



THE UNIVERSITY OF GEORGIA
COOPERATIVE EXTENSION

Colleges of Agricultural and Environmental Sciences & Family and Consumer Sciences

Removal of Arsenic From Household Water

Uttam Saha, Leticia Sonon and David Kissel

University of Georgia Agricultural and Environmental Services Laboratory

Arsenic in your drinking water may damage your health. For further information about arsenic occurrence and health concerns of arsenic exposure, refer to the University of Georgia Cooperative Extension Circular 858-12, *Your Household Water Quality: Arsenic in Your Water*, available at your local Extension office and online at <http://www.caes.uga.edu/publications>.

Because arsenic in household well water is usually dissolved from natural rock in the aquifer, water treatment is the only way to eliminate it. Arsenic in well water occurs in two different forms, “arsenic-III” and “arsenic-V.” Arsenic-III is more toxic to humans and is more difficult to remove than arsenic-V. Because both arsenic forms are found in some Georgia ground water, home treatment systems (like the one described below) should remove both.

If you have tested your water and the arsenic level is greater than 10 parts per billion (ppb), you should re-test to confirm the result before obtaining a treatment system. When re-testing for arsenic, also test the pH, phosphate, silica, hardness, iron, manganese and sulfate levels. The pH, phosphate and silica levels will help your water treatment professional estimate the life of arsenic treatment media, and the hardness, iron, manganese and sulfate levels will determine whether a pre-treatment step is necessary.

Treatment Technology

Arsenic removal from water requires special adsorption media. Granular ferric oxide, titanium and hybrid media that contain iron-impregnated resin are all

highly effective, but there are differences in media life. Before choosing a treatment technology, homeowners should ask water treatment providers to estimate the number of days that media can remove arsenic based on their water usage and water test results. The media are either contained in tanks for whole-house treatment or in cartridges for point-of-use (POU) treatment. Whole-house treatment is intended to treat all water for the house. The POU treatment system is installed at one location, such as a kitchen faucet, that provides water for drinking and cooking.

The whole-house treatment system usually is the preferred treatment technology for arsenic removal, and its media typically lasts for two to three years. Given the higher initial cost of whole-house system, homeowners can consider a POU system that would provide enough water for drinking and cooking in an average household. However, some arsenic exposure may continue from drinking from other faucets, bathing, showering and brushing teeth. The media in POU systems typically lasts for one year.

Some well water may need to be pre-treated before it goes through the arsenic treatment system to extend the system’s life. A water treatment professional can provide information and equipment for pre-treatment. The pre-treatment step is generally recommended when water has one or more of the following test levels:

- Iron higher than 0.5 parts per million (ppm)
- Sulfate higher than 100 ppm
- Manganese higher than 0.05 ppm
- Hardness higher than 300 ppm

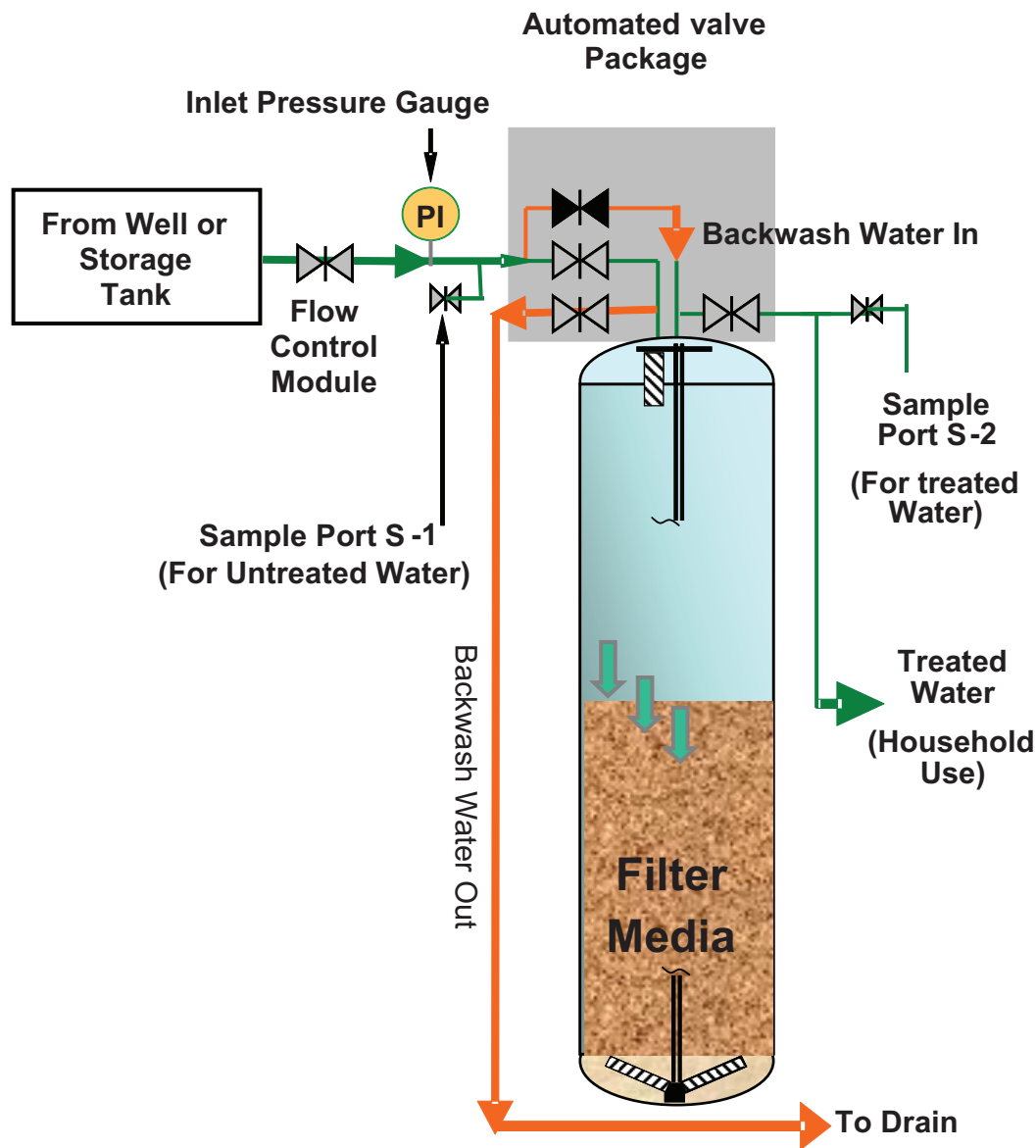


Figure 1. Diagram of a whole-house arsenic removal system.

Installation

A typical whole-house adsorption system installed by a water treatment professional is shown in Figure 1. The system consists of a flow control module, an incoming water pressure gauge, an untreated water sampling port, a tank containing two cubic feet or more (depending on the size of the household and water test results) of adsorption media with backwash control valves, a shut-off valve and a sampling port for treated water. The system should be thoroughly backwashed before being placed into service. The system requires backwashing every 28 days or after treatment of every 8,000 gallons of water. Most systems have an automatic backwash option based on the volume of water treated or the time since the last backwash. This periodic backwash helps to “fluff” the bed to eliminate

channeling and to remove sediment and minerals that increase the pressure and reduce water flow.

Performance Evaluation and Maintenance

Your treatment system should be monitored and maintained as recommended by the manufacturer. Follow the maintenance plan provided by the manufacturer or water treatment professional. You may consider the following:

Whole-House Adsorption System

A few days after installation, test the treated water to determine if arsenic has been removed. Follow the steps below to collect a water sample:

- Run cold water for 10 minutes at 3-5 gallons per minute.
- After 10 minutes and while running the water, fill a 100 mL plastic sample bottle from the sample port S-2 (Figure 1), being careful not to contaminate the sample.

The treatment system should remove all arsenic from the water. After installation, water should be tested once every three months or on a schedule recommended by the manufacturer or a water treatment professional to monitor arsenic removal. When arsenic in treated water tests above 5 ppb, the filter tank should be replaced.

Point-of-Use Adsorption System

The POU system uses under-sink cartridges that contain the same media as the whole-house system. The systems should be installed and maintained according to the manufacturer's instructions. Like the whole-house system, treated water should be tested for arsenic. A sample of treated water can be collected by first running cold water at full capacity for two to three minutes, then reducing the flow to a pencil-size stream of water and filling a 100 mL plastic sample bottle, being careful not to contaminate the sample.

An adequate POU treatment system should also remove all arsenic from the raw water. Water testing to monitor system performance should be done as recommended by the manufacturer or a water treatment professional. Cartridges are typically replaced once per year.

Other Considerations

In homes with water high in arsenic, minerals that have accumulated in water heaters may also contain arsenic. These minerals may release arsenic back into the treated water as it passes through the water heater. Therefore, homeowners with high arsenic levels should also consider testing their hot water after installing a whole-house treatment system and replacing the water heater if the levels are elevated.

Sources

Arsenic Water Treatment for Individual Wells in Maryland (http://www.mde.state.md.us/programs/Water/Water_Supply/Documents/www.mde.state.md.us/assets/document/FactSheets/Arsenic_Treatment_in_Wells.pdf), Maryland Department of the Environment, Baltimore, MD, 2008.

Fact Sheet: Arsenic in Drinking Water (<http://des.nh.gov/organization/commissioner/pip/factsheets/dwgb/documents/dwgb-3-2.pdf>), New Hampshire Department of Environmental Service, Concord, NH, 2006.

Fact Sheet: Drinking Water Standard for Arsenic (http://water.epa.gov/lawsregs/rulesregs/sdwa/arsenic/regulations_factsheet.cfm), USEPA, 2001EPA 815-F-00-015, USEPA, 2001.

Giles, G. 2003. "POE Arsenic Reduction: New Adsorption Alternative for Whole House Treatment." *Water Conditioning and Purification*. March 2003, vol.45/3, 50-54.

Information Circular: Arsenic Water Treatment for Residential Wells in New Jersey (http://www.nj.gov/dep/pwta/Arsenic_Treatment.pdf), New Jersey Geological Survey, Trenton, NJ, 2007.

National Sanitation Foundation (<http://www.nsf.org>).



Circular 996

January 2011

The University of Georgia and Ft. Valley State University, the U.S. Department of Agriculture and counties of the state cooperating. Cooperative Extension, the University of Georgia College of Agricultural and Environmental Sciences, offers educational programs, assistance and materials to all people without regard to race, color, national origin, age, gender or disability.

**An Equal Opportunity Employer/Affirmative Action Organization
Committed to a Diverse Work Force**