Automated Process Development & Miniature Modular Manufacturing

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SusChem Brokerage Event
October 23th 2018

- ***Project name:*** Automated Process Development & Miniature Modular Manufacturing

- ***Institution:*** Chemical and Bioprocess Engineering, University College Dublin, Ireland.
- ***Research Group:*** Advanced Pharmaceutical Process Engineering Group
- ***Academic Lead:*** Assist. Prof. Steven Ferguson

- ***Project Objectives:***

1. Enable automation of chemical process development,

2. Wide ranging impact in chemical processes and production of drugs/ fine chemicals,

3. Enable modular deployment of manufacturing capacity at ultra-low capital cost through intensified continuous flow processes in 3-D printed process equipment.

Technical Challenges addressed by the project:

- 3D-printed process equipment & automated experimental platforms (Flow Reactors, Continuous Separations, Unit Operations),
- Process Simulation (CFD, Mechanistic & Statistical Process & AI/ Machine learning algorithms),
- Integrated automated recursive computational and empirical experimental platforms,
- Translation of data rich automated experiments to manufacturing processes and lines through virtual plant approach,
- High intensity multistep, flow chemistry-based, syntheses with complementary continuous separation operations.

- ***Innovativeness:***

- Advances in automation, in-line analytics, additive manufacturing, new unit operations, new work-up and separation operations. Integration with cutting edge telescoped multistep flow synthesis & application of automated decision making and AI to synthetic chemical processes.

- Potentially allowing a paradigm shift in the development and supply of high value chemicals in Industry and Academia. Accelerating the pace of development of industries and fields utilizing advanced chemical products and technologies.

- ***Current partnerships:***

- Pfizer R&D & Global Supply (US/Ireland), BMS Biotech (MS&T, Process R&D), Merck Research Labs (US) & Elli Lilly (Ireland)

- Irish National Synthesis and Pharmaceutical Research Centre (SSPC); Irish Research Institutions & major MNSs (pharmaceuticals)

- Leading Chemical/Bioprocess research in Irish National Digital/Additive Manufacturing research Centre (I-form); recently launched partnership of additive & digital manufacturing SMEs, MNCs and Research Institutes

- ***Partners sought:***

- Academic institutions, pharmaceutical and fine chemical companies (flow chemistry, analytics, separations, downstream processing, control, AI, reactor design and additive manufacturing)

**The UCD PI (S. Ferguson): interested in integrating to SusChem ETP and the advanced manufacturing research community, transitioning from the US (MIT, Biogen) to Europe.*

- ***Project budget:***

- Large multi-party industry (SME, multinational fine chemical/pharmaceutical company) and multicentre academic collaboration: ideal mechanism to bring this project forward in its totality (5+ M euros)
- Smaller targeted projects looking at solving individual technological challenges are also sought.

- ***Targeted grant schemes***

Establish or join consortium to develop individual technologies or demonstration pilot/manufacturing lines or experimental platforms. Potential schemes:

DT-FOF-08-2019: Pilot lines for modular factories (IA 50%),

DT-SPIRE-06-2019: Digital technologies for improved performance in cognitive production plants (IA),

CE-SPIRE-04-2019: Efficient integrated downstream processes (IA).