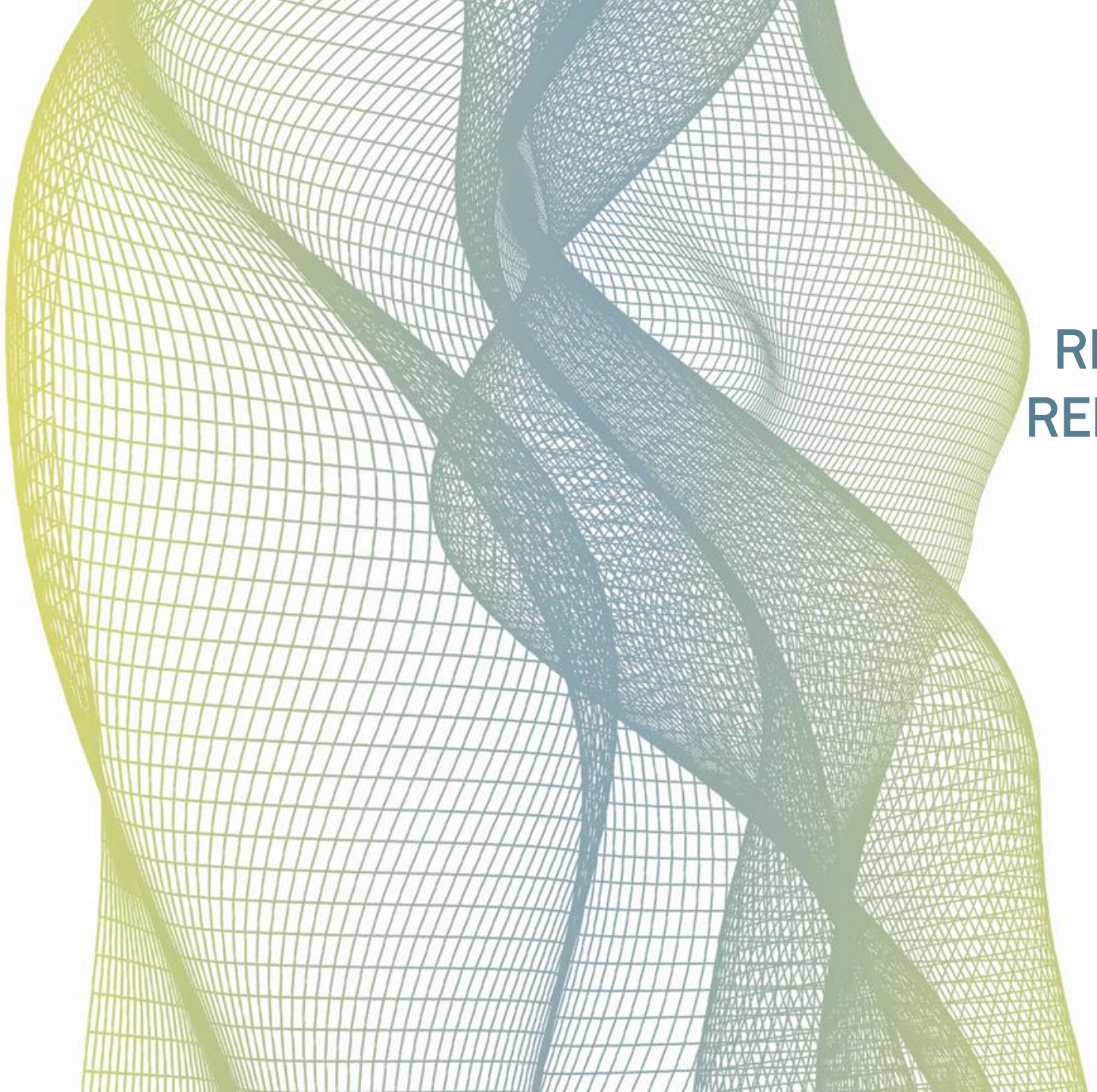

# RECYCLING OF FABRICS REACT REMOVES FINISHING FOR HIGH-PURITY SECONDARY RAW MATERIALS

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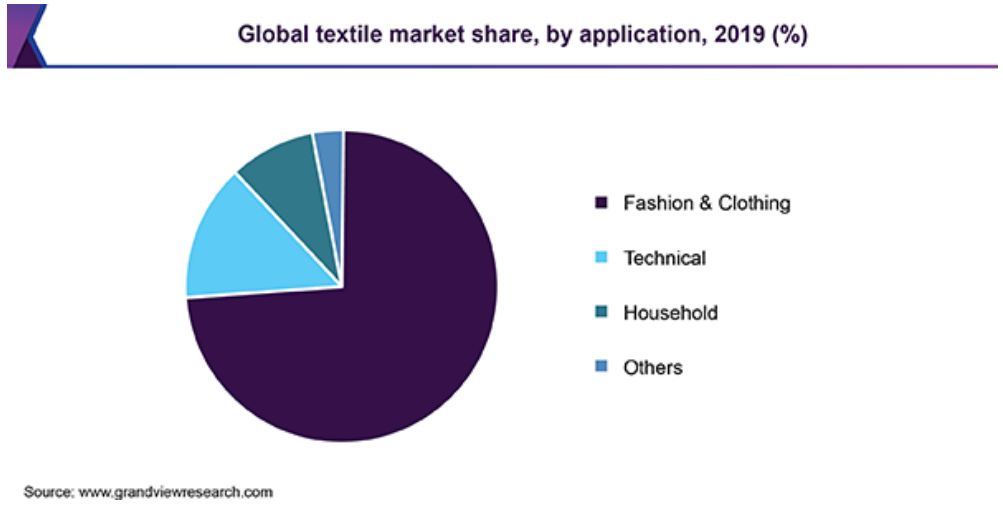
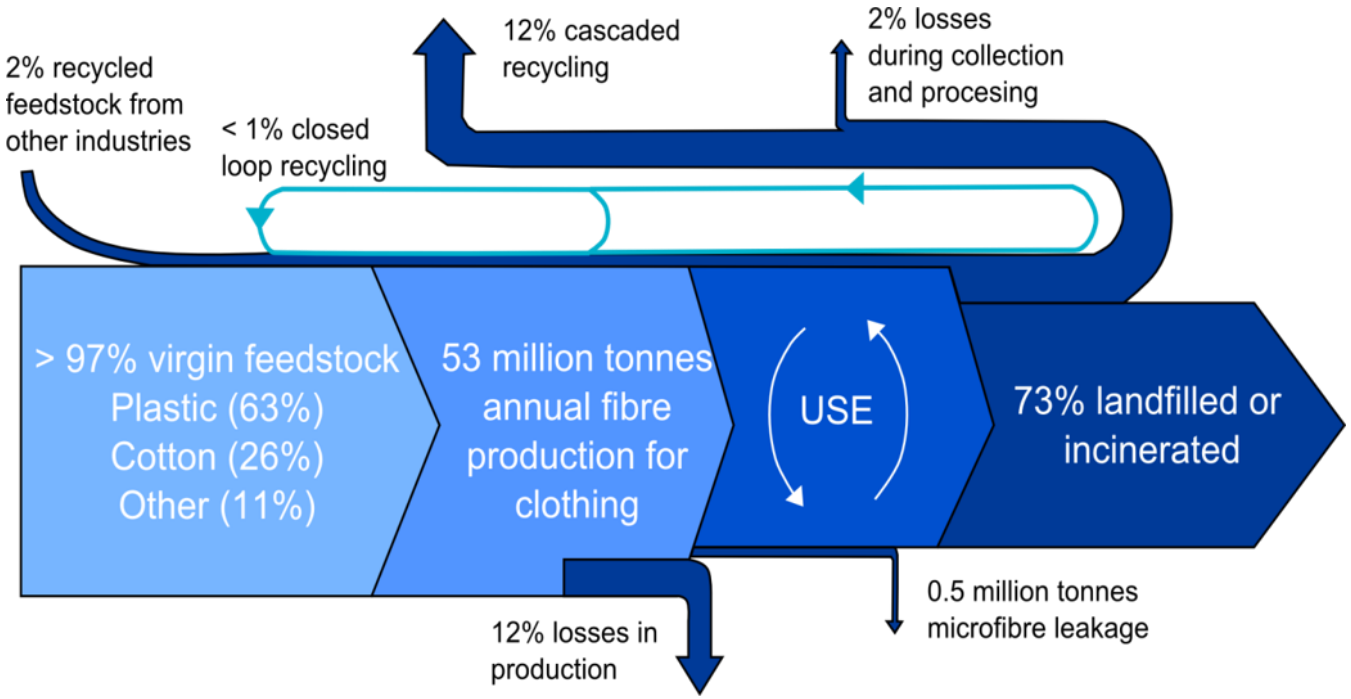
# TEXTILE SECTOR




Market value USD 961,5 billion in 2019

\+ 4,3% to 2027


Textile Market Size, Share & Trends Analysis Report By Raw Material (Wool, Chemical, Silk, Cotton), By Product (Natural Fibers, Polyester, Nylon), By Application, By Region, And Segment Forecasts, 2020 – 2027, Grand View Research

Recycled Textile Market to Reach $8.0 Billion by 2026 at 5.2% CAGR, Allied Market Research

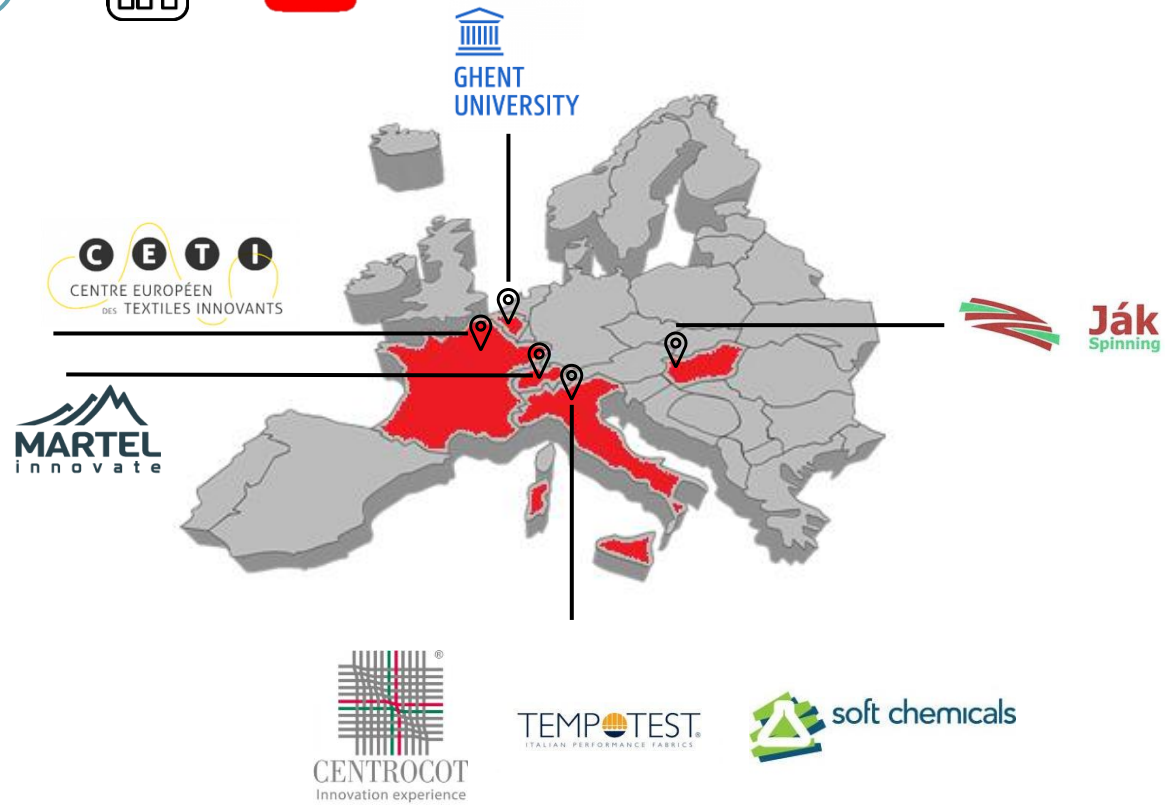
Ellen MacArthur Foundation „A new Textiles Economy: Redesigning Fashion's Future", 2017

# REACT – GENERAL PROJECT INFORMATION

**H2020-SC5-2018-2019-2020:** Methods to remove hazardous substances and contaminants from secondary raw materials

- **36 months duration**
  (June 2019 – May 2022 → September 2022)

- **Consortium:**
  7 partners for 5 EU countries



# REACT - THE PROBLEM

**In the 'awning and outdoor furnishing' textile market, acrylic is still the main material used** (more than 90% of production) **thanks to its unmatchable performance** (combination of weatherability, UV resistance and mechanical strength).

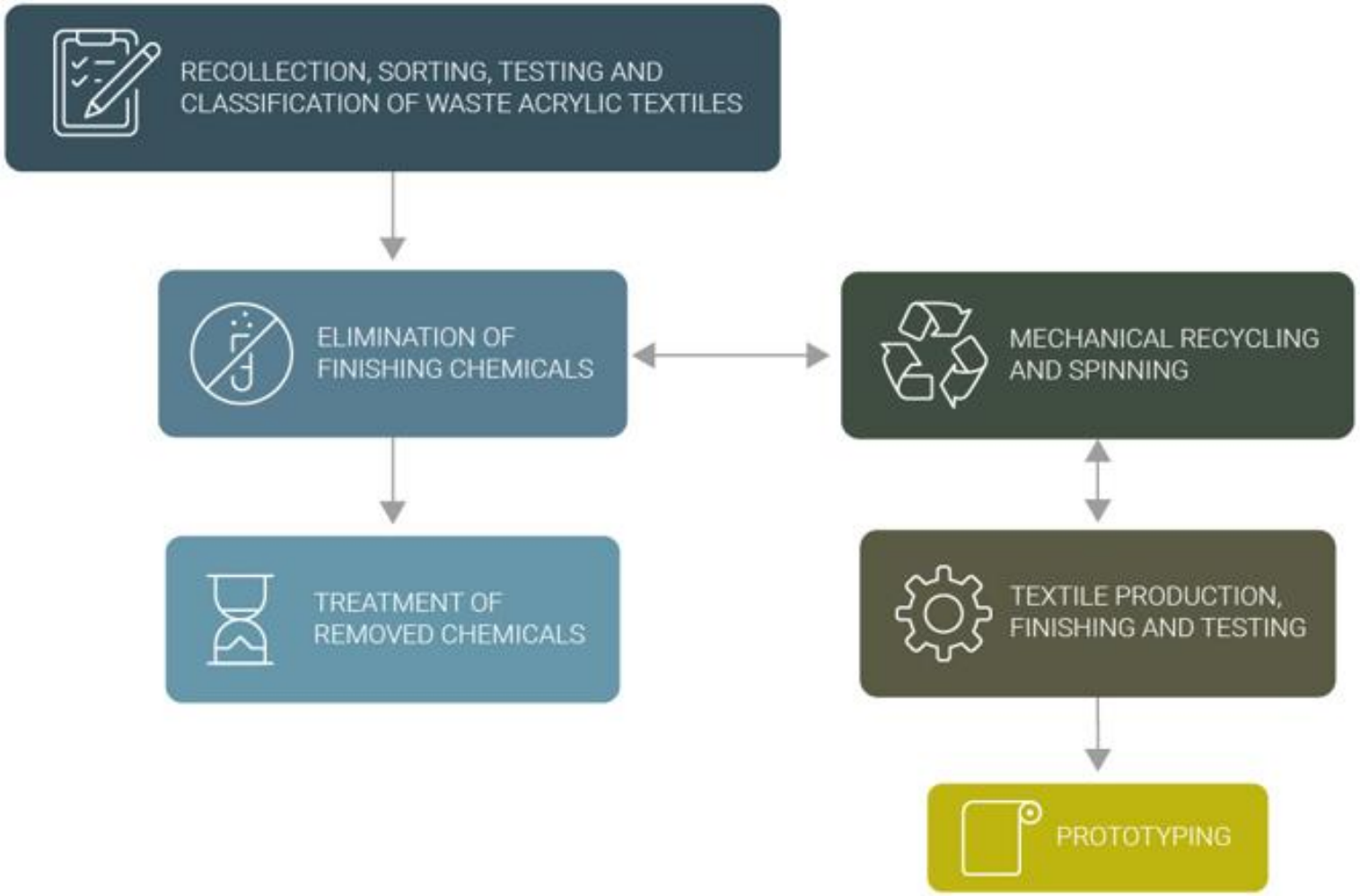
- 11'000 tonnes/year of outdoor acrylic textiles
- 2.5 million awnings installed in Europe

IT IS ESTIMATED THAT EVERY YEAR, IN EUROPE, ABOUT 7'700 TONNES OF ACRYLIC TEXTILE WASTE ARE DISPOSED OF BY LANDFILL OR INCINERATION

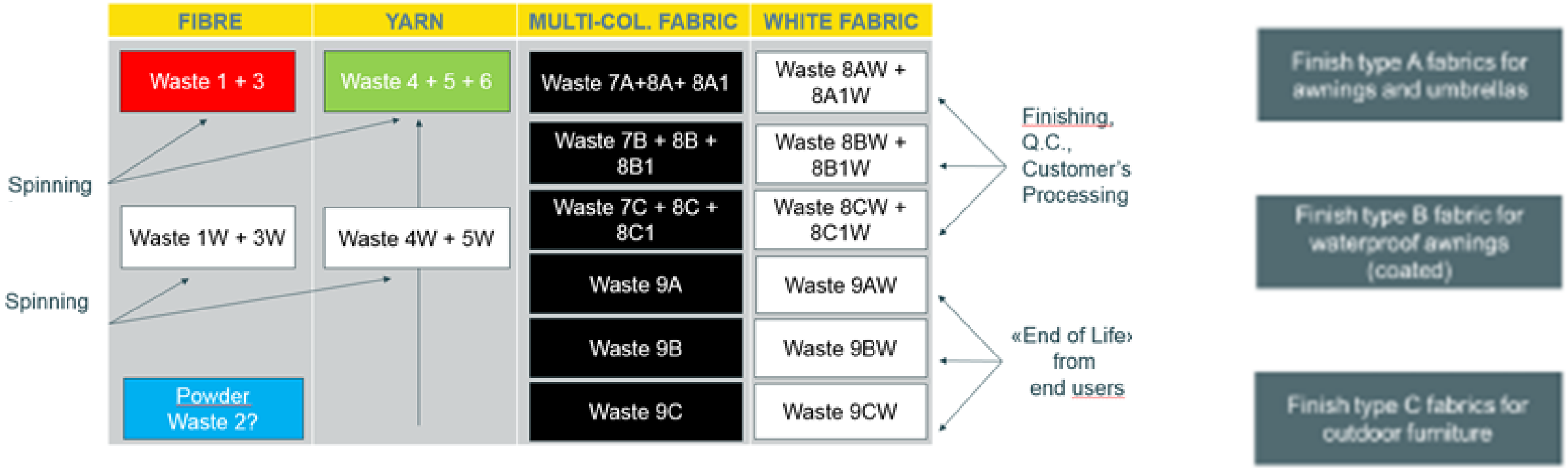
# REACT GOAL

- **to reach a removal rate** of **90-95%** of chemicals/substances that prevent their recycling
- to treat up to **99% of all** sewage **impurities** obtained from removal steps
- to obtain a final textile product with yarn coming from **100% recycled fibre**, mixing regenerated fibres from card, winding opened thread and waste material collected fibre, each up to 33%
- to re-use the acrylic textiles as raw material for other production cycles, to reach 30 % **of waste prevented** from disposal **(3.600 tonnes total)** for the outdoor sector (awnings and furnishing)

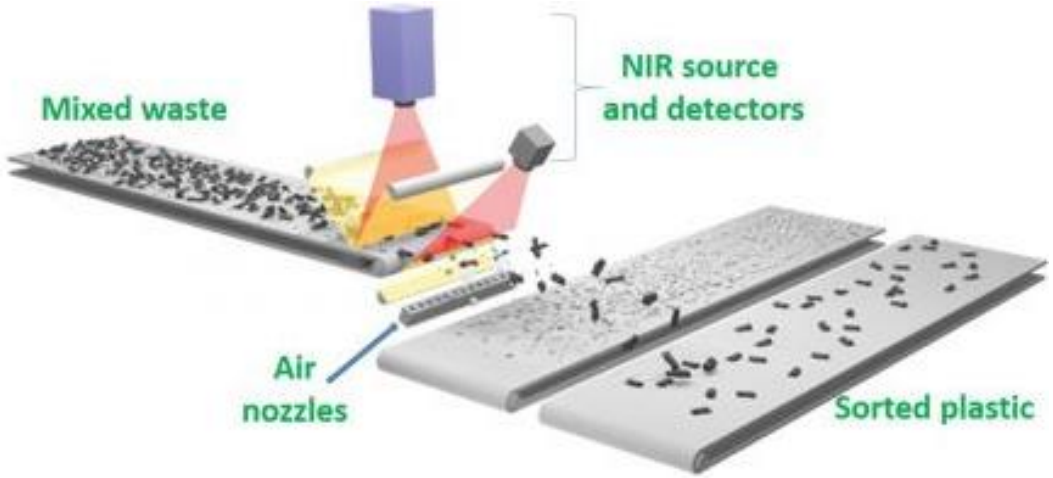
# REACT STEPS


RECOLLECTION, SORTING, TESTING AND CLASSIFICATION OF WASTE ACRYLIC TEXTILES
ELIMINATION OF FINISHING CHEMICALS
MECHANICAL RECYCLING AND SPINNING
TREATMENT OF REMOVED CHEMICALS
TEXTILE PRODUCTION, FINISHING AND TESTING
PROTOTYPING

# REACT: COLLECTION AND SORTING



# REACT: COLLECTION AND SORTING




Fast analysis (~ 1 minute)

Non-destructive

- **Raw fabrics**
- **Pre-consumer fabrics**
  - **Finishing A**
  - **Finishing B**
  - **Finishing C**
- **Post-consumer fabrics**
  - **Finishing A**
  - **Finishing B**
  - **Finishing C**

# REACT: REMOVING RESULTS

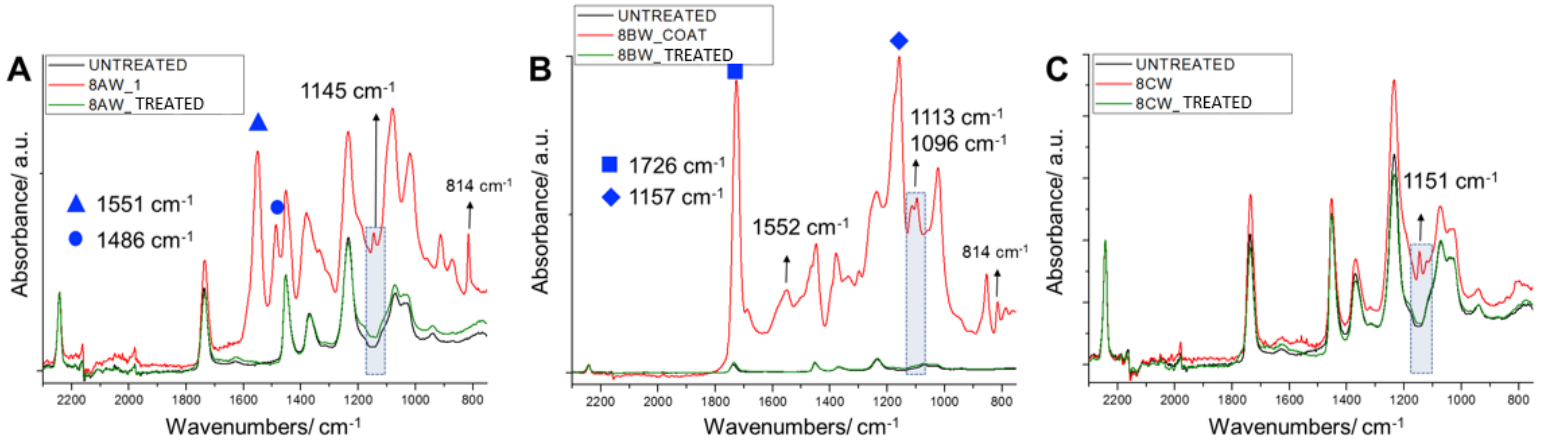
**How to remove hazardous chemicals from acrylic fabrics: chemical approach**

- Combined chemical-mechanical washing
- Acid hydrolysis
- Alkaline hydrolysis

**Chemicals ZDHC certified**

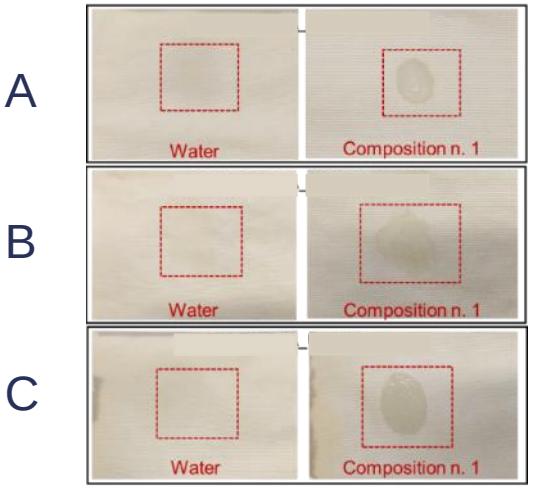
To remove resins **chemical attacks** were investigated, involving wetting and dispersing agents, studying the pH influence.

# REACT: REMOVING RESULTS




| Sample | Termosetting resin removal [%] | Water-repellent resin removal [%] | Waterproof coating removal [%] | Softener removal [%] |
|---|---|---|---|---|
| A | 98.94 | 89.86 | | |
| B | 99.42 | 99.33 | 99.24 | |
| C | | 91.22 | | 100.00 |

## Water and oil repellency




oil repellency according with AATCC 124-2018

Initial oil repellency degree 5

# REACT: SPINNING

## Two approaches: Open-end and Ring spinning

Performance yarns:
unfinished fabrics > finished fabrics > EoL fabrics

Increased properties:
mixing recycled fibres with raw materials
at least 30%

| | | Finished fabrics 60% + raw acrylic 40% | Finished fabrics 70% + raw acrylic 30% | Finished fabrics 50 % + unfinished fabrics 50% |
|---|---|---|---|---|
| Tensile strength | Average cN | 821 | 734 | 726 |
| | Min cN | 699 | 510 | 637 |
| | Max cN | 990 | 876 | 817 |
| Breaking elongation | % | 21.7 | 20.9 | 20.9 |
| C.V. strength | % | 5.4 | 8.2 | 5.0 |
| C.V. breaking elongation | % | 4.8 | 9.0 | 4.0 |
| Average breaking toughness | cN/tex | 13.1 | 25.5 | 12.6 |

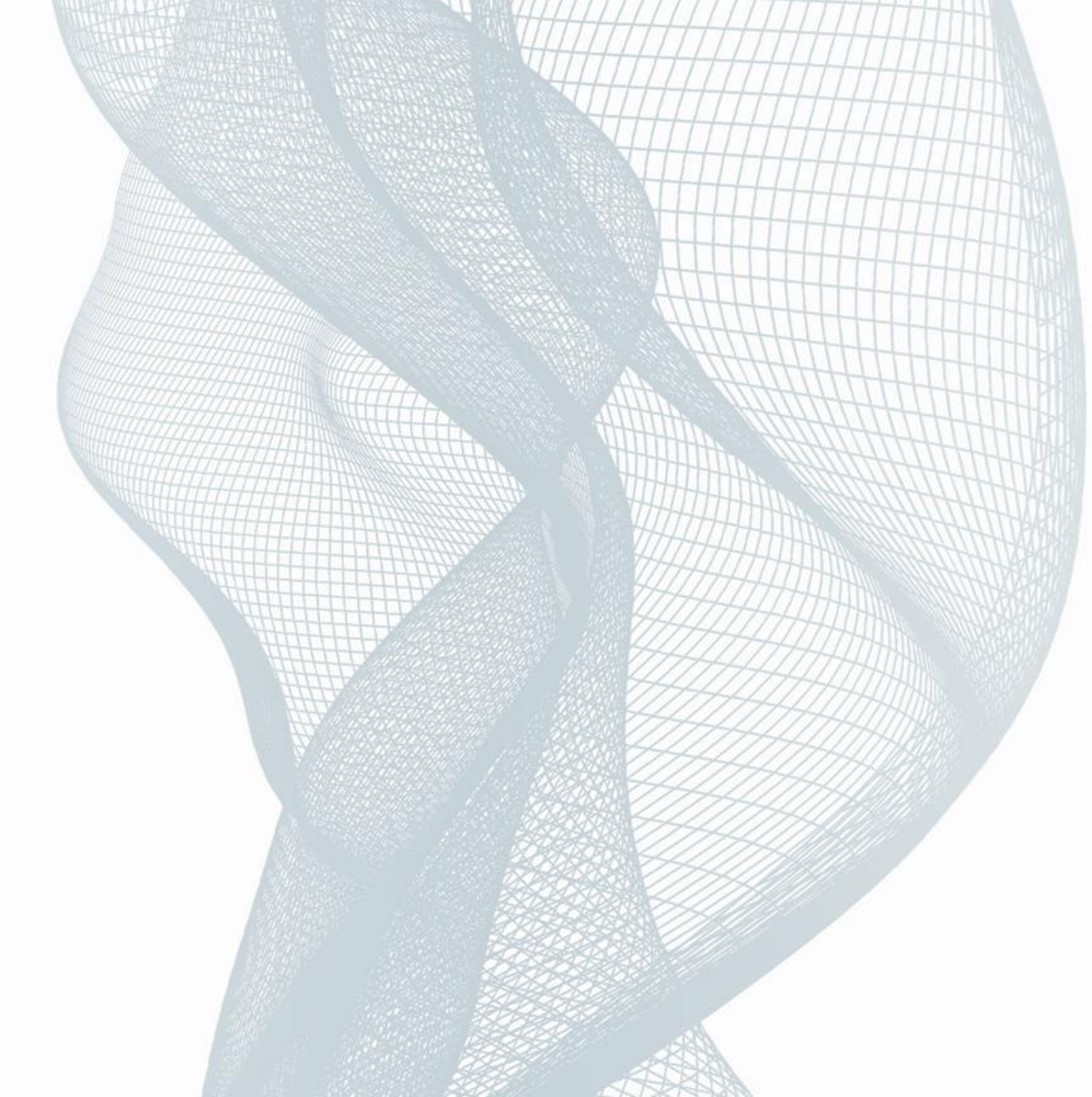
**100%** recycled yarns is possible!

# REACT RESULTS


# REACT RESULTS

- Increased purity and quality of secondary raw materials
  - Our project aims to a **90% removal of chemicals of the finishing** process
  - The mixing with the virgin regenerated fibre, the final purity of the recycled fibre will reach 90-95%

- Reduced risk of retaining hazardous substances in recycled materials
  - A reduction of hazardous substances in recycled materials
  - Reduction of hazardous substances in landfill



# THANK YOU FOR YOUR ATTENTION

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 820869