

Micro Motion® Coriolis Flow Meters Improve Accuracy of Standardization Process in Milk Preparation

BENEFITS

- Highly accurate flow rate control within 0.05%
- Density measurement accuracy of 0.0005 gm/cc provides greater control of overall process
- Temperature sensor accuracy to $\pm 0.010^{\circ}\text{C}$ greatly improves milk fat concentration measurement



APPLICATION

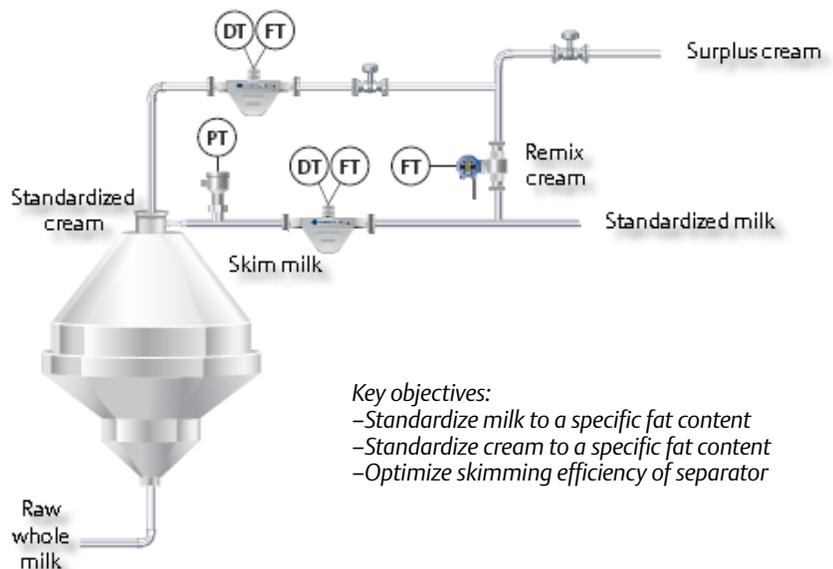
As part of the process of making cheese, yogurt, ice cream or packaged milk, a dairy plant processes raw milk to separate the cream (or milk fat) from the milk to create skim milk. This separation process is then followed by the standardization of the milk, where the cream and skim milk are re-blended to create a “standardized” milk with a desired fat percentage for the product being made.

Because cream, or milk fat, is more valuable than the skim milk, the ability to achieve the minimum possible residue of milk fat in the skimmed product corresponds to the efficiency of the process and can significantly impact the profitability of the operation. Any fat that is not separated and remains in the milk can constitute a clear financial loss. The objective of the standardization process is to reduce losses due to incorrect mixes and improve the quality and consistency of finished products.

In milk standardization, a standardization system controls a centrifugal disc separator to ensure optimal skimming and then remixes the cream with the skimmed milk in order to achieve the required fat concentration. To accomplish this, the separator has two output lines: one for skimmed milk with a fat content no higher than 0.03%, and another for cream, which depending on an application’s requirements, contains either 36% or 40% fat with a requested precision of $\pm 0.02\%$.

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Schematic of the milk separation and standardization process



Key objectives:

- Standardize milk to a specific fat content
- Standardize cream to a specific fat content
- Optimize skimming efficiency of separator



For more information:
www.EmersonProcess.com/solutions/food_bev
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CHALLENGE

An Italian supplier of centrifugal disc separators was asked to provide a separation and standardization system feeding a pasteurizer which supplies milk for a yogurt line. Installing the separator in-line with the pasteurizer would provide automatic standardization of the fat content of both milk and cream. The milk used for the production of the yogurt needed to have a fat content of 3.5%. With a tight specification range of $\pm 0.03\%$, the milk had to have a fat concentration of 3.47% to 3.53%.

Because the accuracy of standardization is a critically important factor in dairy plants, it is essential to have the most accurate meters available to measure the fat concentration and the flow rates of skim milk and cream. Because of the high cost of cream, a system that can save a few hundredths of a percent by lowering the fat concentration from 0.06% to 0.03% can pay for itself in about twelve months.

SOLUTION

The supplier selected a Micro Motion® ELITE® Coriolis mass flow and density meter to control the separator and to ratio blend the milk and cream streams for standardization. The meter's ability to control flow rate to within 0.05% on each stream ensured that targeted milk fat concentration was met. In addition, the meter's density accuracy of 0.0005 gm/cc was ideal for monitoring milk fat density for control of the overall process.

Due to the significant effect that temperature can have on the density/concentration relationship with milk fat, the supplier opted to use a high precision Rosemount temperature sensor in the system. The temperature measurement made by the Rosemount transmitter is accurate to $\pm 0.010^{\circ}\text{C}$, whereas the Micro Motion meters temperature measurement is accurate to $\pm 0.5^{\circ}\text{C}$. The improved temperature measurement from the Rosemount unit, transmitted via HART® protocol to the Micro Motion transmitter, greatly improved the overall concentration calculation made in the Micro Motion transmitter, and ensured the customer's stringent specification for fat concentration was easily met.



Installation of an ELITE CMF100 meter on a standardization system used in milk separation and standardization