MOST COMMONLY ASKED QUESTIONS

1. What is the difference between cleaning and disinfection of the RO system?

Cleaning is the removal of foulants from the feed side of the RO membrane. There are two types of cleaners, high pH (7.5-11) and low pH (2.0-4). High pH cleaners remove silt and organics that clog or foul the membrane, and low pH cleaners strip the mineral scale build-up and biofilm (from bacteria) that prevent the membrane from functioning adequately. Cleaners aid in the control of microbes by stripping the membrane free of deposits that bacteria can adhere to, but they themselves do not kill bacteria like a disinfectant does.

Disinfection decreases and controls microbial levels in the complete system both feed and product side of the membrane and the fluid pathway.

Routine cleaning of the membranes (approximately every quarter) along with regular disinfection (approximately once a month) together in large central systems will expand the life of the RO membrane and control bacteria counts in the system. The membranes in portable units should be cleaned and disinfected every quarter or more often as required.

2. Why do I have decreased product pressure (PSI) or low flow?

Four factors affect product flow or RO water production and pressure:

<u>Temperature of the feed water:</u> Incoming water temperature greatly affects the amount of product water made. RO membranes are rated on an ideal source water temperature of 77°F (25°C). For every 1-degree F lower the feed water temperature is, the product flow is reduced by 1.5%. Temperature blending valves are commonly used on large water systems to maintain the incoming water around 77°F, and for small portable RO machines, larger, or more membranes are used to compensate for seasonal water temperature fluctuations.

<u>RO pump pressure:</u> RO membranes are designed to be operated at a specified pump pressure to create the proper product flow and rejection. Cellulosic membranes generally require twice the pump pressure that thin film membranes need in order to produce the same amount of product water. Operating the RO at a lower than suggested pump pressure will result in reduced product flow. Operating the pump at higher than recommended pump pressure will wear the pump out prematurely.

<u>Cleanliness of the RO membrane:</u> Foulants such as silt, organics and mineral scale deposits can cover portions of the feed water side of the membrane. These foulants can clog the membrane and obstruct the water from passing through, thus decreasing production of RO permeate.

Low city/source feed water pressure: It is common for municipal water systems to have various difficulties. These problems sometimes affect the incoming flow pressure to the RO machine. Either reduced feed water pressure or no feed water pressure can be the result. A booster pump, sometimes coupled with a bladder tank, can reduce the risk of deficient water supply. A storage tank can help in a no water situation for large RO systems. In small, portable RO units, it is best to not use the system until the feed water reaches at least 25 PSI. Decreased flow through the system will cause unnecessary wear and tear on the pump.

3. How long will a carbon tank last before it becomes exhausted?

The length of time between carbon exchange or re-bedding is dependent upon the amount of chlorine/chloramines present in the source water. How often the carbon is changed is best determined by testing for chlorine/chloramine presence before each patient shift. Based on the test results, a pattern can be identified, and a routine established to change the tanks **before** they become exhausted. However, when break through occurs, the carbon is exhausted and needs to be replaced.

In addition to chlorine/chloramines, carbon will also remove organics from the incoming water, and is therefore a perfect medium for bacteria to proliferate. It can also become fouled by dirt and suspended particles, thus reducing the efficacy of the carbon. It is a common practice to backwash carbon to clear it of this matter and prevent channeling of the carbon bed so that the water is exposed to more surfaces, which renders the carbon more efficient. However, this does not renew the carbon; when it is exhausted it must be replaced.

Since bacteria growth is a problem in the carbon tanks, it is recommended that they be changed every three to six months (even if they are not exhausted), or more often before they break through.

4. How long will a RO membrane last?

An RO membrane, which has adequate pretreatment, which is cleaned and disinfected routinely and is maintained well, will last on an average from 3-5 years in a large system, and 1-2 years in a portable system. Along with maintenance, the quality of the source water also determines the life span of the membrane. A higher solute concentrated source water will have more wear on the membrane than a lower ionic supply water.

Thin film (TF) membranes are more durable than cellulose acetate (CA) membranes. TF membranes have a longer life on a wider variety of feed water quality and have a greater range for pH tolerance than CA membranes do.

5. Is it a good idea to store purified water?

There are advantages in a storage tank system. For instance, a smaller RO unit can be used instead of upgrading the size of the RO system when a dialysis center is expanded. If water supply interruption is a problem, there is product water available to furnish the dialysis systems. There are some cases in which it is not feasible to install a direct feed system. For example, a dialysis facility that is limited on space, or a center which has the RO system reside on a lower floor than the patient treatment area.

Storage tank water distribution systems have disadvantages that are not inherent to direct RO feed systems (no storage tank). Storage systems require extra maintenance and monitoring plus the added expense of the storage tank and a distribution pump. Additional time is required in cleaning, sanitizing, monitoring and maintaining the system. The risk of bacterial contamination is greater because of the potential stagnation and because the surface area of the product water is exposed to atmosphere.

6. Why do you typically design your water systems with the softener before the carbon tank?

Either the softener or the carbon tank can be placed first in the pretreatment flow path (the FDA Manual and the film picture the carbon tank primary). We design the system with the softener before the carbon in dialysis applications, because of the reduced risk of bacteria exposure. Carbon tanks are primarily used for the removal of chlorine/chloramines and will therefore eventually experience microbial growth, because chlorine/chloramines are what prevents microbial growth from occurring. If the carbon tank is first in line, the softener will be exposed to de-chlorinated water which will allow for greater microbial growth in the softener, thus allowing both the carbon tank and softener to become contaminated at the same time. However, if the softener is first, it is exposed to chlorinated water and the bacteria will be minimized. Bacteria and endotoxins are rejected by the RO membrane at a rate of 99%+, but the more the membrane is exposed to bacteria, the higher the chance for the microbes to adhere and possibly "grow through" the membrane.

The downside of designing the system with the carbon second is that the softener resin beads are harmed by chlorine, thus the life of the softener may be shortened a few years, depending upon the level of chlorine the softener resin is exposed to. Large system softeners generally last 10 to 15 years, therefore the damage is insignificant when compared to the microbial contamination problem.