

**STUDY ON
ADDITIONAL COSTS
RELATED TO
RECYCLED RAW
MATERIALS
INCORPORATION
FROM
USED TEXTILES
SUMMARY REPORT**

Re_fashion

Introduction

The present document is part of the provisions relating to the eco-design of CHF (Clothing, Household linen and Footwear), to enable the incorporation of raw materials from the recycling of non-reusable used CHF, to be submitted by Refashion to the public authorities by January 1st 2025, in accordance with the provisions of its approval recalled below.

Article 2.2.3: "No later than two years after the date on which its approval comes into force, the eco-organization submits a study to the Minister for the Environment, aimed at determining the additional costs associated with the incorporation of materials derived from the recycling of used CHF. This study is accompanied by a proposal for premiums if its content justifies changes to the price scale".

In 2024, recycling of non-reusable used CHF remains limited due to economic, industrial and technical obstacles. This study was carried out to determine the additional costs associated with the incorporation of Recycled Raw Materials (RRM) from non-reusable used textiles collected in France, for the production of new textiles and in the case where the RRM incorporation stages are carried out in France or in neighboring countries.

Figure 1 below shows the study perimeter.¹

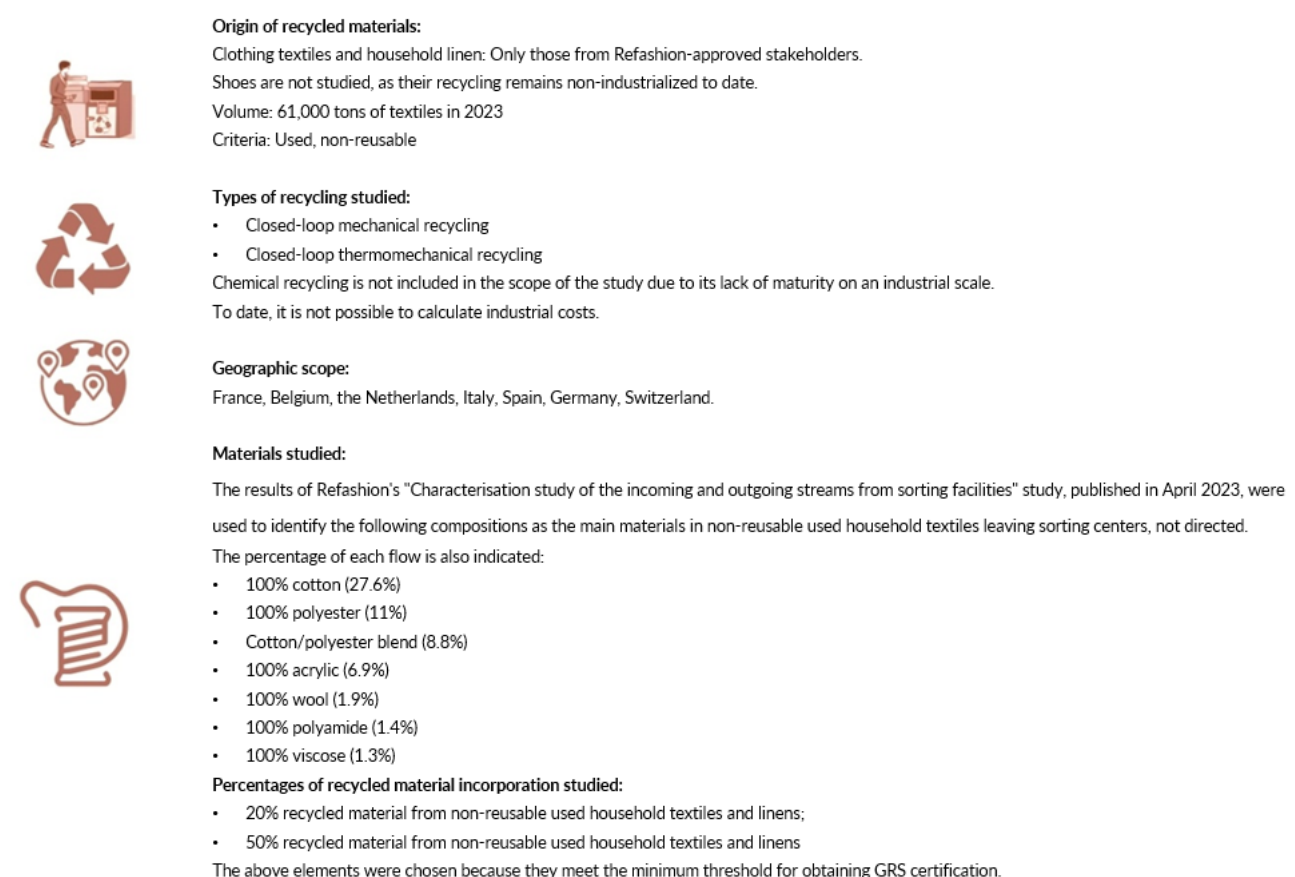


Figure 1: Study perimeter.

NB: the additional costs for recycled materials reincorporation from footwear in a closed loop have not been studied yet, as footwear recycling does not yet exist on an industrial scale.

¹ Source for materials studied: Refashion (2023) Characterisation study of the incoming and outgoing streams from sorting facilities.
Refashion - Summary of the study on the additional costs of incorporating recycled materials from the recycling of used textiles.
2024

The methodology used for this study is as follows:

- Review of the literature as well as scientific and industrial publications on the subject;
- Non-confidential studies and projects already carried out by CETI ;
- Interviews with industry professionals ;
- Cross-checking information ;
- Critical review of all conclusions and recommendations.

Based on the accuracy of the information gathered, a reliability rating on a scale from 1 to 5 was assigned to each cost estimate.

Seven material flows representing 58.9% of total sorting center not focused on reuse, according to Refashion's study *"Characterisation study of the incoming and outgoing streams from sorting facilities"*, published in April 2023, were analyzed as part of this study (see Figure 1).

149 companies were contacted during the study, and interviews were conducted with 41 industry professionals, including players in sorting, sorting for recycling, recycling preparation (in this case, trim removers), recycling, spinning, weaving, knitting and Producer, Brand & Retailer. These exchanges made it possible to collect primary data on the costs of the various operations involved in mechanical and thermomechanical recycling. Certain data, such as loss rate at different stages, and the technical challenges associated with the use of non-reusable used textiles, were validated by comparison with recyclers in Asia, who benefit from greater experience and industrial capacity in this field.

The information from these interviews was cross-referenced with data from previous projects and studies carried out by CETI and others, enabling to estimate the costs of each stage involved in the incorporation of RRM.

It should be noted that the study did not include transportation or R&D costs.

Industry context

In France, over the 833 kt of CHF placed on the market in 2023, 268 kt (or 32.1%) were collected. Of this total, 22% was recycled, excluding wiping cloths, some of it for open-loop non-woven products (Figure 2). ²

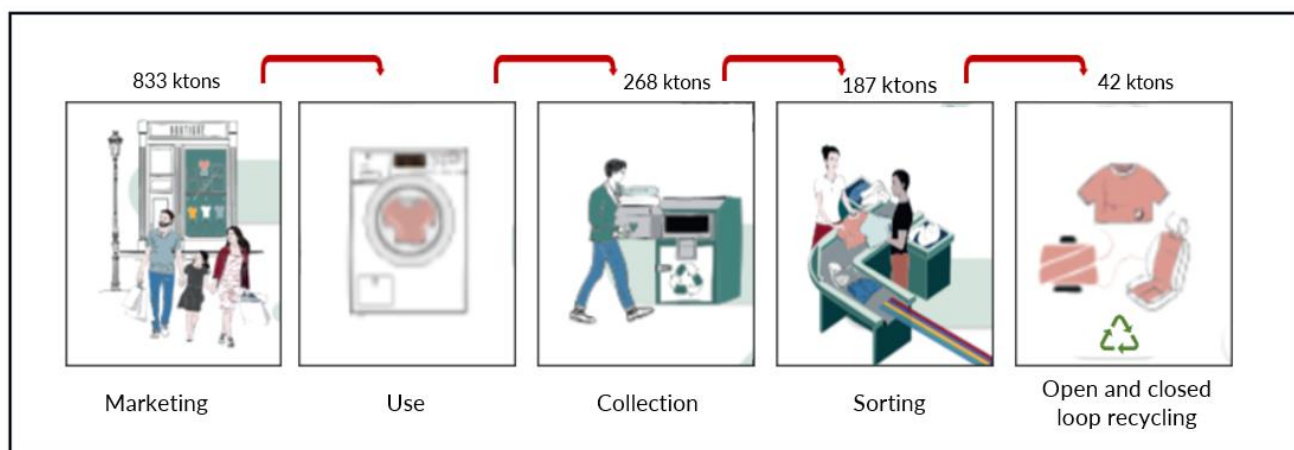


Figure 2: CHF material flows in France in 2023, adapted for the Refashion 2023 annual report.

Only a very small proportion, less than 2%, of non-reusable used textiles is recycled in a closed loop, despite growing legislative pressure.

Textile recycling industries are still underdeveloped in France and Europe. The economic viability of this new industrial value chain remains fragile. This industry is sensitive to many factors, such as the quality of automated sorting of recyclable textile feedstocks, or the proportion of recycled fibers that can be incorporated into yarn.

² Refashion, (2024), <https://rapport-activite-2023.refashion.fr/static/kpi-ra-2023-v1.pdf> consulted on July 08, 2024

Refashion - Summary of the study on the additional costs of incorporating recycled materials from the recycling of used textiles. 2024

The nascent industry therefore faces a number of economic challenges to enable the recovery of non-reusable used textiles in a closed loop.

Textile recycling

Figure 3 below shows the closed-loop textile recycling value chain. The study evaluated the additional costs of the various stages, from sorting for recycling to fabric production.

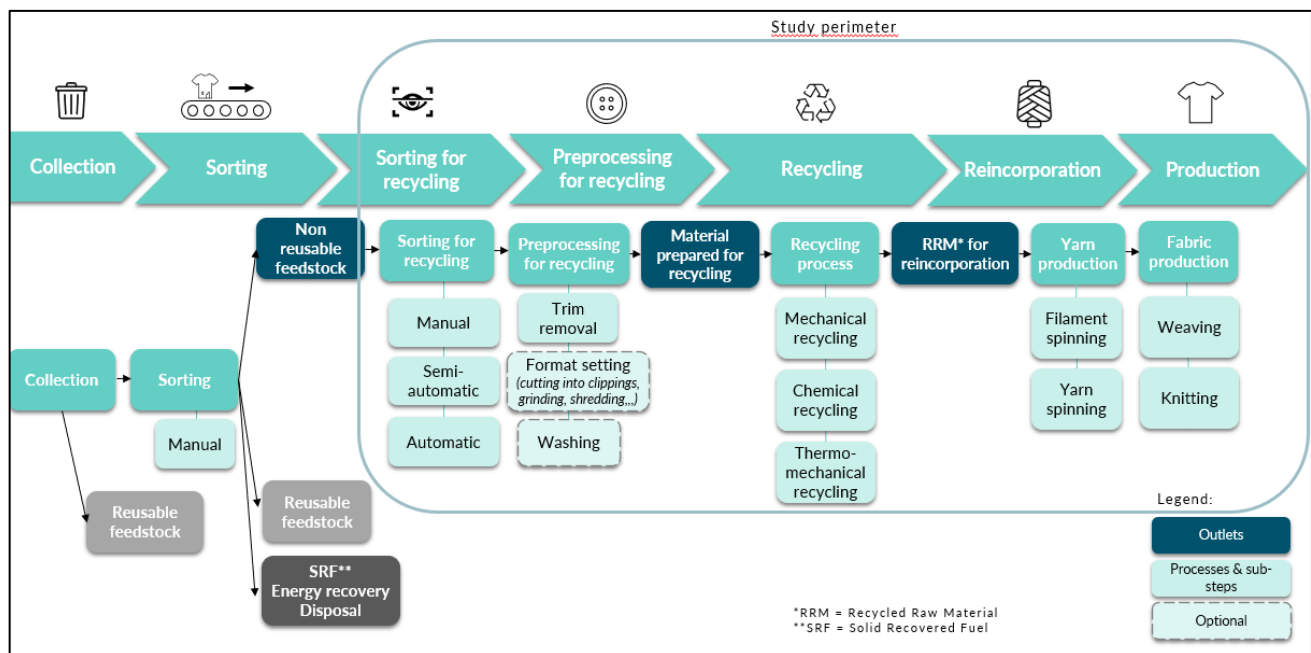


Figure 3: Closed-loop textile recycling value chain

Study's conclusion

The study concludes, with a good degree of confidence, on the additional costs of incorporating RRM from non-reusable used textiles for the following flows: 100% cotton, cotton/polyester blend and 100% polyester.

On the other hand, due to limited data availability, additional costs for 100% acrylic and 100% viscose flows are estimated with less reliability. Additional costs for 100% wool and 100% polyamide flows could not be estimated due to lack of significant data.

The three graphs below (Figure 4, Figure 5 and Figure 6) give an overview of the additional costs of RRM reincorporation to obtain a Nm 12 yarn, for white cotton, polyester and cotton/polyester blends. The price index shown in these three figures are indicative for quantities between 5 T and 10 T. Moreover, prices obtained through interviews are subject to the declarative bias of respondents.

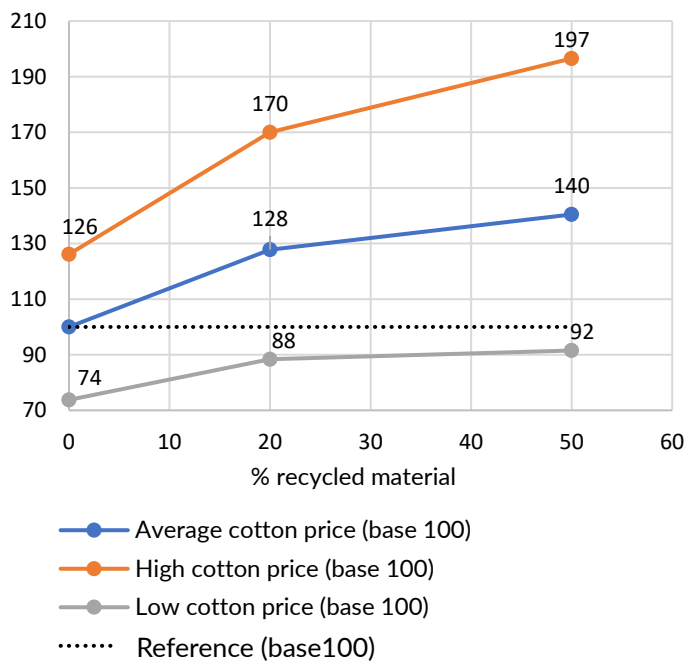


Figure 4: Index of the average additional cost of a Nm 12 white COTTON yarn, depending on the percentage of recycled material incorporated. The reference (base 100) is the price of 100% virgin cotton yarn. (Estimate based on figures collected in 2024).

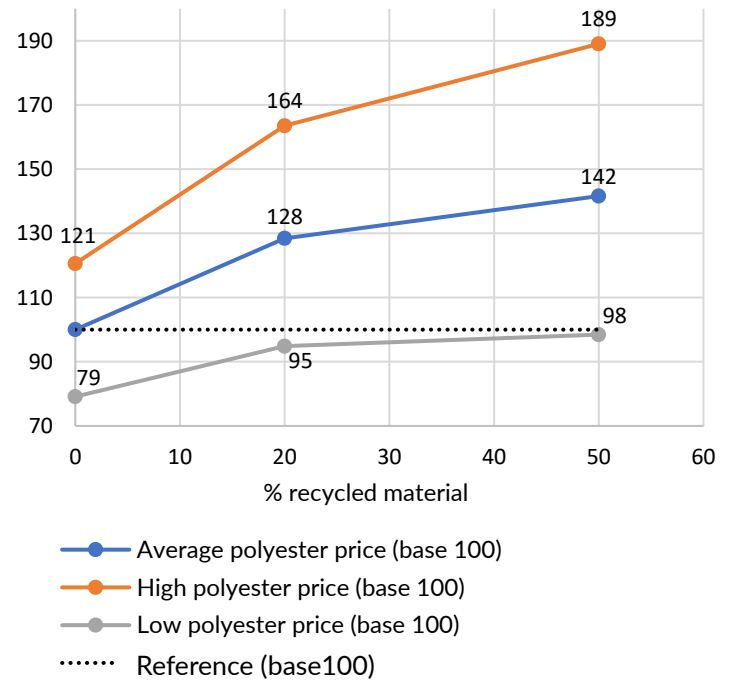


Figure 5: Index of the average additional cost of a Nm 12 POLYESTER yarn depending on the percentage of recycled material incorporated. The reference (base 100) is the price of 100% virgin polyester yarn. (Estimate based on figures collected in 2024)

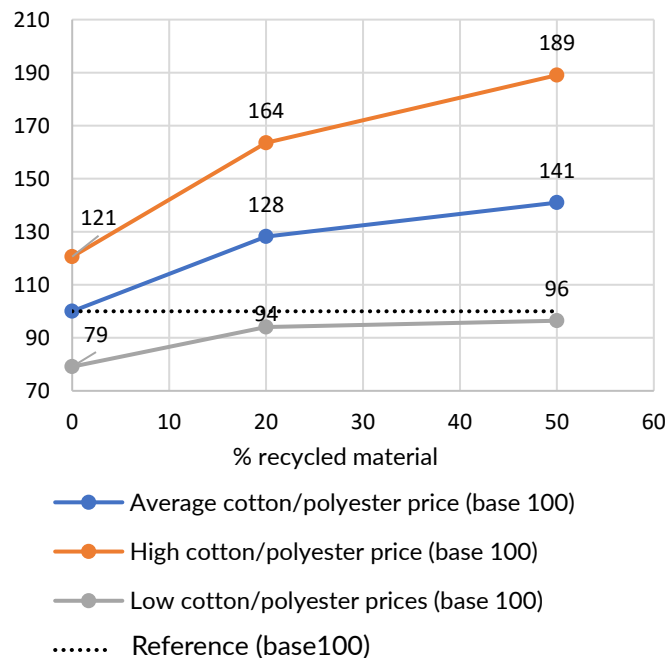


Figure 6: Index of the average additional cost of a Nm 12 COTTON/POLYESTER yarn, depending on the percentage of recycled material incorporated. The reference (base 100) is the price of 100% virgin cotton/polyester yarn. (Estimate based on figures collected in 2024).

Factors contributing to the additional cost for recycled raw material (RRM) incorporation into a closed-loop

The main factors contributing to the additional cost for incorporating non-reusable used textiles into a closed-loop process are as follows;

- The high cost of upstream recycling stages (sorting for recycling, trim removal), particularly in France, due to the predominantly manual nature of these operations;
- The absence of a standardized incoming feedstock, resulting in additional R&D costs;
- The difficulty of obtaining a feedstock with a high level of reliability in terms of composition (between 80% and 95%);
- A fragmented industrial ecosystem, impacting on the fluidity of operations and increasing transport costs;
- A higher rate of waste compared to recycling from post-industrial feedstock.

The analysis reveals a wide range of prices, influenced by several key factors:

- the quality of inputs, which depends on material feedstocks and sorting and recycling preparation operations;
- the type and percentage of recycled material incorporated ;
- the price of virgin materials ;
- the customer specifications ;
- the efficiency and location of operations;
- the economies of scale.

In addition, market variations with supply and demand play an important part in setting prices.

Three major points emerge from this study:

1. **The costs associated with sorting for recycling and trim removal have a strong influence on the price of recycled fibers**, which turn out to be more expensive than virgin fibers, particularly in situations where virgin material prices are low (cotton, polyester, cotton/polyester, viscose). This difference in initial cost is a significant obstacle to the economic viability of incorporating recycled fibers.
2. **The high loss rate** - at least eight times greater in the case of recycled fibers than in the case of virgin fibers - increases the cost of incorporating recycled fibers.
3. **Spinners are reluctant incorporating more than 30% RRM**, often limiting themselves to a range of 20% to 30%, because of the challenges involved. These challenges are first and foremost technical, such as the adjustments needed on the machines, with yarn breakage for example, and the reduction in carding and spinning speeds, and economical with an impact on yarn fineness and the additional time needed for preparation and monitoring for each new feedstock.

Finally, durability is essential to reduce the environmental impact of textiles, it is to remain vigilant about the quality of fabrics, especially those containing RRM.

All these factors accentuate the complexity of the cost structure and underline **the difficulty of defining precise additional costs**, given the immense and constantly evolving variety of factors specific to each situation.

In any case, the study shows that the additional costs associated with incorporating RRM are significant.

Despite these challenges, some companies are succeeding in incorporating RRM from non-reusable used household textiles, and their efforts deserve to be supported. It therefore seems more appropriate to support manufacturers and the entire value chain, rather than focusing solely on managing additional costs.

Experiments involving the incorporation of RRM have been carried out and should continue in order to identify viable outlets and develop this sector.

Overall support for the industrial ecosystem will, in the long term, improve competitiveness, reduce additional costs and promote the durability of the textile sector.