

## Technical Information

### Reverse Osmosis And Nano filtration Membrane Element Precautions

#### Free Chlorine or Other Oxidants In Feed Water of Thin Film (polyamide) Membrane Elements

Chlorine ( $\text{Cl}_2$ ) has been used for many years to treat municipal and industrial water and waste waters to control microorganisms because of its capacity to inactivate most pathogenic microorganisms quickly. The effectiveness of chlorine is dependent on the chlorine concentration, time of exposure, and the pH of the water.

Chlorination for RO/NF pretreatment has been applied usually where biological fouling prevention is required. Chlorine is added continuously at the intake, and a reaction time of 2030 min should be allowed. A free residual chlorine concentration of 0.5-1.0 mg/l should be maintained through the whole pretreatment line. Thin film polyamide membrane is extremely sensitive to chlorine or any other oxidising agent. Dechlorination upstream of the membranes is required, however, to protect the membranes from oxidation. In case of waste water applications due high biological load chloramines are always used. The chloramines level needs to be monitor on continuous basis, if it exceed the limiting condition plant operator should get a warning that concentration oxidising agent in feed water has cross the set limiting condition and it needs to be control on ASAP basis. Operator should increase the concentration of SMBS or to reduce doses of oxidising agent. If the concentration of oxidising agent have reaches a dangerous level in that case plant need to be shut down until the concentration of oxidising agent come to a normal.

#### Feed Water Free from Particulate

Membrane should not be expose to particulate matter which can accumulate on membrane surface and mechanically damage the upper polyamide layer. The addition of unwanted particulate matter in RO feed water will be from improper flushing of pipe and equipment at the time of start up, poorly operated pretreatment, corrosion of metal pipes, valves, pump in feed line. This also happen when cartridge filter is by-pass or use of bad quality or reused of already used cartridges. Observation shows that such particles can become lodge between the feed spacer and the membrane. Vibration of feed spacer due to system pressure and flow push these particles in between feed spacer and membrane and membrane surface start gating damage. This often leads to mechanical damage which leaks feed water into permeate side of element. This damage of membrane sheet reflect in performance of membrane as well as system, there will be slight increase in permeate flow but sizable increase in permeate water TDS. User should refer pre commissioning and commissioning guidelines given in HYDRAMEM product technical information document or contact technical support engineer.

#### Membrane System Precaution

Membranes are highly sensitive to permeate back pressure and will get permanently damage if expose to permeate back pressure. Membrane element shall not expose to permeate back pressure (permeate pressure exceeds feed pressure). Also while shutting down the membrane system there shall be no permeate back pressure.

Permeate valve of membrane system should be always open at all time. This include all the operations like per start up flushing, start up, pre shut down flushing , shout down, cleaning etc.

If the permeate valve is closed during any phase of operation cause pressure differential across the tail end of the system and will likely to damage the glue line of membrane element which is irreversible damage and cannot be repaired. This damage will results in to immediate increase in permeate flow and salt passage.

The concentrate valve also should be always open during startup of any membrane system. To generate required permeate water slowly the concentrate valve should be moved towards close position. Once the required permeate water flow rate (recovery ) is achieved the valve should be kept in that position only till system shut down. Do not start system with concentrate valve close and then open till to generate required permeate flow.

### **Membrane System Pressurisation**

Membrane system starts up needs to be done step by step. It is dangerous to increase the membrane system pressure all of a sudden which can result in mechanical damage of membrane element. This mechanical damage will include telescoping of membrane, cracking of resin outer wrap. In extreme cases the resin outer wrap may get bust due to pressure difference between inside of the element and outside of the element shell. HYDRAMEM recommends that the membrane system pressured not more than 1 bar/ sec to ensure no damage due to high rate of pressurisation of membrane system.

### **Effect of Temperature and Pressure on Membrane Element**

Membranes are made up of plastic and polymer materials, if they are expose to high temperature and pressure condition they may get deform. In case of reverse osmosis element the major concern is of porous polysulfone support may undergo compression at these conditions, which decreases the porosity of polysulfone layer. Due to which the resistance to permeate water flow increase through this layer which finally reflect in reduction of permeate flow through polyamide layer on standard test condition. HYDRAMEM recommends user to operate the membrane elements in given temperature and pressure limits for respective models. For the operating limits pl refer the product specification sheet.

### **Brine Seal and 'O' Ring Lubrication**

To avoid the seepages of feed water through connector 'O' rings, most of the users do lubrication to 'O' rings. It is very important that user should not used any petroleum based lubricant to lubricate the various 'O' rings and brine seal of membrane element. User should only used glycerin and silicon based lubricants.