Dairy HWS

FACT SHEET

Dairy Industry

Hot Water Sanitization

Meeting Stringent Requirements

Without question, the dairy industry is faced with increasingly stringent sanitary regulations. To help meet these requirements, Veolia introduces the Dairy HWS family. Ideal for applications with biologically active feeds, Dairy HWS elements are designed for hot water sanitization (pasteurization) by periodic exposure to temperatures up to 90°C (194°F). An innovative break-through, you can now sanitize the permeate side of a membrane element without risking membrane damage. Additional benefits of Dairy HWS elements include sanitization without the use of ineffective or harmful chemicals, as well as protection against detrimental bacterial growth on the membrane surface – thus limiting replacement costs.

Dairy HWS elements utilize polysulfone parts and unique element construction to meet the requirements for hot water sanitization. Comprised of high quality materials that meet 3A standards and conform to guidelines set by the Code of Federal Regulations, Dairy HWS elements feature a patented Durasan* Cage protective sleeve that enhances element integrity by securing the spiral. In addition, the sleeve improves sanitizing effectiveness by maintaining a controlled by-pass between the element and pressure vessel wall without the use of traditional brine seals.

The Dairy HWS elements comply with:

- FDA Regulations relevant sections of 21CFR
- EU Framework 1935/2004/EC
- Halal & Kosher certification

Membrane Technology

A Valuable Solution

The use of spiral membrane technology in dairy applications allows plants to recover valuables, create saleable products, recycle water and reduce plant effluent. By utilizing Dairy HWS elements, spiral membrane systems can strategically concentrate:

- Sweet Whey
- Lactose
- Whole Milk
- Skim Milk

A Market Leader

Veolia's Commitment to You

After over 30-years of innovation in membrane technology, Veolia has become a market leader in developing new ways to solve even the most difficult industrial and commercial challenges. For sanitization specifications and protocols based on your unique dairy process, please consult a Veolia representative.

Table 1: Element Specification

Membrane	Thin-film membrane (TFM*)

Model	Spacer mil (mm)	Active area ft^2 (m^2)	Part number
Dairy HWS RO3840C30	30 (0.76)	77 (7.2)	1228223
Dairy HWS RO8038C30	30 (0.76)	372 (34.6)	1206651
Dairy HWS NF3838C50 HR	50 (1.27)	55 (5.1)	1240430
Dairy HWS NF3838C65 HR	65 (1.65)	48 (4.5)	3167046
Dairy HWS NF3840C30 HR	30 (0.76)	77 (7.2)	1232322
Dairy HWS NF8038C50	50 (1.27)	282 (26.2)	3002372

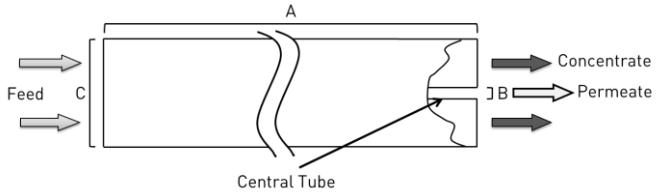

Figure 1: Element Dimensions Diagram – Female

Table 2: Dimensions and Weight

Model	Dimensions, inches (cm)			Boxed Weight lbs. (kg)
	A	B	C	
3838C	38.00 (96.5)	0.833 (2.12)	3.8 (9.6)	7 (3.2)
3840C	38.75 (98.4)	0.833 (2.12)	3.8 (9.6)	7 (3.2)
8038C	38.00 (96.52)	1.125 (2.86)	7.91 (20.1)	29 (13.2)

Table 3: Operating Parameters

Do not exceed 20 GFD (33 LMH) or 2,000 Wagner units under any circumstance.

Typical Operating Pressure	200-500 psi (1,379-3,447 kPa)
Typical Operating Flux	5-20 GFD (8–34 LMH)
Clean Water Flux (1)	RO: 14 GFD (24 LMH) @ 225 psi NF: 14 GFD (24 LMH) @ 110 psi
Maximum Operating Pressure	600 psi (4,137 kPa) : 41 – 122°F (26 – 50°C)
Maximum Temperature	Continuous operation: 122°F (50°C) Hot Water Sanitization: 194°F (90°C)
pH Range	RO elements: 2.0 – 11.0 NF elements: 3.0 – 9.0
Chlorine Tolerance	500+ ppm hours, dechlorination recommended
Maximum Pressure Drop	Over an element: 15 psi (103 kPa) Per housing: 60 psi (414 kPa)

(1) Clean water flux (CWF) is the rate of water permeability through the membrane after cleaning (CIP) at reproducible temperature and pressure. It is important to monitor CWF after each cleaning cycle to determine if the system is being cleaned effectively. CWF can vary ±25%.

Table 4: CIP limits for RO elements

Temperature	pH minimum	pH maximum
50°C (122°F)	2.0	11.5
45°C (113°F)	1.5	11.5
35°C (95°F)	1.5	11.5
25°C (77°F)	1.0	12.0

Table 5: CIP limits for NF elements

Temperature	pH minimum	pH maximum
50°C (122°F)	3.0	10.0
45°C (113°F)	2.0	10.5
35°C (95°F)	1.5	11.5
25°C (77°F)	1.0	11.5

Hot Water Sanitization recommendations

Prior to first use, new elements must be flushed with clean water[1] to remove any residual chemicals for at least an hour, at a transmembrane pressure of not more than 45 psi (3 bar). The system must be started and in operation for minimum 24 hours prior to hot water sanitization.
If the new elements are to be hot water sanitized before first use, the system must be flushed at low transmembrane pressure (up to 45 psi (3 bar)), for minimum 24 hours prior to sanitization.

Transmembrane pressure during hot water sanitization should also be maintained as low as possible, not exceeding 45 psi (3 bar), while ensuring some permeate flow for effective sanitization on the permeate side.

The cross flow to the system should be monitored and adjusted so that the pressure drop is not more than 2 psi per element or 10 psi per housing.
The following procedure should be followed step by step for the hot water sanitization of Duratherm* elements.

1. The elements that have been in operation should be cleaned with approved Clean In Place (CIP) procedure to remove any mineral scales or organic foulants, and then be thoroughly flushed for at least an hour before sanitization.
2. Increase the temperature in the system from room temperature to target sanitization temperature[2] (up to 90°C/194°F) at a rate not higher than 5°C/9°F per minute. Maintain the target temperature for 30 to 60 minutes.
3. Cool the system to room temperature at a rate not higher than 5°C/9°F per minute.

[1] RO permeate is strongly preferred when available. Feedwater which does not foul or form scale on membrane can also be used but only after appropriate filtration. Note that the solubility of some inorganics, for example calcium carbonate and at least above 45°C calcium sulfate, decreases with increasing temperature.

[2] The effectiveness of heat sanitizing is a function of temperature and time. Duratherm elements can withstand 90°C hot water sustained for over 60 minutes, but there is no gain by maintaining the high temperature for longer time than needed to deactivate the microbes that will be deactivated at the chosen temperature.

Loss of permeate flow after repeated 90°C sanitization cycles

It is almost impossible to exactly predict the percentage of permeate flow rate lost from the high temperature sanitations, which among other factors depends on:

1. Rate of temperature increase and decrease.
2. Presence of other species like organics, ionic and metallic compounds that could locally decrease or increase the temperature at the surface of the membrane.
3. Feed flow rate and specifically the heat transfer rate to the membrane surface.
4. The thickness and geometry of the feed spacer used.

At optimum conditions measured in controlled environment with deionized water, between 30% and 50% of the original permeate flow rate was lost before the element performance had stabilized after repeated heat treatments (over 90% of this flow reduction occurred during the first heat treatment). With the loss of permeate flow rate, the salt rejection increases. The rate of cooling and heating was not more than 5°C (9°F) per minute, and the differential pressure drop per element did not exceed 2 psi.

Pilot testing based on the criteria noted above will give the best operating parameters for any specific application.

Veolia Water Technologies
Please contact us via:
www.veoliawatertechnologies.com