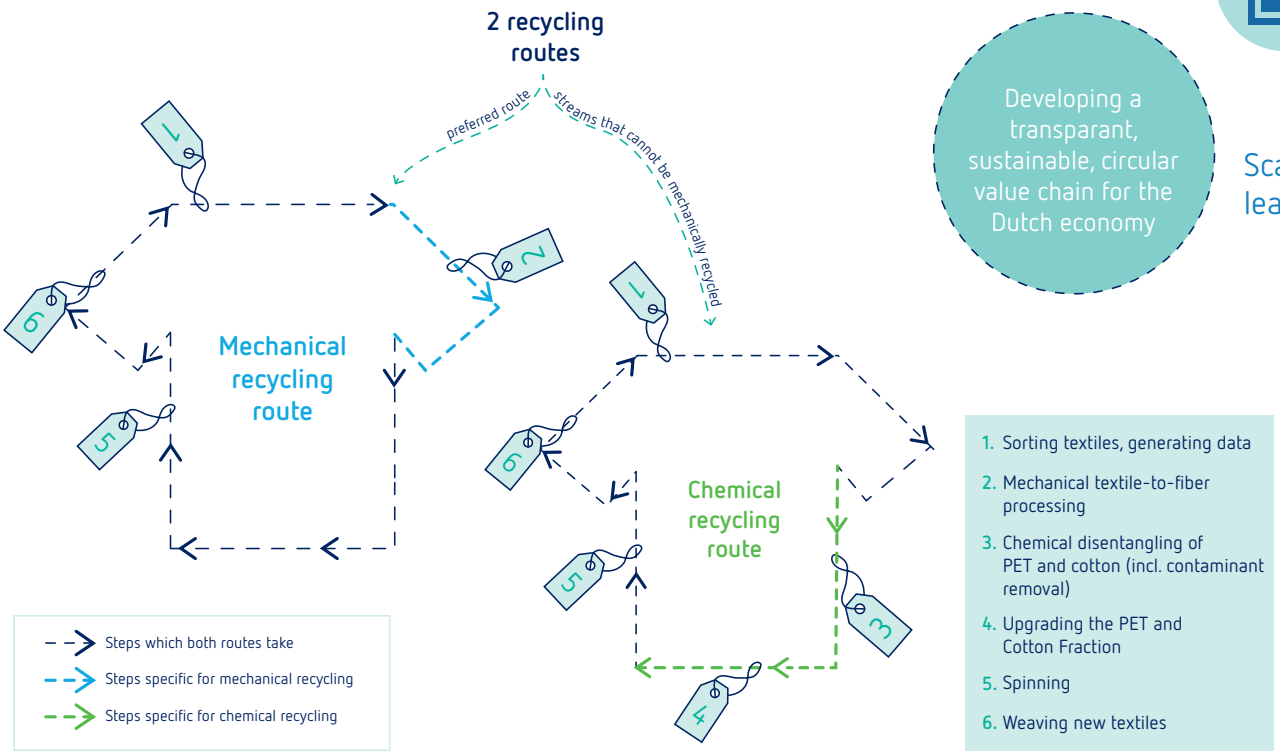
TEXPOWER - Textile Polycotton Waste Evaluation & Recycling



Developing a transparant, sustainable, circular value chain for the Dutch economy

Scan to learn more

TEXPOWER was created in collaboration with 9 circular chain partners, consisting of both large and SME companies and knowledge institutions:

CELLiCON, DPI, Enschede Textielstad, Frankenhuis, ISPT, KringCoop, SaXcell, Saxion University of Applied Sciences, Spinning Jenny, and Textile Fiber Boost

What is the goal?

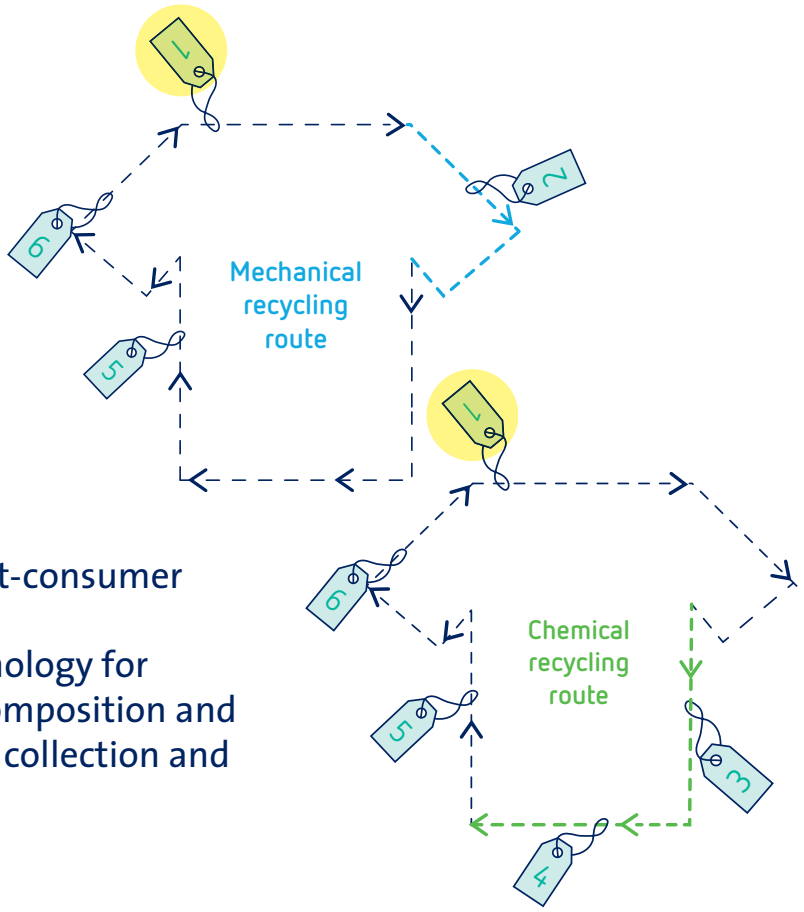
Polycotton is one of the most common textile types in both clothing and interior textiles. Together we try to build a transparent, circular polycotton textile value chain. This chain will be implemented for the future-proof earning capacity of the Netherlands.

We achieve this goal by developing:

- Accurate, innovative and efficient identification, sorting and data processing techniques
- Interfering substance removal techniques
- Techniques to extend or strengthen fibers during mechanical recycling
- A unique polycotton separation technology
- Effective processing of polyester into spinnable fibers, upgrading cellulose pulp into spinnable fibers, and spinning polycotton yarns that can be woven into functional textiles.

Mechanical recycling will be applied where possible. Where this is not feasible, chemical recycling will be used.

1. Sorting textiles, generating data



Executed by:

KringCoop, de Kringloop coöperatie U.A.
+ Saxion University of Applied Sciences

What is done at this step?:

- Collection: Collection of discarded post-consumer textiles.
- Sorting: Development of sorting technology for textiles to improve identification of composition and types of contaminants, including data collection and interpretation.

The incoming material:

The incoming material is discarded post-consumer textiles from textile bins and thriftshops.

Challenges in relation to recycling:

The composition of the collected textiles is crucial for effective textile recycling. (Fast) identification of the composition of textiles made from different materials and the contaminants related to recycling is challenging, but crucial.

The data collection from the identification as well as data handling and interpretation is new and important.

What is done with the material in the project?:

New sorting techniques are being used to sort the polycotton-based textiles. Those with a matching specification for mechanical or chemical recycling within TEXPOWER are prepared for further recycling as part of the project.

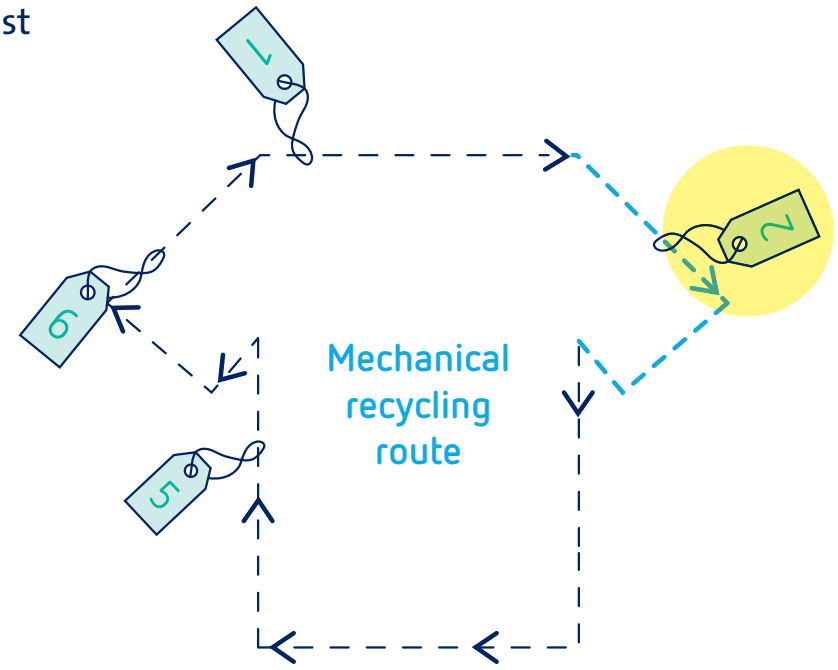
What is the outgoing material?:

Sorted materials suitable for recycling within TEXPOWER.

2. Mechanical textile-to-fiber processing

TEXTILE FIBER BOOST

Executed by:
Textile Fiber Boost



What is done at this step?:
A treatment is added to disposed textiles in the washing process. This treatment improves the quality of the fibers and increases the yield during mechanical recycling.

The incoming material:
Disposed textiles

Challenges in relation to recycling:
Big parts of the industry are not used to processing post-consumer mechanically recycled textiles.

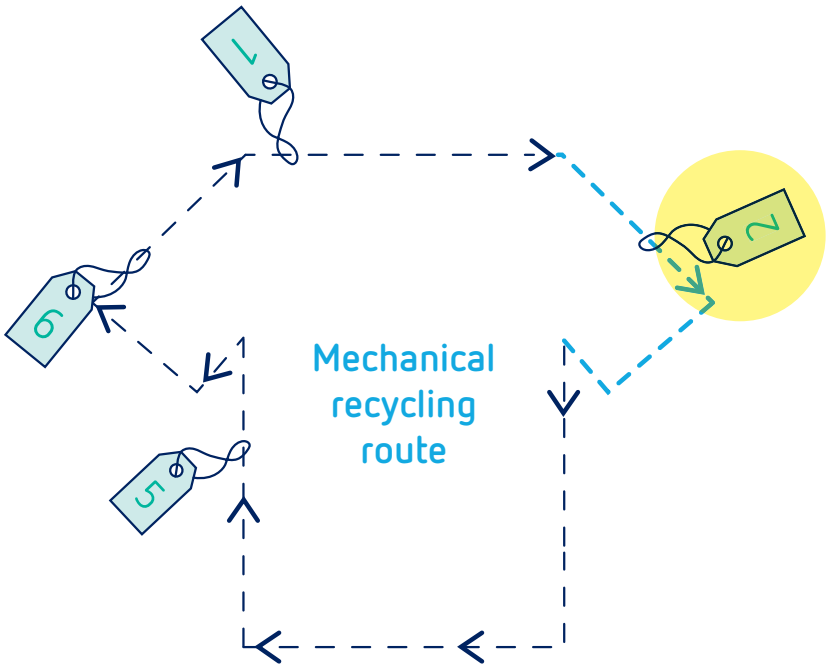
What is done with the material in the project?:
Within the TEXPOWER project the treatment is optimized for polycotton textiles. By improving the quality with a closed loop treatment method.

What is the outgoing material?:
Treated disposed textiles

2. Mechanical textile-to-fiber processing

Frankenhuis

Executed by:
Frankenhuis



What is done at this step?:
Textile materials are opened by a mechanical tearing machine and processed into fibers.

The incoming material:
Post-consumer or post-industrial textiles.

Challenges in relation to recycling:
The industry is not used to work with post-consumer mechanical recycled textile fibers.

What is done with the material in the project?:
Within TEXPOWER, Frankenhuis is optimizing the recycling process for spinnable fibers. This is done by researching the use of pre-treatments and mechanical optimization to reach an improved fiber quality.

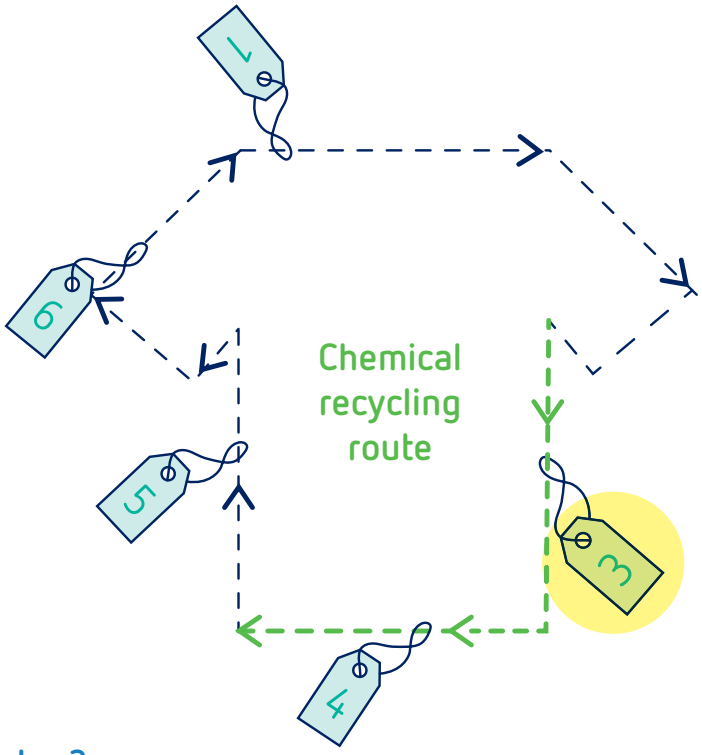
What is the outgoing material?:
Mechanical recycled post-consumer textile fibers.

3. Chemical disentangling of PET and cotton

CELLiCON

Executed by:

CELLiCON



What is done at this step?:

Polycotton textile is chemically separated into polyester and cellulose fractions which can be reused as textile fibers.

The incoming material:

Post-commercial and post-consumer polycotton textile.

Challenges in relation to recycling:

In textiles, polyester and cotton are intimately entwined making physical separation for reuse in textile challenging. The CELLiCON process recovers a polyester staple fiber and a regenerated cellulose as feedstock for MMCF.

What is done with the material in the project?:

Output materials are respun into polyester yarns and converted to MMCF's.

What is the outgoing material?:

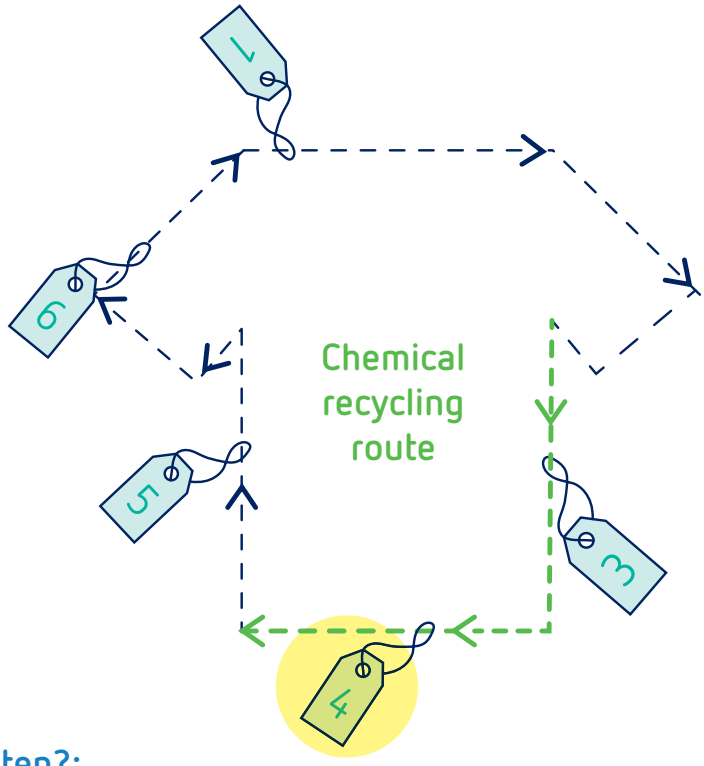
Polyester staple fibers and regenerated cellulose.

4. Upgrading the PET and cotton fraction

SaXcell

Executed by:

SaXcell



What is done at this step?:

Chemical upcycling of cellulose: The cellulose fraction is prepared for the lyocell wet spinning by a pulping step. Here, SaXcell ensures the cellulose pulp meets the requirements of lyocell process to generate high-quality virgin man-made cellulose fibre.

The incoming material:

The incoming material is the cellulose separated by CELLiCON.

Challenges in relation to recycling:

To generate high-quality cellulose fibers using the lyocell process, the incoming cellulose must be of a high quality to ensure smooth spinning.

What is done with the material in the project?:

The SaXcell fibres will be used to make different yarns and fabric qualities within the TEXPOWER consortium.

What is the outgoing material?:

A variety of yarns and fabrics are mixed with SaXcell fibres and different types of polyester, including recycled polyester from the consortium.

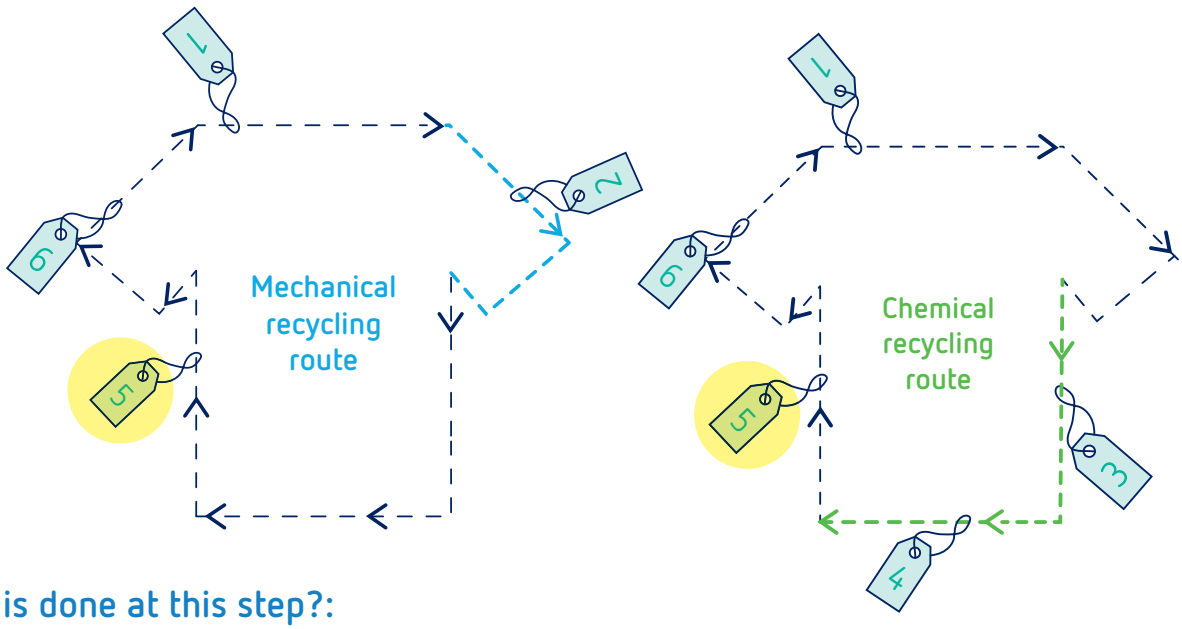
5. Spinning

SPINNING JENNY
sustainable yarn

SAXION HOGESCHOOL

Executed by:

Spinning Jenny B.V. + Saxion University of Applied Sciences



What is done at this step?:

Textiel fibers are spun by Saxion (lab-scale) and Spinning Jenny (demo-scale) into durable and susatinable open-end yarns. Both the fibers and yarns are being analysed on quality and surface characteristics by Saxion.

The incoming material:

Short stapel fibers. Recycled textile fibers. This can be mechanically or chemically recycled. Post-consumer, post-industrial or virgin.

Challenges in relation to recycling:

Ensuring the quality of recycled fiber is an ongoing challenge. This means that a quick and complete quality analysis is key.

What is done with the material in the project?:

The fibers are cleaned and parallelized to a sliver. This sliver is then spun into open-end yarn.

What is the outgoing material?:

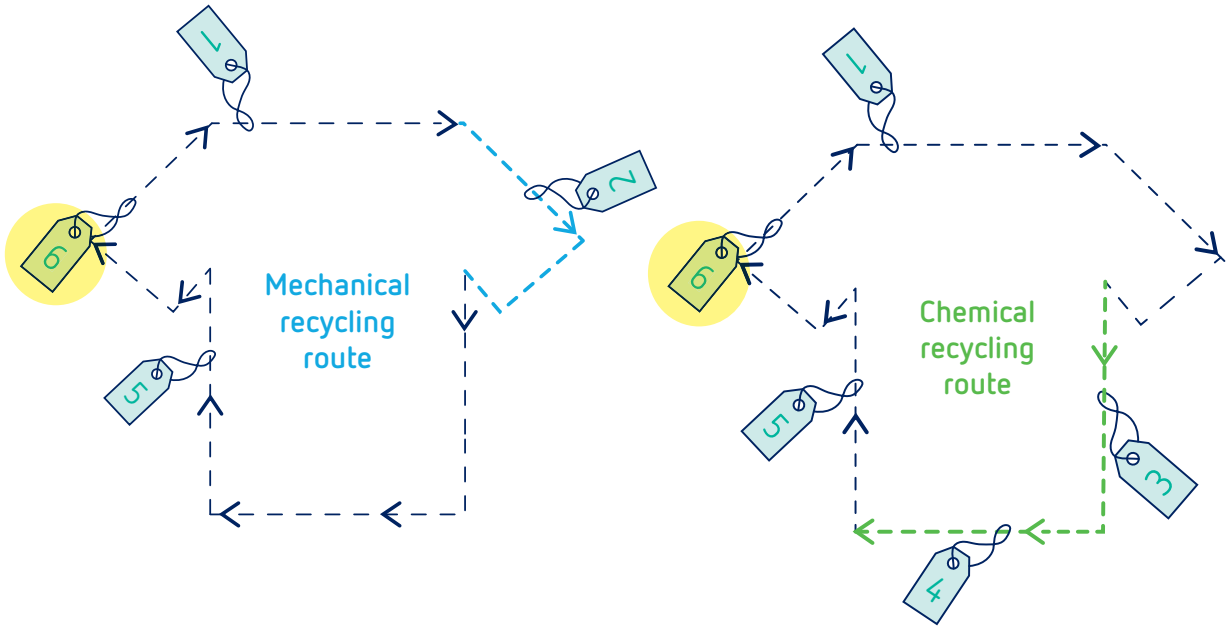
Open-end yarns in various compositions and qualities.

6. Weaving

ENSCHEDE TEXTIELSTAD

Executed by:

Enschede Textielstad B.V.



What is done at this step?:

Testing, optimizing and scaling the construction of a fabric by weaving warp- and weft yarns into a textile material.

The incoming material:

Yarns (with a high percentage of post-consumer and/or post-industrial fibers).

Challenges in relation to recycling:

It is difficult to weave recycled yarns into a fabric that has the same properties as new (virgin) material. Shorter recycled fibers are more prone to abrasion and pilling.

What is done with the material in the project?:

We make a warp (beam) out of recycled yarns in the vertical direction of our loom, and then weave the weft yarns horizontally to create a fabric.

What is the outgoing material?:

Woven fabrics ready for the next step, which is finishing.