Element Start-Up Guide Food & Dairy: RO & NF Elements

The following guidelines are intended to provide information on initializing operation with TRISEP® Food & Dairy reverse osmosis (RO) and nanofiltration (NF) elements. For questions regarding deviations from these guidelines, please contact MANN+HUMMEL Water & Fluid Solutions Technical Service.

SAFETY EQUIPMENT

Having proper equipment is essential for safely executing the following start-up procedure. Appropriate gloves, shoes and safety glasses should be worn at all times. Additional equipment may be necessary depending on specific system design.

START-UP CLEANING PROCEDURE

After the elements have been removed from their packaging and have been installed into their pressure vessels (please refer to **Element Loading Guide – Loading of Pressure Vessels** (TSG-O-006) for loading instructions), a cleaning procedure must be performed prior to initial use of elements per FDA regulation. According to the Code of Federal Regulations (CFR) Title 21 Section 177.2550, "to assure their safe use, reverse osmosis membranes and their supports shall be thoroughly cleaned prior to their first use in accordance with current good manufacturing practice." The cleaning procedure below meets 21 CFR Section 177.2550 specifications and prepares membranes for start-up.

TABLE 1. START-UP CLEANING PROCEDURE FOR TRISEP® RO & NF ELEMENTS USED IN PROCESS APPLICATIONS.

Step	Cycle	pH	Temperature	Duration (min)	Procedure
1	Flush	Neutral	30 – 40°C (86 – 104°F)	10	Flush system with high quality water (see Tables 2 & 3) using a minimum of three times the system hold-up volume, sending concentrate and permeate to drain.
2	Alkaline	10.0 – 10.5	30 – 40°C (86 – 104°F)	20	Add high pH cleaner or sodium hydroxide to adjust pH. Circulate alkaline solution at standard pressure and flow conditions as shown in Table 3 for 20 minutes.
3	Flush	Neutral	30 – 40°C (86 – 104°F)	10	Flush system with high quality water using a minimum of three times the system hold-up volume, sending concentrate and permeate to drain.

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RECOMMENDED WATER QUALITY AND FLOW RATES

The system flush should be performed with high-quality water (see Table 2).

TABLE 2. FLUSH WATER QUALITY RECOMMENDATIONS.

Solute	Recommended Limit
Iron (Fe)	< 0.05 mg/L
Manganese (Mn)	< 0.02 mg/L
Aluminum (Al)	< 0.05 mg/L
Silica (SiO_2)	< 5.0 mg/L
Total Hardness as $CaCO_3$	< 50 mg/L as $CaCO_3$
Total Alkalinity as $CaCO_3$	< 50 mg/L as $CaCO_3$
Chlorine	0 mg/L
Turbidity	< 0.5 NTU
Silt	< 1 SDI

The recommended flow rates for flushing vary based on the diameter of the elements (see Table 3).

TABLE 3. RECOMMENDED FLOW RATES FOR FLUSHING.

Membrane Diameter	Flow Rate per Vessel	Recommended Pressure
3.8"	2.7 – 3.2 m^3/hr (12 – 14 GPM)	1.5 – 4.0 bar (20 – 60 psi)
6.3"	3.6 – 4.5 m^3/hr (16 – 20 GPM)	1.5 – 4.0 bar (20 – 60 psi)
8.0"	7.0 – 9.1 m^3/hr (30 – 40 GPM)	1.5 – 4.0 bar (20 – 60 psi)
8.3"	7.9 – 10.2 m^3/hr (35 – 45 GPM)	1.5 – 4.0 bar (20 – 60 psi)

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FORM NO.: TSG-O-002
REVISION DATE: 07/01/2021

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