Roads to INNOVATION

2019 EDITION

#8

Editorial

Circular Economy: Let's change of an Era!

Alain CLAUDOT,
Managing Director of Eco TLC

This eighth edition is highly symbolic. The number 8 represents two intertwined loops that form an infinite track. The Roads to Innovation focus on identifying and putting forward the initiatives that open the way for a constant improvement of know-how.
Innovation means the conception of a new product, a new service, new manufacturing or organizational processes that can directly be implemented into the economy to meet the needs of the citizens.

To innovate through circular economy means improving the use of the resources as a whole, wheter they are financial, natural or human.

Circular economy for CLF (Clothing, Linen and Footwear) represents several fields of action and we support projects that cover all those stages:

1. The CLF is eco-designed to use less resources all along their life cycle (from production to transformation into a new material);

2. The users of the CLF know the environmental impact of the resources used, they use and take care of the products accordingly;

3. The lifespan of the CLF is studied to be extended as much as possible thanks to repair;

4. The use does not necessarily involve buying new articles, but also buying second-hand products, swap, multiple ownership, borrowing, renting...

MAPPING
PICTURE OF TEXTILE AND FOOTWEAR RECYCLING
PAGES 4 AND 20

OVERVIEW
44 R&D PROJECTS SUPPORTED BY ECO TLC
PAGES 26 AND 27

ECO TLC
L'éco-organisme du textile • du linge • de la chaussure

This document is available in French

Alain CLAUDOT
Managing Director of Eco TLC
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The Roads to Innovation focus on identifying and putting forward the initiatives that open the way for a constant improvement of know-how.

5. When the CLF are no longer reusable, it is effortlessly dismountable and its components can be reused or recycled;

6. The recycling of the CLF and its components is thought and prepared from the outset so that the materials can be reintroduced in the production of new CLF (closed loop recycling);

7. The materials from the dismantling of Textiles and Footwear also become available for all the industries who, thanks to circular economy, are prone to substitute virgin material by recycled material (open loop recycling);

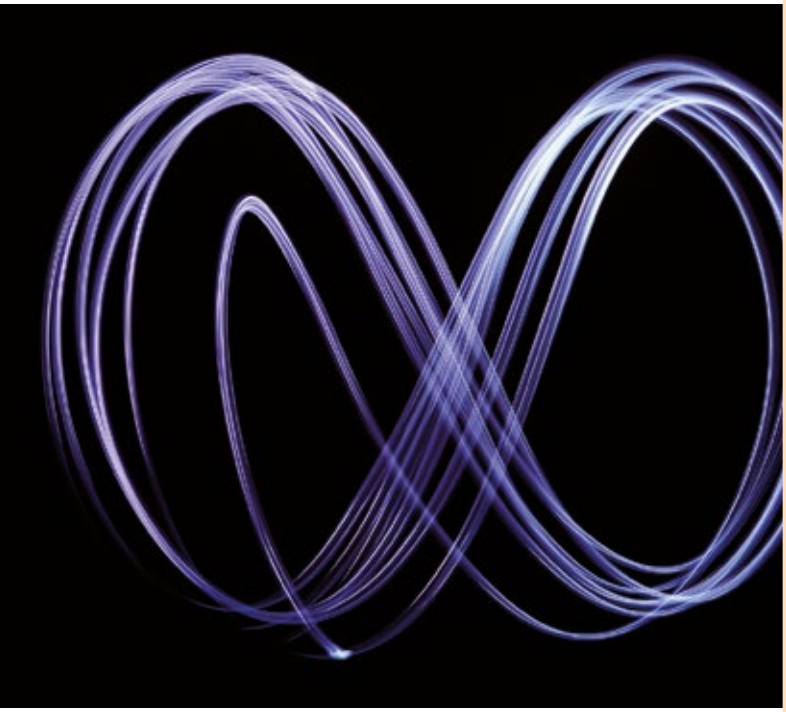
8. The multiplication of the recycling applications of the components, including into energy resource, increases the creation of value and optimizes the quantity of resources generated and regenerated.

You can find the details of those projects in the overview pages 26 and 27.

This year, the CLF sector is at crossroads between the two infinite loops of the 8: one for the reuse of the products and the other for the recycling of materials into new ones.

We are convinced that supporting innovation and mobilizing all the parties involved into the co-construction of solutions are the essentials levers that will allow us to successfully complete this transition.

In that respect, a single watchword for all the committed actors of the sector: **Circular Economy: Let's change of an Era!**



Summary

Textile & Footwear: two problematics

For this 8th edition of our magazine The Roads to Innovation, we have decided to present separately Textiles (Clothing and Linen) and Footwear topics. As a matter of fact, there are major differences between these 2 families of products.

To illustrate these discrepancies and better understand the specific issues of these two categories, you will find in this issue the following elements:

- The scheme below highlights the dissimilarities between textiles and footwear from their market entry to their end-of-life management,
- A mapping of products made from recycled post-consumer textiles (see p. 4 and 5),
- A 4 pages brief about footwear (see p. 20 and 21),
- An overview of the 44 projects supported by Eco TLC since the creation of the Call for R&D projects in 2010 (see p. 26 and 27).

IN 2018: MARKETED ITEMS

Textiles (Clothing & Linen) **81%**

624,000 tons

Footwear 19%

A part is stored in our wardrobes

A part is thrown in the garbage bin

38% OF TONNAGES COLLECTED

Textiles (Clothing & Linen) **94%**

i.e. **239,000** tons

Footwear 6%

224,600 tons

14,400 tons

THEIR SECOND LIFE*

Reuse 56%

Second life of Textiles

Elimination 1%

SRF* 9%

Fraying 24%

Cutting 10%

Recycling and Energy recovery 43%

Second life of Footwear

Reuse 85%

Recycling, SRF, Elimination 15%**

Estimations drawn from the figures of Textiles & Footwear combined

***SRF: Solid Recovered Fuel*

Mapping of products made from

SECTION 1:
Materials preparation stages

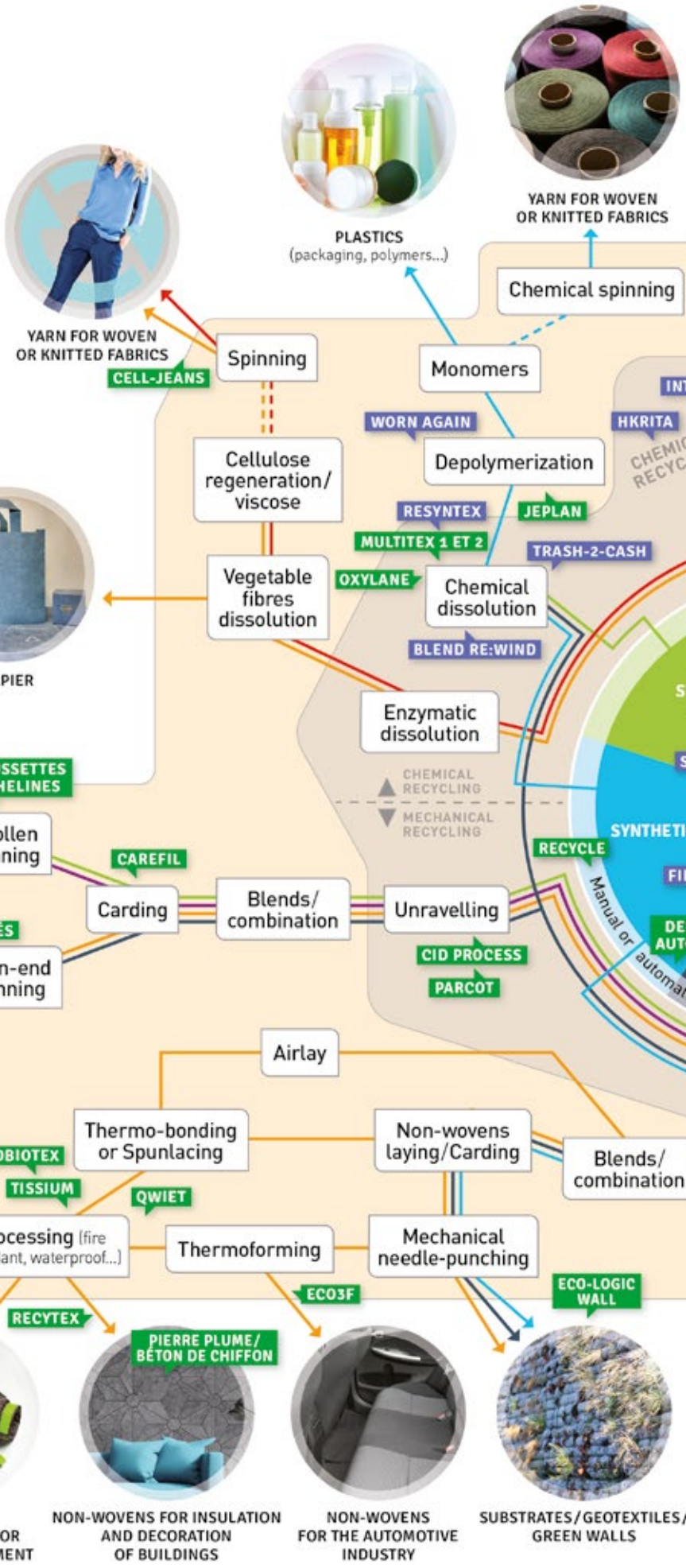
SECTION 2:
Materials integration processes

→ Product examples

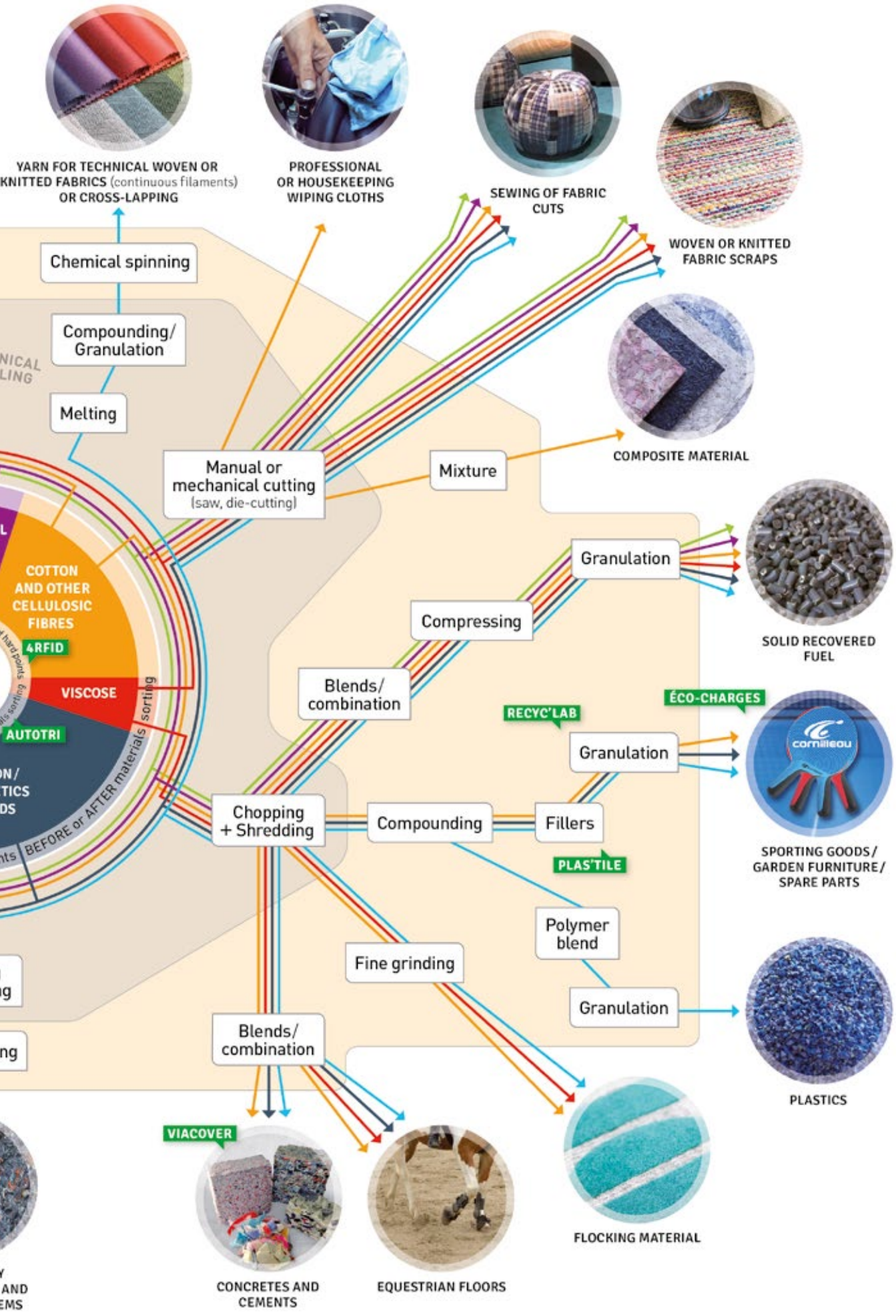
Sorted materials:
- Wool/synthetics blends
- Wool
- Cotton and other cellulosic fibres
- Viscose
- Cotton/synthetics blends
- Synthetics

PROJECT
R&D projects supported by Eco TLC

PROJECT
Other research projects on recycling textiles



recycled post-consumer textiles



NEW PROJECTS

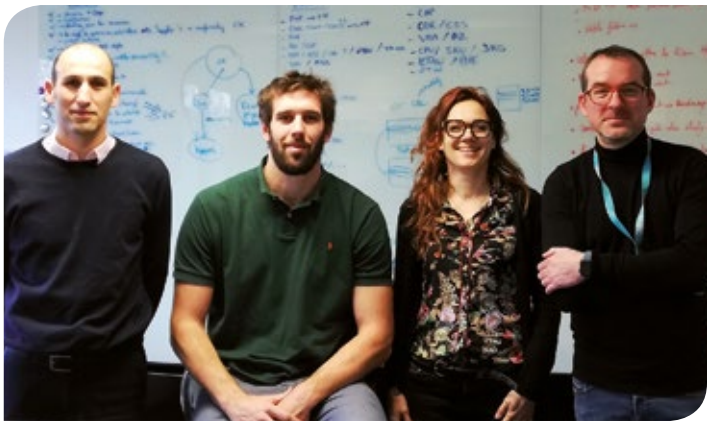
A mobile phone case made from recycled textiles

INTERVIEW

Isabelle DAYDE
Head of textiles purchasing group © Auchan

Auchan RETAIL FRANCE

Project: RECYC'LAB



On the group picture from left to right: Halim MEBARKIA, Head of Telco Market / Internet of Things - Hugo Mazur, Development engineer at Qilive - Isabelle Dayde, head of In Extenso purchasing group - Geoffroy Hulot, Head of Product Design & Engineering at QILIVE. © Auchan

How did your project get started?

In the spring of 2018, Auchan carried out a major social corporate responsibility project, which focussed on three main issues: water conservation, zero waste and recycling. It was in this context that the 4-person team at Auchan Retail, which has its own "In Extenso" label, considered not only issues relating to eco-design but also those concerning end-of-life products, a significant problem in recycling. We observed that recovery of post-consumer textiles was today mostly by way of downcycling, producing flock for insulation, for example. So we were looking for solutions to turn post-consumer textiles into a product of value, which if possible provided an alternative to virgin plastic. It has become the primary goal of our project. One of the strengths of our group is that it is home to a variety of specialists. So we came up with the idea that these post-consumer textiles could be re-used as a replacement for plastic at one of the electronics or luggage firms department of the group. My colleagues in the electronics division were enthusiastic and we decided to try and create cases for mobile phones in the first instance that would be designed from recycled textiles and sold in stores.

How do you intend to proceed?

We have had a meeting with Roctool, the plastics manufacturer, whose machinery allows the moulds to be heated using induction for thermoforming of the material. We presented our project to them. Roctool already has a mould for a phone case and is keen on the idea of conducting these tests using alternative materials. So we are going to carry out these trials soon once the unwoven raw materials have been selected at Minot Le Relais. We aim to work on three sources of post-consumer textiles: 100% cotton, but we already know that in this case it will be necessary to add a binder (a bio-based resin – PLA*), materials in a cotton and synthetics blend and 100% synthetics. We will see if the binder is still needed then. It will allow us to determine the appearance and the physical properties of the products. Roctool is going to be assisting us in establishing the potential for improvement and any new tests that may prove necessary. After that we will conduct an industrial viability study. The idea is to have prototypes and responses regarding the commercial viability of the project ready by December 2019: the price of the raw material, costs for the technical implementation and production, sales price and profitability thresholds depending on the quantities produced and sold. We are full of enthusiasm and have plenty of ideas for developing this potential new material!

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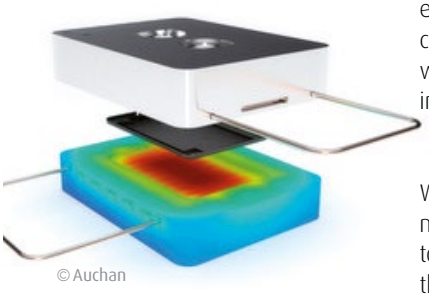

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PROJECT AT A GLANCE

GOAL: Recovering and re-using fibres from end of life clothing in protective cases for mobiles using the Roctool thermal induction process

YEAR OF PROJECT SELECTION: 2018
DURATION: 12 months

LEVEL OF SUBSIDIES FROM ECO TLC: €18,225

TYPE OF CLF COVERED: Cotton and synthetic textiles

© Auchan

**PLA: Polylactic acid*

A machine for removing hard point automatically

Project: **AUTODELISS**

INTERVIEW

Thierry LE BLAN
Sustainable Development Engineer
© CETI

What is hard points removal and how did your project get started?

Hard points removal is the name given to the process during which the disturbing elements termed "hard points" (buttons, zips, seams) are extracted from post-consumer clothing for the purpose of recycling. At present, removal of hard points is only done by hand, which is far too slow and expensive. So we need to find a solution for automating this so that the process can be done on an industrial scale. The goal of the "Deliss" project, which we undertook with the ICAM school of engineering and with support from Eco TLC, was therefore to assess the feasibility of a machine that would automate this process. This initial project allowed us to conduct a review of existing automated solutions for the three steps in hard points removal: detection of the hard point, cutting around the hard point and extracting the hard point. The aim of this new "Deliss 2" project is now to progress to the specific engineering phase of the machine, which will automate this removal of hard points.

What will it involve?

During last year's investigation, we identified a specific problem that we will need to overcome: the issue of seams in the clothing. The first phase in this new project will involve determining to what extent it is necessary and possible to remove seams from post-consumer clothing for the purpose of recycling them. We are starting by conducting tests in Laroche's test chamber: we take half of one batch of clothing and retain the seams and remove the seams from the other half batch by hand. Each batch then undergoes garnetting in order to analyse the quality of the garnetted stock that we obtain. This is the first phase in the project. We hope, as do all the project partners (Eco TLC, ICAM, Decathlon, TDV and Laroche), that the results will lead to us retaining the seams, since we established in the Deliss project that if there were machines for removing the hard metallic points, it is far more complicated for seams.

What will the next steps involve?

The second phase will involve identifying machinery manufacturers that are capable of designing a machine for removing hard points automatically. This will be relatively straightforward, if it is only a question of removing the metallic hard points, but we are less optimistic about the possibility of designing a machine within a short time that has the capacity to remove seams as well. The third phase will see completion of the exact specifications for this machine, the goal is to automate as many steps as possible in order to keep manual handling to a minimum. The fourth and final phase will involve testing the prototype of the machine.

What is your long-term goal?

If all goes well, between now and next autumn, the project should lead on to "Deliss 3", which will see development of a demo version for this hard points removing machine.

CETI
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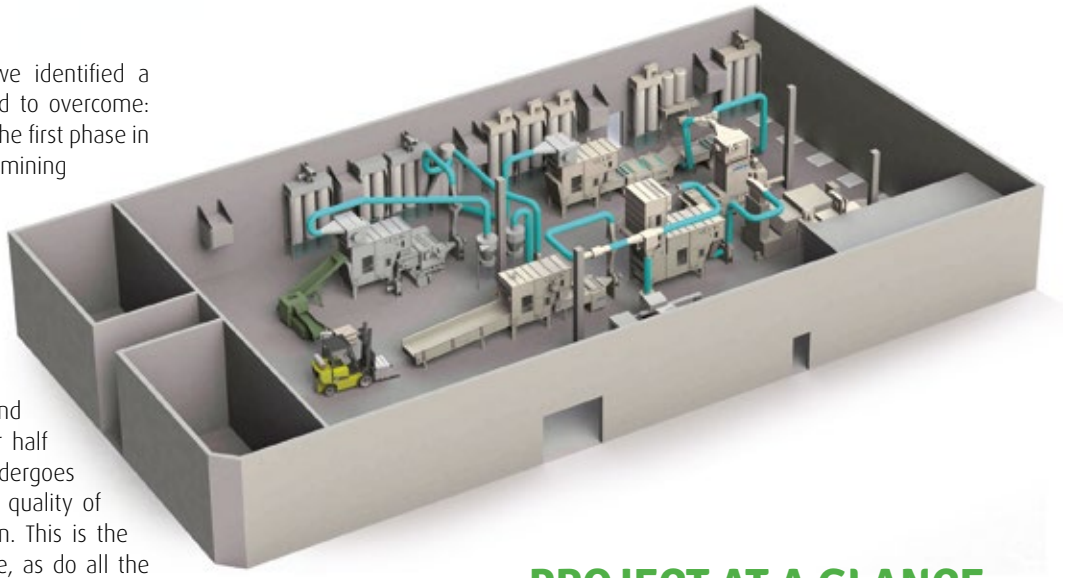

PROJECT AT A GLANCE

GOAL: Developing an industrial-scale process for the future to remove hard points by developing a demo experimental tool in collaboration with a manufacturer of specialist machinery

YEAR OF PROJECT SELECTION: 2018
DURATION: 6 months
LEVEL OF SUBSIDIES FROM ECO TLC: €39,113
TYPE OF CLF COVERED: Cotton fabric

An RFID* chip in each item of clothing

INTERVIEW

Nagy BENSID
Commercial Director

natural yarns & fibres

DECATHLON

Project: 4RFID

How did your project get started?

In the context of the circular economy, huge efforts have been made over the past few years in the industry prior to treatment (collections and sorting of end-of-life textiles), but there has been too little progress on subsequent stages (recycling and recovery). This is partly because the sorting processes are not run on a sufficiently industrial scale to deliver a reliable recycled material for those who want to integrate it in new products. Today sorting is done manually, by reading labels which have often been deteriorated. It is slow and not very reliable. In the best case, sorting is done using spectrometers but they are not 100% dependable, so those who want to recover the materials obtained often end up with parasitic traces of materials. Therefore we want to offer an industrial solution that improves sorting by making it completely fail-safe.

What is this solution?

The idea is to fit each textile article put on the market with an RFID chip containing two pieces of information: the colour and the composition of the product. Once the product reaches the end of its useful life, this would make it possible to sort it fast and without errors. This project brings two concepts together: that of the 4 "Rs" (reduce, repair, reuse, recycle) and that of RFID technology. We named it 4RFID.

How do you intend to proceed?

For about the last five years, all textile products at Décathlon have been fitted with an RFID chip. This allows rapid logistics handling in the warehouses and very accurate inventories completed in record time. We are pioneers in this. However, today this chip is destroyed as it goes through the cash desk and therefore cannot be re-used during the sorting process to optimize recycling. Our project involves also making it very clear that this chip is passive: unlike our phones, which monitor us all day long, the RFID chip does not emit a signal. It only provides information when needed and the only data it contains pertain to product composition and colour.

What will the various phases in your project involve?

The initial part will be technical: we want to make this chip durable, so it will be resistant to washing, laundry products, wear and tear etc. It also needs to be small enough to be unobtrusive. The second phase will involve industrial development. This will be followed by marketing research on a sample group of users. We envisage that the project will run for a fairly long time, five years, as we will be waiting for the first products to reach the end of their useful life and for our customers to return them to us so we can check whether the project is viable and make any necessary tweaks.

What is your long-term goal?

In order for the approach to be of interest, it will need all brands to come on board, so that it becomes a standard. This project is destined to outlast us. We are working for the sake of our children! It goes without saying that, if the project is viable for clothing, we will adapt it to use with footwear and other articles. But first of all we need to make sure that this technology is sustainable and production costs are acceptable.

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PROJECT AT A GLANCE

GOAL: Developing a pilot project on the traceability of textiles, in particular to enable management of their end-of-life, using RFID technology

YEAR OF PROJECT SELECTION: 2018
DURATION: 60 months

LEVEL OF SUBSIDIES FROM ECO TLC: €142,500

TYPE OF CLF COVERED: Textiles

**RFID: Radio Frequency Identification*

Insulating timber-framed houses in combination with post-consumer textiles and bio-based insulation

Project: **MOBIOTEX**

How did your project get started?

It was initiated by the HEI engineering school in Lille, which is working in particular on the problems in recycling textiles. They contacted us as part of a thesis to investigate the potential for recycling large quantities of post-consumer textiles in our timber-frame constructions.

What is your area of expertise?

We are an Industrial Technical Centre [CTI] specialising in timber and its by-products. Our expertise ranges from forestry to furniture by way of first-stage processing and the construction branch. It is the Timber Construction Cluster in Bordeaux which is working on development of this project in particular. Its name, Mobiotex, is the abbreviation taken from the French and standing for: "timber-frame walls made of bio-based materials and recycled textiles".

What challenges do you face?

We are going to explore the potential for using recycled textiles as a rain screen or vapour barrier: these are both essential components in timber-frame walls. They will be used in addition to the bio-based insulation chosen for the study. The aim is provide an alternative to materials from the petrochemical industry and to provide market opportunities for recycled textiles. The complex nature of the project results from the search for an insulating function for recycled textiles and for properties for water-tightness and air-tightness. Needless to say, they will also have to comply with the standards regarding fire protection and durability of materials.

What will the various phases in your project involve?

The idea goes back to 2017 with the start of the thesis at HEI YNCREA in Lille. Our other partners are the manufacturer Soprema, Cuiller Frères, which manufactures timber-framed buildings, and the IFTH, our equivalent in the textile sector. We are first going to undertake a survey of the subject and the methods for characterising materials. Then we will together develop a material from the garnetted stock supplied by Minot Recyclage Textile. The plan is to test different types of garnetted stock, to impregnate some with bio-based products such as vegetable oils, and to combine others with bio-based insulation such as wood wool. Thus, from around fifteen different materials in the form of "solid coverings", by the end of the project we will only be keeping the five that demonstrate the best performance in terms of insulation and impermeability, thickness and the amount of material reused. This will involve laboratory tests, first on the level of the material, then on multi-layers and finally under real-life conditions in timber walls.

And what obstacles do you face?

The main unknown is the end price of this insulation made from recycled textiles: it needs to be very low to be able to compete with materials from the petrochemical industry that do not cost much at all. However we are banking on highlighting the environmental advantages of our future Mobiotex products.

What is your long-term goal?

It is twofold: we want to offer the largest outlet possible for post-consumer textiles in connection with bio-based insulation, and, it goes without saying, develop the market share for timber-frame construction by focussing on performance and cost.

Zaratiana MANDRARA
Innovation & R&D Engineer
©ZM

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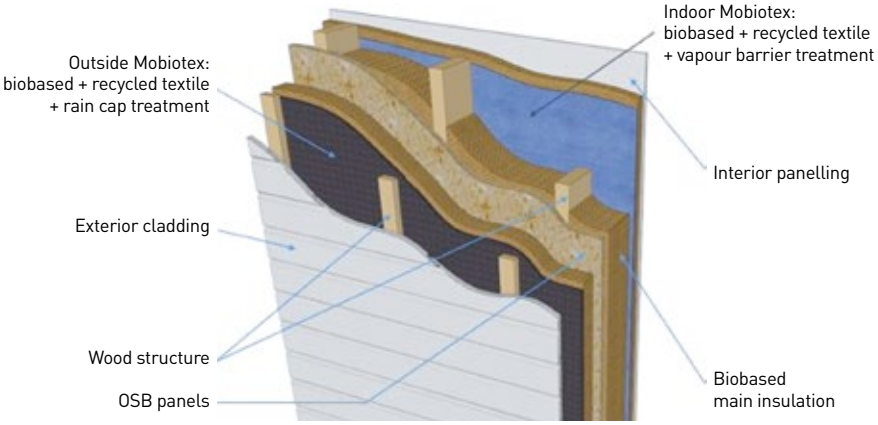


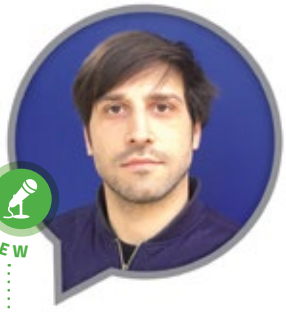
PROJECT AT A GLANCE

GOAL: Investigating the potential for using recycled textile fibres as essential components in timber-frame buildings

YEAR OF PROJECT SELECTION: 2018
DURATION: 18 months

LEVEL OF SUBSIDIES FROM ECO TLC: €77,494

TYPE OF CLF COVERED: Mixed textiles



INTERVIEW

Romée DE LA BIGNE
Designer

Maximum®

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A new design material

Project: TISSIUM

How did your project get started?

As a designer by training, I co-founded the Maximum business four years ago. The goal is to design furniture from industrial arisings. Whereas we made progress last year on a project, which required the use of Métisse –non-woven insulation manufactured by Le Relais and composed of post-consumer textiles–, we approached the Codem Batlab research and development centre to re-process this material by heating it and compressing it tightly. And we obtained a new material: a sheet with very interesting rigidity, which far exceeded our expectations. We realised that this earth-friendly product had the potential to replace the large number of particle board panels, such as chipboard, which are, in ecological terms, not to be recommended (especially on account of the adhesives needed to make them). So in September 2018, we looked for a partner to support us in developing this product, and thanks to Eco TLC, we are now launching a project lasting two years.

What will the various stages involve?

We will first draw up the specifications for the material. Then we will start the first tests for fine-tuning, which should take us through to September 2019. We will then have a year to create a collection of designer furniture with this material; from the prototypes to lines for production. Lastly it would be time for the market launch, with the design of marketing tools and PR.

© Maximum2019

What challenges do you face?

The project involves designing office furniture, as it is the core market for our company today. However we want to go beyond that. What interests us is the material itself. In the first instance, we want to verify whether it is a viable construction material, and, secondly, to establish whether it is possible to make it affordable for the general public. In addition to producing furniture with this material, in the long term we would like to market it as a raw material, so that other people can make use of it, thus expanding the outlets for post-consumer textiles, while reducing the amount of construction materials that are harmful to the environment.

And what obstacles will you be facing?

As yet no real obstacles have been identified. Our intention is to offer a genuine solution for recovering textiles, which cannot be re-used. Our goal is to design a material that contains a maximum of post-consumer textiles in order to provide an outlet for them. We want this material to be of real ecological benefit.

© Maximum2019

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PROJECT AT A GLANCE

GOAL: Developing a rigid material made of fibres from textile arisings and the main application of which is a collection of furniture

YEAR OF PROJECT SELECTION: 2018
DURATION: 24 months

LEVEL OF SUBSIDIES FROM ECO TLC: €40,497

TYPE OF CLF COVERED: Textiles

Reproducing polyester yarn from post-consumer clothing

Project: JEPLAN

INTERVIEW

Julie RAFTON-JOLIVET
Manager of international business and market launches
© Techtera

techtera

JEPLAN
Japan Environment PLANning

How did your project get started?

It all started with the Japanese firm Jeplan, our partner, which has developed and patented a method for recycling polyester fibres from post-consumer clothing. So far, this method, which has been implemented on a wider scale and marketed in Japan, has not been available so far in Europe, where the recycled polyester used in the textile industry only comes from PET bottles. Jeplan intends to set up a factory in France, the nation of fashion, where there is an awareness of the circular economy, specifically in the Lyon region, which was the home of the silk manufacturers who once brought silk from Japan.

What is this technology for recycling?

It enables recycling of all types of textiles composed of several materials. It involves a three-step chemical process: depolymerisation, purification and bleaching the colour out, then repolymerisation, which allows us to separate the materials from the hard points, and then to extract the polyester and to produce it in pellet form (granulated). These pellets can then be spun and woven to make new clothing. Other materials, such as cotton, are today recovered as a source of energy. But it is a question of also recycling them by re-using them on other markets in the form of viscose, for example.

How does Jeplan obtain supplies?

In Japan, the company works with brands such as Asics, which will, for instance, be making the outfits for Japanese athletes and officials for the next Olympic Games with fabrics made from Jeplan's recycled polyester. Since 2010, post-consumer clothing has been collected at almost 2,000 collection points, then recycled by Jeplan and the yarn is subsequently sold to firms. The Japanese company wants to reproduce this model in France and involve French clothing and sportswear brands.

What does the project involve?

The part that Eco TLC is subsidising covers the two initial stages: conducting the project feasibility study, in particular organising campaigns for collecting recycling waste and classifying French arisings. Furthermore we have recently launched a campaign for collecting items with the sportswear manufacturer Picture Organic Clothing.

What is the long-term goal?

The aim is to establish a factory in the Lyon area by the year 2022 that will offer an opportunity for French firms to play a role in recycling post-consumer clothing and to use French recycled polyester to make their clothing. We have observed that there is a real demand from French brands and that there is a very great need to recycle polyester textiles, since it is the material most used in our industry today.

© Jeplan

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INTERVIEW

CITEO

Carlos DE LOS LLANOS
Scientific Director
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"In the packaging sector, the regulatory objectives for recycling set by the European Union and the companies' commitment to integrate recycled plastic are a challenge. Depolymerisation recycling technologies like JEPLAN's could be a solution: it would enable the processing of hard to recycle PET (Polyethylene terephthalate) with the current capabilities and would provide a recycled material of equal quality as virgin plastic."

PROJECT AT A GLANCE

GOAL: Analysing the feasibility of a project for setting up a pilot factory of JEPLAN in France for chemical recycling to convert post-consumer textiles into recycled polyester pellets

YEAR OF PROJECT SELECTION: 2018
DURATION: 12 months

LEVEL OF SUBSIDIES FROM ECO TLC: €25,800

TYPE OF CLF COVERED: Textiles

INTERVIEW

Frédéric LOGEZ
Manager of VERT-tical Nord
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VERT-tical®
Un mur végétal pour tous

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A living wall made from recycled textiles

© VERT-tical

Project: ECO-LOGIC WALL

How did your project get started?

This project started with my desire to find an innovative, local solution in order to offer a living wall from the recycling sector. I got in touch with Le Relais, a firm from the same region as I come from (les Hauts-de-France) and they were soon won over by the idea. We conducted some tests and the first ones have been encouraging.

What are the issues at stake?

They are serious. Development in cities results in considerable financial pressure on landscaped areas, which are in fact vanishing and having a particular impact on biodiversity and infiltration of rainwater. Not only can the living wall offer an answer to environmental degradation caused by land take, but what is more it also makes it possible to use rainwater to supply our walls. If we connect just 1% of our guttering to living walls, it will mean we will have reprocessed thousands or even millions of kilos of post-consumer textiles!

© VERT-tical

And we will have thus given a boost to the circular economy for recovering, recycling and re-using post-consumer textiles.

What stage will your project involve?

It will be broken down into two phases. The first, over three months, will lead to an examination of technical and financial viability. It will, in particular, help me learn which textile fibres retain most water so that I can arrive at my specifications. Depending on the results of this first phase, we will allow 15 months for modifying the various components so that the end product is as efficient as possible in terms of water retention. As far as this development phase is concerned, the first tests I have conducted delivered positive results. Now it remains to see how my walls develop over time.

And what obstacles will you be facing?

In the first instance, it will be necessary to adjust the combination of different natural fibres and to ascertain whether it is possible to design an end product that is usable as is. Next we will have to satisfy building standards in terms of long-term stability. Finally, the end product will need to be at a market price.

What is your long-term goal?

It is ambitious but I really want the innovation to be a product of a circular economy that is as local as possible. I also want the product to come as close as possible to using 100% from the recycling sector and to be recyclable itself. Once the product has reached completion, government authorities will have a real basis on which to decide whether to introduce a tax incentive. That would make it possible to recover and re-use post-consumer textile material and to respond to environmental challenges such as rainwater management, heat island effect, the development of biodiversity in towns, etc.

PROJECT AT A GLANCE

GOAL: Developing a green wall using recycled textiles to replace substrates and sphagnum (natural moss) currently used

YEAR OF PROJECT SELECTION: 2018
DURATION: 18 months

LEVEL OF SUBSIDIES FROM ECO TLC: €53,382

TYPE OF CLF COVERED: Post-consumer textiles

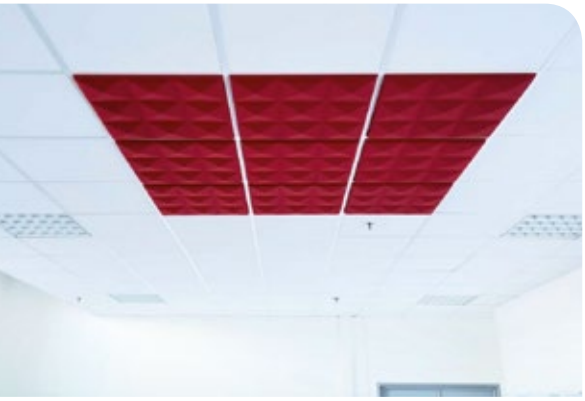
A stylish and durable acoustic insulation panel that is fire-resistant


©Wecosta

Project: QWIET

How did your project get started?

It follows on from an initial project launched in 2016 with the garnetting company Minot and Le Relais, focussing on acoustic panels made from recycled textiles that offer an environmentally friendly alternative to existing products made of polyurethane foam. These panels were installed in Lille airport last year and provided us with a wealth of information about areas for improvement. This new project was also inspired by the lessons we learned from another experiment we took part in: the Eko-room ceiling tiles, which similarly were made from recycled textiles and which failed to reach market launch because of inadequate fire resistance. We have also learned a lot by working on our other products: attenuators for CMV* Silencio (see separate article on page 14).


©Wecosta

What challenges do you face now?

They are threefold: our panels need an attractive design, especially in terms of colours (those at Lille airport were red or grey, and we have had requests for different colours), they need to demonstrate excellent fire resistance, and they must be made from recycled materials in order to answer the demand for an environmentally friendly product.

What does your Qwiet project involve?

We are working with CREPIM (a laboratory for certification and approval of fire resistance for buildings and railways) and with "Les Acrobates", specialists in functional design. First of all, we need a clear understanding of consumers' usage in order to identify their requirements and to design a consistent range, from the portable acoustic panel to ceiling tiles, by way of wall coverings. Then we are going to work independently on the three components of our panels, which each needs to have specific properties: the decorative outer coating must be attractive, while offering good fire resistance and not emitting smoke in the event of combustion; the intermediate case must offer very high fire resistance to offer good protection of the central layer; this itself is made of post-consumer textile fibres and is thus potentially the most flammable.

What hurdles will you have to overcome?

We need to produce a panel that contains the least amount of material possible, as that is key to fire resistance: the more combustible material there is, the greater risks are. So the panel needs to be lightweight while remaining sufficiently rigid to provide stability and easy handling. And of course, it must include as much recycled material as possible, while remaining profitable for us and without being too expensive for the end consumer.

What other stages will the project involve?

After this research has been carried out on each of the components, we will conduct a technological and economic study and an analysis of the competition, which will allow us to position the product properly and to draw up a strategy for launching a demo version. We have found that demand is great for eco-friendly products, as much as it is for good design and eventually we envisage offering a turnkey service, which will involve diagnosing problems with noise in a place and suggesting solutions for these with our products.

Hugues BROUTÉ
Product manager
©Wecosta

WECOSTA
WTX & SEKISO

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PROJECT AT A GLANCE

GOAL: Developing solutions to improve acoustic comfort in public places (offices, industrial and business premises, etc.) by using environmentally friendly materials, in particular materials from the clothing, household linens and shoes sector

YEAR OF PROJECT SELECTION: 2018
DURATION: 24 months

LEVEL OF SUBSIDIES FROM ECO TLC: €156,055

TYPE OF CLF COVERED: Textiles

*CMV: Controlled Mechanical Ventilation

ONGOING PROJECTS

SILENCIO *Attenuators for mechanical ventilation are ready for commercial-scale production!*

Hugues BROUTÉ

Product manager at WECOSTA © Wecosta

How far has your project got?

A year ago we discovered that the new building standards imposed by "RT2020" (2020 French heating regulations) risked making our attenuators made of post-consumer textiles fibres obsolete. We had to make some adjustments that have proven successful.

What were these adjustments?

The product had to be made watertight; to achieve this, we covered it with a plastic film. It is now fully functional. Now we need to test it on an industrial quantities. But we are already enough advanced to market it.

Have you made progress on other aspects?

Yes, we also had to work on the garnetted stock to improve the quality of the non-wovens. We have accomplished that: we now have a reference material and a reliable industrial process. Our two 80 and 125 mm attenuators are ready. We therefore registered the "Ehho®" trade mark at the end of 2018 and we have built a website to present these products: www.ehho.eu.

What will your next steps be?

The next steps will mean publicising and selling the products. Initial production was started in April. We will be presenting our attenuators at trade shows, to developers, architects, engineering consultancies and to large-scale distributors. To help convince them, we have designed a "playback bench", which allows people to see how effective the product is. You can clearly hear that, while the noise of mechanical ventilation is substantially reduced thanks to the attenuator, it is still intentionally slightly present so that the user can be sure it is running.

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WECOSTA WTX & SEKISO — eHHO®

PROJECT AT A GLANCE

GOAL: Developing an eco-friendly acoustic attenuator for ventilation systems in homes

DURATION: 18 months

LEVEL OF SUBSIDIES FROM ECO TLC: €153,125

TYPE OF CLF COVERED: Clothing

REVIVE/RECYCLE *Repair and recycle to stop throwing things away*

Benjamin MARIAS

Founder and joint director of AIR COOP © Aircoop

© Aircoop

AIR COOP — COOPÉRATIVE D'ENTREPRENEUR·E·S DU CHANGEMENT

How far has your project got?

Where the refurbishing phase is concerned, trials were conducted with a major label in late 2018 to ascertain the main issues. We are going to continue with these tests, as the initial results were encouraging. On the other hand, where preparing for recycling was concerned, the tests made it possible for us to rule out certain procedures. So we are exploring other avenues.

What developments have been made as regards refurbishing?

Depending on the classes of products and their repairs, we will now be able to determine the processes, the time for repairs and the associated costs. The idea is to test out all the possible products and repairs so that we can offer a service to brands and resellers. We will need to decide on the business model: will we be selling the products ourselves once they have been repaired, or will the brands be paying us to repair their clothes?

How about the preparatory work for recycling?

Trials for separating the hard points using induction and infrared detection have not proved conclusive. So we are returning to a method we are very familiar with, as it was implemented on the pilot line for recycling footwear at Soex: using vibrating separation. Initial findings are expected in June 2019.

Are there other stages to complete?

We are simultaneously working on a guide to best practice for firms putting products on the market that aims to improve closed-loop systems. Economic modelling and examining the environmental footprint of refurbishing and recycling will constitute the final phase in the project, as planned.

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PROJECT AT A GLANCE

GOAL: Setting up a pilot project for refurbishing clothes and preparing them for recycling (funding from Eco TLC concerns just the preparation to recycling part)

DURATION: 18 months

LEVEL OF SUBSIDIES FROM ECO TLC: €97,450

TYPE OF CLF COVERED: Clothing

PLAS'TILE *A material that is half plastic, half used textiles*

Charlotte WALLET and Damien DELETRAZ
Respectively Coordinator of the textile project at AUDACIE and Head of eco-design at Pôle des Éco-Industries

How far has your project got?

The initial stages of the project enabled us to identify the blends of materials that are most interesting from the technical aspect. From the initial 60 formulations, we kept just three! In particular, we have eliminated the method using 100% cotton as it is not viable and have only retained the blends of textiles. This is a matter of some satisfaction as blends are most difficult to recycle today.

What are the key stages in the project?

Tests have been conducted and enabled us to pinpoint the technical properties of the most interesting formulations. The results are encouraging, sometimes the properties are better than those of virgin plastic. Injection tests were resumed in early 2019, after searching for a new external contractor for shredding textiles. At the same time, a significant amount of work has been carried out on the future "Plast'tile" products. After several sessions of collaborative creation and brain-storming, the decision was taken to focus on two products: storage boxes for


©Charlotte Wallet

industry and, remaining in the textile sector, clothes hangers.

What remains to be done?

While most stages enabling us to validate the feasibility of the project have been completed, we still need to determine the best technological and economic solution so we can move on to industrial scale production. So the next stages involve refining the production process, working out the environmental profile and completing the first lines of products. At the same time, a study into compatibility with 3D printers is also being developed.

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AUDACIE
CONVERGENCE POUR L'INSERTION

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PROJECT AT A GLANCE

GOAL: Making plastic resins by recycling textiles that cannot be reused
DURATION: 12 months
LEVEL OF SUBSIDIES FROM ECO TLC: €8,407
TYPE OF CLF COVERED: Mixed textiles

CID PROCESS *Removing elastane from post-consumer jeans*

Roland GUIBERT
President and CEO of CID-Process ©Roland Guibert

How far has your project got?

Since last year, I have designed a machine prototype that helps keeping the piece of jeans taut during the unweaving process. My aim was to remove the elastane from jeans, thus retaining only the long cotton fibres in order to re-use them. I tested various techniques for unweaving, including mechanical ones.

What was the outcome?

Throughout the project, I was confronted with the elastic nature of elastane. If you try to remove the elastane thread from the weft, it tends to retract and wind around the warp threads. This might cause major problems during mechanical unweaving. So it would be useful to destroy this characteristic, for instance by using heat or cold. In addition, I tested other methods, including using air blowing for unweaving. Using high airflow at a pressure of 10 to 20 bar results in complete destruction of the piece of jeans. I obtain a pile of mixed cotton and elastane fibres. All that remains to do is separate them and, most importantly, to check the length of the resulting cotton fibres.


© Roland GUIBERT

What other avenues will you be exploring?

Looking at the underside of a piece of jeans, I noticed that you can see that the elastane protrudes in the form of small white dots. So I have devised another method, which involves destroying each small white dot of elastane using laser. Once this stage has finished, all that remains to do is use blowing to separate the threads and just keep the cotton. This is another experiment to be run. There is still a broad range of possibilities and I am not short of ideas!

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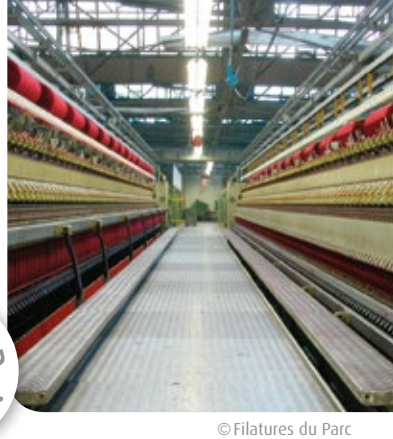
CID-Process

PROJECT AT A GLANCE

GOAL: Mechanical separation of cotton and elastane in post-consumer jeans
DURATION: 13 months
LEVEL OF SUBSIDIES FROM ECO TLC: €59,750
TYPE OF CLF COVERED: Jeans

PARCOT Recycled cotton & polyester yarn ready for market launch

Fabrice LODETTI
Manager of Filatures du Parc © Filatures du Parc


© Filatures du Parc

FINALIZED PROJECT!

How did your project come about?

Buoyed by our experience in recovering woollen coats, we turned our attention to post-consumer textiles made of polyester and cotton blends. There are considerable arisings. There is no solution for recycling them; we have received several requests from companies in relation to this, which we have been forced to turn down due to a lack of solutions. The challenge is a major one as the garments are lightweight and the fibres are all the more complicated to extract. This was all it took to motivate us!

What did it involve?

For three years, from September 2015 until September 2018, we worked on the engineering for the machinery. In particular, we invested one million euros in an exclusive machine for defibration, which we have had totally revamped and that is now, after a number of modifications, working well. We also needed to make some adjustments to the spinning process and undertake a range of internal and external laboratory tests in order to validate technical properties and the quality of the yarn, the fabric and the knit.

Has this been completed?

Yes, we are now in a position to produce a polyester and cotton blend yarn from post-consumer textiles that is of equivalent quality to new yarn. We are currently looking for partners to work with us in launching it on the market. We are optimistic that this project will achieve considerable success as we have managed to design a recycled yarn, the sales price of which will be less than that for new yarn (manufactured under equivalent conditions in terms of the country and spinning system). We are very grateful for support from the Scientific Committee, who really helped us in our meetings when it came to which approaches to take and making decisions.

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PROJECT AT A GLANCE

GOAL: Unravelling of post-consumer clothing made of cotton & polyester for the purpose of weaving or knitting new textiles for clothing

DURATION: 39 months

LEVEL OF SUBSIDIES FROM ECO TLC: €145,000

TYPE OF CLF COVERED: Textiles in cotton & polyester blends

CAREFIL Yarn made from post-consumer textiles

Mickael LEMAIRE, *Development and Innovation Manager at UTT*
Michel LUZNIAK, *Administrator of the Ebs France Le Relais*
Philippe MESNAGE, *Head of Research Unit for Textile Technologies at IFTH*

From left to right:
Philippe Ménage ©IFTH
Michel Luzniak ©Le Relais
Mickael Lemaire ©UTT

What progress has been made in your project

Just as planned! We started in early June 2018 by selecting used clothing according to the raw material. Then we moved on to garnetting tests in order to preserve an ideal length yarn, and then we progressed to spinning tests. Currently we are finalising a test on the three criteria that we want to achieve for each of the materials cotton, wool and acrylic. It is encouraging, both with regard to the fineness, the finish and uniformity of the yarn obtained.


©IFTH

Where do you still need to make progress?

We are conducting tests on various colours with dyes and we need to check the level of reproducibility for these initial trials on larger quantities of garnetted clothing. We are already getting close to achieving our goal of incorporating 30 - 50% of post-consumer material in our yarn and there is still room for improvement with some parameters.

What will the next steps involve?

On the technical side, we are currently concentrating on conventional spinning but we will also be trying out more specialised procedures. The big question remains: the analysis of the life cycle, which we will be conducting and will provide us with real information about the industrial potential of this research. The environmental aspect will be important and the question of the final price will be decisive. Whatever the outcome, the collaboration has been a very worthwhile experience: nothing would be possible without the synergy between the three firms that we represent. This partnership in itself is already a success!

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PROJECT AT A GLANCE

GOAL: Improving the quality of yarn obtained through recycling of post-consumer clothing

DURATION: 24 months

LEVEL OF SUBSIDIES FROM ECO TLC: €142,931

TYPE OF CLF COVERED: Cotton, wool or acrylic textiles

L'Équipe 1083 and the challenge of making a pair of jeans in 100% recycled cotton

As a part of the Call for R&D projects 2016, the Scientific Committee of Eco TLC had selected a first project driven by L'équipe 1083/Modetic. The objective of the project "Jeans Recyclés" was the development of a recycled cotton yarn made from recycled jeans.

Over the first fraying and spinning tests, it appeared that some cotton fibers, too short, could not be usable for a mechanical recycling. Nonetheless, these fibers had the potential to be revalorized through another process, the wet spinning method. That's what motivated L'équipe 1083 to propose a new project during the Call for R&D projects 2017. The "Cell-Jeans" project has been selected too by the Scientific Committee (See the article below.)

The "Jeans Recyclés" project has now come to an end and the results are promising: the technique implemented by L'équipe 1083 permitted them to produce a yarn made up of 50% of recycled jeans and 50% of virgin cotton; another yarn made up of 75% of recycled jeans and 25% of virgin cotton and even a 100% recycled jeans' yarn! Even though the latter still needs to be worked on to optimize its technical characteristics, the 75%-25% blended yarn is highly satisfactory.

Encouraged by this success, L'Équipe 1083 filled an application to the ADEME to industrialize this transformation method of used jeans into a new yarn.

Erwan AUTRET

ADEME - Coordination of the Design Hub Research, Development and Innovation Extended producer responsibility sector, Clothing, Linen & Footwear ©ADEME

"The project "MONCOTON" ("Jeans Recyclés") is supported by the ADEME in the context of the innovation contest for the Future Investment Program.
Its aim is the implementation of the first line able to register used textiles into a genuine circular economy loop.
This line will start by the transformation of jeans into fibres to carry until the production of a yarn entirely made up of recycled textiles.
This project received a financial support of 0,9 billion of euros for a total cost of 2 billion of euros."

CELL-JEANS The benefits of wet-spun cotton

David LEROMAIN

L'Équipe 1083 – Head of Innovation and R&D ©L'Équipe 1083

What have you accomplished in this project so far?

We've made good progress! We have moved on to the next level, bringing us closer to our goal of manufacturing a new yarn using cellulose from post-consumer jeans. First, we needed to define what form our stock should have in order to best exploit it. As a reminder, the fibres obtained from unravelling are usually too short to be re-used in conventional spinning and we are attempting to extract the cellulose from them in order to produce new fibres (something which already exists for cellulose from wood). It turned out that the shortest fibres from garnetted stock are of greatest interest.

What other progress have you made?

The issue of materials sorting has also been addressed: we had to separate the cotton from the interfering synthetic fibres, such as elastane or polyester, which are found in the great majority of jeans. So it is easier for us to remove these synthetic elements in the dissolution process, when the cellulose in the cotton becomes liquid. We have succeeded in producing cellulose fibres from the cotton in post-consumer jeans in this way.

Does this signal the end of the project?

No, because post-consumer jeans have often been dyed, undergone chemical treatment sometimes or washed with laundry agents etc. The cellulose yarn that we obtain is of interest but still doesn't have the mechanical properties required for jeans. So we are working on improving the quality of our yarn and hope to achieve conclusive results by the summer of 2019.

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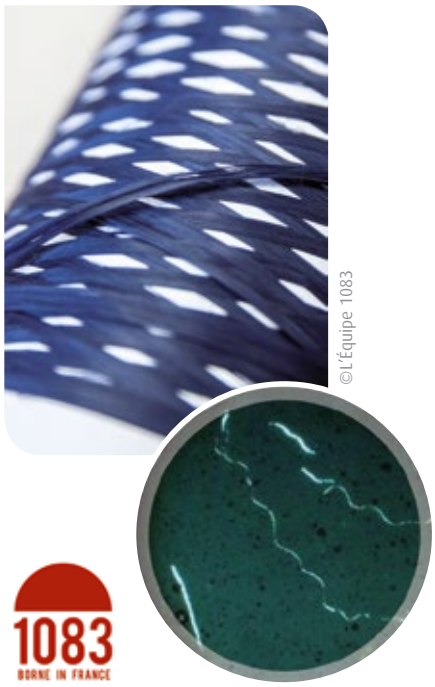

©L'Équipe 1083

PROJECT AT A GLANCE

GOAL: Wet-spinning of cotton from post-consumer jeans for the purpose of creating a man-made fibre

DURATION: 14 months

LEVEL OF SUBSIDIES FROM ECO TLC: €42,700

TYPE OF CLF COVERED: Jeans

PIERRE PLUME

Coming soon: a sound-absorbing material made of recycled textiles!


© Premices and Co.

Amandine LANGLOIS
Co-founder of Premices and Co. © Marie Rouge

How far has your project got?

We have made a lot of progress! We now have two partners to help us: Silac industrie for needle-punching and Appcell for surface lamination. Together we have completed three pilot production runs for the colours concrete grey, slate blue and stone white. Silac developed the finish of the felts in its mini lab; we then completed three pilot production runs that amounting to 50 to 100 running metres. These products were then laminated at Appcell.


© Prémices and Co.

What remains to be done?

The initial acoustic trials were very promising but we have to conduct more of them on larger areas to confirm our results. We are also starting out with some test sites: Pierre Plume will be installed at one of our projects in the 11th district of Paris, the shop for eco-designed objects for children called "Emeu".

Have there been any other setbacks?

Yes, unfortunately we have found out that fire resistance of our product is not as high as we were hoping. In order for our material to be recommended for buildings with public access without any restriction regarding the area, we need to demonstrate a high degree of fire resistance. So we are working both on the felt itself and on the lamination. Apart from that, we are ready. So we are very optimistic that the completed product can be launched on the market within six months, but it all depends on what solutions are found to fireproof product.

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premices and co

pierreplume

PROJECT AT A GLANCE

GOAL: Creating a decorative, sound-absorbing material from recycled textiles

DURATION: 24 months

LEVEL OF SUBSIDIES FROM ECO TLC: €40,000

TYPE OF CLF COVERED: Post-consumer textiles

SHINING THE SPOTLIGHT ON A SUCCESS STORY OF TEXTILE RECYCLING:

the story of Métisse manufactured by Le Relais

Jean-Paul LOPEZ
National sales Manager of Métisse® © Métisse - Le Relais

How did the Métisse venture get off the ground?

It was launched about 10 years ago, with two main goals: to recover used jeans and to create new jobs in the textile sector. Together with our partners, we have succeeded in developing the only insulation on the mainstream market that has guaranteed fire protection using neither boron nor ammonium salts. Today, Métisse accounts directly for around 20 jobs, for just over 1000 tons of jeans recovered in 2018, or around 500 000 sq. m of insulation of 100 mm equivalent thickness.

Have you experienced any major setbacks?

The first problem was obtaining certification from Acermi and Avis Techniques. To achieve this, we needed to establish how to treat the Métisse insulation in terms of fire protection. We developed a method of treatment similar to that for dyeing: our fibres are impregnated using full immersion. Today, the last remaining hurdle, as is the case for all bio-based insulation, is get businesses in the building industry to recognise our material as a greener alternative. A number of them are still undecided about installing this type of insulation, being apprehensive about changing their customary practices. There are no grounds for this concern since the same methods are used to install Métisse as with conventional insulation, an additional convenience.

How about the future?

I want Métisse to consolidate its position as the French leader for insulation made from recycled cotton. The goal is to recruit a second production team of about five people and, sooner or later, to set up a second production unit.

© Métisse - Le Relais

Métisse® L'isolation coton

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What happens to footwear that cannot be reused?

Each year in France 275 million pairs of shoes are marketed, i.e. 119K tons of pieces of leather, rubber, foam and other plastics that are glued/stitched together. Footwear represents 19% of Clothing, Linen and Footwear (CLF) tonnages introduced onto the market but only 6% of incoming CLF tonnages in sorting centres.

How can this difference be explained? Today, a large majority of consumers only dispose of footwear at the 45,000 collection points that is in "good condition"and that can be reused, and throw away footwear that is damaged. Indeed, today the reality of footwear recycling is rather stark: there are no (or few) recovery solutions unlike textiles for which tangible industrial projects are emerging.

HOW CAN THIS GAP BE EXPLAINED?

- Footwear items are comprised of an average of 5 different materials assembled together with glue/stitches making disassembly difficult.
- Once disassembled and sorted, these materials must be processed (shredded, melted, purified, etc.) so that they can be integrated into new applications. This involves many costly technical stages for a result which is unfortunately not as competitive as raw materials.

Working together, engaged together so that ALL footwear has a second life and can be recovered!

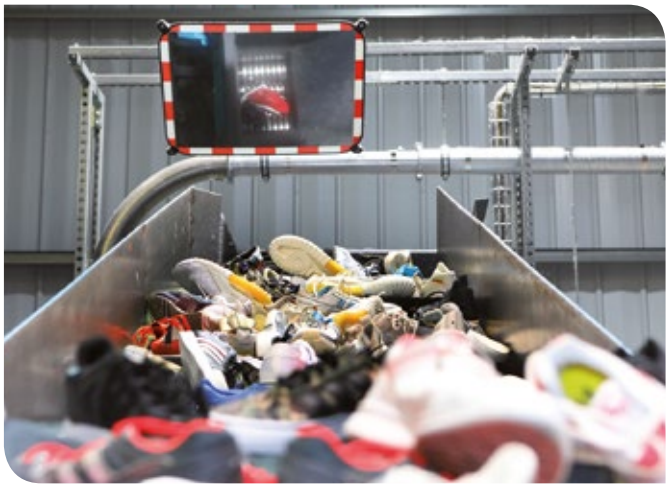
THE STAKES AND CHALLENGES ARE THEREFORE SIGNIFICANT in order to integrate this footwear sector into a circular economy:

- Generalise and deploy eco-design in order to increase the sustainability of products and improve their ability to be recycled (see p.22 for the opportunities that have been identified).
- Develop an efficient recycling industry (see the map on the next page showing the different solutions that already exist) that will enable the different materials in footwear to be characterised (material and colour) and separated.

In brief*:

In France, sneakers now represent 50% of the market (up to 80% for kids shoes)

**Sources : Insee, Fédération Française de la chaussure, CTC, Revue-Projet*



© SOEX

- Identify the sectors where materials resulting from the recycling of shoes can be integrated, mostly in an open loop; footwear is no longer produced in Europe (countries in Asia account for nearly 90% of world production in terms of volume).

Therefore, within the context of its mission to accompany the sector's players in optimising recycling, Eco TLC, participated in particular, in the funding of the only footwear recycling unit in Europe (call for R&D proposals 2012 and 2014). This is the pre-industrial SOEX unit, inaugurated in June 2018 (see article on p.28).

In keeping with its commitment, footwear will be at the heart of several projects implemented by Eco TLC during the 2019-2020 period:

- Updating the characterisation study on used CLF entering sorting centres (see 2014 report).
- Launch of an eco-design platform for entities introducing footwear onto the market.
- Development of a scale for the fees paid by entities introducing footwear onto the market (bonus/penalty system on footwear).
- Follow-up of footwear R&D projects in progress: Ector se recycle (Ector is recycling)/Insoft, Design for repair/Éram, Hodeï/Camy, Thermicuir/CTC.

This first footwear recycling map illustrates well the complexity of the challenges faced by this sector. If you know of other footwear sorting/recycling techniques, do not hesitate to send us the information. This map is regularly updated.

Mapping of foo

Footwear
introduced onto the market:

275,600,000
pairs/year

i.e. **119,000**
tons/an
(19% of total weight of CLF)
FIGURES 2018

12% of those introduced onto the market are collected in collective points (14,000 tonnes)

85%
of footwear collected
can be reused

15%
of footwear collected
cannot be reused and
must therefore be recycled

In brief:*

On average each French citizen buys 5.4 pairs of shoes per year (7.5 pairs for children, 6 pairs for women and 3.5 pairs for men). On average men have 8 pairs and women 17 pairs.

Manual AND/OR automatical sorting
of non-reusable footwear
(2,100 tons)

Closed loop recycling

→ Single-material footwear
(e.g. Okabashi - USA)

Industrial composting

→ Biodegradable materials which are transformed when composted (e.g. Puma InCycle)

Slicing of sports footwear:
separation of the shoe upper from the sole

Sorting then shredding into 3 types of granules:
RUBBER, FOAM AND FIBRES

→ Flooring surfaces, outsoles
(e.g. Nike Grind)

→ R&D projects at the industrial stage

→ R&D projects or trials in progress

PROJET
Projects supported by Eco TLC within the context of R&D projects

Focus on R&D projects supported by Eco TLC

Out of the 44 R&D projects supported by Eco TLC since 2010, only 8 are about footwear.

3 ECO-DESIGN PROJECTS:
DESIGN FOR REPAIR / ÉRAM,
ECTOR / IN SOFT, HODEÏ / CAMY

4 MECHANICAL RECYCLING PROJECTS:
FOOTWEAR RECYCLING PROJECT / AGENCE AIR COOP (2 projects),
ECTOR SE RECYCLE / IN SOFT,
TRUCS-TROUVAILLES

1 THERMAL RECOVERY PROJECT:
THERMICUIR / CTC

**Sources : Insee, Fédération Française de la chaussure, CTC, Revue-Projet*

twear recycling

Models containing sorting disruptors:
- Toe caps (in metal or hard plastic) in safety footwear
- Heels in hard ABS plastic + shoe uppers in steel
- Parts which cannot be separated
- Electrical and/or electronic components

SRF, Energy recovery or incineration/landfilling**

SHREDDING CHALLENGES:
- *Limit intra-material pollution,*
- *Reduce and homogenize particle size*

Complete shredding of footwear
Coarse shredding (about 2 cm²). All types of footwear

FOOTWEAR RECYCLING PILOT LINE

Delamination then densimetric separation of materials

METALS
→ Existing metal recycling processes

TEXTILES
(NATURAL AND SYNTHETIC MATERIALS)
→ SRF**, Energy recovery
→ Integration into non-weaved items

REJECTS AND DUST PARTICLES
→ SRF**, Energy recovery

LEATHER / LEATHER LOOK
→ Mixed with PVC to serve as weighting
→ Mixed in with wood fibres to produce acoustic panels (e.g. Pavatex)
→ Integration into compressed wood panels (e.g. Taimee)
→ Thermal recovery

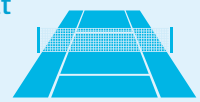
THERMICUIR

RUBBERS
(NATURAL AND SYNTHETIC ELASTOMER),
FOAM, PVC, PU ETC.
FROM SOLES
→ Hard or rebounding coatings, thick mats, outsoles

TRUCS-TROUVAILLES

2,500 pairs...

foam inner soles allowing tennis courts to be built



rubber outer soles, 300m² of play areas for children

**SRF: Solid Recovered Fuel*

How to increase the sustainability of footwear and improve its capacity to be recycled


© ector

1. BY ECO-DESIGNING:

Simplify processes and components so that materials can be more easily sorted and recycled


© 3D Bonding - Simplicity Works

SUSTAINABLE STYLE:

Develop timeless, unisex, personalised models.

MATERIALS:

- Reduce the number of materials making up footwear thanks to new manufacturing processes (e.g. ME:sh by Salomon) or only use a single material (e.g. Méduse in PVC; Futurecraft loop by Adidas in TPU).

HODEÏ

- Select materials having a reduced environmental impact: bio-sourced materials (e.g. CWL by VEja; Cotton + Corn by Reebock), compostable materials (e.g. OAT shoes), recycled materials (e.g. Authentic Material) as well as materials that can be recycled.

ECTOR

- Choose leathers tanned without chrome (with plant substances).
- Support the implementation of detailed characterisation of materials (international pictograms) in order to guarantee traceability and material recognition during sorting.

MANUFACTURING AND DISASSEMBLY TECHNIQUES:

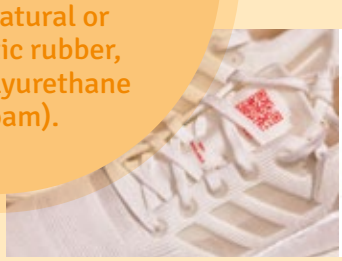
- Generalise the use of prototype design software enabling waste to be reduced: 3D printing and injection of polymer into a three-dimensional finish mould (e.g. 3D Bonding by Simplicity Works).
- Develop methods for "design with a view to disassembly" in order to make it easier to assemble and separate components at the end of their service life, carried out by the consumer (e.g. Comake Shoes) or the brand.

DESIGN FOR REPAIR

- Assemble the upper and sole without glue or stitching (e.g. Loper by Proef designs; ACBC Shooz).
- Use sewing thread which dissolves under heat (e.g. Resortecs) or electromagnetic waves (e.g. wear2).
- Develop glues which make it easier to separate the shoe upper and sole.
- Manufacture soles and/or uppers using 3D printing (e.g. Feetz).
- Design models with repairable and/or replaceable soles.
- Industrialise RFID technology for identifying components during the sorting of end-of-life footwear.

In brief:*

Average composition of footwear: 25% leather, 24% vinyl or polyvinyl, 23% natural or synthetic rubber, 17% polyurethane (foam).


© Futurecraft loop - Adidas


© Comake


© Angarde


© Loper - Proef designs

2. BY LENGTHENING SERVICE LIFE:


© Repair It Yourself - Eugenia Morpurgo

- Make it easier to reassemble, repair and renovation.
- Train consumers in footwear care.
- Develop reconditioning (e.g. sneakerdealers.net).
- Offer rental services (e.g. Atelier Bocage).
- For end of service life footwear, implement a deposit recovery service by the entity introducing it onto the market. (e.g. Angarde).

ECTOR SE RECYCLE

**Sources : Insee, Fédération Française de la chaussure, CTC, Revue-Projet*

Don't buy your shoes anymore, lease them!


© Bocage

Interview with Clémence CORNET
Head of Marketing
(Eram Group)

HOW DID YOUR LEASING PROJECT GET STARTED?

"Around a year and a half ago, we reported several findings that we wanted to address. The economic circumstances were complicated, the environmental issues in the fashion sector did not need to be further demonstrated and our clients' expectations are really evolving towards a need for committed firms. We therefore asked the Imagin'able consultancy, which specialises in innovation for good and in sustainable development, to support us in this exercise.

... the idea of a new type of consumption [...] which moves forward from the culture of ownership and wastage of shoes to a culture of using and re-using!

WHAT ANSWERS DID YOU COME UP WITH?

The consultations with Imagin'able took three months, in all areas of the firm's expertise, and primarily yielded findings for many inspiring good practices. This is what gave rise to the idea of a new type of consumption, on subscription, which moves forward from the culture of ownership and wastage of shoes to a culture of using and re-using.


© Bocage

HOW WAS THIS PROJECT SET UP?

We first established what was offered, in the first instance only with regard to women's footwear collections. The principle is based on a monthly subscription, currently Đ29 in summer and Đ34 in winter, which entitles you to one pair of new shoes every two months. The customer experience is based on a dedicated web platform: latelier-bocage.fr, which makes it easy for our customers to decide on their choice. Once the two months are up, all they need to do is take the shoes back to the shop and choose a new pair. Shoes that have been worn are then sent to our Montjean-sur-Loire (France) factory to be refurbished using a patented reconditioning procedure. In a second phase, between now and the end of 2019 –once we have sufficient stock of recovered shoes – Bocage will offer leasing for pairs of refurbished shoes, at an even more affordable price.


© Bocage

WHAT HAVE THE REACTIONS BEEN FOR THIS NEW OFFER?

The first trial was held in six shops. We have just launched leasing in 30 additional shops, out of the 120 that we have in France. We are making steady progress and have already observed a marked interest, particularly from young customers between 20 and 30 years old. In addition to appreciating the lower price, they also value the other aspect of the project, that consist of assisting them in choosing their shoes: our sales assistants are trained to act as style advisors and our shops have been redesigned as "VIP" spaces where customers are given a warm welcome and advice on what to choose. Our advisors are equally enthusiastic about this initiative.

WHAT STAGES ARE PLANNED NEXT?

We need to bring about some change in our collections so that they satisfy these new requirements better, we need to work on eco-design, ease of repairing, recycling etc. We are also making steady progress in the men's market. Our aim is to make the project profitable within two years. It is not easy being a pioneering brand but we are already convinced by the interest of this new model for society and for the environment!"

l'atelier BOCAGE

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ONGOING PROJECTS

© Hodeï France

HODEÏ *The french shoe that is 100% recyclable and returnable*

Benjamin CAMY
CEO Hodeï France © Hodeï France

How far has your project got?

We are nearing completion of our shoe, even if the need to make some modifications slowed us down somewhat. A new market survey (conducted with the Junior Enterprise – a non-profit organization formed by students – from the Skema business school) proved to be very conclusive. However, after some unforeseen problems, we had to rework the polyurethane pre-prototypes before moving on to the real prototypes made of EVA (Ethylene Vinyl Acetate).

In what respect are the results from the survey conclusive?

The survey showed that 70% of people interviewed would be potential buyers, that they had an appreciation for the circular economy and a good understanding of the concept of returnables shoes.

Why did you have to rework the pre-prototypes?

For a technical issue: we hadn't recognised that it was crucial to mould the EVA foam in a vertical press. So we are currently working with our external contractor on 3D remodelling of our shoe so that they can incorporate this procedure. The goal is to have the steel moulds completed in April, allowing us to have the first EVA prototypes ready by June 2019.

What will the next steps involve?

In September we will be launching a crowdfunding campaign in order to produce the moulds in other sizes. The good news is not just that we have obtained a grant from ADEME but also that the moulds we are currently working on might enable us to make two sizes with each, and not only one size, something that is very interesting in terms of cost!

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PROJECT AT A GLANCE

GOAL: Designing and developing a modular shoe from a single type of material that can be recycled

DURATION: 24 months

LEVEL OF SUBSIDIES FROM ECO TLC: €16,000

TYPE OF CLF COVERED: Shoes

THERMICUIR *Generating energy with leather from post-consumer footwear*

Régis LETY
CTC – Sustainability Consultant © CTC

What stage has your project for gasification now reached?

The tests conducted in spring 2018 have delivered very encouraging results. We were able to confirm our hypothesis: leather from post-consumer footwear has proven to be good fuel for heat recovery technology through gasification.

What other encouraging results have you seen?

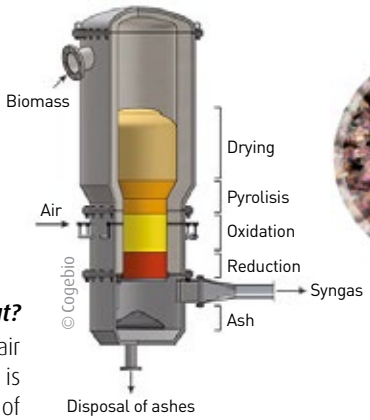
We have found that leather does not interfere with the process. It also has a good mass balance, with a mass loss of around 90%. It releases a substantial amount of energy: the first tests indicated an energy recovery figure of 50%, which could increase to 80% after modifications. Ultimately, the chrome derived from leather tanning remains in processing residues and flue gases in its original, non-toxic, chemical form (chrome 3).

What modifications need to be carried out?

On a commercial scale, filter systems for air emissions will need to be in place; this is one of the insights gained from this series of tests. Theoretically, this is not an insurmountable problem, as it involves very conventional pollution control systems. On the other hand, what we have been working on since summer 2018 is the density of the leather used: we first tried "flakes" of leather but we were advised to convert this material into granules, which are denser. We are currently conducting experiments.

What do you have planned for the next phase?

We still need to conduct a macro-economic study, which will allow us to gauge the impact of potential developments. We are hoping that gasification of leather will be viable and that the project could be developed on a commercial scale.



© Cogebio

© RAGT Energie

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PROJECT AT A GLANCE

GOAL: Recovering heat from waste leather from end-of-life footwear

DURATION: 18 months (extended until June 2019)

LEVEL OF SUBSIDIES FROM ECO TLC: €53,250

TYPE OF CLF COVERED: Leather shoes, rubber or leather soles

ECTOR SE RECYCLE

The recycled shoe will soon become recyclable

Patrick MAINGUENÉ
Managing Director of Insoft ©Insoft


©Insoft

How far has your project got?

The shoes are selling well and our top priority is to ensure production, so that has somewhat held up research work in recycling. Nonetheless we have still made further headway!

Which issues have you made progress on?

We have established the method for collection: we are going to offer each owner of a pair of Ector shoes a free return voucher, which will also include a credit voucher for a new pair. There will also be a collection point in our factory shop. We have also made progress on the issue of separating the upper and the sole as well as recycling them.

Which method of separation do you use?

The approved process is mechanical chopping using a machine that resembles electric shears. A small amount of fabric will remain on the sole section but we have established that this does not impair the recycling process. This means that we can include up to 30% of the old sole in the production of a new one.

How far have you got with the recycling of the upper?

We have validated one important point: it is possible to produce polyester granules from the used uppers in order to make a yarn. As for sole, we will first be incorporating 30% of the post-consumer material in this new yarn. Now we need to move on to tests on a semi-industrial scale to corroborate these results. To do so, we need larger volumes of post-consumer material: that's why we are eager to see collections for used shoes put in place!

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ector

PROJECT AT A GLANCE

GOAL: Recycling the Ector eco-designed shoe
DURATION: 18 months
LEVEL OF SUBSIDIES FROM ECO TLC: €75,717
TYPE OF CLF COVERED: Shoes

DESIGN FOR REPAIR

Footwear made to last

Gauthier BEDEK
Head of R&D of La Manufacture Éram ©Gauthier Bedek

How far has your project got?

Good progress has been made, in close collaboration with one of the brands in the ÉRAM group – Bocage. Our projects are very closely linked. L'atelier Bocage has recently added the finishing touches to its system for leasing footwear (see article on this subject p.23) and we have succeeded in finding an eco-design process.

What does this process involve?

We have established an adhesive mix for welding the upper and the sole. Not only does it allow us to maintain good mechanical performance throughout the useful life of the shoe but it is well suited to the industrial process. Once the shoe has reached the end of its useful life, it is easy to disassemble thanks to a special process that we have just patented.

What are the other features of the project?

Repairing shoes in order to re-use them also means working on one of deterrents of second-hand: the issue of hygiene. We have also made good progress regarding this aspect and have filed a patent for this.

Has the project reached completion?

No, we have yet to assess its viability. Since Bocage has just launched its leasing service, we are waiting until the end of 2019 to accumulate enough stocks of used footwear. Then we will be able demonstrate our capacity for refurbishing. It will take an entire year (end of 2020) before we have real indicators of profitability. The next project to embark on will be that of shoes manufactured using an injection method. We aspire to the same goal of eco-design for this procedure, which, along with that of the "welded" shoe covers most of the market.

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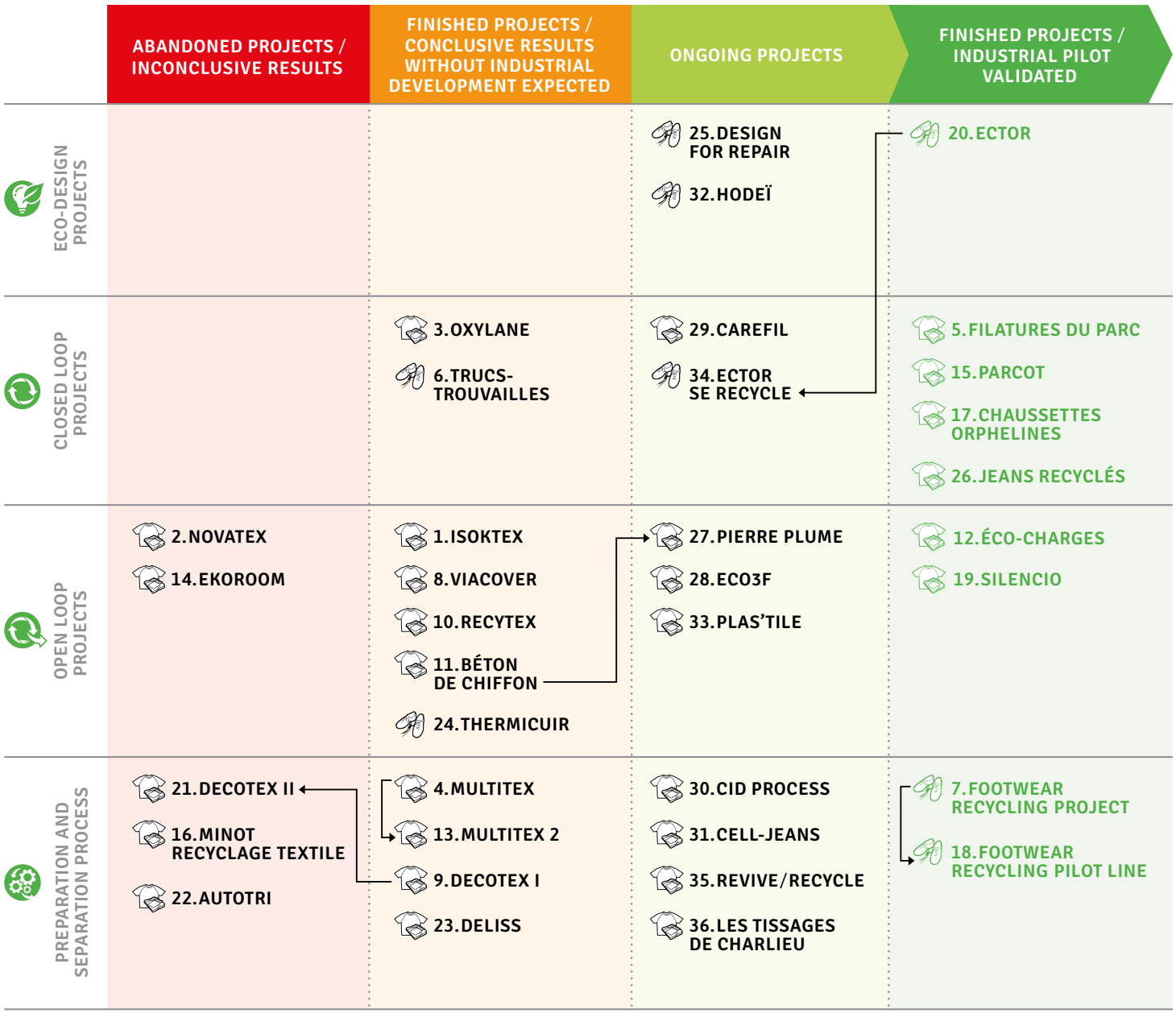
© Gauthier Bedek

LA MANUFACTURE
FABRICATION FRANÇAISE DEPUIS 1927

PROJECT AT A GLANCE

GOAL: Developing a new procedure for design and manufacture of shoes that will permit easy disassembly of all the components in an end-of-life shoe
DURATION: 36 months
LEVEL OF SUBSIDIES FROM ECO TLC: €87,325
TYPE OF CLF COVERED: Leather shoes, rubber or leather soles

OVERVIEW OF THE R&D PROJECTS SUPPORTED BY ECO TLC



1. ISOKTEX / BIC · CPP* 2010
Developing an innovative textile insulation.
Michel KEKAYAS · m.kekayas@cobic.fr

2. NOVATEX / NOVAFLOOR · CPP* 2010
Incorporating end-of-life textiles as inert fillers in decorative plates.
Vincent FORGET · vf@ecolomy.com

3. OXYLANE / DECATHLON · CPP* 2010
Manufacturing polyester yarn from post-consumer Clothing, Linen and Footwear's polyester.
Raffaele DUBY · raffaele.duby@decathlon.com

4. MULTITEX / PÔLE ÉCO-INDUSTRIES POITOU-CHARENTES · CPP* 2011
Developing a process for selective chemical recycling of used mixed textiles.
Damien DELETRAZ
d.deletraz@pole-ecoindustries.fr

13. MULTITEX 2 / PÔLE ÉCO-INDUSTRIES POITOU-CHARENTES · CPP* 2013
Studying the feasibility of a pilot for the chemical separation of used textiles materials.
Damien DELETRAZ
d.deletraz@pole-ecoindustries.fr

5. FILATURES DU PARC / FILATURES DU PARC · CPP* 2011
Transforming used woven material out of wooly fibers into new yarns of the same quality.
Fabrice LODETTI · filatures.parc@wanadoo.fr

6. TRUCS-TROUVAILLES / TRUCS-TROUVAILLES · CPP* 2011
Recycling rubber soles into a new product.
Sylvie DAMERON · sylvie.dameron@gmail.com

7. FOOTWEAR RECYCLING PROJECT / AGENCE AIR COOP · CPP* 2012
Developing an industrial grinding and separation process to find added value recycling outlet.
Benjamin MARIAS · bm@air.coop

18. FOOTWEAR RECYCLING PILOT LINE / AGENCE AIR COOP · CPP* 2014
Improving the purity of the resulting materials (leather/rubber) and output from the recycling line.
Benjamin MARIAS · bm@air.coop

8. VIACOVER / FRAMIMEX · CPP* 2012
Developing an exterior sound insulation shield in lightweight concrete integrating fibers from post-consumer textiles.
Mehdi ZERROUG · mehdi.zerroug@ecotextile.fr

**CPP: Call for Project Proposal*

9. DECOTEX I / FEYECON SEPAREX
CPP* 2012
Developing an un-dye process for polyester fabric based to enable its recycling.
Daniéla TRAMBITAS
daniela.trambitas@feyecon.com

21. DECOTEX II / SEPAREX · **CPP* 2015**
Moving to the pilot scale of DécoTex I project (FEYECON) - CO_2 sc. bleaching technology.
Daniéla TRAMBITAS
daniela.trambitas@feyecon.com

10. RECYTEX / CC PAYS DE COLOMBEY & SUD TOULOIS · **CPP* 2012**
Studying the technical, economic and commercial feasibility for interior decorative plates made up of 20 to 50% of used textiles.
Raphaël KUENY - CETELOR
raphael.kueny@univ-lorraine.fr

11. BÉTON DE CHIFFON / PREMICES & CO. · **CPP* 2013**
Creating a decorative sound-absorbing material from recycled textiles.
Amandine LANGLOIS
amandine@premicesandco.com

27. PIERRE PLUME / PREMICES & CO.
CPP* 2016
Ending the "Béton de Chiffon" project and set up the industrial step.
Amandine LANGLOIS
amandine@premicesandco.com

12. ÉCO-CHARGES / MAPEA · **CPP* 2013**
Recycling of cotton and polyester fibers for use as reinforcement in the plastics industry.
René Genillon · r.genillon@mapea.com

14. EKOROOM / LE RELAIS · **AAP 2014**
Developing textile tiles for suspended acoustic ceilings from recycled textiles.
Jean-Paul LOPEZ · jplopez@lerelais.org

15. PARCOT / FILATURES DU PARC
CPP* 2014
Making use of old cotton/polyester clothes for spinning of recycled materials employing a defibration process that is suitable for weaving or knitting new articles of textile clothing.
Fabrice LODETTI · filatures.parc@wanadoo.fr

16. MINOT RECYCLAGE TEXTILE / MINOT RECYCLAGE TEXTILE · **CPP* 2014**
Optimizing a process of end-of-life textiles to achieve an improvement in the percentage of used textiles unravelling in the process.
Jean-Luc DUSSART · jldussart@lerelais.org

17. CHAUSSETTES ORPHELINES /ANIMA
CPP* 2014
Recycling of damaged socks by creating a yarn for making new clothing.
Marcia DE CARVALHO
contact@marciadecarvalho.fr

19. SILENCIO / WECOSTA · **CPP* 2015**
Developing an eco-friendly silencer made from recycled textiles for ventilation in homes.
Hugues BROUTÉ
hbroute@wtxautomotive.com

20. ECTOR / IN SOFT · **CPP* 2015**
Developing a model for an eco-designed shoe with the upper in a knit fabric.
Patrick MAINGUENÉ ·
pamainguene@in-soft.fr

34. ECTOR SE RECYCLE / IN SOFT
CPP* 2017
Recycling of Ector's eco-designed shoes.
Patrick MAINGUENÉ
pamainguene@in-soft.fr

22. AUTOTRI / SYNERGIES TLC · **CPP* 2015**
Studying and refining of a new sorting method for the purpose selecting secondary materials not destined for second-hand clothes trade.
Thomas FRAINEUX
thomas.fraineux@synergiestlc.fr

23. DELISS / CETI · **CPP* 2016**
Researching and developing either automatic or semi-automatic procedures for removing hard points or for disassembling clothing.
Thierry Le Blan · thierry.leblan@ceti.com

24. THERMICUIR / CTC · **CPP* 2016**
Recovering heat from waste leather from end-of-life shoes.
Régis LETY · rlety@ctcgroupe.com

25. DESIGN FOR REPAIR / LA MANUFACTURE ERAM · **CPP* 2016**
Developing a new procedure for design and manufacture that will permit easy deconstruction of all components in an end-of-life shoe.
Gauthier BEDEK · gbedek@eram.fr

26. JEANS RECYCLÉS / L'ÉQUIPE 1083
CPP* 2016
Recreating a yarn with cotton from old jeans.
David LEROMAIN · david@1083.fr

28. ECO3F / SILAC INDUSTRIE · **CPP* 2016**
Making a range of acoustic insulation for the automotive industry using old textile materials.
Valéran HIEL · vhiel@silacindustrie.com

29. CAREFIL / IFTH - UTT - Le Relais
CPP* 2017
Improving the quality of yarn obtained through recycling old clothes.
Philippe MESNAGE · pmesnage@ifth.org

30. CID PROCESS / CID PROCESS
CPP* 2017
Mechanically segregating cotton and elastane on used jeans.
Roland GUIBERT · roland.guibert@wanadoo.fr

31. CELL-JEANS / L'ÉQUIPE 1083
CPP* 2017
Wet-spun cotton for the purpose of creating a man-made, cellulose-type fiber.
David LEROMAIN · david@1083.fr

32. HODEÏ / CAMY SAS · **CPP* 2017**
Designing and developing a modular shoe in a single type of material that can be recycled.
Benjamin CAMY · benjamin@hodei.fr

33. PLAS'TILE / AUDACIE · **CPP* 2017**
Recycling cotton textiles to make plastic resins.
Charlotte WALLET · c.wallet@audacie.org

35. REVIVE / RECYCLE / AGENCE AIR COOP · **CPP* 2017**
Setting up a pilot project for repairing clothes and preparing them for recycling.
Benjamin MARIAS · bm@air.coop

36. LES TISSAGES DE CHARLIEU / LES TISSAGES DE CHARLIEU · **CPP* 2017**
Making improvements, in terms of the technology and industrial processes, to an article made entirely of recycled post-consumer polyester from Europe and assessment of the difference between the cost price and the market price.
Éric BOËL · e-boel@ltc-jacquard.com

8 NEW PROJECTS

37. RECYC'LAB / AUCHAN · **CPP* 2018**
Valorizing end-of-life clothing's fibers into mobile phone cases using the Roctool induction heating technology.
Isabelle DAYDE · idayde@auchan.fr

38. AUTODELISS / CETI · **CPP* 2018**
Preparing the future industrialization of the textile unsmoothing operation by creating an experimental demonstration tool with a special machine.
Thierry Le Blan · thierry.leblan@ceti.com

39. 4RFID / DECATHLON · **CPP* 2018**
Developing a pilot to create a complete textiles' traceability process, allowing their end-of-life management thanks to the RFID technology.
Nagy BENSID · nagy.bensid@decathlon.com

40. MOBIOTEX / FCBA · **CPP* 2018**
Assessing the possibilities to use recycled textiles' fibers as an essential component of wood framed constructions.
Zaratiana MANDRARA
Zaratiana.Mandrara@fcba.fr

41. TISSIUM / MAXIMUM · **CPP* 2018**
Developing a rigid material made from textiles waste fibers intended for furniture manufacture of the tertiary sector.
Romée DE LA BIGNE · romee@maximum.paris

42. JEPLAN / TECHTERA · **CPP* 2018**
Assessing the reliability of an implantation's project in France of a JEPLAN's plant of pilot recycling of used TLC's transformation into recycled polyester pellet.
Julie RAFTON-JOLIVET · jrafton@TECHTERA.org

43. ECO-LOGIC WALL / VERT-TICAL NORD · **CPP* 2018**
Developing a green wall using recycled textiles to replace substrates and sphagnum (natural moss) currently used.
Frédéric LOGEZ · contact@vert-tical.fr

44. QWIET / WECOSTA · **CPP* 2018**
Developing solutions to improve the acoustic comfort in public spaces (offices, industrial premises etc.) by using ecological materials, including materials from the CLF sector.
Hugues BROUTÉ · hbroute@wtxautomotive.com

Recycling of used footwear: the first dismantling line launched!

Success story for Footwear Recycling project

FINALIZED PROJECT!

© SOEX

Interview with Axel Buchholz, CEO of SOEX and I:Collect

Since the launch of the footwear recycling pilot line in June 2018, what are the key learnings and key issues you are facing?

"It has been an interesting and informative time for us. We gained valuable experience both in the operation of the production line and regarding the market integration of the material outputs with I:Collect partners.

The most positive finding is that we are noticing a great deal of market interest in shoe recycling solutions. We often receive enquiries from shoe manufacturers or shoe retailers interested in sustainability and became aware of SOEX and I:Collect that way.

We develop individually tailored solutions for both major shoe brands and smaller one. We were delighted when our partners confirmed that our recycled shoe material was successfully integrated into the production of new soles. Besides outsole production, we are also seeing strong interest in recycled shoe leather, though the processing method is still under development.

However, at the same time, we are also facing challenges, for example regarding the variety and lack of information about the used shoes we process. Both of these make certifying and documenting the output material and, ultimately, market integration difficult and challenging for us. In this context, it would help to have a special material labelling system for shoes similar to the labelling that already exists for clothing.

Can you share some figures on the footwear recycling line?

We are looking confidently towards the future. From mid-2019, we are planning a constant throughput of around 2–3 tonnes per day with post- and pre-consumer shoes as input material. The long-term plan envisages a steady increase in production in the years ahead, although this will depend on market demand and on the solutions to the challenges described.

What are the main clients/industries for the outputs of the line?

© SOEX

We have now 4 outputs: outsole mixed; leather; metal parts; textiles. The three main applications for the recycled outsole material are new shoe soles, sports grounds and running tracks or playgrounds, and interior design objects like rugs and doormats. Applications for the recycled leather materials are currently under development. Metal parts are sold to traditional metal recycler. Unfortunately textiles are, so far, incinerated.

Our main partners are our existing I:Collect partners, with whom we have been working in an integrated way for many years now.

Are you planning some adaptations / changes in the pilot line to shift to an industrial level?

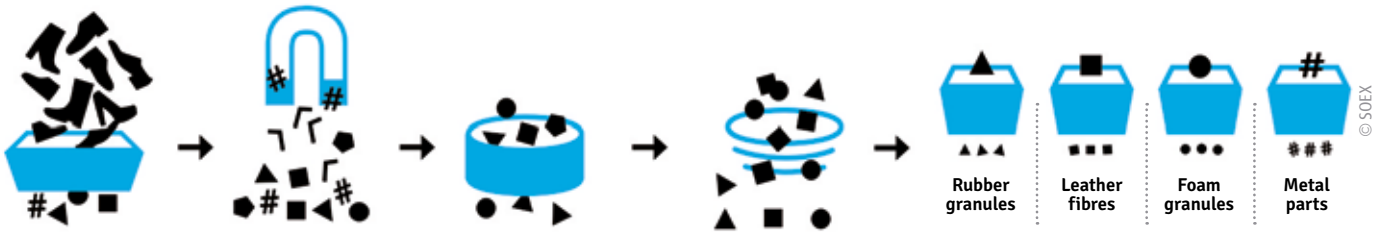
Yes, we are planning improvements regarding the automation of facilities and the cleanliness of recycled materials outputs. The latter primarily by integrating a special filter system adapted to our customers' requirements for further processing of the materials.

If we consider all the different non-reusable shoe categories that are being collected, what are the ones excluded for the recycling line?

We exclude two categories of shoes when we are sorting shoes for recycling:

1) Shoes with very hard components, such as high heels, safety footwear and shoes with studs, mainly because of heavy wear and possible damage to individual components of the machine;

2) Shoes without hard soles, such as slippers, as we currently have no use for recycled textiles. In addition, these types of shoes slow down production productivity significantly because of their light weight."



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1. SHREDDER
Cutting of shoes

2. METAL SEPARATOR
Extraction of ferrous metals

3. DELAMINATION MILL
Fractionation of composite materials

4. AIR SEPARATOR
Separation of materials (rubber, leather, foam)

5. GRANULATOR/FINE GRINDER
Size reduction of separated materials