

### Application

## Powdered infant formula

Targets: Powdered milk manufacturers, dairy industry

#### Application

For the last few years, the global consumption of infant formula has grown worldwide (+11%) and is even more impressive in Asia. The global market for powdered infant formula is about six billion USD, representing half of the entire infant formula industry. Powdered infant formula is complex, comprised of roughly thirty ingredients (sugars, fats, minerals, vitamins, etc.) and requires advanced technology and sanitary environments to develop the numerous formulas. Each powdered formula requires different drying parameters and any change, addition, or subtraction of ingredients means new and completely redefined procedures.

There is a strategic interest in maximizing the quality and efficiency with which powdered infant formula is produced. Since it is through lengthy and expensive empirical tests that most dairy companies determine the drying parameters, producers often cut corners by mixing dried, aggregated ingredients into the powdered formula's drying phase. However, consistent powdered formula quality is achieved when the liquid phase mixture followed by drying is monitored under strictly controlled conditions. **Inline viscosity measurement and control of the liquid phase (prior to drying) is the only way to optimize atomization parameters.**

Manufacturing powdered infant formula is comprised of two main steps; the first is concentration and the second is atomization. Spray drying is commonly used for powdered milk since it produces a more soluble powder and facilitates enhanced organoleptic qualities, which are food-related aspects connected to the five senses. All spray dryers use some type of atomizer or spray nozzle to disperse the liquid or slurry into a controlled drop size spray. **Atomization is a crucial step of the process and viscosity measurement at this key point provides valuable information relating subsequent powdered formula characteristics.**

#### Challenges

Non-efficient parameters in spray drying any powdered infant formula are often related to recipe complexity, time delays, and development costs. Bad spray drying parameters impact production efficiency and have diverse consequences such as:

- Unstable finished product quality: consistency issues, ingredient variations, bad dry extract
- Moisture rate not in accordance with specifications
  - o Nutritive value loss
  - o Less or bad flavor
  - o Clumped batches
  - o Reduced shelf life
- Manufacturing process issues: productivity and profitability losses
- Energy waste: drying towers use massive amounts of energy and increase overhead costs

Measuring concentrated milk viscosity presents additional challenges due to its non-Newtonian properties, suspended solids and gases, hostile process conditions (pressure, plant vibration and fouling) and cleaning procedures.

## Solution

Challenges are easily resolved when spray drying is optimized and production output is increased. With the MIVI sensor installed before atomization, viscosity measurement provides continuous and real-time control of a quality characteristic. The sensor allows clean-in-place, has minimal fouling, and instantaneous response times.

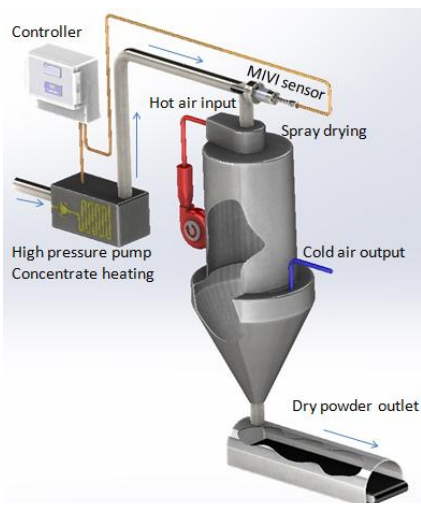
### Installation

According to the process design, flow circulation, and other specific parameters, Sofraser's MIVI sensor can be fitted before the spray nozzle:

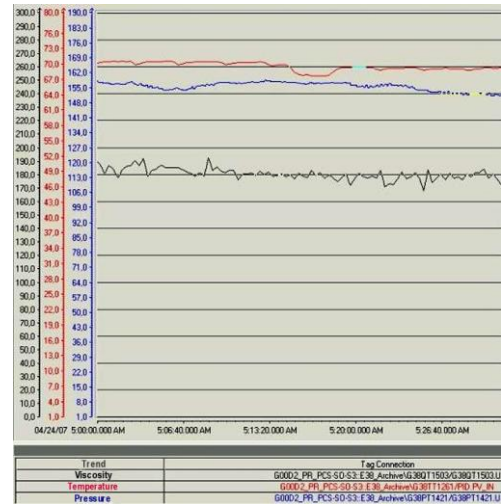
- on a high pressure, sanitary mounting flange welded directly to the pipe
- to a machined measuring chamber

The electronics allow the operator to see, in real time, viscosity and temperature values. Safe and correct batch process operation occurs and the controller activates flow rates or drying temperatures. This maintains optimal settings and meets manufacturers' specifications.

### MIVI sensor operation diagram on a spray nozzle for a powdered milk production



### MIVI viscometer results at a Dutch manufacturer's powdered milk infant formula



### Onsite installation in dairy facility



### Key product characteristics:

- Sanitary 3A sensor design
- High pressure capabilities
- Easy to install
- Many mounting positions to avoid dead spaces
- Clean-in-place
- Temperature probe
- Various coating options, electro polish
- Works in non-Newtonian fluids
- Robust
- Simple to use