Embraced

60 months

7 EU countries involved

€ 10,695,211 EU funding

13 consortium partners

10,000 tons/year amount of waste that will be reconverted into valuable material

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BIO-BASED INDUSTRIES Public-Private Partnership

Bio-based Industries Consortium

Horizon 2020
European Union Funding
for Research & Innovation

EMBRACED

Establishing a multi-purpose biorefinery for the recycling of the organic content of Absorbent Hygiene Products waste in circular economy

INNOVATIVE PROJECT SCOPE

The **EMBRACED** project intends to demonstrate in a relevant industrial environment a replicable, circular, economically viable and environmentally sustainable model of integrated biorefinery based on the valorisation of the cellulosic fraction of post-consumer Absorbent Hygiene Products (AHP) waste towards the production of biobased building blocks, polymers, and fertilizers

PROJECT APPROACH

- **CASCADING APPROACH**: all fractions from the process will be valorized to obtain marketable end-products fully competitive with the respective fossil-based counterparts or other benchmark biobased products, in terms of cost, quality and sustainability
- **CIRCULAR ECONOMY APPROACH**, closing the cycle of raw materials and minimizing the use of primary resources, through the establishment of virtuous models of cooperation among the stakeholders involved along the whole value chain

PROJECT BACKGROUND

- **AHP** waste, which is currently considered a non-recyclable fraction, contribute between **2-4% of the total Municipal Solid Waste** and to about 10% of the organic fraction
- Every year, **8,500,000 tons are disposed of in Europe and over 30,000,000 tons worldwide**
- There is a **quickly growing trend to separate and collect AHP waste in some EU Countries**; for example, **in Italy 11 million citizens** are already served by separate collection services of AHP waste
- **Fater** in the last years have **developed and patented an innovative recycling solution** for post-consumer AHP waste, already demonstrated at 1,500 t/year in Lovadina di Spresiano (TV – Italy) in cooperation with the waste operator **Contarina**.

Milestones

- Nov. '18 → Effectiveness of AHP pretreatment
- May '19 → AHP feedstock availability in Amsterdam
- → Fermentability of sugars from AHP waste cellulose
- → Fermentability of syngas to PHB production
- May '20 → Products and coproducts validation
- Nov. '20 → Integrated biorefinery in Amsterdam up and running

MAIN PROJECT OBJECTIVES

Feedstock

- Recovery of 3 high purity fractions: **cellulose** (15% of the inlet AHP waste), **plastic fraction** (7.5%) and **Super Absorbent Polymer fraction** (7.5%)
- Enhanced quality of cellulose by reducing the SAP content from 50% to 5%

Conversion of AHP waste cellulose into building blocks and polymers

- Demonstration of **enzymatic hydrolysis of AHP waste cellulose (1,000 tons/y) for the production of 2nd gen. sugars**
- Demonstration of **conversion of syngas from AHP waste into biodegradable PHB**
- **Production of 1,4 BDO up to 20,000 tons/y scale**
- **Production of biobased and biodegradable polyesters from 1,4-BDO up to 80/150 tons/day**

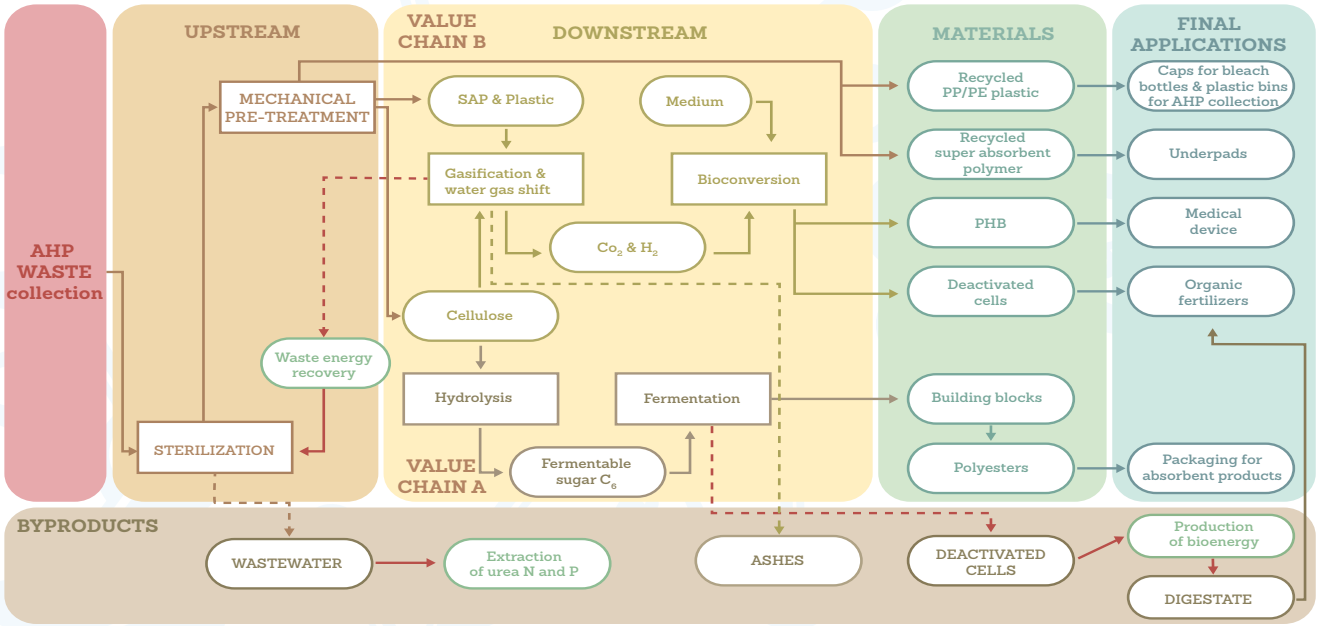
Validation into final products:

- Recycled plastic fraction into **plastic bins and caps**, deactivated cells from PHB fermentation into **organic fertilizers**, PHB into **medical devices**, biobased polyesters into **films for non-food packaging applications**, recycled SAP into innovative **absorbent underpads**

Recovery of high value molecules & production of bio-energy:

- Design of a system **for recovery of phosphate, ammonium, potassium and urea contained in wastewater** from AHP pretreatment process
- **Recovery of cells from 1,4 BDO fermentation process towards the production of biogas**

Realization of a demonstration plant of the integrated biorefinery in Amsterdam at 10,000 t/year capacity



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