Frequently Asked Questions About Reverse Osmosis

How Does a Reverse Osmosis System Work?

Osmosis is a natural process that occurs when two volumes of water are separated by a semi-permeable membrane. A semi-permeable membrane has holes that are small enough to trap contaminants, but allow water to flow through. Water will flow through the semi-permeable membrane from the side of the low solute concentration (fewer contaminants) to the side of the high solute concentration (more contaminants) in order to restore equilibrium between the two sides. This flow of water may be stopped or even reversed if external pressure is applied to the higher solute concentration. This process is used in water purification, manufacturing plants, and chemical laboratories.

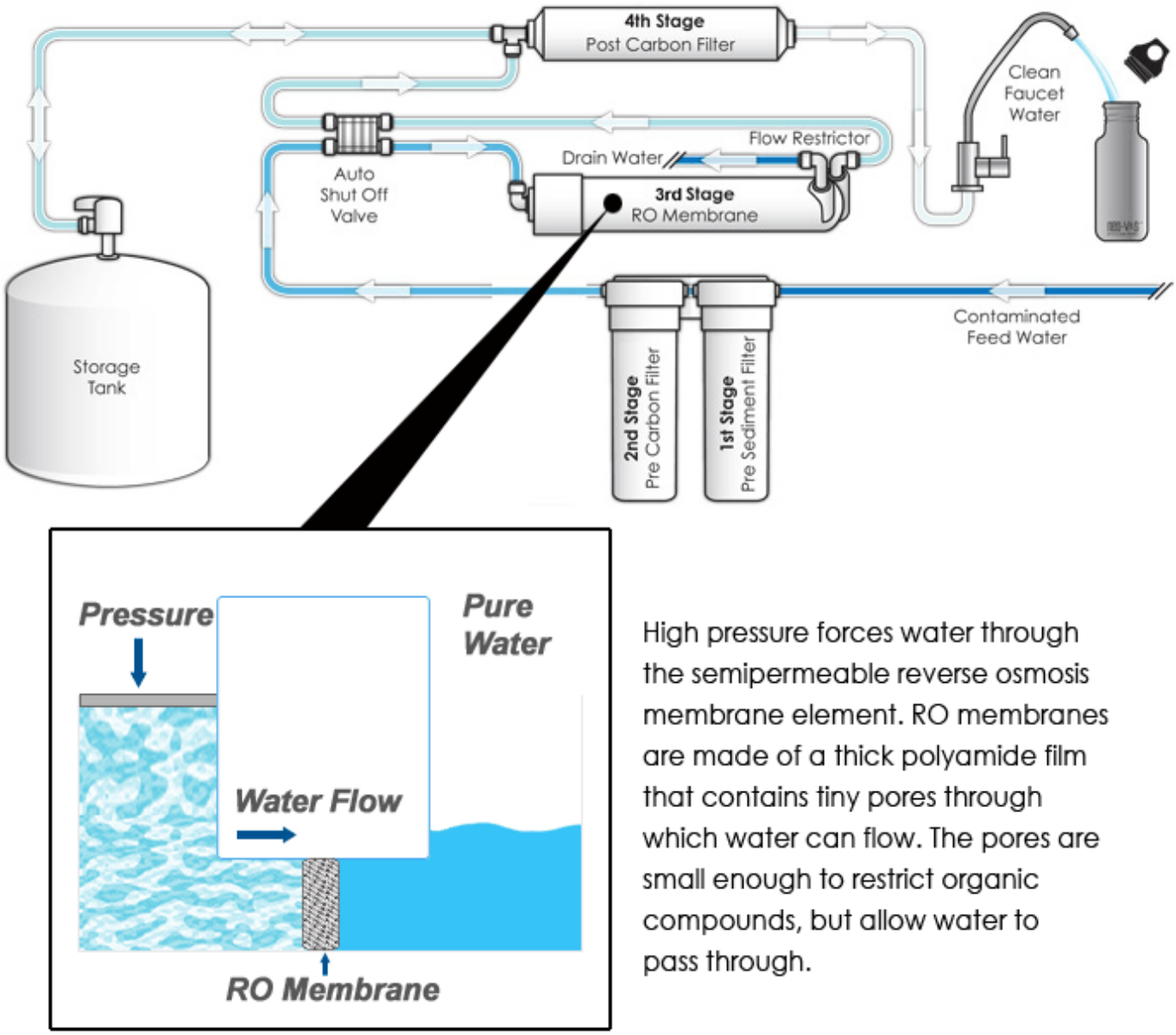
Reverse osmosis occurs when pressure is applied to a volume of water. So, for example, when pressure is applied to a volume of saltwater, the water (the solvent) will pass through the semi-permeable membrane into the other container, leaving behind the salt. This is one way that saltwater can be made potable.

Reverse osmosis (RO) is only one stage of a typical RO system. Sediment and carbon filtration systems are normally included with an RO system, with each stage of filtration contributing to the purification process.

The first stage of filtration is the sediment filter, which reduces suspended particles such as dirt, dust, and rust.

The second stage of filtration is the carbon filter. This filter reduces volatile organic chemicals (VOCs), chlorine, and other compounds that might impact the taste or odor of the tap water. Chlorine should be removed from the water before the water enters the membrane. This will help preserve the life of the membrane.

The center and third stage of a reverse osmosis system is the semi-permeable membrane. It is responsible for rejecting up to 98% of the total dissolved solids in the water. This is where the purification takes place.



High pressure forces water through the semipermeable reverse osmosis membrane element. RO membranes are made of a thick polyamide film that contains tiny pores through which water can flow. The pores are small enough to restrict organic compounds, but allow water to pass through.

What happens to the impurities that were in the water?

Rejected impurities are carried down the drain. Unlike traditional filters, the RO membrane is self-cleaning. As the source water flows through the system, it is divided into two streams. One stream is forced through the membrane, creating the filtered water that eventually makes it out of the tap. The second stream carries the rejected salts, dissolved pollutants, and minerals to the drain. Because the contaminants are carried away with the rejected water (waste water), they are not able to clog the membrane. A more traditional charcoal or carbon filter will become less efficient each time it is used. As the water passes through, the media gradually loses its ability to trap the impurities and contaminants.

Isn't water wasted with an RO system?

A small percentage of water goes to the drain, carrying the rejected impurities with it. These particles are too small to be caught by the filters. Installing a permeate pump with your RO system can reduce the rejected water by up to 80%.

Can rejected water be saved and reused?

Yes. Many companies and homes with RO systems use the concentrate water (waste water) for landscaping or artificial lakes. This drain water will carry the contaminants with it, so it will have a higher TDS reading, but will be safe for the lawn and garden.

What is the minimum water pressure needed to feed an RO system?

Sufficient water pressure is needed to force the water through the membrane for purification and to flush away the rejected water with the contaminants. Systems with low water pressure will result in reduced production and premature fouling of the membrane. The ideal pressure for operating most residential RO systems is 60 PSI. Pressure below 40 PSI is generally considered insufficient, and should be boosted using a pressure booster pump. Booster pumps are strongly encouraged for RO systems as they reduce reject water, allow the tank to fill faster, and prolong the life of the membrane. For more information on booster pumps click here.

Will iron hurt an RO system?

Yes. Iron can foul an RO membrane. The membrane will not be able to flush the iron out, and as the membrane becomes clogged with the iron, it will be more susceptible to oxidation damage. There are two types of iron. Ferrous or clear-water iron exits the faucet clear but can then leave a red or brown stain after standing. Ferric iron, also known as red-water iron can generally be seen immediately. Trace amounts of ferrous iron (up to 2 parts per million) can usually be removed by a water softener. An even smaller amount of ferrous iron is of even less concern and will likely not harm the membrane. However, ferric iron can be removed with a manganese greensand filter, or smaller quantities can be removed with a sediment filter, carbon filter, or a water softener.

What does "Total Dissolved Solids" mean?

Water may begin as rain, but it goes through many places to get to the faucet in your kitchen or bathroom. The various minerals and salts that have been dissolved by the water during this cycle are called "Total Dissolved Solids" or TDS. TDS can include nitrates, sodium, and potassium, to name a few. A TDS meter should be used to test the water going into the RO system and the permeate water coming out of the RO system. Use these two measurements in this simple equation to calculate the percent rejection of TDS (efficiency) that your system is currently achieving.

How will I know the RO system is removing the dissolved solids (TDS) from my water?

RO water that has reduced TDS tastes better and is clearer than untreated water. Ice cubes made with RO water are clearer and take longer to melt, creating great tasting beverages. Ice cubes from contaminated tap water can leave behind unsightly contaminants or change the taste of the beverage. Another way to determine if the TDS has been reduced in the permeate water is by using a TDS meter and this simple equation.

What mineral contaminants are removed by an RO system?

Mineral contaminants can be reduced by up to 99.8%, depending on the water chemistry and the pressure of the water running through the system. For questions on these variables, contact our Certified Water Specialists who will be able to help you select the ideal RO system for your needs.

Contaminants	Average Influent Concentration (mg/L)	Average Effluent Concentration (mg/L)	Average Percent Reduction	Maximum Effluent Concentration (mg/L)
Arsenic	0.28	0.0035	98.7	0.0052
Barium	10.2	0.207	97.9	0.3
Cadmium	0.036	0.0005	98.6	0.0007
Chromium (Hexavalent)	0.15	0.013	91.3	0.03
Chromium (Trivalent)	0.17	0.01	94.1	0.01
Copper	3.1	0.03	99.0	0.04
Cysts	149357 #/ml	5 #/ml	99.99	17 #/ml
Turbidity	10.2	0.26	97.5	0.83
Fluoride	8.0	0.5	93.9	0.7
Lead	0.15	0.002	98.6	0.003
Perchlorate	0.10	0.003	96.5	0.005
Radium 226/228	25 pCi/l	5 pCi/l	80.0	5 pCi/l
Selenium	0.10	0.10	92	0.011
TDS	790	24	97	800

Does RO remove parasites such as bacteria, cysts or cryptosporidium?

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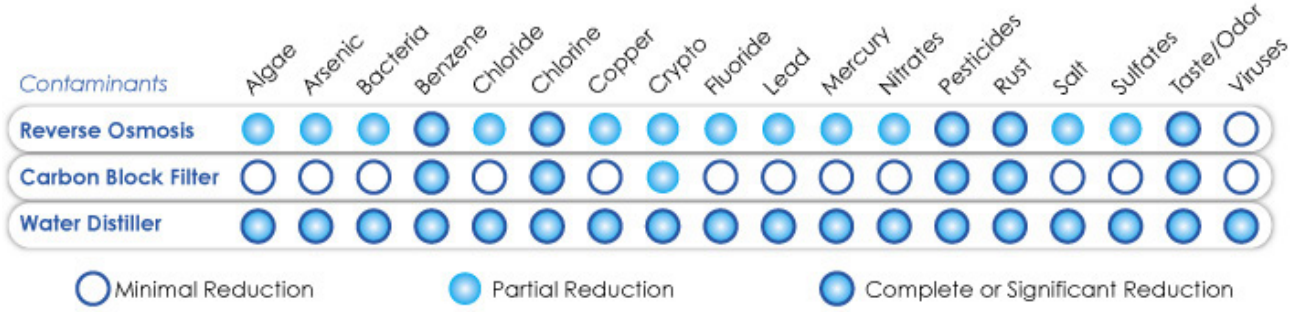

How often should filters be replaced in an RO system?

Change prefilters every six months. This will keep your entire RO system running efficiently. Prefilters will also prevent dirt and other chemicals from plugging the membrane. Local water conditions may necessitate more frequent filter changes. If you have more than one prefilter, the first stage is typically a sediment filter to trap particulates, while the second stage filter reduces chlorine. These prefilters protect the membrane from oxidizing and are comprised of purification grade carbon.

Does the RO unit have to be mounted under the kitchen sink?

No. The RO system can be mounted in a cabinet to either side of the kitchen sink or even mounted remotely in a garage or basement.

How far can a line be run from the RO unit?

A line can be run from the RO system about 20-25 feet with poly tubing. For longer distances, use 3/8" poly tubing. Tubing should always be plastic or poly, not copper. If you still experience low pressure or low flow, a demand delivery pump can be installed for improved performance.

I have a water softener. Doesn't that treat my drinking water?

No. A water softener removes calcium and magnesium from the water. Water softeners are usually installed at the point of entry (POE). This allows the water softener to treat the water for the entire house+s plumbing and appliances. Although this water will be easier to use in the shower or in the laundry, the water softener will not necessarily improve the taste or the contaminant level of the tap water.

Will a water softener harm the reverse osmosis system?

No. Calcium and magnesium (lime scale) are two of the hardest minerals for the RO membrane to remove. Sodium (added to the water by the softener) is much easier on the membrane, and it will reject up to 98% of all sodium in the water. A water softener will actually help extend the life of the membrane.

Will an RO system soften water?

Yes. Water is softened through the reverse osmosis purification process. However, using the RO system to treat hard water (above 7 grains of hardness) can actually shorten the life of the membrane. This will lead to more frequent replacements for the RO membrane.

What's the difference between a CTA and TFC membrane?

A CTA (cellulose triacetate) membrane is made out of paper by-product and bonded to a s ynthetic layer. Due to its cellulose composition, a CTA membrane requires chlorine in the water source to keep bacteria from forming. A CTA membrane has a rejection rate of between 85-94%. CTA membranes have an average life expectancy of 18-24 months and are considered inferior to TFC membranes. TFC (thin film) membranes are made of synthetic material. Before water enters the TFC membrane, any chlorine must be removed as it will damage the membrane. A TFC membrane has a rejection percentage between 95-98%, creating less rejected water than a CTA membrane. A TFC membrane will last between 2-5 years. Many hospitals use TFC membranes in their hemodialysis (kidney) machines because they create higher quality permeate water.