

EXPLANATIONS OF TREATMENT METHODS

<i>Aeration</i>	The addition of air to the water to oxidize iron and manganese so they can be filtered out by other means.
<i>Activated carbon filter</i>	Contaminants are captured while they pass over the large surface area of the activated carbon in a process called adsorption.
<i>Anion exchange unit</i>	A resin with an attraction to negatively charged molecules (like nitrates and sulfates) that releases chloride as negatively charged materials are captured when they pass over the exchange resin. The resin is periodically recharged with chloride.
<i>Cation exchange unit</i>	A resin with an attraction to positively charged molecules (like calcium and magnesium) that releases sodium as positively charged materials are captured when they pass over the exchange resin. The resin is recharged with sodium chloride for the next use cycle. (water softener)
<i>Chlorination</i>	A disinfection process where chlorine, a strong oxidizer, is added to water to kill bacteria, and pathogens.
<i>Distillation</i>	A process where water is heated to boiling producing steam that is condensed back in liquid water leaving behind most of the contaminants.
<i>Green sand filter</i>	See potassium permanganate filter.
<i>Improved well construction</i>	The elimination of sources of contamination at or adjacent to the well by upgrading facilities or replacing the well.
<i>Microfiltration</i>	A filter with extremely small pores which strains large to small particles from the water.
<i>Neutralizing filter</i>	Water passes over a bed of granular calcite (or similar material) to change the pH thus reducing corrosivity.
<i>Ozone</i>	Ozone (O ₃) a strong oxidizer, is mixed with the water to kill pathogens and bacteria by disinfection. Ozone is produced using an electrical corona discharge or ultraviolet irradiation of air.
<i>Poly-phosphate feeder</i>	Iron in the water is coated with phosphates to prevent the iron's oxidation when exposed to air.
<i>Potassium permanganate filter</i>	Iron and manganese is removed by passing the water over a filter bed of manganese dioxide that is recharged by backflushing with potassium permanganate.
<i>Reverse osmosis</i>	Water is forced under pressure through a extremely fine-pore membrane leaving materials larger than water molecules on the other side of the membrane.
<i>Sediment filter</i>	A device that strains large particles from the water
<i>Soda ash feeder</i>	A device that adds soda ash to water to change the pH thus reducing corrosivity.
<i>Ultraviolet</i>	Ultraviolet systems disinfects water by irradiating the water with high levels of ultraviolet light.

Water treatment equipment and methods are not 100 percent effective in the removal of undesired contaminants in water. Water treatment equipment is designed to reduce contamination to acceptable levels. The amount of contaminants removed from water depends on the raw water characteristics, amount, and type of contaminant in the water. The levels of other types of contaminants in the raw water also affect the efficiency of the treatment method.

Consequently, most water treatment designs rely on more than one type of treatment equipment to obtain the desired output water quality. For example, a multiple treatment installation could include:

- 1) a sediment filter after the service entrance prior to
- 2) a cation exchange unit (softener) connected to
- 3) the hot water heater in conjunction with
- 4) a small reverse osmosis unit containing
- 5) an activated carbon filter (ACF) cartridge under the kitchen sink delivering drinking water to a small faucet above the sink.

Water treatment equipment is designed and sized according to needs. Many household-sized distillers and reverse osmosis units have treatment capacities of only a few gallons per day. They are best for treating water only for drinking and cooking. These systems are classified as point-of-use (POW) devices. That means they treat the water where it will be used.

Point-of-entry (POE) treatment equipment treats all water that is used in houses including drinking, cooking, bathing, and toilet flushing. POE treatment devices are large-capacity equipment that include: sediment filters, ion exchange units, and green sand filters.

All water treatment equipment needs maintenance of some kind. Different types of owner maintenance and care include:

- Adding salt to cation exchange units.
- Replacing treatment membranes in reverse osmosis units.
- Changing filters or cartridges in activated carbon filters and micro-filtration units.
- Making sure the unit is functioning properly by periodically testing output water from treatment equipment and the raw water being treated.

Testing is a safety precaution to give owners piece of mind that the water is of satisfactory quality.

Additional references

For more information on drinking water standards and options for treatment, refer to the following South Dakota Cooperative Extension Service publications:

ExEx 1025 Primary Drinking Water Standards
ExEx 1026 Secondary Drinking Water Standards
ExEx 1027 Health Advisories Levels
FS 877P Identifying and Correcting Water Problems
FS 877A Activated Carbon Filtration
FS 877C Chlorination
FS 877D Distillation
FS 877IM Iron and Manganese Removal
FS 877RO Reverse Osmosis

This publication and others can be accessed electronically from the SDSU College of Agriculture & Biological Sciences publications page, which is at <http://agbiopubs.sdstate.edu/articles/ExEx1028.pdf>



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