

Green Gen

TECHNOLOGIES®



PRESS KIT - JANUARY 2022

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INTRODUCTION

Innovation and disruption in the packaging world: the launch of a revolutionary eco-designed container made from vegetable fibres and resin, and designed for the beverage, food, cosmetics and perfume sectors.

Context

Packaging plays an important role in the production chain as it provides protection during transportation, optimal storage and product preservation.

Several thousand years ago humans created containers made of wood, ceramic and glass to facilitate the consumption and transport of certain commodities. The rise of various techniques has made it possible to produce containers from metal and more recently plastic, which has made packaging much more widely available.

Faced with a depletion of resources, global warming and the degradation of our environment due to human activity, we are witnessing a growing demand from consumers, as well as manufacturers, for a sustainable innovation in containers.

Our project is revolutionary in that it will decrease, and potentially one day replace, the use of glass and petroleum-based plastic packaging in favour of eco-designed containers with a much lower carbon footprint (before being processed the plant absorbs carbon and emits oxygen).



Green Gen Technologies'® innovations

Green Gen Technologies® offers bespoke and unique containers, for products ranging from wine bottles and cosmetics to tableware, water bottles and food.

The Green Gen Bottle®

Designed and manufactured in France, the ultra-resistant and ultra-light (less than 200 grams) Green Gen Bottle® is bio-based, sustainable recyclable and (depending on choice of polymer).

We have created a glass-free composite packaging made using flax fibres. It has passed all qualitative tests including the qualitative holding of contents (alcohol of up to 60% volume), the holding of the corking in the required temperature, pressure and humidity conditions. It has exceptional impact resistance.

The Green Gen Water Bottle

This transportable and elegant bottle was designed to be used by consumers on a daily basis and to last for a long time.

Characteristics :

- Bio-based : Made from renewable raw materials.
- Aesthetic : A wide range of customization options.
- Light : A material that's 2 to 3 times lighter than glass.
- Mechanical resistance : A composite structure.
- Unscrewable : To make it easier to clean.
- Transportable : Comfortable to hold in the hand.

Food and cosmetics containers

The technologies we have developed for the Green Gen Bottle® can be adapted to different sectors including food and cosmetics/perfume. The types of cosmetics targeted are jars of creams and cylindrical bottles (micellar water, body milk, etc.). In terms of food and beverage, we can develop cups, plates or lids to cover dishes.

Our technologies

Our innovative technologies are based on the creation of a composite material. This is the combination of at least two immiscible components with good compatibility. Thanks to the principle of synergy, the properties of the composite are more than just a sum of the parts of the materials used. The new heterogeneous material has qualities that the components alone would not possess.

Green Gen Technologies® uses this technology with two types of fibres: very strong long fibres and short fibres that are co-products from certain agricultural industries.

Long fibres

Long fibres give our composite containers an atypical and unique design. They are used, for instance, to create our Green Gen Bottle®.

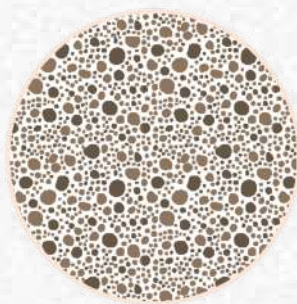
Our main development in this area is the way in which we braid the flax (Masters of Linen® certified) in order to create a strong and aesthetic casing.

Long fibre technology is used for primary packaging, i.e. packaging intended to come into direct contact with the product it holds.

These fibres can also be used to manufacture secondary packaging. For us, this means it does not come into direct contact with the product inside, but provides a protective refillable case in which the product is held. The packaging is therefore designed to have a long service life because it is reusable. It is also a decorative object with high added value as our containers are completely customisable. The fibres can be coloured in different shades for a more or less natural look to align with consumer expectations.



FLAX FIBRES



BIO-BASED
RESINS



OUR
SOLUTION

Our containers are made from a cylindrical braid of flax yarn. The braid is then impregnated with a thermoplastic resin that's either bio-based or recycled, in a complex process that creates a solid, waterproof and bio-based composite.

Short fibres

Short fibre technology enables optimal use of certain resources by integrating them into a composite product. We currently work with different types of vegetable fibres such as wood, rye straw and grape pomace. Other fibres such as flax and hemp may also be considered.

As well as giving the material good mechanical properties, short fibres are also less expensive.

Our first short fibre containers are the Green Gen Water Bottles made of bio-based resin and wood fibres.

This technology can also be used to create containers for cosmetics and washing products (HPC range: Home and Personnel Care). These products are more likely to come into contact with water on the outside, and heat and moisture if it is a shower product. In these specific cases, the most suitable materials are chosen to perfectly meet the constraints of such environments.

Resin

Resin is used to impregnate the flax fibre, reduce its affinity with water, stiffen and stabilise it, as well as to distribute the forces of shocks caused by transport. Resin also brings out the bronze colour of flax and gives it a smooth, satiny and high-end appearance. This highlights the pleasant feel and appearance of the casing, showcasing its added value.

The rise of flax

Flax has been used since ancient times and is truly the oldest textile in the world. Its strength and lightness mean it has frequently been used for fashion and high-end clothing. It comes from a plant, *Linum L.*, which has the appearance of a large stem about a metre in height. There are 80 to 100 spirally distributed leaves around this stem. The five-petal flowers have a lifespan of a few hours. Its root system descends more than a metre into the ground.



A rise in flax quantified by 110,000 tons¹ of fibres grown in France, making it the world's largest producer of flax. However, 80% of this production is exported to China to be spun and then sent back to Europe. To combat the unduly high carbon footprint of this transportation, Safilin, (which already has a 100% European industrial process), announced the upcoming relocation of a spinning plant to the north of France in order to produce a 100% French flax yarn.

Flax has many beneficial properties that explain the recent renewed interest in it, particularly its high mechanical performance. It is increasingly used for its physical qualities, in particular its light weight and very high strength. Its extremely thin fibres are as strong as glass fibres while being lighter.

Other vegetable fibres

The patents held by Green Gen Technologies® cover all fibres of plant origin and, thanks to advanced R&D work, within two years containers made of bamboo, hemp or miscanthus fibres may be possible.

Overview of the concepts of environmental responsibility and sustainability

These are crucial global trends. Environmental respect is becoming an increasingly important purchasing criterion. A European study (2012) shows that **92% of consumers said they were already prepared to be guided by their ethical values in their purchasing behaviour at that time.**

There is no doubt that this trend has gained momentum since then. There is a sociological, economic, philosophical and political convergence leading to a return to an ecological wisdom known as 'ecosophy'. It is about not forcing nature but rather adapting to it. This explains, for instance, the success of organic products and the return of various values related to the land, roots, history, 'the good old days', art, culture and, finally, to what can be called 'reliance' (trust).

¹ E.Derome, « World's leading flax producer, France wants to resist China », We Demain, a magazine to change the times (in French) www.wedemain.fr/Premier-producteur-mondial-de-lin-la-France-veut-resister-a-la-Chine_a3343.html.

Environmental responsibility in fashion

Luxury brands are increasingly taking into account consumers' search for meaning and transparency. To differentiate themselves, their creations must use innovative technologies and affirm their commitment to being environmentally friendly.

For example: BMW's 'eco-friendly' car, Tesla reducing weight thanks to flax fibres, Dassault saying it uses flax fibres inside its aircraft, Cottin with its artisan computer made entirely in France, and so many more.

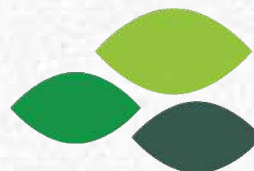
Carbone footprint comparison of a flax fibre container and a glass container

Global production of glass containers in 2020 was 65 million tons. It is expected to reach 65.42 million tonnes by 2022.

The production of glass requires a large amount of energy because its melting point is 1,300°C and its working temperature is 1,550°C. This creates a huge carbon footprint. Manufacturing one ton of glass requires 105 kg (92.4L)² of oil. Petrol-based plastic is also very energy intensive with two tons of oil required to produce one ton of plastic. The carbon footprint of glass is not only impacted by its production but also by its transport (heavy weight). The OIV (International Organisation of Vine and Wine) says that a total volume of 105.8 mhl was exported in 2020, and that the share of bottled wine exported represents 56 mhl or 7.5 billion bottles of 75 cL³.

In addition, glass, while recyclable, is strictly not biodegradable. Not to mention that, to be put back into use, recycled glass needs to be heated to a very high temperature, thus using additional energy.

It should also be noted that while it is true that 100% of collected glass is recycled, only a maximum of 60% cullet (recycled glass waste) can be used to create a new container. It will therefore always be necessary to extract and work silica.



² Gérard Pajean, Une petite encyclopédie du verre, Verre, p. 10, Vol 14 n°1, Février 2008

³ Global Wine Economic Outlook 2020, <https://www.oiv.int/public/medias/7899/oiv-note-de-conjoncture-vitivinicole-mondiale-2020.pdf>

Silica sand is one of the most used resources in the world, just after water.¹ It is omnipresent: in our new technologies, in our glasses, and above all in our construction. It is now so valuable that it is trafficked, leading to 'beach thefts'.² What is the future for glass bottles when all the sand will be used to keep up with construction and population growth ?

The concepts of recycled, recyclable and biodegradability

Being bio-based indicates that the materials that make up the bottle come from biomass (in this case flax fibres and resin of plant origin). Bio-based products are a key element of the circular economy which aims to move countries towards a low-carbon, sustainable and biodiversity-friendly economy.

Recycling is a waste treatment process that reintroduces materials from a similar product at the end of its life, or manufacturing residues, back into the production cycle. It is important to differentiate between a recyclable product, which can be mechanically or chemically recycled with a view to reusing the material that makes it up (if there is a facility for this material), and a recycled product, which can be recycled in an existing nationwide recycling facility. .

At Green Gen Technologies® we make composite products, which means that each of our products contains a minimum of two non-miscible materials ; in this case what is called a matrix (the product providing the structure for our containers, the resin) and fibres (which supply the mechanical properties and improve the strength of the material, while providing an attractive appearance). To date, there is no national network that processes this type of product, although some local projects (specific factories or research facilities) have proven that recycling this type of material is completely possible. The only recycling channels accessible to the general public for packaging and containers in France concern single-material products (plastics: PE, PP, PET; paper and cardboard; glass; aluminium), which hinders packaging innovations.

In everyday language, a substance is said to be biodegradable if, under the action of foreign biological microorganisms in a favourable environment, it can break down into simple molecules, carbon dioxide, water, humus, etc. which will then be released into the environment without adverse effects.

¹ « Le sable, Enquête sur une disparition », Denis Delestrac , Arte, 28 mai 2013 (in French)

² « Le sable marin devient un objet de trafic », www.lemonde.fr/planete/article/2010/03/29/le-sable-marin-devient-un-objet-de-trafic_1325755_3244.html. (in French)

From a technical point of view, biodegradability corresponds to standard EN 13432 and is measured by standard and standardised tests (ISO 14855: Biodegradability under controlled composting conditions). There are four main criteria, evaluated under industrial composting conditions :

- Disintegration : After 12 weeks of composting there must be no more than 10% of the initial dry mass remaining of a dimension greater than 2 mm.
- Biodegradability : After six months, 90% of the initial mass must be degraded.
- Concentration of heavy metals : The concentration of heavy metals (in mg/kg dry matter) must not exceed the predefined maximum values.
- Compost quality : Germination and plant growth tests are carried out on samples of compost resulting from the degradation of the tested material. There should be no difference to the standard control compost.

Compostability refers to the ability of an organic material to generate a final product called compost. This process is the result of aerobic biodegradation that transforms the initial material into fertile soil.

Potencial markets

The market potential for containers made of natural-fibre composites is significant as respect for the environment and sustainability are so important to consumers and distributors. These concepts have become core trends and protecting the environment has become a key purchasing criteria.

Our containers are potentially aimed at all markets where glass is used as packaging. We have particularly targeted alcoholic beverages, tableware, cosmetics/perfumes and luxury food.

As a reminder, the shares of global turnover by product in 2016 were distributed as follows (Source Panel Generation): cosmetics & perfume (32%), food & confectionery (17%), wines & spirits (15%).

90% of French people would be in favour of using bio-based compostable materials as alternatives to common plastics.¹

¹ HAREL Camille, 16/06/2021, LSA GREEN, <https://www.lsa-conso.fr/90-des-francais-favorables-au-plastique-biosource-et-compostable-etude,384978> (in French)

In the beverage world, the flax fibre bottle

has an enormous potential market. It is of interest as an alternative for all wine, beer or spirit bottles whatever their use in both domestic and export markets.

Focusing on wine exports where there is a high carbon footprint caused by transport (because of the distance travelled), the OIV (International Organisation of Vine and Wine) says that the international wine trade is growing year on year and that in 2020 42% of the wines produced in the world crossed at least one border. This is equal to the considerable amount of 7.5 billion bottles, with the rest being sold in small quantities or bulk. If all of these bottles were made of a flax fibre composite rather than glass, this would remove 5.25 million tons of packaging from transport (700 g being the estimated average weight of a glass bottle). Since it takes 92.4 L of oil to make a ton of glass, this would save 1.180 million barrels of oil! In addition, it would reduce the amount of fuel used for transportation. Less energy is required to carry 100 Green Gen Bottles® ($0.195 * 100 = 19.5$ kg) than 100 glass bottles ($0.700 * 100 = 70$ kg).

For packaging (containers) in the food world

The food industry is the main user of packaging, governed by strict regulations. Regulation (EC) No 1935/2004 outlines the specific directives with which materials that come into contact with food must comply. Regulation (EC) 2023/2006 complements this law by setting out the best practices to be followed when manufacturing materials.

There is strong growth in the eco-friendly food packaging market (an Annual Compound Growth Rate of 6% between 2021 and 2026).¹ The potential market is therefore huge: packaging is constantly being improved to keep up with legislation and ever-changing lifestyles and consumer needs, while being aligned with major environmental issues.

¹ Eco-friendly food packaging market, 02/04/2021, <https://www.marketdataforecast.com/market-reports/eco-friendly-food-packaging-market>

Pour les emballages (contenants) dans l'univers cosmétique/parfumerie

Since Green Gen Technologies® began, we have had a lot of demand from both startups and major groups in the cosmetics sector.

A strong trend towards organic and natural products has continued to grow since 2019 with more and more consumers saying they care about the environmental impact of the products they use. According to a study conducted for LSA in 2021, 66% of consumers of natural beauty products want eco-designed packaging.

We believe that now is the time to meet these cosmetics demands with natural fibres, whether long or short, such as flax to create environmentally responsible containers.

Legal note

The technology used is covered by patents held by SAS Green Gen Technologies®. Green Gen Technologies®, SAS Green Gen Bottles® and SAS Green Gen Cosmetics® are registered trademarks.



Industrial production and commercialisation

Green Gen Technologies® has entered into a partnership with a manufacturer based in Europe.

A first commercial production run of the 70 cl Green Gen Bottle® is scheduled for the first half of 2022 for a cognac brand. Another is planned for the first quarter of 2022 for the Green Gen Water Bottle.

In the future, once the bottles are well established in their markets, Green Gen Technologies® will establish itself close to major markets and production lines will be set up in America and Asia (which will also deliver to Australia and New Zealand).



Fundraising

Our development and production capacity is directly linked to sourcing new industry partners adapted to the new target markets.

SAS Green Gen Technologies® did its first fundraiser in 2019;

€350,000 was released in 3 months. A new fundraising round will take place in 2022 for industrial deployment.

Benchmark

Changes in the sector over the last two years

There is a strong desire to offer more environmentally friendly packaging as alternatives to existing solutions. From the smallest companies to the largest groups, brands want to stand out and reinvent themselves by adopting a 'greener' image, as a result of the environmental issues that we are made aware of on a daily basis. Consumers are increasingly experiencing an ecological burden and there is a real demand for solutions that allow them to continue consuming while minimising their impact on the planet. Wine bottles made from 94% recycled cardboard, PET, PHA and paper bottles have therefore seen considerable growth.

The paper bottle is an innovative product, positioned as a more sustainable type of packaging than existing options. It therefore shares the same aims as the Green Gen Bottle®. However, thanks to the braid and fineness of the textile fibres used, our flax composite packaging is attractive, light and has an immediately identifiable and distinguishable finishing touch. We also have a high-end positioning with the Green Gen Bottle®.

Quotes

James de Roany, co-founder

"At Green Gen Technologies®, we are delighted that our innovations are proving so successful and we thank our shareholders for their support and enthusiasm. We have managed to significantly lower our manufacturing costs and in the first quarter of 2022 our first commercial productions will arrive at points of sale. We will also adapt our production tools to meet what promises to be an extremely high demand. We are preparing for a new round of fundraising for this purpose."

— “ —

After a few years of R&D work, our bio-based bottle is ready for industrial production and we are very happy to be accelerated by LVMH. We hope to see our environmentally friendly packaging used by some of their brands for cosmetics, wines, spirits and other high-quality products. This opportunity will introduce our innovation to a wide audience on an international scale. We are extremely grateful to them for showcasing us and trusting in us.

— ” —

Aline Rogeon, Materials Engineer

“Developing the Green Gen Bottle® has been a very interesting challenge as it is a product that must be light and strong, beautiful and aesthetic, but also technical to provide the functions expected for this type of container.”

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