TextileExchange

THE WARP AND FILL OF TEXTILE EXCHANGE'S NEW MATERIAL SNAPSHOTS

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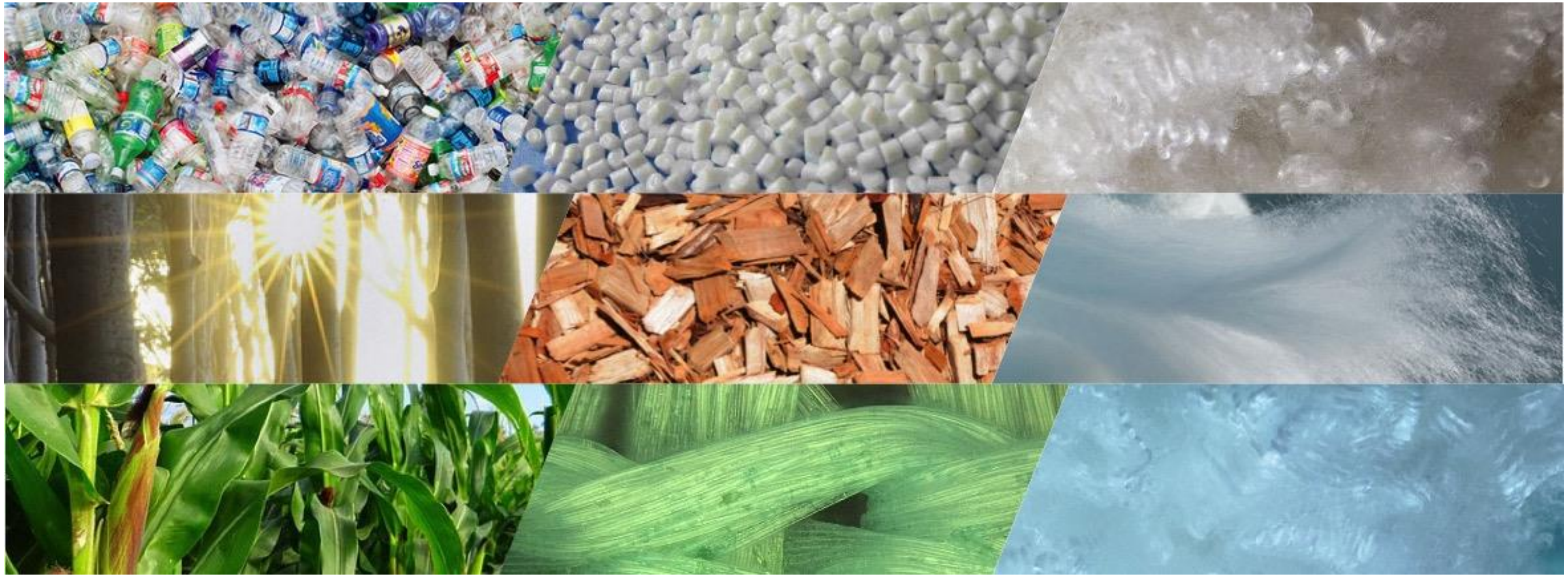


AGENDA

- Introduction and Background - Jeff
- Material Summary Overview - Jeff
- New Material Snapshots – Mike
- Q&A

<u>Webinar Objective</u>: Provide greater understanding of key fiber and material resources Textile Exchange has available to our members and the industry, leading to more informed fiber and material choices.

INTRODUCTION AND BACKGROUND

- Credit to VF Corporation for funding both sets of documents, Summaries and Snapshots… and making available to industry.

- Credit to Mike Brown and team at Brown and Wilmanns Environmental for the literature review and production of the Snapshots.

- Both documents set to specifications provided by VF for their business needs: Summaries for one set of needs in 2013-14; Snapshots for a new set of needs in 2015-16.

- Both resources fulfill different objectives for different audiences:

  Summaries less technical and data intensive; for designers, merchandisers, sourcing, etc.

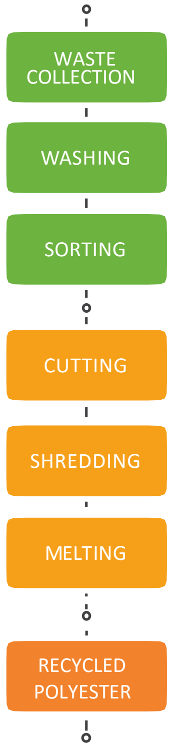
  Snapshots more technical/LCA heavy for the gearheads among us; Sustainability staff, materials staff, etc.

MECHANICALLY RECYCLED POLYESTER

Category
Synthetics

Material Form
Plastic, Filament, Staple Fiber

Conventional /Standard Material
Virgin Polyester



Highlights

IMPACT AREA	ATTRIBUTE
Land Use Intensity	Replaces the need for primary extraction of crude oil extraction and reduces the amount of landfill disposal.
Energy Use	58 percent of virgin polyester.
Green House Gas Emissions	45 percent lower than virgin polyester.

Feedstock Description

Polyester feedstock can consist of either pre-consumer waste (material diverted from the waste stream during a manufacturing process) or post-consumer waste (material generated by households or by commercial, industrial or 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 materials from the distribution chain.

Process Description

In the case of plastic bottles, the waste is cleaned, flaked, melted and extruded. In the case of textile waste (either cut scraps or post-consumer garments), the material is shredded, melted, and extruded into chips.

Sustainability Attributes

LAND-USE INTENSITY

Recycled polyester conserves non-renewable resources by replacing the need for virgin materials which require the extraction of crude oil, thereby limiting the depletion of a non-renewable resource. In addition, it reduces the amount of landfill disposal.

WATER INTENSITY

Water use during recycling is low. Water is needed for washing the waste when post-consumer waste (especially bottles) is used, as well as for waste separation and cooling of processing equipment.

WASTE

Mechanically recycled polyester allows the reduction of waste material which would otherwise be sent to landfills or incinerated. The life of the material is extended by providing it a second life . However, recycling mechanically does not fully close the material loop. The material is degraded during recycling so the number of times it can be recycled is limited. Waste along the process is generally low. By- products including colored bottles and polyethylene (used in caps) account for 6-11 percent of the total mass input are not typically used in polyester recycled for textile fibers . They can be sold and recycled for other applications, sent to landfill or incinerated if infrastructures are unavailable.

BIODIVERSITY

No direct impacts on biodiversity.

CHEMISTRY

To recycle polyester mechanically, no chemistry is used other than detergents for cleaning the recovered materials at the beginning of the process.

TOXICITY

Mechanical recycling uses low hazard chemistry during cleaning of recovered materials and the environmental and human toxicity are considerably lower than that for virgin polyester.

Most virgin polyester used on the market has been produced with a catalyst called antimony which can cause health hazard. Though the antimony is embedded in the polymer, it can be converted to antimony trioxide at high temperatures and can be released to the environment during recycling or at the end of life during incineration.

ENERGY USE

Mechanically recycling polyester to flake requires 58 perent of the energy demand as virgin polyester. Process energy use is responsible for the major part of the environment impacts.

GREENHOUSE GAS EMISSIONS

Mechanically Recycled Polyester production has 64 percent of the global warming potential as virgin polyester.[1]

ANIMAL WELFARE

Not applicable.

ETHICAL/SOCIAL CHARACTERISTICS

Not applicable.

Performance and Processing

FUNCTIONAL ATTRIBUTES

- Typically stronger than cotton
- Resistant to stretching and shrinking
- Resistant to bleaching
- Quick-drying
- Wrinkle- and mildew-resistant
- Abrasion-resistant
- Retains heat-set pleats and creases

Easily machine washed at home The material properties of recycled polyester are comparable to those of virgin polyester. However, they can vary quite widely depending on the purity of the waste stream (cleanliness of bottles, precision of separation, and removal of impurities).

Mechanically recycled polyester cannot normally be spun into microfiber. The highest yarn count possible would likely be 75/72.

MECHANICAL ATTRIBUTES

Mechanical properties should be very close to those of virgin polyester, but they should be tested according to individual requirements, especially for specific end uses such as high abrasion resistance.

AESTHETIC AND SENSORY ATTRIBUTES

Bright, lustrous fiber can be dulled with the addition of titanium dioxide if desired.

TEXTILE PROCESSING

With mechanical recycling, fabrics may show some unevenness and inconsistencies in dyeing, especially if the recycling isn't very carefully controlled or if the waste isn't sufficiently cleaned.

Matching white shades and pale colors can be challenging. Color matching needs to be monitored closely during production as batch to batch variation can occur due to inconsistencies in dye uptake.

COMMON APPLICATIONS

Recycled polyester can be turned into a wide range of materials for apparel, accessories, home furnishings, and footwear. In addition, applications including decorative trims, functional trims, and non-visible product components such as paddings, interlinings, and linings are also good end uses for recycled polyester.

Availability

Mechanically recycled polyester is available globally. Most manufacturers are in Asia, predominantly in Taiwan and China; however, there are some in Europe and the United States.

Recycled polyester suppliers that are certified to GRS can be found here:

http://textileexchange.org/sites/default/files/te_pdfs/integrity/GRS%20Combined%20List.pdf

Certification & Verification

In order to ensure a recycled content claim can be backed up, it is important to have assurance that the raw material being claimed as recycled would have otherwise gone into landfill and that there is proper certification of the chain of custody in place to trace the recycled raw material to the end product.

Available international standards include the Global Recycled Standard (GRS) and the Recycled Claim Standard (RCS) by Textile Exchange and the Recycled Content Certification by SCS.

Questions to ask when sourcing this material:

- What percentage of recycled content is in the product?
- What is the waste origin: pre- or post-consumer waste?
- What recycling method is used?
- Is color matching of white and light colors a problem?
- Certification documentation to garment level to ensure material content
- Is the fiber compliant to chemical management requirements?

Cost

Mechanically recycled polyester tends to be more expensive than virgin polyester, but cheaper than chemically recycled polyester. Recycled polyester pellets can be up to double in price as virgin polyester. However in fabric form, this would translate into 20-40 percent upcharge compared to similar fabric made of virgin polyester.

INTRODUCTION

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Alaska Airlines
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NEW MATERIAL SNAPSHOTS

- Data sources
  - Literature review
    - Evaluate literature for appropriate sources
    - Seek comprehensive scope, up to date, peer reviewed
    - Not always consistent across information sources
  - Estimates using analog materials, assumptions, calculations

Int J Life Cycle Assess (2014) 19:331–356
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LIFE CYCLE IMPACT ASSESSMENT (LCIA)

LCA benchmarking study on textiles made of cotton, polyester, nylon, acryl, or elastane

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Abstract
Purpose The purpose of this paper is to provide an improved (up-to-date) insight into the environmental burden of textiles made of the base materials cotton, polyester (PET), nylon, acryl, and elastane. The research question is: Which base material and which life cycle stage (cradle-to-gate as well as cradle-to-grave) have the biggest impact on the environment?
Methods Life cycle inventory (LCI) data are collected from the literature, life cycle assessment (LCA) databases, and emission registration database of the Dutch government, as well as communications with both manufacturing companies of production equipment and textile companies. The output of the calculations is presented in four single indicators: Eco-costs 2012 (a prevention-based indicator), CO_2 equivalent (carbon footprint), cumulative energy demand (CED), and ReCiPe (a damage-based indicator).
Results and discussion From an analysis of the data, it becomes clear that the environmental burden is not only a function of the base materials (cotton, PET, nylon, acryl, and elastane) but also of the thickness of the yarn (for this research, the range of 50–500 dtex is examined). The authors propose that the environmental burden of spinning, weaving, and knitting is a function of 1/yarn size. The cradle-to-grave analysis from raw material extraction to discarded textile demonstrates that textiles made out of acryl and PET have the least impact on the environment, followed by elastane, nylon, and cotton. The use phase has less relative impact than it is suggested in the classical literature.
Conclusions The impact of spinning and weaving is relatively high (for yarn thicknesses of less than 100 dtex), and from the environmental point of view, knitting is better than weaving. LCA on textiles can only be accurate when the yarn thickness is specified. In case the functional unit also indicates the fabric per square meter, the density must be known. LCA results of textile products over the whole value chain are case dependent, especially when dyeing and finishing processes and the use phase and end-of-life are included in the analysis. Further LCI data studies on textiles and garments are urgently needed to lower the uncertainties in contemporary LCA of textile materials and products.

Keywords Carbon dioxide (CO_2) · Clothing · Eco-costs · Fibers · Spinning · Textile · Use phase · Weaving

Responsible editor: Marzia Traverso

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1 Introduction

In recent years, life cycle assessment (LCA) has been increasingly adopted by textile and apparel companies. Many actors in the textile and clothing chain such as fiber manufacturers (e.g., Lenzing, Advansa, Dupont), producers of flooring material (e.g., InterfaceFlor, Desso, Heugaveld), fashion brands (united in the Sustainable Apparel Coalition), and even umbrella organizations (European Commission and the Dutch branch organization Modint) use LCA to assess the environmental impacts of textile-related products. In addition, educational textile and fashion institutes (e.g., the Amsterdam Fashion Institute) have moved towards life cycle thinking, picking up the signals from companies and other organizations.

In many cases, LCA studies and the development of LCA tools on textile products are carried out by consultancy companies or independent research institutes which interpret

SNAPSHOT FORMAT

- Standardized format specified by VF
- Alignment to format across all Snapshots
  - Material Scenario
  - Common Uses
  - Alternative Textiles
  - Life Cycle Description
  - Attributes

WALKTHROUGH

Material Snapshot

Mechanically Recycled Polyester (mRPET)

TextileExchange

Material Scenario

Generic process for reclaiming waste PET material, primarily PET bottles, for fiber and textile production. Major unit processes include collection of waste material, sorting and separation, washing, grinding, melt-extrusion, pelletizing/yarn spinning, and textile production. Data are from varied sources and the scenario is geographically nonspecific.

Common Uses In Apparel And Footwear

Mechanically recycled PET is generally used to produce fibers greater than 6 denier, which is unsuitable for the 1.5-3 denier range typically demanded for fine apparel applications (Park & Kim, 2014, p. 13). With high quality feedstock, finer fibers can be obtained (Park & Kim, 2014, p. 13). Mechanically recycled PET is used where color and fiber quality are less important, such as in knits for fleece, courser wovens and filling material; it is unsuitable for white and pale shades.

Alternative Textiles That May Be Substituted For Material

- Virgin polyester • Chemically recycled polyester • Solution-dyed polyester (virgin and recycled)
- Rayon • Acrylic • Nylon • Down fill (for insulation)

Life Cycle Description

Functional Unit

1 kilogram mechanically recycled woven PET fabric

System Boundary

Cradle to undyed fabric. The data presented within include all steps required to turn the raw material or initial stock into woven fabric, including transportation and energy inputs. Capital equipment, space conditioning, support personnel requirements, and miscellaneous materials comprising <1% by weight of net process inputs are excluded.

Allocation

Cut-off approach. The "first life" of the product (e.g. as a bottle) is considered entirely separate from the "second life" (e.g. as a backpack), thus any environmental impacts of producing the waste material used to produce the recycled polyester are allocated entirely to the waste material.

GOING FORWARD

- Additional Material Snapshots will be released
- Feedback on Snapshots welcome
- Periodic updates

Questions?

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