

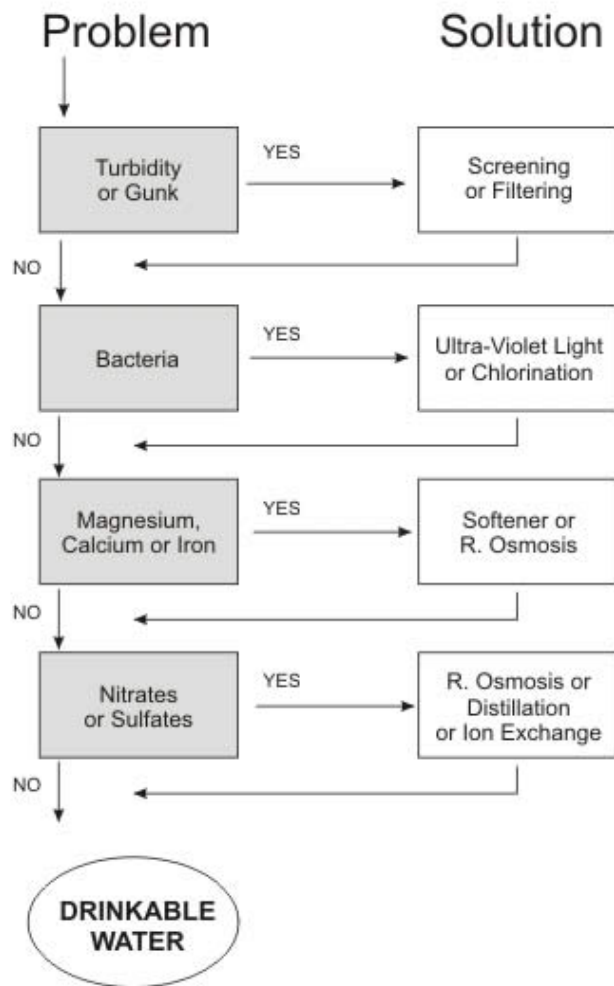
Grants Pass Water Laboratory, Inc

These steps are a simplification of water treatment.

Water Treatment Steps

1. Have water tested
2. Remove fine sand, silt, clay and other particles, using a mechanical filter sediment
3. Treat bacterial contamination, using chlorination or ultraviolet light
4. Remove hydrogen sulfide gas and other odor-causing substances, using chlorination, an oxidizing filter, or activated carbon
5. Remove insoluble iron and manganese particles using a mechanical filter; a water softener, for small amounts of dissolved iron and manganese; an oxidizing filter for higher amounts of dissolved iron and manganese; or a chlorinator followed by a mechanical filter for very high amounts of dissolved iron and manganese
6. Treat for hardness using a water softener
7. Neutralize acidity using a neutralizing filter
8. Remove volatile organic chemicals, trihalomethanes, certain pesticides and radon, using an activated carbon filter
9. Remove heavy metals, such as lead, mercury, arsenic, or cadmium, with reverse osmosis, or distillation

Flow diagram of water treatment system



How treatment devices work

As indicated above, the type of treatment unit used will depend on the individual situation, particularly on what contaminant is found in the water. Below is a summary of the major treatment processes, how they work and what general types of contaminants they are able to remove. We further discuss operational and maintenance problems that have been encountered with some of the units.

Physical filters are simple units that are designed primarily to remove particles such as sand, dirt and rust from water. They are not effective at removing dissolved inorganic or organic contaminants and are inadequate at treating microbiologically unsafe waters.

Water Softeners are ion exchange (IE) units designed specifically to treat "hard" water, that is, water that contains high levels of calcium and magnesium. The water passes through a tank filled with resin beads that have a large number of sodium ions attached to them. The sodium ions are exchanged for the calcium and magnesium ions, rendering the water "soft". Although water softeners are often advertised as treatment devices, they are not intended to make the water any safer to drink. Water softeners do add sodium to the water making it somewhat corrosive. Periodic maintenance, involving back flushing with salt brine to replace the sodium on the resin is required. There are other IE units, using different types of resins, that have had some success at removing dissolved contaminants such as nitrate (anion exchange), arsenic and sulfate.

Activated carbon filters, in the form of granular activated, or processed charcoal, can remove many substances from water. Activated carbon (AC) can remove dissolved organic contaminants responsible for foul tastes and odors, as well as hazardous organics, such as pesticide residues. Activated carbon filters can also remove chlorine. Removal is accomplished by absorption whereby the organic components are attracted to and held by the surface of the activated carbon. AC filters cannot remove most dissolved inorganic components such as nitrate, heavy metals or hardness minerals. Further the AC is not effective at removal of microbial contaminants. In fact, unless the unit is operated properly, the AC filter may actually serve as a breeding ground for bacteria which can be passed on to the water as it flows through the unit. Flushing the filter after periods of non-use is recommended. Changing the filter in accordance with the operating instructions will also reduce the impact of bacterial colonization.

Reverse Osmosis

Very effective in removing inorganic contaminants

Used to remove Salts

Removes contaminants with semi-permeable membrane that permits only water through and not dissolved ions.

Questions to Ask When Purchasing Water Treatment Equipment

What exactly does the analysis of the water done by the treatment professional show? Are health hazards indicated? Should more testing be done?

Many water treatment companies include in their services free in-home testing of the water. Not all contaminants can be evaluated this way; for example, organics, which have been associated with serious health problems, must be analyzed in a laboratory with sophisticated equipment. The consumer must be wary of home analyses claiming to determine more than basic water quality constituents such as hardness, pH, iron, and sulfur.

How long has the company been in business, and is there a list of referrals the consumer can contact?

Have the product and the manufacturer been rated by the National Sanitation Foundation (NSF) or other third party organization? Was the product tested for the specific contaminant you need to remove, over the advertised life of the treatment device (with more than 1 gallon (of water), under household conditions (tap water, actual flow rates and pressures)?

The NSF, whose function is similar to Underwriter's Laboratory, sets performance standards for water treatment devices. Because less ethical companies may make unsubstantiated statements regarding product effectiveness, the consumer must evaluate test results of the device to determine if claims are realistic.

Does the water quality problem require whole-house treatment or will a single-tap device be adequate?

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 ingested. Treatment of all the water used in the household may be required. Reverse osmosis and distillation units are connected to a single tap; activated carbon devices can be installed on a single tap or where water enters the house. The device selected depends upon the type of contaminant in question.

Will the unit produce enough treated water daily to accommodate household usage? If a filter or membrane is involved, how often will it need to be changed, and how does the consumer know when that change should take place?

The consumer must be certain that enough treated water will be produced for everyday use. The maximum flow rate should be sufficient for the peak home use rate. Devices such as activated carbon units, reverse osmosis units, and iron filters need routine maintenance; the homeowner should be fully informed of maintenance requirements.

What are the total purchase price and expected maintenance cost of the device? Will the company selling the device also install and service it, and will there be a fee for labor? Can the consumer perform maintenance tasks, or must the water treatment professional be involved? Will the unit substantially increase electrical usage in the home?

The consumer must watch for hidden costs such as separate installation fees, monthly maintenance fees, or equipment rental fees. Additionally, the disposal of waste materials, such as reject water, spent cartridges from activated carbon units, and used filters, can add to the cost of water treatment and should be figured into the purchase price. Some devices can be installed by the homeowner. Some units require 8-10 gallons of untreated water to produce 1 gallon of treated water. The total water cost as well as electrical usage should also be considered part of the cost of the water treatment device.

Is there an alarm or indicator light on the device to alert the consumer to a malfunction? Will the manufacturer include in the purchase price a retesting of the water after a month or two?

Many units have backup systems or shutoff functions to prevent consumption of untreated

water. Testing the water a month after the device is installed will assure the homeowner that the unit is accomplishing the intended treatment.

What is the expected lifetime of the product? What is the length of the warranty period, and what does the warranty cover?

The warranty may cover only certain parts of a device, so the consumer should be aware of the warranty conditions.

These guidelines are directed at individuals who are planning to consult a water treatment industry representative. It must be emphasized that 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.

Reference: Oregon State University Extension Service: SP 53-367