# PRINTCR3DIT - Process Process Intensification through Adaptable Catalytic Reactors made by 3D Printing

- SPIRE-5: Sustainable Process Industries
- Start/end date: 1/10/2015 TO 31/9/2018

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# Project Case Study

## 1. The EU/ SPIRE needs

Transition from fossil based feedstocks to renewables. SPIRE goal: 20% less non-renewable raw material usage

## 4. How will this happen?

Creating novel knowledge in Europe that can make our industry more competitive using INDUSTRY 4.0 tools. Low TRL yet. Normative is not in place.

## 2. The Project Solution

Novel catalysts and reactor shapes that can allow different modes of process intensification to optimize environmental, efficiency and economic indicators of the plants. R&D is performed in three different cases: commodities, specialties and fine chemicals

## 3. Value to Customers

Customers will be able to buy or design their own catalyst and reactor, tailoring its final design to better adapt to their specific reactions and conditions.
We have two targets: 3D printed reactors and 3D printed catalysts / supports.

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# What are the **key expected sustainability impacts** of PRINT CR3DIT ?

| Indicator | Baseline | Expected Impact |
|---|---|---|
| **Global Warming Potential (mainly $CO_2$ emission reduction)*** | Depends on which of our three applications. | **LCA of additive manufacturing is not fully in place.** |
| **Fossil energy intensity*** | Some heat recovery is in place in large-scale production. | Increase heat recovery by 4.71 kW (maximum expected). Value generation equivalent to 0.9 M€/year. |
| **Total material consumption*** | No critical materials used currently. In our small-scale app (fine chem.), nickel catalyst used in batch is discarded after single usage. | Expect reduction in reactants due to increased selectivity, in materials for manufacture (steel) and catalyst will be reusable |
| **Economic added value e.g. Annual Operating Cost of [manufacturing plant]** | Depend on the product. | Depend on the application. Small and intermediate -scale: reduced CAPEX and OPEX. Large scale: mostly reduced CAPEX. |
| **Citizen involvement** | Attract brilliant minds to technical careers | Creation of a contest, courses of 3D printing in chemical engineering, etc |
| **Preparing industry to the future** | Keep EU leadership in strategic areas | Priceless… |

*Core SPIRE indicator

# What **outputs or learning** from PRINTCR3DIT could have value for other SPIRE projects here?

- Deliverable 1.5 is a booklet of lessons learnt in the project, implementing 3D printing in the different cases.
- We have launched a contest for high-school and universities in 2017 and will launch a similar one in 2018. Very few candidates also indicate lack of such activities at University level. Example: in which course of chemical engineering in EU we teach how to make a 3D printable file?
- We have faced difficulties to test pilots in industrial sites due to lack of normative: standards in reactor construction are made for conventional technologies.
- We will get a flavour of the possibilities of utilization of the technology in industries of different scales.
- Traditional process industries and materials companies are getting involved in the required knowledge and challenges of one of the novel tools of INDUSTRY 4.0.
- Two patent applications by now, both on shapes that can only be produced by 3D printing.

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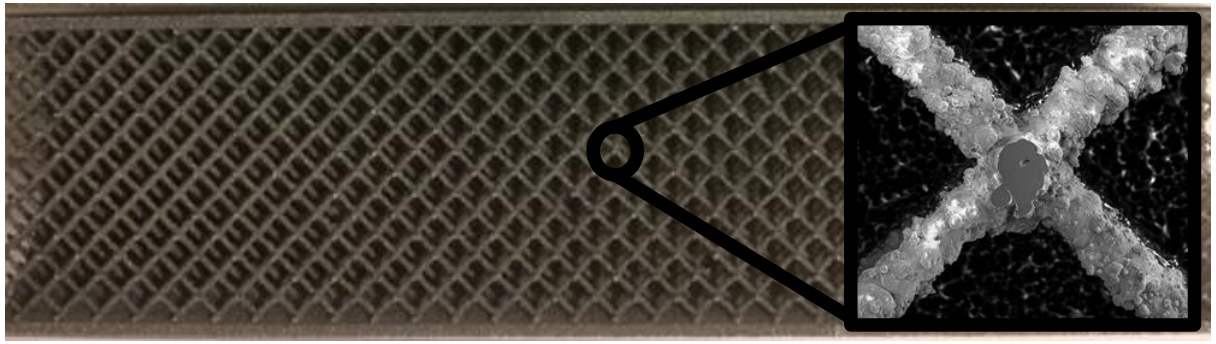
# Let's dream the reactors and catalysts of the future together!

**3D printing is slow and for small things?**

**Our demo will be 7.5 meters long.**

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