PRIVATE DRINKING WATER IN CONNECTICUT

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Effective Against: inorganic contaminants such as: dissolved salts of sodium, dissolved (ferrous) iron, nitrate, lead, fluoride, sulfate, potassium, manganese, aluminum, silica, chloride, total dissolved solids, chromium, and orthophosphate. Also effective in removing some detergents, some taste, color and odor-producing chemicals, certain organic contaminants, uranium, and some pesticides.

Not Effective Against: dissolved gases, most volatile and semi-volatile organic contaminants including some pesticides and solvents. Alone, reverse osmosis (RO) units are not recommended for treatment of bacteria and other microscopic organisms.

How Reverse Osmosis Works

A complete reverse osmosis system consists of a RO module, a storage tank, and a separate faucet. The module contains a semi-permeable membrane that allows water to selectively pass through and collect in the storage tank. The contaminants being treated by the RO unit are rejected and then washed off the membrane into a waste stream.

It is not practical to treat all water entering a home with an RO system because about 75 percent of the water introduced is wasted. Thus, four gallons of raw water into the system produce about one gallon of treated water. This treated water comes out much slower than water from a regular tap, so a tank is used to store the treated water. The treated water is often used only for drinking and cooking. Each manufacturer's RO units differ, but the time needed to produce one gallon of water ranges from 2-78 hours. The volume of wastewater produced by RO systems varies by make and model. In instances where the RO waste is directed to the septic system, the Department of Public Health strongly recommends the volume not exceed 30 gallons per day. Larger flows could cause problems with the function of the septic system.

The line pressure of the water system in the home usually supplies the pressure for RO. *This pressure may need to be increased for RO to work effectively*. To reduce membrane fouling, a sediment pre-filter can be installed. A granular activated carbon post-filter might be included to complete treatment. The pre-filter removes sand, silt, and sediments, while the activated carbon filter removes the organic materials and any dissolved gases not treated by the RO membrane.

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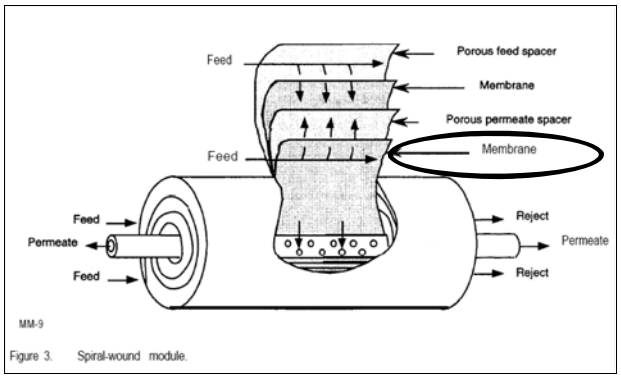
Types of Membranes

Several kinds of reverse osmosis membranes are available. Each has certain advantages and disadvantages. Since certain types of membranes will remove certain contaminants, it is important to know what contaminant (s) you are trying to remove before buying a treatment unit.



Spiral wound Module

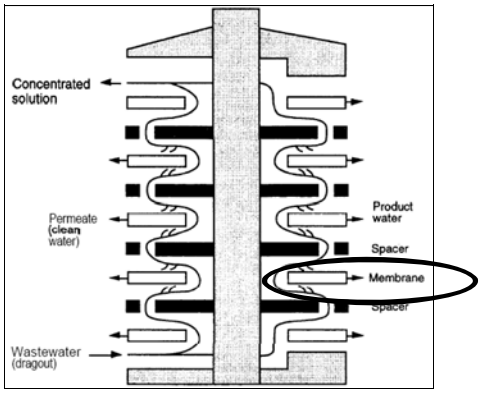


Plate and Frame Module

Check with the manufacturer to see exactly what the RO unit will remove. The effectiveness of the unit depends on the membrane in the treatment unit, the water pressure, the contaminant present and its concentration. Most manufacturers specify the efficiency of an RO membrane by its salt rejection percentage. The higher the salt rejection percentage, the better the membrane. When comparing RO units, be wary of exaggerated claims. RO membranes cannot be certified to remove 100 percent of anything. In addition, it is important to verify that the treatment system you are purchasing has been tested and certified by a third party to ensure manufacturer's claims. See the section on **Product Certification** at the end of this fact sheet.

Maintenance

Regardless of the quality of the equipment purchased, it will not perform satisfactorily unless maintained in accordance with the manufacturer's recommendations for maintenance, cleaning, and part replacement. Keep a logbook to record equipment maintenance and repairs.

The RO water treatment unit is often more costly than simpler treatment methods. For example, using an ion exchange unit to remove dissolved iron (ferrous) may cost less than an RO unit. RO has low water recovery and recycling the wastewater in home systems is not cost effective. The device may require continuous operation to maintain peak membrane performance. Once the storage tank is filled in some systems, surplus water is discarded and water loss from the unit can be excessive. Clogged or torn RO membranes require replacement. A reverse osmosis system that uses pre- and post-device treatment units adds to your purchase and maintenance costs. High levels of particulate matter in the water (like iron particles) can foul or clog the membrane, decreasing water flow.

Other Considerations

Ensure the system you choose is installed and operated according to the manufacturer's instructions. After installation, retest both the raw water (prior to treatment) and the treated water at a state certified laboratory to ensure it is working properly and removing the contaminants. You should continue to test the quality of both the untreated and treated water annually or more frequently (quarterly or semi-annually) if high levels of contaminants are present in the raw water. Frequent testing will also help you determine how well your treatment system is working and whether maintenance or replacement of components maybe necessary.

The efficiency of a reverse osmosis treatment unit can be affected by the presence of turbidity, iron, manganese, hydrogen sulfide or chlorine in water. Because RO devices are "point-of-use" units, it may be necessary for a "point-of-entry" device to be installed to treat these problems if they exist.

RO devices produce what is called "reject water." This is water that is not treated by the membrane and stays on the untreated waterside of the unit. Reject water is discharged to a sewer, dry well, or septic system. Flows of 30-gallons per day or less of reject water to a septic system are considered to be incidental and should not damage the septic system. Larger flows may pose a problem. To minimize the volume of reject water and to optimize the efficiency of the RO units it is suggested:

- Retrofit existing units with a booster or "permeate" pump that will always maintain the RO system pressure above the normal maximum house water pressure (nominally 40 psi).
- Make sure all units have an automatic pressure shutdown switch that turns the flow off when the storage tank is full.
- Make sure all units have an internal dissolved solids monitor for both the raw and treated water to ensure optimum efficiency of the units and indicate when a membrane needs to be changed.

Questions to Ask Before you Buy

Before purchasing a water treatment device, have your water tested at a state certified laboratory to determine the contaminant present. This will help you determine if reverse osmosis is an effective treatment method for your situation. See Publication #19 *Questions to Ask When Purchasing Water Treatment Equipment* for more information.

Consumers should inquire about the following before purchasing a reverse osmosis system:

- Has the treatment system been tested and certified by a third party to ensure that it meets manufacturer's claims?
- How much treated water will the unit produce per day?
- How much water does the unit reject?
- What kind of maintenance is involved?
- How often will the membranes need to be replaced? What will this cost? Can the homeowner change the membranes or does a factory certified person need to do this?
- What pre- or post-treatment devices are needed in conjunction with the RO system?
- Are there any special installation requirements that may add to the equipment cost, for instance, changes to your household plumbing?

Product Certification

NSF, International is a non-profit organization that sets performance standards for water treatment devices. Because companies can make unsubstantiated statements regarding product effectiveness, the consumer must evaluate test results of the device to determine if claims are realistic. Products that have been tested for evaluated by NSF and met their minimum requirements are entitled to display the NSF listing mark on the products or in advertising literature for products. Manufacturers and models that meet NSF's standard are included in a listing published twice a year. For more information contact NSF at: 800-NSF-MARK or http://www.nsf.org/consumer/drinking_water/

For more information please click on the following links:
EPA Office of Groundwater and Drinking Water
http://www.epa.gov/ogwdw/
EPA New England
http://www.epa.gov/region01/

Adapted from *Healthy Drinking Waters for Rhode Islanders*, University of Rhode Island Cooperative Extension, *April 2003*.