Sustainable Processes and Optimized Techniques for Industrially Efficient Water Usage

• SPIRE-01-2016: *Systematic approaches for resource-efficient water management systems in process industries*

• Start/end date: October 2016 – March 2020

• Partners:

EC funding (A) \(6,870,547.00\) €

Private investment (B) \(1,652,580.00\) €
Project Case Study

1. The EU/ SPIRE needs

Optimize the use of natural resources, especially water, in three industrial sectors (Dairy, Paper and Steel).

SPIRE goals: >20% reduction in water use
>30% reduction in wastewater production
>15% reduction in energy use

2. The Project Solution

Assessment of 14 existing and new separation/treatment technologies for new water management practices in the three industrial sectors.

Press filtration, flotation, ultrafiltration, reverse osmosis or deionization; Elevated Pressure Sonication, Micellar Enhanced Ultrafiltration, Biocontrol concept and Chemical Heat Pump.

3. Value to Customers

20% to 90% reduction of fresh water usage and wastewater emissions. Gains generated by the recovery of by-products.

Cost economy related to energy, chemicals and additives saving.

4. How will this happen?

Selected technologies demonstration (up to 7) in real industrial environment.

Business case scenario and market penetration strategy.

Dissemination and training activities.
What are the key expected sustainability impacts of Water Footprint?

**Baseline:** Nowadays, 12% of water utilisation in the EU is devoted to industrial use (approx. 30 billion m³/y in 2007). Dairy, Pulp and Paper and Steel processing sectors contribute respectively to 4%, 17% and 22% of fresh water utilisation by EU manufacturing industry. 60% of industrial wastewater (based on data from eight EU countries) receives treatment before being disposed of into the environment.

<table>
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<tr>
<th>Indicator</th>
<th>Baseline</th>
<th>Expected Impact</th>
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<tbody>
<tr>
<td><strong>Reduction of fresh water usage</strong></td>
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<td>• Process water recycling rate</td>
<td>Dairy industry: 1.0 to 15 m³ per m³ of milk</td>
<td>20 to 50% fresh water recycled or replaced by alternative water sources</td>
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<td></td>
<td>• Milk and Yoghurt &lt; Cheese &lt;= Whey powder</td>
<td>Unsure of impact; data to be evaluated in year 3 of the project</td>
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<td>Paper industry: 5 to 25 m³ per ton of paper</td>
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<td>• Packaging paper &lt; Sanitary paper</td>
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<td>Steel industry: 28 m³ per ton of steel</td>
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<td>• Integrated route = Electric Arc Furnace</td>
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<td><strong>Reuse of waste / substance recovery</strong></td>
<td>Dairy industry: 30 kg per m³ of milk</td>
<td>15 to 30% wastewater reduction</td>
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<td>Paper industry: 40 to 60 kg per ton of paper</td>
<td>50% to 70% valuable substance recovery</td>
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What are the key expected sustainability impacts of SpotView?

**Carbon Footprint**

Baseline: 8.4% of total CO2 emission in EU-28 are from process industries (approx. 370 million ton of CO2-eq /y in 2015*). Dairy, Pulp and Paper and Steel sectors contribute respectively to 3%, 8% and 7% of CO2 industrial emissions in EU.

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| **Global Warming Potential (mainly CO2 emission reduction)** | Dairy industry: 0.1 to 3 ton of CO2-eq /ton of milk  
- Milk and Yoghurt < Cheese < Whey powder  
Paper industry: 0.3 to 2.0 ton of CO2-eq /ton of paper  
- Packaging paper < Sanitary paper  
Steel industry: 1.9 ton of CO2-eq /ton of steel | Decreased by 20% to 30%  
Unsure of impact; data to be evaluated in year 3 of the project |
| **Fossil energy intensity*** | Dairy industry: 0.4 to 20 GJ per m3 of milk  
- Milk and Yoghurt < Cheese < Whey powder  
Paper industry: 4.0 to 20 GJ per ton of paper  
- Packaging paper < Sanitary paper  
Steel industry: 19 GJ per ton of steel | Data to be evaluated in year 3 of the project  
Recovery of **20% heat losses**  
15% increased biogas production  
Reduction in energy requirement |

*Eurostat
What are the key expected sustainability impacts of SpotView?

**Social and Economic Footprint**

**Baseline:** Dairy, Pulp and Paper and Steel processing sectors contribute together to 850,000 direct employments in EU manufacturing industry.

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<td><strong>Economic added value e.g. Annual Operating Cost of the industrial sectors</strong></td>
<td>Dairy industry: turnover 117 b€/y Paper industry: turnover 81 b€/y Steel industry: turnover 70 b€/y</td>
<td>Cost savings up to 1.5 b€ for Europe Production capacity increased, estimated at 22 b€ for Europe</td>
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<tr>
<td><strong>Market opportunities for future services and products beyond the SPOTVIEW project</strong></td>
<td></td>
<td>New equipment that will be sold in Europe: 500 to 2800 New jobs in Europe resulting from these new activities: 1170 to 6950 Generated turnover estimated: up to 1 b€</td>
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</tbody>
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*CERTH, CEPI and WorldSteel
What outputs or learning from **SpotView** Project could have value for other SPIRE projects here?

**Coming next years:**
- Deliverables will present Close loop recycling strategies and alternative water sources for the Dairy, Paper and Steel industry
- The use of process modelling and simulation tools for water management and heat recovery will facilitate the assessment of the new technology concepts
- The implemented processes and technologies will be assessed in term of environmental impacts and benefits (fresh water usage reduction, wastewater rejects, chemicals and energy use)
- Business case scenario and market penetration strategy for each technology will facilitate the exploitation of the SpotView results
- ...
Project Overview

Pilot scale processes

- Separation technologies:
  - Filtration, flotation of suspended solids (KL, AMIII)
  - Ultrafiltration of colloids (VAL)
  - Deionization (BFI, AMIII)
  - Aerobic/Anaerobic MBR (CERTH)

- Disinfection technologies:
  - Elevated Pressure sonication (SERO)
  - Biocontrol concept (XC)

Applications demonstrated in the project industrial water sources

- PAPER industry (SCA, EL, CTP, VTT)
  - Pulp and paper processes water - WWTP effluents

- STEEL industry (AMIII, BFI)
  - Steel processes water - Cooling water - Sea water

- DAIRY industry (MEV, CERTH)
  - Dairy product process effluents - Wash water - WWTP effluents

Technical & Economical benefits
Productivity / competitiveness

- New technologies development
- Valuable substance recovery
- Biogas production
- Reduced fresh water usage
- Reduced wastewater
- Reduced greenhouse gases emissions

Environmental benefits & Process sustainability

- Efluent re-use
- Heat recovery
- Reduced energy consumption
- Minimized water footprint
a new industrial partnership for water efficiency!
“the XV of Europe”
Contact

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Project website: www.spotview.eu

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