LET`S MAKE THE PLANET BEAT

Life Cycle Calculator and use of ECO foams:

Connecting innovation and sustainability

ZFoam
Luxe & eco

Life Cycle Calculator and use of ECO foams: Connecting innovation and sustainability

At ZFoam we have repeatedly demonstrated our commitment to the circular economy, to the increasing use of , **more sustainable and environmentally friendly foams** and to minimising, even reversing, the carbon footprint and other impacts of our business.

This e-book explains what this commitment involves and what tools and materials we use to make it happen.

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01.
LIFE CYCLE ASSESSMENT OF OUR FOAMS:

What is it and why do we calculate it?

Now, when we deliver an order, we also offer the option of including the LCA of that specific product, so that the customer has reliable, quantitative information about the environmental impact. This indicator is increasingly relevant, particularly when it comes to packaging.

The purpose of this analysis is to provide first-hand **quantitative and objective information** on the environmental impact of manufacturing the product, which can also be compared with the footprint of other alternative materials like cardboard or plastic.

Now, when we deliver an order, we also offer the option of including the **LCA** of that specific product, so that the customer has reliable, quantitative information about the environmental impact. This indicator is increasingly relevant, particularly when it comes to **packaging.**

- What exactly do we mean when we talk about Life Cycle Assessment?

Life Cycle Assessment evaluates all potential environmental impacts of a product or service at every point of the supply chain. The goal is to assess the potential impact a product, process or activity has on the environment throughout its entire life cycle: from the extraction of raw materials to waste disposal after the end of its useful life.

Thus, the information the **LCA** provides is much more comprehensive and exhaustive than the information obtained from calculating the carbon footprint, for example; in the **LCA**, the carbon footprint is just one of the 18 total environmental impacts that the tool covers.

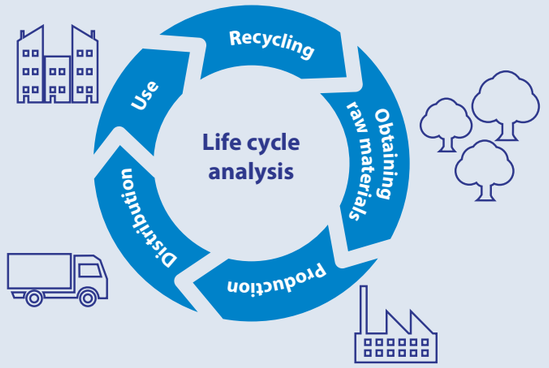
-Life cycle of our foams: How do we calculate it?

The CIRCE Foundation, a technology centre that developed this LCA calculator, has helped us to calculate the Life Cycle Assessment of our products.

To that end, CIRCE has used a series of primary data that ZFoam provided along with internationally recognised databases that all types of organisations regularly use to **calculate their LCA.**

The **LCA calculation** is based on input data (information about the product whose impacts we want to know) and takes the information in the databases into consideration to produce output results that represent the information we seek.

Exciting and revealing, these results demonstrate that some of our foams, particularly those made from forestry waste, used cooking oils and biomaterials, have an even lower impact than other, more popular alternatives.



02. LIFE CYCLE ASSESSMENT (LCA):

Input data and output results

To perform its calculations, the tool requires a series of input data which gets processed to provide the desired output results, that is: the quantification of the environmental impact of a specific product, which can also be compared with the impact of alternative materials like **cardboard or plastic.**

-Life Cycle Assessment, input data

Five basic inputs are needed to calculate the LCA:

✓ **Raw Materials**
We can choose from the different types of foam we have in our portfolio. We will also include whether the piece has adhesive or not. In this section we differentiate between net quantity (including the proportional share of waste, cuttings, inserts, etc.) and the total quantity incorporated into the final product.

That makes it possible to assess the impacts that the final piece generates as well as the impacts of the inserts, cuttings, skins, etc. that are proportional to each piece.

✓ **Consumption**
We include the water and/or energy we use when manufacturing each piece.

✓ **Final Packaging**
Includes the weight of each full box of product and the weight of an empty box.

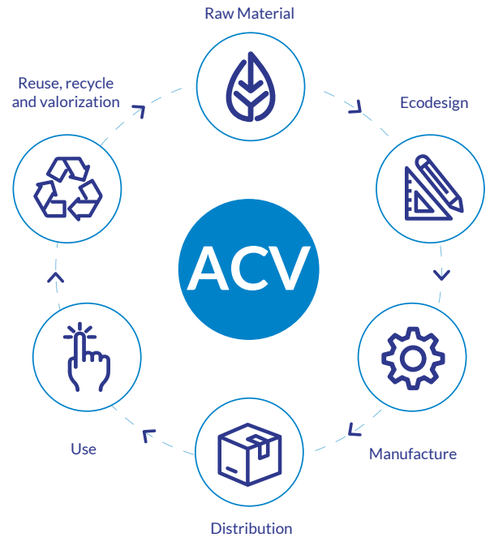
✓ **Transport to Customer**
Estimated distance from ZFoam's facilities to our customer's facilities.

✓ **Waste**
This is the waste generated during the manufacturing process. Here, cardboard is the main waste, since the rest of the waste we generate (foams, skins, pallets, etc.) is recycled internally.

-Calculator (LCA) output results

After entering the data above, **the LCA calculator displays a numerical value for each of the 18 environmental impacts** listed below:

- Climate change, carbon footprint or greenhouse gas emissions
- Ozone layer depletion
- Ionising radiation
- Photochemical ozone formation, human health
- Photochemical ozone formation, terrestrial ecosystems
- Particulate matter formation
- Soil acidification
- Freshwater eutrophication
- Seawater eutrophication
- Soil ecotoxicity
- Freshwater ecotoxicity
- Seawater ecotoxicity
- Carcinogenic human toxicity
- Non-carcinogenic human toxicity
- Natural soil transformation
- Mineral resource use
- Fossil fuel use
- Water use



The values calculated can also be displayed in a graph, also indicating from which part of the life cycle each one comes from (raw materials, consumption, packaging, waste, end of life or total value), **to provide information that is extremely detailed and valuable** and also serves as a guide when it comes to establishing strategies for reducing the impacts generated.

-ZFoam LCA calculator

We hope you find this LCA calculator as useful a tool as we do, and an important resource for increasingly **sustainable and environmentally friendly** manufacturing.

03.
LCA CALCULATOR ENVIRONMENTAL IMPACTS

Main Output results

It is important to note that, because of the properties of the raw materials we use (which weigh between **1.5% and 10% compared to plastic or rigid cardboard**), the inherent nature of our activity, and the internal recycling that we usually do at ZFoam, some environmental impacts are more important than others.

According to our business, the **four** impacts listed below are the most relevant and are those in which, therefore, we can take the most action to reduce or even reverse them:

The weight of a foam is between 1.5% and 10% compared to the weight of a plastic or rigid cardboard

ACV CALCULATOR

+01

Climate change or carbon footprint

This measurement quantifies all CO2 and other greenhouse gas (GHG) emissions that products emit into the atmosphere during their life cycle. These emissions result in an average increase in land and ocean temperatures.

+02

Soil acidification

his is a process where the soil and water pH decrease over time as a result of sulphur and nitrogen oxides emitted into the atmosphere returning to the earth's surface in the form of acids.

+03

Fossil fuel use

This refers to the consumption of fossil fuel resources which, at ZFoam, we strive to reduce as much as possible every day. An example is our firm commitment to the use of plant-based foams as opposed to traditional ones.

+04

Water use

This refers to the consumption of water resources, also known as the "water footprint".

-Other environmental impacts that we consider

The other environmental impacts are much less related to our work, which means we have little influence on them, although we still quantify them. These are:

- Ozone layer depletion
- Ionising radiation
- Photochemical ozone formation, human health / terrestrial ecosystems
- Particulate matter formation
- Eutrophication of freshwater / seawater / soil
- Freshwater / seawater ecotoxicity
- Carcinogenic / non-carcinogenic human toxicity
- Natural soil transformation
- Mineral resource use

So far, we've explained how the **LCA calculator** works "on paper". To provide a more comprehensive overview, below is a case study that we're confident you'll find of interest.

04.
ZFOAM LIFE CYCLE ASSESSMENT CALCULATOR

– Here's how it works

You're already familiar with the **Life Cycle Assessment Calculator** that we developed together with the **CIRCE Foundation**, as well as the input values it needs to provide real, objective data on our environmental impact. Information that we at ZFoam share transparently with all our customers.

Now, we want to show you how the calculator works using a real case study, and the differences we found between the use of different types of foams and other materials, such as cardboard.

- How our LCA calculator works

We start with a challenge and some key points, which serve as a guiding thread in this case study.

Challenge

Use data to illustrate that the use of technical foams can have lower environmental impacts than the use of materials like cardboard.

Key points

The **LCA calculator** proves extremely useful in showing that the use of foams such as **LD18** or **LJ45** BIO provides, in some respects, a lower environmental impact than other traditional materials.

Input data

We start with some input data **(raw materials, water and electricity consumption, final packaging, distance to the customer and waste).**

ZFoam provides all the values, except for the shipping distance (which is provided by the customer) and the waste generated, which we assume will be recycled, and that materials will be sorted correctly.

The model we use in our example is a cardboard piece that is quite popular in the cosmetics world, which includes various gift products, and we compare it with the different types of ZFoam foams.

THE RESULTS AT A GLANCE

Greenhouse Gas Emissions - Carbon Footprint

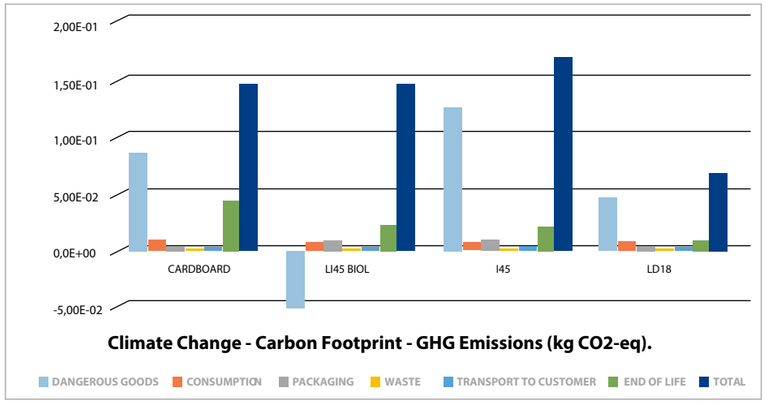


Figure 9: Graph of greenhouse gas (GHG) emissions per each piece manufactured with different materials.

The graph speaks for itself, revealing how the **LJ45 BIO foam has a negative carbon footprint compared to any other material used**, as well as extremely low consumption or waste rates. It certainly represents a significant difference that should be taken into account.

Soil Acidification

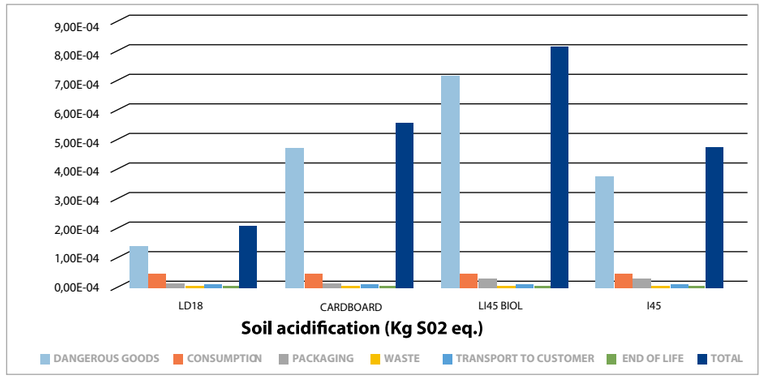


Figure 10: Graph of soil acidification per each piece manufactured with different materials.

In this case, **the environmental impact of some types of foam is once again clearly better than that of cardboard.** Thus, in terms of soil acidification, LD18 foam is found to be the material with the lowest impact, followed by LJ45 foam.

There is a caveat regarding the LJ45 BIO foam, and the high values it has. This is because it is a material made from sugar cane, so the soil acidification is inevitably higher than in other cases; that said, however, it's important to remember that it's the only material we have analysed with a negative carbon footprint.

Water use

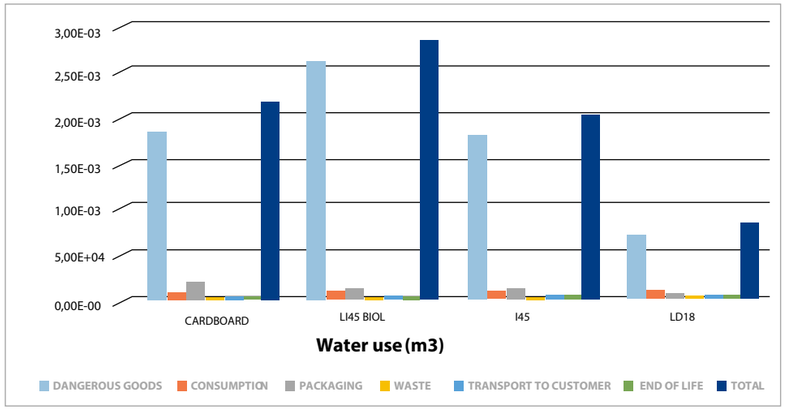


Figure 11: Graph of water use (m3) per each piece manufactured with different materials.

LD18 foam has a considerable advantage over other materials when it comes to water use, since it's an extremely lightweight foam with a very low environmental impact. On the other hand, LJ45 foam, despite not offering as low values as LD18, also performs better than cardboard.

By using the Life Cycle Assessment Calculator, we can clearly see how a material like cardboard isn't necessarily the best choice in every situation.

In fact, we have established with real, verifiable data, calculated on the basis of current regulations, that using foams such as LJ45 BIO or LD18 makes it possible to create packaging that is more environmentally friendly, more sustainable, high-quality and which also offers a wide range of customisation opportunities.

CONCLUSIONS AND CONSIDERATIONS

01 **ZFoam is one of the first European companies in the industry to perform a Life Cycle Assessment on the products it manufactures** and on other alternative products to foam which are used as packaging solutions.

02 **ZFoam offers our customers the service of calculating the LCA of the products we manufacture.** This makes comparisons between different foams or other alternative materials (cardboard, moulded polyester, etc.) possible.

03 **Our LCA calculator has been developed by the CIRCE Foundation.** They have used a set of primary data that we provided and the rest is secondary data obtained from internationally recognised databases. All organisations conducting an LCA use secondary data.

04 **The LCA covers 18 different types of impacts.** Climate change is included among these 18 impacts. Climate change can also be referred to as carbon footprint, CO2 emissions or greenhouse gas emissions. It's exactly the same, but with a different name.

The LCA is therefore much more far-reaching and comprehensive than simply calculating the carbon footprint.

05 **Today, biopolymers are an excellent alternative because they have a much lower carbon footprint than any other material, whether foam or another alternative product.**
Biopolymers are 100% renewable in origin. These sources include sugar cane, forestry waste, even cooking oils.

Additionally, the use of this type of raw materials is aligned with the **2030 Agenda** and rural development as part of the 17 Sustainable Development Goals (SDGs). As a result, it prevents farmland abandonment and leads to the reindustrialisation of rural areas.

06 **It is particularly important to note that a foam made from a biopolymer has the same characteristics as one made from a traditional polymer.**
Además de los beneficios anteriormente citados (huella de carbono negativa), es importante destacar que los residuos vegetales generados se pueden utilizar como biocombustible o fertilizantes haciendo del proceso global un claro ejemplo de economía circular.

07 **These BIO-Polyethylenes are NOT BIODEGRADABLE OR COMPOSTABLE. The same techniques, installations and machinery are used to process BIO-Polyethylenes as for "traditional" polyethylenes.**

08 Data: In terms of data, based on the data provided by the calculator, the following conclusions can be drawn:

08. 1 **Climate Change:** biopolymers are the most sustainable solution to this impact. It is also important to note that a low-density foam (Plastazote LD18 or PLastazote LD24 type) may have a lower carbon footprint value than solid fibre board due to their low density.

08. 2 **Soil Acidification:** the worst performers in soil acidification are both LJ45 BIO and paperboard since both "use" soil to generate their raw materials.

08. 3 **Water Use:** there are also similar results for this impact category as there are for soil acidification, with cardboard and biopolymers the worst performers.

08. 4 Overall, one could conclude that the most sustainable materials are low density LD (18 - 24 kg/m3). If, on the other hand, we only look at the carbon footprint, biopolymers are the most preferable.

09 **Impacts from transport:** in general terms, **the impact related to the transport of the piece to the customer is approximately 1% of greenhouse gas emissions per 1000 km travelled.** In other words, a practically negligible impact compared to the choice of raw material, transformation process, end of life, etc.

10 Finally, we would like to underscore that **we have reduced our greenhouse gas emissions by approximately 10%** since we started recycling all the waste we generate at ZFoam in 2016

To commit to the sustainability of their materials

LIFE CYCLE

We hope that the Life Cycle Calculator that we have presented will become a highly valuable resource for all those professionals who want to commit to the sustainability of their materials without compromising on the quality of the foams used.

EARTH BEATS

EVERY STEP
/ IS AN EARTH BEAT

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