Closed loop post-consumer textile recycling

Dr. Jens Oelerich

EU GREEN WEEK 2021 PARTNER EVENT

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CLOSED LOOP POST-CONSUMER TEXTILE RECYCLING

Dr. Jens Oelerich

Sustainable & Functional Textiles, School of Creative Technology,
Saxion University of Applied Sciences, Enschede, The Netherlands.

REACT Webinar
4 June 2021

SAXION
UNIVERSITY OF APPLIED SCIENCES

- Established in 1875
- University of Applied Sciences (UAS)
- 27.505 students (2019-2020)
- 2.812 employees
- Three locations:
  - Enschede
  - Deventer
  - Apeldoorn
- 14 Schools (Academies)

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Research group Sustainable & Functional Textiles
Applied Science in Textiles

Research group leader: **Dr. Jan Mahy**

Coordinator of the research line Sustainable Textiles: **Dr. Jens Oelerich**

Expertise: Textile Technology, Circular Textiles, Prototyping, Sustainable Chemistry, Fashion Design

>100 Years Industrial experience

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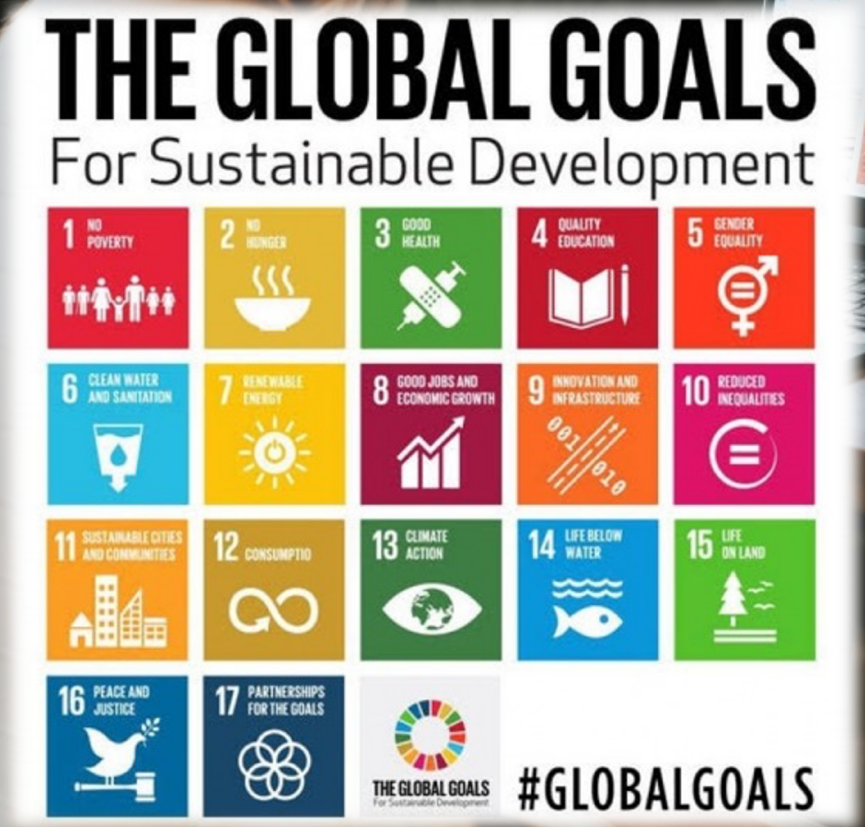
VISION

Students operating in a world where collaboration, co-creation and multi-disciplinary are the standard.

The SDG’s and the increasing role of materials & technologies at the core of innovative developments.

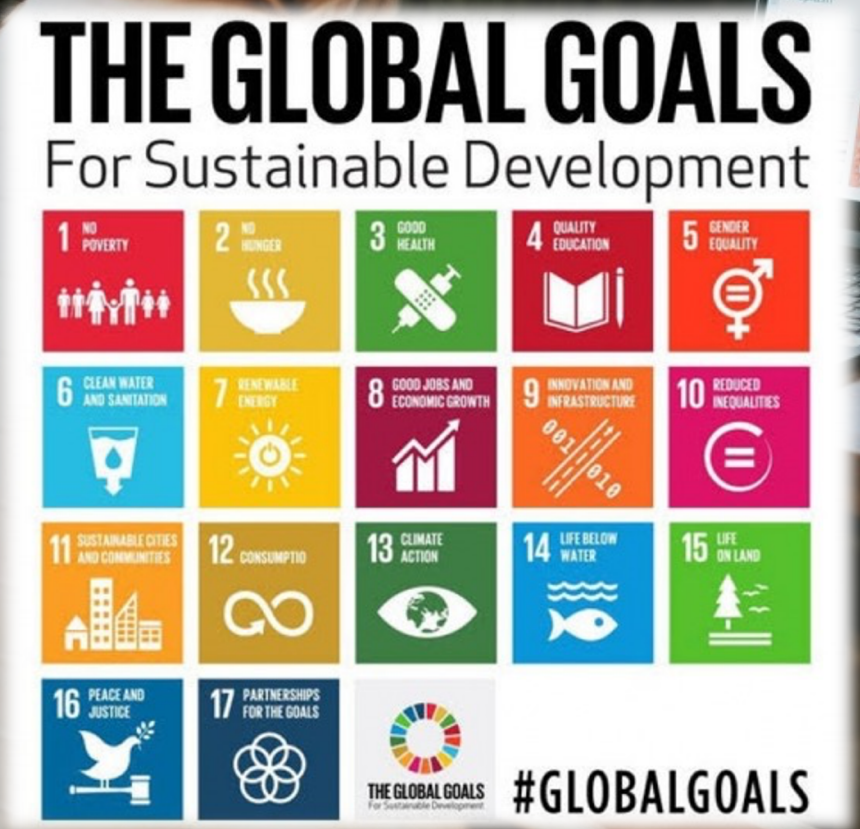


STRATEGY

Innovative prototyping using applied research

Embedded in sustainable development goals

Collaboration with students, researchers and industrial partners

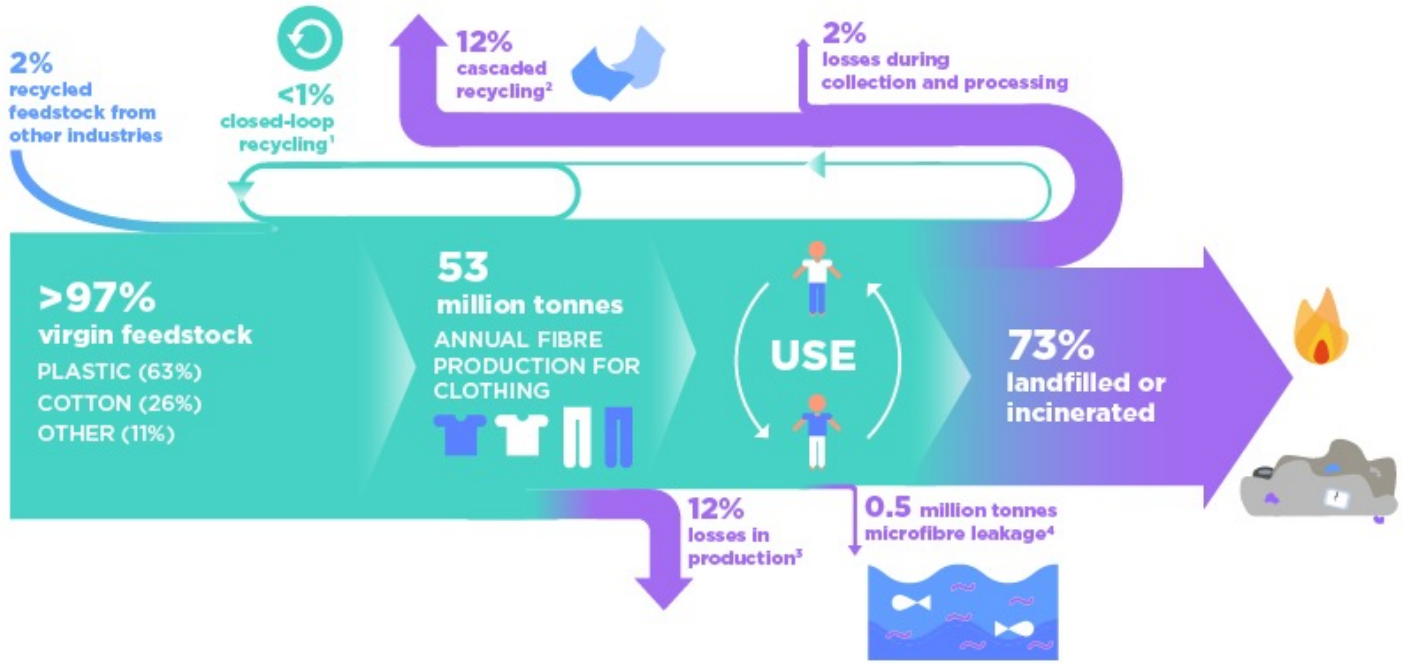


Textile waste recovery options

Textile fiber production

Worldwide textile fiber production in 2018 ~111 Mt

- 79 Mt synthetic fibers
- 32 Mt natural fibers (26 Mt cotton fibers)



1 Recycling of clothing into the same or similar quality applications
2 Recycling of clothing into other, lower-value applications such as insulation material, wiping cloths, or mattress stuffing
3 Includes factory offcuts and overstock liquidation
4 Plastic microfibres shed through the washing of all textiles released into the ocean
Source: Circular Fibres Initiative analysis – for details see Appendix B of the full report

tiny.cc/fibres

Design for recycling

HAVEP
You'll never work alone

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Recycling options

Mechanical recycling

Chemical recycling

General challenges

Feedstock

- Changing and heterogeneous feedstocks
- Elastomers
- Intensive/dark colors

Technology

- Upscaling

Economics

- Investment costs
- Costs for new cellulose solvents (Ionic liquids)
- Low virgin raw material prize

Market/Consumer

- Reluctant buying attitude

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Possible solutions

Feedstock

- Sorting
  - Automatization
  - Categorization
  - Reliable purity of materials
- Design for recycling

http://www.valvan.com/uncategorized/introducing-the-fibersort/

Technology

- R&D, feasibility studies
- Collaborations within value chains

Economics

- Investments (Green Deal)
- Regulations (EPR, etc.)

Market/Consumer

- Transparency (product passport, tracers…), increasing awareness

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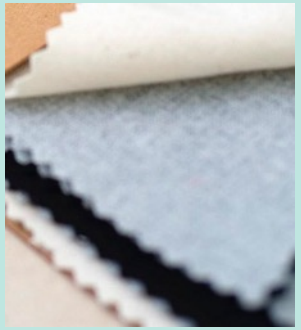
Recycled fiber properties

Mechanical recycling

- Cotton like appearance and properties
- Reduced fiber length
- Colored



www.purewastetextiles.com

Chemical recycling

- Lyocell fibers (mechanically strong, high-end, higher costs)
- Viscose fibers (very flexible process, mechanically weaker, industrial standard, lower costs)
- Carbamate fibers (mechanically weaker, rarely used technology for garments)
- Fibers from Ionic liquids (mechanically strong, rarely used technology, higher costs)

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Workwear fabrics

Cotton

Polyester / Cotton blends

Multifiber blends

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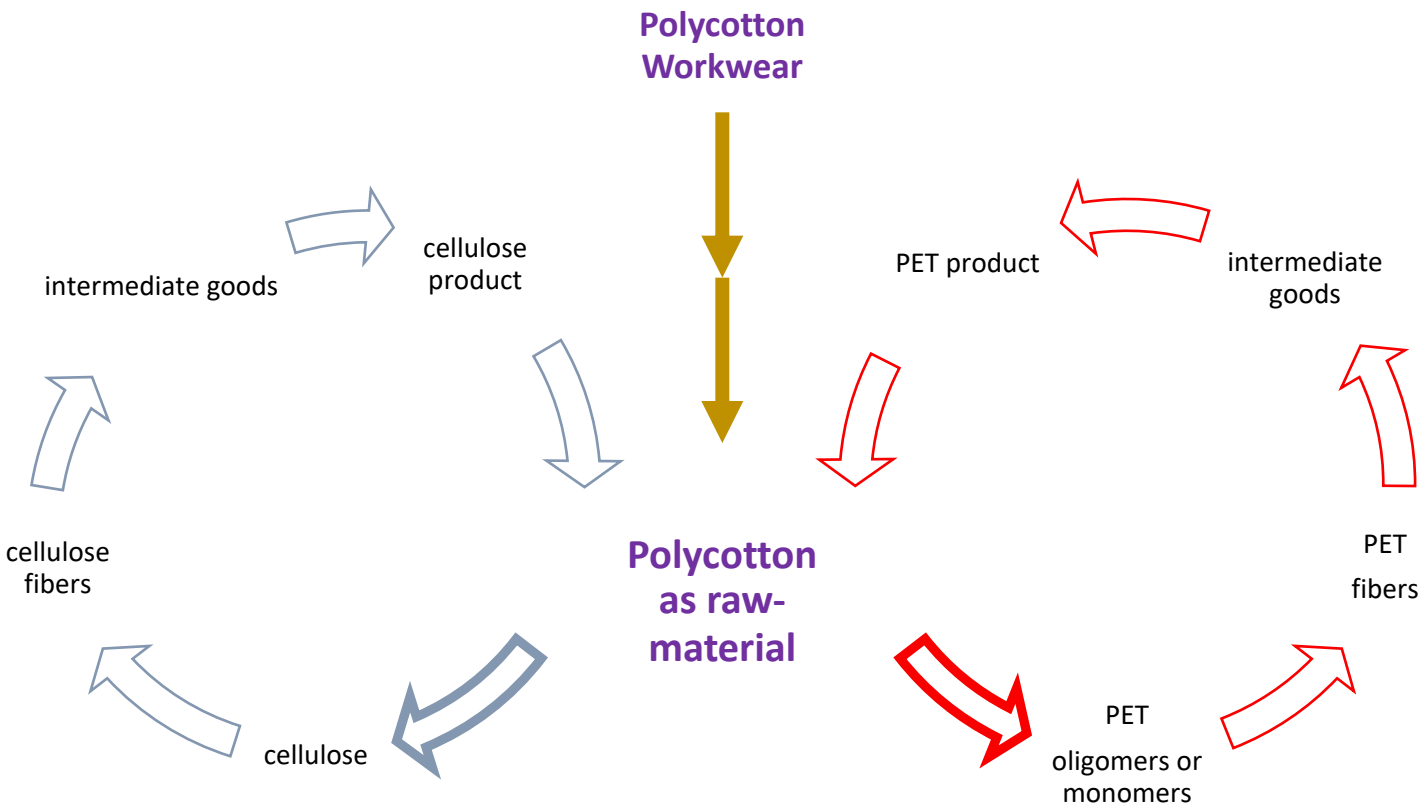
Closed loop workwear recycling



Cotton recycling

Polyester recycling

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Raak-MKB

Breakthrough in polycotton recycling

This research is financed by Regieorgaan SIA part of the Dutch organization for scientific research (NWO)

Regieorgaan SIA

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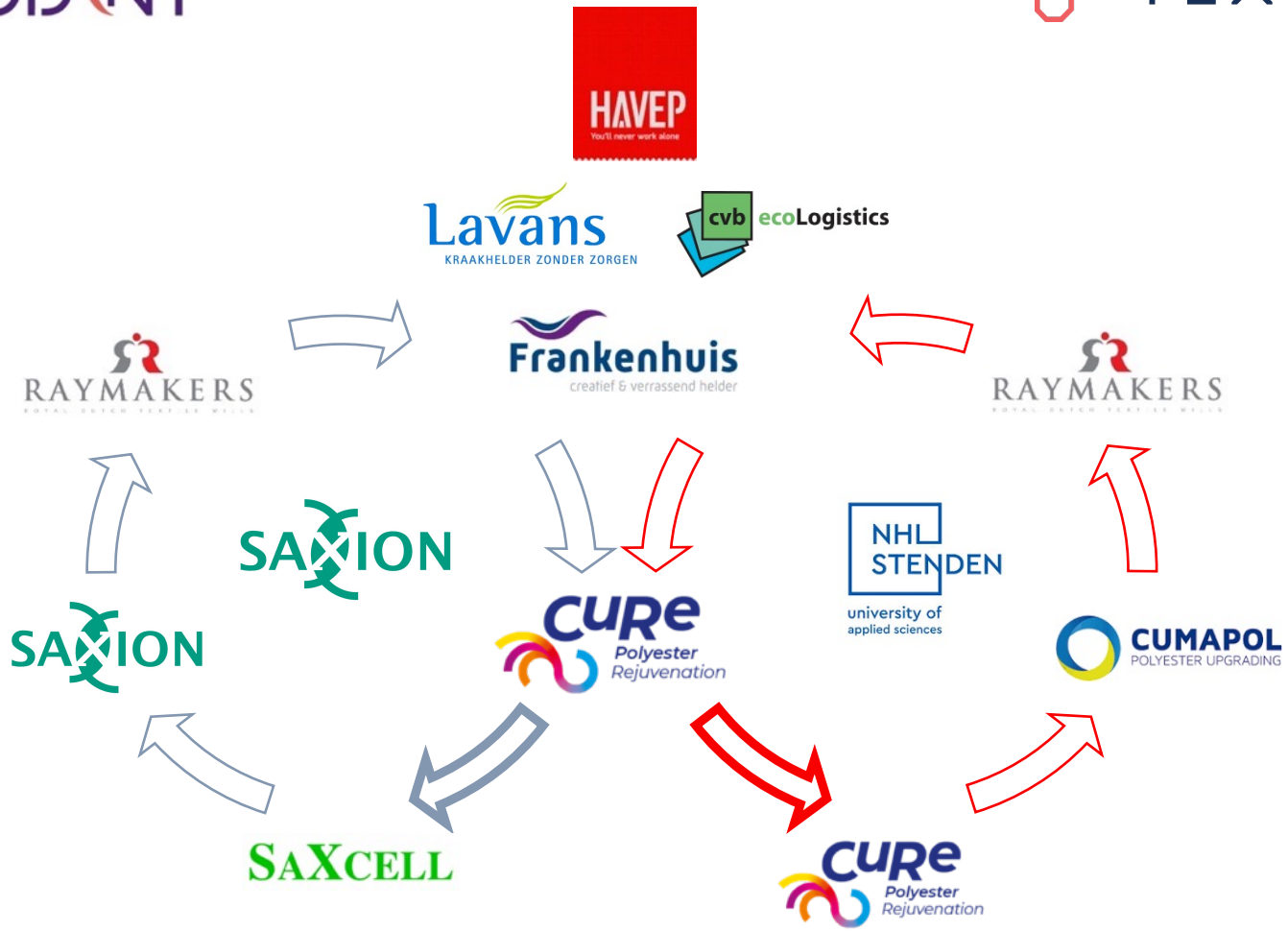
MODINT

TEXPLUS



Cellulose recycling

Polyester recycling

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Chemical cotton recycling

1) Waste collection and sorting

2) Unravelling and/or milling

3) Removal of polyester and other impurities

4) Discolouration of remaining textile waste

5) Adjustment of the degree of polymerization (DP)

6) Spinning of RCFs

7) Yarn production

8) Fabric production

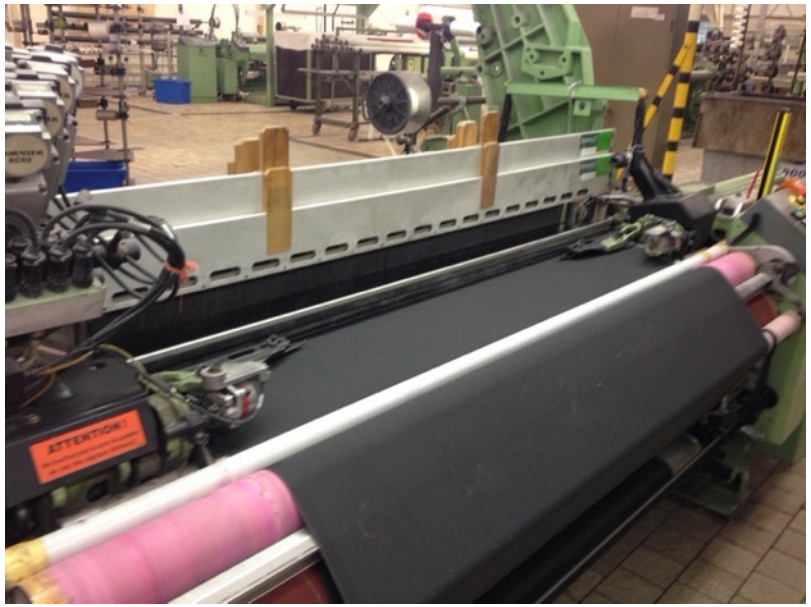
9) Fabric finishing

10) Garment tailoring

Pulping

SaXcell® workwear trousers

100% chemically recycled waste textiles



In collaboration with Havep BV

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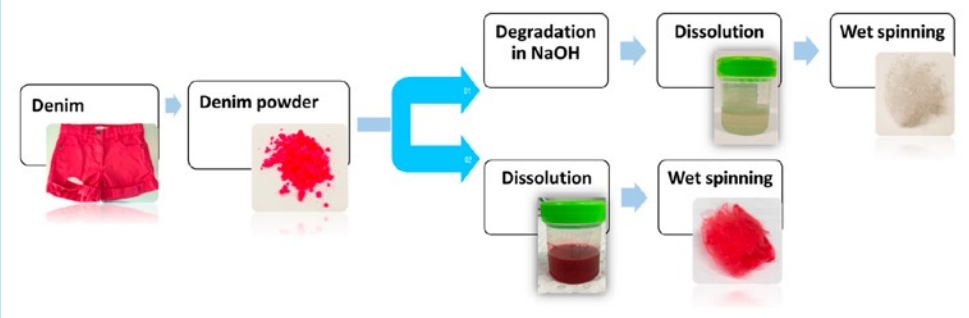
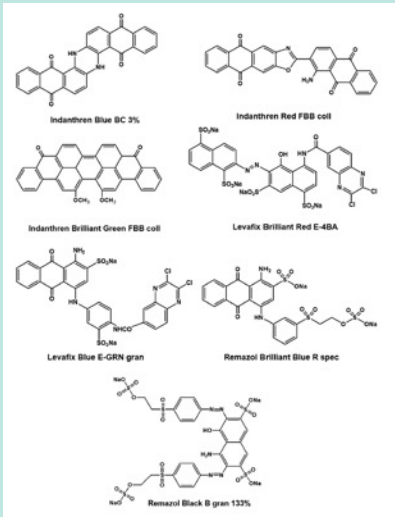
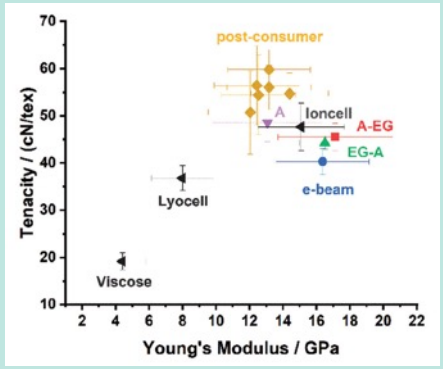
Colored chemically recycled fibers

Deakin University





Aalto University / Ioncell-F



ACS Sustainable Chem. Eng. 2019, 7, 11937−11943
Green Chem., 2019, 21, 5598–5610

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Cotton workwear material cycle

SaXcell® workwear

Waste Overalls

Unraveled fibrous waste

SaXcell® pulp

Virgin SaXcell® fibers

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Project partners:

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Lavans
KRAAKHELDER ZONDER ZORGEN

ARTOFIL
High Tech Yarn & Coatings

Frankenhuis
creatief & verrassend helder

acker
Royal Dutch fabrics since 1807

SAXCELL

TECH FOR FUTURE
Centre of Expertise HTSM Oost

Denim from 100% PCR fibers

MUD JEANS

Sustainable denim with Post-Consumer-Recycled (PCR) fibers

Up to 40% mechanically recycled cotton

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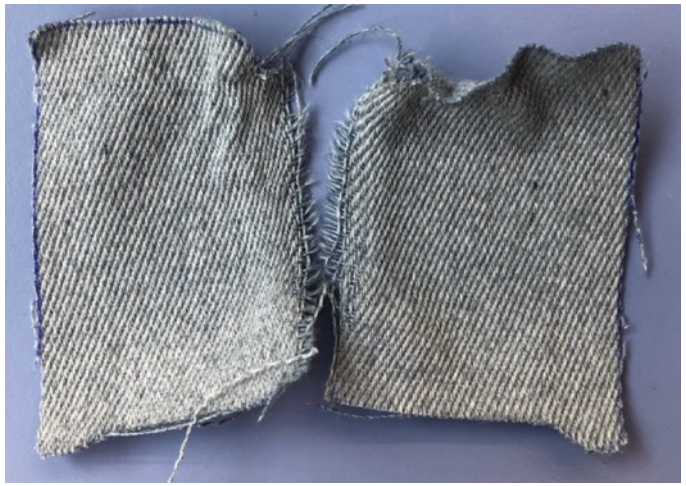
100% PCR fibers

mechanically recycled fibers

chemically recycled fibers

Prototypes



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Saxion Circular Textiles Lab

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