

Summary of Water Treatment Options to Reduce Manganese

Point of Use Treatment	<p>Point of use (POU) treatment systems are designed to treat small amounts of water, usually for drinking and cooking. The treatment system is likely to be located on the counter, attached to the sink faucet, or installed under the sink. Some refrigerators with water/ice dispensers also have a treatment system installed.</p>			
Treatment Option	Description	Best For	Advantages	Disadvantages
Reverse Osmosis (RO)	<p>In a reverse osmosis system, dissolved solids are removed from water as the water diffuses across a non-porous membrane.</p>	<p>Water with multiple contaminants.</p>	<p>Effectively reduces the widest array of contaminants, including manganese, nitrate, nitrite, chlorine, arsenic, sodium, other dissolved minerals, volatile organic compounds (VOCs), and pesticides.</p>	<p>Reverse osmosis systems create wastewater when the membrane is operating (to keep it clean and functioning). The amount of wastewater created can be 1 to 8 times the amount of clean drinking water produced.</p>
Distillation	<p>Distillers use heat to boil the water. Steam is produced and rises, leaving contaminants behind. The steam hits a cooling section where it condenses back to liquid.</p>	<p>Water with multiple contaminants, including bacteria.</p>	<p>Distillation can remove up to 99.5 percent of dissolved solids including manganese.</p>	<p>It can be expensive to heat the water to create the steam that is required for distillation. VOCs and other contaminants may not be removed. Water may taste 'flat' because oxygen and minerals are reduced.</p>

TREATMENT OPTIONS TO REDUCE MANGANESE

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Treatment Option	Description	Best For	Advantages	Disadvantages
Carbon filter in a pour-through pitcher, faucet attachment, or refrigerator water/ice dispenser	Most carbon filters only reduce manganese that is oxidized. Organic contaminants adsorb on the surface of the activated carbon filter. The contaminants are discarded when the filter is removed and replaced with a new filter.	Water with manganese levels less than 200 ug/L for homes that have infants under 1 year. Water with less than 600 ug/L manganese for children over 1 year and adults.	Carbon filters are inexpensive, widely available, and easy to use. Carbon filters may reduce other contaminants, such as chlorine, VOCs, and pesticides.	Installed units are best used on a single tap or faucet because water with iron and/or manganese will fill the filter quickly and will need to be replaced often. There is no clear indication that a carbon filter is no longer removing manganese.
Oxidation and Settling	Manganese is oxidized by aeration when you simply leave a pitcher of water standing overnight. Dissolved iron and manganese will form solids when oxidized, which will drop to the bottom of the pitcher.	Water without biological contaminants such as bacteria.	Does not require additional equipment or chemicals.	Uncertain exactly how effective this method is.

Manufacture’s recommendations for installation and maintenance must be followed in order for a treatment unit to work properly. Treatment units that are not properly maintained may not effectively remove contaminants. In some cases, treatment units that are not maintained may actually make problems worse. For further questions about manganese treatment options, contact Krishna Mohan at MDH: 651-201-4699

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<p>Point of Entry (Whole House) Treatment</p> <p>Point of entry (POE) treatment systems are designed to treat all of the household water. POE systems are installed at the location where water enters the home. When a POE system is used, treated water will be available for all household uses including drinking, cooking, cleaning, bathing, and laundry.</p>				
Treatment Option	Description	Best For	Advantages	Disadvantages
<p>Water Softening (Ion Exchange)</p>	<p>Manganese and dissolved minerals that are in water as cations are removed by water softener ion exchange resins. These resins typically switch sodium for the predominant hardness ions calcium and magnesium. They also reduce iron, manganese, and copper.</p>	<p>Water with iron below 1000 ug/L and manganese below 200 ug/L.</p>	<p>Water softeners are common and easy to use.</p> <p>Sodium chloride and potassium chloride are safe to handle.</p>	<p>Owner has to buy salt and resupply the storage tank as needed.</p> <p>An installed water softener may be piped to treat only the hot water. Or, the kitchen cold tap is left as the only hard water inside the house. To determine which taps are soft in your home, follow the plumbing or use a hardness test strip.</p>
<p>Oxidizing Filter Media</p>	<p>Oxidizing filters have a media bed that changes dissolved contaminants into solid particles. Those solid particles are then large enough to be filtered out of the water.</p> <p>The most common oxidizing filters are greensand filter and birm.</p>	<p>Water with iron up to 2000 ug/L and manganese up to 500 ug/Lug/L.</p>	<p>Properly maintained oxidizing filters are very efficient.</p>	<p>Greensand filters require periodic regeneration of the media, which is messy and must be handled and stored carefully according to specific safety measures. Birm filters require air to be added to the water.</p>

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Treatment Option	Description	Best For	Advantages	Disadvantages
Oxidizing by Ozonation and Filtration	Ozone is generated using electricity and then injected in the water. The ozone changes dissolved contaminants into solid particles. Those solid particles are large enough to be filtered out of the water.	Water with multiple contaminants, especially metals (such as manganese) and bacteria.	Useful when there are multiple water quality issues.	Ozonation systems require significant maintenance and may be more expensive than other treatment options.
Oxidizing by Aeration and Filtration	An aerator brings oxygen into the water. The oxygen helps change dissolved contaminants into solid particles. Those solid particles are large enough to be filtered out of the water.	Water with combined iron and manganese from 2000 ug/L to 10,000 ug/L.	Aeration does not add additional chemicals to the water and may reduce iron, hydrogen sulfide, volatile organic compounds (VOCs), and dissolved gasses in addition to manganese.	Water with too much oxygen can become corrosive and damage plumbing. Aeration filters may require a large tank or multiple tanks.
Oxidizing by Continuous Chlorination and Filter	A pump feeds chlorine into the water, which helps change dissolved contaminants into solid particles. Those solid particles are large enough to be filtered out of the water.	Water with relatively low manganese levels that also has biological contaminants, such as bacteria.	Useful when there are multiple water quality issues.	Chlorination may require a large tank or multiple tanks and regular maintenance is required. An additional carbon filter may be needed for drinking water to remove the chlorine taste.

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