Selecting a Reverse Osmosis System

When selecting a reverse osmosis system, the following factors must be considered:

Is the water supply potable?

An RO system should be used with water that is already deemed bacteriologically safe for human consumption or is adequately disinfected or sterilized on a continuous basis. RO systems can include ultraviolet lights.

Is the feed water supply chlorinated or unchlorinated?

If the water is unchlorinated, a TFC membrane should be chosen due to its greater resistance to bacterial attack. If the water is chlorinated, a CTA membrane that is not chlorine sensitive may be chosen or a TFC membrane that is sensitive to chlorine may be used with the addition of a carbon pre filter. The membrane will need to replace approximately every 2 years, depending on the water quality and quantity. Most systems use TFC membranes.

What is the daily quantity of pure water required?

A suitable residential system should be capable of producing in excess of a minimum of 1/2 gallon of drinking water per person per day. Residential systems typically produce 15 to 25 US gallons per day of pure drinking water. Commercial/Industrial units can produce up to 40000 US gallons per day of pure drinking water and should be sized according to their application.

Is the water supply adequately pretreated?

If present, any contaminant such as iron, manganese or hydrogen sulfide must be adequately reduced or removed by pretreatment in accordance with membrane tolerances. If necessary, the feed water should be treated to reduce hardness to a maximum of 10 gpg to prevent premature fouling of the membrane.

What is the level of TDS (total dissolved solids)?

Drinking water should have a TDS of below 500. City water on the West Coast of Canada has a low TDS of 25, while many other areas have a TDS of 200+. Well water can have a TDS of 1000 to 5000. Sea water has a TDS of 40 000 and the Black Sea can be up to 60 000 TDS. Residential RO units can tolerate up to 2000 TDS. Brackish water RO units can take up to 6000 TDS. Desal RO units are used for higher levels and the membrane pressure vessel will run at approximately 900 psi.

What is the pH of the feed water?

The pH in most city water supplies is 6.9 to 7.5. In many West Coast cities the water can have a low natural pH level, as low as 5.5, making the water very corrosive to copper piping. pH is a logarithmic scale. For example, a pH of 6.9 is ten times more acidic than a pH of 7.0

Is a booster pump required?

A booster pump may be required if your incoming water pressure is less than 50 psi, or you have a TDS count of over 1000, or the inlet water temperature is very low.

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Factors affecting performance of reverse osmosis units

Outlined below are three of the primary factors that have the greatest potential impact on the quality and quantity of reverse osmosis water that an individual system will produce.

TDS of Feed Water

Osmotic pressure is the force binding water molecules to dissolved ions or solids. The higher the TDS, the higher the molecular forces. Before water molecules can start to separate and pass thorough the membrane, these forces must be broken with the application of pressure. Every 100 mg/l of TDS requires 1 psi (pounds per square inch) just to overcome osmotic pressure.

Water Pressure or Feed Pressure

Net pressure across the membrane is a major factor in determining how much water is produced. As the pressure increases, so does the rate of water production. The minimum water pressure required for a residential RO unit is 50 psi. A booster pump can be added to any RO unit which will operate with inlet pressure of as low 10 psi.

Temperature of Feed Water

Water temperature greatly affects the actual rate of production. Membranes are rated in terms of production in gallons per day (GPD) at 77 degrees Fahrenheit. The cooler the water, the lower the rate of production. Water production increases or decreases for CTA membrane - 1.5% per °F and for TFC membranes 2.0% per °F above or below 77 °F. For high output RO units, temperature is an important design factor.