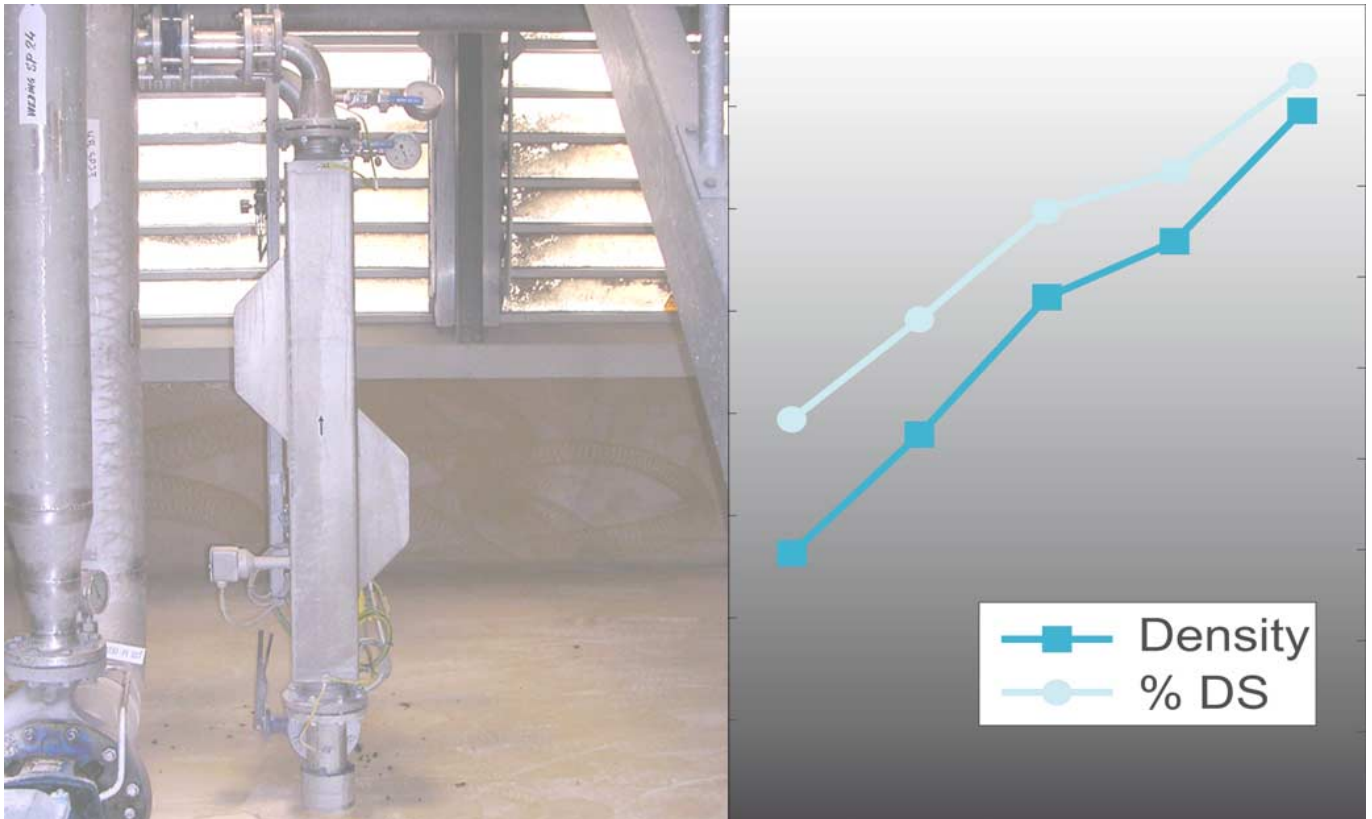




Food & Beverage

Instrumentation Solutions



- High-accuracy density measurement
- Direct conversion into concentration using the characteristic curve
- Simultaneous mass flow measurement

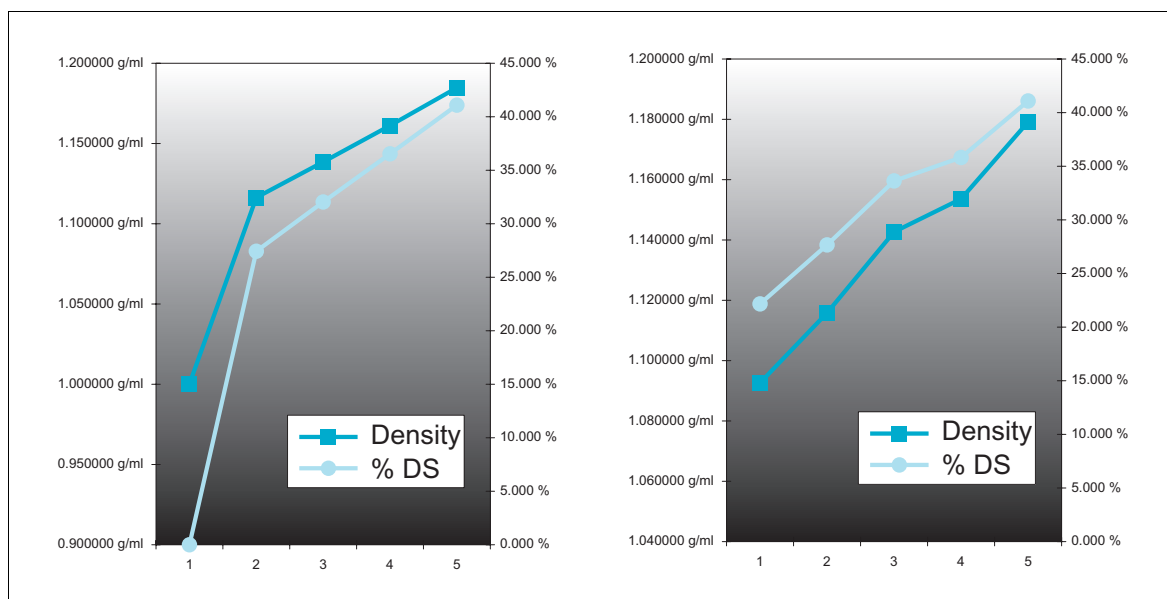
1 The Problem

When removing water from wheat starch suspension in centrifuges, it is important to determine the exact starch content and adjust it to a specific concentration. The starch content can be controlled by adjusting the centrifuge's speed. The objective is to measure the starch content in online mode and use it as the control variable for the centrifuges.

Medium: Starch slurry
 Measuring range: 0 ... 45 % starch content
 Density: 1030 ... 1180 kg/m³

2 Basic Principles

In principle, the starch concentration can be derived from the starch suspension density. However, the ratio of density and concentration is not linear, but follows a characteristic curve.



Example 1				Example 2			
D1	T=20 °C	1.000800 g/ml	K1 0.000 %	D1	T=20 °C	1.092600 g/ml	K1 22.150 %
D2	T=20 °C	1.116200 g/ml	K2 27.510 %	D2	T=20 °C	1.115600 g/ml	K2 27.720 %
D3	T=20 °C	1.138200 g/ml	K3 32.090 %	D3	T=20 °C	1.143100 g/ml	K3 33.660 %
D4	T=20 °C	1.161000 g/ml	K4 36.660 %	D4	T=20 °C	1.153400 g/ml	K4 35.840 %
D5	T=20 °C	1.184600 g/ml	K5 41.260 %	D5	T=20 °C	1.179600 g/ml	K5 41.200 %
kt_conc. 0.0003260 1/K				kt_conc. 0.0002750 1/K			

3 The Solution

An FCM2000 Coriolis mass flowmeter is used in this application for measuring both the concentration and the mass flow.

Density measurement is performed with an accuracy of 1 g per kg. The ratio of concentration and density is mapped in the software with a 5-point-linearization.

The medium flows through 16 series-connected centrifuges where water is removed. The output signal of the concentration/mass flow measurements is used as the setpoint for centrifuge speed control.

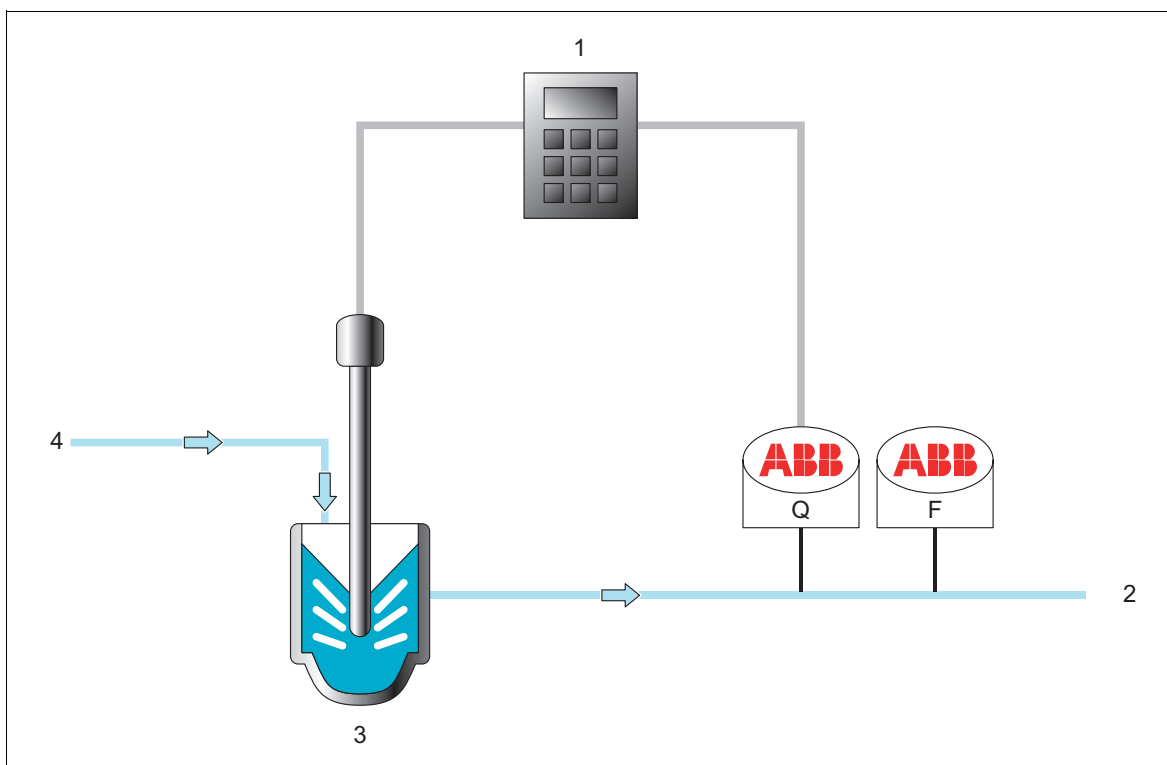


Fig. 3-1: Process chart of starch content control

- 1 Control unit
- 2 Starch slurry
- 3 Centrifuge
- 4 Starch suspension

4 Usefulness

The concentration is measured in online mode, allowing for direct compensation of deviations without time-consuming offline lab analyses. Over-concentration can, thus, be avoided.

5 Features of the Components Utilized


Tag	Instrumentation	
Q and F		<p>FCM2000 Coriolis mass flowmeter, isolated</p> <ul style="list-style-type: none"> • Measurement of starch mass flow and concentration via the density • Output signal 2 x 4 ... 20 mA • Recommended installation: acc. to wheat wet separator • Size DN 100

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