removing impurities from the plastic MLC, or of deinking and deodorising the material, which would guarantee the necessary quality for its repeated use in flexible food packaging. This has been the challenge that the EU project CIRCULAR FoodPack has now successfully overcome.

## Novel sorting process to separate food and non-food packaging

With the innovative tracer-based sorting technology (TBS), the consortium has developed a sorting process for flexible food packaging materials, which uses fluorescent tracers imprinted during production to distinguish between food and non-food packaging. The new sorting technology uses a laser to scan for the near-infrared emission of the fluorescent tracer in a mixed waste stream and sort the traced food packaging items accordingly. This optical system can be easily and economically retrofitted to existing sorting plants. A series of large-scale tests achieved a 99 percent levelised sorting purity in the food packaging items sorted using the TBS technology.

## High-quality recycling of post-consumer food packaging

Pre- and post-treatment technologies have been developed for implementation in a high-quality recycling process cascade for plastic packaging. For the food packaging waste subjected to TBS, an

1 Commission Regulation (EU) 2022/1616 of 15 September 2022 on recycled plastic materials and articles intended to come into contact with foods, and repealing Regulation (EC) No 282/2008

innovative pre-treatment in a water-based delamination and deinking process successfully separated the plastic multilayer composites including primers used as functional coating and removed the printing inks by 95 percent. Infrared deodorising technology removes volatile substances and also reduces the odour of the granulate by 95 percent. Using a solvent-based recycling process[2] that separates polyethylene from multiple contaminants including additives, inks and odours, the researchers were able to obtain high-quality recycled polyethylene from non-TBS post-consumer flexible packaging waste. This polyethylene post-consumer recyclate (PE PCR) is sufficiently pure to be reused in the production of home and personal care packaging. If applied to TBS feedstocks, however, it could be used for new food packaging in the future, behind the newly developed 'functional migration barriers' that effectively separate the recyclate from the food-contact layers in new packaging structures.

## Newly developed flexible monomaterial packaging with up to 50 percent post-consumer recyclate

The CIRCULAR FoodPack project has developed a concept for recyclable flexible monomaterial-based food packaging using polyethylene. Its work has focused on integrating tracers to enable sorting, as well as on the use of PE PCRs behind a functional migration barrier. In the early stages of the project, an extensive series of tests was carried out to develop the optimum migration barrier concept. The chosen approach uses a 'double barrier' with the PCR layer in between to prevent set-off migration and increase safety. The new tracers are incorporated into the printing inks of the packaging, which can then be completely removed during the washing/deinking step of the packaging waste recycling process.

This resulted in industrial-scale production of a packaging film with up to 50 percent PE PCR that meets the technical requirements for flexible food packaging. In addition, practical trials to test the machinability of the film in the production of a range of packaging formats including flow wrap bags, bottom-gusseted bags, stand-up pouches and sachets were successful.

## Market approves the CIRCULAR FoodPack approach

The demand for innovative packaging solutions is growing rapidly, driven by a changing regulatory landscape that encourages stakeholders to adopt new standards. Among these, PE PCR has emerged as a promising option. Processors across various levels of the value chain have expressed interest in the proposed packaging approach, recognising its potential to align with sustainability goals.

Furthermore, feasibility studies for the various valorisation routes have indicated that the price of recycled PE derived from CIRCULAR FoodPack technologies is competitive with the current market price for virgin PE.

For widespread consumer acceptance, the introduction of the new material must be accompanied by clear and effective communication. Consumers generally favour sustainable packaging solutions, such as those offered by CIRCULAR FoodPack, and show a strong preference for recycled materials. This positions the project's solution as both timely and highly marketable.

## CIRCULAR FoodPack supports the EU's aim of a better circular economy

The Packaging and Packaging Waste Regulation (PPWR)[3] adopted by the European Parliament on 27 November 2024 seeks to reduce packaging waste and increase the use of post-consumer recycled materials in packaging. Furthermore, the PPWR imposes a requirement for every piece of packaging to be recyclable by 2030.

"Our innovative, effective sorting and recycling process for post-consumer food packaging waste provides high-quality and pure recycled polyethylene suitable for use in newly designed packaging for sensitive contents. We have demonstrated the economic and environmental viability and assessed the social sustainability of flexible food packaging recycling. With these technological innovations, we want to drive forward the circular economy in Europe, strengthen the recycling industry and contribute to the

2 This process uses the CreaSolv® formulations developed in collaboration between Fraunhofer IVV and CreaCycle. CreaSolv® is a protected trademark of CreaCycle GmbH, Grevenbroich.

3 Current version of PPWR

PPWR objectives", says Project Coordinator Dr Esra Kücükpinar from Fraunhofer IVV. "Investments and further research, however, are needed to implement CIRCULAR FoodPack technologies in the industrial circular value chain and to further monitor and improve integration of PE PCR in food packaging."

## About the EU project CIRCULAR FoodPack

Funded by the European Commission, the CIRCULAR FoodPack project was launched in June 2021. By November 2024 it had received around 5.4 million euros in funding from Horizon 2020, the former EU Framework Programme for Research and Innovation. The objective of the project was to develop novel solutions for recycling complex laminated plastic packaging for flexible food packaging products. The project involved 15 companies and research institutes from Germany, Belgium, France, Greece, the Netherlands, Spain and Switzerland. CIRCULAR FoodPack was coordinated by the Fraunhofer Institute for Process Engineering and Packaging IVV in Freising.

## Project profile

**Project name**: CIRCULAR FoodPack (Grant Agreement Number 101003806)
**Duration**: June 2021 to November 2024
**Project partners:**

- Fraunhofer Institute for Process Engineering and Packaging IVV, Germany
- Bavarian Research Alliance, Germany
- Amcor Flexibles Transpac, Belgium
- Amcor Flexibles Kreuzlingen AG, Switzerland
- Ghent University, Belgium
- IRIS Technology Solutions S.L. (IRIS), Spain
- Polysecure GmbH, Germany
- KREYENBORG GmbH & Co. KG, Germany
- Karlsruhe Institute of Technology, Germany
- Société des Produits Nestlé S.A., Switzerland
- Siegwerk Druckfarben, Germany
- Ecozept France SARL, France
- SUEZ S.A., France
- National Technical University of Athens, Greece
- Maastricht University, Netherlands

**Project management:** Dr. Esra Kücükpinar, Fraunhofer IVV
**Programme:** Horizon 2020
**Total project sum:** 5.4 million euros
**Funding:** European Union
**Website:** www.circular-foodpack.eu

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