IFPRI Project Abstract

Model Assisted Design of Granular Products: Linking Process and Product Models for Wet Granulation

Rachel Smith
The University of Sheffield
Project Start Date: 1st October, 2019
Abstract Date: 25th May, 2022

Project Objective:

The objective of this project is to develop multi-dimensional process models of binder agglomeration that have as their output the appropriate particle properties (likely distributed) that are linked to associated product models to predict product performance. The project scope is constrained to high-shear and/or fluid bed granulation, however the choice of formulation(s) and modeling approach(es) are open.

Approach:

The aim of this research project is to develop a modeling framework for product performance driven process design which is deployable to industry, and demonstrate the potential of this strategy with two case studies: fluidised bed spray granulation and high shear granulation. This will involve the development and linking of population balance models for fluidised bed and high shear granulation with a mechanistically-based product model.

Recent Results:

The project started in October 2019. Since the previous annual meeting presentation, the following key progress has been made:

- The previously developed coupled single-particle model and population balance model for granule disintegration has been further developed and refined, to better incorporate essential physics, and to resolve issues with numerical stability of the model.
- Preliminary sensitivity analysis of the improved model has been performed, and the model is performing as expected in response to changes in granule size, porosity, and primary particle size and absorbance capacity.
- An experimental strategy for model validation has been developed in conjunction with the University of Strathclyde, to verify and validate the granule dispersion model.

Next Steps:

In the next year, focus will be placed on performing a global sensitivity analysis of the coupled single particle – PBM model, and on implementing the experimental strategy to verify and validate the models. The product model will then be linked with our existing high shear wet granulation model. Finally, we will commence the validation of the linked process-product model.