

Membrane **TECHNOLOGY FORUM®**

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Dairy
FOODS



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Improved Nanofiltration Membrane Chemistry to Reduce Element Replacement Rates in Dairy Applications

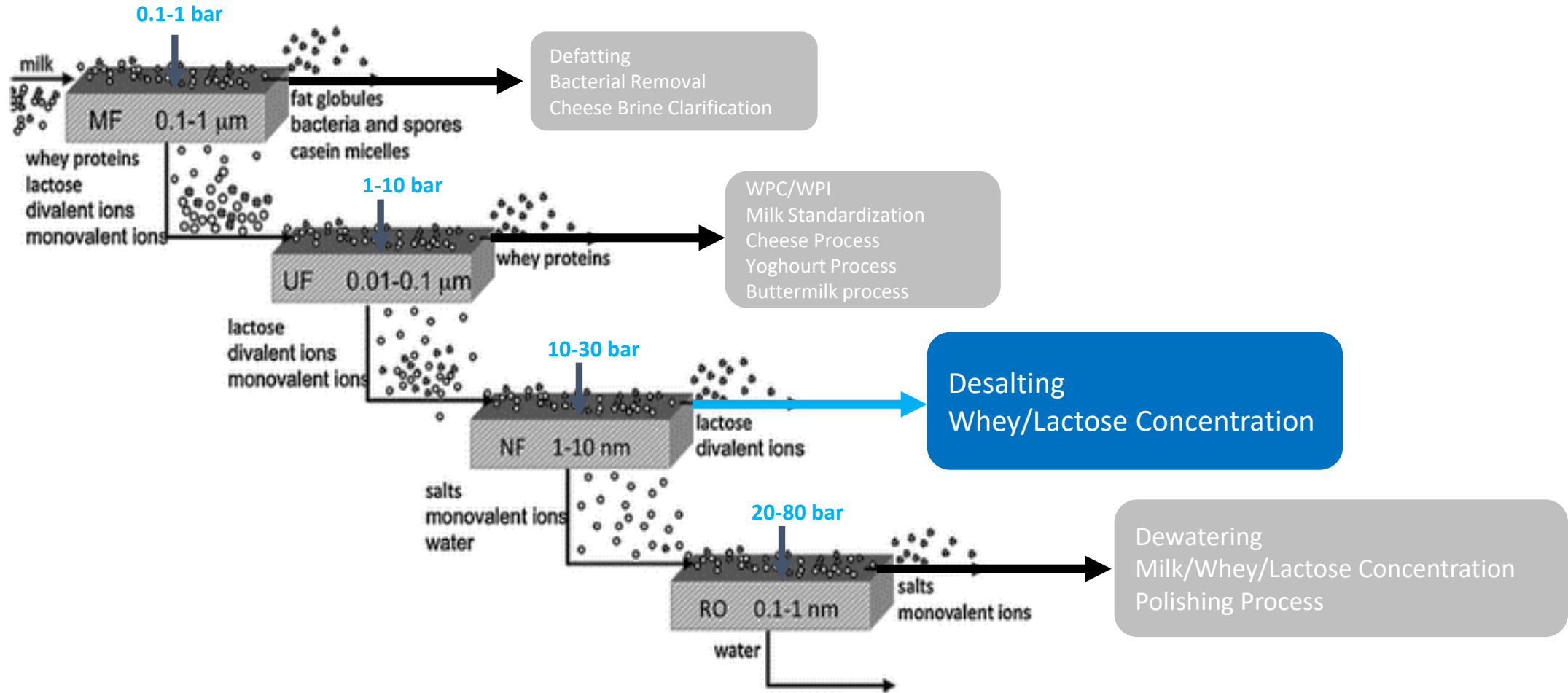
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DuPont

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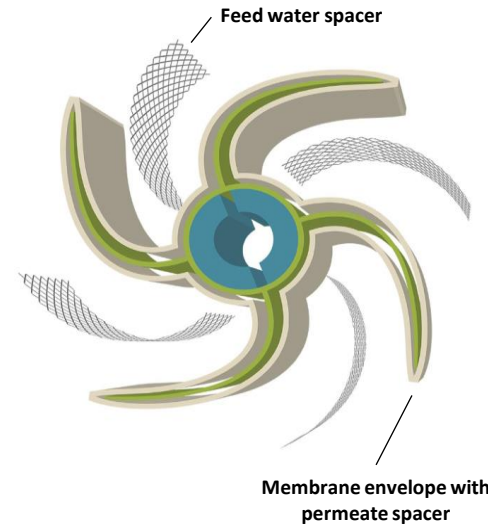
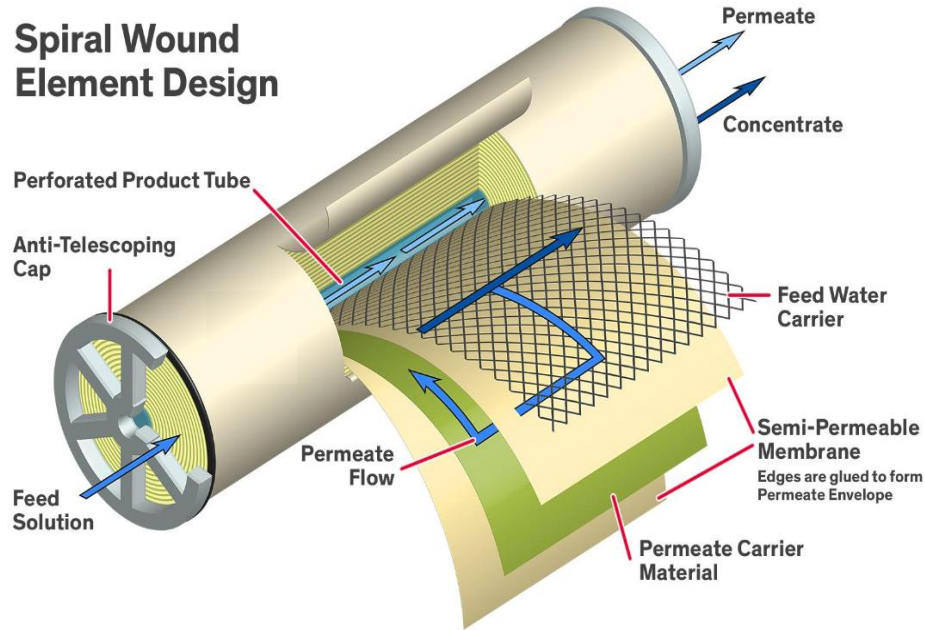


Technology spectrum for filtration in dairy

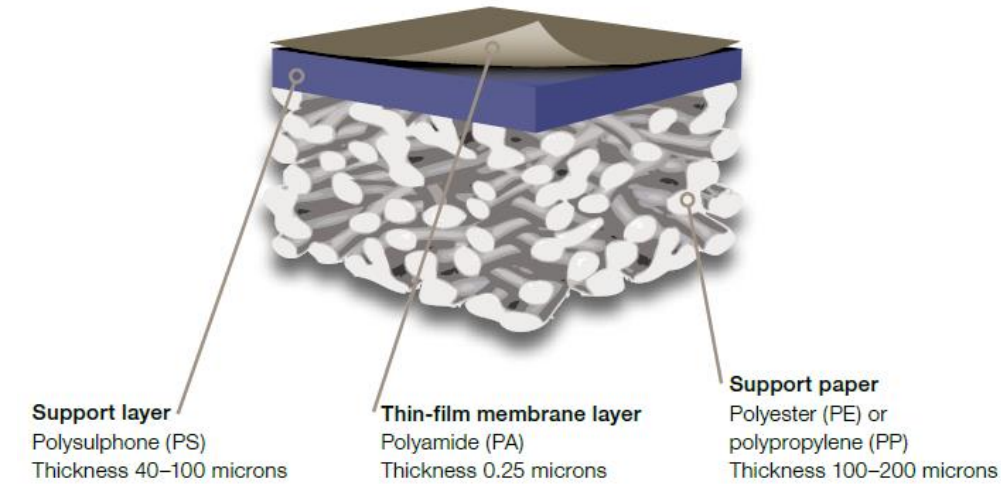


Membrane fundamentals

Spiral Wound Element Design



Schematic cross-section of a thin-film membrane used in reverse osmosis



RO

Pressure is used to drive water and lower molecular weight molecules through a semi permeable membrane

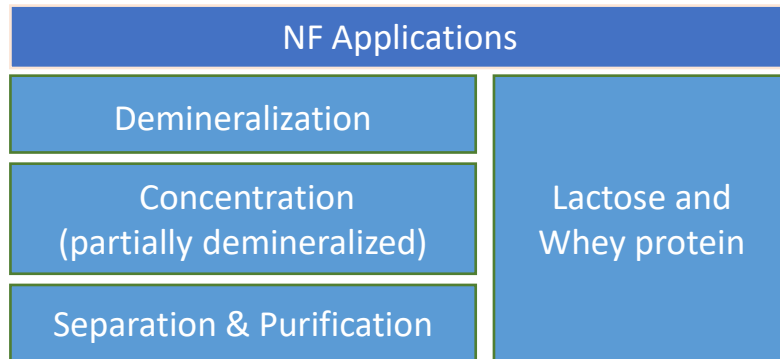
NF

Molecular weight cut off and charges primarily control what is retained and what passes through an NF membrane

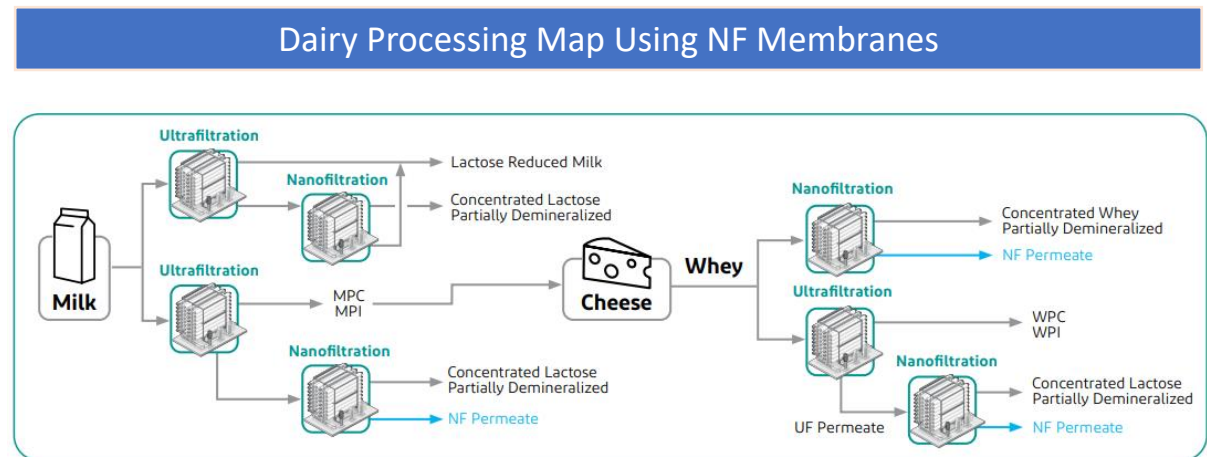
Applications of Nanofiltration membrane

Get more from milk

Concentrating and Separating out the essential milk ingredients, such as lactose and whey protein, enables products from milk and cheese to infant formula and protein shakes.



Separation and demineralization of whey protein and lactose requires a nanofiltration membrane that has an appropriate molecular weight cut off to reject organic molecules but yet is open enough to allow significant transport of monovalent salts.



Nanofiltration is a medium pressure-driven membrane filtration process typically used for the separation of divalent and monovalent ions. It provides a dual benefit of volume reduction and partial demineralization of whey protein and lactose, during a single process step. Besides, the differences in molecular weight cut-off make this membrane technology suitable to produce lactose-free dairy products.

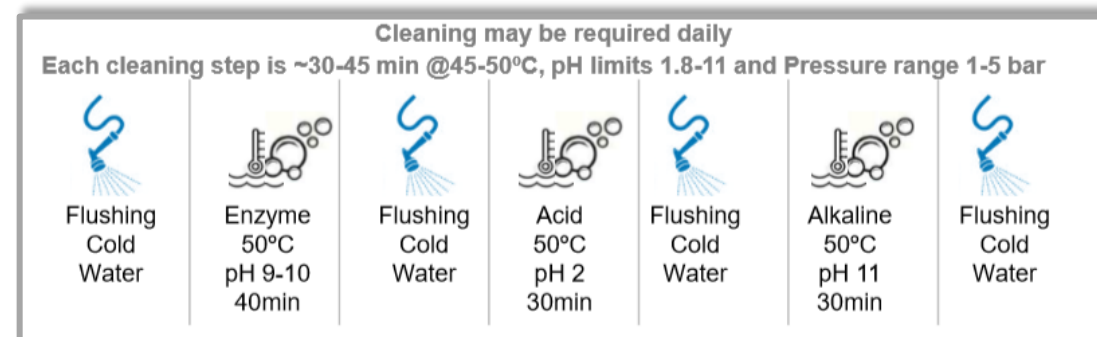
Challenge and Solution - Membrane cleaning and durability

Fouling stands out as a primary challenge for nanofiltration membranes in dairy processes.

To secure optimal membrane performance, regular cleanings under extreme pH conditions are necessary, however the use of abrasive cleaning agents can damage the membrane surface over time, resulting in a shorter service life for the membrane.

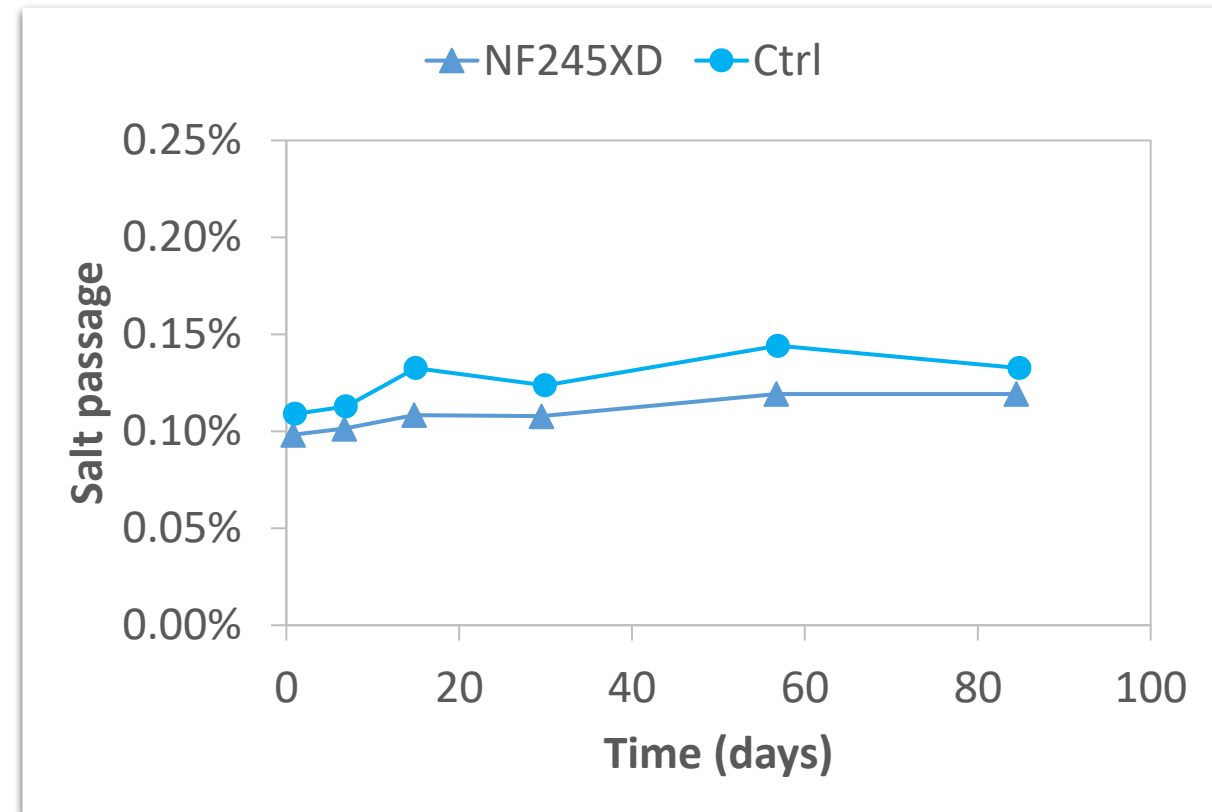
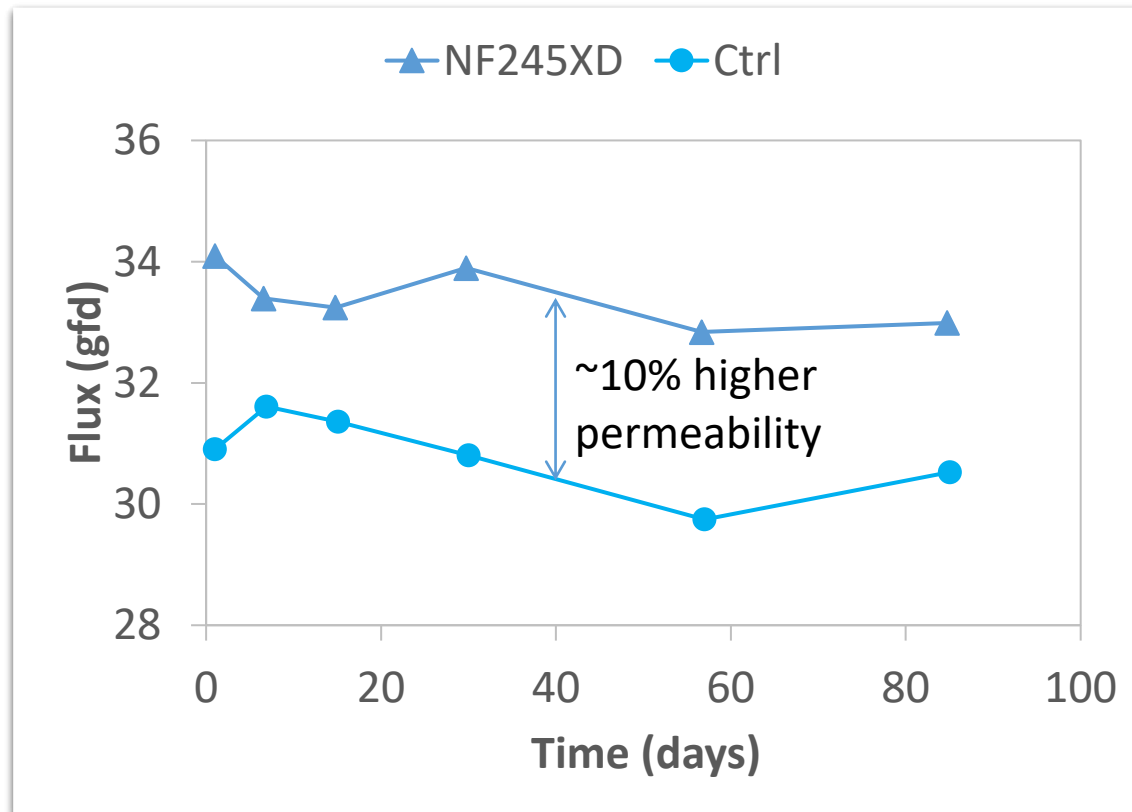
FilmTec™ Hypershell™ NF245XD elements, expertly designed with an improved membrane chemistry, helps endure the stress caused by the demanding conditions of daily cleaning. It enables up to 20% longer service life and 10% more productivity.

Products that last, contribute positively to cost and time savings and minimize environmental waste associated with replacing elements.

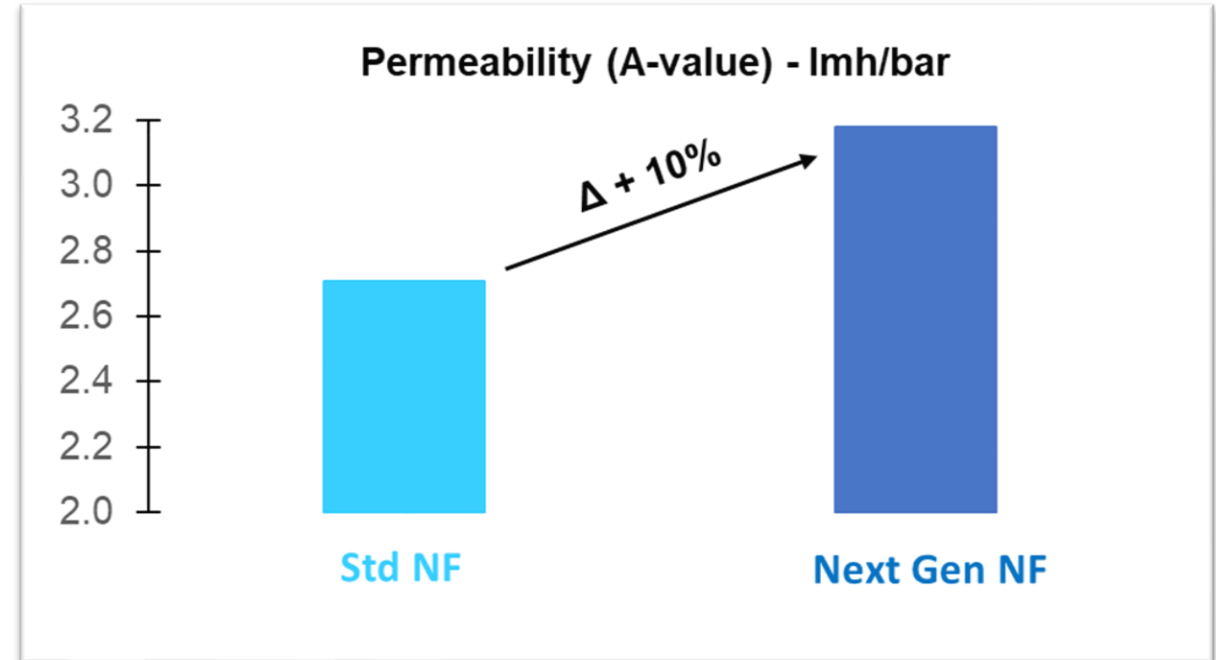
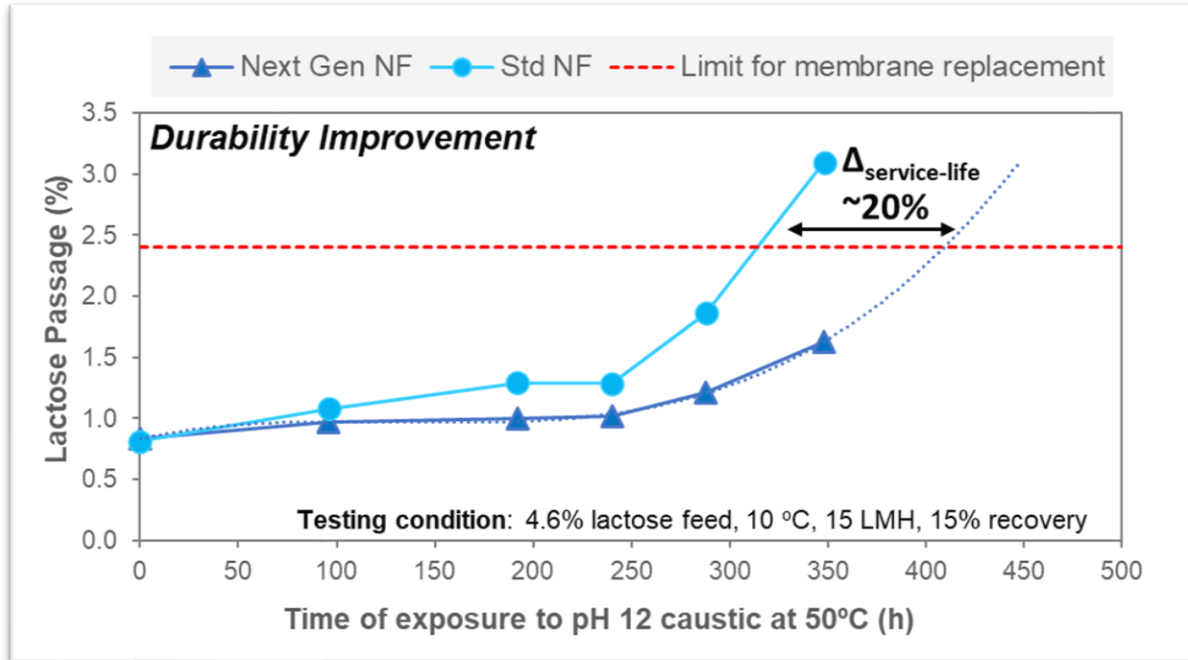


New membrane development

Stable performance over storage



Built to last without compromising performance



Unlike other standard NF elements, FilmTec™ Hypershell™ NF245XD elements are designed to deliver **up to 20% longer service lifetime** and **up to 10% more productivity** that is based on an improved membrane chemistry that has enhanced chemical resistance without compromising performance

Note: Performance depends on the characteristics of each milk and whey plant.

Benefits for dairy processors

 ↑ **Longer Service Life**

 ↑ **Enhanced Chemical Resistance**

 ↑ **Improved Permeability**

 ↓ **Less Frequent Replacements**

Unlock durable performance even in challenging conditions.

FilmTec™ Hypershell™ NF245XD elements have up to 20% longer service life compared to standard NF elements. This is achieved by having an improved membrane chemistry expertly engineered to endure the stress caused by the demanding conditions of daily cleanings.

Achieve improved product yields.

The key to improved yields is in the stability of the membrane. Next Generation NF elements are designed to maintain rejection and concentration performance during the element's service life. This results in less product loss during operations and reduced production downtime compared to standard NF elements.

Experience high efficiency.

New membrane chemistry with enhanced permeability enables up to 10% more productivity vs standard products due to increased flow through the membrane which can translate to lower energy consumption.

Less hassle and inconvenience.

Products that last, can contribute positively to cost and time savings associated with replacing elements, helping to prolong replacement cycles.

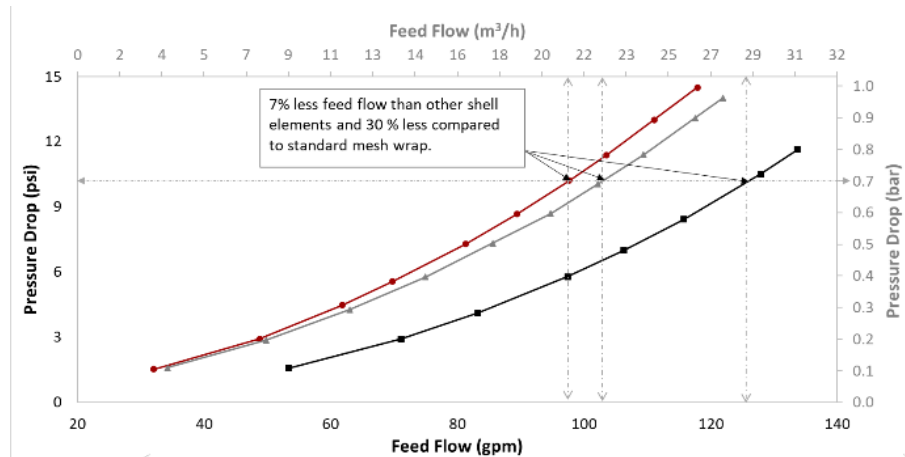
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FilmTec™ Hypershell™ element construction

Less bypass area (up to 60%)



Energy savings (up to 30% less flow)



Improved Efficiency

Have reduced bypass compared to conventional full-fit, mesh wrapped elements, maximizes cross-flow velocity, improved product processing and efficient Clean In Place.

Extended Service Life

Minimize channeling and feed spacer migration, which can lead to a reduction in premature element failure.

Effortless Assembly

Enable safer and faster loading and removal from a system as the outer shell does not expand and preserves its shape during use.



Polypropylene rigid outer shell

Long term testing in Dairy plant

External Trial in Dairy Plant

- Long term trial to demonstrate durability and performance
- Side-by-side 8-inch testing with control elements
- On going

Torture Testing

- Cleanings under extreme pH conditions to validate robustness
- On going





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