



BIO-UPTAKE

Bio-Uptake Delivers Industrial Results for Europe's Biobased Future

After four years of collaborative research, the European project Bio-Uptake has demonstrated that biobased composites can meet demanding industrial requirements while supporting circular manufacturing.

Funded by Horizon Europe, Bio-Uptake set out to remove the barriers that have limited the use of bioplastics in manufacturing. The project has now delivered concrete results across the full value chain, from advanced raw materials and intermediate formats to digital tools, demonstrators and standardisation.

The project has shown that sustainable materials can be processed faster, monitored more accurately and recycled more effectively than many conventional alternatives. This 7th newsletter will present in more detail what have been achieved by all the partners.

Stronger and More Stable Biobased Materials

One of the project's first achievements was improving the quality of biobased reinforcement materials.

developed high-strength, low-shrinkage PLA yarns for composite applications. Shrinkage was reduced from 20% to 8%, while yarn strength increased from 35 to 50 cN/tex. This breakthrough solved a major processing issue. Excessive shrinkage can distort tools and reduce product quality.

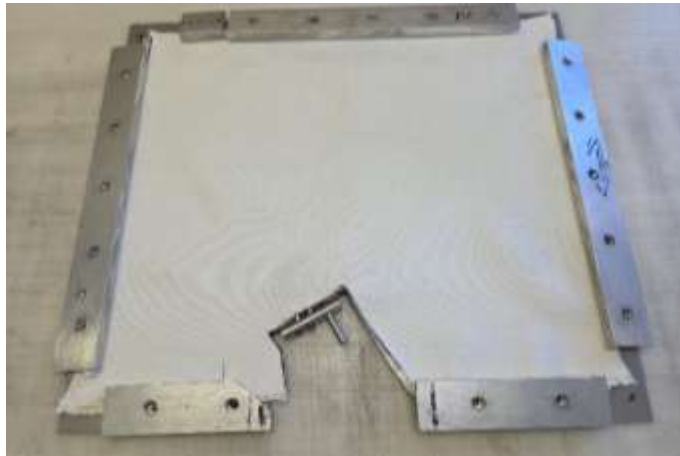
CENTEXBEL also wove two PLA fabrics, a 2x2 twill and a satin weave, for use in the medical demonstrator. These fabrics were supplied to COMFIL for the manufacture of orthotic foot components.



A Fully Biobased Foot Orthosis Manufactured in Half the Time

COMFIL successfully produced a fully biobased foot orthosis using its pilot press line. Traditional foot orthoses are often manufactured using vacuum bagging. In Bio-Uptake, this has been replaced with a press-based process that reduced production time by approximately 50%.

The new approach also integrated pin holes for leg support directly into the part. Several mould redesigns were required to achieve the required dimensional accuracy and functionality. The final result was a robust and fully functional component that demonstrated the viability of biobased composites for personalised medical devices.



New Biobased Pellets for High-Volume Applications

AITIIP developed and selected several biopellet formulations for over-injection processes, made from PA1010 and different amounts of reinforcement (recycled carbon fibre or wood fibre).

These formulations were characterised mechanically at different temperatures to provide input data for process simulation.

AITIIP also introduced a hot-air drying conveyor that cools pellets without water. This innovation prevents moisture absorption and improves injection moulding performance.

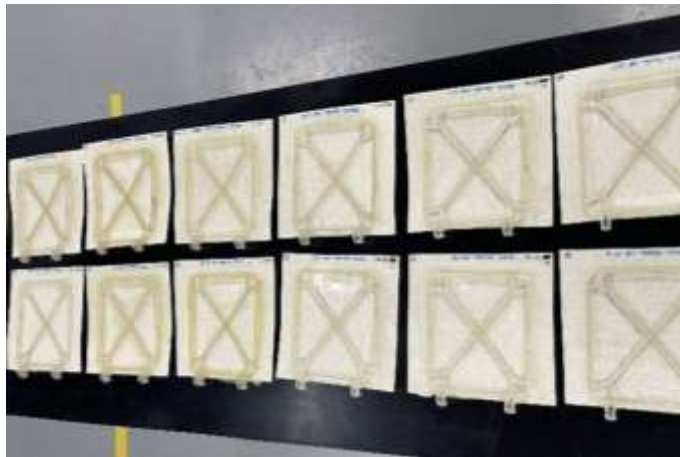


A Lightweight and Circular Packaging Demonstrator

MOSES Products developed a new mould to over-inject PLA laminates with biobased polyamide.

This technology was used to manufacture a garbage container lid for tertiary packaging applications. The new design reduces weight while maintaining mechanical performance. A reversible adhesive enables the lid to be dismantled at the end of its life, allowing materials to be reused or recycled.

MOSES has already demonstrated several packaging components and confirmed that the concept is compatible with different biobased thermoplastics.



Reversible Adhesives and Reprocessable Epoxy Resins

SPECIFIC POLYMERS developed two key material innovations.

The first was a debonding-on-demand adhesive based on reversible Diels-Alder chemistry. This adhesive provides durable bonding during use and heat-triggered separation at end of life. The concept was successfully demonstrated on the garbage lid developed with MOSES. The second innovation was a bio-based epoxy resin containing around 40% biocarbon.

This resin was used to formulate a 3R epoxy system that is reprocessable, repairable and recyclable. Future work aims to increase the bio-based content to 100%.



Recyclable Ceiling Panels for Construction

CIDETEC combined flax fibre reinforcement with the 3R epoxy resin to produce a prepreg material containing around 80% biobased content by weight.

Unlike conventional prepregs, this material can be stored at room temperature. The prepregs were used to manufacture a bathroom ceiling panel thanks to the expertise of PODCOM, through vacuum bag curing.

The demonstrator showed that biobased thermoset composites can achieve high performance while remaining recyclable.



Simulation Reduces Trial and Error

SIMCON developed advanced injection moulding simulations to predict material behaviour during processing.

The models reduce the number of physical trials and accelerate process optimisation. They also improve predictability and support the adoption of new biobased materials. By combining simulation with material characterisation, Bio-Uptake has shortened development cycles and reduced industrial risk.



Artificial Intelligence for Quality Control

AIMEN developed a computer vision system to inspect garbage lids after over-injection. The system detects two critical defects: incomplete filling and excessive pressure. Two dedicated neural networks analyse the structural ribs and identify defects automatically.

AIMEN also developed the project's digital platform, digital thread and decision support system. Together, these tools collect manufacturing data, ensure traceability and recommend process adjustments in real time. The system transforms production data into actionable knowledge for operators and engineers.

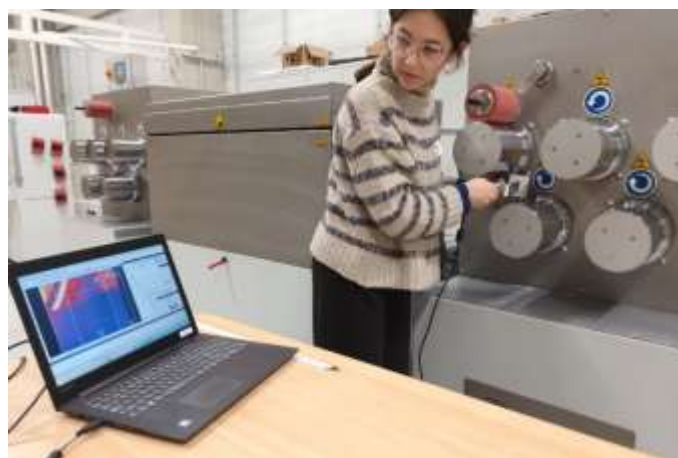


Photonics-Based Monitoring for Real-Time Quality Assurance

IRIS Technology Solutions developed advanced monitoring systems based on near-infrared spectroscopy, hyperspectral imaging and infrared thermography.

These systems measure key indicators such as polymer crystallinity, glass transition temperature and degree of cure.

Predictive models were validated against laboratory measurements and achieved industrially acceptable accuracy. This approach allows manufacturers to move from offline testing to in-line and at-line quality control. As a result, deviations can be detected earlier and production consistency is improved.



Standards to Support Market Adoption

UNE led the project's standardisation activities. In March 2026, the consortium published CWA 18295:2026, which provides guidance for optimising filament extrusion of biobased materials. Other standards are being finalised on technical and ecotoxicological analysis of biobased materials. These documents will help industry adopt new materials with greater confidence.

CEN

CWA 18295

WORKSHOP

February 2026

AGREEMENT

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English version

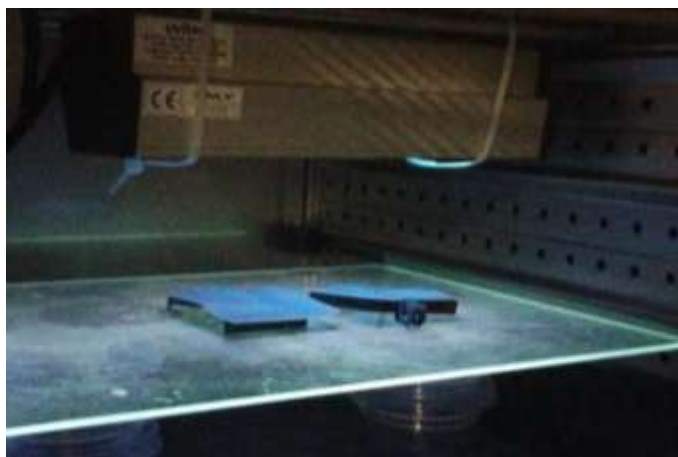
BIO-UPTAKE - Development of reinforced fibres based on
biobased materials

Safety Assessment Under Realistic Conditions

The University of Aveiro evaluated the environmental and human safety of the materials and final products.

On one hand, the garbage lid was tested under simulated indoor and outdoor light exposure, whereas leachates were assessed for ecotoxicity using terrestrial and aquatic organisms.

On the other hand, orthotic and bathroom applications were tested using artificial sweat and real-life exposure conditions. These studies confirm that performance and sustainability can be achieved without compromising safety.



Closing the Loop Through Recycling

In the final phase of the project, **CENTEXBEL** has investigated the recycling of PLA-based composite plates.

Materials are being reprocessed either directly by injection moulding or reintroduced into yarn extrusion. Trials include recycled contents ranging from 10% to 50%.

This work demonstrates also how biobased composites can be integrated into circular manufacturing systems.



A European Success Story

Bio-Uptake has delivered much more than research results. The project has produced stronger materials, faster manufacturing processes, digital tools, safety assessments and standardisation documents.

Three industrial demonstrators have validated the concept in medical, construction and packaging applications.

The project proves that biobased composites are no longer experimental materials. They are practical, competitive and ready for industrial deployment. By combining material innovation, digitalisation and circular design, Bio-Uptake has laid the foundations for a smarter and more sustainable manufacturing industry in Europe.

You can see all of these summarised in our final video: [watch here](#)



MORE INFORMATION ON BIO-UPTAKE

If you want to know more about us, visit our linkedin page to see the presentation of the different partners. You will discover the majority of the members involved in the project and their role with videos and images!

Stay connected with us and we will resume our content with another newsletter around mid-2025.

[Register to our newsletter](#)



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