

Empirical modeling for spray drying process of sticky and non-sticky products.

Abstract

Spray drying is a common drying technique in food industries to convert liquid to powder form. A good understanding on the dynamic behavior of the process is important to ensure proper control. The aim of this study is to develop empirical models for spray drying of whole milk powder and orange juice powder using a nozzle atomizer spray dryer. Maltodextrin was used as the drying agent material in spray drying of orange juice powder as it is considered as sticky powder. A preliminary study on the effect of several inputs such as inlet air temperature, feed flow rate and maltodextrin concentration on the product quality was studied. The selection of suitable inputs is important to ensure the desired quality of final products (moisture content). It was found that inlet air temperature gave more significant effect on outlet air temperature and powder moisture compared to other two inputs. Inlet air temperature and outlet temperature were selected as the manipulated variable and controlled variables respectively. Empirical models were developed by applying step change in the inlet air temperature. For spray drying of orange juice powder, its response was faster to achieve steady state because maltodextrin inhibited sticky behaviour. Both empirical models can be represented by first order plus time delay (FOPTD) and valid because $R^2 \geq 0.6$.

Keyword: Spray drying