

Case Study

Nitta Gelatin Increases Capacity and Reduces Costs



Project Details

Location: Toronto, Ontario, Canada

Application: Gelatin Preconcentration

Product: FLUID SYSTEMS™ TFC™ SR3 Nanofiltration Elements

Overview

Nitta Gelatin Canada, Inc., Canada's only producer of natural, unflavored pork skin gelatin, turned a manufacturing capacity bottleneck into an opportunity to reduce energy costs.

The company had been ramping up production at its Toronto plant to meet a growing demand for its high quality gelatin products, which function as gelling agents, binders, emulsifiers, or thickeners in a wide-variety of products, including gummy candy, ice cream, moisturizing lotions and other cosmetics.

Production was limited by the capacity of the existing evaporators that concentrated the gelatin product. This bottleneck prevented the expansion of the overall plant output.

"Because of the high cost of installing an additional evaporator, we tried to think outside of the box to find an alternative solution," said Nitta plant manager John Walker. "We wanted a solution that was both cost-effective and environmentally sensitive."

The Challenge

To find an economical alternative to concentrate gelatin while increasing productivity.

The Solution

Nitta Gelatin implemented a state-of-the-art membrane filtration system that allowed it to avoid the capital cost of installing a new evaporator. "We determined that by preconcentrating the product with membrane filtration prior to the evaporator process, we could remove a significant amount of moisture mechanically, and thereby increase our production capacity without building an additional evaporator," Walker explained.

Nitta Gelatin turned to Koch Membrane Systems (KMS) for the company's vast experience in developing and manufacturing membranes for concentrating, purifying and clarifying gelatin, egg whites, soy proteins, enzymes and lysine.

KMS designed a membrane system to remove 20 percent of the moisture in the gelatinous fluid. The system contains 64 FLUID SYSTEMS TFC SR3 low pressure, selective rejection nanofiltration elements.

The application at Nitta Gelatin required the use of nanofiltration elements because the process fluid contained a high percentage of low molecular weight proteins. The SR3 membranes have a molecular weight

cut-off of 200 daltons and provide a significantly higher yield of proteins, as compared to ultrafiltration membranes. The SR3 elements retain more than 99.5 percent of low molecular weight proteins.

In addition to high yield, the SR3 element also has the benefit of operating under low pressure (200 – 400 psi), requiring less energy than other nanofiltration elements.

“One of the most important reasons that we chose the SR3 elements is their ability to sustain high process temperatures,” said Walker. The process fluids pass through the membrane system at temperatures as high as 60 degrees Celsius, well above the upper limit of the operating temperature range for most other elements. The high temperature helps keep the process fluid from gelling and fouling the membranes and other equipment. Also, the process fluid must remain at a high temperature to preserve heat energy as the concentrate fluid moves on to the evaporator process.

The Membrane System

Carl Hoffman is the market manager for the food, dairy and beverage business unit at KMS, and has worked closely with Nitta Gelatin in solving the bottleneck problem. According to Carl, “Use of the SR3 nanofiltration system has proven to be a cost-effective solution for Nitta Gelatin by significantly reducing their energy expense while producing a cleaner gelatin product. The SR3 membrane elements have exceeded our life cycle expectations while operating at elevated temperatures.”

“Despite the gelatinous material

and the high temperature operating conditions, the SR3 elements have performed to my expectations and exceeded the product claims,” said Walker. “We have been able to maintain high performance and long membrane life, averaging a year or more, by performing a clean-in-place procedure every second day.”

Not only did Nitta Gelatin avoid the capital expense of a new evaporator, it achieved ongoing reductions in energy costs. The KMS system consumes three to four times less energy to remove an amount of moisture equivalent to that removed in the evaporator process.

“We have removed the bottleneck and increased the plant’s production volume by 20 percent, plus we have significantly reduced our energy consumption per unit of production,” said Walker. “The improved energy efficiency of our process is important due to the high and unpredictable cost of the natural gas we burn to produce steam for our evaporators.”

The nanofiltration preconcentration process has proved so successful that, in the summer of 2006, a nanofiltration system using SR3 membranes was commissioned at Nitta Gelatin’s brand-new, state-of-the-art facility in Fayetteville, North Carolina.

Product Overview

The SR family of spiral membrane elements soften incoming water by retaining low molecular weight organics while letting monovalent salts to pass through the membrane. These membranes:

- Recover expensive chemical compounds.

- Help eliminate hazardous elements from water.
- Soften without the need for disposing of regeneration solutions.
- Achieve separations not possible with other technologies.
- Concentrate pharmaceuticals without phase change in aqueous mother liquids.
- Help eliminate contaminants without the need to process large volumes of sludge or wasted regenerants.
- Polish UF permeate or biological treatment effluents.

The SR family serves a broad array of applications, including:

- Protein recovery
- Sugar concentration
- Salt separation
- Water softening and color removal
- Antibiotic and enzyme separation
- Protein concentration and recovery
- Oil/water separation
- COD/TOC reduction
- Leachate treatment
- Lactose and whey de-ashing



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