



# FILMTEC Membranes

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## RO Systems Shutdown and Lay-up Considerations

A RO system is designed to be operated continuously. However, in reality RO systems will start-up and shutdown on some frequency. When the RO membrane system is shutdown, the system must be flushed with either permeate water or high quality feedwater, to remove the high salt concentration from the modules until concentrate conductivity matches feedwater conductivity. Flushing is done at low pressure (about 3 bar/40 PSI). A high feed flow rate is beneficial for a cleaning effect; however, a pressure drop of 1.4 bar (20 PSI) per element or 4.1 bar (60 PSI) per multi-element vessel must not be exceeded.

The water used for flushing shall contain no chemicals used for the pretreatment. Therefore, any chemical injection is stopped before flushing the system. After flushing the system, the feed valves are closed completely. If the concentrate line ends into a drain below the level of the pressure vessels, then an air break should be employed in the concentrate line at a position higher than the highest pressure vessel. Otherwise, the vessels might be emptied by a siphoning effect.

When the system must be shutdown for longer than 48 hours, take care that:

- The elements do not dry out. Dry elements will irreversibly lose flux.
- The system is adequately protected against micro-biological growth, or regular flushing is carried out every 24 hours.
- When applicable, the system is protected against temperature extremes.

The RO train can be stopped for 24 hours without preservation and precautions for microbiological fouling. If feedwater for flushing every 24 hours is not available, preservation with chemicals is necessary for longer stops than 48 hours.

Depending on the previous operational history of the plant, it will be necessary in almost all cases to perform a cleaning of the RO membranes prior to preservation. This is especially applicable when the membranes are known or assumed to be fouled. A typical sequence for the cleaning can be as follows:

Perform a soft alkaline cleaning at pH=11 for 2 hours, disinfect and perform a short acid cleaning. If the plant has been operated with a feedwater which is free of scalants and metal hydroxides, the acid cleaning can be omitted.

After cleaning and disinfection, the preservation should follow within the next 10 hours as follows:

1. Preservation of the plant using "total immersion" of elements into a solution of 1 to 1.5% of sodium bisulfite (SBS), venting the air outside of the pressure vessels. Use the overflow technique: circulate the SBS solution in such a way that the remaining air in the system is minimized after the recirculation is completed. The SBS solution shall be allowed to overflow through an opening located higher than the upper end of the highest pressure vessel being filled in order to ensure all of the air has been eliminated.
2. Separate the preservation solution from the air outside by closing all valves. Any contact with oxygen will oxidize the SBS.
3. Check the pH once a week. When the pH becomes 3 or lower, change the preservation solution.
4. Change the preservation solution at least once a month.

During the shutdown period, the plant must be kept frost-free, and the temperature must not exceed 45°C (113°F). A low temperature is desirable.

For additional information, please refer to the product information bulletin entitled *FT30 Reverse Osmosis Membrane Biological Protection and Disinfection*, Form No. 609-24010/172-120-E.

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