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

• **Call:** H2020-WASTE-2014-two-stage
  ➢ **Topic:** WASTE-1-2014: Moving towards a circular economy through industrial symbiosis

• **Start/end date:** From 2015-06-01 to 2018-11-30

**Partners:**

![Partner Logos]
Project Case Study

1. Response to EU/ SPIRE needs
RESYNTEX supports SPIRE Key Actions:

1.2 Optimal valorisation of waste, residue streams and recycled end-of-life materials as feed (valorization of ~93% non-reusable waste textiles);
1.3 Optimal and integrated re-use of water (~60% savings via reuse, regeneration and recycle)
2.5 New energy and resource management concepts (Industrial Symbiosis between textile recycling and chemical industry)

Also through process intensification:
80% energy savings

2. The Project Solution
A cascade of integrated innovative chemical and biochemical processes is developed for the production of EtOH, polymers and high value chemicals (PET, PA), and adhesives (from proteins) using mixed waste textile feedstock

3. Value to Customers
A cascade of integrated innovative chemical and biochemical processes is developed for the production of EtOH, polymers and high value chemicals (PET, PA), and adhesives (from proteins) using mixed waste textile feedstock

4. How will this happen?
Via:

✓ New business models
✓ Technology licensing
✓ Process design technology services
✓ Support to European policies (Circular Economy Action Plan and Renewable Energy Directive)

Replace:
✓ Fossil based feedstock for packaging and fiber products by recycled TA and EG (25 and 34 mill t/y market).
✓ Fossil transportation fuels with bio-EtoH (154 billion L/y market 2020)
✓ NH3 by PA oligomers containing C and N. Example product Adipic Acid (10% demand raise in EU market)
✓ Toxic Phenol-Formaldehyde by protein based components in adhesives
# Key expected sustainability impacts of RESYNTEX

**Totally innovative process: no single process can be used as a baseline**

<table>
<thead>
<tr>
<th>Indicator (Max 3-4 key indicators)</th>
<th>Baseline</th>
<th>Expected Impact</th>
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</thead>
<tbody>
<tr>
<td><strong>Global Warming Potential (mainly CO2 emission reduction)</strong></td>
<td>2.74 to 4.54 te CO2 per tonne of PET (0.949 te CO2 per tonne of TA) 0.551 te CO2 per tonne of EtOH</td>
<td>LCA results will be reported in M40 of the project. Estimated reduction of the total average global warming potential by 1.5%.</td>
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<tr>
<td><strong>Fossil energy intensity</strong></td>
<td>Cumulative energy demand currently 81.14 MJ per kg PET 26 MJ per kg of EtOH</td>
<td>May require higher energy usage; data to be evaluated in M40 of the project</td>
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<td><strong>Total material consumption</strong></td>
<td>2.2 tonnes of water per tonne of PET produced + 2.33 tonnes of water per tonne of TA produced 6 tonnes of water per tonne of EtOH produced</td>
<td>LCA results will be reported in M40 of the project.</td>
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<tr>
<td><strong>Economic added value</strong></td>
<td></td>
<td>Rapid expansion of the textile industrial symbiosis with chemical industry will give Europe worldwide leading role in textile circular economy.</td>
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What outputs or learning from RESYNTEX

- Major Challenges and findings:
  - The removal of dyes and impurities from textiles: an open issue
  - Incentive and suggestion for the textile industry to fabricate fibres using biodegradable dyestuff
  - The use of biochemical degradation processes cannot compete in terms of efficiency the chemical processes
  - Incentive for improving enzyme activity, reduce of reaction residence times
  - Cost and energy consuming separation of products coming from blended material
  - New process synthesis, design and optimization solutions required
  - Need for public awareness and new policies
  - Broad dissemination and public engagement is required
Building the missing link in the waste textile Circular Economy!

Globally 0.1 billion tonnes
Contact

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