

# MODEL BASED PREVENTION OF POWDER BUILD-UP IN SPRAY DRIERS

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## ABSTRACT

*In the past, powdered dairy products, such as skim milk and whole milk powder were relatively easy to dry. However, more and more specialty products are developed, such as infant food products and whey derivatives, which are much more sticky from nature. Because of this stickiness, the risk on powder build-up inside a spray dryer increases, resulting in shorter runtimes and more cleaning cycles, resulting in a higher energy and chemical consumption. In addition, lumps of powder can start to smoulder and thereby acting as a source of ignition. Therefore, it is important to avoid powder build-up inside spray dryers.*

*NIZO has developed a software platform, NIZO Premia, which allows modeling of process-product interactions. Within NIZO Premia, a dedicated model has been developed to describe spray drying processes, called DrySpec3. DrySpec3 requires two product properties as an input. First of all, the sorption isotherm, which describes the equilibrium moisture content at a fixed relative humidity and temperature needs to be measured. Secondly, the stickiness curve, which describes the relative humidity at which a powder gets sticky at a fixed temperature, needs to be determined. DrySpec3 applied a near-equilibrium model to calculated process conditions. Therefore, it needs to be calibrated once, using known process properties, to determine how far off-equilibrium conditions a spray dryer is running. After calibration, mass and heat balances can be solved for different process conditions. Using the calculated process conditions, it can be determined in a stickiness plot, based on outlet conditions, whether the dryer is running in a “sticky region” or not.*

*DrySpec3 has been improved recently to allow online interpretation of process conditions. An OPC server needs to be coupled to the PLC system from the dryer. The OPC server can retrieve data from the PLC and send these to DrySpec3. The DrySpec3 model allows determination of the stickiness conditions and online visualization of these data. This way, operators can see real-life whether the dryer is operating with “safe” conditions and whether the maximum capacity has been reached.*