



#### 5-2. Initial Start-up

##### 5-2-1. Checklist before Start-up

Before starting up the RO system, it is important to make sure that the whole pretreatment process is working according to the specifications. If the chemical characteristics of the raw water are changed, then a full analysis of the water entering the RO unit should be done so that proper measurements can be made to put the variables under control.

Factors affecting the feed water quality and thus the system design are as follows :

- Flow, SDI, Turbidity, Temperature, pH, TDS, residual chlorine, and bacteria counts

And also the following mechanical inspections of the RO system are recommended for the initial start-up.

- Operational conditions of media filters and cartridge filters
- Feed line is purged and flushed before pressure vessels are connected
- Chemical addition lines and valves
- Proper mixing of chemicals in the feed stream
- Safety shut off of the RO system when the chemical dosage pumps are shut-down
- Complete chlorine removal prior to the membranes
- Instrumentation for proper operation and monitoring of the pretreatment and RO system
- Installation and calibration of such instrumentation
- Installation of pressure relief protection
- Piping and securing pressure vessels for operation and cleaning mode
- Lubrication and proper rotation of pumps
- Valves for permeate line, feed flow, and reject flow control are in open position
- Initial feed flow is limited to less than 50% of operating feed flow

##### 5-2-2. Start-up Sequence

- Before starting the initial operation sequence, the pretreatment section should be thoroughly rinsed to flush out debris and other contaminants without allowing the feed to enter the elements
- Make sure that all valve settings are correct. The feed pressure control and concentrate control valves should be fully open
- Use the feed water at a low flow rate to expel the air out of the elements and pressure vessels

at a gauge pressure of 30 to 60 psi for more than 30 minutes. All permeate and concentrate flows should be directed to an approved waste collection drain during flushing. At this point, all pipe connections and valves are checked for leaks

- After the system has been flushed, close the feed pressure control valve, but make sure that the concentrate control valve is open
- Open the feed pressure control valve little by little so that feed pressure does not exceed 4.0 kg/cm<sup>2</sup> (60 psi) and then start the high pressure pump
- Increase opening of the feed pressure valve slowly to elevate the feed pressure and feed flow rate to the elements until the design concentrate flow is reached. Then slowly close the concentrate control valve until the ratio of permeate flow to concentrate flow approaches the designed recovery ratio
- Repeat opening of the feed pressure control valve and closing of the concentrate control valve until the design permeate and concentrate flows are obtained, while checking the system pressure to ensure that it does not exceed the upper design limit
- After adjusting the two valves, calculate the system recovery and compare it to the system design value
- Check chemical additions of acid, scale inhibitor, and sodium metabisulfite. Measure pH, conductivity, calcium hardness and alkalinity levels to calculate the Langelier Saturation Index (LSI) or the Stiff & Davis Saturation Index(S&DSI) for a possibility of scale formation
- Take the first reading of all operating parameters after allowing the system to run for one hour. Read the permeate conductivity from each pressure vessel and identify any vessel with any malfunction
- After 24 to 48 hours of operation, record all plant performance data such as feed pressure, differential pressure, temperature, flows, recovery ratio and conductivity reading. And also analyze constituents of feed water, concentrate, and permeate water samples. Compare system performance to design values. Use the initial system performance information as a reference for evaluating future system performance. Measure system performance regularly during the first week of operation