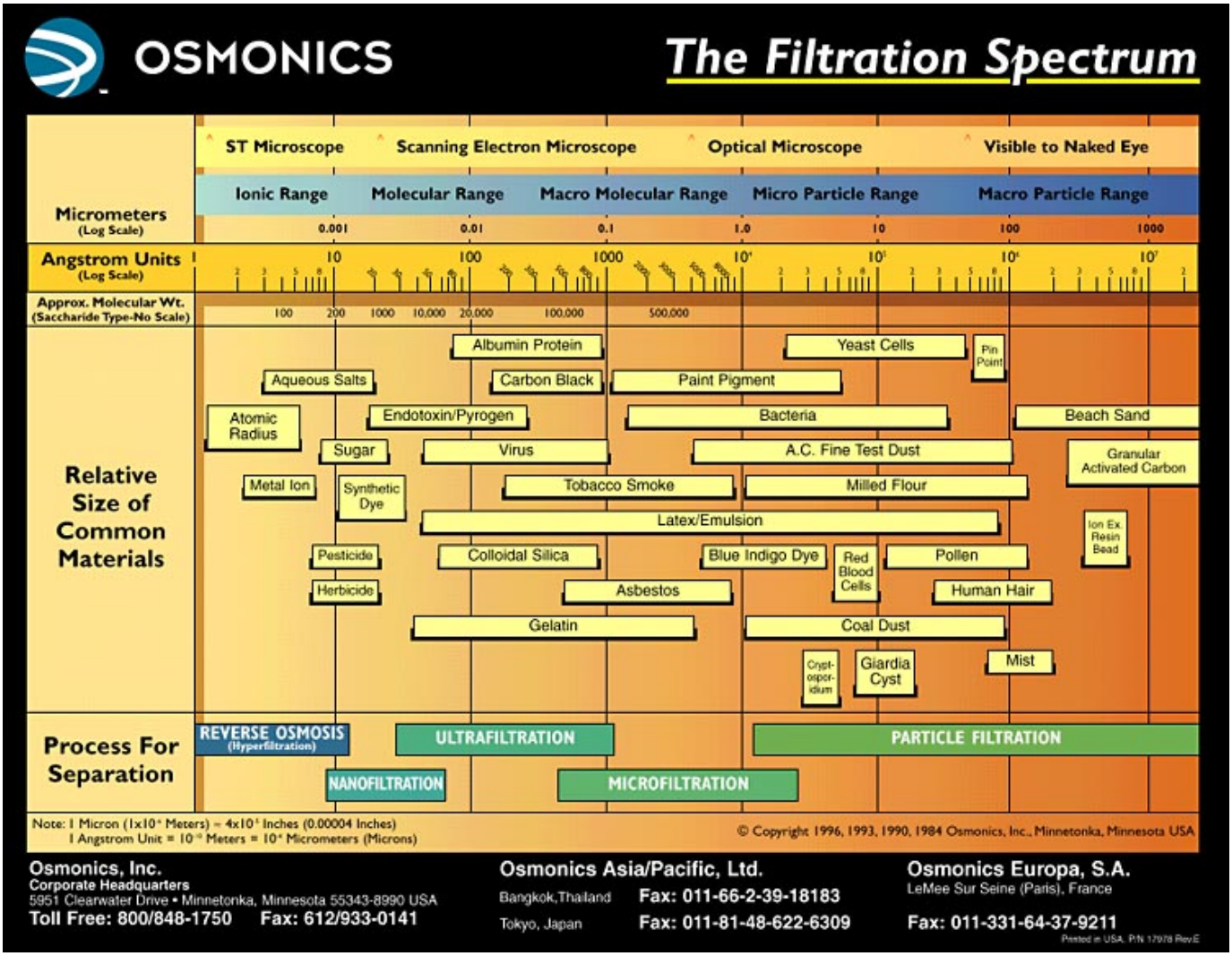
Q & A on

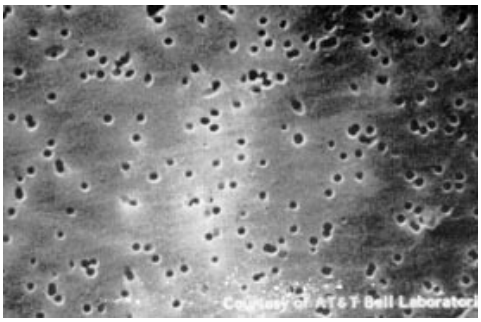
Reverse Osmosis

Q. WHAT IS THE MEMBRANE AND HOW DOES IT WORK?

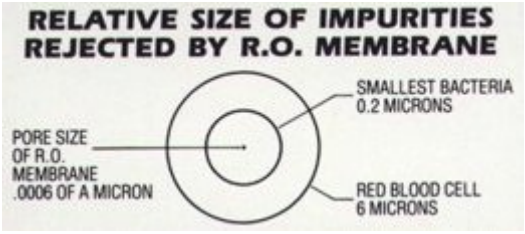
A. The membrane consists of several thin layers or sheets of film that are bonded together and rolled in a spiral configuration around a plastic tube. (This is also known as a thin film composite or TFC membrane.) The material of the membrane is semi-permeable; it allows water molecules to pass through while acting as a barrier to dissolved solids (i.e., mineral & chemical contaminants). The pores of the membrane are too small for the contaminants in water to pass through them.



A high quality membrane is a much better strainer than a simple filter which attaches to your faucet or sits on the counter-top. The photos below were taken with a Scanning Electron Microscope (SEM) at 8000x magnification. The photo on the left shows that the pores of a RO membrane are undetectable, while the pores of a pleated filter on the right are easily seen:

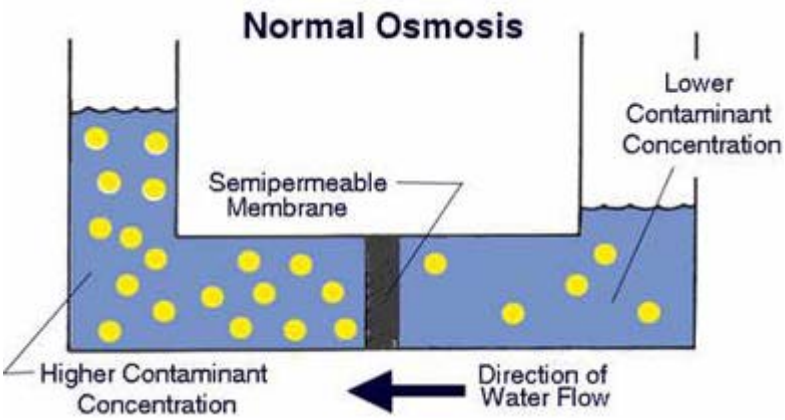


As this diagram shows, a high-quality membrane will prevent even the smallest bacteria from entering your drinking water.



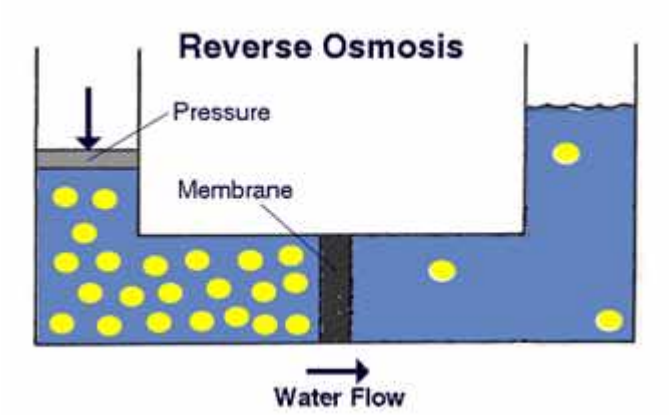
Q. CAN YOU EXPLAIN OSMOSIS?

A. A high quality R.O. membrane is "semi-permeable," which means that it allows water to pass through but prevents dissolved particles from passing through. If you place a membrane between two compartments as in the container shown below, and then place salt water in one half of the container and pure water in the other half, a fundamental scientific principle comes into play. That is, two different concentrations of liquids within the same system will try to reach equilibrium (i.e. the same concentration of contaminants) on both sides of the membrane. Of course the only way for this to happen is for pure water to pass through the membrane to the salt water side in an attempt to dilute the salt solution. This attempt to reach equilibrium is called OSMOSIS.



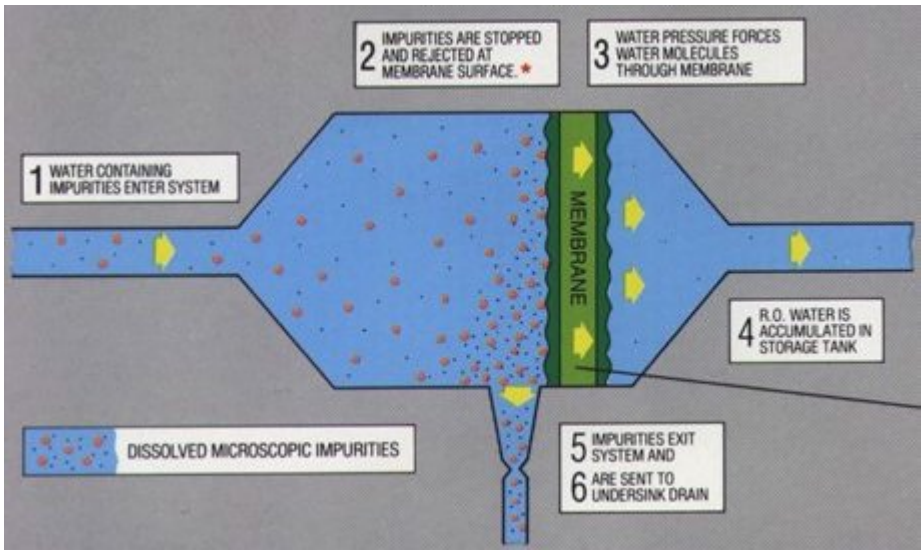
Q. WHAT IS REVERSE OSMOSIS?

A. Reverse Osmosis is the reversal of the natural flow of osmosis. In a water purification system, the goal is not to dilute the salt solution, but to separate the pure water from the salt and other contaminants. When the natural osmotic flow is reversed, water from the salt solution is forced through the membrane in the opposite direction by application of pressure - thus the term REVERSE OSMOSIS. Through this process, we are able to produce pure water by screening out the salts and other contaminants.



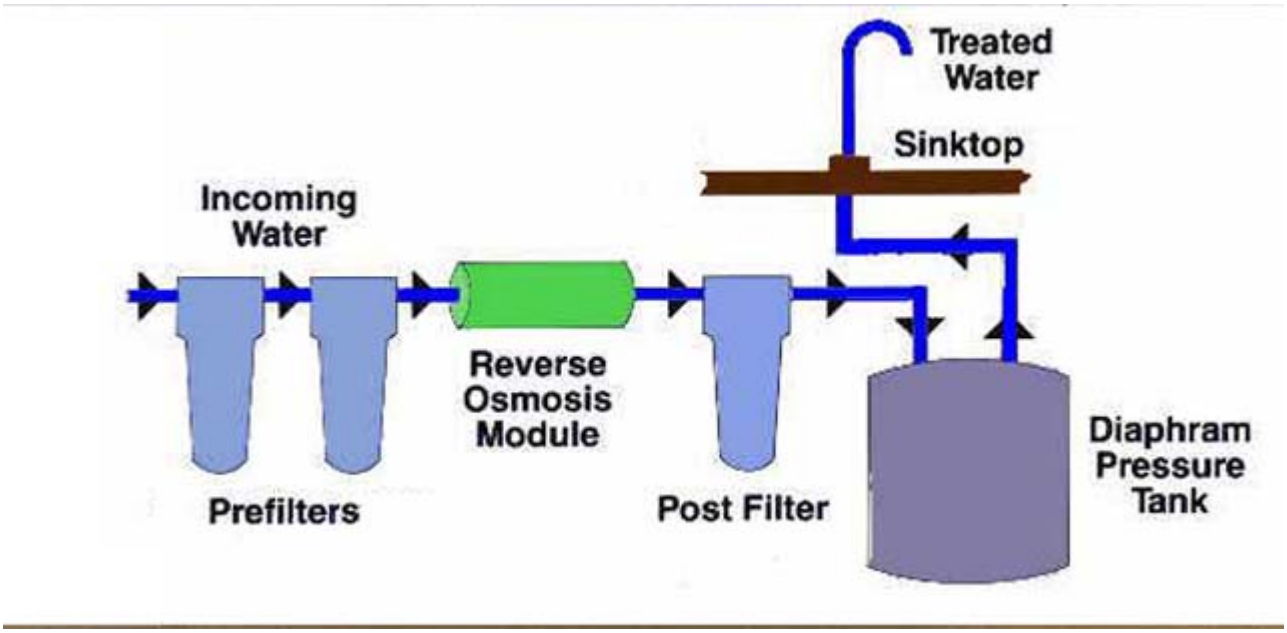
Q. WHAT HAPPENS TO THE CONTAMINANTS?

A. The reverse osmosis process cannot go on indefinitely without removing the contaminants. Ultimately the membrane could become clogged by salt and other impurities, requiring increasingly greater pressure to force water through the membrane. To solve this problem, the membranes are configured to split the feed water into two streams -- one part to be purified and the other part to wash away the particles rejected by the membrane.



Q. WHAT IS THE ACTUAL PROCESS OF A REVERSE OSMOSIS SYSTEM?

A. With our RO System, the raw tap water first flows through a 1 micron SEDIMENT FILTER to remove dirt, rust and other sediment. The water then flows into a .5 micron CARBON FILTER which takes out 98% of the chlorine and organic chemicals. The water proceeds to the Automatic Shut-off (ASO). If the tank is full, all the inlet water stops there. If the tank is less than full, the water continues. The next stage of the process is the reverse osmosis membrane which will separate 95-99% of the dissolved contaminants from the water molecules. The contaminants are then washed down the drain.



The next stage of the process is the small carbon POST FILTER that removes the remaining traces of chemicals, tastes and odors. The R.O. water is stored in a 12 litre TANK. Inside the tank is a balloon-like rubber diaphragm, pre-charged with 7 psi of air. As the tank fills, the air pressure increases and pressurizes the water so that it flows to the FAUCET without a pump. The faucet is installed on the kitchen counter or the sink. It is a dual action faucet offering intermittent flow (to fill a glass, hold the handle down) or continuous flow (to fill a coffee pot, lift the handle up).

Q. HOW MUCH WATER DOES AN R.O. SYSTEM USE?

A. The average system with the automatic shut-off valves uses approximately 25 litres per day, i.e., 10 litres of product water and 15 litres of water to the drain. However, the actual water flow is so slow that most water meters cannot measure the flow.

Q. DOES YOUR SYSTEM PRODUCE MORE WASTE WATER THAN OTHER SYSTEMS?

A. The purpose of the water that becomes waste water is to rinse the outside of the membrane so that it does not become clogged. Up to a certain point, the more waste water which is produced, the longer the membrane will last. Most R.O. systems have a ratio of waste water to drinking water of between 2:1 to 6:1. If a system has too low of a ratio, for example 1:1, you will probably need to replace the membrane frequently -- and often at an extremely high price. With some systems, you have to change the membrane every six **months**! On the other hand, with our system, we recommend that you change the *FilmTec* membrane only after three to six **years** -- at a cost of arround $75. So you see, R.O. systems are like cars -- the cost of having one is not just the initial purchase price, but the cost of maintaining it over several years. With our system, we give you both a reasonable **purchase price** and low **maintenance costs**.

Q. DOES THE SYSTEM NEED TO RUN 24 HOURS A DAY?

No, under certain circumstances an Automatic Shut-Off Valve can be used. It shuts off all the water coming into the system as soon as the tank is 90% full. Then when the tank is half empty, the valve also turns the inlet water back on. This means the prefilters will have an extended life. However, there are circumstances where a continuous flushing of the membrane is necessary. Consult your dealer to advise you on this option.

Q. CAN YOUR SYSTEM HANDLE HARD WATER?

Yes, if your water is 600 parts per million of hardness or less, we call this moderately hard water. With this level of hardness, it can go right into the R.O. system without a problem. However, if you have harder water, it might be a good idea to have a water softener because it removes calcium, magnesium, and iron which can impair an R.O. membrane. The negative side to running softened water through the R.O. system, is that a water softener normally adds salt to the water, and a regular R.O. membrane normally removes only 90% to 95% of the salt. Thus, if you are on a low sodium diet, it would be better not to add salt to your water before sending it through your R.O. system. The only downside to not softening really hard water is that you may just have to change the membrane more often.

Q. WHAT DOES REVERSE OSMOSIS DRINKING WATER TASTE LIKE?

The taste of R.O. water depends on the amount of contaminants in the tap water originally. If 95% of dissolved minerals and chemicals are removed, the R.O. water will taste better than distilled water as distilled water has a dead taste as the oxygen has been removed.

Q. HOW WILL R.O. WATER AFFECT MIXED BEVERAGES?

Because reverse osmosis removes invisible contaminants that mask flavour, it allows the natural taste of your beverages to come through. You will be able to use less coffee and still get the full flavour. Concentrated beverages like orange juice will taste tangier. You will probably be drinking a lot more water as well, since many people drink soda, Kool-Aid, concentrated juices, and beer as an alternative to bad-tasting tap water.

Also, R.O. water eliminates most of the lime buildup on drip coffee makers, preventing the need for frequent cleaning. No longer will you find the white scum on the inside of pans after boiling water.

Q. WHAT QUALITY OF ICE CUBES WILL AN R.O. SYSTEM PRODUCE?

Our RO SYSTEMS will make good tasting ice cubes since it removes most of the contaminants in the water. No more grit! (Note: you won't be able to tell the purity of the ice cubes by their appearance. If your freezer is very cold, your ice cubes will freeze rapidly. Freezing starts on all surfaces and air bubbles are trapped in the middle, so the cubes do not look clear. However, if your freezer is not quite so cold, your ice cubes will freeze slowly and allow the air to escape.)

Q. WHAT FACTORS AFFECT THE OUANTITY AND THE QUALITY OF THE WATER PRODUCED?

There are four major variables to consider:

1. PRESSURE. The greater the water pressure, the better the quantity and quality of the water produced. If the quality of your incoming water is average (between 300 and 700 parts per million of Total Dissolved Solids), you will need water pressure of 40 psi. (If your pressure is less than that, we carry a *FilmTec* membrane which may work for you or you can buy a booster pump from us.) Water pressure of 60 psi is ideal.

Q. DON'T PEOPLE NEED THE MINERALS PRESENT IN WATER?

Most of the minerals that we receive are from the foods we eat. Only a very small percentage comes from the water we drink. If you're concerned about minerals, it's better to take a vitamin supplement and drink pure water than to drink water full of contaminants.

Q. DON'T FILTERS NEED TO BE CHANGED FREQUENTLY TO PREVENT BACTERIAL GROWTH?

Bacteria is likely to grow in the pre-filters of an R.O. system. Although chlorinated water will minimize bacterial growth in the sediment pre-filter, since the carbon pre-filter removes chlorine, there will probably be some bacterial growth in the carbon pre-filter. However, the R.O. membrane will remove bacteria from the water coming from the pre-filters:

Secondly, there is bacteria on our food, dishes, silverware, hands, and faces -- as well as the hands and faces of those we come into contact with -- but because of our immune system, most of it is harmless. We need only be concerned about harmful bacteria. The Water Quality Association's contention is that the common bacteria in filters, which is known as heterotrophic plate count (HPC) bacteria, pose little if any health risk.

Q. ARE THERE OTHER COMPONENTS OF AN R.O. SYSTEM THAT COULD SUPPORT BACTERIAL GROWTH?

The components which follow the R.O. membrane could support bacterial growth. These include the tank, the post-filter, the faucet, and the post-membrane tubing. However, keep in mind, that at this point there are few nutrients in the water on which the bacteria can grow. Secondly, our post-filter will screen out bacteria which is larger than five microns. Thirdly, as noted above, the Water Quality Association contends that the common bacteria in filters, which is known as heterotrophic plate count (HPC) bacteria, pose little if any health risk. Nevertheless, if you are concerned about bacteria, you might want to drain your tank once a week and sanitize it once a year. You could also let the water run for a few seconds before filling your glass in order to flush out the tubing, the post-filter, and the faucet.

Fluoride removal with cartridge filtration.

Generally not possible with a non reverse osmosis system however you will see many claim that their cartridges will remove fluoride.
This is part truth and part deception as a cartridge that contains a resin will remove fluoride but the problem is that it will only do it for 20 to 50 litres at best. We can purchase the same cartridges that these companies sell but don't bother as they are next to useless unless you are trying to deceive people.
Resin works like this: (We stock 7 different types of 100% resin cartridges but don't recommend them as a stand alone treatment)
If you had a standard 9-3/4" cartridge that was 100% full of resin (rather than the cartridges sold as a mix of Carbon and resin) it would treat say Sydney water for about 57 litres and the calculations go like this.
Resin is rated in a unit measure called a GRAIN, 1 Grain = 17.1 parts per million (ppm) of total dissolved solids (TDS) so a cartridge that is 100% resin is usually good for 400 grains so the total TDS adsorption is 400 x 17.1 = 6,840 ppm removal of tds.
Sydney water has a tds of about 120 ppm so take the 6,840 and divide it by 120 and the answer for tds removal for a cartridge with 100% resin is 57 litres, when you consider that the cartridges that are sold for fluoride removal are at best 50% resin you can see that the cartridge will remove many things which includes fluoride but won't do it for very long.
The only reliable way to remove fluoride is with Reverse Osmosis.

Copper removal with cartridge filtration.

Generally not possible with a non Reverse Osmosis system.
Carbon cartridges will do amazing things in the first 50 litres or so and this is called the Holiday period. We have test results on the Matrikx CR1 that removed the copper content of water from 2.93 ppm to un-detectable but do not use such results as the test water was taken in the first few litres through a new cartridge which is in the Holiday period, after this period the cartridge will not continue to remove the copper and other non target substances.
Carbon cartridges are extremely good at removing substances like Chlorine, pesticides, lead and chemicals but not copper or fluoride.
One example of this is the Doulton Ultracarb which is a very good filter, we contacted Fairey Industrial Ceramics LTD as we had noticed several companies that advertised that the Doulton Ultracarb cartridge removed copper which did not appear on their manufacturers specification sheet. They did not confirm that their cartridge removed copper but referred us on to a company in Hong Kong and they forwarded this test sheet click here for Hong Kong test results, we asked further questions about how the test was conducted and over what period length and how many litres, suddenly no further correspondence could be obtained from the Hong Kong testing lab. We know that the Ultracarb won't remove copper except for the holiday period and we believe the Hong Kong test was conducted in the holiday period which means the results are misleading. Further correspondence with the manufacturer confirmed they did not rate their cartridge for copper removal.
There have been many Water Filter Companies prosecuted over the years for using specification sheets obtained using test results conducted in the first few litres through a filter cartridge (holiday period) and we expect that many more will be prosecuted soon and so they should be. The reason they are prosecuted is because the specifications supplied are misleading and not representative of what the customer expects for the service life of the cartridge.