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€

SpotView

SPIRE PROJECT

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.

SpotView

SPIRE PROJECT

What are the key expected sustainability impacts of SpotView ?

Water Footprint

Baseline: Nowadays, 12% of water utilisation in the EU is devoted to industrial use (approx. 30 billion m^3/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.

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

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.

Indicator	Baseline	Expected Impact
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* • **Heat losses recovery** • **biogas production**	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.

Indicator	Baseline*	Expected Impact
Economic added value e.g. Annual Operating Cost of the industrial sectors Gains generated by the recovery of by-products and cost economy related to energy, chemicals and additives saving	Dairy industry: turnover 117 b€/y Paper industry: turnover 81 b€/y Steel industry: turnover 70 b€/y	Cost savings up to 1.5 b€ for Europe Production capacity increased, estimated at 22 b€ for Europe
Market opportunities for future services and products beyond the SPOTVIEW project		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€

*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 colloïds (*VAL*)

Deionization (*BFI, AMIII*)

Aerobic/ Anaerobic MBR (*CERTH*)

Disinfection technologies

Elevated Pressure sonication (*SERE*)

Biocontrol concept (*XC*)

Chemical Heat pump *(CAL)*

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
(MEVGAL, CERTH)

- Dairy product process effluents
- Wash water
- WWTP effluents

Technical & Economical benefits
Productivity / competitiveness

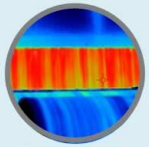
New technologies development

Valuable substance recovery

Efluent re-use

Reduced chemical usage

Biogas production



Heat recovery

Environmental benefits & Process sustainability

Reduced fresh water usage

Reduced wastewater

Minimized water foot print

Reduced energy consumption

Reduced greenhouse gases emissions

a new industrial partnership for water efficiency!

“the XV of Europe”

Spot View

Knowledge Providers

New Technologies developers

Technologies suppliers

Technologies end users

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