Alberta Health & Wellness

DRINKING WATER TREATMENT DEVICES

CONTENT

- The proper water treatment devices can remove harmful bacteria or chemicals in your drinking water.
- Consult with your Environmental Health Officer for the best type of treatment unit.

CHOOSING A WATER TREATMENT DEVICE

In the rural area or smaller communities, there may be a need to further treat the water prior to drinking. A home owner may choose to install a home water treatment device to add a factor of safety or to address concerns about the quality of the water.

Point-of-Use (POU) equipment treats the water that is used at a single tap, while the rest of the water in the building remains untreated. POU equipment is primarily used to treat contaminants like lead and aesthetic contaminants like sulfur. These contaminants are a concern in water used for drinking and cooking.

Point-of-Entry (POE) equipment treats most or all of the water before it is distributed, either throughout a small community or at a single building. POE equipment includes processes that remove health-related contaminants like volatile organic compounds (VOCs) or is used to soften water by removing scale-forming chemicals.

There are many effective and different POU or POE devices, but no single technology is effective for treating or removing all of the possible contaminants. A specific technology or combination of technologies is usually applied to treat a specific problem at hand. This booklet provides a simple guideline on choosing a POU or POE treatment device.

Water treatment devices can help to improve water quality

TYPES OF TREATMENT DEVICES

Home water treatment devices available on the market can generally be categorized into four basic types of systems:

1. Filtration:

Filtration is used to remove small particles in the water. In many cases, particles may be soluble in water and must undergo chemical reactions to bring the particles out of solution so that they can be removed by the filters. Filters can also be effective in removing chemicals and bacteria. Examples of filters include activated carbon filters, microfilters (ceramic candles), manganese greensand filters, activated alumina filters and pour-through filters.

2. Ion exchange:

Ion exchange systems exchange one type of ion in the water with another. The most common use of ion exchange systems is to soften hard water or demineralization.

3. Disinfection:

These devices use chemicals such as chlorine, ozone, or other oxidants to remove harmful bacteria or viruses. Non-chemical disinfection can also be achieved by using distillation or ultraviolet lights.

4. Other Treatments:

The use of reverse osmosis (RO) or electrodialysis (ED) are designed to remove specific contaminants in the water.

New products and devices are also briefly outlined.

FILTRATION

Filters are used to remove taste, odour, chlorine and hydrogen sulphide and may be combined with other treatment processes.

Home filtration units use a media, such as carbon, to adsorb organic contaminants and ions that cause taste and odour problems. Particles are trapped on the porous material while allowing water to pass through the material. Filters can be made of sand, fibres, anthracite, or ceramics. Depending on their design, some units can remove chlorination by-products, pesticides and harmful bacteria and viruses. Mechanical filters cannot remove dissolved constituents in the water and are ineffective at removing hardness, salt, nitrates, some organics and most metals. As filters remove particles, they get clogged and have to be replaced or cleaned. The more solids in the water, the faster the filter will become clogged. The filter media must therefore be replaced on a regular basis.

CARBON FILTERS

Activated carbon is a form of charcoal, and in carbon filters, exists as carbon blocks or granular carbons. Carbon is effective in removing many organic compounds, pesticides, radon, tastes, odours and chlorine.

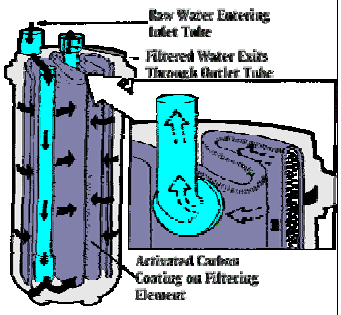
The effectiveness of carbon filters depends on the pore (hole) size. Different carbon filters are designed for the removal of different compounds– some are effective only for chlorine and taste and odour, while others are effective in removing the smallest harmful organism such as viruses, *Giardia* (beaver fever) and *Cryptosporidium*. To determine the effectiveness of carbon filters, look for the seal of approval by the National Sanitation Foundation (NSF) which approves filters based on its effectiveness. For example, under Standard 53, NSF would approve some filters with a pore size of less than 'absolute one micron' to be effective in the removal of the smaller parasites such as *Cryptosporidium*. Usually, only carbon block and precoated activated carbon filters are effective in reducing heavy metals such as lead and mercury.

Limitation:

- Carbon filters foster bacterial growth on the trapped organic substances and may release bacteria into the water. Although some units contain silver, the filters may still have bacteria. *Carbon filters should only be used on water that is treated and meets guidelines for microbiological safety*, and these filters should be flushed for at least 30 seconds before being used. Post filtration disinfection is sometimes needed.

- The carbon filters must be replaced regularly to maintain their adsorptive capacity. Change or replace the filter frequently and follow manufacturer's advice for servicing.

- Carbon filters are not effective in the removal of inorganics such as hardness, iron, nitrate or fluoride.



Contaminants are adsorbed onto the carbon media

POUR-THROUGH FILTERS

Pour-through pitcher filters are inexpensive and can reduce a variety of impurities, depending on filter design. They are usually effective in the removal of taste and odour in water, chlorine, and can remove dissolved organics (benzene, carbon tetrachloride) and heavy metals (lead and cadmium).

Limitation:

- Not effective for microorganisms.
- Limited in the amount of water that can be filtered per day.
- Filtered water may require refrigeration to control bacterial regrowth.

Oxidizing Filters

Oxidizing filters use chemicals or air to oxidize contaminants such as iron, manganese and hydrogen sulfide so they become insoluble, and are then removed by filtration. There are four basic types of oxidizing filters: (1) natural manganese greensand; (2) zeolite coated with manganese oxide; (3) chlorine followed by sand filter; and (4) aeration followed by filtration.

Greensand filters can remove up to 6 ppm hydrogen sulfide, and up to 10 ppm of iron if the water pH is 6.7 or higher. Zeolite requires less backwash water and softens the water as it removes iron and manganese. Chlorine, followed by filters are effective in removing dissolved or oxidized iron and manganese greater than 10 mg/L. Pressure-type aerators can remove dissolved iron and manganese up to 25mg/L.

Limitation:

- All filters need to be regenerated on a regular basis. For example, Potassium permanganate is used to regenerate the greensand once it becomes depleted of oxygen.

- Oxidizing agents such as permanganate may be needed to control the growth of iron bacteria and the formation of gelatinous slime on the filter.

- Aeration is not recommended for water containing organic iron complexes as iron bacteria will clog the aspirator and filter.

Manganese oxidized soluble irons and the filter remove the precipitate

Activated Alumina

Activated alumina is a filter media made by treating aluminum ore so that it becomes porous and highly adsorptive. There are various types of activated alumina, each with different properties and should be chosen specifically to remove the contaminant of concern. Activated alumina can remove a variety of contaminants, including fluoride, arsenic, lead and selenium.

Limitation:

The medium requires periodic cleaning with an appropriate regenerant such as alum or acid in order to remain effective. Similar to carbon filters, bacteria regrowth can occur. This system is usually ineffective in the removal of microorganisms and other minerals other than those listed.

Water enters mechanical filter and contaminants are trapped in the filter while water passes through.

Microfiltration

Microfilters are mechanical filters with a pore size of less than 0.2 microns, and are used to remove small amounts of suspended material such as sediment, sand, rust and precipitated iron particles from the water. Water line pressure forces water through the filter material, trapping foreign particles. These filters can be cleaned and reused a number of times before they lose effectiveness. Filters can be made of sand, fibres, anthracite, or ceramic. Ceramic candle is a type of microfilter in which bacteria and particles are filtered through the candle pores. The candle usually contains silver to minimize bacterial growth.

Some of these filters are approved by NSF for the removal of turbidity and *Cryptosporidium*.

Limitation:

- Not effective in removing chemicals such as lead, chlorine, nitrate, and pesticides.

- Not effective in removing dissolved or very fine particles.

- Some mechanical filters can be backwashed to remove trapped particles, but many require cartilage replacement when water flow slows appreciably

- Occasional abrasion of the candle surface is required to remove material and to restore a normal flow rate. Some studies recommended replacement instead of cleaning candles after removing *Cryptosporidium.*

- Most microfilters are not effective against viruses.

Ion Exchange (IX)

Ion Exchange units can be used to remove any charged (ionic) substances from water, but are usually used to remove hardness and nitrate.

IX units can remove different dissolved inorganic minerals such as calcium, magnesium, and sulfates from the water. A cation exchange unit typically uses sodium or potassium chloride, and can be used to remove lead, radium and is commonly used to soften water. An anion exchange resin uses chloride or hydroxide anions and can be used to remove mercury, nitrates, arsenic and various staining agents.

Inside an IX unit, one type of ion in the water is used to replace another type on the resin. For example, calcium and magnesium in the water are exchanged for sodium or potassium. Eventually, the resin becomes saturated and must be regenerated. This is done by flushing the material in the softening tank with salt or potassium brine. An IX unit should only be used for iron and manganese removal if the concentration is less than 1 mg/L.

Softening

Hardness is measured in grains per gallon (gpg), parts per million (ppm) or gm/L

One gpg = 17.1 ppm or mg/L

Water softeners do not remove particles like filtration nor do they reduce dissolved minerals like reverse osmosis. Softeners replace one ion with another, and are designed to remove ions that cause hardness in water (Calcium and magnesium). Hard water can result in the buildup of scale on appliances such as a kettle or iron; resulting in a lack of suds in the water, and the build up of film on shower doors etc.

A water softener exchanges the calcium with sodium ions giving soft water.

Water must first be pretreated to reduce the suspended solids and total dissolved solids (TDS) load to the IX unit. Water softeners will remove small amounts of dissolved iron (5 to 10 pm). However, if there is oxidized iron or iron bacteria in the water, the resin will become coated or clogged and lose its softening ability. Cation exchange units are rated by NSF for their efficiency (Standard 44).

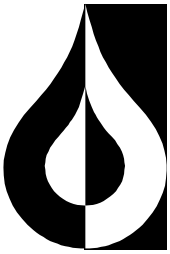
Limitations:

- Although softening water makes it more suitable for washing and prevents deposits in appliances and pipes, the water is not generally recommended for drinking and cooking due to its increased sodium content. Persons on a strict low sodium diet should discuss with their dietitians, the use of a softener which will increase the sodium concentration. For consumers that are concerned about sodium, water softeners are available that use potassium as the exchange ion. A potassium unit, however, should not be used by a predialysis patient on a low protein diet.

- Soft water is also more 'corrosive' and may lead to the leaching of lead into the drinking water.

- Waste water from the softener contains a high level of salt and cannot be discharged into septic tanks or surface water.

NSF/ANSI Standard 44 set standards for residential cation exchange water softener systems.



Soft water is high in sodium and may not be suitable for drinking

DISINFECTION

Disinfection of water may be needed on a temporary or continuous basis to control microbial contamination. Disinfection kills or inactivates biological contaminants present in a water supply. This can be achieved by the addition of a chemical (chlorine or ozone), or by boiling (distillation). Ultra-violet light can also be used to kill microorganisms in the water. One problem for many of the disinfectants is the formation of by-products. Some of these disinfection by-products (DBP) can be very harmful if the concentrations get too high, and may limit the use of some disinfectants.

CHLORINATION

Chlorine is added to the water to oxidize and breakdown bacteria and organic contaminants. Chlorine is effective for most harmful bacteria and viruses, and is also used to treat taste, odour and colour problems in water. Chlorine is also effective in the removal of iron, hydrogen sulfide and colloidal inorganics in the water. Chlorine should be used on a regular basis to control iron bacteria in wells.

Chlorine is the most common disinfectant used in water treatment because it is a proven technology, easy to use and relatively inexpensive to operate. To be effective, there must be proper control of chlorine dosage and contact time. There should also be testing of residual concentration. Homeowners should purchase a unit that is certified under ANSI/NSF Standard 60 as being acceptable for disinfection of potable water. Common household laundry bleach with 5.25% sodium hypochlorite should only be used for emergency and not as a regular source of chlorine in water treatment. Household bleach contains other materials that are not intended for human consumption.

Limitation:

- Chlorine and chlorine products are not effective in destroying hard-shelled cysts such as *Cryptosporidium*.

- In the presence of some organic compounds, chlorine may react to give harmful DBP such as trihalomethanes.

- Chlorine may add taste and odour to the water.

- Care should also be taken in the handling of chlorine equipment as chlorine is hazardous and very corrosive.

- Chemical fed pumps require frequent maintenance.

Disinfection or the oxidation of the water may be required to control microbial contamination of the water. It is also sometimes used to oxidize iron.

Ozone is effective in destroying *Cryptosporidium.*

OZONATION

Air or oxygen can be converted by a generator to produce ozone. Ozone is a stronger disinfectant than chlorine and can inactivate *Cryptosporidium* and will also react with many more organic compounds than chlorine. Similar to chlorine, to be effective, there must be proper control of the dosage and contact time.

Limitation:

- Ozone gas is an irritant and a pollutant in the air. Ozone gas generated must be properly captured and neutralized (by carbon filters).

- Ozone can corrode many materials, including plastics. There must be tight control of any gas being generated.

- The system is more expensive than chlorine to set up and run.

- When treating water with high bromine levels, there may be production of high levels of DBPs.

- Since ozone is very effective in breaking down organic compounds into smaller components, ozonated water can also be a good source of nutrients for bacterial regrowth.

- Ozonated water should not be stored for any length of time without the use of residual disinfectants such as chlorine.

Ultraviolet (UV) System

Ultraviolet light can be effective against Giardia and Cryptosporidium if the water quality is acceptable.

UV radiation can be used to destroy almost all harmful organisms in the water. Filtered water is passed into an exposure chamber where it is exposed to an UV lamp. The use of an UV light has the advantage of not adding any chemicals to the water, resulting in no taste or odour. It is compatible with other systems and no storage of water is required. It is effective against bacteria, viruses and protozoa such as *Cryptosporidium* and *Giardia*. It is also easy to maintain once installed.

Limitations:

- Pre-filtration is required to produce relatively clean water for UV treatment. Suspended particles, turbid or coloured water will interfere with the effectiveness of UV.

- It must constantly be monitored for an increased level of bacteria counts.

- The system requires electricity to operate.

- It is not effective for the removal of contaminants such as organics, heavy metals or salts.

- Depending on the unit, flow rate may be limited. A flow control device should be installed to regulate flow.

- Lamp and sleeves require regular cleaning.

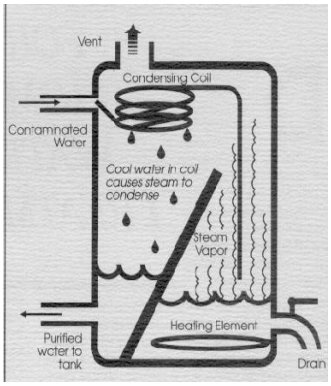
- Intensity of UV emitted by the lamp gradually decreases and eventually the unit becomes ineffective. The decrease in output can be caused by a weak or burned-out light or by sediment coating the lamp. To avoid this problem, an alarm system should be installed. Less expensive models may not have a transmittance monitoring device that may warn owners of decrease in UV output.

- UV radiation can decrease the chlorine level in treated water and should be closely monitored.

- UV may increase the level of formaldehyde in the water and should be monitored.

- Studies have found *E. coli* that have been inactivated by UV can repair itself, and under certain conditions, recover gradually (photoreactivation). If UV-treated water is stored for a prolonged period, it should be further treated with a disinfectant with residual power.

NSF/ANSI Standard 55 set standards for UV microbiological water treatment systems.



Steam is collected after boiling, resulting in very pure water

Distillation

Distillation is very effective in producing contaminant-free water. In distillation, water is first boiled in a chamber which creates steam that rises and leaves virtually all contaminants behind in the boiling chamber. Distillers remove bacteria, minerals, trace amounts of metals, many organic chemicals, and nitrates. The boiling process also kills all microorganisms. The steam is then collected and condensed into clean, distilled water. Impurities remain in the boiling chamber and are either automatically or manually flushed out depending on the system. Distillation units are rated by NSF for their efficiency (Standard 62).

Limitation:

- Most residential distillation units use either air or water cooled condensers. Air cooled units produce less wasted water, fewer service problems and are easier to use and install. A water cooled unit may need 8 to 15 gallons of water to produce one unit of distilled water.

- Most units use about three kilowatt hours of electricity to produce one gallon of water.

- Contaminants that boil at less than, or close to, the same temperature as water (example: gasoline, benzene and toluene) will be vaporized along with the water and can concentrate in the receiving chamber. A quality system should have a vent in the condensing coil to release these VOCs prior to the vaporization of water. These features are not found on cheaper distillers.

- Frequent cleaning is required, especially for hard water.

- The process removes beneficial minerals and makes water taste flat or bland.

- The process is slow, generating half-a-gallon of water per hour.

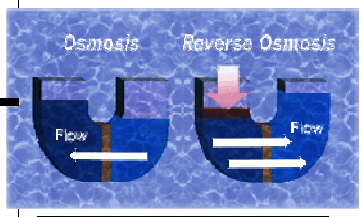
- The treated water must be cooled before consumption, providing opportunity for recontamination.

- In general, the energy input required for distillation is very high, resulting in a much more expensive unit to operate and to maintain when compared to other systems.

Other Treatments

There are other treatment devices on the market that do not fall into the above three categories. These systems can also be very effective and are designed to remove specific contaminants in the water.

Reverse Osmosis (RO)



RO units are effective in removing up to 95% of contaminants.

RO can effectively remove nearly all contaminants, including inorganics (lead, nitrate and sodium), pesticides, heavy metals, and microbiological contaminants. RO is particularly effective when used in series.

RO removes contaminants from water using a semi-permeable membrane that permits only water, and not dissolved ions such as sodium, to pass through its pores. The most common type of membranes are cellulose acetate and polyamide. To be effective, RO units usually require pre– and post-treatment of water, including the use of particulate pre-filters, followed by an activated carbon filter. Although not designed for microbial removal, RO units can prevent the passage of viruses and *Cryptosporidium* through the membrane. RO units are rated by NSF for their efficiency (Standard 58)

Limitation:

- The wastewater (brine solution) cannot be discharged into septic system.
- The membrane is prone to fouling.
- RO does not remove soluble organics of low molecular weight.
- Hardness can hinder the working of the unit by clogging its pores. RO should not be used on water with hardness exceeding 171 mg/L as $CaCO_3$ unless it is being first treated with a softener.
- RO should not be used on water that contains high iron concentrations or coliform bacteria.
- Some units waste 50 to 70% of the water they process.
- Units are usually large and bulky.
- Chlorine may damage the membranes.
- Damaged membranes are not easy to detect and need to have an electronic monitoring system.
- Efficiency is dependent on water pressure in the home. A pressure of at least 40 psi is needed.
- They require a technician to install and service them.
- High capital and operational costs.

Electrodialysis (ED)

ED is an electro-membrane process in which ions are transported through ion permeable membranes. The process is similar to reverse osmosis, but use currents to electrically charge ions to be transferred through the membrane instead of forcing water through the membrane under high pressure. ED are selective in the minerals that can be removed, but are effective for most heavy metals (arsenic, chromium, cadmium, lead, and mercury) and some ions, such as nitrates and fluoride. It is not as effective for bacteriological removal as RO.

Electrodialysis uses an electrical current to attract ions for removal by the membrane.

New Products

- Ionic silver is being tested, and under certain conditions is effective in the control of bacteria and viruses.
- The use of copper-silver ionization has been found to be effective in the control of *Legionella*.
- Electrolyzed oxidizing water is being used as a disinfectant to inactivate various harmful organisms in food, and can be effective for water disinfection.
- Chlorine dioxide can be effective in the inactivation of various harmful microorganisms and reduce taste and odour in water.

For information on these and other new products, please contact your local authorities (Page 10).

QUICK REFERENCE GUIDE FOR IMPURITIES REMOVAL

X = Effective
S = Some models only
L = Limited effect or limited to selected compounds only
SOCs = Synthetic organic contaminants, including pesticides, herbicides and insecticides
VOCs = Volatile organic compounds

PARAMETERS	Carbon filter	Pour Thru Filter	Oxidize Filter	Alumina	Microfilters	Ion Exchange	Chlorination	Ozonation	UV	Distillation	RO	Electro-dialysis
MICROORGANISMS												
Bacteria/Viruses							x	x	x	X	x	
Cryptosporidium/Giardia	s				s			x	x	x	x	
MINERALS												
Fluoride				x		x				x	x	x
Hardness						x				x		
Hydrogen Sulphide	x		x									
Iron/Manganese			x		x	L	L			x		
Nitrates						s				x	x	x
Sodium						s				x	x	
TDS										x	x	
CHEMICALS												
Chlorine	x	x								x	x	
Heavy Metals	X	L		L		L				x	x	x
Lead	x			x						x	x	
SOCs	x							s		x	L	
Radon	x					x						
VOCs	x	L						x		L	L	
PHYSICAL PARAMETERS												
Colour	s	L	L		L			x		x	x	
Taste & Odour	x	x						x		x	x	
Turbidity	x		x	x	x					x	x	

SUMMARY OF TREATMENT DEVICES

TYPE	ADVANTAGES	LIMITATIONS	REQUIREMENTS
Activated Alumina	Effective for arsenic, fluoride and lead removal.	Will not remove other minerals and microorganisms. Bacteria can grow on media.	Replacement of spent cartilage
Carbon filters	Remove taste, odour, organics, chlorine, pesticides, low levels of hydrogen sulphide. Some are effective for *Giardia* and *Cryptosporidium.*	Should be used only on microbiologically safe water, and should be flushed before use. Bacteria growth may occur in the filter if not maintained. Not very effective against inorganics such as hardness, iron, nitrate or fluoride.	Regular replacement of cartilage, periodic backwashing
Chlorination	Proven technology and effective for bacteria and viruses. Also effective for iron, hydrogen sulfide and colloidal iron removal. Recommended for emergency disinfection of water and regular maintenance of wells.	May require additional filters to remove protozoan cysts, requires handling of hazardous chemicals. May add taste and odour to the water. Chlorination may produce disinfection by-products.	Test kit, feed pumps
Distillation	Effective against all pathogens and most contaminants.	Batch system and uses lots of energy, water-cooled units waste water; slow process; bland tasting water; limited volume. May concentrate volatile organics.	Electricity and frequent cleaning especially with hard water
Electrodialysis	Effective for some minerals.	Not effective for microorganisms.	Electricity
Ion Exchange	Hardness, barium, radium nitrate, sulfate, calcium, magnesium, and iron (<1 mg/L).	Produce soft water that may be corrosive; waste water discharge; waste large amount of water.	Requires backwashing and regeneration (with sodium or potassium chloride), replacement of spent resin and cartilages
Microfilters (ceramic candles and others)	Inexpensive, simple. Effective for suspended solids.	May not be effective against viruses, lead and other organics..	Backwashing or cleaning
Oxidizing filters	Remove iron, manganese, hydrogen sulphide.	May clog or reduce effectiveness due to bacterial growth.	Backwashing and regular regeneration, replacing media
Ozonation	Effective against all pathogens.	High operational cost and an indoor air quality issue. No residual	Electricity, cleaning and maintenance of ozone generator and treatment tanks
Pour-through filters	Inexpensive, effective for taste, odour and chlorine removal. Effective for some heavy metals and dissolved organics.	Not effective for microorganisms, limited water can be processed per day, and water subject to bacterial regrowth.	Replacement of filters
Reverse osmosis	Inorganic salts (lead, nitrate and sodium), can be effective against viruses and protozoa.	Susceptible to clogging, scale build up, tearing of membranes, some membranes get damaged by chlorine, uses large amount of water; will not remove all organics (such as chloroform).	Adequate water pressure and flushing.
Softeners	Hardness (calcium and magnesium).	Elevate sodium content, waste water, corrosive water.	Electricity
Ultra violet Light	Effective against all bacteria, viruses and protozoa such as *Giardia* and *Cryptosporid-*	Needs water that is relatively clear, nd will not remove chemicals.	Electricity, regular monitoring and cleaning of bulk housing, replacement of UV bulks

Iron removal

Iron is a common concern for groundwater. The removal of iron is dependent on the types and concentration of iron, and often require a combination of devices. The most often used devices are:

1. Cation-exchange Softener

Treat up to 3 mg/L, iron that is in ferrous state. Ferric iron will clog exchanger. Iron is filtered from water by softener's resin bed and is removed during regeneration. Resin-cleaning compound (Sodium hydrosulphite or phosphoric acid) is needed to clean unit.

2. Oxidation (iron filters):

a) Air injection

Air is introduced and oxidize soluble iron to form rust particles and strained out by filter (usually carbon filter). Can treat up to 30 ppm of iron. Require retention tanks, air release valves and mixing devices.

b) Chlorination-filtration

For water with high iron concentration, there is a need to oxidize before removal by ion exchange or filtration. Special iron filter performs both oxidizing and filtering steps followed by carbon filter to remove excess chlorine.

c) Manganese greensand (oxidation filter)

See oxidizing filters

d) Aeration and settling

Outdoor settling basin and aeration can remove some iron in the water

NOTE: For colloidal iron, there may be a need to add polymers to form larger clumps, followed by oxidation and filtration

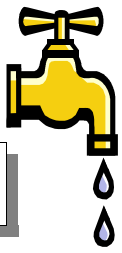
3. Chemical sequestration

(Polyphosphate)

Water is treated with an organic compound (polyphosphate) to form complex with metallic ions to prevent changing to ferric state and coming out of solution. Remain suspended in water and no staining

4. Iron Bacteria:

Can be controlled by shock chlorination



All systems have limitations and have specific uses.

Alberta Health & Wellness

Technical Advisory Committee on Safe Drinking Water

- Alberta Health and Wellness
- Alberta Environment
- Calgary Health Region
- Capital Health
- Chinook Regional Health Region
- David Thompson Health Region
- East Central Health Region
- Peace Country Health
- Health Canada, Healthy Environment & Consumer Safety Branch
- Health Canada, First Nations & Inuit Health Branch
- Prairie Farm Rehabilitation Administration
- Provincial Laboratory for Public Health (Microbiology)

NF/2004

Points to remember in selecting your POU or POE devices:

- Contact your local Health Agency to have your water tested for chemical and bacterial quality.

- Discuss the results with your Public Health Officer/Environmental Health Officer to determine what improvement is needed.

- Decide on the improvement that is needed for your water, and the system or combination of systems that are best to accomplish the task and options available.

- Select reputable dealers. Shop around for the best price and service. Consider the capital, cleaning, maintenance, chemical, electricity and replacement cost of the system.

- Consider safety issues relating to the operation of the devices

- Check for approval logos from independent organization such as NSF, ANSI, UL or Water Quality Association (WQA) for the removal or treatment of the parameters of concern.

- Standards Council of Canada has accredited the following agencies to certify drinking water treatment devices as meeting appropriate NSF/ANSI standards: Canadian Standards Association International, NSF International , Underwriters Laboratories Inc., Quality Auditing Institution, International Association of Plumbing ad Mechanical officials

- Realize the operational limitation and maintenance that is required for each type of system.

- Maintain your system according to manufacturer recommendation.

- Understand any warranty provided with the equipment.

- Test your water on a regular basis.

AGENCIES THAT CAN PROVIDE ASSISTANCE TO YOUR WATER PROBLEM

Alberta Agriculture, Food and Rural Development
www.agric.gov.ab.ca/
Alberta Environment
www3.gov.ab.ca/env/
Alberta Health & Wellness
www.health.gov.ab.ca/
Health Canada
www.hc-sc.gc.ca/

Prairie Farm Rehabilitation Administration
www.agr.gc.ca/pfra/pfintroe.htm

Regional Health Authorities

Useful web sites:
- *www.nsf.org*
- *www.ul.com*
- www.wqa.org
- www.csa-international.org
- www.iapmo.org