Do I need to install a water treatment system?

(The following information is provided by the City of Broomfield's Water Treatment Facility in order to help customers make informed decisions regarding home water treatment devices. It is not a recommendation or endorsement of any commercially-available product or brand.)

Extensive analysis of Broomfield's drinking water indicates that it is free of harmful concentrations of any known contaminants, and that further treatment in the home is not necessary for health reasons. Sometimes residents wish to treat their water to minimize mineral deposits, remove chlorine, improve flavor, or provide extra confidence. Because the effectiveness of treatment devices varies for different contaminants, it is important to know what materials you want to remove before selecting a treatment system. It is also important to realize that there are often risks, such as excess sodium, contaminant breakthrough, leaching of metals and bacterial growth, associated with home treatment units. Below is a summary of the major types of home water treatment units, how they work, what they are most and least effective at removing and the risks associated with each type of system.

ION EXCHANGE SYSTEMS (WATER SOFTENERS)

These systems are designed to remove the undesirable but harmless minerals, calcium and magnesium, which are primarily responsible for "hard" water. "Hardness" describes the capacity of water to combine with soap and form scale on surfaces resulting in soap scum in bathtubs and sinks, dull-looking laundry, spots on dishes, and scaly deposits on faucets, showerheads, and inside water heaters and pipes. Water containing up to 3.5 grains/gallon (60 milligrams per liter) is considered to be "soft;" moderately hard water has 3.5 to 10.5 grains/gallon (60 to 180 milligrams per liter) and very hard water has 10.5+ grains/gallon (180 milligrams per liter). Removing hardness does not make the water any safer to drink.

How they work

Most ion-exchange systems substitute sodium or potassium salts for the hardness minerals. Unless the system provides further treatment, the level of these salts in the product water will be increased. If the primary concern is scale formation or water spots, softening only the hot water can be effective at reducing these problems without increasing the salt content of the cold water used for drinking and cooking.

Effective at removing	Primarily used for removal of calcium and magnesium.
May help with	Iron, manganese and other metals; chlorine,
May not remove	Microbial contamination, sodium, nitrates, organic chemicals, radon

Risks

- Bacterial growth can occur in the ion exchange beds and home plumbing.
- In cation exchange, the product water may have elevated sodium (salt) levels. Please check with your physician for specific advice on the dietary uptake of salt from drinking water.
- In anion exchange, the product water from the softener may become corrosive to household plumbing, resulting in elevated levels of copper, iron, or lead in addition to shortening the life of the plumbing fixtures.

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NOTE: The hardness level in water delivered to local residents ranges from 2 to 8 grains/gallon, which is in the soft to moderate hardness range.

ACTIVATED CARBON FILTERS

Activated carbon filters are the most widely used home treatment devices. Carbon filters are designed to remove organic compounds such as industrial solvents, pesticides, chlorine, and chlorination by-products. Activated carbon units are typically the easiest to install and maintain. Operating costs are usually limited to filter replacement.

How they work

Activated carbon removes contaminants from water by adsorption, or the attraction and accumulation of one substance on the surface of another. In activated carbon processes, the adsorption surface consists of pores, or small openings, created in carbon granules during the activation process. In general, high surface area and pore structure are the prime considerations in adsorption of organics from water. Carbon filters work best when they are able to operate slowly.

Effective at removing	Chlorine, organic chemicals, pesticides, radon, odors and bad taste.
May help with	Sediment and turbid water.
Less effective against	Microbial contamination, sodium, nitrates, lead and other heavy metals, fluoride, and hardness minerals.

Risks

- Activated carbon provides an ideal medium for the accumulation and growth of bacteria. A unit containing a bactericide, usually a silver compound, will minimize this risk.
- Contaminant breakthrough can occur if the filter is used after the carbon bed is exhausted. When breakthrough occurs, previously-adsorbed contaminants are released from the bed and contaminant levels in the product water can exceed those in the source water. Changing the filter regularly can eliminate this risk.
- Activated carbon removes radon, however as the radon decays in the filter, long-lived radiation is produced. The amount of radiation is related to the level of radon and other radioactive materials in the water supply and the amount of water used. For more information, call the Colorado Department of Public Health and Environment at (303) 692-3040, or go to the CDPHE web site at: http://www.cdphe.state.co.us/hm/rad/radon/radon.asp

Note: Broomfield's municipal water supply comes entirely from surface water sources and contains no detectable radon. Those with private wells may wish to test the air inside their homes for radon to determine the need for treatment.

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REVERSE OSMOSIS

Reverse Osmosis systems remove a wide variety of contaminants, including minerals, organics, and microorganisms. However, they waste a great deal of source water in order to make a few gallons of treated water per day. Only about 25 percent of the water passing through the unit is forced through the membrane; the rest goes down the drain. They are also slow; most units require between 3 and 6 hours to process 1 gallon of drinking water. The production rate is greatly affected by the temperature of the water. For example, a 50° F water supply can result in as much as a 54% decrease from the manufacturer's stated production rate.

How they work

Pressure in the water line moves the water along a semi-permeable membrane. This membrane is very selective; it rejects charged particles and large molecules and allows water and small organic molecules to pass through. These systems are usually used in conjunction with either a water softener or an activated carbon filter.

Effective at removing Inorganic contaminants, such as dissolved salts of sodium, ferrous iron, fluoride, nitrate, lead, and some organic contaminants. Most systems will also remove suspended solids, bacteria and viruses.

Not effective against Less effective than carbon filters for many organic molecules; may not eliminate taste and odor.

Risks

Bacterial growth can occur in the post treatment storage reservoir.

DISTILLATION

Distillation consists of boiling water and condensing the steam. It is effective at removing dissolved inorganic materials, but it is a slow process and takes considerable energy to convert a gallon of water into steam. Also, the boiling chamber becomes coated with a mineral scale. This scale is difficult to remove, generally requiring treatment with an acid.

How they work

Distillers boil the water then cool the steam until it condenses; the resulting distilled water drips into a container. Dissolved minerals (inorganic compounds), nonvolatile organic chemicals and particulates do not evaporate with the water and are left in the boiling tanks. The steam is cooled into purified water.

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Effective at removing	Dissolved solids, metals such as lead and iron, nitrates, hardness, which is mainly calcium and magnesium, and particles. Most bacteria and some viruses are killed by either the high temperatures or are separated from the water as the steam rises.
May help with	Cloudy, turbid water, chlorine.
Not effective against	Pesticides and volitile organic chemicals such as chloroform and benzene.

Risks

- Volatile organic chemicals and other contaminants that vaporize at or below the boiling point of water can be collected and concentrated in the treated water. Systems are available that will counter this problem.
- Although the distilled or purified water container is relatively free of non-volatile contaminants, bacteria may grow in the storage container.
- The unit gets very hot and may pose a contact hazard.

WATER FILTERS AND CARAFES

For consumers wishing to treat only water used for consumption, not the whole house, inexpensive faucet-mounted filters and freestanding carafes are often good choices. These products can do a good job of improving taste and removing lead, chlorine, chlorination by-products, and microbes. As with other types of filters, changing the filter according to the manufacturer's recommendations is essential for maintaining good performance.

ADDITIONAL INFORMATION

If you are considering a home treatment device, always look for one that meets the requirements of the National Sanitation Foundation (NSF) Standards. NSF Standard #53 applies to water treatment devices used to reduce health risks.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons, such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbiological contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

A number of publications dealing with home water treatment devices are available; a few sources of information are listed on the next page:

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NSF International: www.nsfconsumer.org or 877/8-NSF-HELP
Underwriters Laboratories Inc.: www.ul.com or (888) 547-8851
The Water Quality Association: www.wqa.org or (630) 505-0160
Consumer Reports, pp. 52-55, October 1999.
The NSF Consumer Drinking Water Book (Available through the NSF web site at www.nsf.org, or by calling 1-800-673-8010)
"Home Drinking Water Treatment Devices." Colorado Department of Public Health and Environment. www.cdphe.state.co.us or (303) 692-3500

We hope this information is helpful in answering your questions about home water treatment devices. If you have any further questions or concerns please call 303-464-5606 or 303-464-5600. Broomfield's Water Treatment and Water Quality Laboratory staff is always happy to assist.