Master's Thesis

on the topic of:

„Prediction of Product Parameters in Spray Drying Using Physics-Informed Neural Networks"

Motivation

Spray drying is an established process for manufacturing powdered products from liquid raw materials. Although the basic process control of a spray dryer is considered robust, reliably predicting process and product parameters, especially for new products or plant configurations, proves challenging. Previous attempts to predict product parameters using machine learning (ML) have shown that accurate predictions are possible with a sufficient data basis. However, extrapolation to process states outside the available data space remains a key challenge.
Physics-Informed Neural Networks (PINNs) offer a promising approach here. These models integrate physical laws directly into the learning process, enabling predictions that are not only data-driven but also physically consistent.

Objectives

The main objective of this thesis is to develop and implement an ML pipeline for physics-informed neural networks and to test it using the product parameters residual moisture and sauter mean diameter (d3.2).
As part of this work, an existing data and modeling pipeline for spray dryer data from a previous master's thesis will be expanded and adapted. The developed models will be validated using existing measurement data. Finally, a systematic comparison of the predictive quality of different PINN architectures with conventional, data-driven ML methods will be carried out.

We offer

- **Innovative work in the field of food processing digitization**
- **Innovative research in the field of ML and spray drying**
- **Excellent working environment and close supervision**

Contact

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