

Nonlinear model-based inferential control of moisture content of spray dried coconut milk

ABSTRACT

The moisture content of a powder is a parameter crucial to be controlled in order to produce stable products with a long shelf life. Inferential control is the best solution to control the moisture content due to difficulty in measuring this variable online. In this study, fundamental and empirical approaches were used in designing the nonlinear model-based inferential control of moisture content of coconut milk powder that was produced from co-current spray dryer. A one-dimensional model with integration of reaction engineering approach (REA) model was used to represent the dynamic of the spray drying process. The empirical approach, i.e., nonlinear autoregressive with exogenous input (NARX) and neural network, was used to allow fast and accurate prediction of output response in inferential control. Minimal offset (<0.0003 kg/kg) of the responses at various set points indicate high accuracy of the neural network estimator. The nonlinear model-based inferential control was able to provide stable control response at wider process operating conditions and acceptable disturbance rejection. Nevertheless, the performance of the controller depends on the tuning rules used.

Keyword: Inferential control; Spray drying; One-dimensional; NARX; Neural network; Moisture content; Coconut milk powder