Case Study

Cold Filtering Skim Milk Concentrate

Project Details

Client: California Dairies Inc., Tipton, CA

Application: Cold Filtration for Skim Milk Concentration

Product: HFK™-131 Spiral Ultrafiltration Membranes

KOCH MEMBRANE SYSTEMS™

Overview

California Dairies, Inc., the state's largest dairy cooperative, processes milk with a unique On-Farm® Concentration ultrafiltration (UF) system. The process removes water and selected non-protein components from milk at the cooperative's plant so that concentrated milk solids can be transported to cheese producers at significantly reduced freight and storage costs.

Commercial milk protein concentrate typically is made using a recirculating hot process, but California Dairies uses a single-pass cold milk process that produces a non-pasteurized, non-denatured raw product with higher functionality and significantly less whey disposal.

While this cold process is extremely efficient for whole milk, skim milk presented a serious challenge. "Our existing UF membrane could process whole milk, but simply could not handle skim milk. We were not recovering proteins or solids, which are very costly to lose," explained Steven Cooper, Vice president of Operations for the Tipton and Artesia, California facilities.

The Challenge

To find a cold process UF system able to concentrate skim milk.

The Solution

After testing membrane products from several manufacturers, California Dairies chose the HFK™-131 UF spiral element from Koch Membrane Systems (KMS). HFK membranes provide exceptionally high yields for whey and milk processing and, when compared with other membranes, reduce protein losses by as much as 33 percent.

The HFK elements use the proprietary KMS polyethersulfone (PES) membrane to achieve 99.8 percent instantaneous true protein rejection, a yield that is recognized as the highest within the industry.

"We chose the KMS membranes because of their superior performance, but an added benefit of working with them is their quick turnaround time," Cooper said. "They delivered their membranes in three weeks, about half the time required by other vendors."

The KMS membranes installed at California Dairies continue to perform extremely well after more than 12 months of operation, providing stable protein rejection and flux. “With protein levels in the permeate at less than 0.01 percent, we are saving money every day,” said Cooper. “We usually run the system for 24 hours or longer between cleanings, and the membranes clean-up well.”

“We are very pleased with our decision to work with KMS,” he continued. “They really know the dairy industry, and this expertise was critically important not only in membrane selection, but in optimizing the process to handle our very difficult cold-processing application.”

The Membrane System

Membranes can be used to concentrate milk prior to the cheese making process. The use of UF is a cost-effective method to increase plant throughput, allowing for the production of more pounds of cheese each day than can be produced without this pre-concentration step. Ultrafiltration is also used to concentrate milk to reduce shipping volumes when being transported for use in other facilities.

The California Dairies system is situated at the cooperative’s Tipton plant to process milk arriving from any of the 650 member farms. Raw milk is pumped through the UF membranes. The membranes are engineered with specific pore sizes large enough to allow water, lactose and salts to pass through into the permeate stream but small enough to retain the protein (and butterfat in the case of whole milk processing) in the concentrate. All of the protein, one-third of the lactose and half of the mineral ash are retained in the milk concentrate. Transporting the concentrate instead of the milk allows a tanker to carry three times the milk solids.

The Tipton plant switched over to the KMS membranes in October 2006, and the current UF systems contain a total of 576 elements.

Product Overview

The HFK-131 UF membrane is the preferred product for milk pre-concentration. It has the proper selectivity for concentrating proteins and fats, allowing a portion of the lactose and minerals to pass through the membrane. The HFK-131 membrane has proven to be the industry’s consistent performer in dairies around the world and has been in continuous production for more than 25 years.

- Recovers 33 percent more protein than other membranes
- Increases protein yield equating to hundreds of thousands of dollars per year
- Longer life
- Elements available in 3.8” to 8” diameter and 38” long
- Large variety of spacers for optimized whey and milk processing.

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