Re_-generate materials
Re_generate materials

In order to accelerate the development of an operational recycling industry, competitive in France and Europe, the eco-organisation supports the textile industry via several major tools: working groups on “auto mobile non-woven materials” and “composite materials”, the SMP Committee; the Textile Materials Library; the Innovation Challenge, with a new format this year, and above all, the “Recycle by Refashion” platform enabling industrials to find and integrate materials from used, non-reusable clothing and footwear into their production processes.

Collection

The 1st step in the second lease of life given to clothing, footwear and household linen

Collection is an essential stage in regenerating waste. This is one of three textile industry performance indicators, along with sorting and recovery.

The overall volume of waste collected in 2021 has increased by 40,000 tonnes compared to 2020, the year of the health crisis, and marks the recovery of business in the textile industry. The tonnages of collection activities are very close to those of 2019 (244 kT in 2021 compared to 248 kT in 2019).

Increasing collection remains necessary in order to achieve the target set in the eco-organisation’s authority approval specifications (50 % collected in relation to the tonnages placed onto the market). However, is it a priority to increase collection if the sector does not have industrial recycling solutions for non-reusable textiles at this moment in time? The health crisis demonstrated that as soon as the export markets stopped being operational, collection and sorting mechanically came to a halt. Refashion is convinced that it is necessary to concentrate its efforts and resources on the industrialisation of used, non-reusable textiles as a preliminary step to increase collection.

Distribution of self-deposit banks (SDB) in France

Containers in a public area remain the vast majority (i.e. 66% of SDB). A certain stability can be seen in the breakdown of SDB types.

There are now 408 owners of self-deposit banks (SDBO) compared to 376 in 2020. A rise of 8.5% in the number of self-deposit banks can be seen, linked to the tightened measures for tracking sorted tonnages. This rise confirms the necessity for SDBO to be identified by Refashion. Those involved in collection operations have various profiles: these can be commercial or private companies or associations. Some companies manage several locations, others only one. Some of those with banks manage a sorting activity in addition to collection activities, others sell the resource collected. The disparity in bank owners provides good national coverage with 1 self-deposit bank per 1,494 inhabitants. Nonetheless some local areas need to be optimised, such as densely populated areas or those with low-density populations.

The average yield of a SDB is 5.4 tonnes/year.

Following 2020, which was strongly affected by the health crisis, 2021 shows the same level of performance as 2019.

What needs to retained about 2021:

- 244,448 tonnes collected (i.e. an average weight of 3.6 kg/inhabitant/year, close to 2019 levels)
- 4,829 owners of self-deposit banks compared to 4,633 in 2020

3 key performance indicators for the textile industry in 2021 show a return to 2019 levels after being strongly affected in 2020 due to the health crisis.
Sorting
The challenge: maximise clothes sorting for reuse and material sorting for recycling purposes

Following collection but before treatment, the sorting stage consists of the essential routing of collected clothing and footwear waste to recover it. Sorting operators separate the reusable clothing and footwear, a priori profitable thanks to their resale as second-hand products. They also sort non-reusable clothing and footwear which will be transformed into new raw materials that are more costly to prepare.

2021, post-health crisis, was marked by several factors: after the decrease in 2020, sorted volumes are nearly as high as those of 2019; financial support has been boosted by the differentiation in the fee scale per type of category sorted, sorting’s economic and environmental balance sheet for the 2016-2019 period was established and shared.

What needs to retain about the business:
66 sorting centres have signed an agreement (compared to 64 in 2020), 51 of which are in France and 15 elsewhere in Europe. This increase is due to 4 new sorting centres that signed an agreement (2 in France and 2 outside of France) and the halting of the processing of CHF from France by 2 sorting centres (one in France, the other in Europe).

190 kT sorted (compared to 156 kT in 2020); i.e. an increase of nearly 22% compared to 2020, but which remains 3% lower compared to the volume sorted in 2019 (196 kT).

Lastly, like every year, the difference in volume between the total collected by those possessing referenced SDB and sorting operators having signed an agreement is high, standing at 54 kT in 2021 (compared to 48 kT in 2020).

There are 3 reasons for this difference in collected and sorted tonnages:
1. Tonnages sent to sorting operators outside of France that have not signed an agreement (between 30 and 40 kT).
2. Tonnages sent directly for reuse by the collector (between 10 and 20 kT).
3. Tonnages sent directly to landfill (between 0 and 5 kT).

The breakdown per category of sorting carried out in the 66 centres in France and outside France:

- Reuse, still remains the highest, i.e. the share of clothing and footwear intended for resale on the second-hand market in France and for export. This is on the rise standing at 57.9% in 2020, an effect of the health crisis and is at 57.9%.

- Recycling accounts for 32.1% (compared to 33.3% in 2020 and 33.5% in 2019), a decrease in the relative share for the last two years. Sorting of materials for garneting account for 23.1% and remains stable compared to 2019 whilst production of rags to be shredded at 9% is lower compared to 2019 (10%).

- The SRF (solid recovered fuel) production process (shredding and densification of an alternative fuel for cement kilns) was lower at 8.7% (compared to 9.1% in 2020) and on the rise compared to 2019 (7%).

190,548 tonnes were sorted for the 2016-2019 period was established and shared.

A rise in funding for sorting
In consultation with the sorting operator representatives, additional temporary funding was introduced in 2020 for tonnages intended for recycling and SRF (solid recovered fuel). This measure enabled a sum of between €105 and €136 supported sorted tonne to be paid per centre, depending upon the individual percentages of recycling and SRF. In 2021, Refashion conducted a consultation process to strengthen the differentiation of financial support according to the reality of the destination of sorted sources, the results of which were made official by the French ministerial decree of 2 March 2021, as follows:
- Reuse: €80/t
- Recycling, SRF: €180/t
- Energy recovery: €20/t
- Disposal: €0/t

Distribution of sorted tonnages per category of operator (France and Europe)

<table>
<thead>
<tr>
<th>Nº of sorting centres</th>
<th>Sorted tonnages</th>
<th>% of total sorted</th>
</tr>
</thead>
<tbody>
<tr>
<td>LeRelais</td>
<td>18</td>
<td>94,645</td>
</tr>
<tr>
<td>Independent operators</td>
<td>15</td>
<td>26,588</td>
</tr>
<tr>
<td>Eurosia</td>
<td>8</td>
<td>20,464</td>
</tr>
<tr>
<td>Association platforms</td>
<td>10</td>
<td>17,225</td>
</tr>
<tr>
<td>Operators outside of France</td>
<td>15</td>
<td>31,626</td>
</tr>
<tr>
<td>Total</td>
<td>66</td>
<td>190,548</td>
</tr>
</tbody>
</table>

The relative market share in sorted volume per category of stakeholder is stable from one year to the next, in particular the sorting centres outside of France which account for 54% of the total sorted.

These overall results mask very different percentage breakdowns per sorting centre.

Indeed, the reuse rate covering premium choice reuse, recycling and SRF, as well as the different ways of disposal all show very high differences related to a sorting centre’s capacity.

It should be noted that the higher the sorting capacity, the lower the differences become, but they still remain very high, as shown in the following table:

Relative share of the main sorting outlets for 4 sorting capacity categories each representing 25% of the total sorted tonnage in 2021:

- Reuse de 17 % à 79 % de 47 % à 70 % de 45 % à 67 % de 47 % à 61 %
- Recycling + SRF de 0 % à 17 % de 1 % à 8 % de 2 % à 9 % de 2 % à 6 %
- Disposal (with or without energy recovery) de 0 % à 8 % de 0 % à 7 % de 0 % à 2.2 % de 0 % à 1.3 %

Observatory Committee Works
In 2021, based on economic information provided by the sorting centres for the 2016 to 2019 period, the consulting firms RDC Environment and KPMG established and shared the net cost of sorting and the environmental impact of used CHF collection and sorting during the Observatory Committee. The works, currently under progress for 2020 and 2021 data, will allow fee scales to be adjusted.
Reuse

The first choice for used clothing and footwear

The majority of clothing collected and sorted is destined for reuse: it is resold on the second-hand clothing market, be this charity shops or second-hand clothes shops, in France or abroad. In regards to the ranking of waste treatment methods, reuse should be the prime choice due to its low environmental footprint.

In 2021, reuse accounts for 57.9% of tonnages sorted by operators having signed an agreement, a percentage close to that of 2019 (before the health crisis). Nevertheless, the trend for reuse is declining (64% in 2014 compared to 57.9% in 2021). Indeed, over the last few years major changes in the textile industry have been seen: the placing of products onto the market that do not last as long; the development of many solutions to resell/exchange/return items aimed at consumers and, lastly, the increase in the tonnages collected. The combination of these three tendencies means that a greater amount of clothing, footwear and household linen collected is in a state of wear and tear that does not allow them to be reused. This means that a new recovery equilibrium model must be found that will integrate more reusable clothing and footwear into new resources (rags, geotextiles, fibres, non-reusable materials, composite plastics etc.). Consequently it provides multiple ‘closed-loop’ outlets - applied to the textile industry- but also and above all ‘open-loop’ outlets, for example in the construction, automobile and plastics manufacturing industries. It provides an opportunity to use materials that are already available thereby saving natural resources.

Focus on what becomes of clothing sorted for reuse

Africa is the number one recipient continent for the direct export of reusable clothing and footwear collected in France (excl. Haiti). In 2021 the total tonnage is 60,000 tonnes, i.e. 37% of the total exports under the French Customs and Excise code (“second-hand clothes”).

Recipient countries

<table>
<thead>
<tr>
<th>Recipient countries (1)</th>
<th>In tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haiti</td>
<td>11,090</td>
</tr>
<tr>
<td>Topa</td>
<td>7,955</td>
</tr>
<tr>
<td>Madagascar</td>
<td>7,463</td>
</tr>
<tr>
<td>Senegal</td>
<td>4,166</td>
</tr>
<tr>
<td>Burkina-Faso</td>
<td>4,136</td>
</tr>
<tr>
<td>Mozambique</td>
<td>2,465</td>
</tr>
<tr>
<td>Mozambique</td>
<td>2,109</td>
</tr>
<tr>
<td>Benin</td>
<td>1,869</td>
</tr>
<tr>
<td>Rwanda</td>
<td>1,379</td>
</tr>
<tr>
<td>Cameroon</td>
<td>1,290</td>
</tr>
<tr>
<td>Mali</td>
<td>1,211</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>1,068</td>
</tr>
<tr>
<td>Somalia</td>
<td>742</td>
</tr>
<tr>
<td>Republic of Djibouti</td>
<td>530</td>
</tr>
<tr>
<td>Nigeria</td>
<td>265</td>
</tr>
<tr>
<td>South Africa</td>
<td>351</td>
</tr>
<tr>
<td>Lebanon</td>
<td>333</td>
</tr>
<tr>
<td>South Sudan</td>
<td>329</td>
</tr>
<tr>
<td>South Sudan</td>
<td>329</td>
</tr>
<tr>
<td>Djibouti</td>
<td>317</td>
</tr>
<tr>
<td>Chad</td>
<td>217</td>
</tr>
<tr>
<td>Mauritius</td>
<td>207</td>
</tr>
<tr>
<td>Republic of the Congo</td>
<td>168</td>
</tr>
<tr>
<td>Democratic Republic of the Congo</td>
<td>960</td>
</tr>
<tr>
<td>Rwanda</td>
<td>153</td>
</tr>
<tr>
<td>Chad</td>
<td>148</td>
</tr>
<tr>
<td>Comoros</td>
<td>121</td>
</tr>
<tr>
<td>Djibouti</td>
<td>56</td>
</tr>
</tbody>
</table>

Between 5,000 to 12,000 tonnes | Between 1,000 to 4,999 tonnes | Between 50 to 999 tonnes

(1) Source: French Customs and Excise / “second-hand clothes” code.

Recycling

Towards a 100% circular industry

The acceleration in industrialising the recycling of non-reusable clothing and footwear is a major stake for future years. Refashion funds innovative projects and supports stakeholders who are striving for a 100% textile industry in France and in Europe.

Recycling, what exactly is this?

The recycling process consists in transforming non-reusable clothing and footwear into new resources (rags, geotextiles, fibres, non-reusable materials, composite plastics etc.). Consequently it provides multiple ‘closed-loop’ outlets - applied to the textile industry- but also and above all ‘open-loop’ outlets, for example in the construction, automobile and plastics manufacturing industries. It provides an opportunity to use materials that are already available thereby saving natural resources.

The “Non-woven” and “Composite” working groups

Since 2020, Refashion funds two working groups on two priority segments: non-woven textiles for the automobile industry and composites. Managed by experts, these groups have established processes for sorting and material preparation trials.

Non-woven automobile textiles

The working group, created in 2019, has developed three, high acoustic performance non-woven felt samples that can be used in different parts of a vehicle. These three products were the subject of specifications for the trials undertaken for the Sorting and Materials Preparation Committee (SMP) in 2022.

Composites

The Composites working group created composite prototypes for the sports and leisure industry. Despite the successful trials on the different manufacturing processes, no transformation operator is willing to establish the specifications at the present time.

The SMP Committee (1)

Made up of referenced stakeholders on the Recycle by Refashion platform, the purpose of this committee is to improve the sorting and the preparation of materials in view of the industrial recycling of non-reusable textiles and footwear into new high-performance materials. To do this, it is necessary to bulk the source. Specifications are given to sorting operators and material preparation companies by material transformation companies. Sorting and material preparation trials will take place throughout 2022.

(1) SMP: Sorting and Material preparation
Launch of RECYCLE by Refashion

The first European digital platform for connecting stakeholders in the clothing and footwear industry

Within the framework of its mission to accelerate clothing and footwear recycling, Refashion is innovating with its “Recycle” platform which provides a response to a major challenge: build bridges to connect companies offering materials with industrials who will integrate them into their production processes.

For who, why?

“An inter-industrial vocation”

Mainly aimed at sorting and material transformation companies, the digital Recycle by Refashion platform is not only intended for “closed-loop” stakeholders in the textile industry but also for “open-loop” industries: plastics manufacturing, construction, automobile. This is the particularity of this unique, European level tool.

“Recycling waste on an industrial scale in the textile industry is only possible by opening up opportunities to other industries other than the textile industry”

Alain Claudot,
(Refashion CEO 2009 – 2021)

The origins of the project

Refashion partnered with the company Inex Circular, specialist in digital relations between stakeholders in the energy and waste recycling sectors. Their robust technology has already been validated by market leaders in France and Europe.

The platform in figures

Recycle by Refashion already counts 245 stakeholders, 75 % of which are French and 25 % European. Amongst these, 40 % are clothing materials and footwear suppliers, and 60 % transformation companies offering semi-finished and finished products to the textiles, plastics, transport and construction industries and even the sports industry.

The Textile Materials Library

How can material characterisation be improved with a view to the industrialisation of recycling?

One of the eco-organisation’s flagship missions is to support the development of recovery technologies for used clothing and footwear sorting coming from French household consumption.

The development of sorting and optical textile material recognition technologies has been identified as an essential lever for the development of recycling solutions. These technologies do however require a large database, calibrated using a very wide range of textile materials samples of known composition and certified.

✓ 25 categories of material compositions  
✓ 20 samples per category  
✓ 409 pieces of textile materials

Indeed, textiles are made of many material compositions (cotton, polyester, wool, etc.). Manual sorting only (feel, labels) does not enable rapid and reliable identification. The recycling is, therefore, faced with a problem in the characterisation of materials.

For this reason, in 2021 Refashion decided to establish a common base by creating a Textile Materials References Library. This is a key element for calibrating and optimising automatic characterisation systems for textiles, which contribute to accelerating the development of textile materials sorting with a view to recycling.

The Textile Materials Library, a user guide

409 samples of textile materials that are representative of the textile market can be found.

The composition of each sample has been certified by two specialised laboratories: Celabo and Intertek.

This library enables textile material recognition technology suppliers to configure and optimise their systems.

In 2021, Refashion played its role of “facilitator” by making available 10 copies of its Textile Materials References Library.

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Innovation challenge the 12th edition has a make-over

For the 2021 edition, the Refashion Innovation Challenge was the subject of an exceptional format. In partnership with SoScience, the challenge revealed new and collaborative solutions providing responses to the following: “How can high environmental performance materials be produced from used, non-reusable clothing and footwear which meet the functional and economic needs of the market?”

For this edition, contrary to the 2020 edition, the expected solutions did not have a minimum technological readiness level (TRL), other than preliminary research work.


The call for applications process and key figures

Open from October to December 2021, the call for international applications was sent out to 310 experts. 110 companies from 25 different countries showed an interest.

The 2021 Innovation Challenge Jury selected 34 applicants to participate in the Partnership Meeting sessions, the highlight of the “The Future Of” programme.

These two half-days, organised in February 2022, brought together 50 participants, encouraging the emergence of 12 collaborative projects.

8 projects were finalised and submitted to the 2021 Innovation Challenge Jury at the beginning of March.

At the end of the selection process, the jury recommended Refashion’s Board of Directors to fund 5 finalist projects for a total of €622,000.

Taking a look at the Innovation Challenge rules

Open to all for solutions established in France or in Europe, the Innovation Challenge has a minimum budget of €500,000 per year and is open to free-for-all applicants. This call for projects proposals aims at developing innovative and commercial solutions that optimise used, non-reusable textile and footwear recycling from households in France, and at accelerating the development of a more circular industry in synergy with other sectors (construction, automobile, etc.).

Since 2010, the eco-organisation has therefore committed more than 5.6 million Euros to co-finance 60 ambitious projects on the recycling of used, non-reusable clothing and footwear selected by the Innovation Challenge Jury. This collaborative body is composed of twenty experts from Refashion’s Scientific Committee who also supports the eco-organisation in following up the funded projects. Refashion sincerely thanks them for their commitment.

The 5 winning projects in the 2021 Innovation Challenge

1. TISSIUM INDUSTRIE

Founded in 2015, the company Tissium designs and produces furniture made from industrial waste. Already a winner in 2018, Tissium developed a rigid composite material, TISSIUM, entirely made from waste (recycled textile fibres and recycled thermo-hardening binder).

In 2022, the company Tissium SAS was created for the development of a 1,300m² industrial demonstrator located at Aix-les-Bains, France. The aim is to produce TISSIUM in the form of machine panels for the furniture and furnishings market. Its partner Gebetex will provide a sustainable source of used, non-reusable household textiles and a sorting process that has been adapted to the project’s requirements.

2. REVIVAL

Located in the Hauts de France region, the company REVIVAL by impact.capital aims at being the first industrial recycling platform for used footwear in France. It has partnered with Bouyer Leroux, a construction components manufacturer, who is looking for recycled materials as an alternative to oil-based materials. The REVIVAL project is creating a demonstrator using EVA (elastomer polymer) resulting from the recycling of trainer soles to be used as underlay for residential parquet (wooden) flooring.

3. MISTERY

The MISTERY (Multispectral Optical Sensors for Textiles Recycling), collaborative project, within the framework of the Institut de Recherche Technologique (IRT) Nanoeléct, aims at prototyping the use of multispectral optical sensors for characterising used household textiles. The tests under industrial conditions will be carried out thanks to the support provided by the Boer Group Recycling Solutions at the Gebetex sorting centre. The two other partners in the project are Aalto University which provides it expertise in the use of optical sensors for textile sorting, and Horbia Scientific, a specialist in the production of analytical and measuring technologies.

4. GREENCOS

INDUO is a young Franco-British company specialised in textile innovation. INDUO has developed a chemical recycling process, Greenose, that enables cotton-based textiles to be recycled into a dual-component fibre for the clothing sector. Thanks to Refashion’s funding, the GREENCOSE project is accelerating its development by testing this innovative process on used textiles mainly comprised of cotton. The characterisation of suitable sources will be defined directly at the sorting centres, with the support of Centex, ENSAIT and the CETI.

5. AURAreFil

Recos Filter is a young company that has developed a low-carbon, plastic (PET) depolymerisation solution. It is associated with the Tecthera Competitiveness Cluster and Grenoble-Alpes Métropole. The AURAreFil project aims at adjusting the chemical recycling process to transform used, non-reusable polyester textiles (spun and blanched) into recycled polyester thread in the Auvergne Rhône-Alpes region. Tecthera will coordinate this project aiming at creating a genuine local industry producing high-quality, recycled polyester thread. Grenoble-Alpes Métropole will supply the sorted textiles.
Appendices

Collection, sorting and recovery in figures

Self-deposit banks (SDB) in France

Over all, the number of self-deposit banks (SDB) is stable compared to 2020 (44,629 compared to 44,633 in 2020). The addresses are identified on the Refashion Citizen website with a map allowing geolocation.

<table>
<thead>
<tr>
<th>Type</th>
<th>Number of SDB</th>
<th>% in n° of SDB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Association/clothing deposit</td>
<td>4,087</td>
<td>9.1%</td>
</tr>
<tr>
<td>Boutique/Sales point</td>
<td>1,404</td>
<td>3.1%</td>
</tr>
<tr>
<td>Container, of which:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public space</td>
<td>29,887</td>
<td>66%</td>
</tr>
<tr>
<td>Private space</td>
<td>4,682</td>
<td>10.4%</td>
</tr>
<tr>
<td>Not visible private space for the general public</td>
<td>682</td>
<td>1.5%</td>
</tr>
<tr>
<td>Municipal Recycling Facility</td>
<td>3,214</td>
<td>7.2%</td>
</tr>
<tr>
<td>Occasional deposit point(1)</td>
<td>1,173</td>
<td>2.6%</td>
</tr>
<tr>
<td>Total</td>
<td>44,829</td>
<td>100%</td>
</tr>
</tbody>
</table>

80% of tonnages collected are exported. Data from French Customs and Excise provides an additional indicator for the change in second-hand clothes market (articles sorted and unsorted intended for reuse) and the rags market (sorted and unsorted destined for recycling). The export volumes of items to be recycled ("rags" code) have increased by 49% compared to 2019 whereas the volume to be sorted and sorted for reuse is stable ("second-hand clothes" code). Note the high rise in prices for both categories. In parallel, a significant share of the same items is imported into France, in particular, rags that have been shredded abroad.

Break down of used clothing and footwear exports per recipient country (1)

<table>
<thead>
<tr>
<th>Country</th>
<th>2019</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pakistan</td>
<td>12%</td>
<td>17%</td>
</tr>
<tr>
<td>Belgium</td>
<td>19%</td>
<td>18%</td>
</tr>
<tr>
<td>Tunisia</td>
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<tr>
<td>India</td>
<td>7%</td>
<td>8%</td>
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<tr>
<td>The Netherlands</td>
<td>5%</td>
<td>7%</td>
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<tr>
<td>Haiti</td>
<td>3%</td>
<td>6%</td>
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<tr>
<td>United Arab Emirates</td>
<td>10%</td>
<td>4%</td>
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<tr>
<td>Togo</td>
<td>6%</td>
<td>4%</td>
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<tr>
<td>Germany</td>
<td>2%</td>
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<tr>
<td>Madagascar</td>
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<td>Senegal</td>
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<tr>
<td>Burkina Faso</td>
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<td>Mozambique</td>
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<tr>
<td>Mauritania</td>
<td>2%</td>
<td>1%</td>
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<tr>
<td>Other African countries</td>
<td>11.5%</td>
<td>12%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Textiles and footwear key:
- Sorted for reuse and recycling
- To be sorted or sorted for reuse
- Sorted for recycling
- Sorted for reuse

(1) French Customs & Excise ("second-hand clothes" and "rags" codes)
The 66 sorting operators having signed an agreement

1. Actifrip
2. Agir
3. Alpes Tlc
4. Apivet
5. Audacie
6. Audo-Tri
7. Continental Frip
8. CTFC
9. Eco Tri International
10. Euro Used Clothing
11. Eurotrip
12. Evadam NV
13. Evira
14. Framimex
15. Gebetex Tri Normandie
16. Gebetex
17. Humana Barcelone
18. Humana Madrid