FILMTEC™ Membranes
Understanding Reverse Osmosis

Semipermeable Membranes are at the Heart of RO Systems

The process of reverse osmosis (RO) represents the finest level of liquid filtration available today. While ordinary liquid filters use a screen to separate particles from water streams, an RO system employs a semipermeable membrane that separates an extremely high percentage of un wanted molecules.

For example, the membrane may be permeable to water molecules, but not to molecules of dissolved salt. If this membrane is placed between two compartments in a container as shown in Figure 1, and a salt solution is placed in one half of the container and pure water in the other, water passes through the membrane while the salt cannot.

Pressure is Applied to Reverse Natural Osmotic Flow

Now a fundamental scientific principle comes into play. That is, dissimilar liquid systems will try to reach the same concentration of materials on both sides of the membrane. The only way for this to happen in our example 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.

But if the goal in our example water purification system is to remove the salt from water, it is necessary to reverse the natural osmotic flow by forcing the salt water through the membrane in the reverse direction. This can be accomplished by applying pressure to the salt water as it's fed into the system, creating a condition know as "reverse osmosis." See Figure 1.

Cross-flow Filtration Permits Long-term Performance

While the principals of reverse osmosis are simple, in practical terms, the RO process cannot go on indefinitely unless steps are taken to ensure that the membrane doesn't become clogged by precipitated salts and other impurities forced against it by the pressurized stream of feed water. To significantly reduce the rate of membrane fouling, RO systems employ cross-flow filtration (shown in Figure 2), which allows water to pass through the membrane while the separate flow of concentrate sweeps rejected salts away from the membrane surface.

Figure 1.

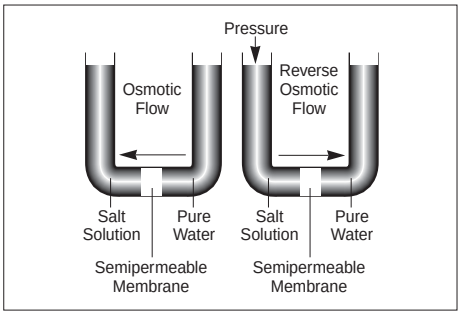
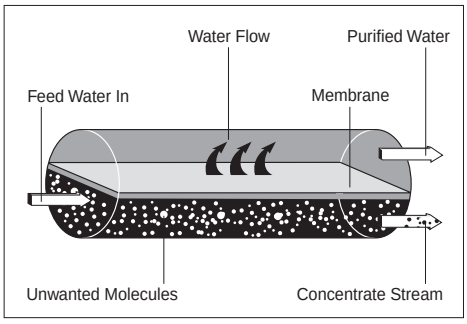


Figure 2.



FILMTEC™ Elements Maximize the Performance of RO Water Purification Systems

The membrane element is the heart of any RO water purification system. To make sure you're getting the most effective, efficient system available, make sure it's built around a FILMTEC™ element. Here's why.

- FILMTEC home drinking water membrane elements are constructed using advanced automated manufacturing technology. This means FILMTEC elements are built to optimum physical tolerances, and element-to-element differences are minimized. What's more, critical fastening points are sonic-welded for maximum strength and durability, and extensive quality tests are performed to ensure that high standards for fabrication of FILMTEC elements are met. Some other manufacturers handroll and assemble their elements on primitive manufacturing lines.

- FILMTEC elements have been installed as part of more systems...in more applications...than any other thin-film composite membrane. Besides offering superior performance, their consistency and reliability in service are well documented. FILMTEC™ elements have been the market leader in both consumer and commercial RO systems for more than a decade. Hundreds of thousands of drinking water systems based on FILMTEC elements are in successful operation today.

- The FT30 membrane inside FILMTEC elements screens out a higher percentage of dissolved solids than cellulosic membranes. Salt passage, for instance, is often 50% lower than that of cellulose acetate membranes operated at the same water recovery rate. The FT30 membrane has also been found to reject a higher percentage of undesirable dissolved solids- such as chloride, lead and nitrates- than other thin-film composite membranes.

- FILMTEC elements produce more high-quality water per day- two to three times more- than elements containing cellulosic membranes. They also last longer than cellulose based membranes under typical operating conditions due to superior resistance to compaction, chemical degradation and microbiological attack.

FILMTEC™ Membranes
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