



innovation

Re_fashion

#11

Discover the winners of the 2021 Innovation Challenge

p.4

Textiles and footwear
recycling mappings

p.14

Former winners:
what did they become?

p.20

The MSP Committee:
testing new recycling solutions

p.26

Re_fashion

A look back at the 2021 Innovation Challenge

In its twelve years of existence, the Innovation Challenge has identified 60 ambitious projects co-financed by Refashion and developed with a view to optimizing used, non-reusable textile and footwear recycling. The objective of this call for projects is to make the regenerative and circular economy a reality in the Textile and Fashion industry.

How to produce environmentally performing materials from post-consumer non-reusable textiles and footwear that fit the market's functional and economic needs?

This was the challenge to be resolved by this twelfth edition of the Innovation Challenge. An edition designed in an exceptional format of a call for project applications, in partnership with SoScience, the specialist in collaborative research and responsible innovation programs, in order to identify new, collaborative solutions. SoScience applied its "The Future Of" methodology as part of a dedicated program known as "The Future of Textiles & Footwear Recycling".

Open from October to December 2021, this unprecedented international call for proposals was circulated to 310 international experts. 110 companies from 25 countries including France, Austria, Bulgaria, Germany, The Netherlands, Spain, Lithuania, Bangladesh, Brazil, Canada, India and The United States showed an interest in this 12th edition of the Innovation Challenge.

34 proposals were selected by the 2021 Innovation Challenge Jury to participate in partner meeting days, the highlight of the "The Future Of" program. Thanks to these meetings, 13 collaborative projects emerged, 8 of which completed the project application process, then the Innovation Challenge Jury selected 5 projects for funding support from Refashion. Like every year, the Innovation Challenge benefits from a minimum budget of 500 000 euros, without shareholding requirements or royalties.



In the eyes of Véronique Allaire-Spitzer,
Regenerative Solutions Division Director, Refashion

"Thanks to the partnership with SoScience, a company specialized in collaborative innovation, this year's Innovation Challenge enabled candidates to form consortiums right before their financing. The meeting days, which took place virtually owing to the health crisis, were fascinating. Connections were quickly formed between the various participants, enabling those not acquainted with the sector's challenges to benefit from a must faster acculturation. This also enabled us to reach out to stakeholders from other sectors, industries and countries and to develop projects with multi-cultural consortiums. That was the highlight of this year's edition!"



AURAreFIL Project

#1

An innovative and ecological polymer removal project for used textiles

At the origin of the AURAreFIL project, the start-up Recyc'Elit is looking to become a pioneer in chemical and ecological depolymerization technology for PET recycling in Europe.

"We don't reject plastic, we recycle it!", this is the credo of Karim and Raouf Médimagh, respectively Chairman and R&D Director of the start-up Recyc'Elit. Within the context of the AURAreFIL project, the brothers, both doctors in chemistry, have perfected a unique, patented molecular recycling process permitting polymers to be removed from PET in order to obtain the two original monomers, Dimethyl Terephthalate (DMT) and Monoethylene Glycol (MEG). The objective: to recycle all types of PET (Polyethylene Terephthalate) based from waste and materials, even the most complicated (colored, opaque, multilayer containers), whatever their origin.

Bearing in mind that more than half of the PET consumed at a global level is oriented towards the textile market, Recyc'Elit has naturally included the treatment of polyester-based textile waste in its business strategy.

A virtuous environmental approach

At the heart of this chemical transformation process, the environmental impact occupies a preponderant position: very low energy consumption with high productivity, a reduced use of water as well as a very reduced use of

non-toxic reagents and solvents. Further proof of the virtuous nature of this low carbon depolymerization solution: the textiles feedstock is 100% local, only coming from France Auvergne Rhône-Alpes region.



Unity makes strength

Thanks to its application to participate in Refashion's Innovation Challenge, this fledgling company has joined forces with the Techtera competitiveness hub and the Grenoble Alpes Metropolis to develop the AURAreFIL project. Techtera will coordinate the project, so as to develop a local outlet around the production of a high quality recycled polyester yarn, whilst Grenoble Alpes Metropolis will provide used polyester textiles which are sorted and prepared according to specifications jointly compiled with Recyc'Elit. The project is undergoing a laboratory test phase followed by a pre-pilot phase for tests on used pure polyester textiles and blends with cotton and elastane. If results are conclusive, a first mini-demonstrator will see the day at the end of 2023. Recyc'Elit hopes that this model will eventually be duplicated in other regions on a national and international scale.

The 3 project stages

- 1 - Material sorting and preparation of used polyester textiles (pure and blended).
- 2 - Depolymerization and re-polymerization tests to obtain a rPET resin.
- 3 - Manufacturing of a recycled polyester thread made from used textiles.

Jury's words

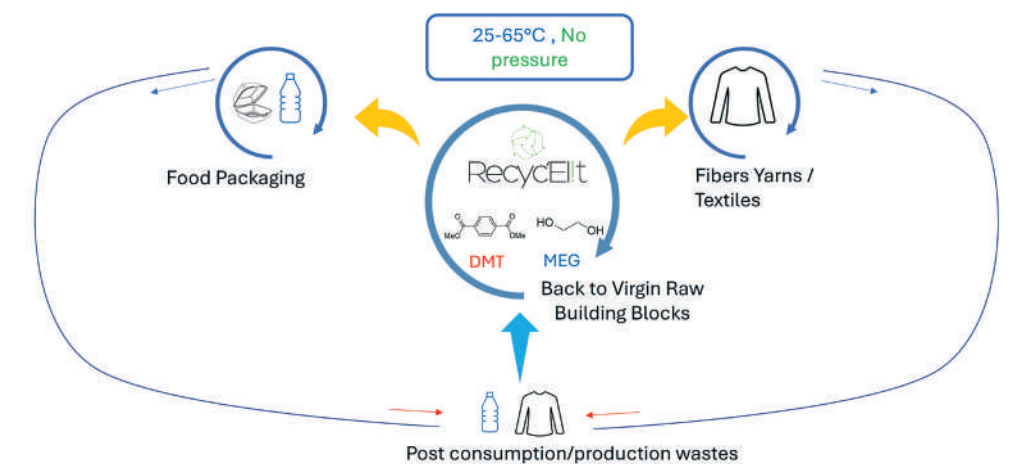
"This low-environmental impact chemical recycling process permits a return to high quality virgin monomers from used polyester textiles, offering a chance to create a veritable regional value chain."

Christine Browaeys – Director of T3Nel (TIC, Textiles, New Technologies) – Member of the 2021 Innovation Challenge Jury

PROJECT OBJECTIVE

Adapting the Recyc'Elit chemical recycling process to transform post-consumer non-reusable polyester textiles (pure and blended) into recycled polyester threads.

A 100% circular recycling solution



PROJECT SYNOPSIS

PROJECT DURATION

9 months

PROJECT PARTNERS:
RECYC'ELIT, TECHTERA,
Grenoble Alpes Métropole

TYPE OF CHF COVERED
Clothing

Refashion funding: €73,959

*CHF = Clothing, Household linen and Footwear

GREENCOSE Project

#2

Recycling cotton textile waste into a bi-component fiber for the clothing industry

With GREENCOSE, Induo is striving to produce a high quality fiber from used, non-reusable cotton-rich clothing. The company has consequently developed a totally new chemical recycling process. Currently at the laboratory test stage, financing from Refashion should enable the project to grow.

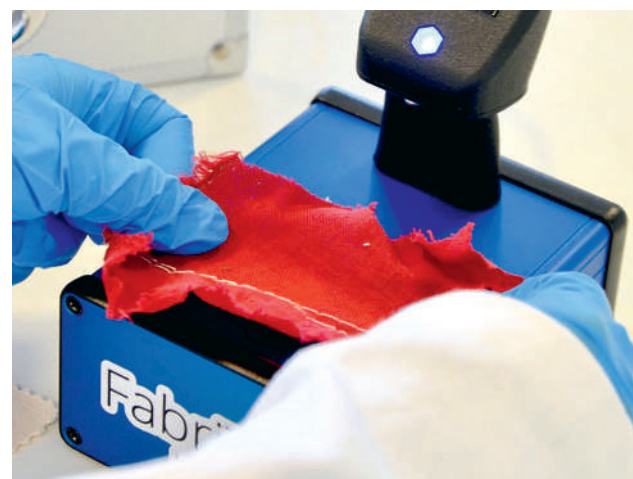
The GREENCOSE project is steered by Induo, a young Franco-British company specialized in ecological textile innovation which has already attracted attention by developing a shirt fabric which is resistant to stains, sweat and creasing, marketed in 25 countries.

On this occasion, Induo is standing out from the crowd by proposing a cellulose recycling technique enabling non-reusable cotton-rich clothing to be recycled.

A fiber combining the dual qualities of cotton and polyester

In concrete terms, the process invented by Induo consists in reducing textile waste to powder form, then chemically separating the various components. The result of this unprecedented chemical recycling process is a bi-component textile fiber which presents the same properties as cotton combined with polyester resistance and crease proofness. This technique should permit a new textile material, wholly "Made in France", to be produced, consequently contributing towards the independence of the nation's textile industry.

GREENCOSE therefore constitutes an answer to three fundamental stakes for the future of the textile industry: waste management, a reduced environmental impact and re-industrialization.



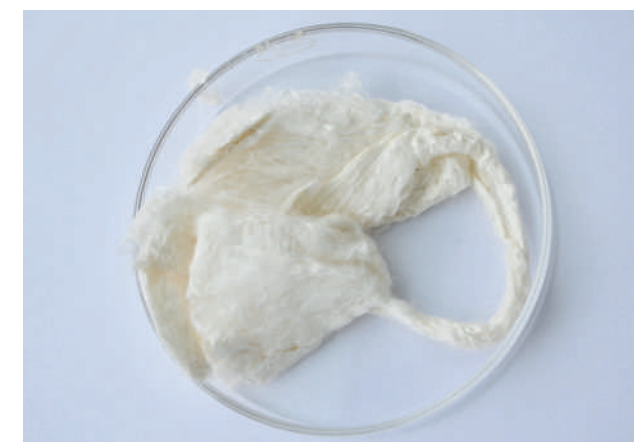
An ambitious project

As a winner of the Refashion Innovation Challenge, the GREENCOSE project benefits from funding support which will enable it to accelerate its development by testing this innovative process on used, non-reusable cotton-rich textiles.

The characterization of suitable textile feedstock will be directly defined in sorting centers, with partners such as Gebetex and Le Relais. From 2023, Induo is hoping to take this initiative one step further and is striving to raise funds in order to develop an industrial demonstrator capable of processing 200 tons of waste per year. In the long-term, the company hopes to build a plant in Northern France in order to transform used, non-reusable cotton, linen and viscose clothing into a 100% recycled and recyclable fiber.

The 3 project stages

- 1 - Identify the right used, non-reusable cotton-rich textile feedstock.
- 2 - Test whether the selected textile feedstock can be recycled into Greencose bi-component fibers.
- 3 - Develop a protocol in order to identify textile feedstock suitable for GREENCOSE technology.



Jury's words

"This new chemical recycling process is extremely promising as it targets the most common material blends: cotton (or other cellulose) and polyester, and the recycled fibers can directly be used to make new clothing."

Jeanne Meillier – Business Manager at EuraMaterials – Member of the 2021 Innovation Challenge Jury

PROJECT OBJECTIVE

Testing the Greencose chemical recycling process on cotton-rich used textile feedstock.



PROJECT SYNOPSIS

PROJECT DURATION

12
months

PROJECT PARTNERS:

INDUO, GEBETEX,
LE RELAIS, PATATAM

TYPE OF
CHF COVERED

Clothing

Refashion funding: **€ 50,689**

*CHF = Clothing, Household linen and Footwear

MISTERY Project

#3

Multispectral optical sensors to optimize textile recycling

MISTERY is a collaborative project whose objective is to prototype the use of multispectral optical sensors in order to characterize used household textiles and assess their suitability thanks to field tests.

First things first, let's unveil this MISTERY: it's an acronym for Multispectral Optical Sensors for Textiles Recycling. In other words, this project is striving to perfect a technique to detect textile composition using multispectral optical sensors at the start of the textile recycling stage. The objective: to improve material sorting, which is currently mostly carried out by hand, by using cameras or NIR (Near Infrared) imagers with recourse to SWIR (Short wave Infrared) imagers. A technology which should permit a more sophisticated and more precise analysis of textile waste.

Industrialize used textiles recycling

The MISTERY project is steered by YSPOT – the CEA's (French Atomic Energy Commission) collaborative innovation center – and uses the System Lab multispectral and multimodal imaging platform financed by the Nanoelec Technological Research Institute. Presented at Refashion's 2021 Innovation Challenge, System Lab won over several industry players who are supporting YSPOT to assess, in laboratory and industrial conditions, the suitability of the platform's optical sensors in improving the

identification of used, non-reusable textile material components and the identification of potential contaminants. Test results will provide a twofold response: firstly, to the problem faced by Refashion concerning the industrialization of Textile Industry recycling and secondly, to the System Lab project which is to explore possible applications for optical sensors in the textile sector.



From Laboratory tests to industrial conditions trials

In June 2022, a kick-off meeting brought together all of the MISTERY project partners: CEA YSPOT, Boer Group Recycling Solutions, Aalto University and Horiba Scientific. Together, they defined in laboratories an experimentation plan, with tests firstly being conducted in laboratories, then in industrial conditions at Gebetex Tri Normandie. Support from Refashion will enable this project to be co-financed, and more particularly, a hyperspectral camera, whose design is especially costly, to be specifically designed. In the long-term, test results will enable the MISTERY business model to be assessed and to determine whether or not the optical system developed would permit a noteworthy gain in terms of sorting used, non-reusable textiles oriented towards recycling (mechanical, chemical etc).

The 3 project stages

- 1 - Laboratory tests with the Refashion textile materials library.
- 2 - Design of a specific hyperspectral camera for used textiles characterization.
- 3 - Industrial scale tests on a textile sorting line with a view to developing a business model.



Jury's words

“Sorting textiles according to fiber typology is a crucial stage in orienting used, non-reusable textiles towards the most suitable recycling process. The use of multispectral optical sensors is a new solution well worth exploring.”

Arnaud Parenty – Director of LAVOISIER CIRCULAR TRANSITION – Member of the 2021 Innovation Challenge Jury.

PROJECT OBJECTIVE

Prototyping the use of multispectral optical sensors for the characterization of used household textiles.



PROJECT SYNOPSIS

PROJECT DURATION
14
months

PROJECT PARTNERS:
CEA YSPOT, Boer Group Recycling Solutions, Gebetex Tri Normandie, Aalto University, Horiba Scientific

TYPE OF CHF COVERED
Clothing

Refashion funding: **€ 88,809**

*CHF = Clothing, Household linen and Footwear

REVIVAL Project

#4 Sneaker soles as parquet underlay



REVIVAL is an eco-circular project aiming to compile a catalogue of footwear recycling outlets and solutions whilst rising to the challenge of developing an efficient model on an industrial and economic level.

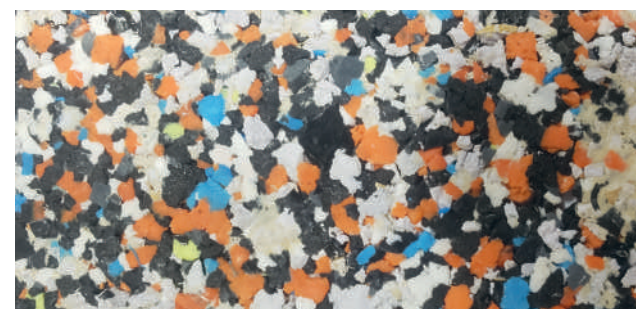
The REVIVAL project is the brainchild of Hélène Guerret, Marie Soudré-Richard and Guillaume Haffreingue. It is based on the concept that whilst used, non-reusable footwear no longer has a commercial value, it constitutes a gold mine in terms of materials. After having benchmarked the market, the three partners concluded that in France, only partial solutions with respect to footwear recycling existed.

Impressive R&D and a unique technical capital

Wanting to be among the first to contribute towards the industrialization of footwear recycling, they began by developing an impressive R&D hub in partnership with the IMT Nord Europe, then validated the industrial phase of their project. In effect, the technical capital of the company REVIVAL by impacte.capital is currently extremely successful with respect to material separation, an essential stage in order to optimize recycling and obtain high value and high performing recycled materials, which meet at 95% the same specifications as original materials.

An alternative to oil-sourced materials

Within the context of the REVIVAL project, the company is working on a demonstrator using EVA (elastomer polymer) from sneaker soles recycling for use as parquet underlay, and which possesses the same properties as the materials available on today's market, namely as regards soundproofing and sealing. The company is in a partnership with Bouyer Leroux, a building component manufacturer which is looking to use recycled materials as an alternative



to oil-sourced materials. The challenge of the project is therefore to develop a sustainable model which will permit the industrial and cost-controlled production of a new eco-material which will replace a material which depletes fossil resources. More widely, REVIVAL is working on compiling a catalogue of outlets, permitting other solutions to be rapidly determined and their cost estimated for the end-of-life management of used, non-reusable footwear collected. With the help of predictive software and knowledge of materials, in-coming footwear feedstock will either be oriented towards a high added-value transformation or a low value-added outlet, as it is essential to look for maximum positive impact!

The 3 project stages

- 1 - Isolate thermoplastic components and rubber from sneaker soles.
- 2 - Carry out mass fragmentation and decontamination.
- 3 - Recycle components into raw material for parquet underlay and other applications.



Jury's words

"We are still in the early stages of used footwear recycling in France. This project is a first step towards recycling footwear materials for use in the building industry."

Jean-Claude JEGOU – Innovation and Development Manager with the French Footwear Federation – Member of the 2021 Innovation Challenge Jury

PROJECT OBJECTIVE

Building a demonstrator using EVA (elastomeric polymer) derived from the recycling of used sneaker outsoles to make underlay for parquet flooring.



PROJECT SYNOPSIS

PROJECT DURATION
16
months

PROJECT PARTNERS:
REVIVAL by impacte.capital,
Bouyer Leroux, IMT Nord Europe

TYPE OF CHF COVERED
Footwear

Refashion funding: **€ 27,600**

TISSIUM INDUSTRIE Project

#5

Design panels for fittings and furnishings

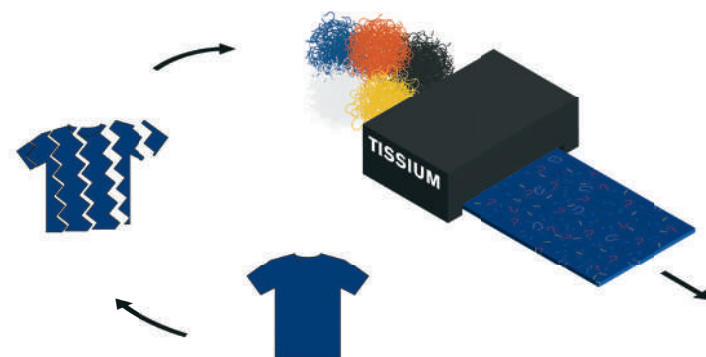
Since 2015, the company Maximum has been designing and producing furniture using industrial waste. Today, Romée de la Bigne and Basile de Gaulle, graduates of France's National School of Decorative Arts, are confirming their commitment to this industrial upcycling initiative with the TISSIUM INDUSTRIE project.

TISSIUM is a recycled composite panel, just as rigid as MDF, composed of 70% textile waste and 30% paint waste and is therefore made 100% from waste! It represents a great ecological alternative to chip board, which is widely used in furnishings and whose manufacturing requires the use of glues, hazardous to human health and the environment.

No material sorting

27 kilos of textiles are needed to produce a 122cm x 244cm, 2cm thick Tissium board. To supply itself with raw materials, the company is targeting used, non-reusable clothing feedstock that is collected and sorted in France, a large proportion of which is exported, namely towards Asia. TISSIUM therefore represents a new outlet for used, non-reusable textiles without leaving the country. Besides being sustainable, this design material has another significant advantage: its making doesn't require any material sorting; the used fiber - cotton, polyester or other - having virtually

no impact on the end product's mechanical properties. On the other hand, for purely aesthetic purposes, TISSIUM requires textiles color sorting, which is much easier to do, in order to be able to build on textiles' color and propose a finished material which does not require any painting or redecorating.



An ecological solution for the future

After several years of R&D during the previous project supported by Refashion in order to fine-tune the new material, the project is embarking on the industrialization phase with the creation of a pilot unit. Based in Ivry-sur-Seine, this industrial demonstrator is due to produce the first panels by mid 2023. Intended for the furniture and furnishing markets via retail, direct sale or through brands, TISSIUM will be sold at around €50/ m². With its exclusive open loop design process which recycles used, non-reusable textiles, TISSIUM seems to represent a veritable ecological solution for the future.

The 3 project stages

- 1 - Finalization of the R&D phase.
- 2 - Industrialization phase.
- 3 - Production phase.



Jury's words

"The previous project supported by Refashion has enabled the TISSIUM material to be developed. Reaching the pre-industrial production stage for this material will enable growing volumes of textile waste to be processed in France."

Franck Duhamel – Development Manager, PLASTIUM – Member of the 2021 Innovation Challenge Jury

PROJECT OBJECTIVE

Development of a pilot production unit of the rigid composite material Tissium, made from recycled textile waste, in the form of machinable panels for the furniture and furnishing markets.

PROJECT SYNOPSIS

PROJECT DURATION

9

months

PROJECT PARTNERS:
SAS TISSIUM,
GEBETEX TRI NORMANDIE

TYPE OF CHF COVERED

Clothing and household linen

Refashion funding: € 381,162

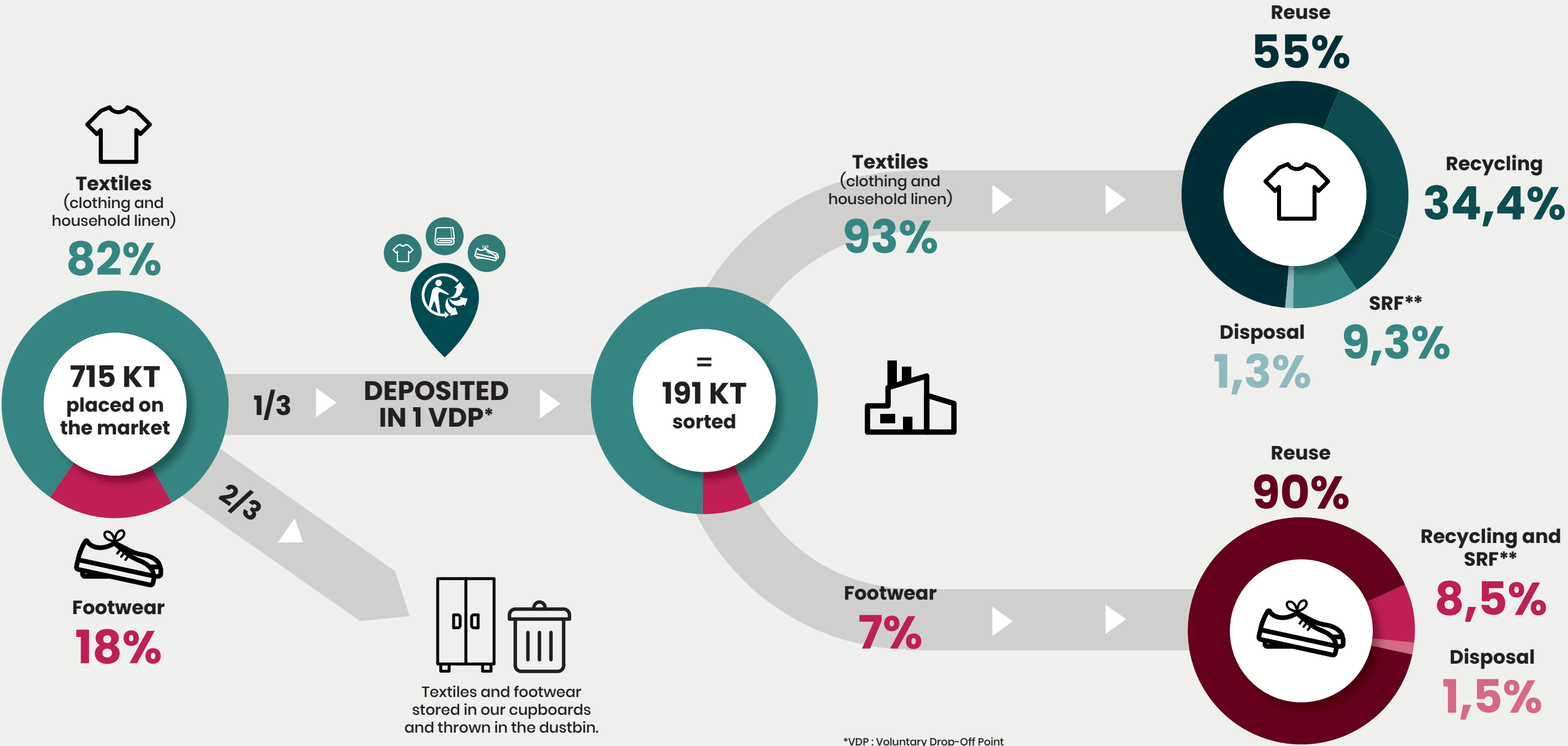
THE FUTURE OF USED TEXTILES AND FOOTWEAR

In 2021, 715 000 tons of textiles and footwear were put on the market. Only one third of this feedstock was disposed of at one of the 45 000 Voluntary Drop-Off Points (VDP) in France, the remaining two thirds being stored in our cupboards or ending up in our dustbins.

This is particularly true for footwear, which only accounts for 7% of sorted tonnages, whilst it accounts for 18% of tonnages put on the market. The vast majority of consumers deposit footwear, which is generally “in good condition” and which could be reused, in VDPs, whilst badly worn footwear tends to end up in the dustbin. This is why almost 90% of collected footwear is eligible for reuse, as opposed to just 55% for textiles. Today, the reality of used footwear recycling is harsh: there are still not enough recovery solutions, unlike for textiles where veritable industrial projects are beginning to emerge.

SO WHY IS FOOTWEAR RECYCLING SO FAR BEHIND?

On average, footwear is composed of 5 different materials assembled with glues / stitching which make them difficult to disassemble. Once disassembled and sorted, these materials must be processed (cleaned, shredded, melted down, purified...) to be able to be used in new applications. There are a lot of technical and costly stages for a result which is economically less competitive than that of a virgin material. Out of the 60 projects supported by Refashion within the context of the Innovation Challenge, only 12 projects concern footwear recycling.



*VDP : Voluntary Drop-Off Point
**SRF : Solid Recovered Fuel. Data 2021 (estimates)

17

Mapping of footwear recycling

- Industrial stage
- R&D projects or trials in progress

PROJECT

Projects supported by Refashion within the Innovation Challenge

*SRF: Solid Recovered Fuel

A vast majority
of collected footwear
can be reused



A small fraction
of collected footwear
cannot be reused and
therefore must be recycled

**Manual AND/OR
automatical
sorting
of non-reusable
footwear**



DESIGN FOR REPAIR

**Disassembly
upper-sole
+ remanufacturing
or sole recycling**



**Closed loop
recycling
(shredding-melting-
injection)**

→ Single-material footwear

HODEI



**Industrial
composting**

→ Biodegradable materials
that degrade when composted

**Slicing
of sport footwear:
separation of the shoe
upper from the sole**

**Sorting then shredding
into 3 types of granules:
RUBBER, FOAM AND FIBRES**
→ Flooring surfaces, outsoles



**SRF*,
Energy recovery or
incineration/landfilling**

**Shredding/
compressing**

- 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



**SHREDDING
CHALLENGES:**

- Limit intra-material pollution,
- Reduce and homogenize particle size

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

**Delamination
then densimetric separation
of materials**

FOOTWEAR RECYCLING PILOT LINE

**RUBBERS
(NATURAL AND
SYNTHETIC ELASTOMER),
FOAM, PVC, PU, ETC.
FROM SOLES**

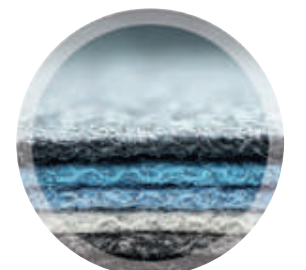
→ Hard or bouncing floorings,
thick mats, outsoles

TRUCS-TROUVAILLES



METALS

→ Existing metal recycling processes



TEXTILES

(NATURAL AND SYNTHETIC MATERIALS)

→ SRF*, Energy recovery

→ Integration into nonwovens



**REJECTS
AND DUST PARTICLES**

→ SRF*, Energy recovery



LEATHER/FAUX LEATHER

→ Shredded to be used as filler

→ Mixed with PVC to be used as filler

→ Mixed in with wood fibres to produce acoustic panels

→ Integration into compressed wood panels

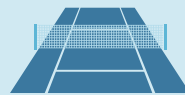
→ Thermal recovery

THERMICUIR



2,500 pairs...

of foam insoles
allow one tennis court
to be built



of rubber outsoles,
300m² of children's
playgrounds



Re_fashion

Pour une filière 100% circulaire

THE SUCCESS STORIES OF FORMER WINNERS

In its twelve years of existence, the Innovation Challenge has enabled sixty projects to be rewarded and benefit from the financial support of Refashion. Putting the spotlight on four former winners is a chance to see what they became via a three step interview covering the past, the present and the future.

1-REVIVE/RECYCLE

The objective of this project was twofold: firstly, to give a new lease of life to clothing able to be repaired thanks to upcycling, and secondly, to develop a recycling preparation technology for used, non-reusable textiles in order to avoid landfill or incineration. It was this second aspect which was partly financed by Refashion.

Refashion
funding
€ 97,450

**PRIZEWINNER
IN 2017**



3 questions for Virgile Aymard,
Eco-Design and Life Cycle Analysis
Engineer at AIR coop

What have you been able to accomplish within the context of your project?

We have developed a pilot machine which permits trims to be automatically separated at high speed, approximately 200 kilos / hour. The technology is based on air flows: on one side, the machine recovers all heavy elements (metals, plastics, labels...) and, at the end of the line, we obtain clean squares of fabric which we can send to the suitable recycler depending on the material.

And what's the current situation?

Because of Covid, the project end date was delayed by two years. It was therefore only completed last May. We're now looking for an industrial partner, ideally in France, who'd be interested in going on to the next stage, in other words, using our initial technology to improve it and fine-tune sorting parameters in order to be able to propose an automatic trims removal solution, thereby helping recycling preparation.

How do you see the future?

The long-term objective is to be able to propose a turnkey solution to brands, a comprehensive process to prolong the life of clothing insofar as possible, and if that's not possible, to recycle materials on an industrial scale. Our Spanish partner on the project, Recuprenda, already has several contacts and promising avenues to explore. I'm hopeful that this technology will be developed in the near future.

2-CAREFIL

Born from a collaboration between UTT, IFTH and Le Relais, this project had the objective of optimizing spinning and garning methods for used, non-reusable knitwear in order to obtain a better quality end yarn, whether dyed or not, for reuse in a closed loop.



3 questions for Mickael Lemaire,
Innovation and Recycling
Manager at UTT

What have you been able to accomplish within the context of your project?

We successfully finalized the project in July 2021. Using four materials from used knitwear sorted by Le Relais, which we processed in parallel – wool, cotton, polyester and acrylic- we succeeded in producing various good quality yarns, incorporating between 30 and 50% of post-consumer textiles depending on the compositions.

Refashion
funding
€ 142,842

**PRIZEWINNER
IN 2017**

And what's the current situation?

Thanks to the success of CAREFIL, we are currently working on a new project, known as REFIL'ON, the aim of which is to install a spinning mill in Trélon in order to produce industrial quantities of yarn from recycled multi-material textile waste. Our project has been selected within the context of the France Relance program and the plant is about to begin operations. This first line will produce between 700 and 800 tons of yarn per year.

How do you see the future?

We are looking to become a leading player in the recycled materials spinning industry in France. To achieve this, we hope to set up a second line during the next two to three years if everything goes as planned, then a third line and even a fourth one in the long-term, in order to increase our production volumes. We're working closely with our clients to this end.



3-MOBIOTEX

This project had the objective of studying the possibility of using recycled textiles to produce rainscreens or vapor barriers, two essential elements for timber-frame walls. The objective was twofold: firstly, to propose an alternative to materials from the petrochemical industry and secondly, to offer new outlets for recycled textiles.



3 questions for Laurent Bedel,
R&D Insulation Director
at Soprema

What have you been able to accomplish within the context of your project?

We were able to successfully complete the various stages of the project, from the selection of materials obtained from garnetting textile fibers to the design, production and integration of new products within optimized and functional timber-frame walls, also going through the extremely sophisticated and precise characterization of the thermo-hydric behavior of the manufactured products.

Refashion
funding
€77,494

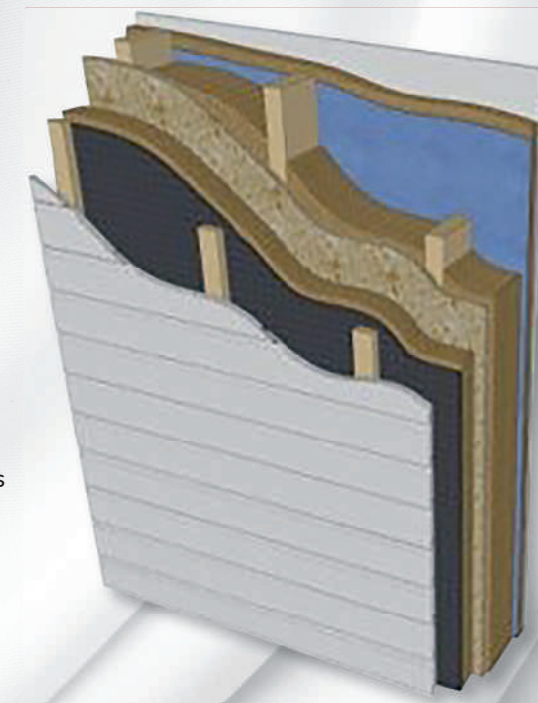
**PRIZEWINNER
IN 2018**

And what's the current situation?

Thanks to this project, we have been able to perfect a rainscreen and a vapor barrier majoritarily composed of recycled textiles. So technically it works. On the other hand, in terms of the quality-price ratio, we have not achieved economic competitiveness in relation to the standard oil-sourced products which are currently available on the market.

How do you see the future?

Objectively, the MOBIOTEX project is in phase with future trends. Like numerous companies, Soprema has committed to a strong carbon reduction strategy with respect to its products. Replacing raw materials from the petrochemical industry by recycled fibers unquestionably contributes towards this. Thanks to this project, we know what is feasible and what isn't and that's already really important. We have not yet reached a level of performance enabling economic profitability to be reached for this type of product, but should the market change in the near future, these capacities and this knowledge will be extremely valuable.



4-TRIMCLEAN

Using artificial intelligence, the system developed by the Valvan company has the objective of industrializing the preparation of used, non-reusable textiles for recycling, by quickly and efficiently removing trims. For this, a smart algorithm detects the pieces of fabric containing trims, which are then ejected from the conveyor belt with the help of air streams.



3 questions for Maurits Vandeputte,
Innovation Manager at Valvan

What have you been able to accomplish within the context of your project?

We began the first Research and Development stage several months behind schedule owing to the health crisis, but in spite of this, we succeeded in conducting our 18 months of research in order to test the various technologies and the different types of cameras permitting trims to be identified and recognized. Thanks to these test months, we were able to identify the best possible configuration for an industrial process.

Refashion
funding
€61,213

**PRIZEWINNER
IN 2019**

And what's the current situation?

Within the context of the TRIMCLEAN project we have developed a small prototype which has enabled us to show our technology to potential clients. One of them has shown a significant interest and we have already sold a first industrial installation. It is currently being built and should be up and running from October. It will enable between 800 kilos and 1.5 tons of textiles to be trimcleaned per hour.

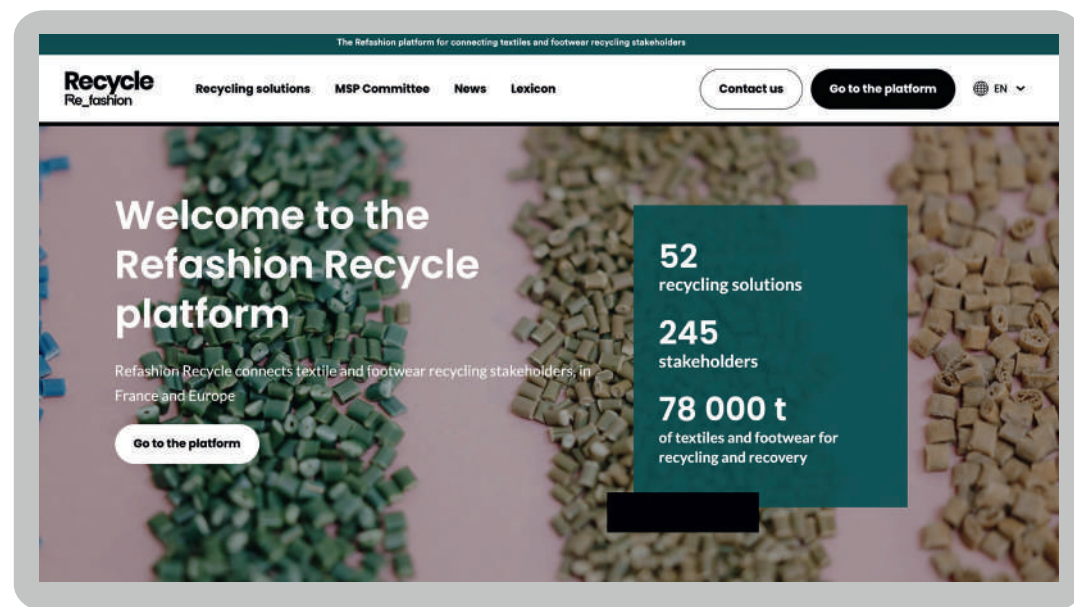
How do you see the future?

Our ambition is to set up a complete industrial chain. We have already perfected another technology, FIBERSORT, which permits large volumes of post-consumption textiles to be sorted on the basis of fiber composition: cotton, wool, polyester, any blend of these fibers... In a few years time, the TRIMCLEAN/FIBERSORT combination should permit the industrialization of recycling preparation at an affordable cost.



Recycle by Refashion

The first digital platform for connecting textile and footwear recycling stakeholders



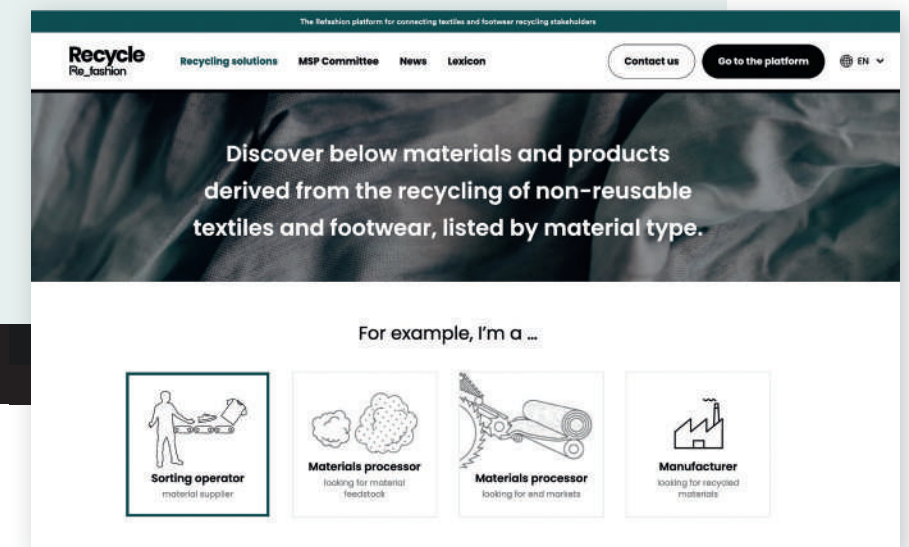
Bringing together companies offering materials and industrialists who will integrate those into their production processes – this is the objective of Refashion's RECYCLE platform. An unprecedented, effective and cost-free tool which perfectly corresponds to the eco-organization's strategy, whose global objective is the industrialization of used, non-reusable textiles in France and in Europe.

The two cartographies which illustrate existing recycling processes reveal all of the stages in preparing and transforming non-reusable textiles and footwear into new products. Refashion wanted to propose a digital tool which, would not only bring together the companies proposing these industrial recycling solutions, but would also permit contacts to be made with the industry players who will be incorporating the resulting materials into their production processes. This tool is RECYCLE, developed by Refashion, a unique platform on a European scale which focuses on materials and provides a tangible solution to the lack of visibility of materials to be recycled.

A CROSS-INDUSTRIAL APPROACH

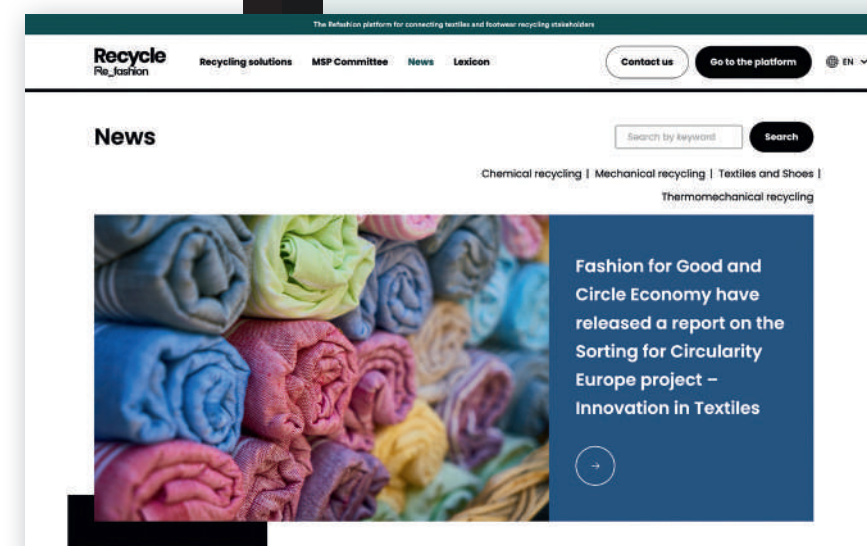
Mainly aimed at textile sorting operators and reproducers, the Refashion RECYCLE platform is not only intended for "close-loop" Textile Industry stakeholders but also for all of the "open loop" industries capable of offering bio-sourced products from a textile deposit: plastics processing, chemical industry, building industry, automobile sector, furnishings, sporting equipment...

Thanks to this interactive tool, which is available in both French and English, professionals can identify, in just three clicks, the potential of deposits, along with solutions to recycle non-reusable textiles and footwear and the detailed profiles of companies which meet their particular search criteria in the region of their choice, either in France or in Europe.



TOWARDS A FUTURE SECONDARY MATERIAL EXCHANGE

Officially launched on October 5, 2021, Refashion's RECYCLE platform already counts some 268 players, 75% of whom are French and 25% European. Among them, 40% are textile and footwear material suppliers and 60% material processors offering semi-finished and finished products for industry players proposing new outlets for these recycled materials.



Thanks to Refashion's RECYCLE platform and numerous interactions between suppliers, transformers and client-industries, 52 recycling solutions have already been identified. But the eco-organization is already planning ahead and is hoping to expand market limits. In effect, in the future, Refashion's RECYCLE could become a stock exchange for secondary materials. A natural evolution, which perfectly corresponds to Refashion's mission to accompany towards a circular economy and which would give a new boost to the industrialization of recycling.

The MSP Committee

Launched at the beginning of 2022, the Material Sorting and Preparation Committee (MSP) is solely composed of stakeholders referenced on the Refashion RECYCLE platform. Its aims is to improve material sorting and preparation to accelerate post-consumer textiles and shoes recycling capacities towards high-performance materials and components.

In keeping with its strategy to industrialize used, non-reusable textiles and footwear recycling, Refashion has created the MSP Committee. Composed of sorting operators, material preprocessors and recyclers, all referenced on the Refashion RECYCLE platform, this Committee aims to identify and test new, local recycling solutions for non-reusable post-consumer textiles and footwear and to consolidate the prepared feedstock.

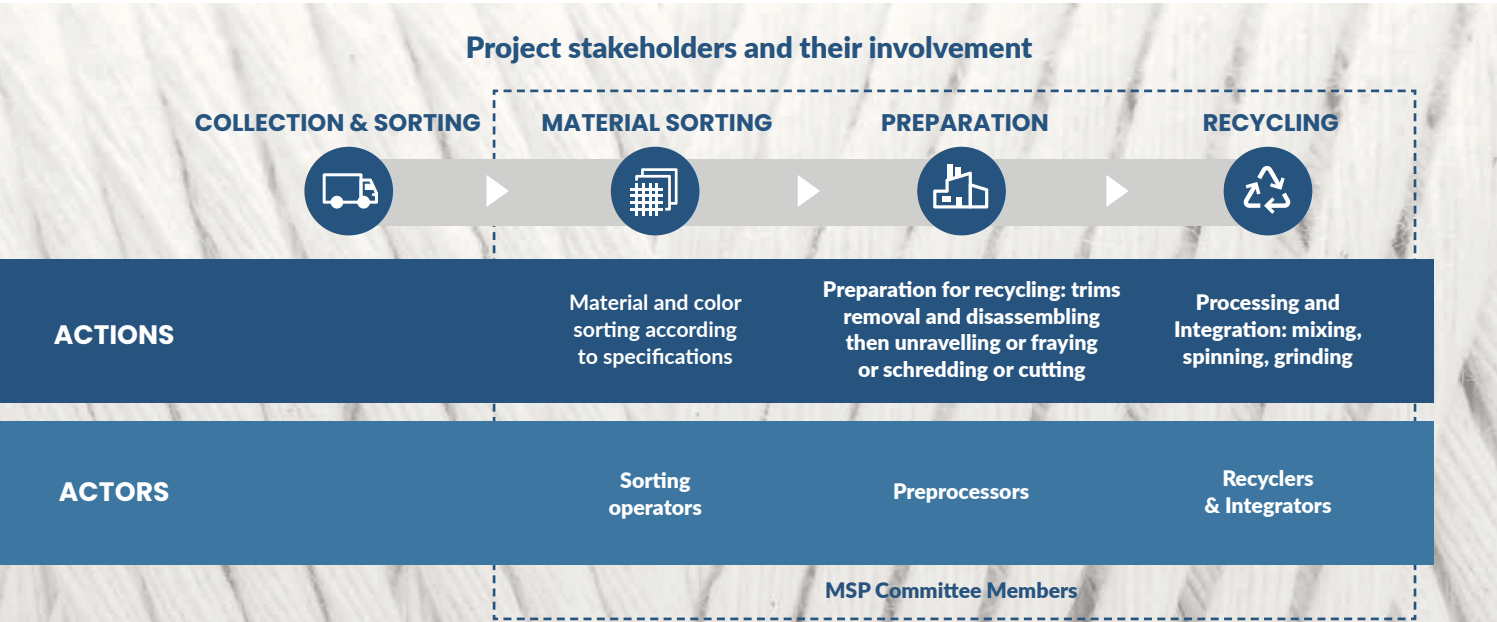
How does this Committee work?

Initially, Refashion asks recyclers and integrators to propose specifications targeting one or more materials that can be found in sorting operators' feedstock. For every specification, a project group is formed. Within each project group, one or several teams is constituted, regrouping a sorting operator, one or several preprocessors, and recyclers and integrators. For sorting operators and preprocessors, the objective is to develop new material sorting and preparation processes with a view to material recycling, in keeping with the specifications established by recyclers. Several teams can work on the same project, the idea being that each team can propose a MSP solution. As a consequence, several MSP solutions can be identified for the same project.



What are the different stages?

After a first stage at the beginning of the year during which Refashion circulated recyclers and integrators specifications to sorting operators and preprocessors, the MSP Committee is currently experimenting the MSP solutions. The end of the year will be given over to analyzing and summarizing the results of all of the MSP experiments. Indeed, the MSP Committee needs to assess each solution, taking into account both technical and economic aspects, in order to issue an opinion on the projects and make recommendations for financial support. Lastly, 2023 will be given over to deploying the solutions selected by the MSP Committee and the associated financing.


































































































Overview of projects funded by Refashion

since 2010 within the Innovation Challenge

| KEY | | |
|--|---|---------------------------------------|
| Strategic line | Status | Category of products concerned |
| Preparation of materials for recycling | Projects abandoned/inconclusive results | Textiles |
| Incorporation of materials from CHF recycling into other sectors | Projects finalized/conclusive results but no industrial development planned | Footwear |
| Eco-design of products from the CHF sector | Projects in progress | |
| | Projects finalized/industrial pilots validated | |

| N° | Nom du porteur de projet Nom du projet | Projet | Contact / Mail | AAP | Axe strat. | Statut |
|----|---|--|---|------|------------|--------|
| 1 | BIC ISOKTEX | Developing an innovative textile insulation. | Michel KEKAYAS m.kekayas@cobic.fr | 2010 | | |
| 2 | NOVAFLOOR NOVATEX | Incorporating end-of-life textiles as inert fillers in decorative plates. | Vincent FORGET vf@ecolomy.com | 2010 | | |
| 3 | DECATHLON OXYLANE | Manufacturing polyester yarn from post-consumer polyester textiles. | Raffaele DUBY raffaele.duby@decathlon.com | 2010 | | |
| 4 | PÔLE ÉCO-INDUSTRIES POITOU-CHARENTES MULTITEX | Developing a process for chemical separation of used mixed textiles (2 projects). | Damien DELETRAZ d.deletraz@pole-ecoindustries.fr | 2011 | | |
| 13 | PÔLE ÉCO INDUSTRIES POITOU-CHARENTES MULTITEX 2 | Feasibility study of a pilot enabling the chemical separation of used mixed textile materials (2 projects). | Damien DELETRAZ d.deletraz@pole-ecoindustries.fr | 2013 | | |
| 5 | FILATURES DU PARC FILATURES DU PARC | Manufacturing recycled wool yarns of the same quality as yarns made with virgin wool fibres. | Fabrice LODETTI filatures.parc@wanadoo.fr | 2011 | | |
| 6 | TRUCS-TROUVAILLES TRUCS-TROUVAILLES | Recycling rubber soles into new soles. | Sylvie DAMERON sylvie.dameron@gmail.com | 2011 | | |
| 7 | AGENCE AIR COOP FOOTWEAR RECYCLING PROJECT | Developing and testing an industrial grinding and separation process in view of creating a footwear recycling pilot line. | Benjamin MARIAS bm@air.coop | 2012 | | |
| 18 | AGENCE AIR COOP FOOTWEAR RECYCLING PILOT LINE | Improving the purity of the resulting materials (leather/rubber) and output from the recycling line. | Benjamin MARIAS bm@air.coop | 2014 | | |
| 8 | FRAMIMEX VIACOVER | Developing an exterior sound insulation shield in lightweight concrete integrating post-consumer textile fibres. | Mehdi ZERROUG mehdi.zerroug@ecotextile.fr | 2012 | | |
| 9 | FEYECON SEPALEX DECOTEX 1 | Developing an undyeing process for used polyester clothes to enable their recycling. | Daniéla TRAMBITAS daniela.trambitas@feyecon.com | 2012 | | |
| 21 | SEPALEX DECOTEX 2 | Moving the DécoTex I project (FEYECON) - supercritical CO2 undyeing technology to pilot scale. | Daniéla TRAMBITAS daniela.trambitas@feyecon.com | 2015 | | |
| 10 | CC PAYS DE COLOMBEY & SUD TOULOUS RECYTEX | Technical, economical and commercial feasibility study of creating a rigid decorative tile integrating 20 to 50% of used textiles. | Raphaël KUENY raphael.kueny@univ-lorraine.fr | 2012 | | |

| N° | Project developer name Project name | Project | Contact / Mail | CFP | Strat. line | Status |
|----|--|--|--|------|---|---|
| 11 |  PRÉMICES & CO. BÉTON DE CHIFFON | Creating a range of decorative acoustic products entirely made from recycled textiles. | Amandine LANGLOIS amandine@premicesandco.com | 2013 |  |  |
| 27 |  PRÉMICES & CO. PIERRE PLUME | Finishing the "Béton de chiffon" project and developing it to industrial scale. | Amandine LANGLOIS amandine@premicesandco.com | 2016 |  |  |
| 12 |  MAPEA ÉCO-CHARGES | Recycling of used cotton and polycotton clothes for use as reinforcement in the plastic industry. | René GENILLON r.genillon@mapea.com | 2013 |  |  |
| 14 |  LE RELAIS EKOROOM | Developing acoustic suspended ceiling tiles from recycled textiles. | Jean-Paul LOPEZ jplopez@lerelais.org | 2014 |  |  |
| 15 |  FILATURES DU PARC PARCOT | Developing a defibration method for recycling used polycotton clothes into materials suitable for weaving or knitting new clothing products. | Fabrice LODETTI filatures.parc@wanadoo.fr | 2014 |  |  |
| 16 |  MINOT RECYCLAGE TEXTILE MINOT RECYCLAGE TEXTILE | Optimising the end-of-life textiles recycling process in order to achieve a higher percentage of used textiles in the garnetting process. | Jean-Luc DUSSART jldussart@lerelais.org | 2014 |  |  |
| 17 |  CHAUSSETTES ORPHELINES ANIMA | Recycling used socks into a recycled yarn for use in hosiery. | Marcia DE CARVALHO contact@marciadecarvalho.fr | 2014 |  |  |
| 19 |  WECOSTA SILENCIO | Developing an eco-friendly acoustic silencer for housing ventilation systems. | Hugues BROUTÉ hbroute@wtxautomotive.com | 2015 |  |  |
| 20 |  IN SOFT ECTOR | Developing an eco-designed shoe with a knitted fabric upper. | Patrick MAINGUENÉ pamainguene@in-soft.fr | 2015 |  |  |
| 34 |  IN SOFT ECTOR SE RECYCLE | Recycling the Ector eco-designed shoes. | Patrick MAINGUENÉ pamainguene@in-soft.fr | 2017 |  |  |
| 22 |  SYNERGIES TLC AUTOTRI | Studying and developing a new sorting method for non reusable textiles in order to use these secondary materials. | Thomas FRAINEUX thomas.fraineux@synergiestlc.fr | 2015 |  |  |
| 23 |  CETI DELISS | Studying and developing either automatic or semi-automatic processes for removing trims from used clothing to facilitate recycling. | Pascal DENIZART pascal.denizart@ceti.com | 2016 |  |  |
| 24 |  CTC GROUPE THERMICUIR | Recovering heat from waste leather from end-of-life shoes. | Régis LETY rlety@ctcgroupe.com | 2016 |  |  |
| 25 |  LA MANUFACTURE GROUPE ERAM DESIGN FOR REPAIR | Developing a new design and manufacturing process allowing for easy disassembly of all components in a shoe at end of life. | Gauthier BEDEK gbedek@eram.fr | 2016 |  |  |
| 26 |  L'ÉQUIPE 1083 JEANS RECYCLÉS | Developing a recycled cotton yarn from old jeans. | David LEROMAIN david@1083.fr | 2016 |  |  |
| 28 |  SILAC INDUSTRIE ECO3F | Making a range of acoustic insulation for the automotive industry from used textile materials. | Valéran HIEL vhiel@silacindustrie.com | 2016 |  |  |
| 29 |  IFTH / UTT / LE RELAIS CAREFIL | Improving the quality of yarns made from recycled used clothes. | Philippe MESNAGE pmesnage@ifth.org | 2017 |  |  |

| N° | Project developer name Project name | Project | Contact / Mail | CFP | Strat. line | Status |
|----|--|--|--|------|---|---|
| 30 |  CID PROCESS CID PROCESS | Mechanical separation of cotton and elastane in used jeans. | Roland GUIBERT roland.guibert@wanadoo.fr | 2017 |  |  |
| 31 |  L'ÉQUIPE 1083 CELL-JEANS | Wet-spinning cotton waste from used jeans in order to create a man-made cellulosic fibre. | David LEROMAIN david@1083.fr | 2017 |  |  |
| 32 |  CAMY HODEI | Designing and developing a modular, monomaterial and recyclable shoe. | Benjamin CAMY benjamin@hodei.fr | 2017 |  |  |
| 33 |  AUDACIE PLAS'TILE | Recycling used non-reusable textiles into plastic resins. | Charlotte WALLET c.wallet@audacie.org | 2017 |  |  |
| 35 |  AGENCE AIR COOP REVIVE/RECYCLE | Setting up a pilot project for repairing used clothes and preparing them for recycling. | Virgile AYMARD va@air.coop | 2017 |  |  |
| 36 |  LES TISSAGES DE CHARLIEU LES TISSAGES DE CHARLIEU | Improving, in terms of technology and industrial process, an article entirely made of recycled post-consumer intra-European polyester, and assessing the difference between cost price and market price. | Éric BOËL e-boel@ltc-jacquard.com | 2017 |  |  |
| 37 |  AUCHAN RECYC'LAB | Recovering fibres from end-of-life clothing into mobile phone cases using the Roctool induction heating technology. | Isabelle DAYDE idayde@auchan.fr | 2018 |  |  |
| 38 |  DECATHLON 4RFID | Developing a pilot to achieve textile traceability, allowing for their end-of-life management, thanks to the RFID technology. | Stéphanie BAILLY stephanie.bailly@decathlon.com | 2018 |  |  |
| 39 |  FCBA MOBIOTEX | Assessing the possibilities of using recycled textile fibres as an essential component of wood framed constructions. | Zaratiana MANDRARA Zaratiana.Mandrara@fcba.fr | 2018 |  |  |
| 40 |  MAXIMUM TISSIUM | Developing a rigid material made from textile waste fibres intended for furniture manufacturing for the tertiary sector. | Romée DE LA BIGNE romee@maximum.paris | 2018 |  |  |
| 56 |  MAXIMUM TISSIUM INDUSTRIE | Development of a pilot production unit of the rigid composite material Tissium, made from recycled textile waste, in the form of machinable panels for the furniture and furnishing markets. | Romée DE LA BIGNE romee@maximum.paris | 2021 |  | NEW |
| 41 |  TECHTERA JEPLAN | Assessing the reliability of an implantation project in France of a JEPLAN's plant for recycling used polyester textiles into recycled PET pellets. | Julie RAFTON -JOLIVET jrafton@techtera.org | 2018 |  |  |
| 42 |  VERT-TICAL NORD ÉCO-LOGIC WALL | Developing a green wall using recycled textiles to replace substrates and sphagnum (natural moss) currently used. | Frédéric LOGEZ contact@vert-tical.fr | 2018 |  |  |
| 55 |  VERT-TICAL NORD SOLIOTI | Development of a full size (> 50m2) green wall demonstrator integrating a recycled textile nonwoven and an optimised watering system. | Frédéric LOGEZ contact@vert-tical.fr | 2018 |  |  |
| 43 |  WECOSTA QWIET | Developing solutions to improve the acoustic comfort in public spaces (offices, industrial premises, etc.) by using ecological materials including materials from the used textiles sector. | Hugues BROUTÉ hbroute@wtxautomotive.com | 2018 |  |  |

| N° | Project developer name Project name | Project | Contact / Mail | CFP | Strat. line | Status |
|--|---|---|--|------|---|--------|
| 44  | CYCL-ADD TEXTIC | Developing a recycling process for used non reusable polyamide clothing, including sorting, trimming, characterisation, micronization and compounding for plastic making. | Hervé GUERRY hguerry@cycl-add.fr | 2019 |  +  | ✓ |
| 45  | FABBRICK FABBRICK | Developing a structural, insulating and aesthetic construction material from recycled used textiles. | Clarisse Merlet clarisse.merlet@fabbrick.fr | 2019 |  | ➔ |
| 46  | FILATURES DU PARC PAMREC | Recycling used polyamide clothes into a recycled yarn for use in textile products. | Fabrice LODETTI filatures.parc@wanadoo.fr | 2019 |  +  | ➔ |
| 47  | HUMEAU BEAUPRÉAU REBOOT | Pre-study on the feasibility and cost of recycling used PVC footwear; and testing of a recycling loop with defining specifications for setting up the recycling loop at an industrial scale. | Anne-Céline Humeau ac.humeau@bopy.fr | 2019 |  +  | ➔ |
| 48  | IDELAM RECHAUSS | Developing an innovative technology for delaminating shoes (leather/textile) by supercritical fluid and a new recycling loop for used shoes. | Eric DURIVALT eric.durivault@idealtechnologies.fr | 2019 |  | ➔ |
| 49  | LE SLIP FRANÇAIS LE SLIP CIRCULAIRE | Developing a yarn containing the highest possible % of recycled cotton with a fineness up to 1/60Nm from used underwear and socks for use in the making of Le Slip Français' products. | Solène NAEYE solene.naeye@leslipfrancais.fr | 2019 |  +  | ➔ |
| 50  | SYNERGIES TLC UTILE | Feasibility study of setting an industrial unit for the trimming and sorting of used cotton, polyester and polyamide textiles (100% and blends), based on material specifications defined with recyclers. | Clara POTTON c.potton@synergies-tlc.com | 2019 |  | ➔ |
| 51  | VALVAN TRIMCLEAN | Development of an automated integrated solution that allows the removal of trims (including labels, buttons, zippers etc.) from used clothing. | Maurits VANDEPUTTE maurits.vandeputte@valvan.com | 2019 |  | ✓ |
| 52  | Groupe ERAM ZAPATEKO II | Development of a demonstrator for disassembling non-reusable footwear via automated sorting and assisted pulling. | Gauthier BEDEK gbedek@eram.fr | 2020 |  | ➔ |
| 53  | Phénix Sport R-SHAPE | Developing a demonstrator for recycling non-reusable polyester sportswear into a plastic composite material used to create sport accessories (cups, cones, blocks, etc.). | Paul-Emmanuel GUINARD paul@phenix-sport.com | 2020 |  | ➔ |
| 54  | SOEX TexID | Developing an automated sorting pilot line for textile materials recognition though NIR spectroscopy to the industrial scale. | Louisa TEMAL temal@ico-spirit.com | 2020 |  | ➔ |
| 57  | IMPACTE CAPITAL REVIVAL | Building a demonstrator using EVA (elastomeric polymer) derived from the recycling of used sneaker outsoles to make underlay for parquet flooring. | Hélène GUERRET helene@impacte.capital | 2021 |  | NEW |
| 58  | CEA MISTERY | Prototyping the use of multispectral optical sensors for the characterization of used household textiles. | Gaël PARENT gael.parent@cea.fr | 2021 |  | NEW |
| 59  | INDUO GREENCOSE | Testing the Greencose chemical recycling process on cotton-rich used textile feedstock. | Sébastien FRANCOIS sebastien@induo.fr | 2021 |  +  | NEW |
| 60  | RECYC'ELIT AURAREFIL | Adapting the Recyc'Elit chemical recycling process to transform post-consumer non-reusable polyester textiles (pure and blended) into recycled polyester threads. | Raouf MEDIMAGH r.medimagh@recyc-elit.com | 2021 |  +  | NEW |