Integrated Control and Sensing for Sustainable Operation of Flexible Intensified Plants (CONSENS)

- SPIRE-01-2014 – Integrated Process Control
- 01/2015 – 12/2017
- EC funding: 6 Mio €
Project Case Study

1. The EU/ SPIRE needs
   - More efficient and smaller plants
   - Less use of fossil feedstocks
   - Less chemical waste
   - Flexible (& mobile) production
   - New high-quality & high-value products

2. The Project Solution
   Enable Flexible Intensified Continuous Production by:
   - Flexible control methods and novel sensors (e.g., online NMR, rheology sensor)
   - Data-based tools for optimal operation and sensor failure detection
   - Integrated process control design

3. Value to Customers
   Making processes resilient to variances in feedstocks and to external disturbances
   - Enabling the migration of batch processes to flexible intensified continuous processes
   - Enhancing fast development of new products

4. How will this happen?
   - Licensing of PAT sensor technology and software toolboxes for chemometrics
   - Commercialization of sensor(s) by Krohne
   - Services provided by atlan-tec and BAM
   - Publication of control methods and other results
Key Expected Sustainability Impacts

**Baseline:** Status of EU chemical industry in 2014, **Assumption:** migration from batch to intensified continuous plants in EU: 3% of fine chemicals & pharmaceuticals market, 30% of laundry detergents and 30% of specialty polymers (PA, PE, polyols, and TPE) – Gate to Gate assessment based on findings from F³ Factory project.

<table>
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<tr>
<th>Indicator</th>
<th>Baseline</th>
<th>Expected Impact</th>
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<tr>
<td><strong>Global Warming Potential</strong></td>
<td>Emissions of CO2-equivalents, EU chemical industry, 2014: 132,000,000 t/year ¹</td>
<td>400,000 t/year less CO2 emissions from EU production of pharmaceuticals, fine chemicals, and specialty polymers.</td>
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<td><strong>Total material consumption</strong></td>
<td>Consumption of solvents, EU economy, 2010: 5,000,000 t/a ²</td>
<td>176,000 t/year less use of solvents in pharmaceutical and fine chemical industry</td>
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<td><strong>Economic added value</strong></td>
<td>Total value added, EU chemical industry, 2014: 114,709 M€ ³</td>
<td>265 M€/year financial savings in pharmaceutical and specialty industry, production of consumer chemicals, and specialty polymers.</td>
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<td><strong>Acceleration in development of new products</strong></td>
<td>-</td>
<td>2x faster additional innovations 2x shorter times-to-markets</td>
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*Core SPIRE indicator

¹ CEFIC, ² ESIG, ³ Eurostat
Outputs and Learnings from CONSENS

• **Online NMR sensor, inline rheology sensor, and fouling sensor** can be used in “traditional” plants too.

• **Control concepts** and **data-based tools** are suitable for any continuous process.

• At low TRLs, avoid industrial case studies where you need **ATEX-certification** for your novel technology. It’s extremely time-consuming and expensive.

• **Frequent face to face meetings** with all people working on the project (not only managers!) help to bring everyone on the same page.

• Plan sufficient **budget for public workshops**. It’s more expensive than you’d think.

• Organizing **public workshops jointly with similar EU projects** increases visibility, attracts more participants, and reduces the effort for each project (and you’ll meet interesting people).

• **Risk management and contingency plans** are really important and helpful. Take your time to discuss them with your partners.
Flexible Intensified Continuous Plants will increase Competitiveness of European Process Industry

**Characteristics**
- Miniaturized equipment
- Intensified heat & mass transfer
- Possibly modular & mobile setup

**Benefits**
- Product uniformity
- Sustainability
- Fast adaption to market demand
- Innovative products

**The Vision:**
- Fast adaptation to new products
- Optimal quality from the very beginning
- Plug & Produce

Adapt quickly to increasing market demand by numbering up

Produce where and when needed

Maximum Flexibility!
Workshop
TACKLING THE FUTURE OF PLANT OPERATION – JOINTLY TOWARDS A DIGITAL PROCESS INDUSTRY

13 - 14 December 2017
Barcelona - Spain

REGISTRATION OPEN:
http://www.tfpo.talkb2b.net/

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Contact

Project coordinator email: manuel.remelhe@bayer.com

Exploitation manager email: malte.salge@invite-research.com

Project website: http://www.consens-spire.eu/