

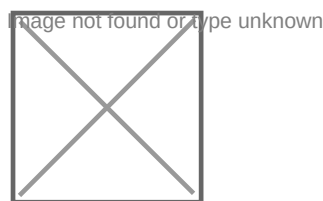
IbD - State of the art review in Process Intensification (PI) technologies related to solids handling

Project:

Intensified by Design® for the intensification of processes involving solids handling

The IbD Project has delivered the EU process industry with an affordable and comprehensive devices-and-processes design-platform endeavoured to facilitate process intensification (PI), which specially targets -but is not limited to- solid materials processing. Five PI industry case studies have been implemented in mining, ceramics, pharmaceutical, non-ferrous metals and chemical processes using the IbD approach and to validate the IbD methodologies, tools, PI modules, control and fouling remediation strategies and the ICT Platform itself for the industrial implementation of PI in processes involving solids. The Platform includes design modules for the commonest intensified reactors- Rotating fluidized beds, micro-structured reactor and spinning disk, among others, as well as a generic Module Builder -equipped with a set of both proprietary and third-parties design tools- for designs carried out on the basis of radically novel ideas. The IbD Platform output is basically a data set that comprises the intensified reactor design -ready to be built or assembled-, an optimised whole process design including the upstream/downstream intensified unit operations and their solids handling capability, as well as cleaning methods, etc. and the expected economic and environmental quantitative impacts.

Project website: <http://ibd-project.eu/> This project has received funding from the European Union's Horizon 2020 research and Innovation programme under grant agreement No **680565**



Sector:

Ceramics

found or type unknown

Chemicals

found or type unknown

Engineering

found or type unknown

Minerals

 found or type unknown

Non-ferrous metals

 Summary:

The original objectives of this project outcome can be summarized as follows:

- To prepare Built-in PI modules for a range of existing, well-known PI technologies as well as more novel, less well-studied technologies for incorporation into the IbD® Platform.
- To consider fouling mitigation and control strategies in the PI modules
- To develop a PI module designer template for incorporation of new PI designs into the IbD Platform for specific applications as defined by the IbD case studies

Theme:

[Process Intensification - SPIRE05-2015](#)

Keywords:

process intensification, solids handling, process design, digital platform

Type:

[Case study
Document](#)

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[IbD Project](#)

- A review paper describing the state-of-the-art technologies for solids handling applications has been published in August 2017. Technologies for various common processes such as crystallisation, precipitation, mixing, drying are highlighted as well as processes that are more pertinent to the IbD project such as granulation, grinding, milling and particle classification.
- Five well established PI modules, namely the RFB, SDR, MRT, OBR and the Coflore Reactor (also referred to as the Agitated Tube Reactor) and four additional novel modules (Mop-fan deduster, Tube inserts, Heat Pipe Screw Dryer, Taylor-Couette) have been characterised for coding into the IbD Platform. The key characterisation data included for each PI module are: description/geometry of technology; key design and performance models (theoretical/empirical models); areas of

application highlighted in terms of gas/liquid/solids handling; fouling and control/instrumentation considerations. In addition, a User Interface Flowchart has been developed for each technology to highlight a detailed design algorithm in order to facilitate coding of the module in the IbD Platform.

- The PI module design template has been designed based on the common information present in each of the existing PI module backlogs highlighted above. There is also a greater focus on inclusion of solids handling data. This template will be used to code an additional six case-study related PI modules (Elbow Jet Classifier, High Shear Mixer Granulator, Flash Floatation unit, Twin Screw Granulator, Torbed, Coflore) as part of WP6.
- Process monitoring and control requirements for the built-in and novel PI modules were evaluated in co-operation with PI experts and control experts. As a result, qualitative information about important variables and their interactions to be considered in preliminary control design, taking place in an integrated manner with the process design, was established.
- Input tables for fouling functionalities in the IbD® platform for built-in PI modules (RTB, SD, MRT and MAT) and novel PI modules (Mop fan, Heat pipe screw dryer, Tube inserts and Taylor-Couette reactor) have been prepared. These input tables provide information on key features of technologies for fouling prevention/reduction, important parameters that affects fouling, possible remedies and relevant references.

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