434b Optimization of a Fluid Bed Dryer by Implementation of a Model Predictive Controller

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In 1994 Anchor Products, Inc. implemented MPC software in their evaporators for a milk powder plant. As a result of implementing a predictive controller they have reduce variability in concentrate density up to 70%, the evaporators are reaching the desire target 95% faster for density control and they have minimized energy consumption and improved product quality. Up to date the evaporators have increased their capacity up to 7 to 8%.

The drying process is composed of four steps. Of those four steps, only two are of most concern: constant rate and falling rate. By understanding the dynamic of the drying curve we can create a model that describes the drying process in a fluid bed dryer, and, consequently, try to optimize the process. Through the work of Magaly Arocho, we can develop a model that describes these portions of the drying curve, where mass and heat transfer were one of the key factors, and model the curve.

The simulation of the drying process optimization was separated into two parts: modeling of the drying curve and developing the MPC algorithm. Using basic energy and material balance we can describe the drying curve and use the model to determine the parameters necessary to design the MPC controller. The simulation shows that by implementing an MPC controller we get to the desired set point in half the time as to working at the fluid bed dryer's maximum settings, plus consuming less energy.