Maximising Capacity and Yield of an Industrial Milk Spray Dryer Through Improved System Tuning and Control

J. Neale¹, M. Atkins¹, T. Walmsley¹, M. Walmsley¹

¹University of Waikato, New Zealand

Abstract

Modern industrial milk spray dryers typically employ an open loop multistage drying approach; utilising a main dryer chamber, along with multiple static and vibrating fluidised beds. The airflow into each drying stage can have individually tuned temperature, humidity and mass flow rates that can be tuned to provide the optimum drying kinetics for any given product specification. The dynamic response of the total dryer system is directly governed by the interaction between the multiple inlet and exhaust fans that are connected in both series and parallel. With common inlet filtration and exhaust systems it is quite common to encounter low frequency oscillations in airflows across the multiple stages of the dryer, which in turn can induce corresponding oscillations in the thermal balance and performance of the dryer itself.

Using several industrial case studies this paper will highlight the change in dryer performance as the airflow streams are tuned and balanced correctly. Starting with an assessment of the transient oscillations in critical process variables individual control loops are tuned and balanced, followed by an overall balancing of the dryer itself. Through the systematic control of the coupled air streams and careful balancing of the relevant heat exchanger loads, the level of oscillation in critical process control parameters is minimised, which has then resulted in improved product quality and yield, and realised increased plant capacity.