



Ohio Department of Health Bureau of Environmental Health

Treatment of Arsenic in Ground Water for Private Water Wells

"To improve and protect the health of all Ohioans"

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Arsenic (As) is a naturally occurring metallic element that occurs at low concentrations in most rocks and soils. Its presence in ground water largely is the result of arsenic-bearing minerals dissolving naturally over time as certain types of rocks and soils are weathered.

Please note that the removal of arsenic can be successfully accomplished by a variety of treatment devices and is a good alternative for well owners. However, these treatment systems are not for the do-it-yourselfer and should be installed by a professional water treatment dealer who is registered and bonded with the Ohio Department of Health.

Arsenic occurs in two forms (or oxidation states) in ground water, either as As (III) (arsenite) or As (V) (arsenate). Successful removal of arsenic is dependent on the type of arsenic present. Past studies of ground water samples with arsenic detections have shown that the As(III) state may constitute 50-75% of the total amount of arsenic present. As(III) must be oxidized to the As(V) for successful removal with treatment systems. This typically requires the use of an oxidizing resin, continuous chlorination, ozonation, potassium permanganate, or other commercially available treatment technologies. After oxidation to the As(V) state, the arsenic can be removed with an anion exchange unit, activated alumina cartridges or reverse osmosis with good success.

Treatment efficiencies may also be affected by water pH, depending on the technology applied, and other minerals (ions) dissolved in the water. Higher pH tends to decrease removal rates; high sulfate, fluoride, and phosphate concentrations also tend to decrease removal rates. Most ground water in Ohio has a relatively neutral pH of 7. If other metals, such as iron, barium or strontium are present in the ground water, then cation exchange units (traditional water softeners) should also be used to prevent clogging of the oxidizing resins.

The following table summarizes treatment options and costs.

<i>Treatment Options</i>	<i>Use</i>	<i>Costs</i>	<i>Pre-oxidation required</i>
Cation exchange/philox resin/ anion exchange units	Whole house treatment	\$3000 - 4000	Included in system
Continuous disinfection (for oxidation)	Whole house treatment	\$500 - 1500	N/A
Activated Alumina cartridges (disposable)	Point of use treatment	\$50 - 75	Yes
Reverse Osmosis	Point of use treatment	\$500 - 600	Yes
Advanced Adsorptive Media (Apyron Aqua-Bind)	Point of use treatment	\$60 - 200	No
(Bayoxide E33)	Whole house treatment	\$2000-2500	No

Many of these technologies work on the principle of selectively removing or absorbing arsenic from the water onto the treatment media. The treatment media, over time, will become saturated with arsenic and other inorganic constituents. At some point, the media will become very saturated with arsenic and will start releasing arsenic at high levels back into the water supply. This is called breakthrough. ***It is very important that any treatment system that is installed be evaluated to determine the frequency at which the treatment media must be replaced or regenerated to ensure that breakthrough of arsenic does not occur.*** The treatment media must be replaced or regenerated at the schedule recommended by the water treatment installer to ensure effective removal of arsenic.

Initial and periodic monitoring of arsenic levels after the treatment system is installed is also very important. The water treatment equipment installer should perform this testing. After initial installation of a treatment system, the treated water should be monitored to determine how effectively the treatment media is removing arsenic. Treated samples should be collected and analyzed at a state certified laboratory. It is recommended that treated samples also be tested at the end of the suggested media replacement or regeneration cycle to make sure that high levels of arsenic are not breaking through into the drinking water tap used prematurely. Periodic testing of the treated water is recommended, for example on yearly basis, after installation of the system. Continued maintenance and monitoring of any treatment system is essential to ensure effective removal of arsenic from the water supply.

Internet resources on treatment technologies may be found at:

www.epa.gov/safewater/ars/treatments_and_costs.pdf
<http://www.epa.gov/ogwdw000/ars/treat.html>

Please contact the Ohio Department of Health regarding questions on treatment technologies for removal of arsenic, or for a list of registered water treatment dealers at (614) 466-1390 or www.odh.state.oh.us.