



E-OilÉ: Rethinking plastic packaging with innovative biomaterials and artificial intelligence

The E-OilÉ Horizon Europe project is rethinking the way we use monodose packaging for the food and cosmetic sectors

THE PACKAGING industry is the source of around 40% of the planet's plastic waste¹ and European plastics and materials Industries are facing a **crucial moment**.

Plastic waste, regulatory demands, and increasing consumer awareness are pushing companies to find alternatives that are not only sustainable, but also functional, scalable, and economically competitive. The European Union (EU) has been at the forefront of regulating packaging waste, and central to this effort is the recently adopted **Packaging and Packaging Waste Regulation (PPWR)**, which entered into force in 2025 and replaces the long-standing Packaging and Packaging Waste Directive.

The PPWR establishes binding requirements for all packaging placed on the EU market, including design criteria, recyclability, recycled content thresholds, and measures to minimise waste across the entire life cycle of packaging. A core objective is to make **all packaging recyclable in an economically viable way by 2030** while significantly reducing dependence on virgin materials and enhancing resource efficiency in line with the European Green Deal and broader circular economy goals.

Within the **food and cosmetics packaging sectors**, this regulatory shift presents both challenges and opportunities. **Single-use packaging, in particular mono-dose packaging**, has become an essential part of modern life. It ensures hygiene, safety, precise dosing and convenience across sectors such as food, pharmaceuticals, cosmetics, etc. However, these formats are extremely difficult to recycle due to their small size, contamination, and multi-layer structures.

The same challenge applies to many complex plastic applications, where traditional recycling is simply not efficient or economically viable. **In this context, compostable or biodegradable are increasingly recognised as valuable and safe alternatives to consider.**

E-OilÉ: Biodegradable by design, sustainable by nature

The E-OilÉ project aims to demonstrate **safe and sustainable end-of-life routes for single-use monodose packaging for oily products**. And it focuses on the replacement of fossil-based polymers such as polypropylene (PP) or polyethylene terephthalate (PET) by developing two complete value chains for biodegradable polymers and materials.

E-OILÉ aims to engineer two lines of biodegradable compounds at TRL7, and seeks to:

- i. Develop **novel biodegradable biopolyester grades** derived from biobased building blocks: IcDCA from the fermentation of sugars and used cooking oils, olive production wastes rich in oleic acid, and sebacic acid from castor oil (TRL 5-7).
- ii. Develop **novel bio-based and biodegradable polysaccharide-based grades**.
- iii. Develop and produce at least **four optimised monodose packaging for oily products** at TRL 6-7 in three industrial plants for four use cases that will be validated in terms of performance and safety (See Fig. 1.):



Fig. 1: The four use cases of E-OilÉ



Fig. 2: The three pillars of E-OilÉ

- a. **UC1 - Olive oil: Thermoformed cups**
- b. **UC2 - Oily sauces: Flexible sachets**
- c. **UC3 - Body oil: Tube extrusion and over injection molding**
- d. **UC4 - Cosmetic face oil-serum: Flexible sachets**

What innovative solutions does E-OilÉ bring to the table?

Key innovations of the project are aimed at increasing productivity, reducing costs, and enhancing material performance in continuous industrial plants, including:

1. The use of non-ecotoxic and sustainable catalysts;
2. The development of masterbatches with food-contact-approved additives for efficient use during processing and packaging;
3. Ecodesign strategies based on minimisation of multilayer approaches; and
4. Advanced process monitoring and parameter optimisation across the different techniques: extrusion (casting and blowing), coating, tube extrusion and head over moulding and thermoforming lines.

In addition, a **key differentiating element of the project lies in not only the rigorous validation of E-OilÉ solutions in food and cosmetic end-user lines sector but also in the End of Life** where biodegradation tests in open environments will be used, together with artificial intelligence (AI) assisted biodegradation predictive

models. AI will also be applied to validate a smart sensor in case these types of packaging reach recycling.

Beyond the technical dimension, we recognise that true success depends on economic viability and societal acceptance. That is why a thorough economic impact assessment will be carried out, alongside engagement through social sciences and humanities.

The project brings together **15 E-OilÉ partners** from nine different countries representing key strategic actors across the packaging value chain, large companies, SMEs, material producers, manufacturers, and end-

users. The consortium is further strengthened by RTOs and non-profit organisations with expertise in Safe-and-Sustainable-by-Design (SSbD), biodegradation testing, risk assessment, packaging and product validation, exploitation strategies, SSH, and digital technologies.

In summary, E-OilÉ aims to bring new packaging solutions to the markets through the integration of innovative compostable materials science with circular design principles, leveraging EU regulations that both challenge and enable biodegradable single-dose format packaging innovation. Six months in, and the project successfully demonstrated the conversion of oleic acid-rich waste from olive oil production into key biopolyester building blocks. Don't miss what's coming, follow along.



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References

1. <https://ourworldindata.org/data-insights/packaging-is-the-source-of-40-of-the-planets-plastic-waste>



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