

# RESYNTEX



**A new circular economy concept  
from textile waste towards  
chemical and textile industries feedstock**

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We are...



Institute for Environmental protection and Sensors, est. in 2006 in Maribor, Slovenia

- R&D organization, SME → innovative solutions, combine science and economy
- The solutions are environmentally friendly, sustainable, green and in the context of a circular economy
- Experience in **management and participation in R&D and demo projects** national and international consortiums.

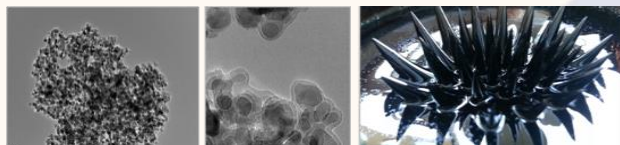
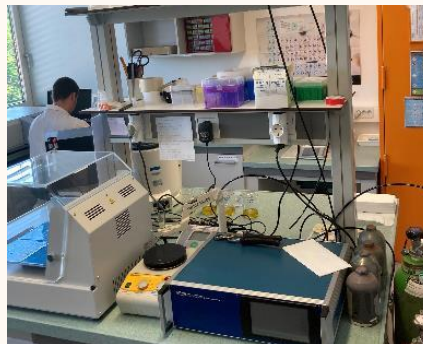
*“Creating new knowledge for designing innovative products”.*





## R&D areas

- Recycling & environmental protection
- Optical chemical sensors
- Nanomaterials



## Products

- **MBR + Waste(R)ecycling technology - Waste(R)use concept** in water treatment and recycling,
- **secondary raw materials** - chemical recycling of plastic and textile waste
- **(wearable) sensor systems** - healthy living, sensors provide (continuous) info about the environment, food and ourselves - **SmartLiving® concept**



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## EU Horizont 2020

### **RESYNTEX** – A new circular economy concept: from textile waste towards chemical and textile industries feedstock

Thematic area: WASTE-1-2014: Moving towards a circular economy through industrial symbiosis

Duration: 42 months, 2015-2019

20 partners, 10 countries

## EraMin2

### **MetRecycle:** Recycling of Rare Earth Metals using functionalized magnetic nanomaterials

Duration: 36 months, 2018-2021

5 partners: Slovenia, Sweden, Argentina, France

## Demo Piloti II

### **POLYCIRCULARITY:** Waste as a source of secondary raw materials

(POLY KROŽNOST: Odpadki kot vir sekundarnih surovin)

Duration: 33 months, 2019 – 2022

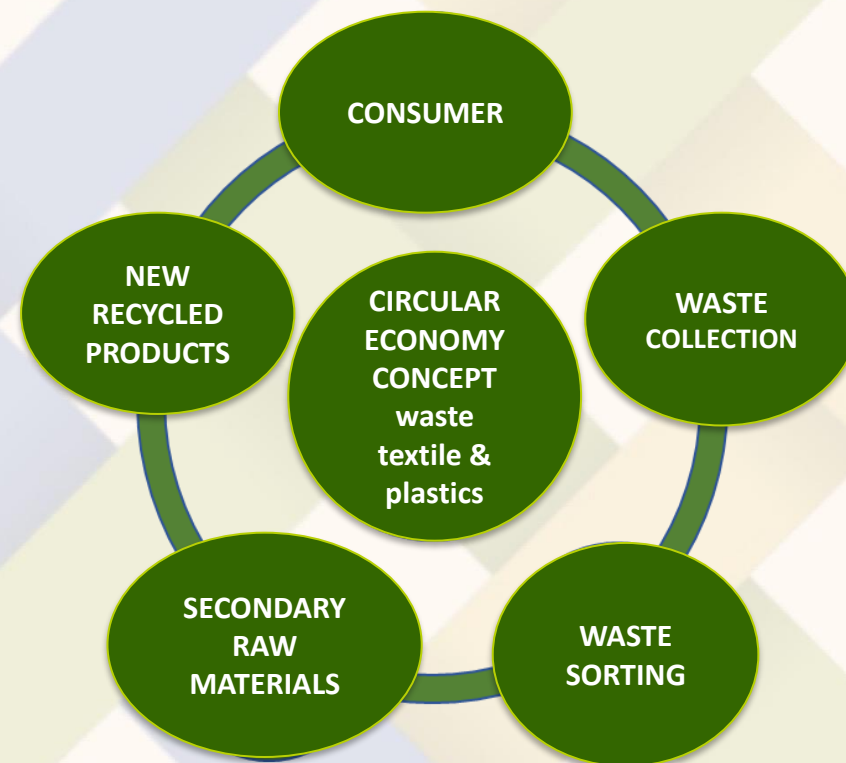
9 partners from Slovenia: Surovina, IOS, MikroPolo, Roto, Messer, Omega, EKTC, Snaga, Tekstina

## Eurostars

### **HMRecycle:** Recycling of Heavy Metals using functionalized magnetic nanomaterials

Duration: 36 months, 2019 -2022

2 partners: IOS Slovenija, Roto Hrvatska





# MixMatters – Smart and flexible Separation and Valorisation of mixed bio-waste from along the agri-food value chain

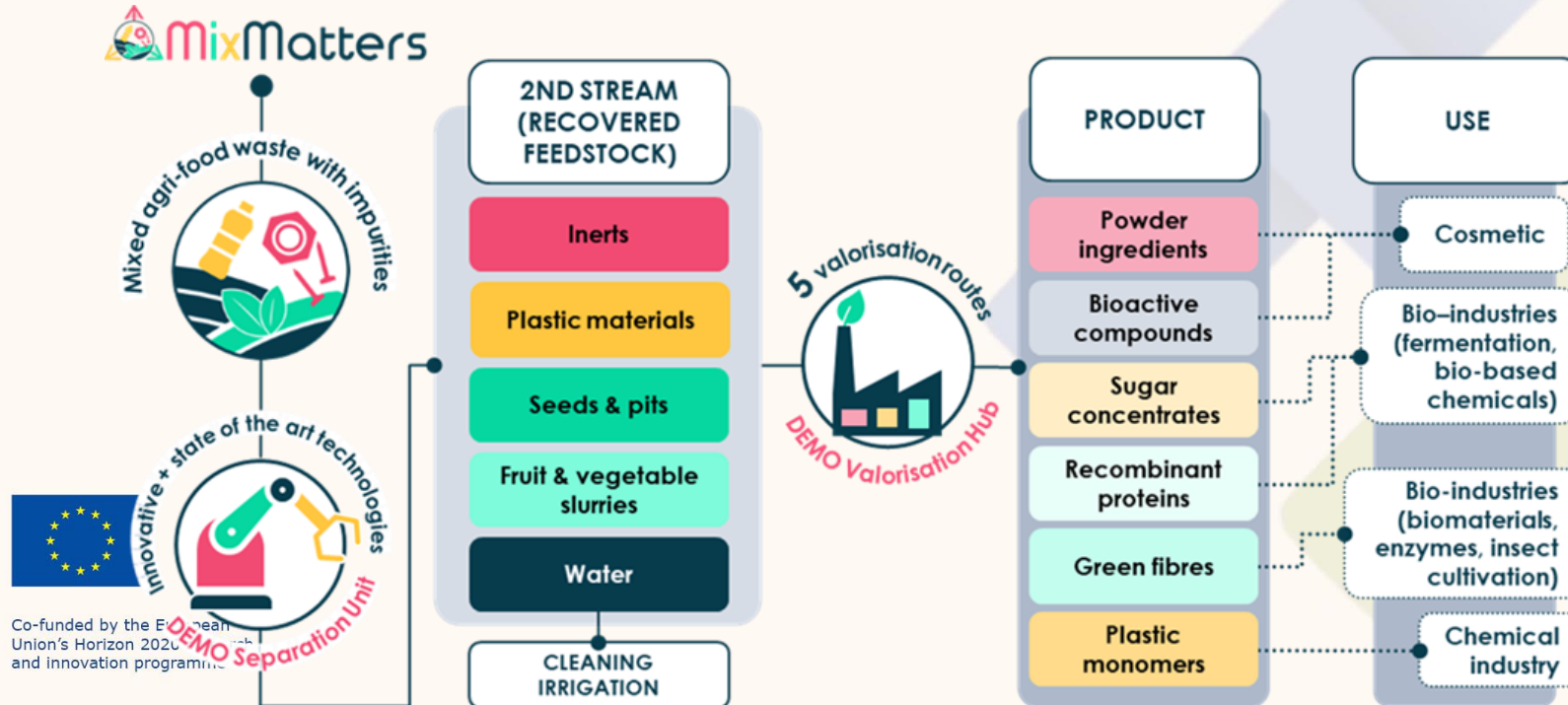
Call: HORIZON-JU-CBE-2022

Area: HORIZON-JU-CBE-2022-IA-04 Co-processing of mixed bio-based waste streams

Duration: 48 months, 1.6. 2023 – 31. 5. 2027

18 partners, 8 countries

IOS role: partner, demonstrator (degradation of packaging)



# PESCO- UP: Textile fibre recycling from mixed streams of PESCO textiles

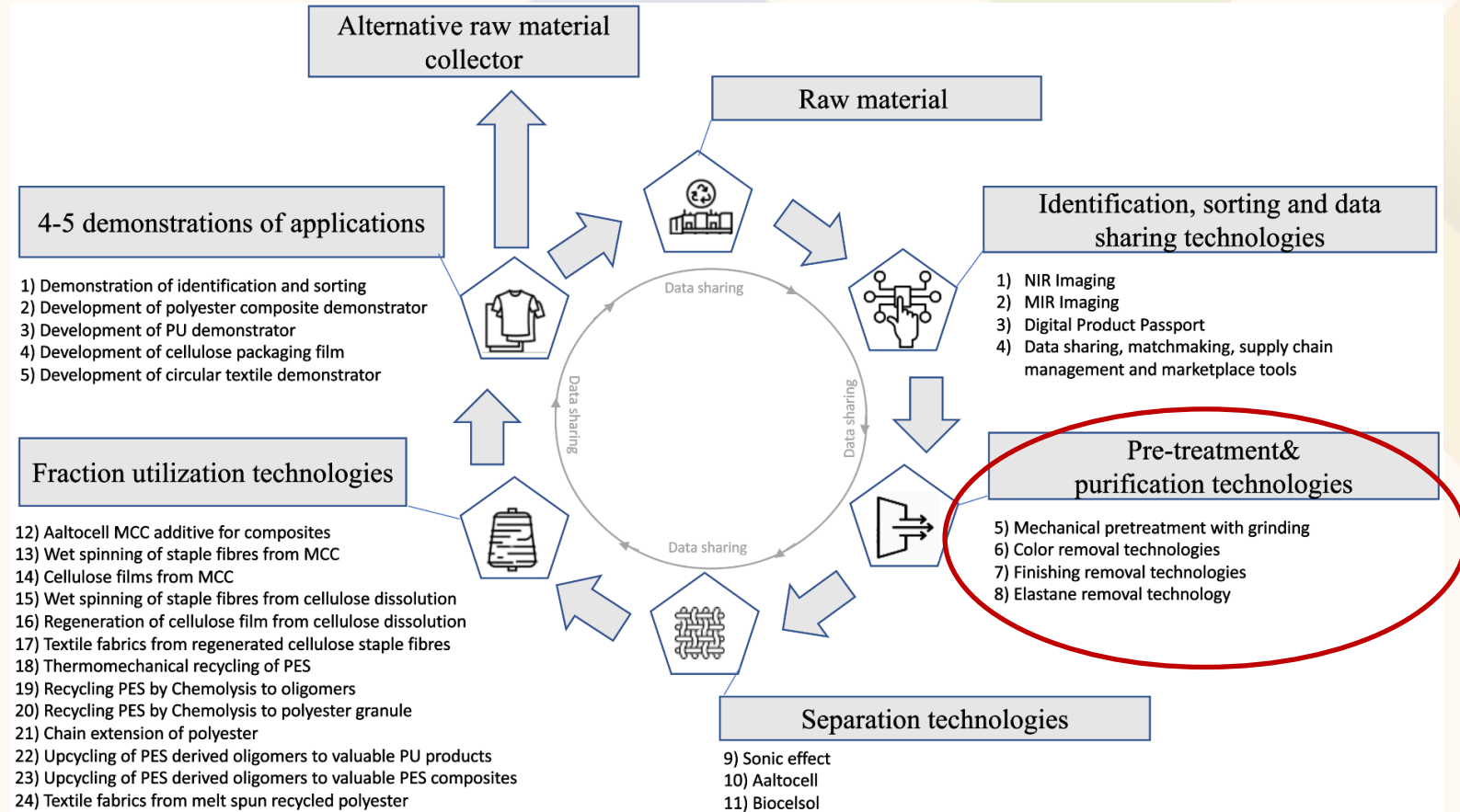
Call: **HORIZON-CL4-2023-TWIN-TRANSITION-01**

Area: HORIZON-CL4-2023-TWIN-TRANSITION-01-42: Circular economy in process industries:  
Upcycling large volumes of secondary resources (Processes4Planet partnership) (RIA)

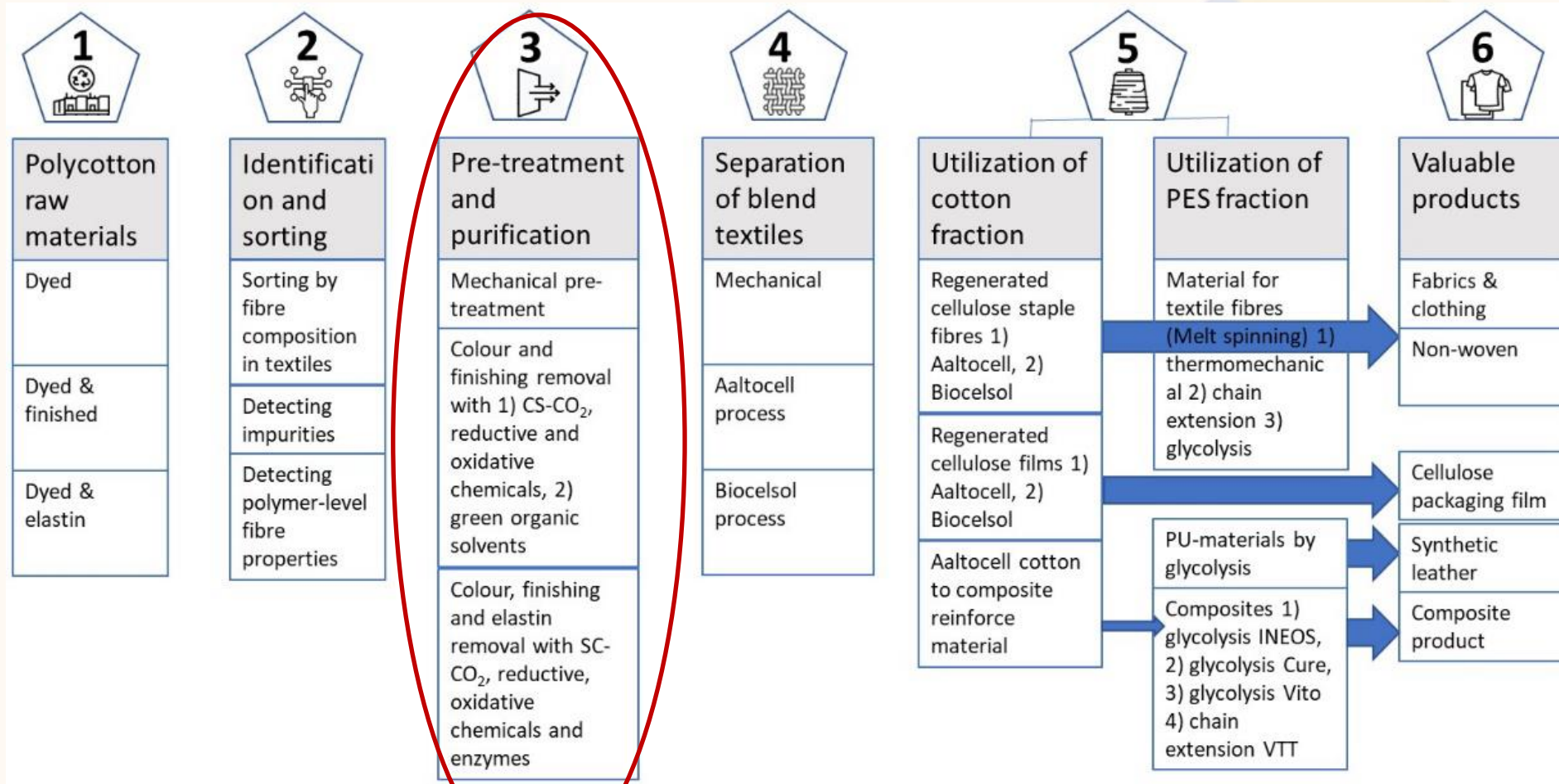
Duration: 48 months, 1.1. 2023 – 31.12. 2027

20 partners, 10 countries

**IOS role: WP leader**



# PESCO - UP: Textile fibre recycling from mixed streams of PESCO textiles

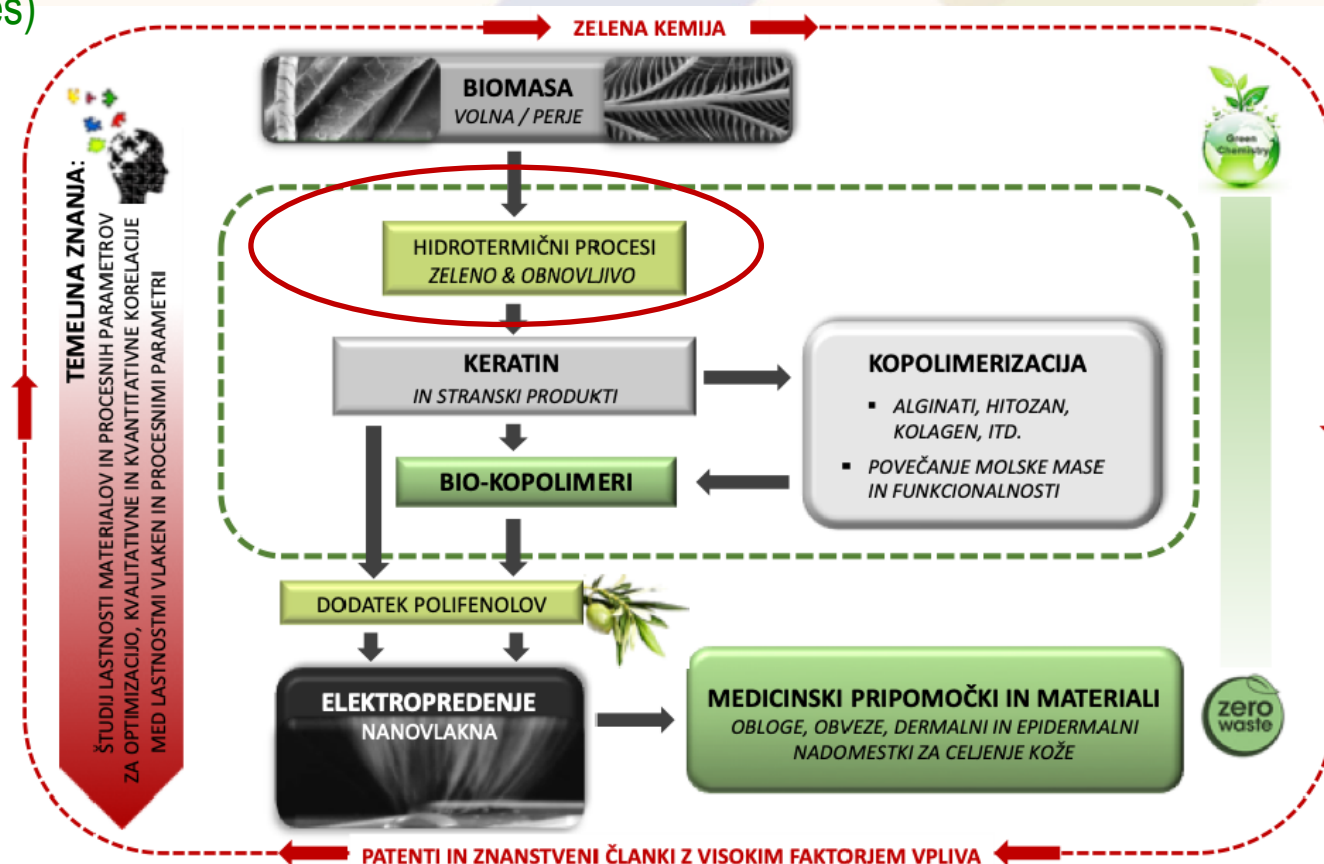




# Biomassmedtex - Advanced technological processes for the recycling of waste keratin biomass and the development of new functional keratin-based bio-products

- Call: **ARIS** (national)
- Duration: 01. 10. 2022 – 30.9. 2025
- Role IOS: partner (HT degradation of protein substrates)

**Project goal** → preparation of **bioactive nanofibrous structures of keratin**, isolated from waste wool and poultry feathers with environmentally friendly processes.



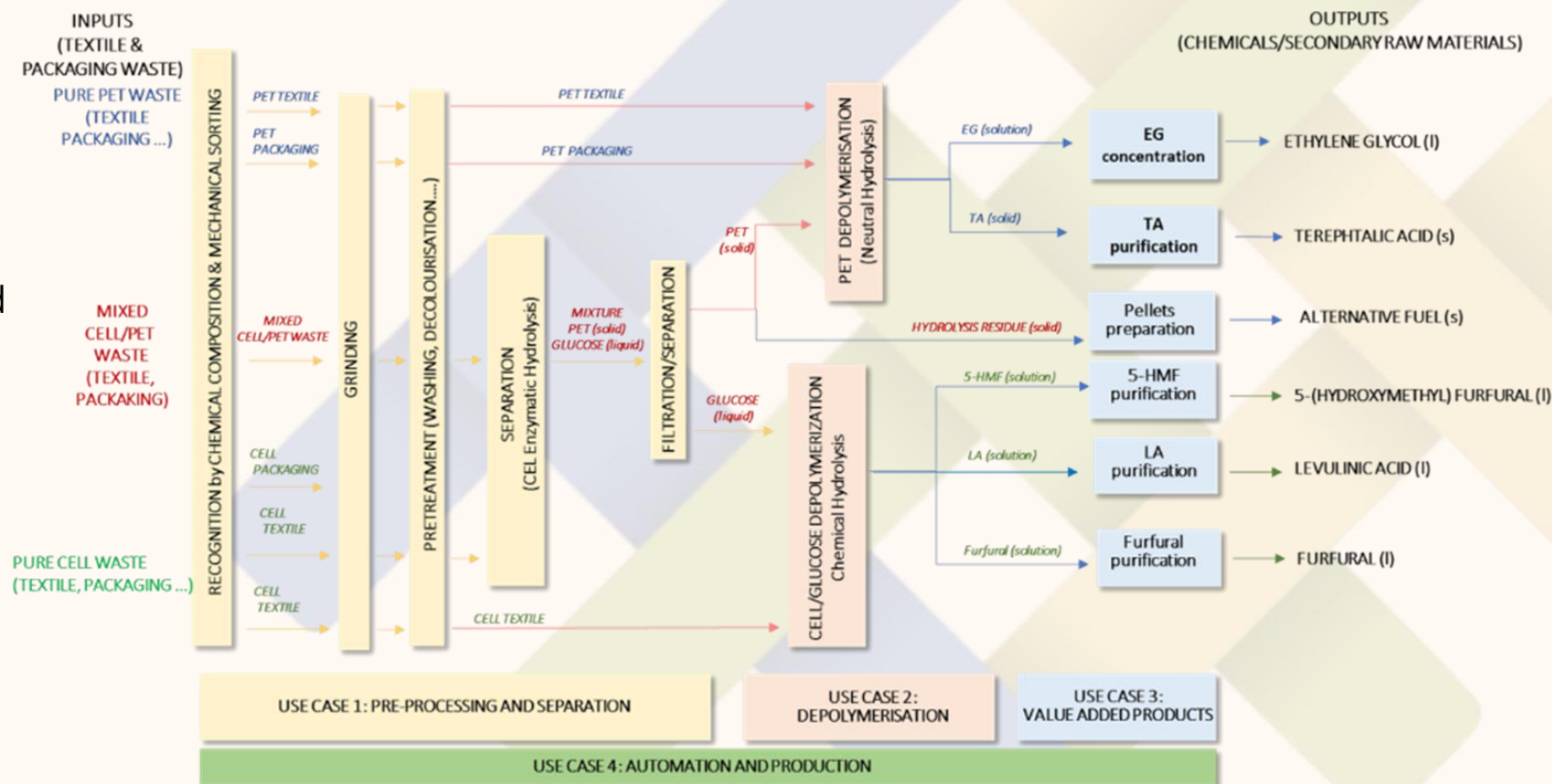


# OpenLOOP recycling technology - sustainable and profitable solution to the management of PET/cellulose waste

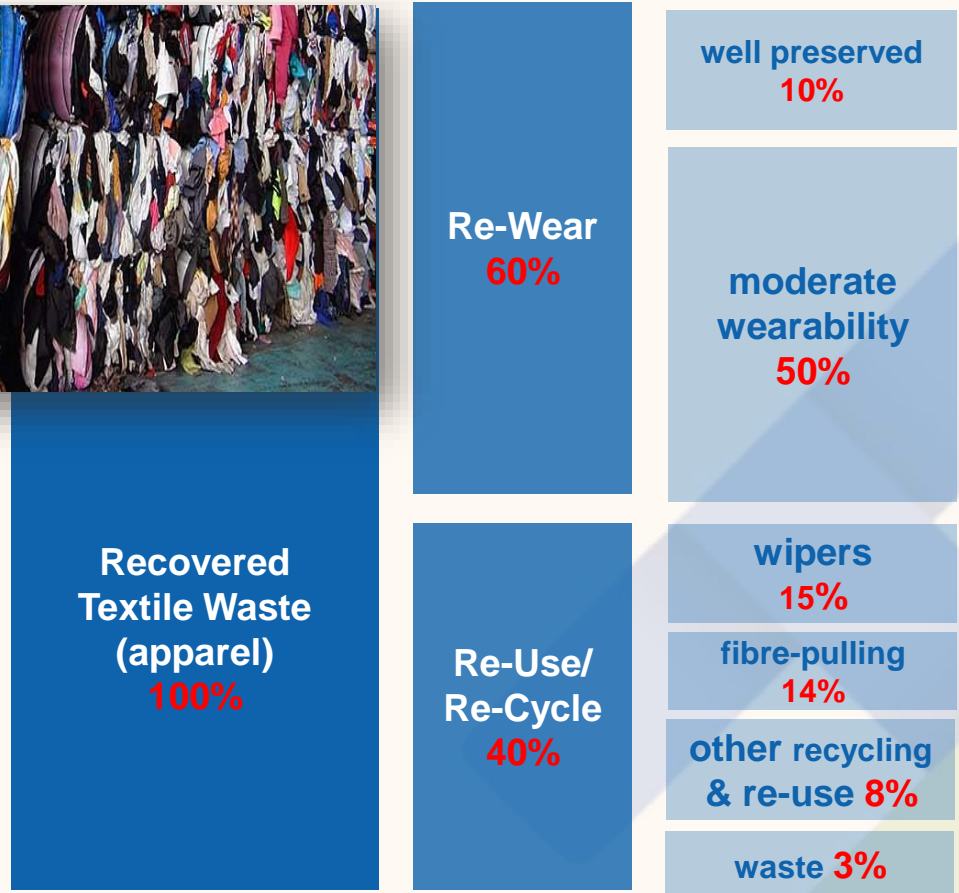
- Call: **HORIZON-EIC-2022-ACCELERATOR**
- Duration: 01. 04.2023 – 31.3. 2025 (+ equity phase)
- **Role IOS: sole partner**

**Project goal** → novel chemical recycling technology:

- to degrade any mixture of textile/plastic PET and CELLULOSE waste.
- final output yields high-value feedstock: 5-HMF, LA furfural, rTA
- environmentally friendly
- successfully implemented in industrial environment.



## Why Resyntex



Material Reutilisation



- 75 mio. t/y of textile are produced worldwide (EU 16 mio t/y)
- Less than 20 % of the overall textile waste (low-valued) flow is recycled (mechanically)
- currently ~ 60 mio. tons/y of textiles - sent to landfills or burned





## Project vision

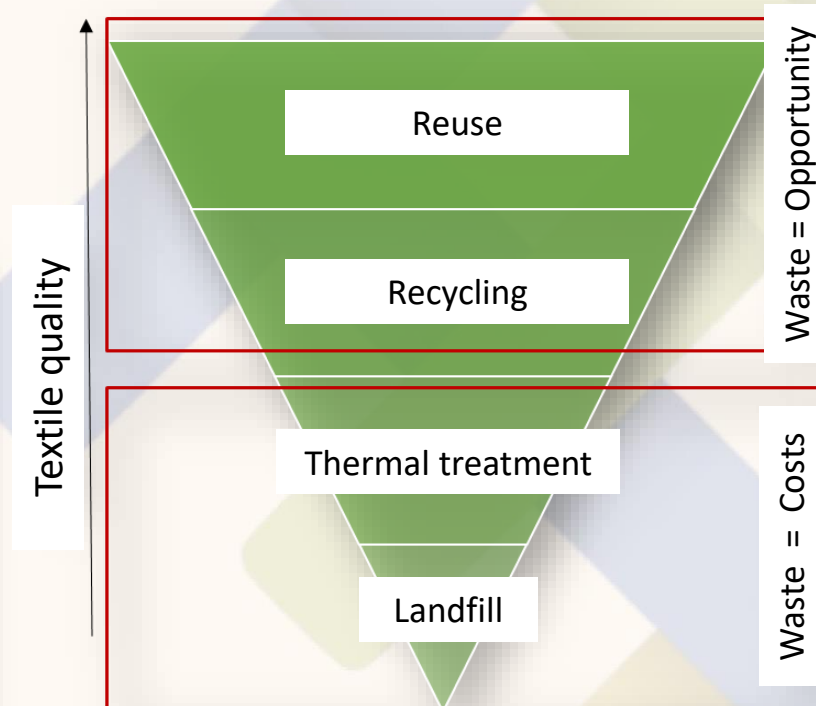
# A new value chain in the circular economy concept

- ❑ **Project goal:** to create the circular economy concept →  symbiosis between the textile and chemical industry
- ❑ Protecting the environment &  raising social awareness and responsibility  → introduction of  **the circular economy concept**
- ❑  **Aim:** usage of the  innovative recycling concept  for production of  secondary raw materials  for the chemical industry
- ❑ Textile waste  **becomes a source for the textile and chemical industries**



## Process input

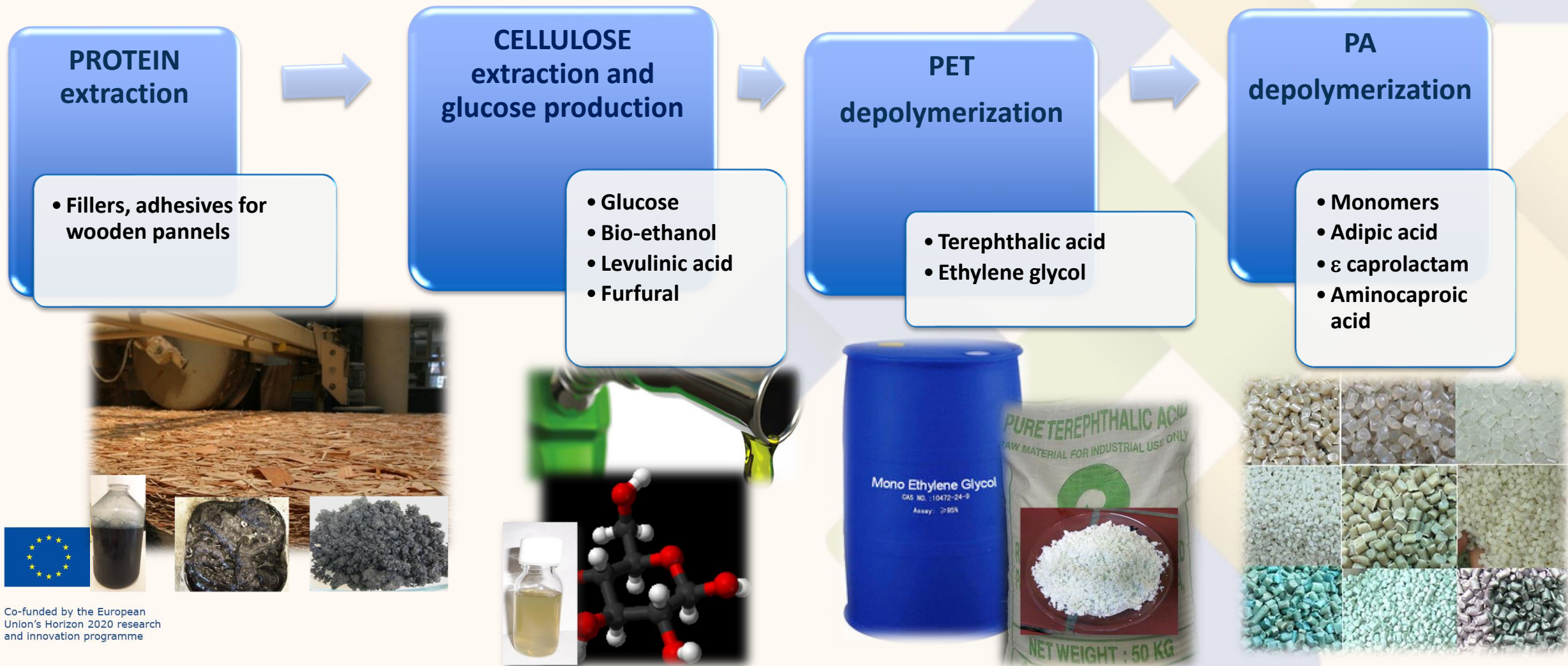
- ❑ **Waste textiles - low value raw material** for recycling in existing recycling processes (disposal, incineration without energy recovery).
- ❑ **New concept - processing of textile wastes and blends** (protein, CELL, PET in PA fibres) into **secondary raw materials** for the **chemical industry**.
- ❑ **95% of the weight of low grade waste textiles**





# Process outcomes

## □ Secondary raw materials for the chemical industry



## DEMO pilot of a capacity of 30 t/y in Maribor

- Pilot size: cca. 250 m<sup>2</sup>
- Total area (incl. storages, buffer tanks, etc.): cca. 400 m<sup>2</sup>
- Purpose:  
transformation of textile, (bio)plastic and other kind of (bio)waste to (bio)energy
- Main components:
  - **3 reactors** (discoloration reactor, synthetic hydrolysis reactor, and cellulosic hydrolysis bioreactor)
  - **extruder** (mechanical pretreatment of cellulosic and protein fibres)
  - **separation systems** (tape press filter for L/S separation, drum vacuum filter)
  - automatic **chemical dosing system**
  - **Wastewater treatment plant (WWTP)** and **WasteToEnergy plant (WtEP)**
  - feeding, mixing and storing tanks
  - pumps, pipes, instruments, equipment needed for the safe, efficient operation and control of the pilot



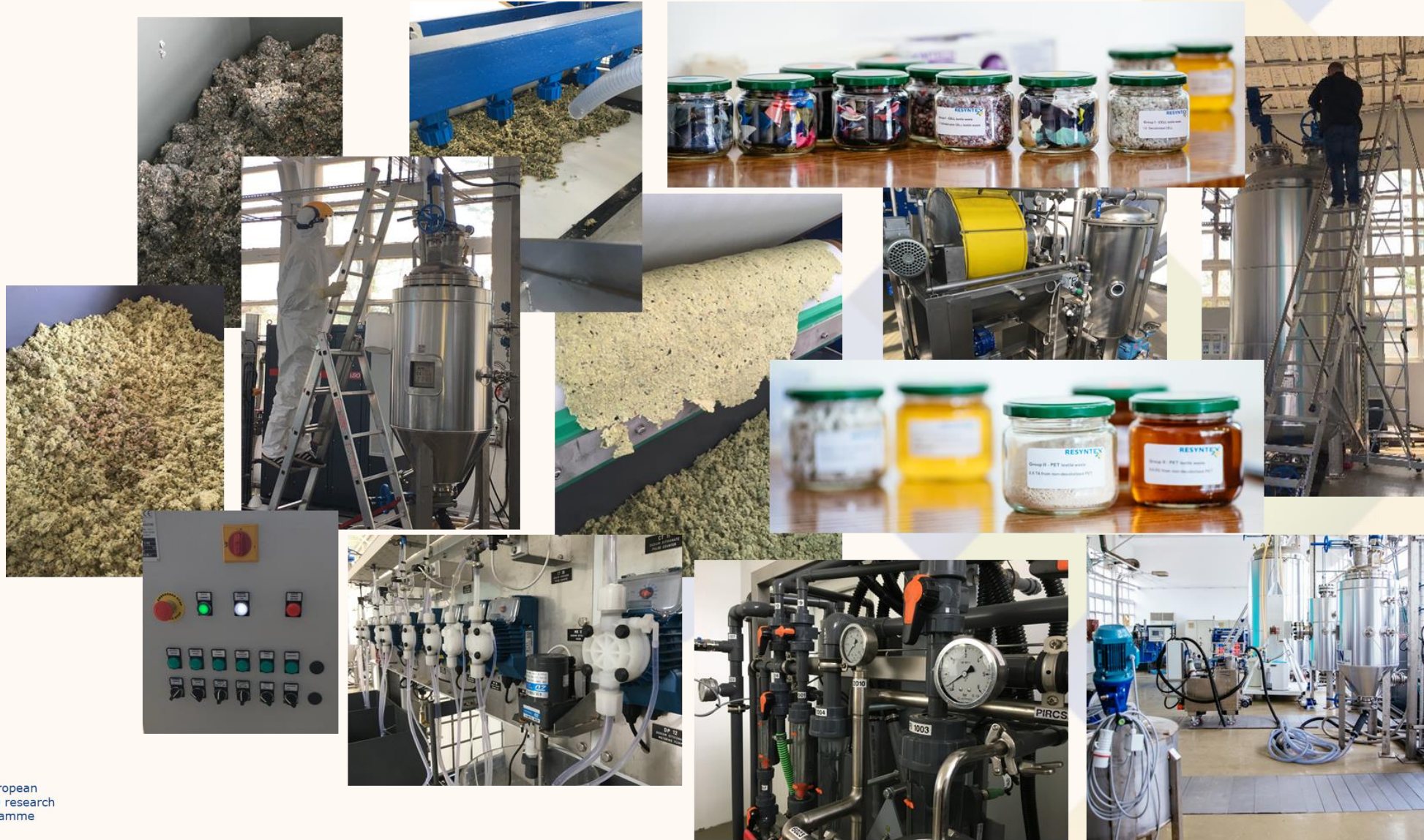


# Proces demonstration – DEMO pilot in Maribor





# Proces demonstration – DEMO pilot in Maribor





- 20 partners from 10 EU countries,  
**3 from Slovenia**
- All segments of newly established **value chain**:
  - waste collectors;
  - end-users of secondary raw materials;
  - academic, expert and consulting organizations;
  - stakeholders at the highest EU level.





## Acknowledge

RESYNTEX project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement 641942.

