



DOW FILMTEC™ Membranes System Operation: RO & NF Systems Shutdown

RO & NF Systems Shutdown

An RO/NF system is designed to be operated continuously. However, in reality membrane systems will start-up and shutdown on some frequency. When the membrane system is shutdown, the system must be flushed preferentially with permeate water or alternatively with high quality feedwater, to remove the high salt concentration from the pressure vessels until concentrate conductivity matches feedwater conductivity. Flushing is done at low pressure (about 40 psi/3 bar). A high feed flow rate is sometimes beneficial for a cleaning effect; however, the maximum pressure drop per element and per multi-element vessel – as stated on the DOW FILMTEC™ membranes product information sheet - must not be exceeded. During low pressure flushing, the vessels of the last stage of a concentrate staged system are normally exposed to the highest feed flow rates and therefore they show the highest pressure drop.

The water used for flushing shall contain no chemicals used for the pretreatment, especially no scale inhibitors. Therefore, any chemical injection (if used) is stopped before flushing. 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 high pressure pump is switched off, and the feed/concentrate side had not been flushed out with permeate water, a temporary permeate reverse flow will occur by natural osmosis. This reverse flow is sometimes referred to as permeate draw-back or suck-back. Permeate suck-back alone or in combination with a feed-side flush may provide a beneficial cleaning effect. To accommodate permeate suck-back, enough water volume should be available to prevent a vacuum from being drawn or air being sucked back into the membrane element. For dimensioning a draw-back tank, see [Tanks \(Section 3.13.6\)](#).

If the permeate line is pressurized during operation and the system shuts down, the membrane might become exposed to a static permeate backpressure. To avoid membrane damage from backpressure, the static permeate backpressure must not exceed 5 psi (0.3 bar) at any time. Check valves or atmospheric drain valves in the permeate line can be used to safeguard the membrane. These safeguard valves need to work also and especially in case of non-scheduled shutdowns, e.g. because of a power failure, or emergency shutdowns.

When the system must be shut down 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 membrane plant 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. Please refer to [Preservation of RO and NF Systems \(Section 7.4\)](#) for further lay-up considerations.

DOW FILMTEC™ Membranes

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Warning: Oxidizing agents such as nitric acid attack organic ion exchange resins under certain conditions. This could lead to anything from slight resin degradation to a violent exothermic reaction (explosion). Before using strong oxidizing agents, consult sources knowledgeable in handling such materials.

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