

Water Treatment NOTES

Cornell Cooperative Extension, College of Human Ecology

Guidelines for Purchasing Water Treatment Equipment

LINDA WAGENET AND ANN LEMLEY

Fact Sheet 1, April 1991 (updated June 2005)

Until recently, the water treatment industry focused on improving the aesthetic quality of household water that comes from both municipal and private sources. Within the past 10-20 years, this industry has been thrust into the forefront of treating household water for contaminants that may pose a health hazard to individuals. A variety of companies and products promise to render the consumer's drinking water safe and contaminant-free. Potential buyers must sort through advertising claims and technical data to select the appropriate treatment method.

This fact sheet provides information about testing and treating drinking water. With this and other fact sheets in this series (see page 4), the individual can make informed decisions regarding drinking water quality.

Drinking water standards

Municipal water supplies in the United States are regulated by state and federal agencies to provide drinking water that meets specific standards for chemical, microbiological, and radiological content as well as taste, odor, and turbidity. The U.S. Environmental Protection Agency (EPA) formulates these standards and regularly reviews and amends them to ensure good quality drinking water in public supplies. Information about federal and state drinking water regulations can be obtained from local Cooperative Extension offices or departments of Health or Environmental Conservation.

Individuals who use private water supplies, such as wells, springs, ponds, or cisterns, are solely responsible for the quality of their water. Federal standards can be used as guidelines to assess the quality of a private water supply, but the protection, testing,

and treatment of that supply are determined by the individual homeowner.

The first step in choosing water treatment equipment

Before any purchase is made, the consumer should know what contaminants, if any, are in the water. Municipal supplies are required to be tested by the supplier on a regular basis, and these test results are available to the customer. Individuals on private water supplies should have their drinking water tested by an EPA/state-certified laboratory, especially if they suspect possible health hazards in the water. Yearly testing for coliform, nitrate, pH, total dissolved solids (TDS), hardness, and iron provides information about the general quality of the water. Testing for specific organic chemicals should be done if there is a buried fuel storage tank, industrial waste area, or other organic contaminant sources such as landfills or agricultural areas of high pesticide/fertilizer use near the water supply.

Special circumstances call for immediate testing of the water supply. Some of these situations are:

- Any time there is a noticeable change in the water quality;
- Family members or house guests experiencing recurrent gastrointestinal illness-;
- Plumbing containing lead;
- When a home is purchased; or
- When any water treatment equipment is added or maintenance performed.

Further information about water testing is included in the other fact sheets of this series.

Many water treatment companies include in their services free in-home testing of water. Such testing is a conflict of interest for the treatment company. In addition, not all contaminants can be evaluated by a simple test; for example, organic chemicals must be analyzed in the laboratory with sophisticated equipment. The consumer should be wary of in-home analyses claiming to determine more than basic water quality constituents such as hardness, pH, iron, and TDS. Basing a purchase decision on EPA/state-certified testing laboratory results avoids the confusion that may be caused by questionable sales tactics.

Treated water versus "pure" water

No individual water treatment device removes "everything" from the water. A system installed to produce pure water would be quite costly and probably provide bland tasting, corrosive water. Once your drinking water has been tested, purchase or rent only the treatment equipment required to remove the undesirable contaminants that are present. Some water sources may be so contaminated, however, that treatment cannot provide adequate quantities of good quality drinking water. Under these circumstances, an alternate source (new well, bottled water) may be the only option.

Rating water treatment equipment

The Environmental Protection Agency (EPA) does not test or approve home water treatment equipment. An EPA registration number may appear on certain types of equipment; this merely indicates that the unit has been registered with the EPA, a requirement if the device contains certain substances, such as silver. It does not indicate EPA approval of the system.

Few states regulate what the water treatment industry can say or do to sell its products. In New York State, legislation has been passed requiring water treatment salespeople to show verification of their claims, but there is little enforcement capability built into this law. The Water Quality Association (WQA), a trade organization of the water treatment industry, has encouraged its members to abide by the WQA Code of Ethics to promote "the highest principles of honesty, integrity, fair dealing and professionalism in the water quality improvement industry." Compliance with this code is strictly voluntary, as is membership in WQA. The National Sanitation Foundation (NSF) is a third-party, nonprofit certification organization that sets performance standards for water treatment devices and tests equipment **voluntarily** submitted by the manufacturer.

Manufacturers must pay for this testing service at costs ranging from \$20,000 to \$70,000, depending on the type of equipment tested. NSF certifies that the equipment conforms to NSF standards, and it continues to monitor fabrication and performance of the device. If changes are made in the equipment or problems arise, NSF retests and recertifies the equipment.

It is a good idea to examine several brands of water treatment equipment before buying. In reviewing any equipment claims or system test results, be sure that the device has been tested for the specific contaminant you wish to remove from your water, over the advertised life of the system (with more than 1 gallon of water), and under household conditions (tap water, actual flow rates and water pressures).

Sales scams and misleading promotions

Many treatment companies offer free in-home testing of drinking water. Unfortunately, some unscrupulous dealers use this as an opportunity to frighten consumers into purchasing equipment that may not be needed. The salesperson might add chemicals to the water that cause particles to form or color changes to occur. These demonstrations prove nothing about the safety of the water for drinking. Some states are considering legislation to ban in-home testing. Before purchasing any device, have the water tested by an EPA/state-certified laboratory. Another sales tactic offers water treatment equipment as part of a larger prize promotion. The individual is forced to purchase the water treatment device in order to obtain the larger prize, and both often prove to be of little value.

Do not purchase equipment from salespeople who use misleading newspaper articles or governmental reports, or who misrepresent themselves as employees of a water utility. Many states do not allow false or exaggerated claims in advertising water treatment equipment, or the use of such graphic representations as a skull and crossbones over a glass of water. A more subtle advertising technique than those discussed above is to understate the maintenance requirements of the equipment. Most water treatment devices do require some maintenance such as filter changes, the addition of chemicals, or backwashing. Certain salespeople de-emphasize these maintenance requirements so that the equipment seems cheaper and easier to use than might be the actual case. Others might insist on selling a maintenance contract with the equipment when the maintenance can be easily done by the user. The individual can combat all these scenarios by using common sense in purchasing water treatment equipment and getting all claims and promises in writing.

Problems with misrepresentations or fraudulent claims can be addressed to the Federal Trade Commission, 6th and Pennsylvania Avenue, N.W., Washington, DC 20580, phone: (202) 326-2222, or to the Attorney General of your state. Complaints can also be filed online via the website. ([https://rn.ftc.gov/pls/dod/wsolcq\\$.startup?Z_ORG_CODE=PU01](https://rn.ftc.gov/pls/dod/wsolcq$.startup?Z_ORG_CODE=PU01))

Point-of-entry (all water) versus point-of-use (single tap) treatment

Although less than one percent of tap water is used for drinking and cooking, some contaminants are as hazardous when inhaled or absorbed through the skin as when they are ingested. Radon is an example of such a chemical, and point-of-entry (POE) treatment of all water used in the household may be required for it or other contaminants with similar properties. POE treatment is also recommended for iron removal. Although not a health hazard, iron is a nuisance in the laundry, bathtub, and toilet. Iron removal devices and water softeners (ion exchangers) are examples of POE equipment.

If the contaminant you wish to remove is only a hazard or nuisance in drinking or cooking water, a point-of-use (POU) treatment device is adequate. Reverse osmosis and distillation are examples of this type of treatment unit. Activated carbon devices can be installed on a single tap (POU) or where water enters the house (POE). The appropriate device depends upon the type and amount of contaminant to be removed.

Adequate quantities of treated water

The consumer must be certain that enough treated water will be produced for everyday use. The maximum flow rate of the water treatment device should be sufficient for peak home demand. If the manufacturer's claims seem high, check the pressure and flow rate under which product testing was done. Typical household water pressures from a well or spring are 40 psi (pounds per square inch) and typical flow rates range from 5-30 gpm (gallons per minute). Municipal water distribution system pressure could be 90 psi, but there may be a pressure reduction valve before the water enters the home.

Renting equipment and using bottled water

In certain situations, purchasing water treatment equipment is not the best alternative. If the water has been contaminated by a spill, and permanent treatment is not required, renting equipment or buying bottled water are viable solutions.

Also, if an individual is renting his/her residence but is not pleased with the water quality, equipment rental is reasonable. Renting is a practical way to become familiar with the device prior to purchase. Rental allows the consumer to determine maintenance requirements, costs, and the effectiveness of the treatment system. A rental agreement should clearly specify in writing the responsibility for maintenance, as well as any application of monthly rent to an eventual purchase. Insurance costs and periodic testing are other stipulations that need to be made.

Enforcement of chemical and microbiological standards for bottled water varies between states. Generally, standards for bottled water are no more stringent than those for public water systems. It is probably not cost-effective to purchase bottled water "for health reasons" when the normal supply is a municipal system, unless there is a health hazard within the home distribution system (such as lead pipes). There is no maintenance requirement with bottled water, nor any mechanical apparatus to operate, which appeals to some people.

Cost is a major determining factor in deciding to purchase or rent water treatment equipment, or to buy bottled water. The situation determines which may be less costly. Watch for hidden expenses such as separate installation fees or monthly maintenance fees. Additionally, the disposal of waste materials, such as reject water from reverse osmosis systems, spent cartridges from activated carbon units, and used filters, can add to the cost of water treatment and should be figured into the purchase or rental price.

Maintenance and monitoring requirements

Most water treatment devices require some routine maintenance to function properly. Systems on the market today have maintenance procedures that range from manual to fully automatic. The consumer should realistically determine how active he or she wishes to be in maintaining the unit. This is extremely important if the device will be used to remove a health hazard from the water. Aside from possible damage to the system itself, improper maintenance can result in the contaminant entering the treated water. Some dealers offer a service contract for maintaining the treatment device and the cost of this, as well as any other upkeep cost, should be added to the purchase price when comparing different options.

Once the equipment is installed, the consumer should have a means of determining if the unit is removing the contaminant in question. Testing the treated water is the most straightforward approach to this problem.

This can range from simple and inexpensive (a pool test kit to analyze chlorine residual) to costly and time-consuming (organic chemical scan for an activated carbon unit). If a laboratory analysis is required, as in the latter case, the owner may not test frequently enough.

It is better to have a built-in monitor or alarm on the device than to leave water testing to the discretion of the consumer. Some manufacturers incorporate monitors into their systems. For example, certain reverse osmosis units have total dissolved solids (TDS) meters on the faucet. Ultraviolet radiation disinfection systems often include a buzzer to warn of a decrease in lamp intensity. Although a monitoring device might increase the cost of the treatment system, it can avoid the cost of frequent water testing at an independent laboratory. Since not all treatment devices incorporate such alarms or monitors, verify the best method for determining proper system function before purchasing a water treatment device.

Product lifetime and warranty

Although a salesperson may estimate the effectiveness of the water treatment device over a certain time period, the actual lifetime depends on such factors as maintenance, water flow rate, and amount of contaminant to be removed. As with any consumer purchase, careful study of the warranty conditions is essential.

Summary

These guidelines are for individuals who are planning to consult a water treatment industry representative. Water treatment can be for aesthetic as well as health factors. If drinking water poses a health risk, the consumer should consider the cost of purchasing bottled water as an alternative to treatment. Eliminating the source of contamination or finding a new water source are also alternatives to treatment.

Compensation for treatment of problem water resulting from environmental contamination may be possible. Contact the local Cooperative Extension office for more information concerning this option.

- Individuals on a private water source are responsible for testing and treatment.
- Testing water for other than basic constituents (pH, iron, hardness, and TDS) should be done at an EPA/ state-certified drinking water laboratory.
- Purchase only the equipment you need. Be sure it provides the quantity of treated water you require at your household water pressure and flow rate.
- It is not necessary to buy POE equipment if the treated water is to be used only for drinking and cooking.

- It is a good idea to purchase equipment that has been tested and rated by a third-party organization (such as NSF).
- Avoid unscrupulous dealers who add chemicals to the water or who offer prize inducements in return for the purchase of water treatment equipment,
- Consider equipment rental or purchasing bottled water if the contamination is temporary or if it is more cost-effective.
- As with all consumer purchases, be fully aware of maintenance and monitoring requirements, as well as the product's lifetime and warranty period.

The chart appearing on pages 5 and 6 is a quick reference for water treatment equipment. Price-range estimates should only be used as guidelines in the purchase of equipment. Further information about each type of device can be obtained from the local office of Cornell Cooperative Extension.

References

- Code Of Ethics*, Water Quality Association. January, 2004.
- Culotta, Nancy, Manager, Water and Wastewater Program, National Sanitation Foundation. Personal telephone communication, September 17, 1990.
- "Fit to Drink?" *Consumer Reports*. January 1990.
- Kocher, J. and Dvorak, B. "Drinking water treatment: what you need to know when selecting water treatment equipment." *Nebguide*. Nebraska Cooperative Extension **G03-1488-A** October 2003 .
- Hairston, J et al. "Drinking water and water treatment scams." Fact Sheet: Alabama Cooperative extension WQ-10-03 October 2003.
- Powell, G.M., and R.D. Black. "Questions To Ask Before Buying Water Treatment Equipment." Fact Sheet: Kansas State Univ. June 1989.
- Hairston, J. et al" Buying water treatment equipment" Fact Sheet: Alabama Cooperative Extension System. September 2001
- Wagenet, L.P., and A.T. Lemley. "Questions To Ask Before Purchasing Water Treatment Equipment." Fact Sheet: Cornell Coop. Ext. 1987.
- "Water Testing Scams" *Facts for consumers from the Federal Trade Commission*. Fact Sheet: Office of Consumer/ Business Education.

Linda Wagenet is a former extension associate and Ann Lemley is Professor and Chair in the Department of Textiles and Apparel, College of Human Ecology, Cornell University, Ithaca NY 14853.

Table 1. Water treatment devices

<i>Treatment type</i>	<i>Contaminant treated</i>	<i>Description</i>
Chemical feed pump	Microorganisms, hydrogen sulfide, iron, manganese, musty odors, pH	Small amounts of chemical mixed with untreated water
Mechanical filtration	Particles, some microorganisms	Acts like sieve to filter particles from water; micro filtration removes particles as small as 1 micron
Activated carbon (charcoal)	Certain organic chemicals, pesticides, tastes, odors, some particles, THMS, radon,** mercury, lead ***, cysts***	Porous carbon adsorbs and retains chemicals from water
Oxidizing filter	Iron, manganese, hydrogen sulfide	Oxidizes contaminants from dissolved state to solid state, then filters
Neutralizing filter	Corrosive water due to low pH (acidity)	Adds calcium to water to raise pH
Ion exchange	Hardness (calcium/magnesium), some lead,** iron, manganese, barium	A resin saturated with sodium exchanges sodium for hardness minerals
Reverse osmosis	Certain metals (iron, lead, arsenic), particles, some organic chemicals, nitrate	Water "separated" from contaminants by pressure through cellophane-like membrane
Distillation	Microorganisms, metals, certain organic chemicals and pesticides	Water boiled in chamber, steam captured, condensed; impurities left behind
Ultra-violet (UV)	Certain microorganisms	Germicidal lamp inactivates microorganisms as they pass by light
Aeration		
Air injection	Iron, manganese, hydrogen sulfide	Air mixed with water, contaminant oxidized to solid state then filtered
Air stripping	Volatile organic chemicals; radon	Air bubbled through water, or water cascades down grid
Ozonation	Microorganisms, iron, manganese, hydrogen sulfide	Air passed through electrical discharge creating ozone, a powerful oxidizer

* Price ranges based on water treatment industry estimates and may vary with dealer and location.

** Not the preferred method for removal of this contaminant.

*** Product needs to be specifically certified for this contaminant.

This publication is issued to further Cooperative Extension work mandated by acts of Congress of May 8 and June 30, 1914. It was produced with the cooperation of the U.S. Department of Agriculture; Cornell Cooperative Extension; and the College of Agriculture and Life Sciences, the College of Human Ecology, and the College of Veterinary Medicine at Cornell University. Cornell Cooperative Extension provides equal program and employment opportunities. Helene R. Dillard, Director. Produced by Media Services at Cornell University

<i>POU/ POE</i>	<i>Approximate Price</i>	<i>Notes</i>
POE	\$90-3000	Adequate Mixing of Chemical and water essential; pressure tank not sufficient capacity for mixing
POE	Auto: \$400-1,500	May be simple screen, ceramic cartridge of layered media; must clean or replace filter material
POE or POU	Taste/odor: \$10-80 In-line: \$150-3000 (POE)	Carbon cartridge needs replacement; end-of-tap unit for non hazardous tastes and odors only; large units for serious problems
POE	\$400-1300	Manganese-greensand common device; resin recharged with potassium permanganate- can be hazardous; other oxidizing media exist
POE	\$500-900	Makes water hard due to addition of calcium
POE	\$400-1,500	Resin backwashes with sodium; can be manual, semi-automatic, fully automatic; treated water contains sodium- a consideration for people on sodium restricted diet
POU POE	\$50-\$1500 \$270-\$2500	Significant amount of wastewater; must have certain minimum household water pressure
POU	\$250-1,450	Certain chemicals may be distilled with water; electrical/maintenance considerations
POE, Centralized	\$600-900 \$1000-5000	No residual disinfection; lamp intensity affected by color, cloudiness, time, unit should have monitor to alert when lamp intensity it too low
POE	\$800-900	Often preferable to manganese greensand because of no chemicals added
POE	\$1,825	Volatile chemicals vented; current method of choice for radon
POE	\$1,500-1,800	Ozone generated on-site; converts to oxygen fairly rapidly so residual disinfection not long-term' new process at homeowner level, so equipment not well tested

