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Possible Treatments

Ultraviolet Radiation, Ozone Treatment, And Aeration

In addition to the common household water treatment systems—filters, reverse osmosis, distillers, softeners, and chemical feeders—many other treatment methods exist. A few of the more important of these include ultraviolet radiation, ozone treatment, and aeration.

Ultraviolet Radiation For Disinfection

How Ultraviolet Radiation Works. Ultraviolet (UV) systems expose the water to light from a special lamp. The light is at a specific wavelength, which is capable of killing common bacteria. The system adds nothing to the water, produces no tastes or odors, and usually requires only a few seconds of exposure to be effective.

What Ultraviolet Radiation Treats. Ultraviolet radiation is very effective on pathogens but not on protozoan cysts such as those responsible for giardiasis. UV systems, however, have no action beyond the point of application because the light penetration of water is shallow (usually only 2 to 3 inches) and suspended solid particles of inorganic or organic matter can shield organisms against the light. Because of the possible presence of protozoan cysts, microfiltration must be added to ensure that the system is completely disinfected.

Factors To Consider Before Buying An Ultraviolet Radiation System. The major problems with such a system are cost, fouling of the chamber, collection of sediment, and growth of algae. In the latest ultraviolet radiation systems, Teflon tubes are used instead of quartz tubes and seem to decrease these problems.

Holding UV-treated water outside of the water system causes some increase in the risk of contamination from reintroduction of bacteria. Storing water in the refrigerator for a cold drink or reconstituted drinks that normally are refrigerated are the common problems. Water for such uses might best be boiled or treated with a disinfectant if UV is the primary treatment process.

Additionally, the ultraviolet lamp must be cleaned frequently to ensure proper exposure of the water to the light.

Ozone Treatment For Disinfection

Ozone is a chemical form of pure oxygen that is extremely reactive. It is the product smelled near an electric spark or lightning strike. For many years, municipal systems in Europe have used ozone treatment to disinfect water, but only recently has the technology been applied to public systems in the United States. Now small units are available for the householder.

How Ozone Treatment Works. The home devices are a “black box” approach to water treatment. They are installed in the plumbing system and connected to an electrical power supply. Raw water enters one opening and treated water emerges from another. Inside, ozone is produced by an electrical corona discharge or ultraviolet irradiation of dry air or oxygen. (At present all home systems use dry air to produce the ozone.) The ozone is mixed with the water whenever the water pump is running. A system to clean and remove the humidity from the air must be included, and such a system requires routine maintenance.

What Ozone Treats. Ozone, like chlorine, is a strong oxidizing agent and is used in much the same manner. It is an excellent virucide, is effective against most amoebic cysts, and destroys bacteria and phenols. Ozone may not kill large cysts and some other large organisms, so these should be eliminated by filtration or other procedures prior to treatment.

Ozone is also effective in eliminating or controlling color, taste, and odor problems not amenable to other methods. It oxidizes and permits removal of iron and manganese and aids in turbidity removal.

Factors To Consider Before Buying An Ozone Treatment System. The major benefit of ozone treatment is that ozone is extremely active as a disinfectant. In contrast to chlorine, ozone is active over a wide pH and temperature range. The required contact time is so short that it is not a consideration in the system design. Another benefit of ozone treatment is the lack of potentially harmful by-products like trihalomethanes (THMs), which chlorination can produce.

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Like chlorine, ozone is a toxic gas, but its greatest drawback is its lack of residual time. Ozone has an active residual measured in minutes while the residual for chlorine is measured in hours. Test equipment for residual ozone is now available and should be purchased with the unit. The only way to know if the unit is working is to test for ozone residual or have bacterial tests conducted on the treated water. Ozonation equipment is expensive, and chlorination may still be desirable because of low residual time for ozone.

Aeration For Removal Of Dissolved Gases

Simple aerators on the end of faucets sometimes have a significant effect on improving taste. Aeration and oxidation usually remove odors and improve tastes only if volatile substances are removed.

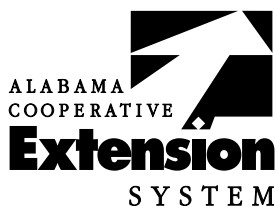
Carbon dioxide, methane, and hydrogen sulfide are the most common gases that are removed by aeration. Radon gas may also be treated with aeration. Aeration can be used for the precipitation and removal of iron and manganese. Aeration should not be used if water is subjected to airborne contamination.

References

Haman, Dorota Z., and Del B. Bottcher. 1986. Home Water Quality And Safety. Circular 703. Florida Cooperative Extension Service. University of Florida. Gainesville, FL.

Plowman, Faye T. 1989. Bacteria (Private Water Supply Disinfection). Water Quality Fact Sheet 2. New Hampshire Cooperative Extension Service. University of New Hampshire. Durham, NH.

Powell, G. Morgan. 1989. Disinfection Of Private Water Supplies. MF-886. Kansas Cooperative Extension Service. Kansas State University. Manhattan, KS.



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