Arsenic Treatment for the Homeowner

AIR & WATER QUALITY INC.
160 US Route 1 • Freeport, ME 04032
388 Bangor Road • Ellsworth, Me 04605

Testing

Arsenic in drinking water is odorless, tasteless and colorless. The only way to tell if arsenic is present is to test for it. We recommend using a state certified lab. We also recommend a minimum of two tests to confirm the concentrations. Even if the initial test is low, we recommend a second test to confirm the results.

Arsenic forms

Arsenic(As) exists in nature in two forms. One is As(III) and the other is As(V). The roman numerals represent their relative abilities to combine with other substances. The As(V) has a greater combining capacity then As(III) and because of this greater combining capacity it is more easily treated. If there are high concentrations of As(III), most treatment systems will require it be converted to As(V). The conversion will require the As to be oxidized. This can be done with the addition of an oxidant like chlorine. The addition of chlorine is done with a solution feed system.

Treatment Techniques

The ability of the homeowner to monitor the performance of the system is one of the most critical considerations in determining the appropriate choice of a reduction technique for health related contaminants.

There are a number of ways to remove arsenic from drinking water. Three of the most common include:

- Adsorption with iron based media(IBS)
- Ion exchange with anion
- Reverse osmosis(RO)

Iron Based Sorbents

Iron based sorbents work well on As(v) and do have limited ability to adsorb As(III). These systems have the following disadvantages:

- The system performance is affected by water with an elevated pH.
- The system will require the replacement of media once it is exhausted.
- These systems require regular testing to provide safe operation.

The advantages are:

- These systems require very little operator/homeowner involvement.
- They are inexpensive alternative to a point of entry (POE) reverse osmosis (RO) systems.

Ion exchange with anion resin

Ion exchange with anion resin only works on As(V). It has the advantage of not being affected by pH. It does have the following disadvantages:

- An improperly operated and/or maintained system can dump collected arsenic back into the water. This dumping can cause concentrations to rise well above those being removed.
- The capacity of the system can be decreased over time by other materials in the water.
- The home owner must add salt to maintain the system.
- There is no good way for the homeowner to monitor the performance of the system.
- It will lower the pH of the water causing it to become corrosive and potentially creating lead and copper problems.

Reverse osmosis

Reverse osmosis systems work well on As(V) and will remove some As(III). It has the following advantages over the other techniques:

- The performance of the system can be easily monitored.
- Arsenic can't be dumped back into the water because none is stored in the unit.
- The equipment does not require the addition of chemicals or salt.
- The system does not require any special skills to operate.

Experience

Our experience in Maine has shown that most of the arsenic is As(V) and is very effectively removed with a reverse osmosis system. As when treating any health related parameter, testing of raw and treated water should be done on a regular basis after the installation of any treatment system. We recommend that initial testing be done within a week after installation, again in six

AIR & WATER QUALITY INC.
160 US Route 1 • Freeport, ME 04032
388 Bangor Road • Ellsworth, Me 04605

months, and then each year thereafter or when there is any observable change in the quality of the water.

When a POE IBS system is installed we recommend quarterly testing to confirm operation.

Conclusion

If most of the arsenic in the water is As(V) and ingestion is the only concern, the arsenic should be treated by a point of use (POU) RO system. The RO is chosen for the following reasons:

- RO systems provide for performance checks on a regular basis by the homeowner. A total dissolved solids (TDS) meter can provide these checks and can be a permanent part of the system.
- Arsenic is typically only considered a problem if ingested and therefore only enough treated water for drinking is necessary.
- There are no operator skills required.
- There are no chemicals to handle.

If point of entry (POE) treatment is desired, then an IBS system should be considered on low arsenic concentrations. If concentrations are high, then a point of entry RO system should be considered. Both POE systems will require knowing if As(III) is present. If most of the arsenic is As(III), then a solution feed system will need to be added to add chlorine to the system.