

New 10 kDa Membrane for Enhanced Performance in Dairy Ultrafiltration



Process filtration solutions: Dairy ultrafiltration for whey and milk



Typical customers

- Dairy plants in Europe and the US
- Manufacturers of filtration plants for the dairy industry



New TRISEP 10kUF membrane for the filtration of whey and milk

Typical process spiral module sizes were used (e.g., 6338)



Outcome

Significantly higher flow rates without significant change to retention and permeation characteristics

THE APPLICATION

Ultrafiltration (UF) is widely applied in dairy processing for fluids like milk and whey. It allows for the concentration of macromolecules, such as proteins, while smaller molecules, like lactose and salts, can pass through the membrane. In case of dairy UF applications, 10 kDa membranes are commonly used as a standard.

Spiral wound elements offer a large membrane area in a compact design. Additionally, they allow easy handling and maintenance.

THE CHALLENGE

The challenge in filtration is always to get the desired separation characteristics with a throughput as high as possible. The filtration performance for dairy products like whey and milk cannot be derived by typical membrane characteristics like clean water flux and retention/molecular weight cut-off. Therefore, tested the new TRISEP 10kUF membrane in field validation trials together with customers under real process conditions and against various references.

Since the dairy industry has various products that need to be concentrated, it is not sufficient that the membrane performs well at only one specific application; it needs to function for various dairy products.

FAST FACTS

Location:

Europe and the US

Technology:

Ultrafiltration

Application:

Concentration of different whey products and milk

Modules:

Sanitary (DS) spiral wound elements (typically 6338)

Start date:

2023 (US)
2024 (Europe)

Products:

Whey protein concentrates
Whey protein isolates
Skim milk



THE SOLUTION

Product experts and engineers have developed a new 10 kDa membrane called TRISEP 10kUF and validated it for dairy applications.

The validation at customer sites successfully revealed the suitability of this membrane for dairy applications. The separation characteristics stayed comparable to the references while reaching higher permeate flux values.

The fact that the product showed a superior flow performance for various dairy products at different sites demonstrates its potential for this kind of applications.

Tests were conducted against different references. The key assessment criteria were flux and retention/permeation characteristics.

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In dairy ultrafiltration (UF), salts and sugars like lactose should pass through the membrane unhindered, whereas proteins should be retained quantitatively.

Membrane Model: TRISEP 10kUF (element size DS 6338)

Products: whey protein concentrates, whey protein isolates, acid whey, skim milk

Assessment criteria: permeate flow, feed flow, pressures, feed and permeate composition

Operating mode: crossflow, concentration, circulation mode, diafiltration

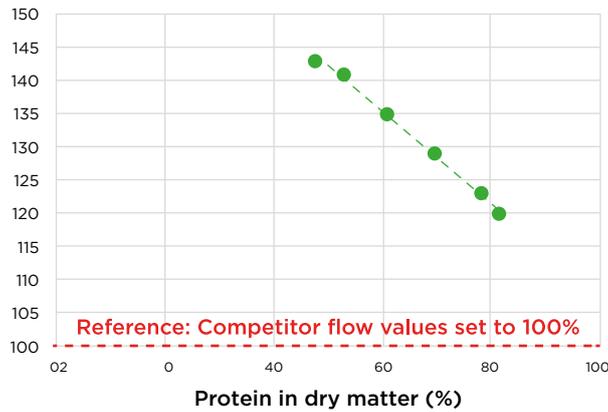


Figure 1: Relative permeate flux of TRISEP 10kUF membrane compared to references

THE RESULT

The elements were tested in parallel with the same product to minimize product and process-specific variations. Tests were conducted at customer sites according to their standard protocol.

In Figure 1, the results for the permeate flux for different whey protein concentrates are shown as a function of protein content in dry matter. In this diagram, the flow rates are shown relative to a reference (set to 100%). As can be seen, the flow rates varies between 20% up to more than 40% dependent on the protein concentration. Flow varies between 20% up to more than 40% dependent on the protein concentration.

In Figure 2, the results obtained so far are summarized for different dairy products. For all products filtered, the performance of the TRISEP 10kUF membrane was higher compared to the reference. This also includes products that are typically difficult to filter, such as acidic whey.

It should be noted that for all filtrations, the permeation characteristics were similar, resulting in a low protein concentration in the permeate and a good passage of lactose and minerals like calcium. Additionally, it could be observed that the relative flow reduction was comparable for the filtrations with the TRISEP 10kUF compared to the references.

In summary, the following observations were made:

- Flow rates for the TRISEP 10kUF were significantly higher for various dairy products
- There were no significant differences in the retention/transmission characteristics (same MWCO)
- The flow reduction of the membrane was comparable to the reference at long filtration runs in circulation mode

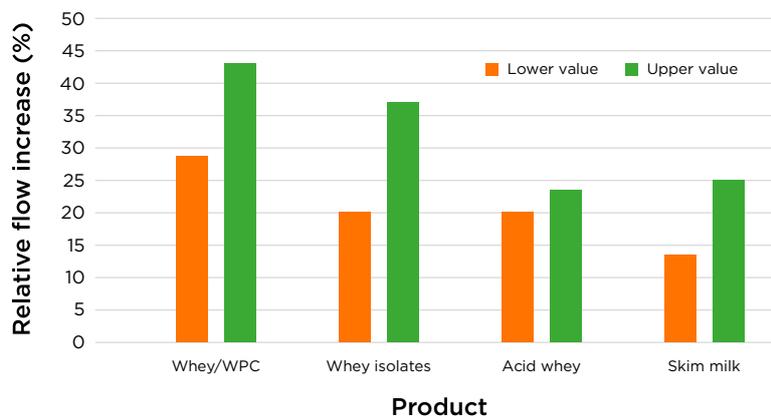


Figure 2: Relative flux increase for the TRISEP 10kUF membrane for different products

Learn more about our Solutions
for Dairy applications:

