Technical Service Bulletin

October 2019 TSB118.16

Membrane Start-up, Shutdown, and Preservative Flushing Guidelines

This Technical Service Bulletin provides information related to starting up and shutting down an RO/NF system with Hydranautics membranes, and for flushing composite elements prior to use.

Preservative Flushing Introduction

To preserve elements from biological growth and to help maintain performance over time, Hydranautics Composite Polyamide type membranes are stored in dionized water, a 0.99% sodium bisulfite solution, or a combination of 0.99% sodium bisulfite and 10% propylene glycol solution (Please see product specification sheet to determine preservation solution for each specific product). It is therefore advised to flush membranes prior to use to eliminate residual preservatives in the product stream.

Once the elements have had the preservatives flushed from them, they would need to have preservatives re-applied for long-term storage. Please refer to TSB108 which details our short-term and long-term storage procedures for our composite membranes.

Preservative Flushing during Start-up

Hydranautics has received NSF61 approval of our RO and NF products. Such approved RO and NF products are listed on NSF official website, for more information, please visit:

http://info.nsf.org/Certified/PwsComponents/Listings.asp?Company=31590&Standard=061 .

These approvals are contingent on 30 minutes of low pressure flushing of new elements to ensure that sodium bisulfite (SBS) preservative is sufficiently removed from the element prior to use. We also recommend that the user carry out a bisulfite test of the product water after flushing to ensure that SBS concentration is below any additional regulations required by local authorities. If the elements are to be used in systems requiring ultrapure water, a minimum flushing time of 24 hours is recommended to reduce the TOC concentration to below 50 ppb (assuming zero TOC in the feedwater).

Warning: For potable applications using models that are packaged with both sodium bisulfite and propylene glycol, discard the product water for at least 24 hours prior to drinking or using in food applications.

Ingestion of the preservative may cause irritation to the gastrointestinal tract, colic, diarrhea, or other similar symptoms.

For membrane models that are packaged with sodium bisulfite only or no preservative at all (such as dry packaged membrane), discard the product water for at least 30 minutes prior to drinking or using in food applications..

For membrane products that are packaged with SafeGuard® 100, a commercial membrane preservative chemical made by Avista Technologies, initial preservative flushing will lead to temporary high TOC discharge in the reject stream. Some regulations will allow discharge when below a certain concentration. In some cases, simply doing a standard flush and combining the flush water with the neutralization water will be a sufficient means of diluting the residual preservative. Please consult local regulations to determine what is right for your operations.

The table below demonstrates reference dilution factors for relevant final organic discharge concentration levels. Each 8-inch element contains 0.5 liters residual preservation liquid. The preservation liquid is SafeGuard® 100 at 2% by weight solution. The initial and corresponding diluted organic concentration measurements for 2% (wt) SafeGuard® 100 are shown in the table below. The standard flush assumes that each element in the train holds 19 liters (5 gallons) of flushing water.

	Approximate Initial Value	Standard Flush 38 X Dilution	Recirculation 150 X Dilution	Recirculation 300 X Dilution
BOD	2,610 ppm	69 ppm	18 ppm	9 ppm
COD	13,200 ppm	347 ppm	88 ppm	44 ppm
TOC	10,800 ppm	284 ppm	72 ppm	36 ppm

If the initial residual preservation solution flushing (standard flush) discharge TOC concentration is not in compliance with the site regulation, a dilution procedure such as that shown in Figure 1 should be considered. Operators may use a CIP tank to run dilution flushes to the pressure vessel to rinse off the residual preservation solution and get the right dilution to satisfy the discharge limit on TOC. For example, a membrane train containing 400 pieces of 8inch elements would require 30,000 liters of dilution water to achieve 150 x dilution.

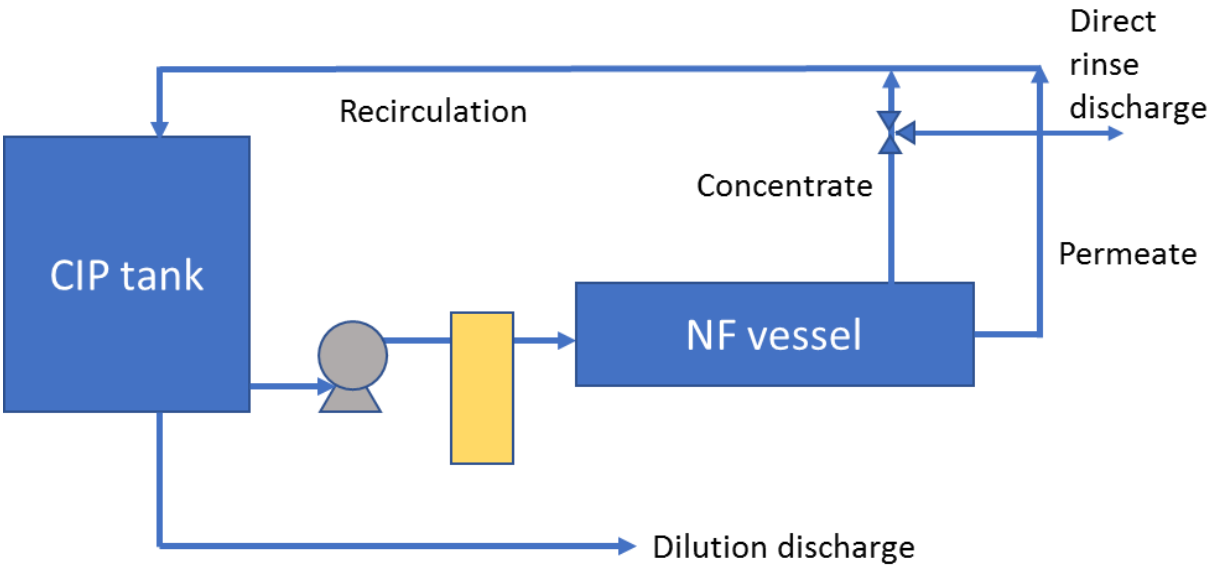

Figure 1. Initial Rinse and TOC Dilution

RO/NF System Start-up

It is important to be sure that the elements are loaded and shimmed correctly to remove any excess slack that may cause disconnects (see TSB122 - Element Loading Guidelines). A low pressure flush to purge air from the membranes is always recommended before a high pressure startup. This can be accomplished through the use of a soft-start mechanism, or a variable frequency drive. Failure to do this can result in a water shock wave (water hammer) that can cause physical damage to the RO/NF membranes. The permeate valves should always be open to drain during this flush to prevent damage to the membranes.

After the air has been purged from the system the feed pressure should be increased gradually up to the working pressure of the RO/NF unit. Pressurization (and depressurization) of the membrane elements should not exceed ten (10) psi/second (0.7 bar/second) at any time.

Note: Elements shipped dry (no preservative) may take at least 24 hrs of operation for performance to fully stabilize.

RO/NF System Shutdown

Brackish Systems

Upon shutdown for brackish systems, a flush with the feed water at low recovery (brine valve wide open) is usually sufficient to remove the high concentration of salts from the membranes. The permeate valves should be open to drain during this flush to prevent damage to the membranes.

Seawater Systems

Upon shutdown for seawater systems, a flush with RO/NF permeate is recommended to remove the high concentration of salts from the membranes. The permeate valves should be open to drain during this flush to prevent damage to the membranes. If RO/NF permeate is temporarily unavailable, the membranes should be flushed with RO/NF feed at low recovery (with brine valve wide open). The membranes should then be flushed with RO/NF permeate as soon as it is available. The seawater RO/NF system should not be left unflushed with a high concentration brine on the membrane surface.

NOTE:

The quantity of water used in both normal *RO/NF System Start-up* and *RO/NF System Shutdown* flushing should be equal to or greater than that which is retained in the system. For standard 16-inch X 40 inch elements assume thirty-four (34) gallons (130 L) per element. For standard 8-inch X 40-inch elements assume ten (10) gallons (37.85L) per element. For standard 4-inch X 40-inch elements assume three (3) gallons (11.35L) per element.

If further information is required, please relay questions to the Technical Support department at our corporate headquarters.

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