

Introduction

BioFoam is a particle foam made from E-PLA (Expanded Poly Lactic Acid). Foamed PLA beads are fused to make light weight products like complex packaging parts or simple plates. These beads can be used as such as well in applications like beanbags or cushion fillings.

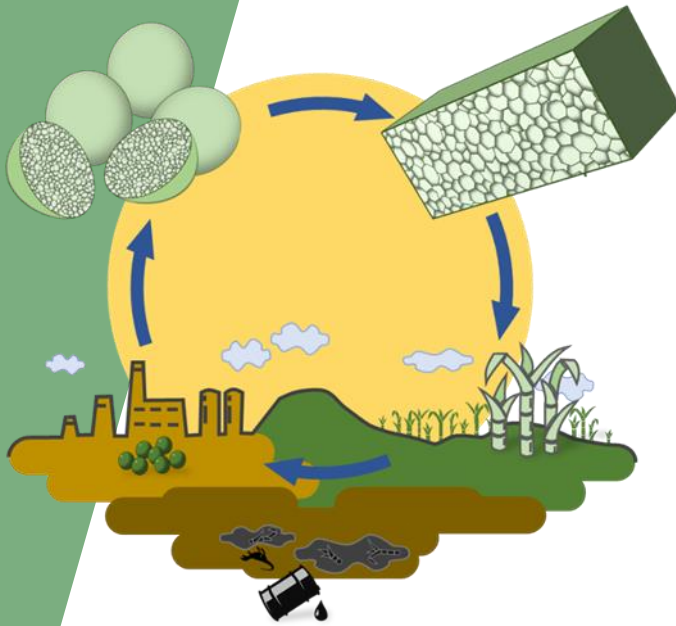


Figure 1: Life cycle of a BioFoam part

Biobased feedstock is used to make lactic acid, the building block for PLA. Sugar from sugarcane or beet, corn and cassava are the main sources. BioFoam is fully circular: it is biobased, biodegradable and also recyclable.



Figure 2: Carbon footprint of PLA compared to other fossil based polymers (Kg CO₂ eq per Kg polymer)

The carbon footprint of PLA is low compared to fossil based alternatives because of the biobased origin. The CO₂ that might be released at the end of life of a BioFoam part is captured again by the plants that grow to make new feedstock for PLA.

Processing

The (raw) beads for BioFoam are compounded on an extruder and have a typical bead size of 0,9 - 1,2 mm. These beads are impregnated with CO₂ in a high pressure tank prior to pre-foaming. The density of the foamed beads (pearls) can be adjusted with the CO₂ pressure and can vary from 200 kg/m³ to as low as 15 kg/m³.

Table 1: Typical BioFoam pearl size

16 kg/m ³	4,5 mm
25 kg/m ³	3,0 mm
35 kg/m ³	2,5 mm

Pearls for loose bead applications are ready for use after pre-foaming. Pearls for molding undergo a surface modification. These foamed beads are coated to improve fusion of the beads. Typical densities for molding range from 25 kg/m³ to 60 kg/m³.

Molding is done with pre pressurized beads similar to EPP, but the steam pressures used are much lower and compare to EPS. Air is used to pre pressurize the beads and the pressure needed depends on the desired density.

Key properties

Most of the properties of BioFoam are similar to EPS. On top of that BioFoam falls in the highest category of biobased content (> 85%), is certified for food contact applications by Triskelion and the fact that BioFoam is biodegradable offers extra options for the end of life. BioFoam will be converted into water and CO₂ when composted. It is even Cradle-2-Cradle certified!

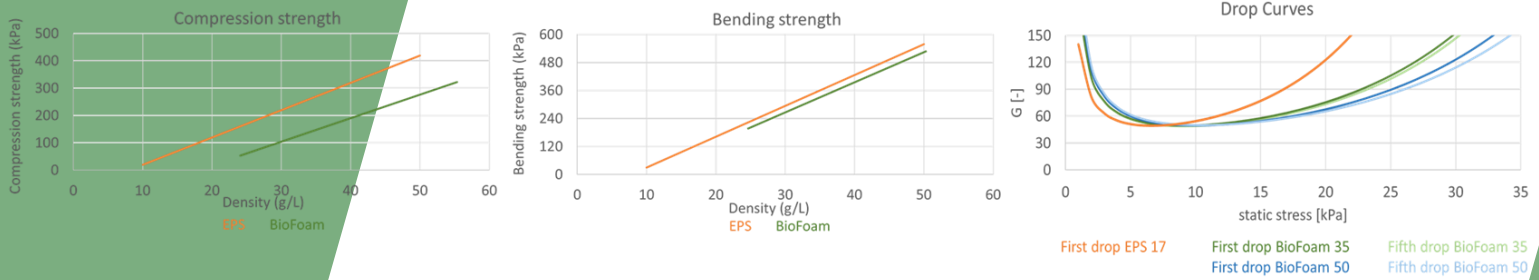


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Mechanical properties



The mechanical properties of BioFoam are shown in the graphs above which show strong resemblance with average EPS values. The compression strength of BioFoam is lower than the compression strength of EPS as a result of the higher density of PLA compared to PS. It is possible to have the same compression strength, but then a BioFoam part needs to be heavier.

Composting

Compostability of BioFoam has been tested by OWS in Belgium according to EN 13432. The pictures below show a sample at the start of the trials (left), after 26 weeks of cold composting (middle) and after four weeks of composting at industrial conditions (right). Cold composting is done at lower temperature (30°C) than the industrial process (60°C).



Figure 3: Samples for composting (left: start, middle: after cold composting, right: after industrial composting)

EN 13432 requires that materials do not contain harmful chemicals. Next to that this standard concerns the disintegration of materials. This means that they should fall apart into smaller pieces, which can be converted into CO₂ and water. Disintegration is studied in a pilot scale test. Biodegradation is studied on lab scale by measuring CO₂ release

over time. The result of such a test is shown in the graph below in which BioFoam is compared to a reference material (cellulose). As one can see the biodegradation is initially slower, but the speed increases towards the end of the test and ultimately the material is fully converted within 60 days.

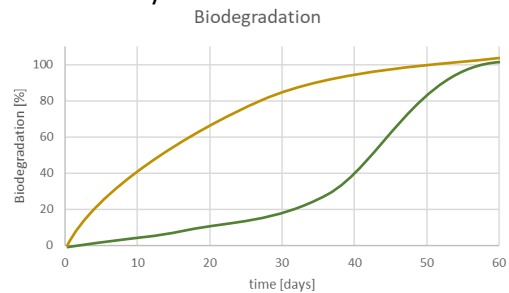


Figure 4: Biodegradation of BioFoam

Availability

BioFoam is ready to take over the world. At the moment state of the art technology is used for foaming in the Netherlands. It is expected that more hubs will follow as BioFoam will further expand. BEWI is determined to lead the change, for a better everyday!

More information on BioFoam is available on our website (www.bewi.com) or feel free to contact your sales representative for further questions or to receive your first BioFoam samples.

