



IFPRI BRIEF TEMPLATE

Check One: **Project** **Review** **Collaboration**
 Workshop **Other**

Descriptive Title	Control of particle formation with big data approach
Working Title¹	Machine Learning process control
Technical Area²	SE
Date	June 13, 2023
Short Description	<p>Inline sensing technology is crucial in particulate processing as it enables real-time monitoring of the product quality and production efficiency. This technology can be integrated into the process to detect any deviation from the desired quality parameters and provide timely feedback to the control system, prompting necessary adjustments to maintain product consistency and quality.</p> <p>However, industrial processes measure e.g. P, T, feed flow etc. every second, versus hourly product performance check (often manually by an operator). Currently this way of working makes it not suitable to integrate these data in ML.</p> <p>The integration of big data and machine learning in particulate processing can help in optimizing the process parameters for maximum efficiency. By analyzing large amounts of data from various sources, machine learning algorithms can identify the most effective process parameters, predict product quality, and optimize the process to achieve maximum output.</p> <p>Equipment needed for inline sensors and Cauty may be able to offer help. How do treat and manipulate the reams of data, esp. when sampling frequency is highly different between sensors? Using existing sensors, new inline sensors and output data and linking together with the process. Review on PAT may be a good input</p> <p>This will go being the already implemented model predictive control, where the model needs to be trained a priori. A ML approach would not need training.</p>
Objectives	<ul style="list-style-type: none"> ● Reduce variability of product properties by using ML ● Show the improvement potential by replacing infrequent manual sampling and measuring by in-line product properties (e.g. particle size, porosity,

¹ Title used in meeting agendas and file archives

² One or more from the following list: W = wet systems; D = dry systems; F = particle formation; SR = size reduction; M = modeling; SE = systems engineering

	<ul style="list-style-type: none"> • Define which data/sensors (and their properties like measurement frequency) are needed that feed into ML plant control. • A ML approach that can keep product properties constant when process or inlet conditions vary.
Scope	Complex multiphase continuous process (can be e.g. extrusion, spray granulation, spray drying, compaction/tabletting and may be more than 1 unity operation in series). PI to generate own big data with pilot plant equipment.

Recommended Contractors (2 or 3)		
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