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Substrates adoption methodology (SAM) to achieve "Fast, Flexible, Future (F^3)[1]" pharmaceutical production processes

Ravendra Singh[1], Raquel Rozada-Sanchez[2], Tim Wrate[2], Frans Muller[2], Krist V. Gernaey[1], Rafiqul Gani[1], John M. Woodley[1]

[1]Department of Chemical and Biochemical Engineering, Technical University of Denmark, DK-2800 Lyngby, Denmark

[2]AstraZeneca Limited, Charter Way, Silk Road Business Park, Macclesfield, Cheshire SK10 2NA, UK

There is a significant cost associated with process development of a portfolio of pharmaceutical products, few of which will reach the market. Continuous processing will increase the "chemical space" which can increase development efficiency. For example one, particularly attractive option is to develop manufacturing processes based on modular continuous systems; a flexible generic continuous modular plant which can be adapted for different substrates.

In the work reported here, a substrates adoption methodology (SAM) has been developed. The proposed SAM identifies the necessary changes to a *template* recipe & flowsheet in order to adapt it for a given substrate. The changes can be related to reagents (e.g. reducing agent, solvent, catalyst), process conditions (e.g. operating temperature, flow rates), as well as in the physical arrangement (configuration) of the modular process equipment within the template. In this way the substrates adoption methodology helps to achieve "fast, flexible, future (F^3)" pharmaceutical production processes by adapting a recently designed generic modular process-plant. The supporting tools for the substrate adoption are: (1) an ontological knowledge-base consisting of the properties of substances, reaction characteristics and characteristics of unit operations; and (2) a model library consisting of the mathematical models.

The objective of this presentation is two-fold: First to highlight the substrates adoption framework and the associated models, methods and tools, and second to demonstrate its applications using a pharmaceutical manufacturing case study involving the nitro reduction of 2-Nitro-4'-chlorodiphenylamine.

[1] F3 Factory project, European Community's 7th Framework Program under grant agreement n° 228867 http://www.f3factory.com/scripts/pages/en/home.php