Textile Exchange

# Guide to Recycled Materials

GRS-202-V2.0-2025.07.01 | RCS-202-V2.0-2025.07.01

The *Guide to Recycled Materials V2.0* replaces *Textile Exchange Guide to Recycled Inputs V1.0* and is effective as of July 1, 2025. The mandatory implementation date for *Guide to Recycled Materials V2.0* is October 1, 2025. **All audits and assessments conducted after October 1, 2025 shall be conducted using *Guide to Recycled Materials V2.0*.** See section A2 for more details.

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English is the official language of the *Guide to Recycled Materials*. In any case of inconsistency between versions, reference shall be made to the English version.

## Disclaimer

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## Document Revision

*GRS-202 Guide to Recycled Materials* will undergo a review process at least every five years. Points of clarification may be incorporated into supplementary and guidance documents prior to the next review. More substantive feedback or suggested changes will be collected and assessed as part of the next review of the document.

You may submit feedback to Textile Exchange's standards system at any time via this form or by sending an email to standards@textileexchange.org.

## Revision History

*GRS-202-V0.1 Guidance: Mechanical Recycling of Cotton*, released June 2021
*GRS-202-V1.0 Textile Exchange Guide to Recycled Inputs*, released September 2021
*GRS-202-V2.0 Guide to Recycled Materials*, released July 1, 2025

# Contents

# Section A – General Information on Recycling

## A1. How to Use this Document

This document provides normative requirements and guidance for authorized certification bodies (CBs), certified sites, and buyers of certified materials to interpret how the Recycled Claim Standard (RCS) and Global Recycled Standard (GRS) definitions should be applied. While this document is a combination of normative and general guidance, it may be used as a supplement for interpretation decisions regarding the qualification of materials to be certified under the RCS or GRS.

Users of this document are primarily certification bodies but it can also be referred to by certified sites and potential certified sites.

The following table serves as a general outline of applicability of the contents of this document and clarifies what is mandatory and what is guidance.

| Section | Subsection | Certified Organizations | Certification Bodies |
|---|---|---|---|
| Section A – General Information on Recycling | A4. Definitions (Mandatory) | **Mandatory** | **Mandatory** |
| | A5. Necessary Context on Terminology for Pre-Consumer Material (Mandatory) | **Mandatory** | **Mandatory** |
| | A6. Understanding By-product vs. Waste (Guidance) | Guidance | Guidance |
| | A7. Basic Processing Steps (Guidance) | Guidance | Guidance |
| | A8. Types of Recycling (Guidance) | Guidance | Guidance |
| Section B – Textile Waste Generation Examples (Guidance) | | Guidance | Guidance |
| Section C – Mechanical Recycling | C1. Shredding of Animal, Plant-based, Cellulosic (MMCF), and Synthetic Material (Guidance) | Guidance | Guidance |
| | C2. Shredded Fiber – Technical Limitations (Mandatory) | **Mandatory** | **Mandatory** |

| Section | Subsection | Certified Organizations | Certification Bodies |
|---|---|---|---|
| | C3. Melting or Dissolution of Synthetic Material (Guidance) | Guidance | Guidance |
| Section D – Chemical Recycling | D1. Pulp from Plant Fiber/Material/Textiles Waste (Guidance) | Guidance | Guidance |
| | D2. Chemical Recycling Synthetic Materials (Guidance) | Guidance | Guidance |
| Section E – Biological Recycling (Guidance) | | Guidance | Guidance |
| Section F – Accepted Textile Reclaimed Input Materials | F1. Examples of Accepted Textile Post-Consumer Reclaimed Input Sources (Mandatory) | **Mandatory** | **Mandatory** |
| | F2. Examples of Accepted Textile Pre-Consumer Reclaimed Input Sources (Mandatory) | **Mandatory** | **Mandatory** |
| Section G – Accepted Non-Textile Reclaimed Input Materials | G1. Alternative Pre-Consumer Material Definition for Plastics (Guidance) | Guidance | Guidance |
| | G2. Examples of Accepted Non-Textile Reclaimed Input Sources (Mandatory) | **Mandatory** | **Mandatory** |
| Section H – Criteria for Certification Bodies (Mandatory) | All subsections | | **Mandatory** |

## A2. Implementation

The following implementation timelines apply:

**A2.1.1** The Textile Exchange Guide to Recycled Materials V2.0 replaces Textile Exchange Guide to Recycled Inputs V1.0, is effective July 1, 2025, and may be used immediately.

**A2.1.2** The mandatory implementation date for Textile Exchange Guide to Recycled Materials V2.0 is October 1, 2025. All audits and assessments conducted on or after October 1, 2025 shall be conducted using Textile Exchange Guide to Recycled Materials V2.0.

## A3. References and Further Reading

The following Textile Exchange documents should be referenced in conjunction with this guide, and all can be found at textileexchange.org/knowledge-center/:

- *ASR-221 Calibration Log*
- *CCS-101 Content Claim Standard (CCS)*
- *CCS-201 CCS User Manual*
- *GRS-101 Global Recycled Standard (GRS)*
- *GRS-201 GRS Implementation Manual*
- *RCS-101 Recycled Claim Standard (RCS)*
- *RCS-201 RCS Implementation Manual*

In addition to the Textile Exchange documents listed above, the external publications listed below provide further insight and guidance on recycled materials:

- *ISO 14021:2016 Environmental labels and declarations – Self-declared environmental claims (Type II environmental labelling)*
- *ISO 17088:2021 Plastics – Organic recycling - Specification for compostable plastics*
- *ISO 15270:2008: Plastics – Guidelines for the recovery and recycling of plastic waste*
- *ISO/TR 14049:2012 Environmental management – Life cycle assessment*
- *ISO 16929:2021 Plastics – Determination of the degree of disintegration of plastic materials under defined composting conditions in a pilot-scale test*
- *ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories*
- *ScienceDirect – Environmental impact of textile reuse and recycling*
- *Zero Waste Europe – El Dorado of Chemical Recycling*

- *European Commission – A circular economy for plastics*
- *Accelerating Circular Supply Chains for Plastics*
- *Plastics Industry Association*
- *Ellen MacArthur Foundation*
- *Rieter - The Increasing Importance of Recycling in the Staple-Fiber Spinning Process, Part 1 and Recycling Spinning System*
- *Circular Plastic Alliance – Guidance on Waste Definitions*

## A4. Definitions (Mandatory)

Refer to the Textile Exchange glossary for definitions of terms used in this document. Defined terms are shown in italics in the first usage in this document, and in some other uses for clarity.

NOTE: Please note that TE-101 Terms and Definitions for Textile Exchange Standards and Related Documents will not be updated going forward and will become obsolete (i.e. retired) alongside the mandatory implementation date of the Materials Matter Standard (TE-MM-STN-101). Therefore, TE-101 may still be referenced until the Materials Matter Standard becomes mandatory, but the Textile Exchange glossary (https://textileexchange.org/glossary/) takes precedence in case of any contradiction or omission.

## A5. Necessary Context on Terminology for Pre-Consumer Material (Mandatory)

### Recovered Materials Diverted from the Waste Stream

An important aspect of the ISO 14021 definition focuses on material that is diverted from the waste stream (landfill or incineration, etc.) during the manufacturing process. Materials historically having commercial value or potential use in other industries as is (e.g. without recycling or further processing) are excluded from being eligible as pre-consumer reclaimed material.

For pre-consumer recycled content claims, it is a best practice that such claims apply to waste generated and discarded from one commercial process and then collected and reprocessed in another commercial process. However, it is not necessary/required that the waste leaves the premise of the factory that generated it, and/or it is not necessary/required that a different entity from the one generating the waste uses the pre-consumer reclaimed inputs to make a product. The

only condition that needs to be fulfilled is that the recovered material was demonstrably going to a landfill/waste stream and was diverted back to be qualified as reclaimed pre-consumer material.[1]

NOTE: Established recycling channels are not required to demonstrate that the material has been diverted from the waste stream. For this reason, this document includes examples of approved or eligible feedstocks in Section F and G. Feedstocks not covered in the examples or not listed must demonstrate that the material was diverted from the waste stream and will require approval from Textile Exchange.

### Reutilization of Materials Without Processing

Conventional thinking often considers in-plant wastes, such as regrind, rework, or scrap, that is generated during the manufacturing process and reutilized within the same process that generated it, as recycled material. Thus, to avoid misleading claims by having stringent requirements around pre-consumer material, the following section clarifies what constitutes acceptable reclaimed input material in a pre-consumer recycled content claim:

Pre-consumer reclaimed material, as defined herein, excludes reworked materials such as regrind or scrap that are generated and reclaimed within the same process that generated it. These materials are not considered reclaimed inputs for the purposes of recycled content claims. This aligns with the intent of ISO 14021, which discourages the use of recycled content claims for routine manufacturing practices that reutilize in-plant waste within the same process.

“Same process” means the same manufacturing operation for the same type of product in the same or in a different physical location.

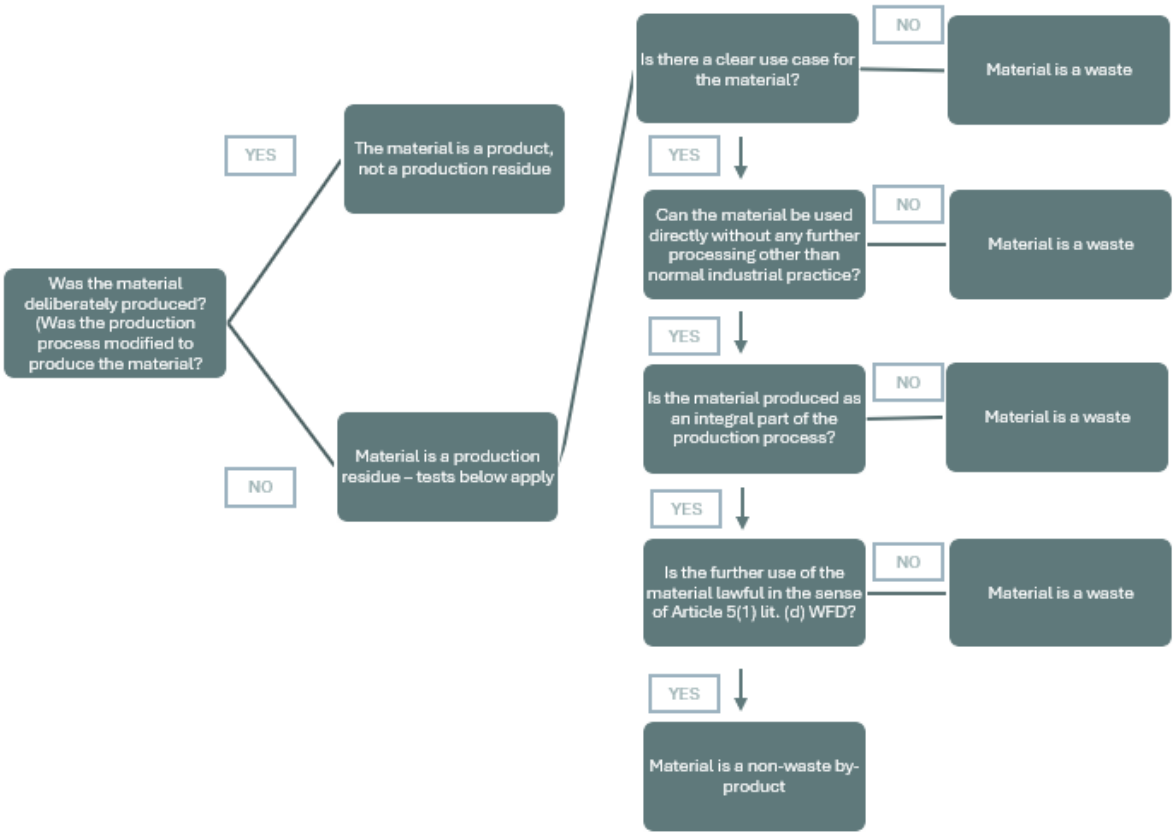
“Reutilization” means the recovered substances or objects, if utilized directly into manufacturing or reintroduced in the same manufacturing steps with or without processing, recovery, or decontamination operations (e.g. sorting, crushing, shredding, size-reduction, flaking, bailing), then such substances or objects are excluded from being eligible as pre-consumer reclaimed inputs.[2]

Note: The term ‘pre-consumer material’ is often used interchangeably with the term ‘post-industrial material’.

## A6. Understanding By-product vs. Waste[3] (Guidance)

The following guidance to outline the difference between a by-product vs waste. This document has also provides examples of what is accepted vs. not accepted as reclaimed inputs for both textiles and non-textiles in Sections F and G respectively.

[1] Based on ISO 14021:1999
[2] Based on ISO 14021:1999
[3] Based on Circular Plastics Alliance – Guidance Document on Waste




Organizations should take appropriate measures to ensure that a substance or object resulting from a production process – where the primary aim is not the production of that substance or object - is considered a by-product rather than waste, if the following conditions are met:

a. The further use of the substance or object is certain;

b. The substance or object can be used directly without any further processing beyond normal industrial practice;

NOTE: 'Normal industrial practice' may include all steps which a producer would take for a product and are considered as an integral part of production processes. 'Recovery operations' processes that address typical waste-related characteristics (e.g. contamination with hazardous or useless components) would not be included in the definition of normal industry practice (e.g. sorting, baling, crushing, flaking, etc.)

c. The substance or object is produced as an integral part of a production process; and

d. The further use is lawful, meaning the substance or object meets all relevant product, environmental, and health protection requirements for the specific use, and will not result in overall adverse environmental or human health impacts.

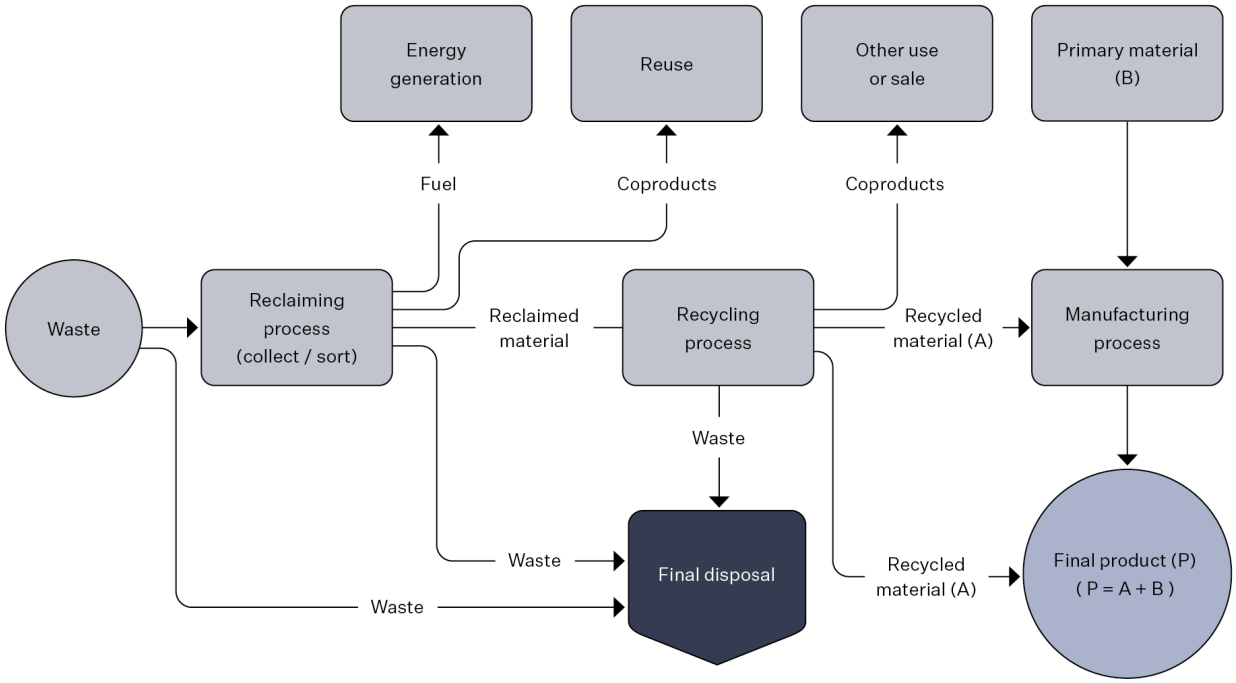
A substance or object is considered a 'by-product' and not waste when all of the above conditions are fulfilled.

## A7. Basic Processing Steps (Guidance)

Recycling always starts with diversion from the waste stream, collection and sorting, and the recycling process. Following the principle of the waste hierarchy, the first priority should be to reduce the amount of waste generated. This can be done through creating increased efficiency in production or by making products designed to last. The next step is reuse. After a material has either met its intended use or can no longer be used as intended, it is recommended to look for ways to reuse the item as it is without additional processing. Recycling materials should be a final step in the long life of a material. The steps below and diagram explain the recycling process.

- Step 1: Waste (pre-consumer and post-consumer)
- Step 2: Collection and concentrating (reclaiming process)
- Step 3: Recycling process (mechanical, chemical, biological)
- Step 4: Further manufacturing if needed.

### Diagram 1: Simplified Recycling System[4]




*Recycled content of product ( X% ) = ( A / P ) × 100*

[4] Based on ISO 14021:2016

# A8. Types of Recycling (Guidance)

For the recycling process, there are different methods that are typically used depending on the type of material and the intended use of the recycled material.

## Mechanical Recycling

Processing of waste into secondary raw material or products without significantly changing the chemical structure of the material.

- **Shredding:** Any mechanical process by which wastes are fragmented into irregular pieces of any dimension or shape. Shredding usually signifies the tearing or cutting of materials that cannot be crushed by fragmentation methods applicable to brittle materials, as typically carried out in a hammer mill.

NOTE: When plastic is shredded before melting or heat process, this is not considered the recycling step.

- **Synthetic fiber/material and cellulosic (MMCF) fiber recycling:** Processing of plastics waste or any other synthetic materials and cellulosic (MMCF), animal, and plant-based material for the original purpose or for other purposes, excluding energy recovery. Takes plastic and reforms it into usable pellets with melting (heat) process or dissolution (acrylic dope, dissolving pulp).

## Chemical Recycling

Chemical recycling, also called “advanced recycling and recovery”, refers to several different chemical processes that use existing and emerging technologies that return pre- and post-use cellulose-based, synthetic textile and plastic/material to their basic chemical building blocks for creating a versatile mix of new textiles, plastics, chemicals, fuels, and other products.

Chemical recycling can be divided into three different categories depending on the level of decomposition that the cellulose-based, synthetic textile and plastic waste will be subject to:

1. **Solvent-based purification**, which disassembles cellulose-based textile back to the polymer stage.
2. **Chemical depolymerization** (glycolysis, methanolysis, hydrolysis), which breaks down the synthetic textiles back into their monomers via a chemical reaction.
3. **Thermal depolymerization** (pyrolysis and gasification) which in some cases can be considered a form of chemical recycling, breaks down the polymers into monomers and further into hydrocarbons. While thermal depolymerization can also produce fuels, this process is no longer considered recycling if the hydrocarbons are used as fuel. To qualify as recycling, the resulting hydrocarbons must be used as feedstock for producing new polymers.

All these outputs (except if used as fuels) are then reprocessed to form new plastics.

In simple terms, chemical recycling breaks down plastic to its core building blocks at a molecular level.

## Biological Recycling

Aerobic (composting) or anaerobic (digestion) treatment of biodegradable plastic waste under controlled condition using micro-organism to produce, in the presence of oxygen, stabilized organic residues, carbon dioxide, and water, or, in the absence of oxygen, stabilized organic residues, methane, carbon dioxide, and water.

The two forms of biological recycling are biodegradation and organic recycling. Biodegradation[5] is the degradation of animal, plant-based materials caused by biological activity, especially by enzymatic action, leading to a significant change in the chemical structure of a material. Organic recycling is the controlled microbiological treatment of biodegradable plastic waste under aerobic or anaerobic conditions.

Controlled biological recycling is still a nascent technology and may have limited application in many supply chains. While the RCS and GRS could be used to verify that inputs to a biological recycling process were diverted from the waste stream, the standards are not intended to verify whether a material – such as a biopolymer – is recyclable or biodegradable.

NOTE: Chemical and biological (organic) recycling is currently used for plastic material only, such as Polyethylene (PE), Polyethylene Terephthalate (PET), Polypropylene (PP), Polystyrene (PS), Polyvinyl Chloride (PVC), Polyolefins (PE, PP), Polyurethane (PU), PA -Polyamides (PA), Polylactic Acid (PLA), Polycarbonate (PC), Polyhydroxyalkanoates (PHA), Polyethylene Furanoate (PEF), or a plastic mix.

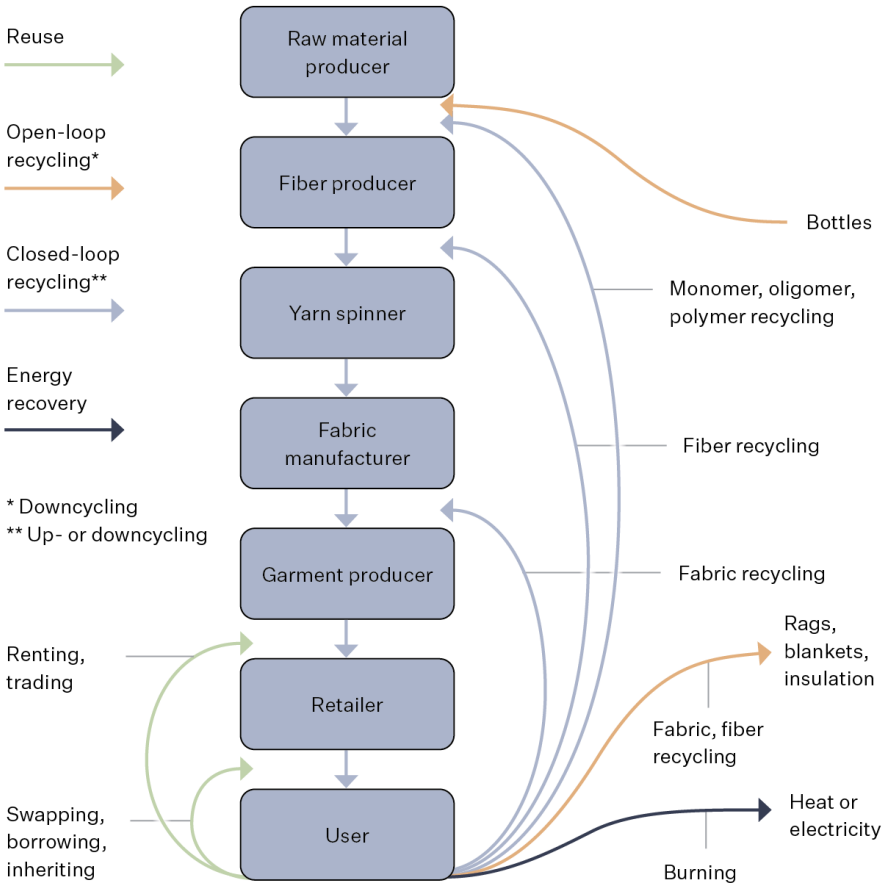
[5] Based on ISO 16929:2021

# Section B – Textile Waste Generation Examples (Guidance)

The examples in this section are taken from textile facilities and reflect the intended application of the definitions in section A4 of this document. All examples are for guidance purposes only. Users (certification bodies and certified organizations) are expected to carry out their own assessment of the reclaimed material and exercise their best judgment on qualifying said material as pre-consumer or post-consumer waste.

Diagram 2 shows a classification of textile reuse and recycling based on the post-consumer source of the waste. Diagrams 3 and 4 show the animal, plant-based, and synthetic processes, illustrating which feedstocks are accepted under RCS or GRS based on their source.

## Diagram 2: Classification of Textile Reuse and Recycling Routes[6]

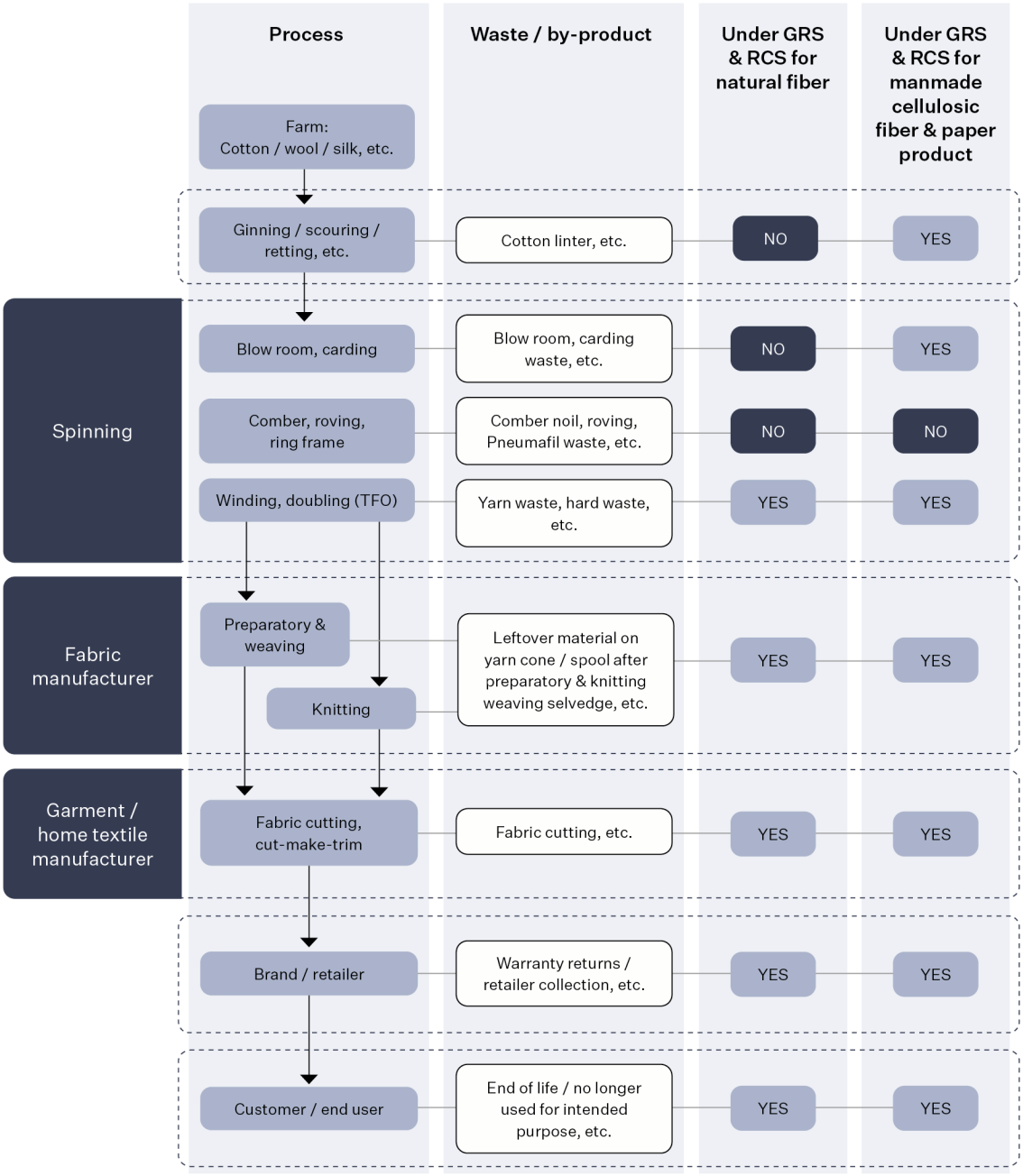



NOTE: Reuse, renting, or trading of a garment or other finished product does not qualify as recycled input under GRS or RCS. These are examples of reuse without recycling.

[6] Based on ScienceDirect – Environmental Impact of Textile Reuse and Recycling

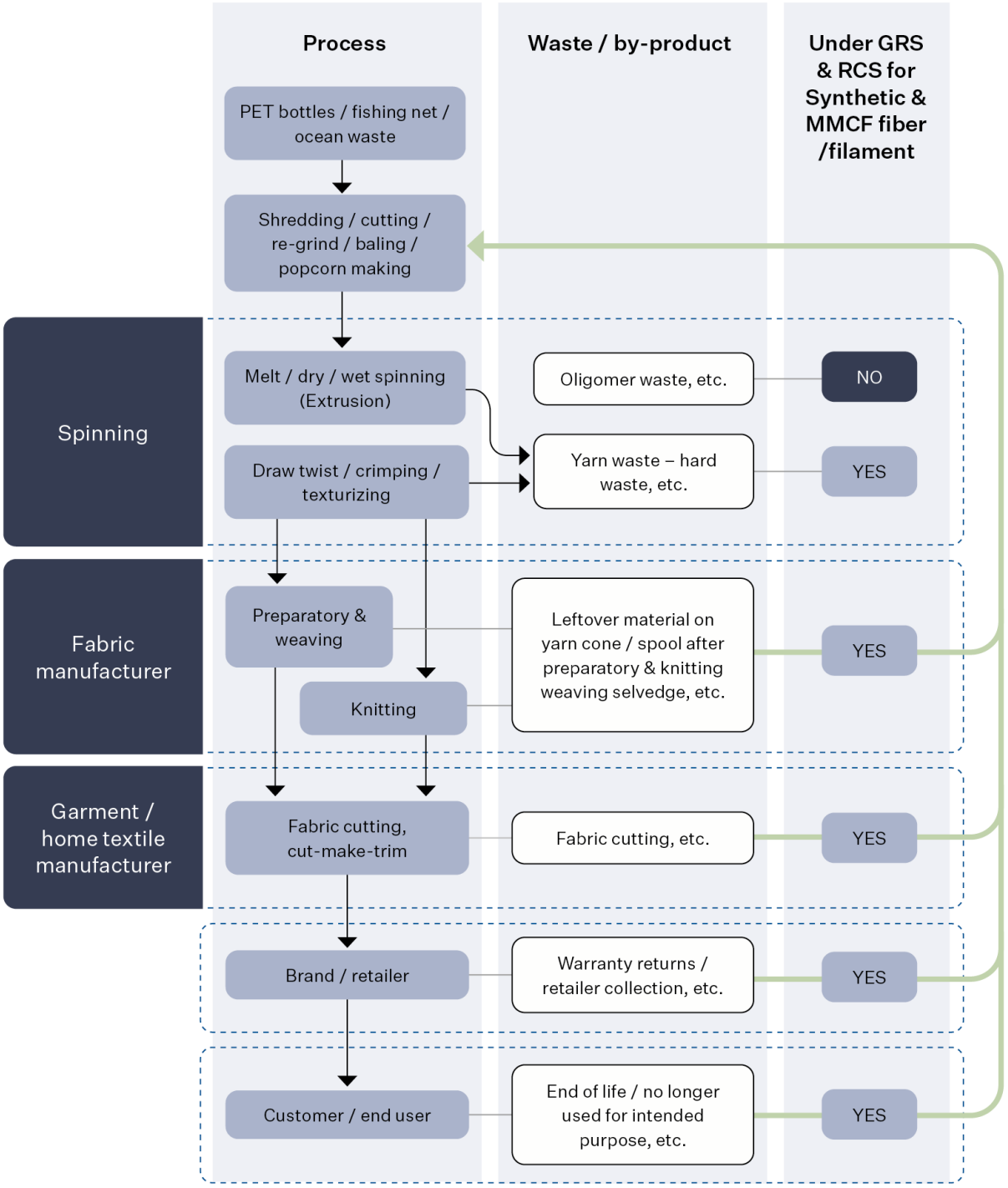
## Diagram 3: Animal, Plant-based Fiber Process Steps and Accepted Recycled Feedstocks

Animal, Plant-based fibers generally include plant and animal-derived fibers and materials, primarily cotton, wool, and silk. However, this diagram also refers to cellulosic (MMCF) fibers (man-made cellulosic), such as lyocell, modal, viscose, acetate, cupro (cuprammonium rayon), etc. Refer to Section F for more information.



## Diagram 4: Synthetic Fiber Process Steps and Accepted Recycled Feedstocks

Synthetic fibers include polyester, nylon/polyamide, acrylic, and all synthetics. In this diagram, it is assumed that all pre-consumer and post-consumer reclaimed material goes to shredding, cutting, or popcorn making stages. Refer to Section F – for more information.



# Section C – Mechanical Recycling

Most recycled content is currently mechanically recycled. This occurs using two methods: shredding, and melting/dissolution. This section describes the two methods of mechanical recycling.

## C1. Shredding of Animal, Plant-based, Cellulosic (MMCF), and Synthetic Material (Guidance)

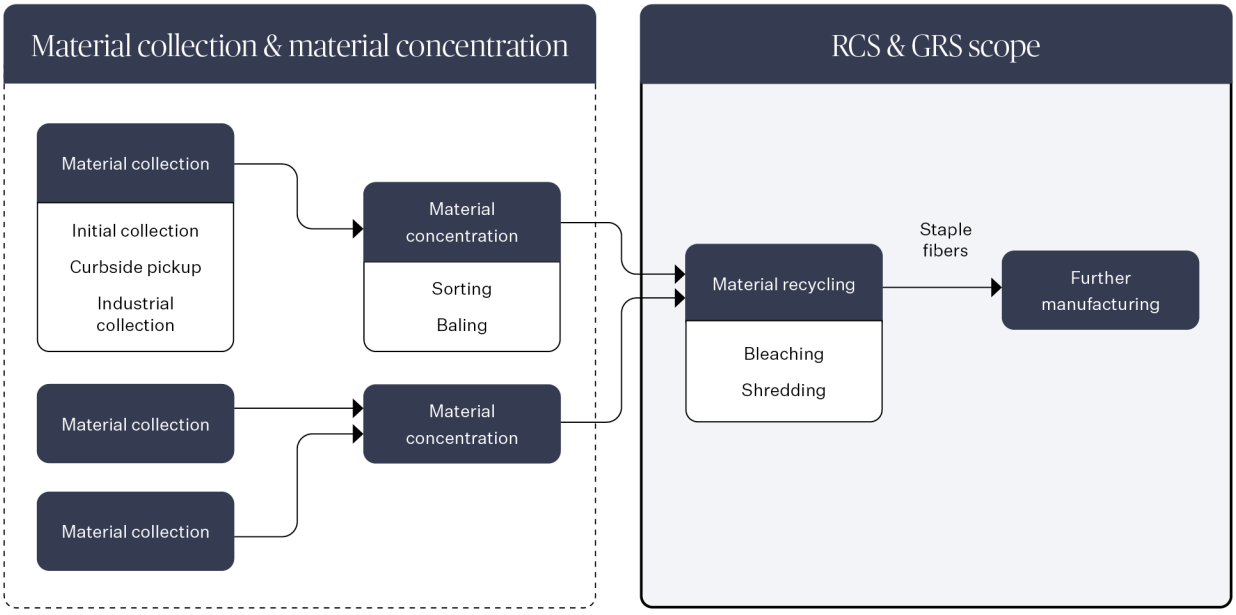
Processing of waste into a secondary raw material or product without significantly changing the chemical structure of the material is achieved via the shredding process. It may also be known as “garneting”.

Examples of fiber recycling feedstocks which are commonly shredded include cotton, wool, cashmere, other animal fiber, manmade cellulosic (MMCF) fibers (rayon, lyocell, acetate, viscose, cupro (cuprammonium rayon), viscose made from bamboo), mixed fibers, polyester, polyamide, acrylic, elastane, and all synthetics.

Material collection may be from pre-consumer or post-consumer sources. The most substantial volume of recycled cotton sources is produced through pre-consumer waste, such as cutting scraps. Post-consumer waste is more challenging to sort through due to various color shades and fabric blends and is generally a more labor-intensive process.

### Diagram 5: Process Flow – Mechanical Recycling by Shredding

This diagram includes the flow for both animal, plant-based, and cellulosic (MMCF) fibers, as well as synthetic fiber recycling.



# C2. Shredded Fiber – Technical Limitations (Mandatory)

Due to the nature of shredding fibers, some shortening of staple length is unavoidable. For all fibers, this results in some technical limitations for recycled materials. Due to this technical limitation, staple length is an important risk factor to identify material which may have been claimed to be recycled but is actually virgin material. This section includes guidance for certified sites and certification bodies to understand the limitations of both shredded cotton and wool, as well as any other fiber/filament or material.

This document provides more detailed information to allow certification bodies to assess a product (yarn) made from mixed cotton and other blended fibers under RCS and/or GRS for both currently certified sites and new applicants.

## Mechanically Recycled Cotton Specifications

Textile Exchange has identified cases where combed products made from mechanically recycled cotton fiber have applied for certification under RCS or GRS, but which would not be possible due to known technical limitations.

- Due to the technical limitations of combing, carded, and recycled cotton yarn, only products containing mechanically recycled cotton with a yarn count of <Ne 34 and a fiber length of <22mm may be certified to the RCS or GRS without additional due diligence by the certification body.
- Products containing mechanically recycled cotton with a yarn count of >Ne 40 or a fiber length of >25mm are not eligible to be certified to the RCS or GRS since they are not technically possible to produce. Scope or transaction certificates are shall not be issued for products containing mechanically recycled cotton with a yarn count of >Ne 40 or a fiber length of >25mm.
- Products containing mechanically recycled cotton with a yarn count of Ne 34-40 or a fiber length of 22-25mm shall require additional due diligence by the certification body to ensure the authenticity of the products (see section H4).

## Commonly Used Process

Garneting (shredding) of spinning yarn hard waste, selvage (selvedge), fabric cutting waste, or garment cutting waste can achieve a maximum fiber length as outlined in Table 1. For pre-consumer yarn hard waste, fiber lengths will vary according to the quality of the materials.

Spinning sites perform mixing or blending of material to create yarn. Table 2 outlines a list of possible yarn counts.

## Table 1: Parameters for Mechanically Recycled Cotton Fiber

| Feedstock | Output Fiber Length (mm) |
|---|---|
| Pre-consumer garment cutting waste | 6 to 21 |
| Pre-consumer yarn hard waste | 6 to 26* |
| Pre-consumer yarn hard, woven selvage waste | 6 to 21 |
| Post-consumer denim/jeans waste | 6 to 18 |

* Dependent on the input quality of pre-consumer materials.

## Table 2: Possible Yarn Counts with Mixing and Blending Ratios

| Type of Spinning | Yarn counts | Mechanically Recycled Cotton *Recycled Pre-consumer (RM0106) or Post-consumer (RM0107)* | Non-Recycled Cotton (for Mixing) *No attribute (RM0102), In-conversion (RM0103), or Organic (RM0104)* | Other Fibers for Blending (non-cotton) *Various codes possible, under any attribute for Textile Exchange standards* |
|---|---|---|---|---|
| Open End (OE)/Rotor | Ne 1 to Ne 24 (maximum) | 5% to 100% | 0% to 95% | 0% to 95% |
| | Ne 24 to Ne 34 (maximum) | 5% to 60% | 40% to 95% | 40% to 95% |
| | Ne > 34 | Not applicable | | |
| Ring spun / Air jet (Vortex) spun – Carded, Carded compact, Carded core-spun | Ne 1 to Ne 16 (maximum) | 5% to 100% | 0% to 95% | 0% to 95% |
| | Ne 16 to Ne 34 (maximum) | 5% to 60% | 40% to 95% | 40% to 95% |
| | Ne > 34 | Not applicable | | |
| Ring spun / Air jet (Vortex) spun – Combed, combed core-spun, combed compact | Not applicable | | | |

The certification body may issue scope and transaction certificates as outlined above and is expected to verify these details during the on-site audit. The certification body shall withdraw, invalidate, or not issue scope and transaction certificates (as applicable) where specifications fall outside of the possible fiber lengths and yarn counts.

## Innovative Processes

Some production sites claim that technological innovation allows them to achieve a higher quality (fiber length and yarn counts) with mechanically recycled cotton fiber compared to regular production (as outlined in section C2). However, a fiber length of up to 26mm can only be achieved with pre-consumer yarn hard waste as shown in Table 3.

### Table 3: Mechanically Recycled Cotton Fiber Parameters

| Feedstock | Output Fiber length (mm) |
|---|---|
| Pre-consumer yarn hard waste<br>[High quality fiber (length 29-40) in pre-consumer yarn] | Up to 26 |

The following Table 4 outlines the possible yarn counts with mixing and blending ratios in correlation with Table 3 as input.

Industry guidance defines hard waste as yarn waste obtained from the ring frame and winding departments that is not reusable; hence, it is referred to as 'hard waste'.

### Table 4: Possible Yarn Counts with Mixing and Blending Ratios

| Type of Spinning | Yarn counts | Mechanically Recycled Cotton<br>*Recycled, Pre-consumer, Post-consumer* | Any Cotton (for Mixing)<br>*Virgin* | Other (for Blending – non-cotton)<br>*Virgin, Recycled, Pre-consumer, Post-consumer* |
|---|---|---|---|---|
| Open End (OE)/Rotor / Ringspun / Air jet (Vortex) Spun – Carded, Carded compact | Ne 20 to Ne 30 (maximum) | 5% to 100% | 0% to 95% | 0% to 95% |
| | Ne 30 to Ne 40 (maximum) | 5% to 25% | 75% to 95% | 75% to 95% |
| | Ne > 40 | Not applicable | | |
| Open End (OE)/Rotor | Any yarn count | Not applicable | 5% to 95% | 5% to 95% |

| Type of Spinning | Yarn counts | Mechanically Recycled Cotton<br>*Recycled, Pre-consumer, Post-consumer* | Any Cotton (for Mixing)<br>*Virgin* | Other (for Blending – non-cotton)<br>*Virgin, Recycled, Pre-consumer, Post-consumer* |
|---|---|---|---|---|
| Ringspun / Air jet (Vortex) spun – Carded, Carded Compact, Combed, Combed Compact, Core-spun | Any yarn count | Not applicable | Fiber length and yarn count relationship needs to be ensured[7] | |

The certification body shall verify such outputs (as per Table 3 and 4) by reviewing a third-party test report and collecting a sample during the audit. Details of findings shall be shared with Textile Exchange prior to issuing or renewing certification.

For more information on how cotton fiber quality relates to yarn count and product suitability for cotton, please refer to Organic Cotton: A Fiber Classification Guide.

## Shredded Wool – Technical Limitations

Garneting (shredding) of spinning yarn hard waste, selvage (selvedge), fabric cutting waste, or garment cutting waste can achieve a maximum fiber length as outlined in Table 5. For pre-consumer yarn hard waste, fiber lengths will vary according to the quality of the materials.

## Table 5: Mechanically Recycled Wool Fiber Parameters

| Feedstock | Output Fiber length (mm) |
|---|---|
| Post-consumer garment cutting waste | 20-50 |
| Pre-consumer fabric cutting waste | 20-60 |
| Pre-consumer woven selvage, yarn hard waste | 20-60 |

Spinning sites perform mixing or blending of material to create yarn. Table 6 outlines a list of possible yarn counts.

NOTE: Worsted yarn is not possible to make with mechanical recycled wool fiber.

[7] Based on Organic Cotton – A Fiber Classification Guide (pg. 4-6)

## Table 6: Possible Yarn Counts with Mixing and Blending Ratios

| Type of Spinning | Yarn counts | Mechanically Recycled Wool | Other Material* |
|---|---|---|---|
| Woolen spinning system (Ring carded Yarn) | Nm 1 – 10 | 100% | |
| | Nm 6 – 12 | 85-90% | 10-15% |
| | Up to Nm 15 | 75-80% | 20 – 25% |
| | >Nm 15 | Unable to spin yarn with mechanically recycled wool | |
| Open end spinning | Up to Nm 20 | 85-90% | 10-15% |

* Recycled polyester, polyester, mixed fiber, viscose, nylon, recycled nylon, recycled acrylic, acrylic etc.

## C3. Melting or Dissolution of Synthetic Material (Guidance)

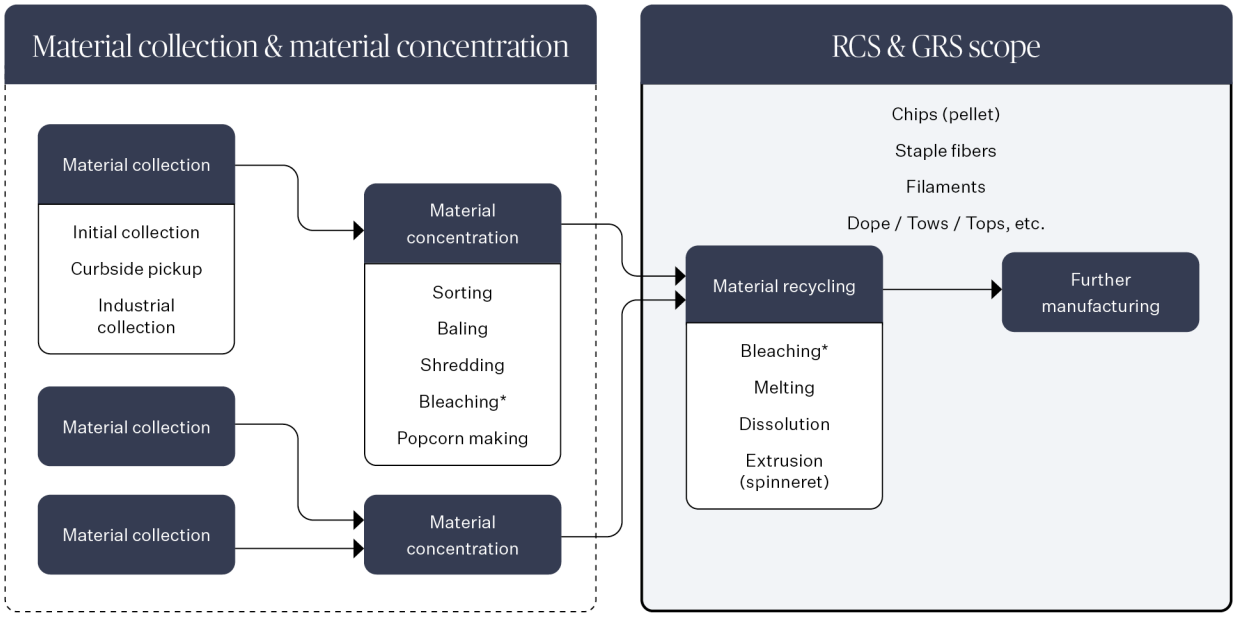
Examples of mechanically recycled polymers include acrylic, nylon, and polyester. The output of material concentration with a bleaching process will be post-consumer processed flakes and without a bleaching process will be post-consumer unprocessed flakes. Common pre-consumer inputs for this process include textiles, woven selvage, and fabric or garment cutting waste. The most common post-consumer inputs are plastic bottles and textile waste; however, fishing nets are also used.

NOTE: Acrylic polymers and other acrylic waste are physical dissolutions during processing.

The initial output is either filament yarn or staple fiber. Examples of this type of filament include DTY – Draw Textured Yarn (DTY), Fully Drawn Yarn (FDY), Partially Oriented Yarn (POY), Low oriented Yarn (LOY), Highly Oriented Yarn (HOY), Air-textured Yarn (ATY), Fully Oriented Yarn (FOY) etc.

### Diagram 6: Process Flow – Mechanical Recycling by Melting

This diagram includes the flow for mechanical recycling (melting) of polymers.




* Bleaching is an optional process and may not be used in all material concentration or recycling processes.

# Section D – Chemical Recycling

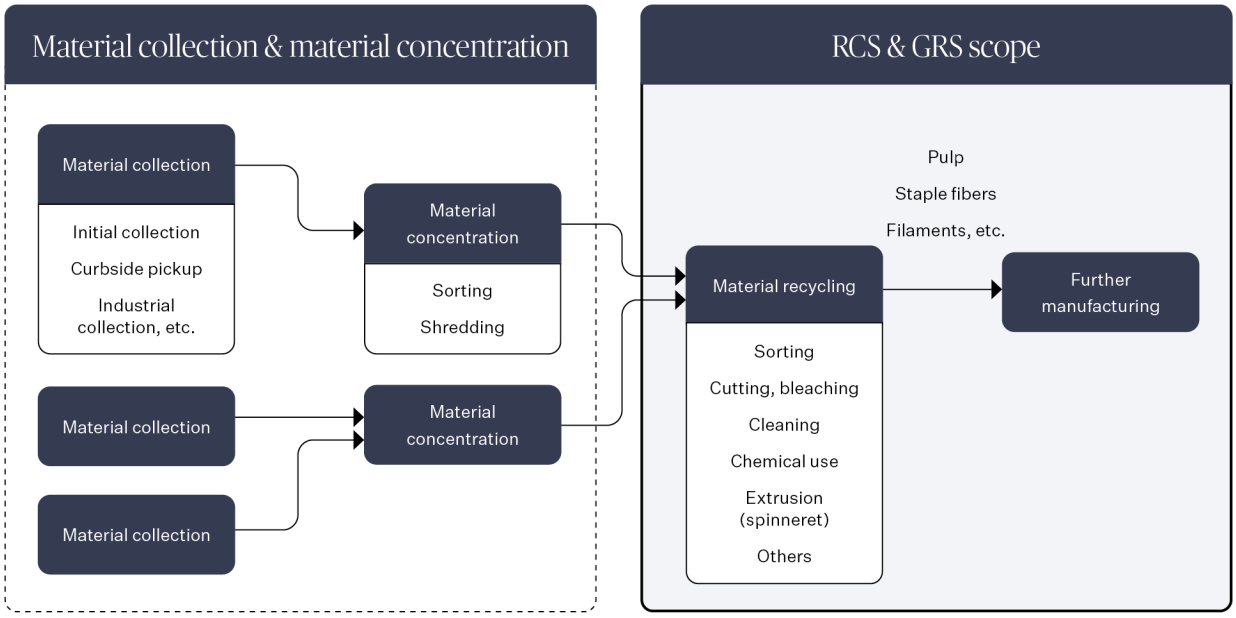
## D1. Pulp from Plant Fiber/Material/Textiles Waste (Guidance)

Another source of recycling is turning cellulosic (MMCF) material into pulp and then fiber. The input materials are textile waste from plant-based materials (e.g. cotton, man-made cellulosic (MMCF)) and waste from agriculture production. The initial output is pulp, filament yarn, or staple fiber of the following varieties: acetate, cupro (cuprammonium rayon), rayon, viscose, lyocell, and others.

A few production sites are also chemically recycling plastic, $CO_2$, and other materials to make cellulosic (MMCF) pulp, fiber, filament, PET, or PA instead of performing mechanical recycling.

### Diagram 7: Process Flow – Pulp from Textile Waste

This diagram includes the flow for chemical recycling (pulp making).

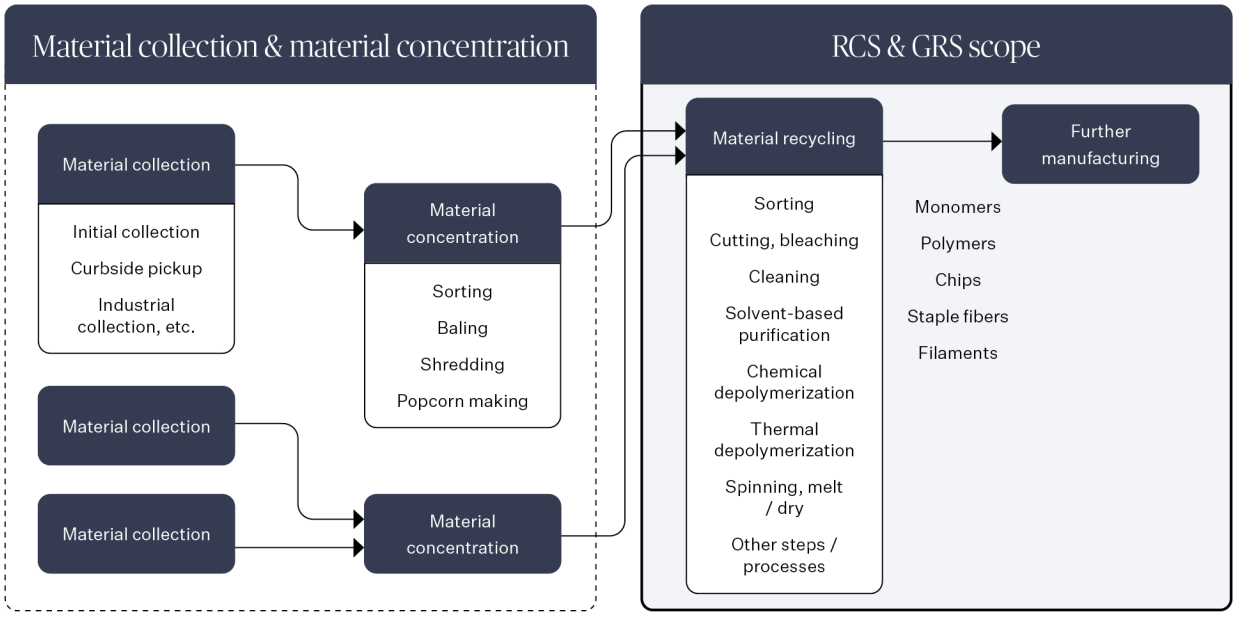


# D2. Chemical Recycling Synthetic Materials (Guidance)

Chemical recycling almost always uses pre-consumer materials and limited post-consumer materials as the input, with the primary target being to increase the recycling rates of post-consumer textiles/non-textile inputs (e.g. tires/plastic). The initial output is either filament yarn or stale fiber. Examples of this type of filament include Draw Textured Yarn (DTY), Fully Drawn Yarn (FDY), Partially Oriented Yarn (POY), Low oriented Yarn (LOY), Highly Oriented Yarn (HOY), Air-textured Yarn (ATY), and Fully Oriented Yarn (FOY).

## Diagram 8: Process Flow of Chemical Recycling

This diagram includes the flow for chemical recycling of synthetic fiber and material inputs such as PET, elastane/spandex, nylon, and polyester.

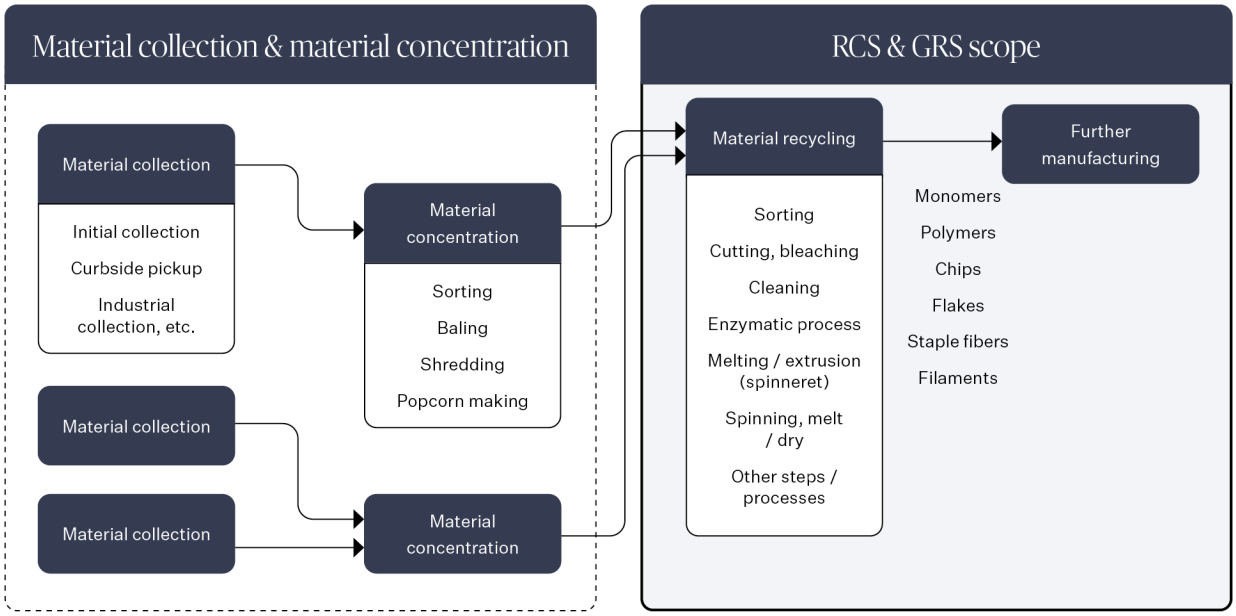


# Section E – Biological Recycling (Guidance)

Controlled biological recycling is still a nascent technology and may have limited application in many supply chains. While the RCS and GRS could be used to verify that inputs to a biological recycling process were diverted from the waste stream, the standards are not intended to verify whether a material – such as a biopolymer – is recyclable or biodegradable. Refer A5 for more detail.

## Diagram 9: Process Flow of Biological Recycling

This diagram includes the flow for biological recycling of fiber and material such as PET, elastane/spandex, nylon, and polyester.



# Section F – Accepted Textile Reclaimed Input Materials

The following tables provide examples of pre-consumer and post-consumer input materials that have been accepted into the RCS and GRS. The categories include animal and plant-based fibers /materials, man-made cellulosic fibers (MMCF), and synthetic fibers.

Pre-consumer and post-consumer waste that can be used without undergoing a recycling process is not considered *recycled material* and therefore is not accepted as an input for RCS or GRS.

Example: Fabric and fabric waste collected from post-consumer and pre-consumer garments (respectively) is sewn into new garments or bags etc. In this case, the waste is being reused rather than recycled. This type of material may be identified and tracked withing GRS and RCS but may not be identified or labeled as "recycled" nor with any reference to the GRS and RCS.

Processes such as opening, cleaning, sorting, screening, contamination removal, balling, and/or converting size (bottle or fabric to a smaller size of flakes or fabric) are considered material concentration and not considered recycling.

## F1. Examples of Accepted Textile Post-Consumer Reclaimed Input Sources (Mandatory)

| Material Source | Accepted as Reclaimed under Post-Consumer | Not Accepted as Reclaimed under Post-consumer |
|---|---|---|
| **Sources** | Material generated by households or by commercial, industrial, and institutional facilities in their role as end-users of the product which can no longer be used for its intended purpose. This includes returns of material from the distribution chain. | Materials that are discarded by a manufacturing process but that have properties allowing it to be reused on site by being incorporated back into the same manufacturing process that generate it; or<br>Can be sold in second markets without any changes. |
| **Brand/Retailer** | • Used garments collection programs<br>• End-of-life** | Second hand or second quality |
| **Customer/End user** | Used garments | |
| • **Government owned/operated collector or concentrator entities** | • Used garments<br>• PET bottles | Finished garments or products from:<br>• reused, renting |

| Material Source | Accepted as Reclaimed under Post-Consumer | Not Accepted as Reclaimed under Post-consumer |
|---|---|---|
| (i.e. municipality) or donation center;<br>• Curbside pickup;<br>• Industrial collection;<br>• Business entity (Brokers/ Commercial operation -retail stores); and<br>• Non-profit organization | • Fishing nets<br>• Plastics<br>• Tires<br>• etc. | • trading<br>• swapping, borrowing, inheriting<br>• other |

## F2. Examples of Accepted Textile Pre-Consumer Reclaimed Input Sources (Mandatory)

| Material Source | Accepted as Reclaimed under Pre-Consumer | Not Accepted as Reclaimed under Pre-consumer |
|---|---|---|
| **Sources** | Material diverted from the waste stream during a manufacturing process.<br>Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it. | Materials that are discarded by a manufacturing process but that has properties allowing it to be reused on site by being incorporated back into the same manufacturing process that generated it; or<br>Materials that can be sold in a secondary market without any changes. |
| **Ginning (including delinting)** | Not applicable | • Cotton linter*<br>• Gin motes* |
| **Scouring** | Not applicable | Lanolin |
| **Fiber dyeing** | Not applicable | Quality rejection (such fiber may be used for mélange, heather, or second grade production does not qualify for GRS or RCS certification) |

| Material Source | Accepted as Reclaimed under Pre-Consumer | Not Accepted as Reclaimed under Pre-consumer |
|---|---|---|
| **Spinning** | Not applicable | |
| **Blow room** | Not applicable | Blow room waste* |
| **Carding** | Not applicable | Carding waste* |
| **Drawing** | Not applicable | Drawing (draw frame)* |
| **Combing** | Not applicable | • Comber noil (cotton)<br>• Comber noil (wool) |
| **Top making** | Not applicable | Top/tow waste |
| **Roving frame** | Not applicable | Roving waste |
| **Ring frame** | Ring frame yarn waste (hard waste) | Ring frame - pneumatic waste and automated vacuum collection (overhead travelling cleaners) |
| **Winding machine** | Winding machine yarn waste (hard waste) | Winding machine – automated vacuum collection (overhead travelling cleaners) |
| **Open end** | Open end yarn waste (hard waste) | Sliver waste |
| **Air (vortex) spinning** | Air (vortex) yarn waste | Air (vortex) fiber waste |
| **Melt / Wet / Dry spinning**<br>**Texturization (Crimping)** | Melt, wet, dry, or texturizing (crimping) spinning yarn waste etc. (final) | Melt, wet, dry, or texturizing (crimping) spinning waste etc. (intermediate) |
| | Not applicable | • Oligomer waste<br>• Canceled order (excluding quality rejection) |
| **Dyeing (Yarn dyeing and finishing)** | Quality rejections of yarn** | Quality rejection of fibers (such fiber may be used for mélange or heather but does not qualify for GRS or RCS certification) |

| Material Source | Accepted as Reclaimed under Pre-Consumer | Not Accepted as Reclaimed under Pre-consumer |
|---|---|---|
| **Preparatory** | Not applicable | Leftover stock of yarn at preparatory without damage |
| **Weaving** | • Woven selvage<br>• Quality rejection stock, any kind of quality rejection of fabrics**<br>• Waste of warping process<br>• Remnant from bobbins of weft<br>• Waste of loom frame/shaft change<br>• Waste from Initiation and end of fabric rolls | Leftover stock of yarn or fabrics without damage |
| **Knitting** | • Remnant from bobbins<br>• Dirty and damaged bobbins<br>• Waste from Initiation and end of knitted fabrics | • Leftover stock of yarns without damage<br>• Leftover knitted fabrics without damage |
| **Silk** | Hard waste from the spinning factory | Intermittent waste from the spinning factory |
| **Pre-treatment, Dyeing, Finishing** | Quality rejection fabrics** | Leftover stock without damage |
| **Manufacturing (Cut, make, and trim)** | • Fabric cutting waste<br>• Quality rejection fabrics**<br>• Quality rejected garments** | Leftover stock without damage |
| **Brand/Retailer** | • Consumer or warranty returns due to damage**<br>• Third party distribution chain returns (due to inferior quality)**<br>• Quality rejected garments** | • Leftover stock without damage<br>• Unsold goods and materials without damage<br>• Aged goods without damage<br>• Sampling goods at any stage |

* Allowed only as feedstock for cellulosic (MMCF) fibers/filament in dissolving pulp making process, acetate, cupro (cuprammonium rayon), rayon, viscose, lyocell, pulp for paper making, etc.

** Allowed only if goods cannot be sold in secondhand market or at discounted price (i.e. on sale). Finished products which do not reach their full, end-of-life use shall not be classified as post-consumer but may be considered pre-consumer. Product returned to a retailer under warranty or functional components returned by the consumer at the time of purchased may be considered pre-consumer. Any return where the consumer receives a replacement product or a substantial refund or credit towards a new product is considered a warranty return. If a brand collects returns of its end-of-life products, these products may be considered post-consumer. To claim this material as post-consumer, the brand is expected to ensure that other product (e.g. warranty returns or overstock) are not mixed with end-of-life products.

# Section G – Accepted Non-Textile Reclaimed Input Materials

The certification body shall emulate non-textile industry practices regarding eligibility for pre- and post-consumer waste. If the application lacks suitable examples, the certification body shall contact assurance@textileexchange.org for approval. The certification body's review shall include the information outlined in section G2. Approval is only required to be obtained once per type of example per site (i.e. does not need to be repeated for subsequent recertifications). New examples may be introduced within ASR-221 Calibration Log separately and included in this document upon revision.

## G1. Alternative Pre-Consumer Material Definition for Plastics (Guidance)

According to EN 45557, "Regrinding internal scrap from a forming process, e.g. injection molding, extrusion, etc., producing plastic parts or intermediate products and reusing it in the same process ("in-house use") in the form of flakes or granules, shall be excluded from the calculation of recycled content, in accordance with ISO 14021 principles. Regrinding may also be applied to plastics proceeding from damaged or defective products, warranty returns due to damage from distributors, and wholesalers which have not been put on the market. In this case, the ground plastic, in the form of flakes or granules shall be considered as pre consumer recycled material."[8]

NOTE: **Pre-processing is not a part of the qualification criteria for the eligibility of reclaimed pre-consumer material.** Although plastic production residue may undergo pre-processing before manufacturing, it does not qualify as pre-consumer material since plastic production residue has reutilization potential. However, defective/damaged plastic end products which have undergone pre-processing shall be accepted as pre-consumer materials as they do not have reutilization potential as they are highly complex products.

## G2. Examples of Accepted Non-Textile Reclaimed Input Sources (Mandatory)

| | Reclaimed under Post-Consumer | | Reclaimed under Pre-Consumer | |
|---|---|---|---|---|
| | **Accepted** | **Not Accepted** | **Accepted** | **Not Accepted** |
| **Metal** | End-of-life | Second hand or second quality that can be sold in second markets | Quality rejection finished metal, Returns from distribution chain due to inferior quality | Intermittent log changing process waste |

[8] Based on Circular Plastic Alliance – Guidance on Waste Definitions

| | Reclaimed under Post-Consumer | | Reclaimed under Pre-Consumer | |
|---|---|---|---|---|
| | Accepted | Not Accepted | Accepted | Not Accepted |
| **Wood** | Wood from construction site, broken furniture<br>Construction debris<br>Commercial transport packaging (e.g. pallets) at end-of-life | Second material that could be sold in second markets<br>Forestry waste including urban salvage | Not applicable | Co-products of primary processing (e.g. wood chips from sawmills) |
| **Paper** | End-of-life | Not applicable | Quality rejection finished paper | Leftover and excess production of the material.<br>Intermittent waste from the production process like cutting waste, lot change waste, maintenance waste |
| **Electronics** | End-of-life | Second quality electronics that could be sold in second markets. | Quality rejection electronics, Returns from distribution chain due to inferior quality | Not applicable |
| **Foam** | End-of-life mattress. | Second material that could be sold in second markets | Quality rejection finished foam products, Returns from distribution chain due to inferior quality | Leftover and excess production of the material; or<br>Intermittent waste from the production process like cutting and molding, lot change waste, maintenance waste. |
| **Ceramic** | End-of-life or broken ceramic products from households, | Second quality material that could be sold in second markets | Quality rejection ceramics, Returns from distribution | Intermittent log changing production waste such as milling, grinding, forming, drying, glazing, and |

| | Reclaimed under Post-Consumer | | Reclaimed under Pre-Consumer | |
|---|---|---|---|---|
| | Accepted | Not Accepted | Accepted | Not Accepted |
| | hotels, restaurants etc. | | chain due to inferior quality | firing process waste. The waste generated to set quality and maintenance; or<br>Leftover and excess ceramic products |
| **Films** | End-of-life films discarded from industrial packaging material, household, etc. | Not applicable | Quality rejection films, Returns from distribution chain due to inferior quality | Intermittent log changing production waste such as extrusion, blowing, cutting process waste. The machine maintenance, lot changing production; or<br>Leftover and excess films. |
| **Glass Material** | End-of-life and broken glass from building scrap, industrial waste. | Not applicable | Quality rejection finished glass products, Returns from distribution chain due to inferior quality | Leftover and excess production of the material.<br>Intermittent waste from the production process like refining, glass foaming, cutting, moil, lot change waste, maintenance waste. |
| **Fur** | End-of-life fur collected from household | Not applicable | Outside of GRS/RCS scope | Not applicable |
| **Leather** | End-of-life | Not applicable | Shavings/trimmings from leather tanning, splitting, post-tanning, and finishing operations | Animal fibers (including wool), and animal hides, sourced following slaughterhouse |

| | Reclaimed under Post-Consumer | | Reclaimed under Pre-Consumer | |
|---|---|---|---|---|
| | Accepted | Not Accepted | Accepted | Not Accepted |
| **Down; or Feather** | End-of-life clothes, jackets and filling material | Not applicable | Outside of GRS/RCS scope | Not applicable |
| **Polythene; HDPE; LDPE Material; or Plastic** | End-of-life polybags discarded from industrial packaging material, household, etc. | Not applicable | Quality rejection polybags, Returns from distribution chain due to inferior quality | Intermittent log changing production waste such as extrusion, blowing, cutting process waste. The machine maintenance, lot changing inappropriate quality production;<br>Leftover and excess polybags;<br>Leftover resin sheet from buttons; or<br>Oligomer waste. |
| **EVA; Products; ABS; PE; PU; Rubber; TPU; etc.** | End-of-life yoga mats, worn-out shoe soles, luggage, water filters, discarded foam packaging materials, and end-of-life products. The above are examples only. | Second material that could be sold in second markets | Quality rejection finished products of the material inner soles, outer soles, heels, phone cases, yoga mats etc., Returns from distribution chain due to inferior quality | Leftover and excess production of the material; or<br>Intermittent waste from the production process, lot change waste, maintenance waste. |

NOTE 1: Chemical, agriculture, and food products are out of scope for input materials for GRS/RCS.

NOTE 2: The affected scope could be continued until their renewal audit.

# Section H – Criteria for Certification Bodies (Mandatory)

This section includes criteria for certification bodies to apply when evaluating reclaimed inputs and recycled outputs from certified sites.

## H1. Evaluation of Non-Textile Feedstocks

**H1.1** Prior to accepting a new reclaimed feedstock within the scope of certification, the certification body shall ensure the feedstock's eligibility using one of the following options. This includes initial audits of concentrators and recyclers as well as changes in scope to add additional feedstocks.

**H1.1.1** The feedstock is shown in Section G as an allowable reclaimed input (post-consumer or pre-consumer). Or

**H1.1.2** Approval from Textile Exchange has been obtained for the feedstock. Approval shall be requested using the process in H1.3.

NOTE: If a feedstock is shown in Section G as "not applicable", the certification body shall reject the feedstock as ineligible and shall not request approval from Textile Exchange.

**H1.2** Prior to recertification of a facility with approved reclaimed inputs, the certification body shall ensure that the feedstock's eligibility is documented using one of the following options.

**H1.2.1** The feedstock is shown in Section G as an applicable reclaimed input (post-consumer or pre-consumer).

**H1.2.2** Approval from Textile Exchange has previously been obtained for the feedstock, and documentation of this approval is available. In this case, the certification body should email assurance@textileexchange.org with details of the feedstock for consideration in future updates to this document. Or

**H1.2.3** If no previous approval is on file, approval shall be requested using the process in H1.3.

**H1.3** To request approval from Textile Exchange for a reclaimed feedstock, the certification body shall submit the information specified in H2 by email to assurance@textileexchange.org or using another submission method provided by Textile Exchange.

# H2. Information Required for Non-Textile Reclaimed Feedstock Approval Requests

All the information listed below is required to be included in each submission under H1.3.

**H2.1** Specification of if the application is for pre-consumer waste or post-consumer waste.

**H2.2** For the typical virgin process with non-reclaimed feedstock (i.e. what the organization would do without reclaimed feedstock):

- **H2.2.1** A flow chart outlining the process and material with photos;
- **H2.2.2** A list of the types of waste produced during the process with photos and waste percentage (%) (i.e. how much waste is produced); and
- **H2.2.3** A list of the input and output products with photos.

**H2.3** For the recycling process to be approved:

- **H2.3.1** A list of the type of waste used in the recycling process, described using specific terms (e.g. extruder waste, cutting waste, quality control);
- **H2.3.2** Identification of where the waste was generated;
- **H2.3.3** A flow chart of the recycling process and material with photos, including the waste generation process;
- **H2.3.4** A list of the type of waste produced during the recycling process with photos and waste percentage (%) (i.e. how much was produced) and the reason for waste generation;
- **H2.3.5** A list of the input and output products in the recycling process with photos;
- **H2.3.6** A flow chart of the application (i.e. use) of the waste produced during the recycling process;
- **H2.3.7** The date (month and year) when the site began the recycling process;
- **H2.3.8** A description of the site's previous process(es) for such waste before the recycling process began;
- **H2.3.9** A review of the typical industrial practice for such waste; and
- **H2.3.10** A past record of waste discarded for landfill or energy recovery, including evidence from a government body for disposal of waste.

## H3. Yarn Produced with Mechanically Recycled Cotton and Wool Inputs

Properties of products produced with mechanically recycled cotton and wool are specified in section C2. However, Textile Exchange recognizes that innovations are possible which may result in products which exceed the specified parameters. This section outlines how such requests are managed.

**H3.1** The certification body shall review the properties of products made with mechanically recycled cotton to ensure that they fall within the expected parameters from section C2, Table 1 and Table 2 based on feedstock, fiber length, type of spinning, yarn count, and blend percentages.

**H3.1.1** Properties which fall outside of those specified in section C2, Table 1 and Table 2 shall only be accepted upon approval from Textile Exchange. Approval shall be requested using the process in H1.3.

**H3.2** To request approval from Textile Exchange for mechanically recycled cotton products which exceed the properties specified in section C2, Table 1 and Table 2, the certification body shall submit the request as outlined in H1.3 with the information specified in H4.

**H3.2.1** Approval is required prior to each recertification.

**H3.2.2** Approvals will generally be limited to products which meet the parameters specified in section C2, Table 3 and Table 4.

**H3.2.3** Textile Exchange may ask for additional information and/or supporting evidence to an application, in addition to what is listed in H4.

**H3.2.4** Manufacturing/production of material done before approval shall not be eligible to be considered as certified material or included on a transaction certificate.

**H3.3** The certification body should inform Textile Exchange if they believe that fiber and yarn counts outlined in section C2, Table 1 and Table 2 are not possible to manufacture.

**H3.4** The certification body may issue transaction certificates for recycled wool which exceeds the parameters in section C2, Table 6 provided that the certification body is satisfied with the authenticity of the product.

# H4. Information Required for Mechanically Recycled Cotton Properties Approval Requests

All the information listed below is required to be included in each submission under H3.2.

**H4.1** Documentation of the process to produce the products, including:

- **H4.1.1** A process and material flow chart from recycler to spinner;
- **H4.1.2** A list and photos of pre-consumer waste used as reclaimed inputs;
- **H4.1.3** A list and photos of post-consumer waste used as reclaimed inputs;
- **H4.1.4** A list of all possible yarn counts (e.g. mix – recycled cotton + cotton, or recycled cotton + polyester/MMCF/acrylic); and

**H4.2** Test reports, including the following, which shall be conducted by a third-party laboratory accredited to *ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories*.

- **H4.2.1** A recycled cotton fiber test report;
- **H4.2.2** A yarn test report for yarn(s) outlined in H4.1.4 that outlines the yarn count, CSP/RKM value, and hairiness value; and
- **H4.2.3** A fabric test report for pilling for fabrics made with mechanically recycled cotton.

**H4.3** A comparative study or chart based on the yarn test report that outlines:

- **H4.3.1** Virgin cotton versus mechanically recycled cotton fiber; and
- **H4.3.2** Yarn made with virgin cotton versus mechanically recycled cotton with yarn count and yarn count CV (coefficient of observed variation), CSP/RKM value, and hairiness value.

**H4.4** Any additional supporting evidence the certification body deems necessary to support the application, which may include the results of on-site visits or trials.

**H4.5** A recommendation from the certification body that this product be approved, based on the certification body's evaluation of the products authenticity.