

Reverse Osmosis (R/O): Installing and Maintaining a Reverse Osmosis Unit

By Arthur Fisher, Jennifer Reisig, Pamela Powell, Mark Walker

This publication describes how to install and maintain a reverse osmosis treatment system in your home. For information about how reverse osmosis works and selecting a reverse osmosis unit, please see FS-05-08 and FS-05-09.

WHERE CAN I GET A R/O SYSTEM?



Most people's needs can be served by a system in the \$150 to \$500 range.

Reverse osmosis systems are widely available from local hardware stores, home improvement centers, and plumbing supply stores. A wide selection of systems is available from internet sites. The cost varies from \$50 to \$5,000 depending upon the quality and capacity of the system. Most people's needs can be served by a system that costs \$150 to \$500. A well-constructed, installed and maintained reverse osmosis system can improve water quality.

It is also helpful to have a large supply of sponges or paper towels to mop up water spilled and leaked during installation. It is helpful to have a properly sized brass tee to plumb the unit into the cold water line.

The first step in the installation process is to remove everything that is stored beneath the sink to allow room for the installation and to prevent it from getting wet. Unplug any appliances that are connected to electrical outlets under the sink. If you have a garbage disposal and a dishwasher, be sure to note which

INSTALLING A R/O SYSTEM

Most reverse osmosis systems are installed beneath the kitchen sink and supply drinking water to a second, separate faucet that comes with the unit (Figure 1). These faucets are generally constructed of 316 or 304 stainless steel to resist corrosion. Be sure to check the installation kit for the reverse osmosis unit for all necessary parts and directions. In general to install a system you will need a screw driver to attach the reverse osmosis unit to the cabinet, a drill for pilot holes, a hole saw to drill through the counter top to install the faucet, a hack saw to cut into water supply lines and waste lines, two adjustable wrenches to attach water lines, and a good flashlight to provide light under the sink.



Figure 1: Treated water from reverse osmosis units is usually dispensed from a separate faucet (1).

electrical outlet each was connected to. The one for the disposal is connected to a switch on the wall. If (at the end of the project) you plug in the garbage disposal and it immediately turns on, it is plugged into the wrong outlet. Also, if the dishwasher will not operate after the reverse osmosis unit is installed, it is probably plugged into the garbage disposal socket.



You should hear a trickling sound from the drainpipe as waste water flows from the R/O system.

Make sure to follow the installation instructions that come with the reverse osmosis unit, paying close attention to the location of the wastewater line from the reverse osmosis unit. There should be an air gap between the wastewater that pools in the P-trap and the wastewater line. The larger the gap the better. Any wastewater from the sink that backs up in the drainpipe could enter the reverse osmosis system.

Within fifteen minutes of turning on the water flow to the reverse osmosis system you should hear a trickling sound from the sink's drainpipe as waste water flows from the reverse osmosis unit into the drainpipe. If there is no sound of trickling water, the end of the wastewater line may be in standing water or blocked against the drainpipe. The reverse osmosis unit cannot work properly if waste water cannot flow freely during treatment. It is important to place the wastewater line so that at least part of the tubing forms a large bend that is higher than where it empties into the drain pipe. This prevents sink water or macerated garbage from being siphoned into the unit. Installation instructions should be clear about this, so be sure to follow them carefully.

Finally when installing the reverse osmosis faucet it is helpful to have a sink with an extra hole specifically designed for such a use. Alternatively, if the kitchen has a stainless steel sink it is possible to drill a hole to mount the faucet on the stainless margin of the sink. Do not try to drill a hole in a porcelain-coated cast iron sink. Cast iron is brittle and can break like pottery when drilled. Installation in this type of sink requires experience and special drill bits. In this case, it is preferable to drill through the counter top and locate the faucet discharge over the sink.

IMPORTANT:

The reverse osmosis unit cannot work properly if waste water cannot flow freely during treatment.

THINGS TO REMEMBER WHEN INSTALLING A R/O UNIT:

- *Remove everything stored under the sink*
- *Unplug anything that is connected to electrical outlets under the sink*
- *Carefully follow instructions that come with the R/O unit*
- *Pay close attention to the location of the wastewater disposal line*
- *There should be an air gap between the wastewater line in the P trap and the R/O discharge line*
- *After turning on the water flow to the R/O system you should hear a trickling sound from the drainpipe*

HOSE CONNECTIONS ON THE R/O SYSTEM

Most reverse osmosis systems have four water lines. The first supplies water and runs from the household plumbing to the filtration unit. Installation of this line normally requires cutting into the cold water copper tubing leading to the kitchen sink and installing a compression fit tee. It is recommended that a valve be installed on the line leading to the filtration unit. This allows continued use of the kitchen sink while changing cartridges. A second line runs from the clean water discharge of the reverse

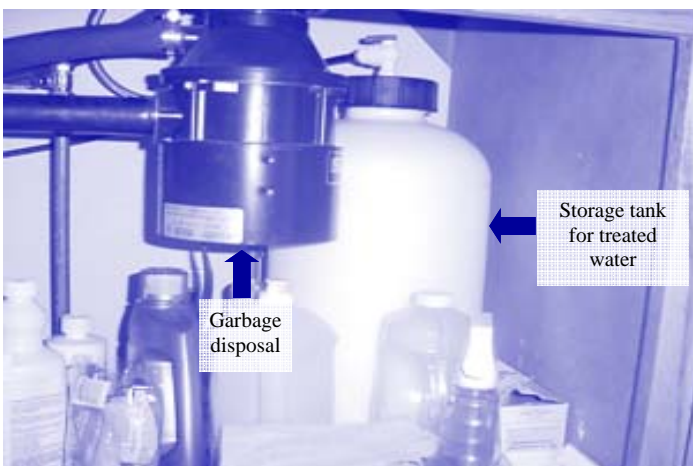


Figure 2: The storage tank for treated water, shown behind the garbage disposal (1).

osmosis unit to a water holding tank. A third line runs from the water holding tank to the separate drinking water faucet on the sink. Finally, a fourth line carries waste water to the kitchen sink drain pipe. These four lines are generally distinctively colored or sized to prevent mis-installation of the units. Follow instructions for installation carefully and avoid alterations that can bypass the filtration unit or, even worse, send waste water to the faucet.

MAINTENANCE OF R/O SYSTEMS



A reverse osmosis system, like any piece of machinery, needs periodic maintenance to work efficiently. In most cases, the manufacturer provides a recommended maintenance schedule. Usually manufacturers recommend that the membranes be replaced every one to three years. In general, the amount of maintenance that will be necessary to keep a reverse osmosis system operating efficiently depends upon numerous factors, such as the quality of the feed water, the amount of water passed through the membrane and the operating temperatures. Some systems are equipped with a warning light that will turn on when membranes should be changed. The light is triggered when salts accumulate in water and conduct electricity. In theory, when a membrane fails, dissolved solids pass through and the light illuminates. In practice however, this is not always reliable. The batteries in these units are easily forgotten and the lack of an indicator light could be due to a bad wire or dead battery.

Under most operating conditions the membranes will last a year or two. However, consideration should be given to maintenance if there is a noticeable change in the taste or odor of the purified water, or there is a major reduction or increase in water output. If the system is equipped with carbon filtration units, these should be replaced at the same time as membrane cartridges. The functional part of a reverse osmosis unit is a thin membrane. These should never be allowed to freeze because the membrane may crack.



The manufacturer of a R/O system provides a recommended maintenance schedule.

SIGNS OF PROBLEMS

A change in taste or odor of the purified water may indicate a need for maintenance or repair. Bacteria can colonize reverse osmosis systems, especially if food particles and other materials from the sink or garbage disposal have been siphoned into the wastewater discharge line or forced into the membrane unit. Also, reverse osmosis systems do not remove gases that are dissolved in water, such as hydrogen sulfide. If the water for the entire house smells like rotten eggs and the same smell is noted in the reverse osmosis treated water, it does not necessarily mean that the membrane is defective. However if the treated water smells like rotten eggs and the untreated water does not, there may be bacterial growth on the membranes and they should be replaced.



Another common condition that indicates that the membranes need to be replaced is when all water flow ceases from the unit. This can be caused by several different conditions. The filter part of the unit may clog with sand or other particulates. It is the least expensive part of the unit and its purpose is to prevent sand and mud from clogging the reverse osmosis filters.

When maintaining the systems always replace other filters that are part of the system. If the system was installed primarily to remove objectionable tastes imparted by chlorine, and the chlorine taste is returning, the fault may be that the carbon filtration cartridge is over-loaded and needs replacement. This filter is much less expensive than the membranes and removes different chemicals in the water.



A change in taste or odor of the purified water can also indicate that attention needs to be paid to the R/O system.

NEW MEMBRANES

Reverse osmosis membranes are shipped from the factory with a coating of food grade glycerine to prevent damage by freezing. The coating acts as a moistener to keep the membranes from



Oily membranes are OK when new.

drying out in transit. If the membranes were to completely dry out prior to their installation they could crack and or delaminate, rendering them useless. Most manufacturers recommend that the first few gallons of water produced by a new membrane be discarded because it may contain a low level of glycerine. Glycerine is harmless and has a sweet taste. However, it may have some laxative effects.

OPERATING PRESSURE

The amount of water produced by a reverse osmosis system is directly related to the amount of pressure applied. If the home is served by a private well, water pressure is controlled by a pressure tank. The pressure tank is a large vessel normally located either in a pump house near the well or inside the dwelling where the water line enters the house. Inside the tank there is a large inflatable rubber bladder. The higher the air pressure in the bladder, the higher the water pressure will be in the home. Air pressure in the bladder can be measured using a regular tire pressure gauge at the valve stem normally located on the top of the pressure tank. It is important to follow manufacturer's recommendations on tank air pressure. If pressure is too high the bladder may rupture, ruining the tank. For residences served by a community water system with inadequate pressure there are reverse osmosis systems available that incorporate a pump to raise water pressure.

SPARE PARTS AND REPAIRS



If the R/O unit is improperly installed, it may provide water that is of worse quality.

Most hardware stores carry an inventory of plastic and stainless steel fittings that are appropriate for use in a reverse osmosis system. Always replace plastic lines with new plastic tubing that is meant for drinking water supply. Do not use copper tubing because this may create problems. Water treated by a reverse osmosis system is corrosive to copper tubing and brass connectors, unless there is a unit in place to add dissolved minerals back into the

treated water (known as a re-hardener). Manufacturers design reverse osmosis systems to use plastic tubing and stainless steel faucets to avoid contaminating the treated water with copper and lead.

ASK IF IN DOUBT

If you have questions about installation and maintenance, be sure to ask a professional. If the reverse osmosis unit is improperly installed, it may provide water that is of worse quality than the water you are trying to treat. In the case of chemicals, you may not be able to taste, see or smell concentrations that would affect your health. Rather than installing the system incorrectly, it is always better to consult a professional when in doubt.

For further information please contact:

Mark Walker, Associate Professor, Hydrologist
Natural Resources and Environmental Science,
University of Nevada
College of Cooperative Extension and Agriculture,
Biotechnology and Natural Resources
Phone: (775) 784-1938
FAX: (775) 784-4789
E-mail: mwalker@cabnr.unr.edu

Additional Resources:

Water Testing for Private Well Owners (SP-00-02:
www.unce.unr.edu/publications/SP00/SP0020.pdf)
Matching Drinking Water Quality Problems to Treatment
Methods (SP-00-19: www.unce.unr.edu/publications/SP00/SP0019.pdf)
Drinking Water Quality in Nevada (FS-00-46:
www.unce.unr.edu/publications/FS00/FS0046.pdf)
Reverse Osmosis (R/O): How It Works (FS-05-08)
Reverse Osmosis (R/O): Selecting a Reverse Osmosis Unit
(FS-05-09)

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