



Case study report – Bel Albatros

Good practice of circular economy business models

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As part of the TRANSFORM-CE project, several case studies are done to benchmark existing circular economy business models. This document covers the results of the case study conducted at Bel Albatros, based in Belgium. A total of 20 case studies will be done, with five cases per country (The Netherlands, Germany, Belgium and the United Kingdom).

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1. Introduction and method

1.1 Goal of case study

TRANSFORM-CE is an international research project which researches amongst others successful applications of circular business models, barriers, enablers and needs for circularity, and offers in-depth support for the uptake of recycled feedstock by businesses. A core part of the project is to provide advice to businesses on their way to transition towards a circular economy (CE).

In order to help businesses with developing circular business models (CBM's), it is first important to benchmark existing CBM's of companies. This is done by conducting case study projects with 20 selected businesses throughout North-West Europe. The aim is to provide participating businesses with an in-depth analysis of their current situation and business model, to identify opportunities and provide recommendations for facilitating the transition towards a CBM for these and other companies. The case studies also present a unique opportunity to study barriers, enablers and needs for circularity (and recycling) in more detail.

1.2 Company background

Bel Albatros is a small family company, funded in 2017, that produces panels for design and interior architecture applications. The panels are 100% made of recycled plastics through a hot compression-moulding process. Panels up to 6 m long can be produced. Panels can be polished to give a marble effect, and sawn or milled with traditional machining tools. The input is industrial or commercial waste. Bulk post-consumer waste could also be used. A short overview of Bel Albatros is given in table 1.

Table 1: Overview of company

Topic	Information
Company name	Bel Albatros
Website	http://belalbatros.com/
Country	Belgium
Size of company (0-10, 10-200, 200-500, 500+ employees)	0-10
Mission/vision	Bel Albatros offers to accompany companies concerned about their environmental footprint towards a responsible management of their plastic waste according to the principles of the circular economy.
Product category	Plastic panels
Production/operational process	Compression moulding
Used materials	Mostly commodities thermoplastics: HDPE, LDPE, PS, PP Mostly clean industrial waste (production scraps...)

1.3 Case study process

This case study was carried out in July 2021. The case study process is structured in four steps¹, with an iterative approach at the end of each step. The first step (circularity of the business model) aims at creating a general overview of the company, the context and its (circular) business model, to capture how the company creates and delivers value. The second step (circularity in the value chain) involves a circularity assessment of the company and its activities in the value chain. The third step (circularity of operational activities) is focussed on the circularity of the company's operational activities. The last step involves a wrap-up of the results and concludes with the case company's strengths regarding circularity, an overview of the barriers and enablers for circularity, and opportunities for further enabling circularity. The final result is a case study description, covering the previously established information.

An overview of the case study analysis process is shown in figure 1 on the next page. To obtain the results, each of the three steps is divided into four sub steps: 1) desk research and preparation; 2) interview; 3) reporting results; 4) iteration of results. More information about the process and the steps needed for receiving the results can be found in a separate document ('case study methodology') explaining the case study process in more detail. Three interviews are conducted for this case study, with one interview per step and the interviewed persons each having a different function and responsibility within the company. Table 2 gives an overview of the interviewed persons for Bel Albatros.

Table 2: Overview of interviewed people

	Interviewed person	Function
Interview 1: Circularity of business model	Guilain Sevriere	CEO
Interview 2: Circularity in the value chain	Grégoire Hupin	Process development & Public relations
Interview 3: Circularity of operational activities	Guilain Sevriere & Grégoire Hupin	-

¹ We make grateful use of insights and methods derived from previous research, in particular the case study method of R2π (2017, 2019), the work of Circulab (2020) and the Ellen MacArthur Foundation (2017, 2019). TRANSFORM-CE case studies' methodology and templates were developed by TRANSFORM-CE partner Hogeschool Utrecht (NL).

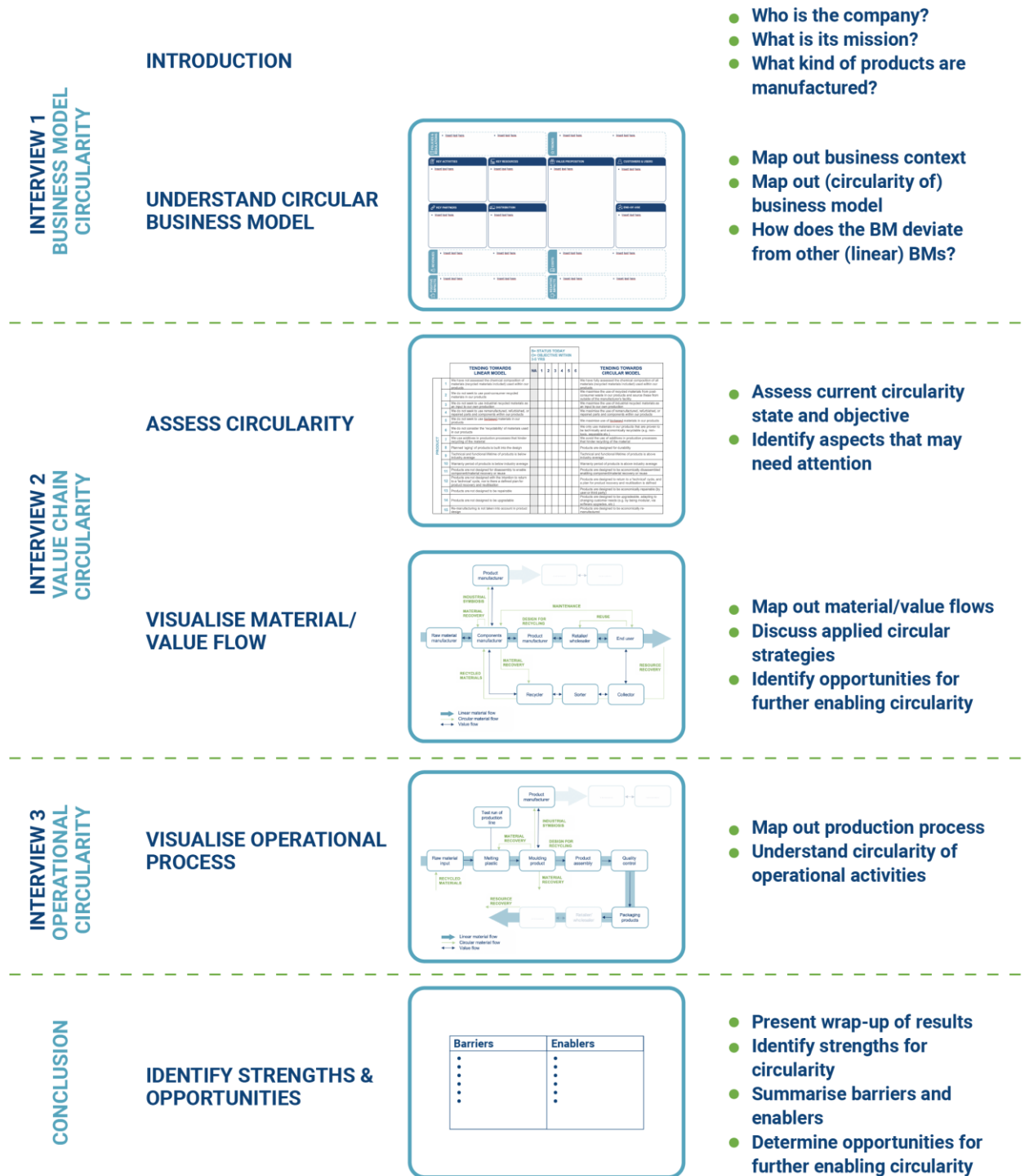


Figure 1: Overview of case study process

2. Circularity of business model

The first step aims at creating an overview of the company's business model and the context in which it operates, to capture how the company creates and delivers value (for circularity).

The circularity of the business model is investigated by using a circular business model canvas (CBMC). This model is created for the purpose of this study and shows how the company creates, delivers and captures value, highlighting circularity aspects of the business. The CBMC of Bel Albatros is visible in figure 2 and a description of each element is given below.

Value proposition

Bel Albatros manufactures large plastic panels (up to 6 m long) that can be used in various building and interior design applications such as inner walls, flooring, kitchen worktop or credence... All produced panels are unique, and bespoke design and combination of colours is possible (figure 3). The panels are 100% made of recycled materials and 100% mono-material (excepted potential impurities in the secondary raw material used). This 100% mono-material policy is meant to ensure the best potential for recyclability of the panels themselves after use. The secondary raw material is never blended with virgin plastic material, and any surface modification that would lead to an alteration of the global composition (paint, varnish...) is excluded.

The initial business model of Bel Albatros was mostly based on injection moulding technology. However, it appeared that injection moulding is not an easy technology for a small company to make efficient recycling of plastics, since it requires high levels of purity for pellets that are difficult to reach. Washing and sorting machines are therefore needed that are hardly affordable for a small company.

Besides, injection moulding leads to products with a rather homogeneous coloration, and marble patterns are difficult to achieve. This is considered a problem in terms of marketing; recycled products "look more recycled" with marbling.

There has therefore been a switch of business model, now mostly dedicated to the production of panels with the recently (2020) acquired thermo-press. The required level of purity for secondary material is lower, and compatible with the feedstocks Bel Albatros has access to. Another advantage of this new model with regards to Bel Albatros' philosophy is that those panels can more easily be collected for new cycle after end of use than small injection-moulded objects such as combs that are more disseminated.

Circular Business Model Canvas - Bel Albatros



Figure 2: CBMC of Bel Albatros

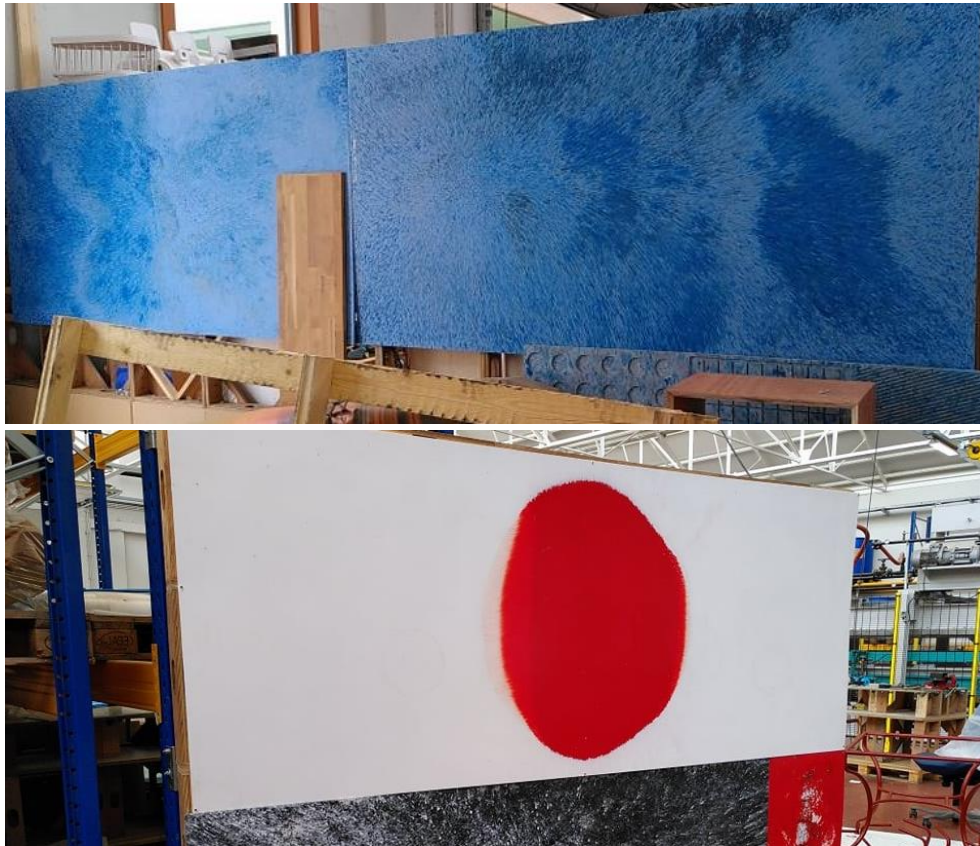


Figure 3: Examples of coloured panels

Customers & users

The customers of Bel Albatros are for the moment mostly individuals or architects, though the company aims at answering public calls for tenders for larger markets soon.

The customers reach Bel Albatros by word of mouth; with very few advertising about the new business model (the company website has been updated since the interviews and now focuses on the panel production activity), the demand is already high enough for the current production capacity.

Customers are people who are aware of environmental issues and ask for products 100% circular, both recycled and recyclable, which is what Bel Albatros offers.

Key activities

The production of pressed panels starts with the collection of secondary raw materials. The partnership with Bruxelles-Propreté, a waste collector that hosts Bel Albatros in its RECY-K platform among other companies active in circular economy (CE) and/or social and solidarity base economy (SSE), offers easy access to some waste feedstock. Other sources of waste for Bel Albatros are post-commercial or industrial waste, that can be obtained from local plastic transformers (with the help of the network created by the Belgian cluster Plastiwin).

Panels are produced by thermo-pressing process. Pelletised or shredded secondary plastic raw material is placed between the plates of a heating press inside a floating frame. Under heat and pressure, the pellets are fused, and a homogeneous panel is obtained. The cooling of the formed panel can be completed in a secondary cold press, thus enabling using the hot press for another panel production.

Unique patterns can be achieved with the selection of specific-coloured secondary materials (cf. figure 3). The process is not a continuous process; the production capacity is currently limited 12 m²/day and could with the same equipment reach up to 60 m²/day with new staff and logistic optimisations.

Bespoke finishing operations can be proposed by Bel Albatros, sub-contracted to a partner company, or be made directly by the customer with machining tools (a company producing CNC machines is located in the same RECY-K premises) to provide polishing of the surface and enhance the marble-like aspect or to design specific geometries.

Key resources

The main resources of Bel Albatros in terms of equipment are the hot press for compression moulding and the cold press for panels cooling.

Other crucial equipment are a grinder and a pelletizer for transformation of feedstock into processable material, as well as floating frames and equipment for panels handling.

Two types of feedstocks are used by Bel Albatros for panel production: soft plastics (LPDE or PP films) and hard plastics (mostly HDPE). Most feedstock is currently post-industrial or post commercial clean waste. Though there is a will to use also post-consumer plastics, especially bulky waste that can easily be obtained with the proximity with Bruxelles-Propreté, the use that can be made of such source is currently limited because of insufficient shredding capacity.

Main sources of feedstock are production scraps from plastic transformers (e.g. PS from injection moulding of pharma packaging. Thanks to Plastiwin cluster, Bel Albatros has access to a large network of small size plastic transformers, and thus to a wide range of industrial scrap. Most of such feedstock is white material about 5% would be coloured plastics.

"It is never difficult to find post-industrial waste batches."

- *Guilain Sevriere, CEO of Bel Albatros*

For enabling a large range of colours and offer more possibilities for bespoke design, Bel Albatros started a collaboration with a leading masterbatch producer to collect decommissioned masterbatch library (figure 4). This producer keeps indeed few kg samples that are kept 5 years for reference after sale and would otherwise be eliminated after this period by incineration.



Figure 4: Coloured masterbatch samples from decommissioned producer's library

Another significant source of feedstock is post-commercial waste from catering sector such as decommissioned batches of straws or cups that can be directly provided by restaurant chains (figure 5), or logistic packaging for fashion, collected from retailers in Brussels shopping centers (soft plastics: bags and films) by Bruxelles-Propreté.



Figure 5: Decommissioned drinking straws batch

Key partners

As already explained, the partnership with the waste collector Bruxelles-Propreté provides soft plastics films feedstock. This specific flow requires however manual sorting and removal of labels, which is ensured by a collaboration with L'Ouvroir, a social and solidarity-based company. Belgiplast, a partner plastic processing company, offers consultancy about chemistry or plastic processing issues and, when needed, access to injection moulding machines. Located in the same Recy-K premises, Mekanika gives access to CNC milling machines. Depending on the nature and amount of milling process needed, a direct contact between the customer and Mekanika can be established.

Distribution

Panels are directly delivered on the use site, there is no need for packaging, except for very specific cases where reused cardboard is favoured.

End-of-use

A take-back of end-of-use panels is proposed for new recycling step, but this has not occurred yet given the youth of the business and the use lifetime of products. There is no doubt that recycling for similar application will be possible, however enhancing shredding capacities will be necessary to treat large panels.

Costs & revenues

Investment costs are high for machinery (especially the press), and it is difficult to have access to financial support when second-hand machines are purchased. No consumables are used, and no waste are generated by the process.

Policies & regulations

Regulatory compliance for production activity is monitored by the RECY-K structure, Bel Albatros only provides required information.

Very few compliance tests are made about the products for the moment. There is no distribution circuit with big retailers that would demand that. The customer knows the product may not be compliant with all standards and assumes the risk. For some big sales with architects, standard fire resistance tests will be made however to provide compliance certificate. Anyway, the question of compliance to standards will have to be tackled soon to enable market expansion.

Regarding public policies, the CEO regrets that there is no 0% VAT for recycled products, that would help developing the market. Besides, more incentives for investing in second-hand machinery would be appreciated.

Trends

There is a growing demand for the panels. The competitors are growing, and investors come with proposals. Growth will probably become a necessity soon for Bel Albatros.

Positive and negative impacts

Bel Albatros recycles 15 tons of plastic yearly, in a process that generates no waste. Local production, sourcing and delivery contribute to the company's positive impacts and limit negative impacts of transportation.

3. Circularity in the value chain

After analysing the company's current (circular) business model, a more detailed circularity assessment of the company and its activities in the value chain is made. The material and value flow map is presented, together with its adopted circular strategies.

3.1 Material and value flow map

The ultimate goal of a CE is for resources to flow in circles, with limited leakage out of the system. To evaluate this, it is important to map and visualise the current flow of materials and value within the company's value chain. The material and value flow map of Bel Albatros is presented in figure 6. The value flows (blue) indicate that value is being exchanged between actors and enables an analysis of the relationships amongst key partners. The circular material flows (green) show where the material comes from, where it goes and how it may return into the cycle. The map was discussed and adapted during the second interview. The interaction with private sector waste collectors is not yet achieved, hence the dotted arrows. Besides the circular strategies largely involved in the base model (Recycled materials, Industrial symbiosis and Product take-back), Remanufacture and Reuse were also cited as marginal strategies also considered in the company.

Material/value flow map - Bel Albatros

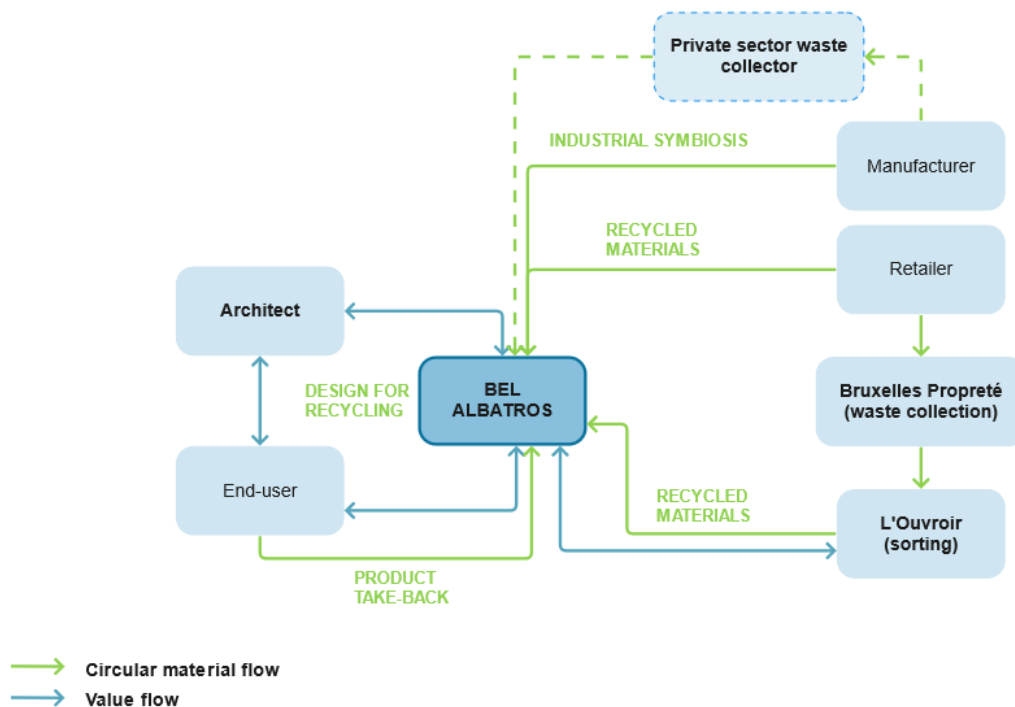


Figure 6: Material/value flow map of Bel Albatros

3.2 Circular strategies

As shown in figure 6, Bel Albatros applies multiple circular strategies: use of *recycled materials*, *industrial symbiosis*, *product take-back* at end-of-use and *designing products for circularity*. Each of the strategies is further explained below.

Recycled materials

Bel Albatros produces panels with 100% recycled materials, with no inputs of virgin material. Feedstocks are post-industrial or post-commercial waste. Mostly single material waste streams are used, and no further sorting is required, with the exception of post-commercial fashion packaging collected from retailers that requires in some cases manual sorting and always removal of labels.

Three types of plastics are used: HDPE, LDPE and PP. Other resins could be considered, but there are technical limitations due to the press, and processing temperature should not exceed 200 °C.

Industrial symbiosis

Thanks to the support of the Plastiwin cluster, Bel Albatros has access to a large number of Belgian plastic processing industries that provide their production waste (scraps, out-of-specs...) they will not put back in their own production cycles or obsolete samples has a raw material feedstock for Bel Albatros process.

Product take-back and design for recycling

The products of Bel Albatros are specifically designed for an easy recyclability at end-of-life. All panels are monomaterials. Plastics feedstocks are never mixed with any bulk additives that could prevent further recycling. Surface treatments that would modify the chemical nature of the material, such as paint or varnish, is also banned. Besides, the hot-pressing process used by Bel Albatros is supposed to induce less thermomechanical degradation of the plastics than other melt processing recycling processes, thus enabling a potential higher number of cycles.

The possibility of product take-back for a new recycling step is proposed to the customers. However, even if the end-of-use panel goes through a different waste collection system, the ease of recycling a monomaterial remains.

4. Circularity of operational activities

After assessing the circularity of the company's activities within its value chain, a more detailed assessment of the circularity of the company's operational activities is done. A visualisation of the operational process is presented, together with its adopted circular strategies.

4.1 Operational process map

To get a better understanding of how the company's operational activities are affected, an overview of the process is made, see figure 7. This includes circular sourcing of materials, the production process and quality assurance of products. Each of the steps will be further explained below.

Operational process map - Bel Albatros

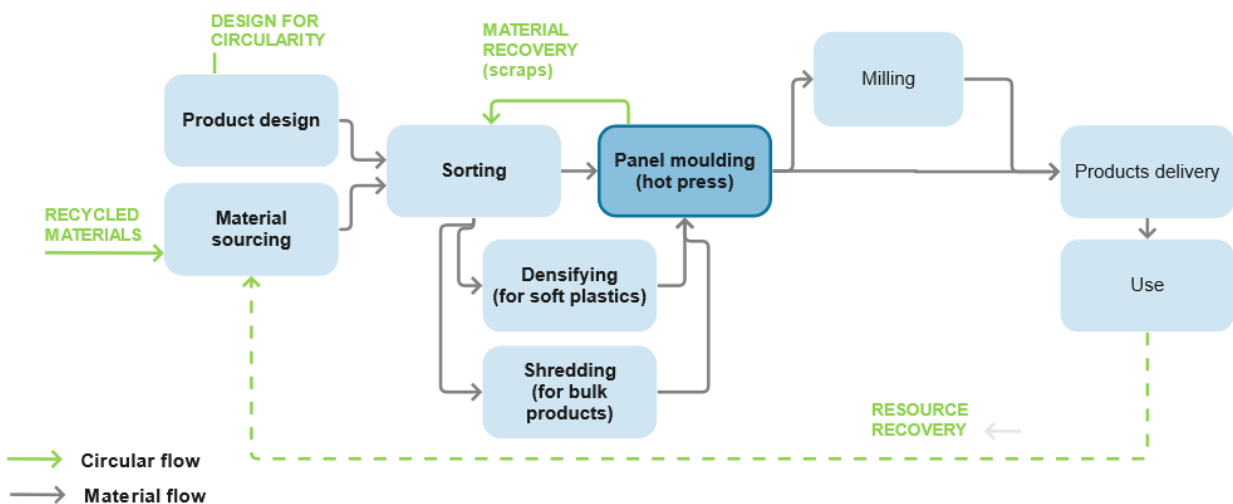


Figure 7: Operational process map of Bel Albatros

4.2 Circular sourcing and design

Product design

The design of the panels is decided in concertation with the customer. When desired colours are not available the library, then Bel Albatros tries to look for a plastic transformer that may have scraps of this particular colour. However, the clients are usually not very demanding about colours; they usually want the product to “look” recycled, and small imperfections may be considered assets.

Material sourcing

Recycled material come from different sources: post-industrial waste, obsolete samples, or post-commercial packaging waste.

Specific and homogeneous waste batches are obtained that do usually not require sorting steps. Coloured masterbatches are stored separately to be used for bespoke coloured compositions of panels.

To control the colour of final product and avoid a greyish aspect, the use of these masterbatches is crucial, but also the rest of incoming waste matters, especially when inks were used for the first use life of material.

“The grey coloration problems with recyclates mostly come from the ink used on the bags to advertise their recyclability...”

- Grégoire Hupin, Bel Albatros

Feedstocks are obtained under different forms (pellets, bulk products, films...) that may or not require a physical or thermos-mechanical pre-treatment for being processed with the hot press.

The quality of material received is so far always good enough for the application and the subsequent operations (milling, sawing...). However, Bel Albatros has rarely a very accurate knowledge of the quality of the materials and does not have equipment for measuring properties. The received batches are always identified, but not with detailed datasheets. The technology used is however robust and can deal with impurities easier than injection moulding.

4.3 Production process

The production process starts with pre-treatment of the feedstock, followed by hot-pressing of a panel. Further finishing steps (polishing, milling...) can be applied depending on the application requirements.

Shredding

Bulk products have to be shredded to the size of pellets. Though a large scale equipment suitable for large bulk products is still a pending investment, Bel Albatros already has a shredder that can be used for small parts of rigid plastics (figure 8).



Figure 8: Shredder (left) and extruder (right) for waste pre-treatment

Densification

Soft plastics waste such as packaging films or beverage straws need a pre-treatment densification process to obtain the material under a pellet-like form suitable for the main production process. A single screw extruder is used for that purpose, that has a throughput of 50 kg/h (figure 8).

Panel moulding

Pellets and shredded materials are placed on the surface of the press in a floating frame, then heated for melting and hot-pressed. After primary cooling the panel is removed and put for further cooling in a second cold press so that a new panel can be pressed. Depending on the colours of pellets and their spreading on the surface, different types of marble-like patterns can be obtained, as exemplified in figure 9.

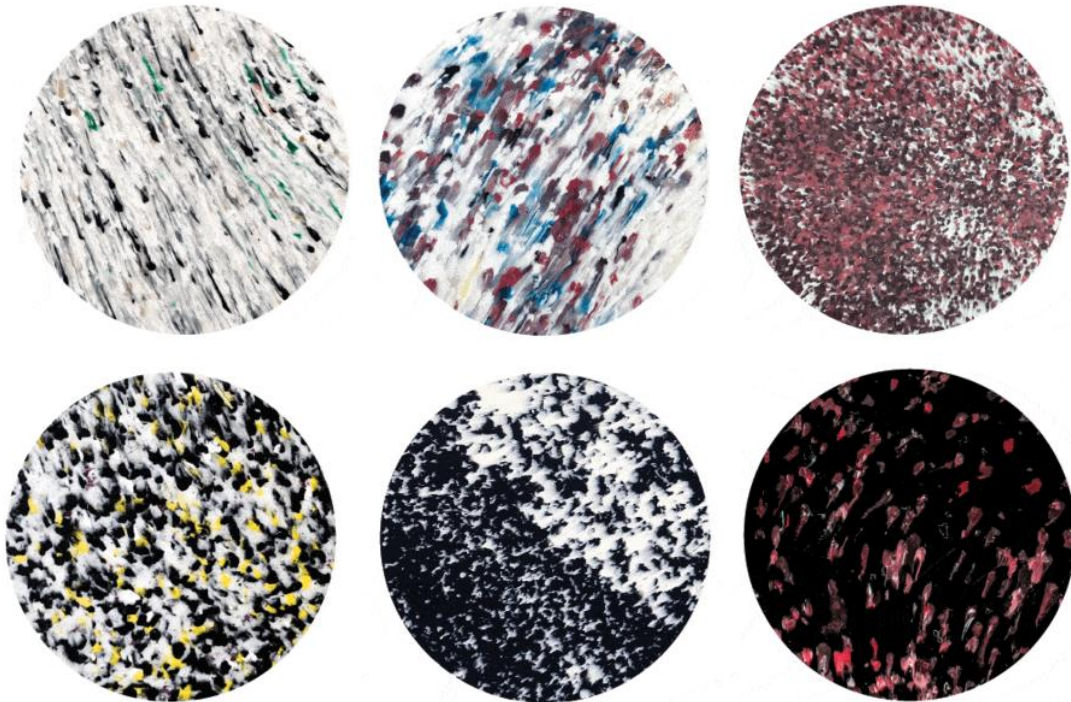


Figure 9: Some examples of panels – Bel Albatros

Finishing and forming post-treatments

Depending on the requirements of the application, different finishing and forming treatments can be applied, that do not require additional material to be added according to the philosophy of Bel Albatros to ensure that the monomaterial products will be further recyclable. All panels can be polished, sawn, milled by CNC, heat-formed... to achieve the shapes required by the design. These steps are more difficult with PP, therefore PE is preferred for production.



Figure 10: Sawn and milled elements of a dinghy.

4.4 Quality assurance

Quality control

Quality control is only a visual control for the moment. Fire certifications will soon be obtained, since they are necessary for some markets. For the moment, though the products may not be 100% compliant with all regulations, since it is new and sustainable, there is a general will to help the business start, and no one wants to put a spanner in the works.

5. Conclusion and recommendations

Based on the outputs derived from all three interviews with Bel Albatros, strengths of the business model and operational process regarding circularity are identified, barriers and enablers for circularity are summarised, and opportunities for circularity are described.

5.1 Strengths for circularity

A strong aspect in the model of Bel Albatros is to produce at a local scale 100% recyclable products with 100% recycled material. Waste as feedstock is collected from local businesses, shops or industries, directly or through a waste collecting organisation.

The production process is robust and does not involve high levels of thermomechanical degradation that would prevent the products to be further recycled. The marble aspect obtained by the process is attractive for designers as each panel is unique.

The market trend for such products appears to be promising, with a significant growth observed for competitors in other NWE countries (FR, UK) in the recent past.

5.2 Barriers and enablers for circularity

The main barriers and enablers for the circular business of Bel Albatros are listed in table 3 below.

Table 3: Barriers and enablers for enabling circularity at Bel Albatros

Barriers	Enablers
<ul style="list-style-type: none"> • Investment support for second-hand machinery is hard if not impossible to find. • Properties and composition of waste feedstock may not be well identified, for example difficulties were faced with flame-retardant additives not clearly mentioned. • Better incentives for purchasing recycled materials, e.g. lowered VAT, should be put in place by public authorities to promote recycled products. • Logistic issues may arise because materials come in various packaging forms. For the time being however it remains easy to deal with it. • Sometimes difficult to have the access to some waste flows for preliminary tests when those are controlled by public waste management organisms; the human factor is the barrier here because you have to find the right person that will accept to deal with “outside-the-routine” solicitations. • Coaching programs for circular initiatives in Belgium mainly focused on business issues, where technical support would also be useful. 	<ul style="list-style-type: none"> • Products designed for further circularity • Proximity with key partners and waste suppliers • Trend of growing demand for circular products • Though the product is mainly sold for its circularity, it has anyway excellent performance. • Suppliers and customers already conscious of recycling issues, no need to educate them. • Good availability of circular materials, suppliers are not reluctant to long term supply agreements. • Good coaching programmes and challenges for circular initiatives in Belgium.

5.3 Opportunities for circularity

The mission of Bel Albatros from its inception is to be circular, to work only with recycled materials and to produce only recyclable goods. Everything in the business model and in the operation process is meant with a circular philosophy, including the will of using second-hand machinery and reused packaging for supplies or expedition when needed.

However, some opportunities for enhanced circularity may remain, and are suggested hereunder.

Product take-back and resource recovery

Product take-back is already proposed to customers. A specific business model including take-back could be considered and marking of the products could facilitate take-back or recycling through general bulk waste treatment system.

Access

Other options for implementing circular strategies includes product *access*, in which consumers and/or customers only use (access) the product, instead of owning it. Bel Albatros could then stay the owner of the product, which not only helps to ensure product take-back, but will also make them responsible for maintenance and EOL options (e.g. to make sure product actually gets recycled). This could however be difficult to implement for products where much post-treatment has been done and could be reserved for large panels used as worktop or wall decoration.

Remanufacture or refurbishment

End-of-use products, especially collected in an access system, that would only be partially damaged can be used with milling / cutting as parts for furniture (tabletop, stool...) or in other design applications.

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About the project

The problems associated with plastic waste and in particular its adverse impacts on the environment are gaining importance and attention in politics, economics, science and the media. Although plastic is widely used and millions of plastic products are manufactured each year, only 30% of total plastic waste is collected for recycling. Since demand for plastic is expected to increase in the coming years, whilst resources are further depleted, it is important to utilise plastic waste in a resourceful way.

TRANSFORM-CE aims to convert single-use plastic waste into valuable new products. The project intends to divert an estimated 2,580 tonnes of plastic between 2020 and 2023. Two innovative technologies – intrusion-extrusion moulding (IEM) and additive manufacturing (AM) – will be used to turn plastic waste into recycled feedstock and new products. To support this, an R&D Centre (UK) and Prototyping Unit (BE) have been set up to develop and scale the production of recycled filaments for AM, whilst an Intrusion-Extrusion Moulding Facility, the Green Plastic Factory, has been established in the NL to expand the range of products manufactured using IEM.

Moreover, the project will help to increase the adoption of technology and uptake of recycled feedstock by businesses. This will be promoted through research into the current and future supply of single-use plastic waste from municipal sources, technical information on the materials and recycling processes, and circular business models. In-depth support will also be provided to a range of businesses across North-West Europe, whilst the insights generated through TRANSFORM-CE will be consolidated into an EU Plastic Circular Economy Roadmap to provide wider businesses with the 'know-how' necessary to replicate and up-scale the developed solutions.

Lead partner organisation

Manchester Metropolitan University

Partner organisations

Materia Nova

Social Environmental and Economic Solutions (SOENECS)

Ltd

Gemeente Almere

Save Plastics

Technische Universiteit Delft

Hogeschool Utrecht

Hochschule Trier Umwelt-Campus Birkenfeld Institut für angewandtes Stoffstrommanagement (IfaS)

bCircular GmbH

Countries

UK | BE | NL | DE

Timeline

2019-2023