

# Micro Motion® Coriolis Meter Improves Efficiency of Spray Drying in Powdered Milk Processing

## BENEFITS

- Reduced downtime due to plugged nozzles
- Eliminated shutdown costs of \$5,000 per truckload
- Improved final product quality and consistency



## APPLICATION

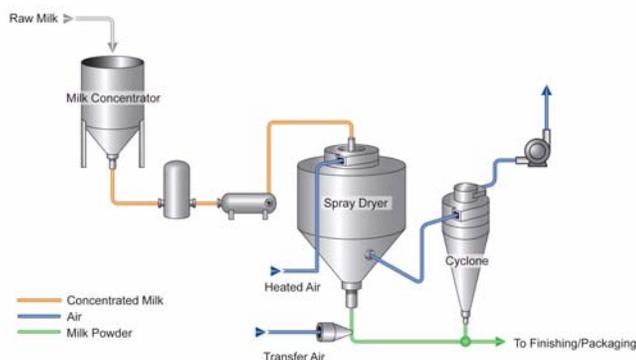
A large dairy manufacturer in New Mexico produces powdered milk. By removing water from the milk, the shelf life of the product can span from six months to three years, depending on the fat content of the final product produced. In addition, shipping and storage costs can be greatly reduced due to the huge reduction in the dehydrated product's volume and weight. Powdered milk can be recombined easily into consumable liquid milk by simply adding water and it is often used as an ingredient in many processed foods such as baked goods, baby foods and chocolate.

The process of making powdered milk is usually done in two stages. In the first stage, raw milk is concentrated by evaporating off water with heat under a vacuum. This concentrated milk, with approximately 48% solids content, is then pumped to a spray drying unit where it is atomized and sprayed into a heated drying chamber. As the mist of concentrated milk enters this chamber, a rapidly moving stream of hot air instantly causes the water in the droplets to evaporate out the top of the chamber while dried milk powder, with a moisture content of between 1.5 - 5.0%, falls to the bottom where it is collected and further refined before packaging.

## CHALLENGE

The efficiency of the spray dryer is dependent on two critical process variables: the concentration of the milk entering the dryer and the flow/temperature of the heated air entering the chamber. If the concentrated milk contains too much water, the final product will not meet minimum moisture specifications. If the concentrated milk

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*Milk spraying process*



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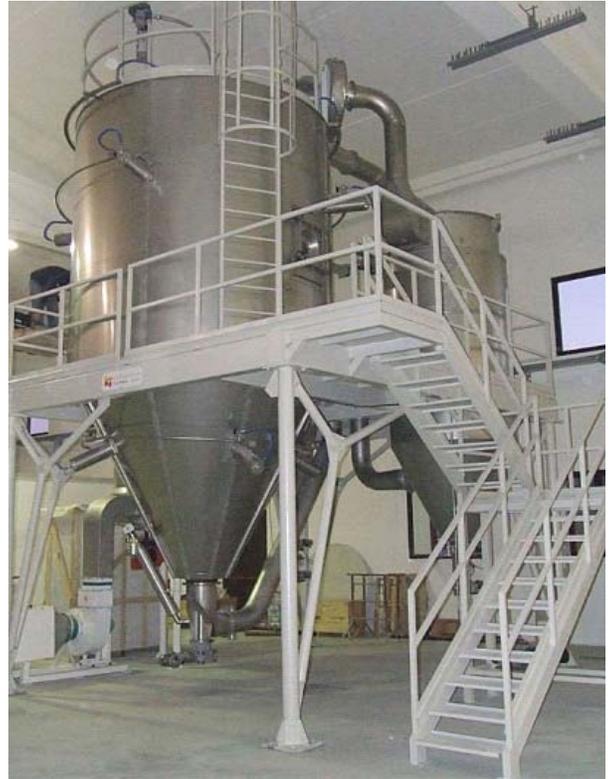
contains too little water, the atomizers can plug, shutting down production or final product quality can be compromised as the product is overheated, which impacts its flavor, aroma and solubility.

Historically, spray drying operators took periodic samples to monitor the concentration of milk entering the spray dryer. Evaporation control would be adjusted if the percent solids varied outside of desired parameters. The lack of real-time control often resulted in out-of-spec concentrate going to the spray dryer, thus causing pluggage and product quality issues noted previously.

The dairy manufacturer in New Mexico was encountering these problems due to erratic concentrations from the evaporator. Shutdowns of the spray dryer due to plugged atomizers were common, shutting down the dryer for cleaning/maintenance and these shutdowns required product to be shipped to another site for drying at a cost of roughly \$5,000 per truckload. Over the course of one day, these shutdowns could cost this dairy over \$400,000 in outside drying charges.

### SOLUTION

A Micro Motion® H200 meter was installed at the outlet of the first-stage evaporator to measure both the flow and percent solids of concentrated milk being fed to the spray dryer. Controls were installed to divert concentrated milk back to the evaporator if targeted percent solids fell out of the desired ranges. This ensured that concentrated milk flowing to the dryer's atomizer was optimized, avoiding plugging and quality issues previously encountered with feedstock that was not in spec. In addition, the flow rate to the dryer was precisely controlled using the mass flow signal from the Micro Motion meter, optimizing product throughput and minimizing energy costs.



*Spray dryer and cyclone used to produce powdered milk*