Membranes that perform. People who deliver.™

NF Lactose Concentration Case Study

Nanofiltration technology is commonly used after ultrafiltration to further concentrate acid whey UF permeate for whey processing applications within the dairy industry. The removal of salts via nanofiltration is important for the production of high-quality lactose, and can also prevent scaling and build-up on evaporators. In this case study, two of Synder's NF membranes were tested for their lactose concentration and demineralization capabilities.

Overview

The objective of this study was to examine the flux, total organic carbon (TOC) rejection, and calcium rejection performance of Synder's NFX and NFS membranes, with acid whey UF permeate used as the incoming feed stream. These results will determine the potential for NFS to be used in the dairy industry for applications such as lactose concentration and demineralization, with specific focus on calcium removal.

Experimental

Two independent trials were tested with Synder's NFX and NFS membranes in 2540 spiral wound element modules. Acid whey UF permeate generated from Synder's ST 2540 spiral wound elements was used as the incoming feed stream. Elements were tested at 440 psi with a feed flow rate of 2 gpm at 25°C. Permeate flux and calcium rejection was measured from 1x to 3x volumetric concentration factor (VCF).

Table 1: Acid Whey Powder Composition

Description	Specification
Ash	10.5% max
Fat	1.2 max
Moisture	5.0 max
pH	4.5-5.0
Protein (as is)	11% min
Sediment	15.0 mg max
Titratable Acidity	0.30% min

Project Goal
Examine performance of Synder's NFX and NFS membranes for lactose concentration & decalcification

Feed
Acid Whey UF Permeate

Elements
NFX-2B-2540M
NFS-2B-2540M
ST-5PB-2540M

Parameters Measured
TOC rejection
Calcium rejection
Permeate flux

Testing Conditions
Pressure: 440psi
Feed flow rate: 2gpm
Temperature: 25°C

Results

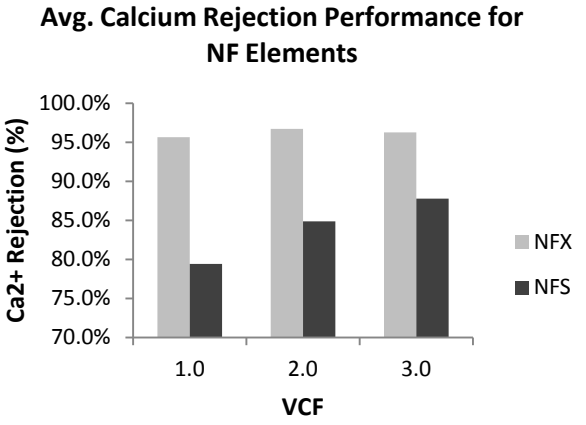

Figure 1: Average calcium rejection performance for Synder's NFX and NFS 2540 elements obtained up to 3x VCF.

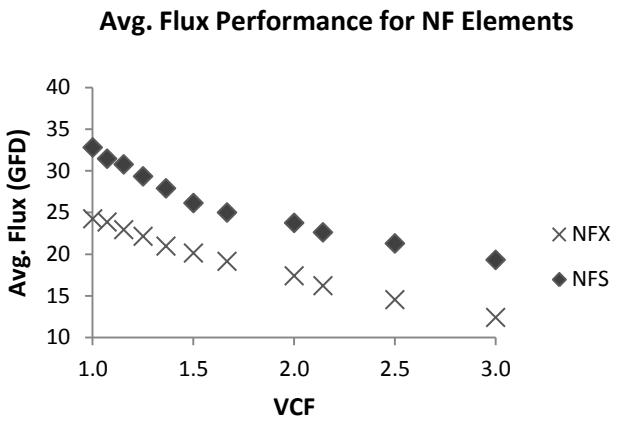

Figure 2: Average flux performance for Synder's NFX and NFS 2540 elements obtained up to 3x VCF.

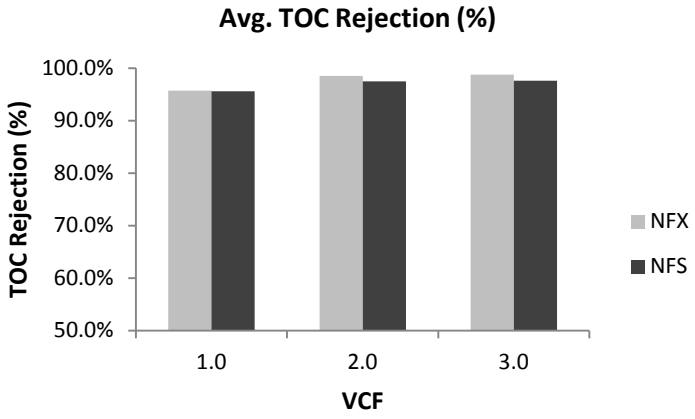

Figure 3: Average TOC rejection performance for Synder's NFX and NFS 2540 elements obtained up to 3x VCF.

Conclusion

The results of this study indicate that Synder's NFS membrane shows superior flux and higher calcium passage compared to NFX, in a feed stream composed of acid whey UF permeate. The considerable difference in calcium rejection performance between the two membrane types shows the benefit for NFS to product higher-quality lactose. TOC rejection performance data was also comparable for both membrane types. These results indicate the potential for the NFS membrane to be used for lactose concentration and decalcification applications.