



# FILMTEC Membranes

## System Operation: Initial Start-Up

### Start-Up Sequence

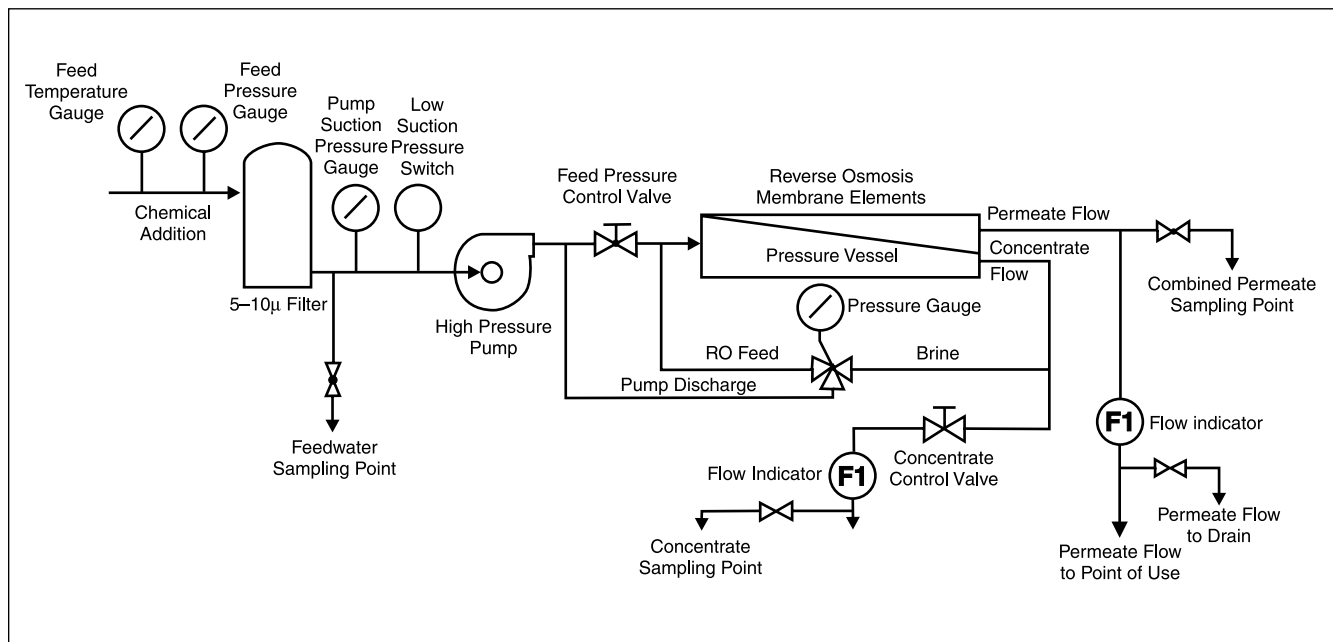
Proper start-up of reverse osmosis (RO) water treatment systems is essential to prepare the membranes for operating service and to prevent membrane damage due to overfeeding or hydraulic shock. Following the proper start-up sequence also helps ensure that system operating parameters conform to design specifications so that system water quality and productivity goals can be achieved. Measurement of initial system performance is an important part of the start-up process. Documented results of this evaluation serve as benchmarks against which ongoing system operating performance can be measured.

Before initiating system start up procedures, membrane pretreatment, loading of the membrane elements, instrument calibration, and other system checks should be completed. Following is the recommended RO system start up sequence:

### Typical Start-Up Sequence

- Before initiating the start-up sequence, thoroughly rinse the pretreatment section to flush out debris and other contaminants without letting the feed enter the elements. Follow the Pre-Start-up check list.
- Check all valves to ensure that settings are correct. The feed pressure control and concentrate control valves should be fully open.
- Use low pressure water at a low flow rate to flush the air out of the elements and pressure vessels. Flush at a gauge pressure of 0.2 - 0.4 MPa (30 to 60 psi). All permeate and concentrate flows should be directed to an approved waste collection drain during flushing.
- During the flushing operation, check all pipe connections and valves for leaks. Tighten connections where necessary.
- After the system has been flushed for a minimum of 30 minutes, close the feed pressure control valve.
- Ensure that the concentrate control valve is open.
- Slowly crack open the feed pressure control valve (feed pressure should be less than 0.4 MPa/60 psi).

### Typical RO System



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- h. Start the high pressure pump.
- i. Slowly open the feed pressure control valve, increasing the feed pressure and feed flow rate to the membrane elements until the design concentrate flow is reached. The feed pressure increase to the elements should be less than 0.07 MPa (10 psi) per second. Continue to send all permeate and concentrate flows to an approved waste collection drain.
- j. Slowly close the concentrate control valve until the ratio of permeate flow to concentrate flow approaches, but does not exceed, the design ratio (recovery). Continue to check the system pressure to ensure that it does not exceed the upper design limit.
- k. Repeat steps "i" and "j" until the design permeate and concentrate flows are obtained.
- l. Calculate the system recovery and compare it to the system's design value.
- m. Check chemical additions of acid, scale inhibitor, and sodium metabisulfite (if used). Measure feedwater pH.
- n. Check the Langelier Saturation Index (LSI) or the Stiff & Davis Stability Index (S & DSI) of the concentrate by measuring pH, conductivity, calcium hardness, and alkalinity levels and then making the necessary calculations.
- o. Allow the system to run for one hour.
- p. Take the first reading of all operating parameters.
- q. Read the permeate conductivity from each pressure vessel and identify any vessels that do not conform to performance expectations (e.g., vessels with leaking O-rings or other evidence of malfunction).
- r. After 24 to 48 hours of operation, read all plant performance data such as feed pressure, differential pressure, temperature flows, recovery and conductivity readings (please refer to separate information). At the same time draw samples of feedwater, concentrate, and combined system permeate and analyze sample constituents.
- s. Compare system performance to design values.
- t. Confirm proper operation of mechanical and instrumental safety devices.
- u. Switch the permeate flow from drain to the normal operating position.
- v. Lock the system into automatic operation.
- w. Use the initial system performance information obtained in steps "p" through "r" as a reference for evaluating future system performance. Measure system performance regularly during the first week of operation to ensure proper performance during this critical initial stage.

The technical information contained here is extracted from the **FILMTEC Membranes - Technical Manual**. References to other sections of the manual have been replaced with short references to additional but separate information available from our web site. The information in these extracts has been updated and supercedes that contained in the full manual.

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