

Concentration Measurement in Yogurt Production

Relevant for: Dairy industry, Food industry

Producers of yogurt rely on concentration monitoring of the blending process (%TDS and °Brix) to achieve optimum end-product consistency. The concentration measured at the outlet of the blending process is a key parameter and provides best data for quality control.

Anton Paar's inline refractometer L-Rix 5100 has proven to be well suited for the continuous concentration monitoring for food and beverage production processes and can be directly installed into the production line or tank to measure %TDS and °Brix in real-time.

1 Yogurt production

Yogurt is a dairy product, which is made by lactic fermentation of milk. The milk for the product is inoculated with a starter culture which converts part of the lactose to lactic acid. Various ingredients that provide flavor and color may be added before or after fermentation. Consistency, flavour and aroma vary depending on the type of production and the addition of different non-dairy ingredients.

When the milk has been pretreated and cooled to inoculation temperature, the procedure for further treatment depends on the type of yoghurt produced. For cup-set yogurts the starter culture and all other components are blended in a mixing tank, filled into the single packages and are incubated in the package (Figure 1).

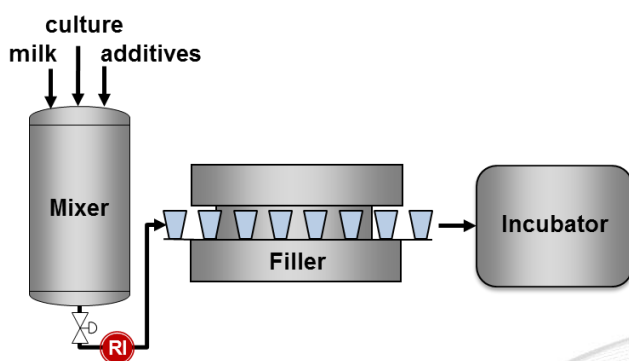


Figure 1: Production of cup-set yogurt

Common additives are fruits and berries in syrup, sugar, flavour, colorings and stabilizer. In addition to flavour and aroma, correct appearance and consistency are important properties. In commercial manufacturing the concentration in yogurt is controlled to ensure consistency of production.

Stirred type yogurts are incubated in tanks after inoculation of the milk and then blended with additives before packing (Figure 2).

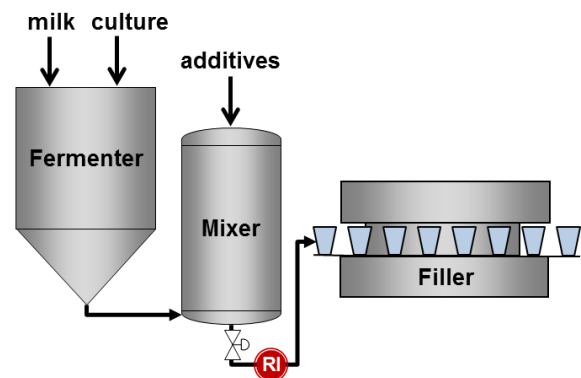


Figure 2: Production of stirred type yogurt

The inline monitoring of the total dissolved solids (%TDS) content for natural yogurts and the correct ratio of yogurt to fruit or sugar (°Brix) for flavored yogurts after the blending step is important for the optimization of the process and to guarantee a consistent quality of the final product.

Refractometers have been widely used for many years in the food industry, for measuring concentration in drinks, juices and dairy. As these products can be turbid, pulpy or contain bubbles, an in-line refractometer is perfectly suited to measure the refractive index and determine the solids or sugar content of intermediate and final products.

2 Concentration monitoring

The Anton Paar inline refractometer L-Rix 5100 is installed at the outlet of the blending process before or after the fermentation process and measures the solid/sugar concentration and the line temperature continuously.

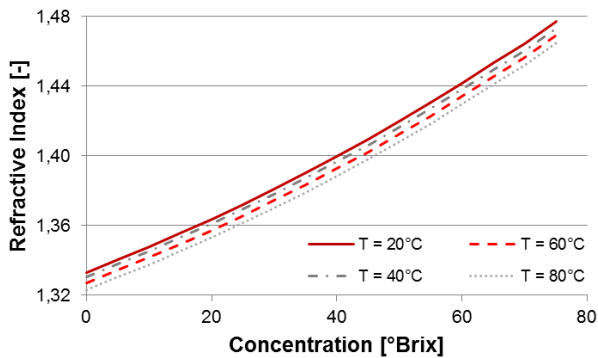


Figure 3: Concentration (°Brix) measured with L-Rix 5100 refractometer at different temperatures

The RI measurement with the L-Rix 5100 includes the concentration of all soluble solids in the milk or yogurt. Depending on customer requirements the measured RI values can be converted into alternative measures, e.g. %TSD or °Brix (Figure 3).

3 Measurement Setup

The Anton Paar solution for controlling the blending process consists of the L-Rix 5100 Inline Refractometer which is installed directly in the line and measures the refractive index and temperature continuously. The design of the sensor is according to EHEDG guidelines.



Figure 4: L-Rix 5100 Inline Refractometer

L-Rix 5100 is installed directly into the process line using a Varivent® or TriClamp® flange.

The application specific calculations are carried out in the mPDS 5 or with the Pico 3000 (optional also with HMI) evaluation units. Up to 4 Sensors can be connected to one mPDS 5 and the results can be displayed and transferred to a PLC or to the Davis 5 data acquisition and visualization software.

Alternatively the L-Rix can be connected to a Pico 3000 RC housing for remote control (for a single production line).

Specifications of L-Rix 5100:

Refractive Index	1.3100 to 1.5400 Accuracy: nD ±0.0002 (equivalent to ± 0.1 % mass) Repeatability: nD ±0.0001 (equivalent to ± 0.05 % mass)
Process temperature	-20 °C to 105 °C CIP/SIP up to 145 °C for 30 minutes
Ambient temperature	-20 °C to 60 °C
Pressure range absolute	100 mbar to 16 bar (10 bar @ >120 °C)
Communication (using Pico 3000)	Analog Analog/Digital Modbus RTU PROFIBUS DP PROFINET IO EtherNet/IP

4 Benefits

The reliable and accurate L-Rix 5100 enables

- Precise monitoring of the °Brix concentration in real-time
- Improved end-product consistency
- Optimization and control of the blending process
- No negative influence of bubbles on the measurement
- Direct comparison with lab reference method

5 Other Anton Paar sensors in the dairy industry

L-Dens 7400 + mPDS 5

- Fat content determination during milk standardization
- Interface detection before the filler

Oxy 510

- Measurement of dissolved oxygen in milk and dairy products

L-Rix 5100 / L-Vis 510

- Control of the spray drying process for milk powder production

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