MARZOLI

MARZOLI
Textile Engineering

MARZOLI RECYCLING TECNOLOGY

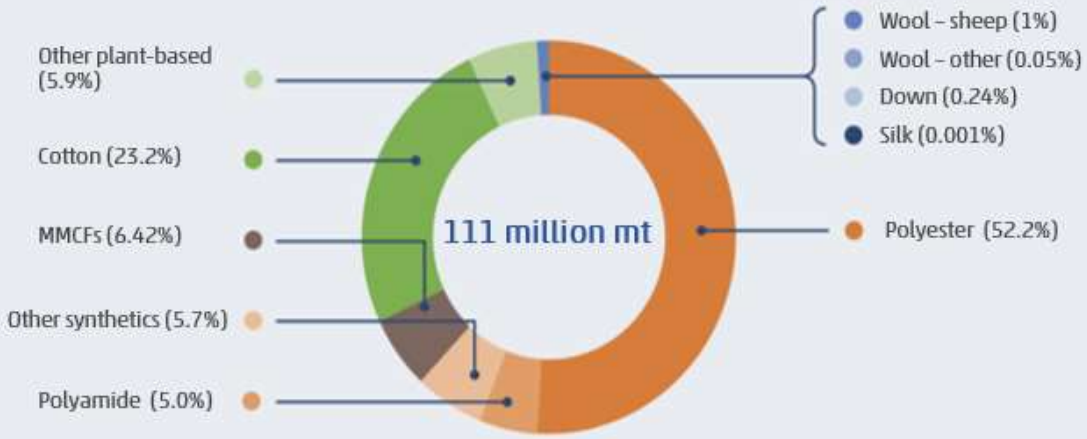

MARZOLI
Textile Engineering
1 INSIGHTS
2 DEFINITIONS
3 MARZOLI TECHNOLOGY
4 PROJECTS


MARZOLI
Textile Engineering
1
INSIGHTS

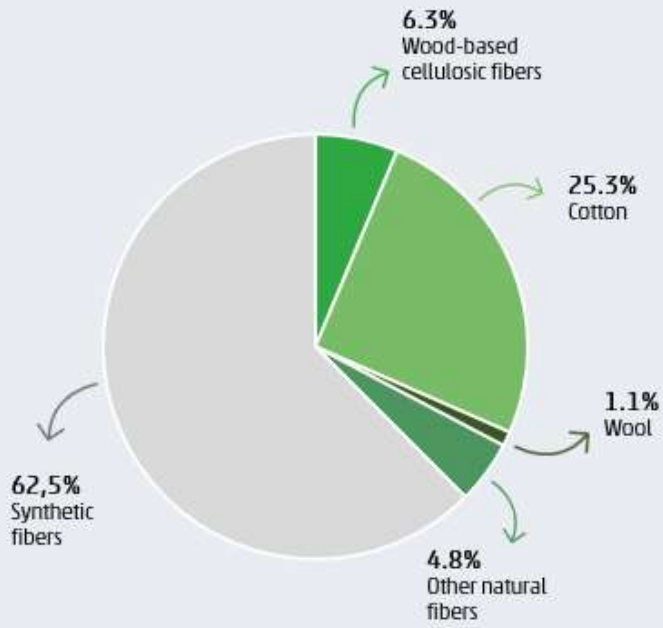
GLOBAL FIBER PRODUCTION & CONSUMPTION

MARZOLI
Textile Engineering

GLOBAL FIBER PRODUCTION 2019
in million MT (+%)



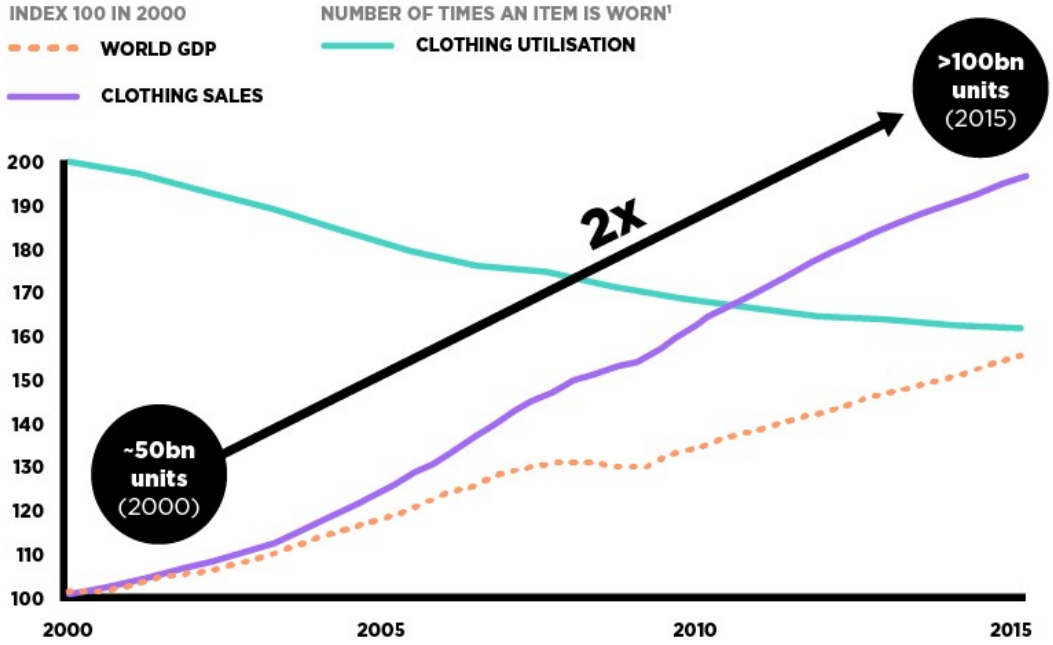
GLOBAL FIBER CONSUMPTION IN 2018
in million MT (+%)



Source: Textile Exchange – Preferred fiber and materials

CLOTHING SALES AND CLOTHING UTILIZATION

- *Clothing production*: has **doubled** in the last 15 years
- *Clothing utilization:* worldwide has **decreased by 36%** compared to 15 years ago
- Globally, customers miss out on **USD 460 billion** of value each year by throwing away clothes that they could continue to wear
- *Overproduction*: **only 30%** of the clothing produced today is sold at the recommended retail price, **another 30%** goes in the sales and **40%** remains unsold.



Source: A new textiles economy: redesigning fashion's future – Ellen MacArthur Foundation

CLOTHING INDUSTRY'S FOOTPRINT

MARZOLI
Textile Engineering

MAIN ANNUAL IMPACTS OF THE CLOTHING INDUSTRY

RESOURCES DEMAND

WATER CONSUMPTION: 93 bn m^3
4% of global consumption

OIL CONSUMPTION: 98 ml tons
2% of global consumption

LAND USAGE: 631 ml hectares
2.5% of arable land
18% of pastures land

POLLUTION

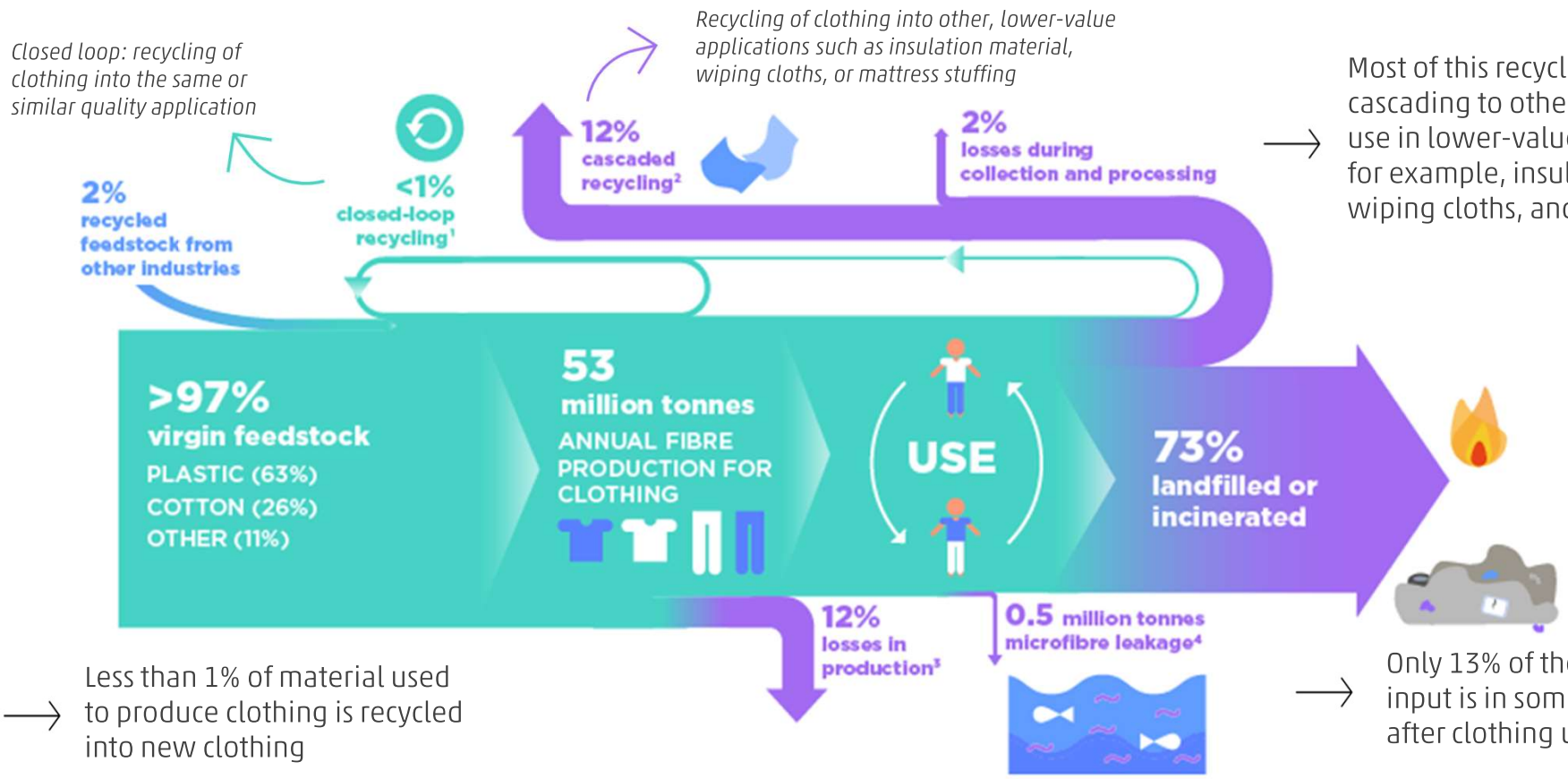
WATER POLLUTION: 20% of industrial water pollution

CO2 EMISSION: 1.20 bn CO2
2% of GHG emissions: > aviation and shipping combined

OCEAN MICRO FIBRES: 0.5 ml tons
35% of total microfibers released into oceans from washing

Source: Ambienta – Environmental investments

GLOBAL MATERIAL FLOW FOR CLOTHING



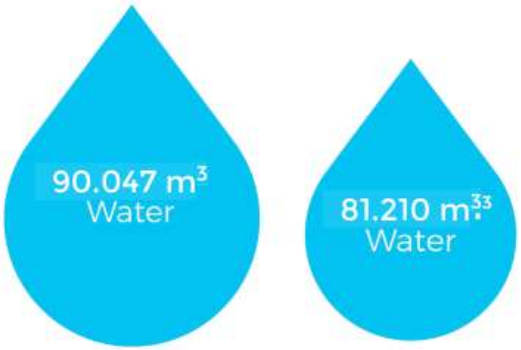
Most of this recycling consists of cascading to other industries and use in lower-value applications, for example, insulation material, wiping cloths, and mattress stuffing

Less than 1% of material used to produce clothing is recycled into new clothing

Only 13% of the total material input is in some way recycled after clothing use

Source: A new textiles economy: redesigning fashion's future – Ellen MacArthur Foundation

ENVIRONMENTAL IMPACTS: VIRGIN VS RECYCLED COTTON

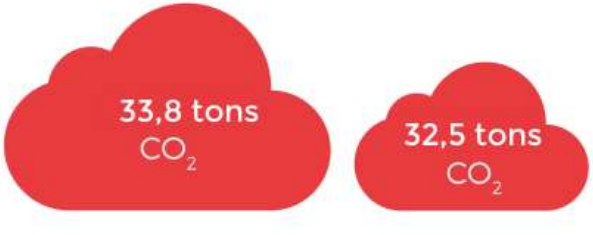


Water consumption Reduced by 9,8%

Avoidance of virgin cotton. Recycled cotton uses minimal amounts of water, which leads to the overall decrease of water usage.

Energy consumption reduced by 4,2%

Spinning and weaving are the highest contributors to primary energy consumption and they not change in recycling.



CO2 emissions reduced by 3,8%

Recycled cotton *avoids greenhouse gas emissions from cultivation*, such as fertilizer and pesticide production and use.

** Results based on mechanically recycling . 1 tonne of denim goods to produce 7.050 m (4.65 tonnes) of denim fabric with a make up of 12% recycled content.*

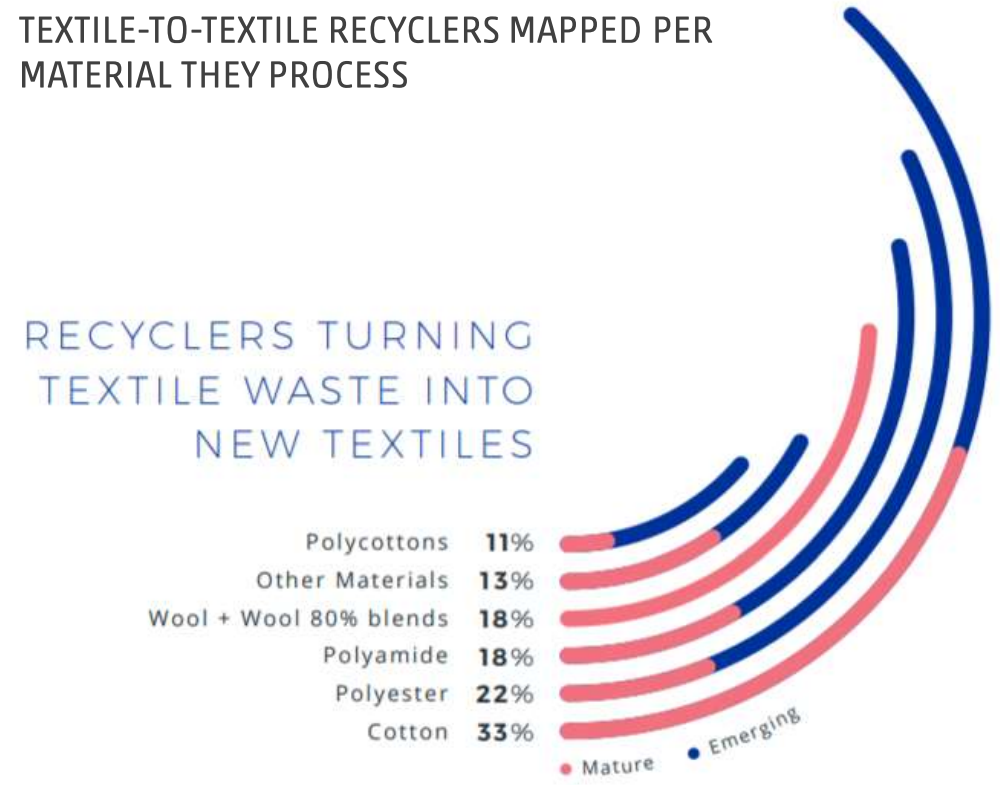
Source: circle economy – G-Star row: measuring the potential impact of denim recycling

TEXTILE-TO-TEXTILE RECYCLED MATERIALS

The most common material recycled is ***cotton***, followed by ***polyester***, ***wool*** and ***polyamide***.

For materials such as wool, acrylic or their blends, there is a mature mechanical recycling market, with technologies at scale.
Hence, although the global market share of wool is relatively small, accounting for around 1% of global production, when focusing on the textile recycling market, wool and wool blends become a largely important fibre to secure at its end-of-use.

TEXTILE-TO-TEXTILE RECYCLERS MAPPED PER MATERIAL THEY PROCESS



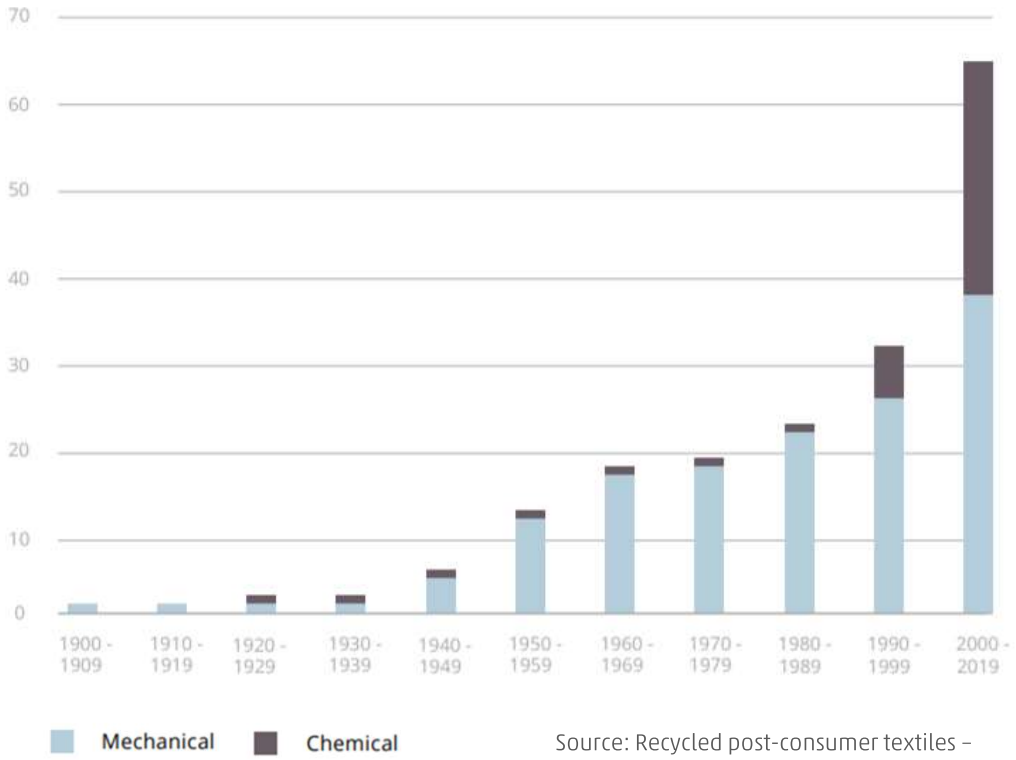
Source: Recycled post-consumer textiles – Fibersort – Circle Economy

MECHANICAL AND CHEMICAL RECYCLING

Mechanical recycling takes waste and recycles it into a secondary material without changing its basic structure. Some common mechanical techniques for textile recycling include shredding fabrics and melting and extruding plastic fibers such as polyester

In the *chemical recycling* landscape, a rising trend can be seen in solutions being developed over the last decade to recycle different materials. A growing number of recyclers are currently focusing on material separation, such as separating cellulose and PET from polyester-cotton blends.

TEXTILE-TO-TEXTILE RECYCLED TREND



Source: Recycled post-consumer textiles – Fibersort – Circle Economy

2 DEFINITIONS

T&C WASTE

MARZOLI
Textile Engineering

POST INDUSTRIAL
Textile by product from the manufacturing stage (e.g. clipping waste, offcuts, roll ends and remnants)

10-30%

PRE-CONSUMER
Finished textile products which are unfit for sale at a regular retail store (e.g. product returns, manufacturing rejects, and deadstock)

UP TO 30%

POST-CONSUMER
Used textiles products that have been disposed by the consumer (e.g. used clothing, footwear, accessories, linens..)

75 – 80%

Spinning → Textile fabrics → Finishing

Garment manufacturing | Retailing | Consumption | Landfill

POST INDUSTRIAL

PRE CONSUMER

POST CONSUMER

OPEN LOOP AND CLOSED LOOP

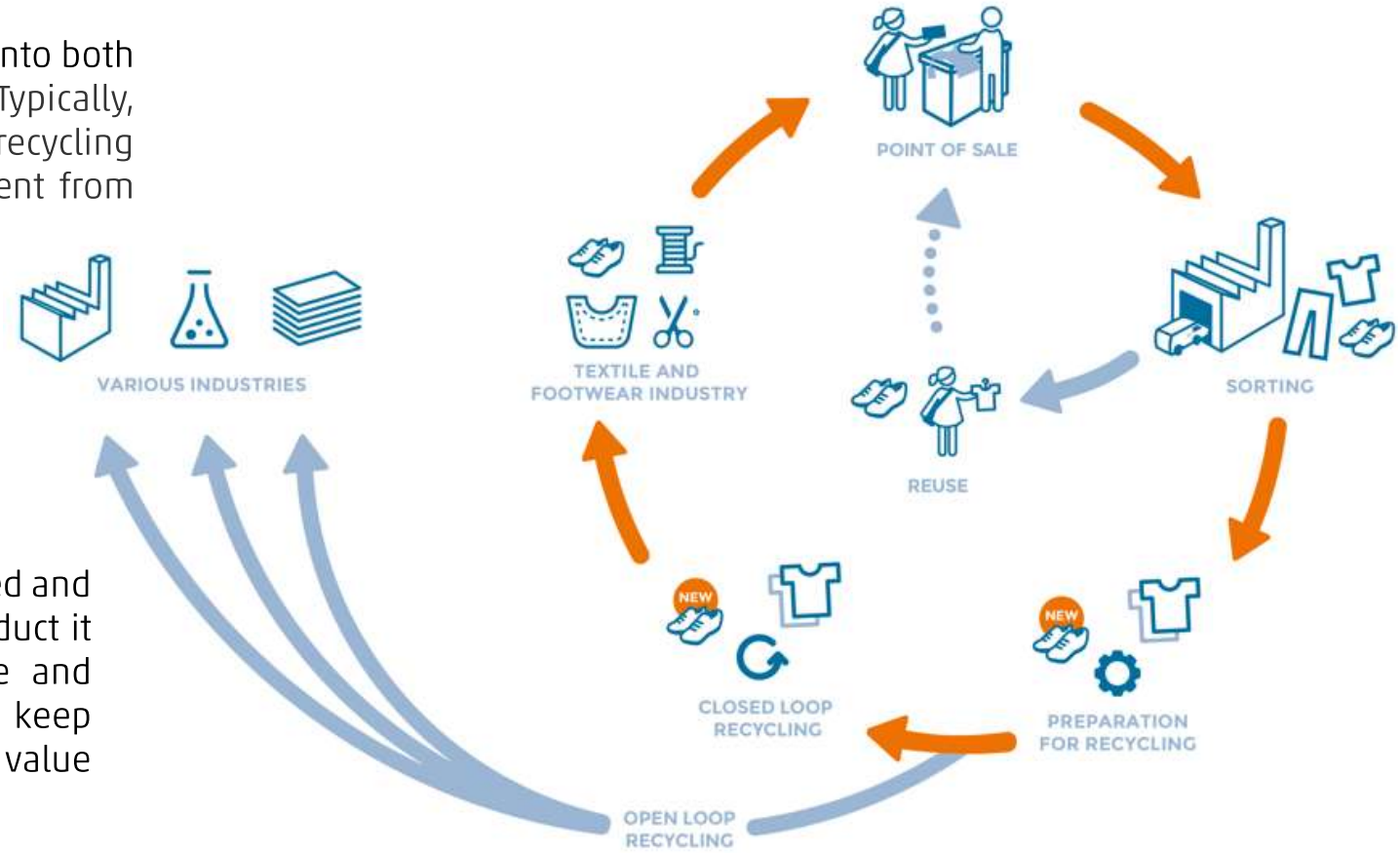
MARZOLI
Textile Engineering

OPEN LOOP RECYCLING

Any process where waste is converted into both new raw materials and waste product. Typically, materials recycled through open-loop recycling go on to be used for purposes different from their former, pre-recycled purpose

CLOSED LOOP RECYCLING

Process where waste is collected, recycled and then used again to make the same product it came from. This process is restorative and regenerative by design and aims to keep materials at their highest utility and value always.



RECYCLING – UPCYCLING - DOWNCYCLING

Recycling

Converts waste material into something of roughly the ***same value***. Pure cotton, polyester, nylon, and wool can be turned into new cotton, polyester, nylon, and wool textiles

Upcycling

Transforms unwanted products and textile waste into something of ***higher value***. Upcycling uses either pre-consumer waste, post-consumer waste, or both.

Downcycling

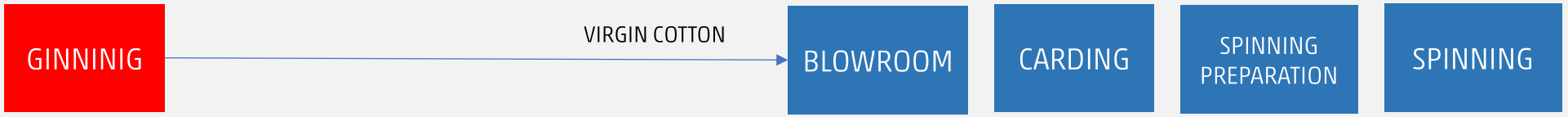
Downcycling turns textile waste into something of ***lower value.*** Examples include recycling used garments into non-woven textiles, building insulation, rags, or carpet underlay.


MARZOLI
Textile Engineering
3
MARZOLI TECHNOLOGY

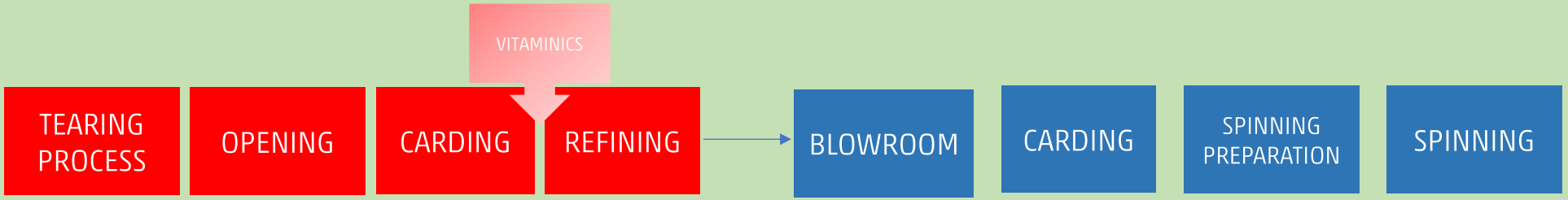
PROCESSES

MARZOLI
Textile Engineering

STANDARD SPINNING PROCESS FOR SHORT STAPLE COTTON FIBRES



RECYCLING PROCESS FOR SHORT STAPLE COTTON FIBRES



MARZOLI PROCESS

PRODUCTION CAPACITY

TEARING PROCESS

Up to 2000 kg/h

OPENING

Up to 1700 kg/h

CARDING LINE

Up to 1500 kg/h

12.000 tons/year

PROCESS MATERIAL

BLACK COTTON

- Ne30 YARN
- Double carding process
- 70% black cotton
  + 30% raw cotton blend

Card production
50 kg/h

BLACK COTTON

- Ne30 YARN
- Double carding process
- 50% black cotton
  + 50% raw cotton blend

Card production
80 kg/h

BLACK COTTON

- Ne30 YARN
- Double carding process
- 70% black cotton
  + 30% polyester blend

Card production
50 kg/h

PROCESS MATERIAL

BLUE NOMEX

- Ne12 YARN
- Double carding process
- 66% blu nomex
  + 33% viscose blend

Card production
25 kg/h

RED NOMEX

- Ne38 YARN
- Double carding process
- 70% blu nomex
  + 30% fr viscose blend

Card production
25 kg/h

POLYESTER

- Web output sucked and baled

Card production
30 kg/h

PROCESS MATERIAL

NYLON

- Web output sucked and baled

Card production
40 kg/h

PES

- Web output sucked and baled

Card production
80 kg/h

RAYON

- Rayon 80% + viscose 20%
- Web output sucked and baled

Card production
60 kg/h

PROCESS MATERIAL

COTTON

- Web output sucked and baled

Card production
70 kg/h

COTTON

- Sliver sucked from web detaching And baled
- 71% cotton
  + 29% combed sliver

Card production
30 kg/h

NYLON

- Ne12 YARN COMPACT
- 70% nylon
  + 30% viscose

Card production
30 kg/h

PROCESS MATERIAL

COTTON

- Ne12 YARN
- 70% cotton
  + 30% polyester

Card production
40 kg/h

COTTON

- Ne12 YARN
- 66% rejuvenated cotton
  + 33% polyester

Card production
30 kg/h

BLACK POLYESTER

- Sliver sucked from web detaching and baled

Card production
25 kg/h

PROCESS MATERIAL

BLU NOMEX

- Ne18 YARN
- 50% Nomex blu
  + 50% fr viscose

↓

Card production
25 kg/h

PURPLE NOMEX

- Ne12 YARN
- 70% Nomex blu
  + 30% fr viscose

↓

Card production
20 kg/h

GREEN META-ARAMID

- Ne5 YARN
- 70% green meta-aramid
  + 30% fr viscose

↓

Card production
40 kg/h

PROCESS MATERIAL

BLUE JEANS

- Ne 0,10 CARD SLIVER

↓

Card production
30 kg/h

BLACK DENIM

- New fiber (draw frame sliver processed on RWR)

↓

Card production
30 kg/h

COTTON

- Web output sucked and baled
- 75% cotton
  + 25% cotton sliver

↓

Card production
40 kg/h

PROCESS MATERIAL

COTTON

- Web output sucked and baled (nw)
- 70% cotton + 30% cotton sliver

↓

Card production
35 kg/h

COTTON

- Web output sucked and baled (nw)
- 70% cotton + 30% viscose

↓

Card production
35 kg/h

COTTON

- Double carding process
- Web output sucked and baled (nw)
- 75% cotton + 5% hydrophilic cotton +20% viscose

↓

Card production
35 kg/h

PROCESS MATERIAL

MODA-ACRYLIC

- Web output sucked and baled

Card production
40 kg/h

GREY MODA-ACRYLIC

- Card sliver
- 80% moda-acrylic + 20% acrylic

Card production
25 kg/h

PIMA BLUE COTTON

- Ne24 YARN
- 54% pima blu cotton + 36% cotton

Card production
25 kg/h

PROCESS MATERIAL

PIMA BLUE COTTON

- Ne24 YARN
- 40% Pima blu cotton
  + 60% cotton

↓

Card production
25 kg/h

GREEN META-ARAMID

- Card sliver

↓

Card production
25 kg/h

4 PROJECTS

- Industrial production plant
- Re-Act

INDUSTRIAL PRODUCTION PLANT

- *Input*
  - Post industrial scraps
  - Pre consumer scraps
  - Post consumer

- *Purpose*: fiber recovered to be sold for several purposes (blend, yarn, nonwovens..)

FABRICS

TEARING PROCESS → OPENING → CARDING → REFINING

REGENERATED FIBER

Production capacity:
up to **800 kg/h** of baled fiber

RE-ACT PROJECT

MARZOLI
Textile Engineering

PARTNERS:

UNIDO, The Egyptian Cotton project (Egypt)

T&C Garments (Egypt)

Circle Economy

Filmar Spa (Italy-Egypt)

Albini Group (Italy-Egypt)

Fashion Designers (Italy-Egypt)

RE-ACT PROJECT

MARZOLI
Textile Engineering

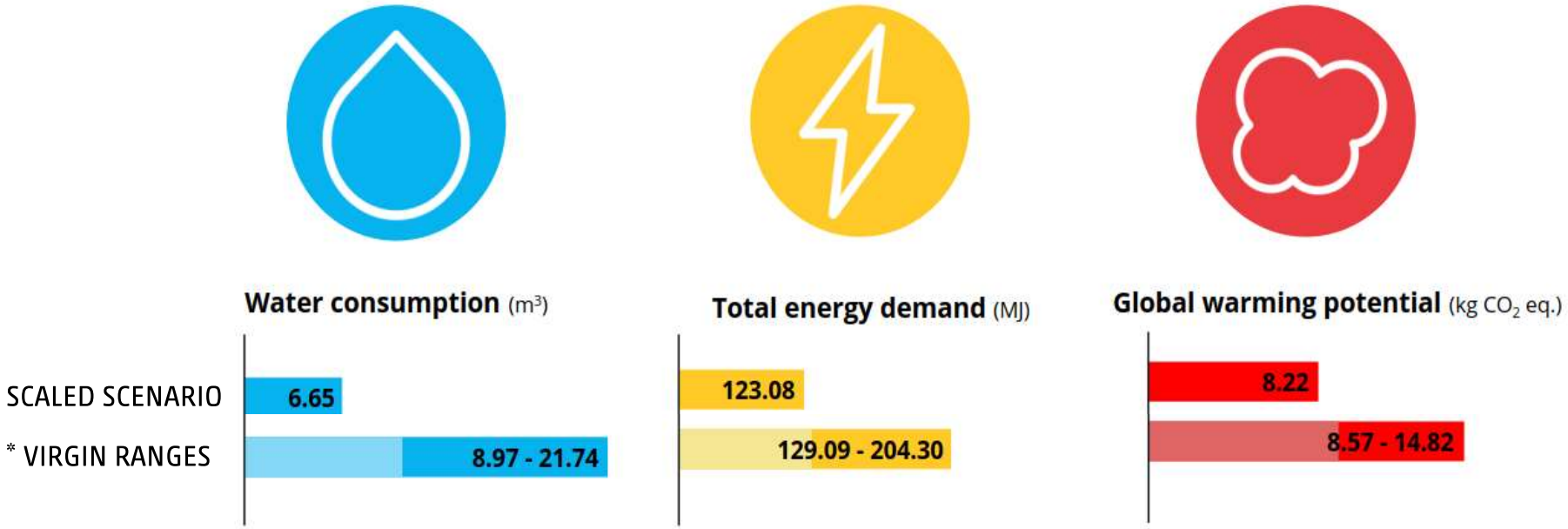
Post industrial denim scraps

Yarn: Ne 30/1 blended compact
50% recycled and 50% virgin material

Fabric: 20% of recycled yarn

RE-ACT PROJECT

MARZOLI
Textile Engineering



** Virgin ranges are based on available data in the Ecoinvent database v.3.6. used for the life cycle assessment*

RE-ACT PROJECT

MARZOLI

Textile Engineering

A Camozzi Group Company