

# Ultrafiltration for Whey Concentration

Industry: Dairy  
 Location: Northern Europe  
 Application: Whey Protein Concentrate  
 Environment: Large Scale Production, Sanitary Design

## Is a 5 kDa membrane really better?

The end user is a multinational company with multiple production sites. It produces a broad range of dairy products and high value commodities used as food ingredients and for nutrition. Their strategy is to innovate new products through primary research, investing in quality systems, and production through sustainable methods.

### Customer Motivation

This particular location is a state-of-the-art dairy production facility in Europe with significant research capabilities. It uses these capabilities to continuously evaluate and implement the newest technologies.

This site is motivated to:

- Increase throughput of existing loops without adding CAPEX
- Reduce production energy costs
- Meet primary KPIs such as low protein passage in UF permeate

To capture more protein, the end user tested and integrated the use of 5 kDa UF membranes by another company to capture more protein from the whey stream. However, these UF elements are less productive on a permeate basis, and the use of 5 kDa membranes requires additional CAPEX to expand the loops to keep the whey productivity the same.

With the trade-off in productivity in mind, is a 5 kDa membrane really better for this end user?

To investigate if this productivity versus protein retainage is a necessary trade-off, this end user first started off-line testing Applied Biomimetic UF membranes in 2017, and positive results from these tests led to production trials. The following production trial started in November 2019.

### Test Conditions

Whey Protein Concentrate, Loop #3  
 Retentate TOP 1.5 – 1.6%  
 Test Start: November 2019  
 Status: Ongoing

Applied Biomimetic	End User's Reference
DairySep™ 6338-31	Reference 6338-30
PS 10 kDa membrane	PES 5 kDa membrane

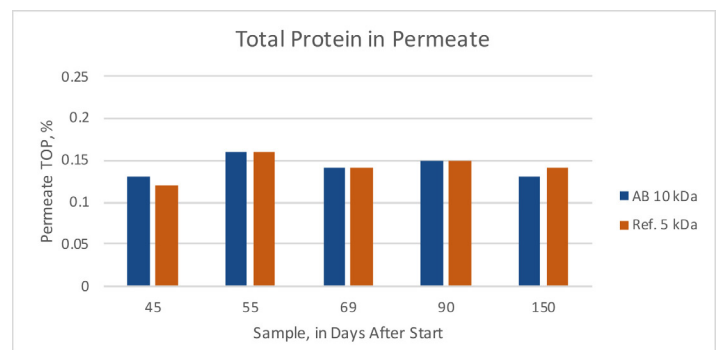
### Test Objectives

1. Compare AB 10 kDa element versus Reference 5 kDa element
2. Test in live production environment
3. Compare element productivity and protein passage

### Results

The end user has shared performance data over the first 150 days of operation, and the elements remain in the production environment.

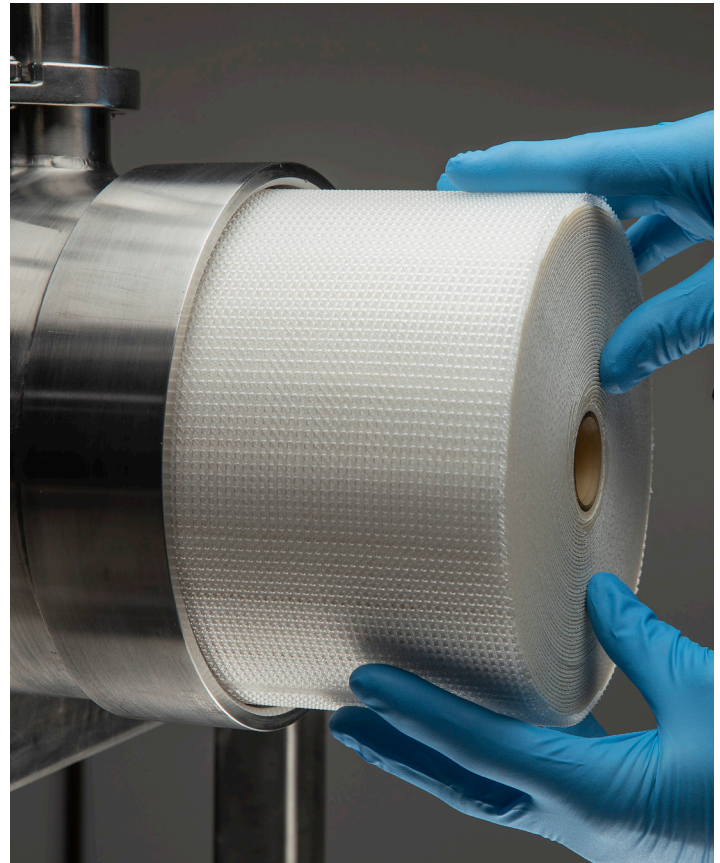
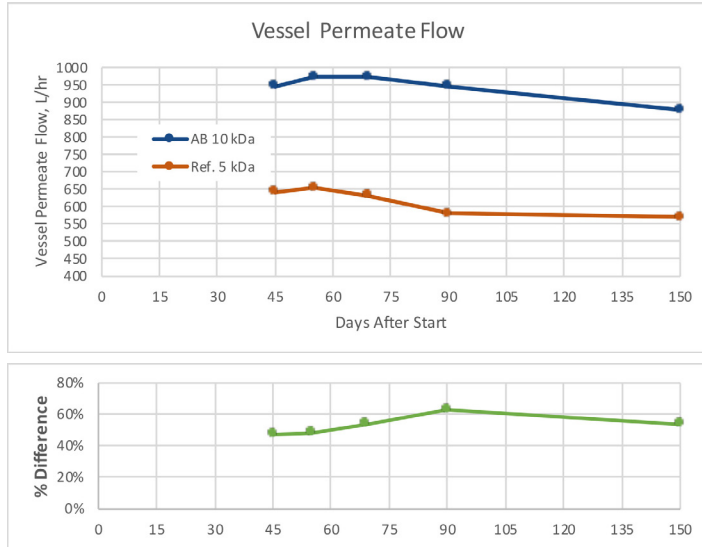
Both elements demonstrate steady protein retention, as indicated by measuring the inverse: the protein passage into the permeate side of the elements:



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However, there is a **big difference** in the element productivity as measured by vessel permeate flow:

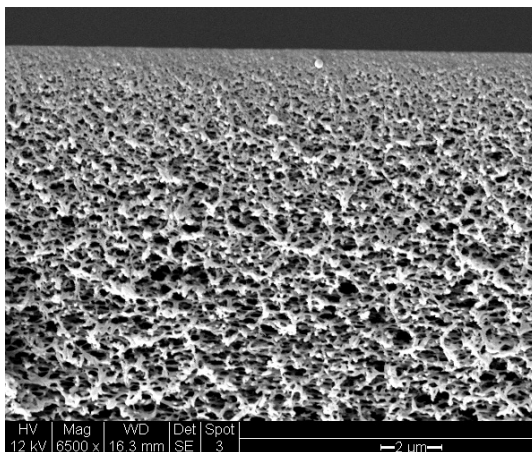
- The AB 10 kDa elements had steady output during the period
- The Reference element decreased in productivity, indicating irreversible fouling in time
- The AB element permeability was 45% to 65% higher than the Reference element



On a linear basis, this productivity gain of 45% to 65% will easily

- Avoid CAPEX to increase the size of the loops
- De-bottleneck productivity
- Allow higher productivity during seasonal surges
- Reduce energy consumption

**This test demonstrates that the DairySep™ 10 kDa UF elements meets the high protein retainage objective without the trade-off in productivity seen by 5 kDa membranes normally found on the market.**



SEM of PS 10 kDa MWCO Membrane

## About Applied Biomimetic, Inc.

Applied Biomimetic is a leader in the convergence of polymer and protein membrane technology. We have developed a high-performance membrane platform for water, life science, enzyme, food, and dairy separation applications.

## APPLIED BIOMIMETIC

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