Case study report - Vinventions

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 Vinventions, 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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Deliverable WPT3 D2.1 Benchmarking existing circular economy (CE) business models

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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

A short overview of Vinventions is given in table 1.

Table 1: *Overview of company*

Topic	Information
Company name	Vinventions
Website	https://www.vinventions.com/
Country	Belgium
Size of company (0-10, 10-200, 200-500, 500+ employees)	200-500
Mission/vision	"To be the most innovative, durable and reliable closure solution supplier in the industry for still and sparkling wines" "Helping wine producers and marketers to offer wines that meet their expectations, while ensuring their customers' satisfaction and being recognized on the market"
Product category	Wine closures
Production/operational process	Extrusion and finishing processes
Used materials	- Biobased PE from sugar cane (Nomacorc Green Line) - Fossil-based PE (Nomacorc Red Line) - Cork (Sübr, Ohlinger) - Recycled-based LDPE (Nomacorc Blue line)

1.3 Case study process

The case study has been carried out between May 2021 and July 2021. The case study process is structured in four steps[1], 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. Three interviews were 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 Vinventions.

Table 2: *Overview of interviewed people*

	Interviewed person	**Function**
Interview 1: Circularity of business model	Denis Van Roey	CEO
Interview 2: Circularity in the value chain	Meredith Ghysen	Global Sustainability Manager
Interview 3: Circularity of operational activities	Frederic Gregoire	Head of Global Operations

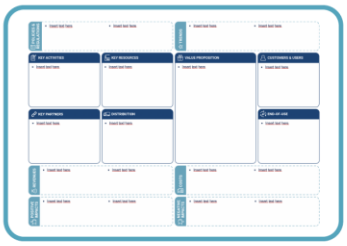
1 We make grateful use of insights and methods derived from previous research, in particular the case study method of R2π (2017, 2019), the work of Circulab (2020) and the Ellen MacArthur Foundation (2017, 2019). TRANSFORM-CE case studies' methodology and templates were developed by TRANSFORM-CE partner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

INTERVIEW 1 BUSINESS MODEL CIRCULARITY

INTRODUCTION

- Who is the company?
- What is its mission?
- What kind of products are manufactured?

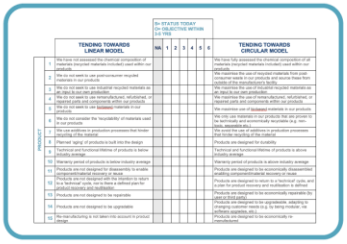
UNDERSTAND CIRCULAR BUSINESS MODEL



- Map out business context
- Map out (circularity of) business model
- How does the BM deviate from other (linear) BMs?

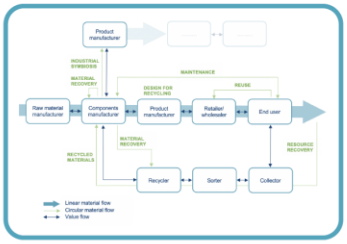
INTERVIEW 2 VALUE CHAIN CIRCULARITY

ASSESS CIRCULARITY



- Assess current circularity state and objective
- Identify aspects that may need attention

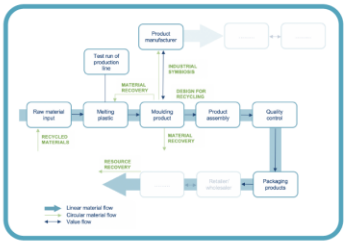
VISUALISE MATERIAL/ VALUE FLOW



- Map out material/value flows
- Discuss applied circular strategies
- Identify opportunities for further enabling circularity

INTERVIEW 3 OPERATIONAL CIRCULARITY

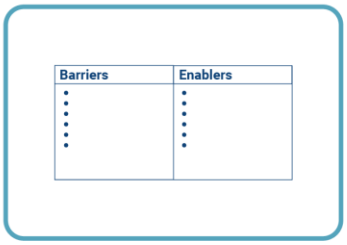
VISUALISE OPERATIONAL PROCESS



- Map out production process
- Understand circularity of operational activities

CONCLUSION

IDENTIFY STRENGTHS & OPPORTUNITIES



- Present wrap-up of results
- Identify strengths for circularity
- Summarise barriers and enablers
- Determine opportunities for further enabling circularity

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). This study focuses more particularly on the new Blue Line range of Vinventions, that uses recycled LDPE as raw material.

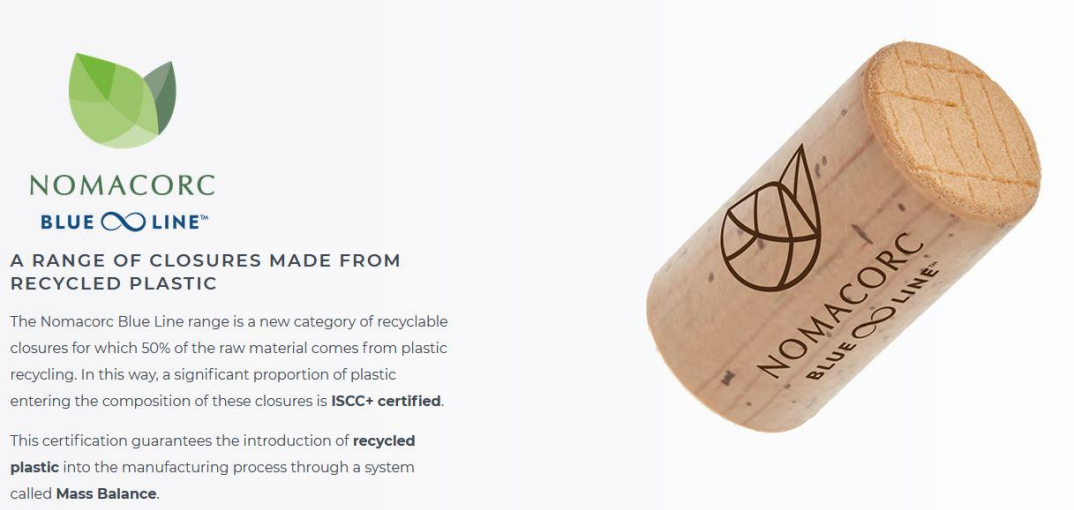


Figure 2: *Nomacorc Blue Line – from Vinventions' website*

2.1 Circular business model canvas

The circularity of the business model is investigated by using a circular business model canvas (CBMC). This model was created for the purpose of the TRANSFORM-CE case studies to show how the company creates, delivers and captures value, highlighting circularity aspects of the business. The CBMC of the Blue line range of Vinventions is visible in figure 3 and a description of each element is given below.

Circular Business Model Canvas - Vinventions

Policies & regulations

- European and french regulations on the use of plastics.
- Food contact skills
- Packaging waste
- Intern policy Corkloop (conversion of non conformity into new closures)

Trends

Three closure solutions are rising trends in the world wine closure market:
→ Screw caps
→ Wine boxes
→ Synthetic closures

Key activities

→ Processes
-Co-extrusion process
-Finishing processes (chamfering and embossing)
-Decoration processes

→ Sustainable approach
- Minimization of water in the processes
- Use of renewable energy
- Reinjection of non conformity products into production line

Key resources

→ Materials: Recycled LDPE and virgin LDPE, TPE.
→ Packaging: Plastic bags of 1000 closures, cardboard

→ Machines:
* Co-extrusion machines
* Chamfering machines
* Embossing machines
* Printing machines

-Intangible resources: know-how of the advanced recycling, patented co-extrusion process...

Value proposition

→ Wine closures solutions for wine producers and marketers

→ Nomacorc Blue Line range: new category of closures where 50% of the raw material come from a certified recycled plastic

→ 3 factors:
1) Performance
2) Design
3) Sustainable development

Customers & users

Customers: Mass retailers or wine producers

Users: Private individual wine consumers

Key partners

Collaboration with:
→ Plastic producer : advanced recycling of PE / raw material provider
→ Plastic transformer mechanical recycling of used stoppers into "low value" products

Distribution

Traditional distribution channel

Costs & Revenues

→ Most of the cost due to the raw material

→ The costs increase if the raw material is recycled PE

End-of-use
→ Collection: Collection procedure with Nicolas stores
→ Open-loop recycling: Partership with transformer(in Flanders) who recycles end-of-life closures into champagne buckets, goblets, plant pots...
→ Perspective: Increase the collection rate

Positive impacts

→ Limit plastic waste
→ Reduce CO2 emissions by avoiding plastic incineration
→ Reduce the use of plastic fossil feedstock

Negative impacts

→ Still using 50% of virgin plastic

Figure 3: *CBMC of Blue Line range of Vinventions*

Value proposition

Vinventions proposes wine closures solutions to help wine producers and marketers to offer wines that meet their expectations by ensuring that their customers are satisfied and that they are recognized in the market. Three factors are considered: performance, design, and sustainable development. The customer can choose the range of products he needs based on these three criteria.

The Nomacorc Blue Line range is a new category of closures where 50% of the raw material comes from a certified recycled plastic. Closures are made of LDPE foam surrounded by a TPE (thermoplastic elastomer) skin. The skin provides robust bottling performances and easy grip, with soft touch. The range meets the following criteria:

1) Performance: wine preservation up to 25 years, TCA- and fault-free, consistent, and controlled O_2 ingress, reliable bottling performance, easy opening and reinsertion.

2) Design: Natural woodgrain markings, soft-skin feel, premium and treatment.

3) Sustainable development: Made from recycled plastic, avoid plastic pollution, recyclable, using renewable energy in its production.

"Nomacorc Blue Line is the first Vinventions step towards a circular closure solution, 50% of the current raw material is replaced with certified recycled raw material.."

Denis Van Roey, CEO of Vinventions

Customers & users

Vinventions' customers are often mass retailers or wine producers. The logo of the client wine producer is printed on the closures. Users are private individual wine consumers.

Key activities

Recycled LDPE is mixed with virgin LDPE before the co-extrusion process. This co-extrusion process blends both centre foam (in LDPE) and exterior skin. This step makes it possible to obtain the shape of the closure. The closure then undergoes a finishing step: chamfering and embossing. Finally, the closure undergoes a printing step, which will be specific to the client company. Vinventions has adopted a sustainable approach in its activities:

1) Minimization of water used for cooling the co-extrusion process (1 drop / closure)

2) Reinjection of non-conformity products into production line (in the skin of the product)

3) Use of renewable energy (not yet 100% for Germany and USA production facilities, the target for 2030 is 100% renewable energy)

4) Reduction of bottles, wine, labels, and closures waste by warrantying wine quality thanks to oxygen control.

Key resources

The main resources in terms of machines are co-extrusion machines, finishing machines (chamfering and embossing), and printing machines. Furthermore, the reinjection of the production scraps requires a machine which remakes and re-granulates the material. Specific equipment is also required for quality control.

Closures are made of LDPE foam surrounded by a TPE skin. 50% of the closure's total weight comes from an ISCC+ certified recycled plastic. So, in terms of materials, the resources are recycled LDPE, virgin LDPE and virgin TPE. Recycled LDPE and virgin LDPE may come in the co-extrusion machine in form of pellets. Since no recycled TPE is available yet, the TPE used for the skin is virgin material for the moment.

Recycled LDPE comes from the advanced recycling of used plastics. Those are collected and sorted by the conventional collection systems and transformed by a recycling company through a thermal anaerobic conversion process in an oil feedstock that can be used as a raw material for polyolefins synthesis by plastic manufacturers. Recycled LDPE and virgin LDPE, since they are both synthesized from chemically similar monomers despite their diverse origin, can exhibit the very same properties.

Packaging and conditioning are also required resources. Indeed, the closures are sold to Vinventions' customers in large plastic bags of 1000, which are themselves placed in boxes on pallets.

Other intangible resources are requested, like the know-how for the advanced recycling of PE (suppliers), or the patented co-extrusion process.

Key partners

Vinventions is in collaboration with polyethylene producers who are pioneers in the advanced recycling and therefore provides the material to Vinventions to produce closures of the Blue Line range. Partnership with Beologic have also been established for end-of-life recycling of closures into champagne buckets, goblets, and plant pots. Another partnership will soon be established, for recycling the closures into returnable food storage containers for take-out catering.

"Our suppliers' circular polymer concept uses mixed end-of-use plastics as feedstock for manufacturing new virgin polymers to make new recyclable closures"

Denis Van Roey, CEO of Vinventions

Distribution

Wine closures are delivered through a traditional distribution channel, that is, directly to customers, or through distributors.

End-of-use

Collection:

Currently the closures are too small to be sorted efficiently in all the sorting centers. Vinventions develops a collection procedure with Nicolas's wine stores which will collect the closures and send

them to a manual sorting centre. Synthetic closures will there be separated from cork closures and then, will be returned to Vinventions for recycling.

"The issue of collection is one of the points on which we are working within the framework of our Corkloop program."

Meredith Ghysen, GSM of Vinventions

Open loop recycling:
Today, the collected closures are recycled in other applications. Vinventions has a partner in Flanders (Beologic) who recycles end-of-life closures into champagne buckets, goblets, and plant pots. Another partnership will soon be established, for recycling used the closures into returnable food storage containers for take-out catering.

Perspective: The first ambitions of Vinventions would be to increase the collection rate of end-of-life closures.

Costs & revenues
The raw material represents most of the production cost of the closures (about 80%). If the raw material is recycled, the cost increases further.

Policies & regulations
This activity is concerned by all European regulations regarding plastics. The products have to be compliant with food-contact regulations.

Trends
Synthetic closures are rising in the sector of wine; screw caps and wine boxes also are.

Positive and negative impacts
Because Vinventions uses 50% of recycled materials for production, the main positive impacts are limiting plastic waste, avoiding plastic incineration, and reducing the use of plastic fossil feedstock.

To improve the value proposition, the proportion of recycled material must increase. Furthermore, the collection system could be optimized. The use of plastic packaging creates also new sources of waste. The transport stage is not considered in the company's circularity approach. So, the vehicles used for transportation still run on fossil fuels.

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 are presented, together with its adopted circular strategies.

3.1 Material and value flow map

The 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 Vinventions is presented in figure 4. 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.

3.2 Circular strategies

As shown in figure 4, Vinventions applies multiple circular strategies: use of *recycled materials*, *material recovery* of their own production scraps, *product take-back* at end-of-use, *designing products for circularity* and *biobased materials*. Each of the strategies is further explained below.

Recycled materials
50% of LDPE raw material is recycled material from advanced recycling of post-consumer PE feedstock. Used plastics are collected and sorted by conventional collection systems, and then are sold to a recycling company who transform them into oil through a pyrolysis process. This pyrolysis oil is resold to manufacturers of (recycled) plastics. Recycled LDPE and virgin LDPE, both obtained by polymerization of building blocks of the same chemical nature, have the same properties.
It must be underlined that the recycled LDPE is purchased with a system of certificate. The ISCC+ certificate is based on the same principles than renewable energy certificates: it certifies the proportion of recycled material entering the process of the material supplier but does not guarantee that every atom of the purchased material actually comes from recycled plastic.

Product take-back
Vinventions offers customers the possibility to take-back products at end-of-life: Vinventions develops a collection procedure with Nicolas wine stores which will collect the closures and send them to a manual sorting centre, where synthetic closures will be sorted from cork closures. Synthetic closures will be returned to Vinventions for recycling. This flow will go to mechanical recycling and therefore will not be returned to Vinventions production process (mechanically recycled plastics do not comply with food contact regulations).

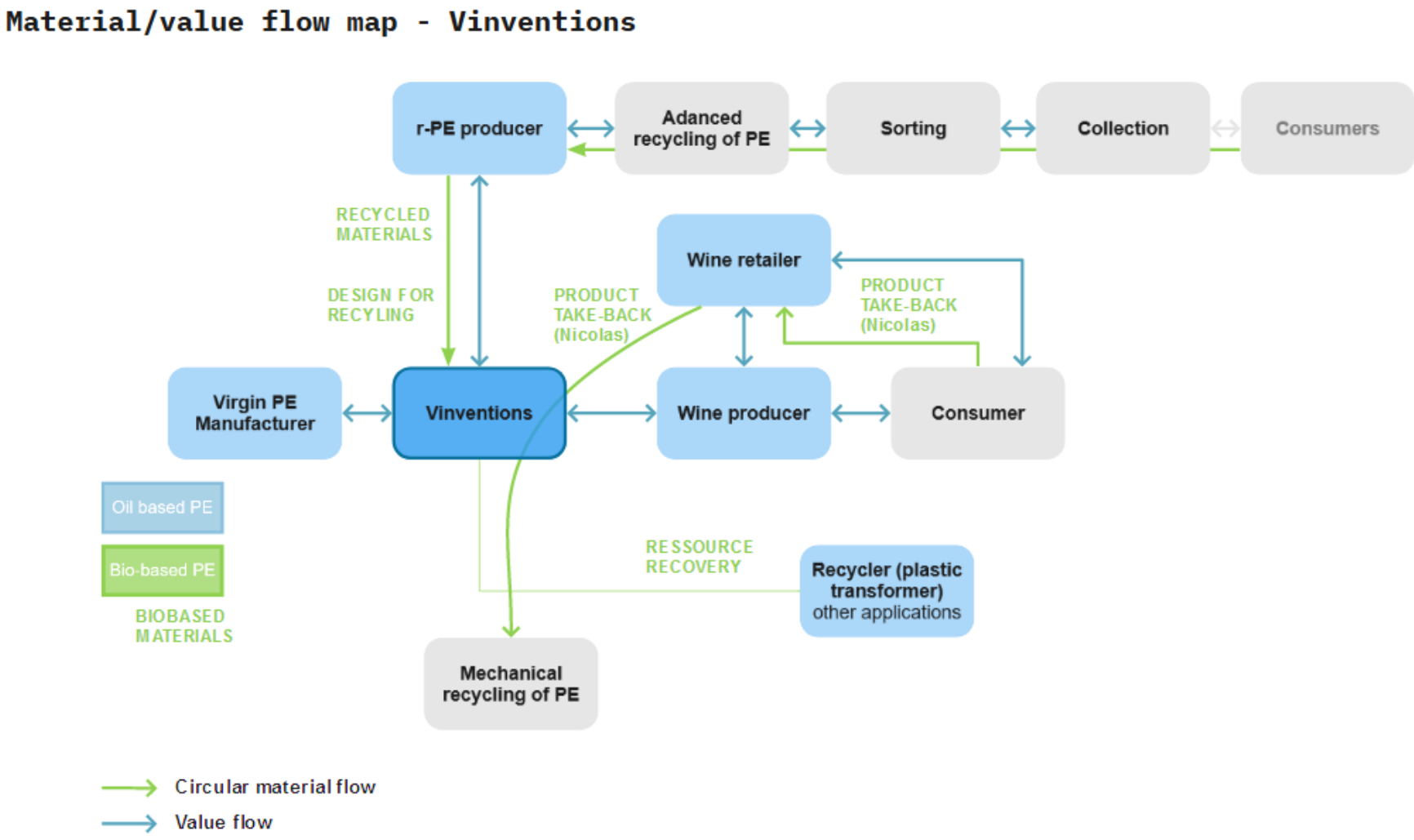


Figure 4: *Material/value flow map of Vinventions*

Resource recovery

Today, the collected closures are recycled in other applications. Vinventions has a partner in Flanders (Beologic) who recycles end-of-life closures into champagne buckets, goblets, and plant pots.

Design for circularity

The used closures by Vinventions are suitable for recycling.

Biobased materials

Vinventions also uses polyethylene from renewable resources (sugarcane) in its production process. This is obviously the case for the Green Line closures, but also may occur in the case of the Blue Line this case study particularly focuses on.

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 5. This includes circular sourcing of materials, the production process and quality assurance of products. Each of the steps will be further explained below.

4.2 Material sourcing

Virgin and recycled LDPE come from plastic producers. Recycled and virgin LDPE have the same properties. The cost of recycled LDPE is, however, more expensive than that of virgin (about twice the price). The recycled content of the purchased PE is guaranteed by the ISCC+ certificate. The material is received in the form of pellets with masterbatches. The pellets are mixed before the co-extrusion. It has to be noticed here that Vinventions also may use bio-based polyethylene (from sugarcane) in this production process.

4.3 Production process

The production process starts with a co-extrusion process, followed by the cooling, the cutting, the finishing processes, the printing, the treatment, the quality control, the packing of the products and the product sale.

Co-extrusion process, cooling, cutting.
The patented co-extrusion process consists of two stages. First, raw materials are mixed, melted, and extruded to create a long, foamed cylinder in LDPE, forming the closure's core. Then a second extrusion process applies a flexible outer skin consisting mainly of TPE, which is thermally bonded to the inner cylinder. The shape is stabilized in cooling water before high-speed cutting operation cuts the closures to the proper length. The technology is a continuous process which ensures complete bottle-to-bottle consistency and performance. The products consist of an inner foam core which allows predictable and defined oxygen ingress rates and an outer skin material that ensures smooth extractions, reinsertions and trouble-free bottling line performance. So, the co-extrusion technique is different depending on the desired mechanical properties, the desired oxygen exchange and the level of aesthetics and pigmentation of the closures.
Productions scraps are granulated and reinjected in the process, where it is used for the skin part.

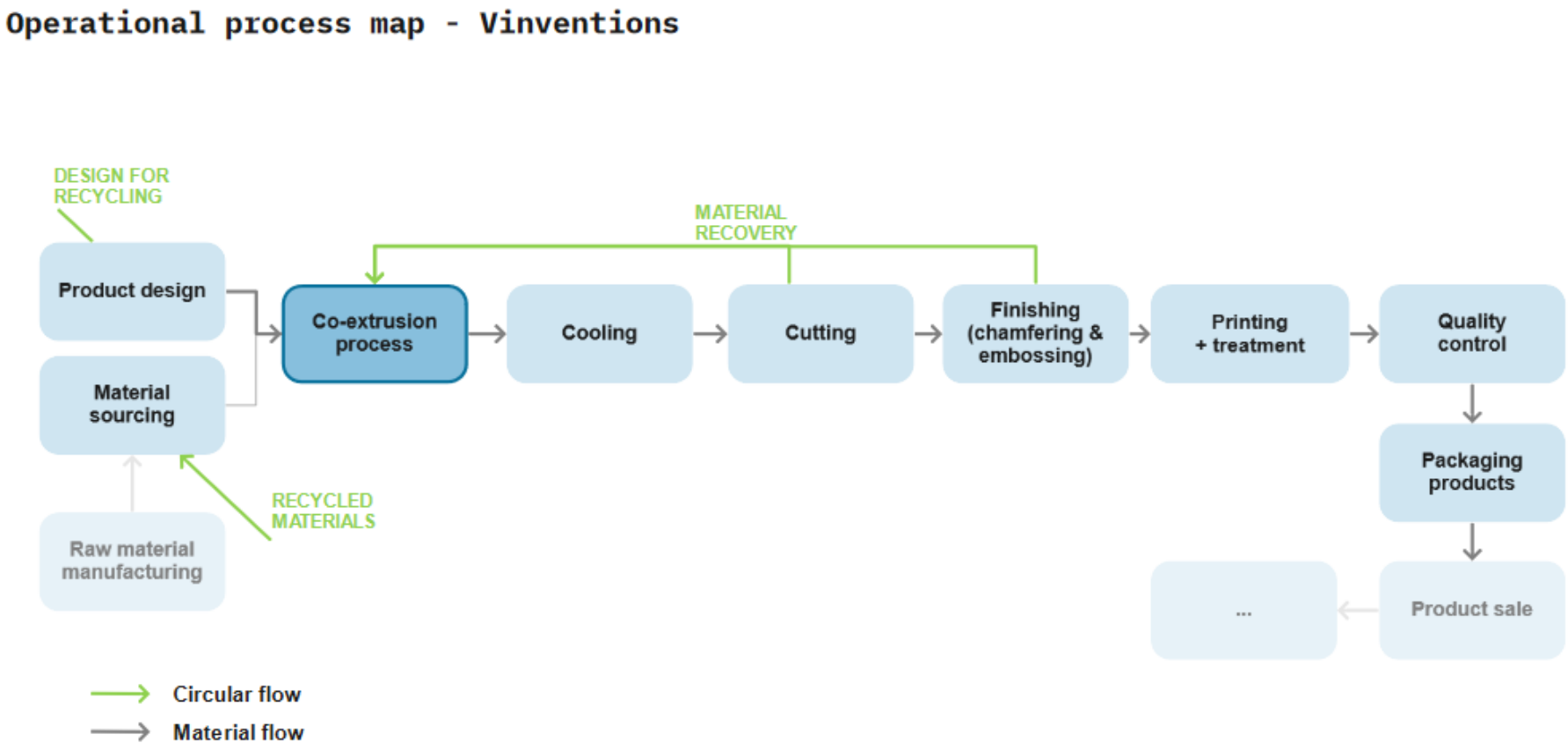


Figure 5: *Operational process map for Blue Line closures - Vinventions*

Quality control
The closures pass a quality test to check the dimensional consistency of length, diameter, and ovality. The quality control plan is the same as for closures incorporating only virgin LDPE, since functional requirements are identical.

Finishing processes
The chamfering step removes a small portion of material from the edge of the closure to facilitate bottling. The embossing step allows to dress both sides of the closure to give it a natural appearance.

Printing and treatment
The next step is to print the customer's logo on the cap. The treatment phase removes dust from the closures to facilitate bottling.

"Closures that have already been printed cannot be re-injected into the production process. They are therefore resold as raw material."

Frederic Gregoire, HGO of Vinventions

Packaging products & product sale
The closures are sold to Vinventions' customers packed in large plastic bags of 1000, which are themselves arranged in cardboard boxes on pallets**.**

5. Conclusions and recommendations

Based on the outputs derived from all three interviews with Vinventions, 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

The use of recycled material does not change the production processes because the recycled LDPE has exactly the same properties than virgin LDPE. Thus, the use of recycled material does not imply any additional cost in terms of production processes. Furthermore, the product is designed to be 100% recyclable. Vinventions works closely with its customers. As a result, a collection procedure could be put in place at wine producers, as is already the case with Nicolas' stores. Finally, more and more wine producers and consumers are sensitive to environmental issues, so the use of recycled material can be a selling point.

5.2 Barriers and enablers for circularity

Because of the uncertainty of availability of recycled LDPE, Vinventions must constantly seek new companies to obtain sufficient material for their products. Furthermore, the price of the recycled LDPE is higher than the virgin LDPE. Regarding the end-of-life, Vinventions offers consumers the possibility to take-back products to the wine producers. However, consumers are likely to throw end-of-life closures into the household garbage bins, and not return them to Vinventions customers.

"The problem with advanced recycling and the resulting polyethylene is that the available volumes are very low and do not meet our demand. "

Frederic Gregoire, HGO of Vinventions

***Table 3**: Barriers and enablers for enabling circularity at Vinventions*

Barriers	Enablers
• Uncertainty of availability of recycled LDPE. • Time to find companies that produce recycled LDPE • High price of recycled LDPE • Difficulties in collecting end-of-life closures from consumers	• Recycled LDPE has the same properties as virgin LDPE. • Closures are 100% recyclable. • Taking responsibility for the end-of-life of the products. • Works closely with customers • Customers and consumers are looking for responsible packaging

5.3 Opportunities for circularity

The options offered by Vinventions are completely different from a linear business model. However, there are still some opportunities for the company to further enhance circularity. Vinventions also recognises this and is actively working on further enhancing circularity. Vinventions objective for 2030 is that 100% of the production will be circular and/or biobased and/or biodegradable.

Increase in the proportion of recycled material in the product

Currently, 50% of the product's raw material is recycled LDPE. From a technical point of view, there would be no obstacle to rising the recycled fraction of LDPE up to 100%. However, the availability of recycled LDPE is very uncertain.

Step up our efforts in efficient waste collection

One of the biggest challenges for Viventions is ensuring that end-of-life closures are collected. Vinventions developed collection partnerships with Nicolas wine stores or associations such as France Cancer or Agir Cancer Gironde, for collecting the closures and sending them to manual sorting centers. Synthetic closures will there be separated from cork closures. Synthetic closures will be returned to Vinventions for recycling. Collaboration is sought with large distribution chains to also set up a collection system from consumers.

Adopt a circular approach in the packaging and conditioning of the product.

The closures are currently sold to Vinventions' customers packed in large plastic bags of 1000, which are themselves arranged in cardboard boxes on pallets. The packaging is something the company wants to work on to no longer use these plastic bags.

Improve the formulation of production scraps

Re-injection of the production scraps cannot be done in the foam for reasons of loss of mechanical properties. Vinventions are considering improving the formulation of production scraps in order to re-inject them into the foam and not just into the skin.

Reduce the environmental impact on the transport

The transport stage is not considered in the company's circularity approach. So, the vehicles used for transportation still run on fossil fuels. Electric vehicles could be an option in the future.

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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 pilot plants will be set up, one in Almere (NL) and one in the UK. The plants will make use of two innovative technologies – intrusion-extrusion moulding (IEM) and additive manufacturing (AM) – to turn plastic waste into recycled feedstock and new products.

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

www.nweurope.eu/transform-ce