



The White Papers Series 6

Reverse Osmosis Membrane Care

Introduction

Membrane care is one of the principal maintenance issues with water makers.

HRO Systems' Membranes

HRO Systems' Reverse Osmosis Membrane Elements are manufactured exclusively to more demanding requirements and higher specifications. Using industrial grade with high flux (more water per square feet of membrane) and high rejection (for higher product water quality).

Flow Rate ▪ Salinity ▪ Pressure

A number of things can affect the flow rate through a membrane, and the pressure in the system, notably the salinity of the source water and its temperature. With traditional water makers at any given pressure, the lower the salinity, the greater the percentage of the source water that will be converted to product water. If the pressure is not adjusted downward to lower the ratio of product water to brine, inadequate membrane flushing occurs and membrane life is shortened. Warmer source water also increases the ratio of product water to brine, while lower temperatures decrease it. Once again, adjustments in the pressure are necessary if an optimal ratio is to be maintained.

Aside from changes in salinity and temperature, any kind of fouling of the membrane will clearly impair its performance. Fouling may take the form of fine particles of silt, or oil and chemicals, which make their way through the filtration system, or biofouling. Biofouling is especially likely if a water maker is left unused for more than a week.

Membrane Maintenance

Depending on how the water maker is used, membrane care can be the major part of the needed maintenance. The extent of the work involved varies markedly from unit to unit, principally as a function of the quality of the source water filtration, regularity of use, and whether there is an automatic flushing circuit.

Flushing a Membrane

If a membrane is left unused for more than a week, it will be susceptible to bacterial fouling. The best way to minimize water maker maintenance is to use it often. If the unit is to be left unused for more than a week, it either needs to be put into storage mode or else flushed with fresh water at least once a week.

Typically, the water used for flushing is drawn from the boat's water tanks. However, traces of chlorine will do permanent damage to membranes. For this reason, some installations include a separate tank into which product water is diverted and held for flushing purposes, while others include an activated charcoal filter between the water tanks and the flushing circuit. The charcoal filter removes any trace of chlorine. (HRO recommends the Cruiser Package, which includes a Charcoal Filter).

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Reverse Osmosis Membrane Care (Cont'd)

Cleaning a Membrane

Over time, a membrane inevitably becomes fouled. The water maker will exhibit higher than normal pressures, and lower than normal product water flow rates. However, before assuming the membrane is to blame, check the feed salinity, feed temperature, operating pressures, and filters.

There are two types of membrane cleaner – alkali and acid. The alkali is most effective on biofouling, and is generally used first. The acid is effective on mineral fouling (e.g. calcium), but is generally only used if the alkali fails to restore product water flow rates.

To clean a membrane, it is first flushed with clean water and then the alkali solution is mixed with clean water in a bucket. The unit is depressurized, and the suction, product water, and discharge lines diverted into the bucket. The unit is run for an hour or so to circulate the solution through the membrane, then allowed to rest for an hour or so, and then run again for 15 minutes or so. After this, the system is put back into service, unpressurized, and run for 15 minutes or so to clear out the cleaning solution, before being returned to regular service. Once again, the initial product water will need to be discharged overboard, either manually or automatically.

Winterizing

Freezing temperatures cause extensive mechanical damage to the system components and irreversible damage to the Reverse Osmosis Membrane Element.

The expansion of water as it freezes will damage components in the system. If the system is exposed to freezing temperatures, special procedures must be followed. These procedures prevent damage to the membrane, membrane vessel assembly, and all components containing water.

Never store the Reverse Osmosis Membrane Element in direct sunlight or expose the membrane element in direct sunlight nor expose the membrane to storage temperatures above 120° F / 50° C or below 32° F / 0° C. High temperatures cause significant membrane production loss that results in an increase in operating pressure and places undue stress on the membrane. This damage is irreversible.

HRO Systems Recommends

HRO Systems recommends a Fresh Water Flush. This feature removes salt water from the R.O. system's internal parts and will flush the membrane with clean water. This process will prevent corrosion of the internal parts and reduces biological fouling of the membranes. If the R.O. system is not being used, a unique timing feature allows it to automatically flush itself with fresh water once every seven days.

Note: For additional technical or care information regarding membranes, please contact HRO Systems.

Contributing Source: Nigel Calder



PO Box 5463
Carson, CA 90745

Website: www.hrosystems.com
E-mail: sales@hrosystems.com

Toll Free: (800) 366-4476
Office: (310) 631-6300
Fax: (310) 631-6395