IMPROOF

• H2020-SPIRE 04-2016
• Start/end date: 01/09/2016 – 31/08/2020
The objective of the present proposal is to drastically improve the energy efficiency of steam cracking furnaces by at least 20%, and this in a cost effective way, while simultaneously reducing emissions of greenhouse gases and NO\textsubscript{x} per ton ethylene produced with at least 25%.
Project Case Study

1. The EU/ SPIRE needs
   Improve the energy efficiency of steam cracking furnaces by at least 20%, in a cost effective way, and reduce emissions.

2. The Project Solution
   Reduce coke formation on the reactor wall, through the use of advanced coil materials, combined with 3D reactor designs, improved process control, and more uniform heat transfer.

3. Value to Customers
   Improved materials
   Less expensive processes
   Less emissions

4. How will this happen?
   Modelling, tests of new materials, scaling-up
   Dissemination through partnership, customers.
What are the key expected sustainability impacts of IMPROOF?

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Baseline</th>
<th>Expected Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Warming Potential (mainly CO2 emission reduction)*</td>
<td>Currently ~2 te CO2 equivalent per tonne of product</td>
<td>Unsure of impact; data to be evaluated in yr3 of project</td>
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<tr>
<td>Fossil energy intensity*</td>
<td>Cumulative energy demand currently ... MJ per tonne of product</td>
<td>May require higher energy usage; data to be evaluated in yr3 of project</td>
</tr>
<tr>
<td>Total material consumption*</td>
<td>No critical materials used currently. 250kg of fossil materials per kg of product</td>
<td>Expect 20% reduction in non-renewable raw material usage. Current evaluation shows 10-30% likely reduction.</td>
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<tr>
<td>Economic added value e.g. Annual Operating Cost of [manufacturing plant]</td>
<td>€2 million per year</td>
<td>Expect 5% reduction in OpEx</td>
</tr>
<tr>
<td>e.g. Toxicity of Process Chemicals</td>
<td>High tox process solvents in common use</td>
<td>Eliminate use of ‘non-green’ solvents</td>
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<tr>
<td>ENERGY CONSUMPTION</td>
<td>Emissive coating emitting in the non-absorbent flue gas spectrum</td>
<td>reduction of 10% compared to state of the art</td>
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<tr>
<td></td>
<td>Enhanced heat transfer between flue gas and the process</td>
<td>reduction of 3% compared to state of the art</td>
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<tr>
<td></td>
<td>Novel radiant coil alumina forming alloy tubes that lower the coking rate</td>
<td>reduction of 3% compared to state of the art</td>
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<tr>
<td>Operating costs</td>
<td>Increase production rates</td>
<td></td>
</tr>
<tr>
<td>Reduction of emissions</td>
<td>NO\textsubscript{X} and CO\textsubscript{X} emissions</td>
<td>At least 25% of reduction</td>
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</table>

*Core SPIRE indicator
What **outputs or learning** from IMPROOF could have value for other SPIRE projects here?

- Knowledge on material emissivity
- Advanced coil materials
- 3D reactor designs

→ **What is transferable / shareable outside the project?**
  - e.g. New furnace material developed may be of use to others with high temperature process environments
  - Methodologies for process simulation and optimization
Journey to a more efficient industry – IMPROOF will guide you through!
Contact

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