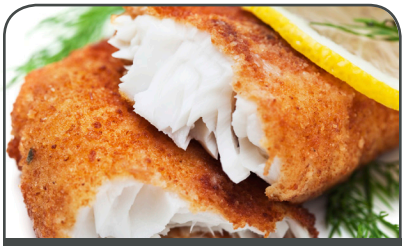
Case Study

KMS Develops Protein Concentration System for Proteus



Project Details

Client: Proteus Industries, Inc.
Gloucester, Massachusetts

Application: Protein Concentration for Food Processing

Product: ROMICON® Hollow Fiber Ultrafiltration Membranes

KOCH MEMBRANE SYSTEMS®

Overview

Proteus Industries, Inc. of Gloucester, Massachusetts, has developed a way to produce low fat fried fish, chicken and meat by applying Nutrilean®, a thin, invisible layer of fat-impenetrable protein, to the product. Nutrilean dramatically reduces the amount of cooking oil that would normally seep into the product during frying, locking in moisture and enhancing taste.

The secret to Nutrilean is that it is made from same-species protein extracts, meaning if the solution is to be used on Atlantic pollock, the protein must also be derived from Atlantic pollock rather than other types of white fish. The protein must remain functional to perform effectively, which requires a separation that can concentrate the protein at a low enough temperature to preserve its molecular structure. Membrane technology offered a potential separaton solution.

However, at low temperatures, the highly viscous protein solutions contain large-molecule protein complexes that can quickly clog membrane pores. Membrane fouling not only hampers processing performance, but the cleaning process can result in a significant loss of the protein product.

The Challenge

To find a membrane system able to increase protein concentration at a low temperature with high recovery and high yield.

The Solution

Koch Membrane Systems (KMS), with extensive experience with protein concentration applications, was able to offer a customized solution to address Proteus' special challenges. Pilot tests determined that KMS' ROMICON® hollow fiber ultrafiltration (UF) membranes offered the best performance to balance salt and pH and reduce viscosity. Proteus purchased a complete pre-engineered protein concentration system employing ROMICON cartridges.

Despite the challenges of concentrating proteins at low temperatures, the KMS systems perform well. "The systems produce a high yield and require practically no maintenance. The membrane filters just keep going and going," said Proteus Founder and Chief Scientist Dr. Stephen D. Kelleher. "We are able to cost-effectively concentrate the proteins while preserving the molecular structure of these complex organic compounds, so

that they can perform their function of keeping the fat out of, and the moisture in, our fried foods."

"By working closely with KMS, we have been able to find an optimal membrane solution for each type of protein that we process," said Kelleher. "Now that we have developed a good way of concentrating our product, tailored for each type of protein, we plan on expanding to three or four new plants during the next 18 months, using the KMS technology," he added. "The Proteus business model also calls for drying the protein to powdered form, which the KMS UF technology permits us to do efficiently."

The Membrane System

KMS' ROMICON hollow fiber membranes operate with process flow from the inside out during filtration. The process fluid flows through the center of the hollow fiber and the permeate passes through the fiber wall to the outside of the membrane fiber. The tangential flow of the process fluid continually acts to limit membrane fouling. In addition, the construction of the hollow fiber permits backflushing with permeate and the reversal of retentate flow. These operating modes are highly effective in maintaining flux rates. KMS developed a special low pH cleaning procedure that enhances protein recovery and avoids damaging the molecular structure of the Proteus product. ROMICON polysulfone membranes meet FDA sanitary requirements for food contact.

Product Overview

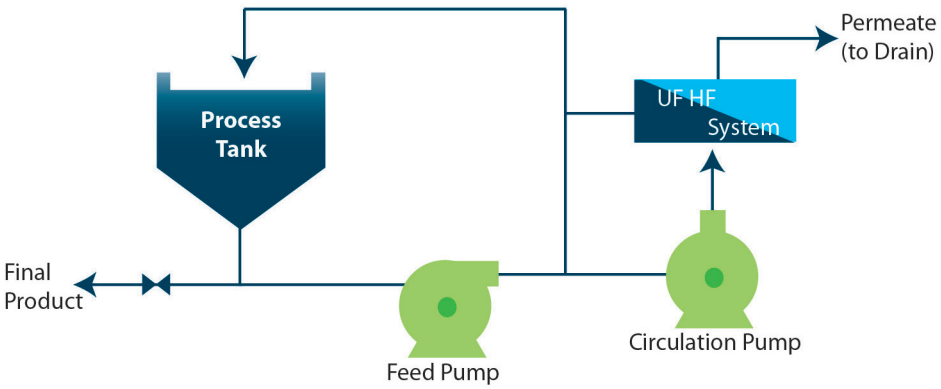
ROMICON hollow fiber membranes are suited for nearly all types of food, dairy, and beverage processing and many pharmaceutical applications. The hollow fiber geometry allows a high membrane surface area to be contained in a compact module, providing high capacity utilizing minimal space with low power consumption.

Hollow fiber membranes, due to their structural integrity and construction, can withstand permeate back pressure thus allowing flexibility in system design and operation. Compared to other separation processes, KMS hollow-fiber ultrafiltration membranes result in:

- Smaller space requirements
- Decreased labor costs
- Lower chemical costs
- Less waste disposal
- Overall savings with enhanced quality and performance standards

ROMICON Hollow Fiber Cartridges

Process Flow Diagram



Koch Membrane Systems, Inc.
850 Main Street, Wilmington, MA 01887-3388
Main: 1-978-694-7000 • Fax: 1-978-657-5208
Toll Free: 1-888-677-5624
Visit Our Web Site for International Contacts
www.kochmembrane.com