



TOWARDS CIRCULAR ECONOMY OF TEXTILES

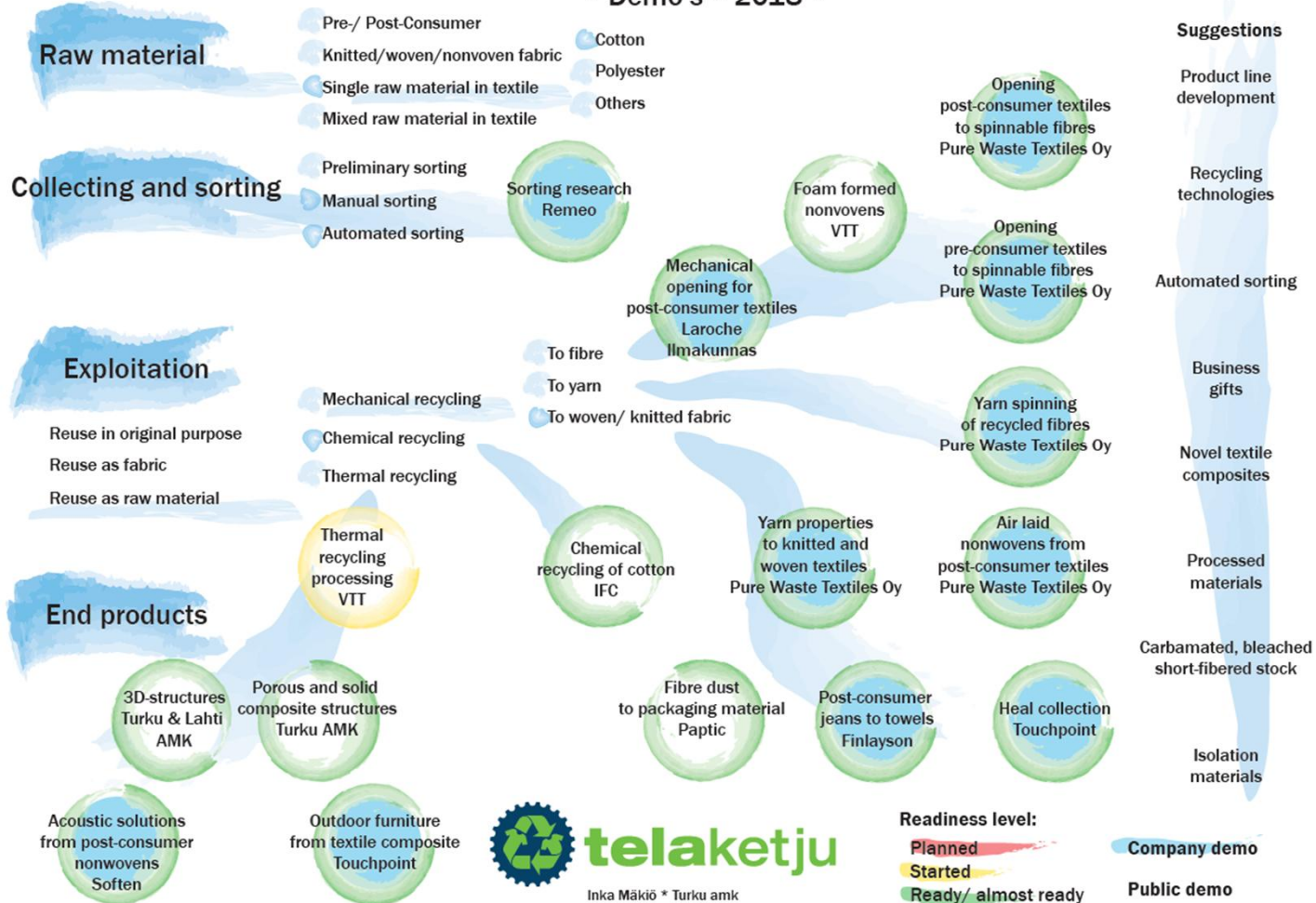
Demonstrating new materials and products
from recycled textile fibres

Eetta Saarimäki
September 18th, 2018
Hanasaari



TELAKETJU Demos

* Demo's * 2018 *



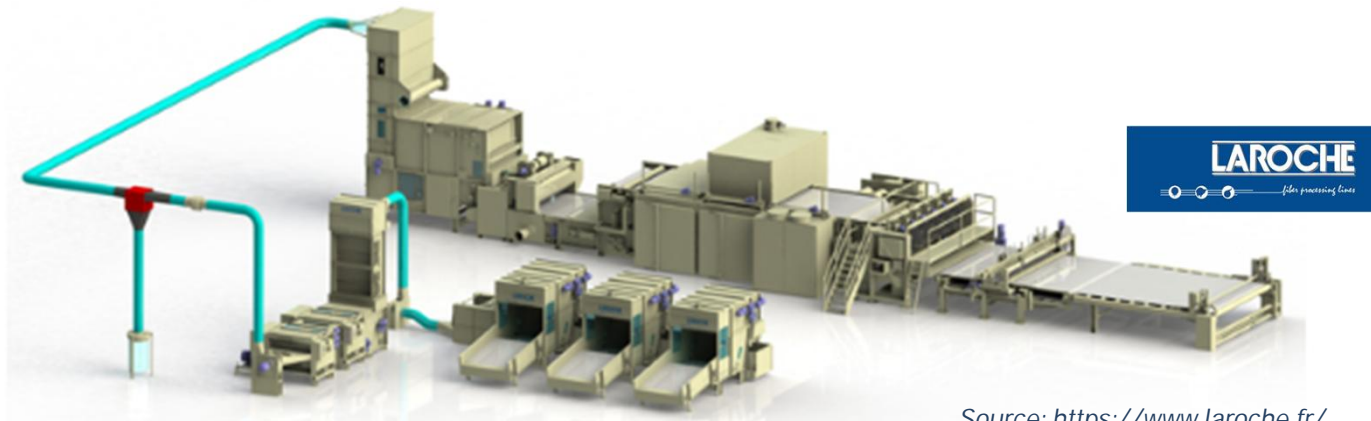
Fibre based materials from post-consumer textiles to TELAKETJU purposes

Textiles gathered and sorted in Finland and sent to Laroche (France)

- Material based sorting
- Knitted and woven fabrics together

Textiles were converted back to fibres by cutting and opening

- Part of the fibres mixed and made to nonwovens



Source: <https://www.laroche.fr/>

Mechanical recycling

Thermal recycling

Chemical recycling



telaketju

Mechanical opening to TELAKETJU purposes



Sorted fibres cut to pieces
in two directions



Opened fibres



PET baled for transportation

Source: VTT

Materials:

- Recycled CO
- Recycled PET
- Industrial waste PP
- Virgin bi-component PET

Mechanical recycling

Thermal recycling

Chemical recycling

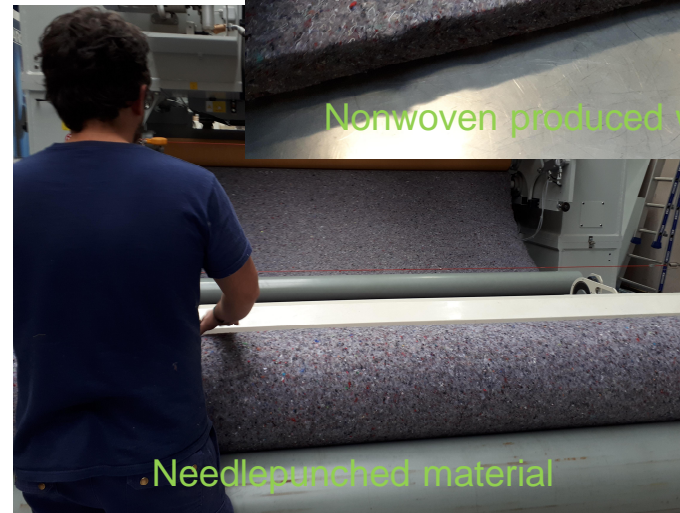
Nonwovens for TELAKETJU purposes

Four formulas manufactured from opened fibres with air lay technology

- Thermoformable nonwovens (3) containing 50-90% recycled fibres (needle punched)
- Isolating material containing 80 % recycled fibres
- Thicknesses up to 3800 g/m²
- Both opened fibres and nonwovens used in many demo products



Nonwoven produced with air lay



Needlepunched material

Source: VTT

Mechanical recycling

Thermal recycling

Chemical recycling

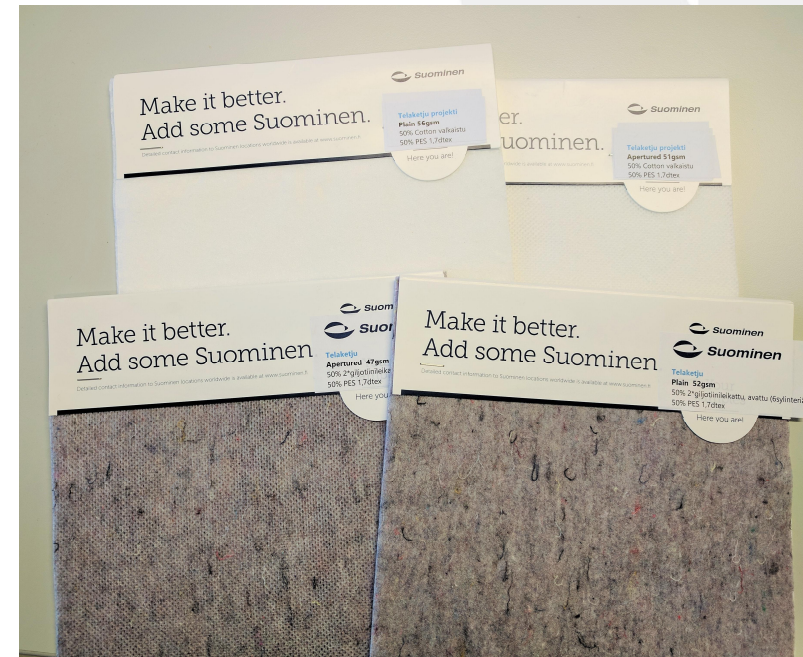


telaketju

Nonwoven manufacturing from post-consumer cotton fibres

To replace part of the raw-materials with recycled fibres

- Technology: carding and hydroentanglement at Suominen's pilot facilities
- 50% recycled fibres with 50% standard polyester
- Basis weight 45-50 g/m²
- Possible to process the recycled fibres in a pilot scale
- Blending with standard polyester fibres helped in the carding process



Source: Suominen

Upper samples: Recycled bleached IFC fibres + polyester

Lower samples: Laroche demo fibres + polyester

Mechanical recycling

Thermal recycling

Chemical recycling

Acoustic panel manufacturing from post-consumer recyclates

Manufactured with production moulds

- Panel thickness 1500 g/m² nonwovens containing 10 % of bi-component PET
- Well formed panels (good edges)
- Good acoustic properties



Source: Turku AMK



Source: Soften

Panels produced from
Laroche demo nonwovens

Mechanical recycling

Thermal recycling

Chemical recycling



telaketju

Recycling of customers workwear

Well-fitting collection of ecological workwear

- manufactured from recycled raw materials, such as recycled pet bottles
- manufactured from fabrics that can be recycled to new raw material
- at the end of the life cycle can be used as raw material to composites, used for example for outdoor furniture
- Service model under development



Source: Touchpoint

Mechanical recycling

Thermal recycling

Chemical recycling

From waste to textiles



Source: <http://purewastetextiles.com/>

Pre-consumer waste to textiles

- Development of mechanical opening to spinnable fibres
- Spinning development of recycled fibres
- Feasibility testing for different type of knitted and woven fabrics

Post-consumer waste to textiles

- Yarn made containing 20 % post-consumer, 40 % pre-consumer and 30 % of polyester
- Further step to manufacture knitted fabric

Mechanical recycling

Thermal recycling

Chemical recycling

From post-consumer old Jeans to towels

Worn out jeans collected from customers in Finlayson shops

- Jeans sent to Belgium for sorting, recycling, spinning and weaving
- 40 % of recycled cotton in the product
- The product is not dyed



Source: Finlayson

Mechanical recycling

Thermal recycling

Chemical recycling



Packaging materials from mechanical process reject and dust



Source: <https://paptic.com/>

Samples made from Laroche demo fibres and "blue" dust

- Textile fibre consumption 30 % and 70 % tested
- Product appearance and feel can be adjusted from felt like material to paper like material by varying the textile consumption

Mechanical recycling

Thermal recycling

Chemical recycling



Mechanically opened CO-fibres dissolved and recycled back to fibres

Chemical recycling of cotton by dissolving

- Yarns manufactured from regenerated fibres
- Knitted fabric manufactured from yarns



Source: IFC

Mechanical recycling

Thermal recycling

Chemical recycling



telaketju

Recycled post-consumer pillows and blankets into thermoplastic composite material

Aim to process covers and fillings during one process step without separate handling to composite material

- Grinding very challenging due to porous material structure
- Variety of pillow and blanket structures very large
- Possible to produce thermoplastic material



Source: www.familon.fi



Source: LAMK

Mechanical recycling

Thermal recycling

Chemical recycling



telaketju

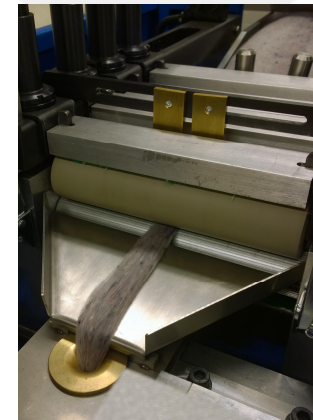
Yarn manufacturing from postconsumer fibres

Fibres from Laroche demos

- Yarns from post-consumer cotton and polyester with virgin viscose and cotton manufactured
- Yarns containing up to 70 % recycled fibres



Carded fibres



Sliver



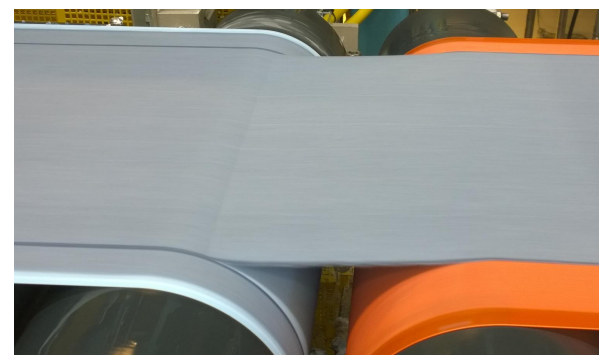
Final ring spun yarn

Source: VTT

Foam formed nonwovens

Materials from Laroche demo fibre rejects, PureWaste pre-consumer fibres and "blue" dust

- Textile consumption up to 70 %
 - Capable of utilizing residues, which are waste to most mechanical recycling processes
- Small amount of bi-component fibres used in few samples
 - Enables strengthening by thermal activation



Source: VTT

Mechanical recycling

Thermal recycling

Chemical recycling

Thermoformed demos from of mechanically recycled textiles

Thermally formed sheet structures from different types of post-consumer textile fractions

- Materials: Recycled textile fibres, bi-component PET-fibres, shredded textiles and recycled plastics



Source: TurkuAMK



Compression moulding with
Hydraulic thermoforming press:
Labtech Engineering LP-S-20

Mechanical recycling

Thermal recycling

Chemical recycling



I want to thank all the project
partners participating and enabling
production of demos!

