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Iron and Manganese Testing and Treatment

Iron (Fe) and manganese (Mn) are typically present in drinking water in 3 basic forms, and knowing the forms and concentrations of iron and manganese helps in the selection of the appropriate treatment.

- **Dissolved (soluble)** – very small minerals in water that pass through a 0.2 micrometer lab filter. If the water sample is clear at first but contains red or black particles after sitting in a glass for 24 hours, dissolved (soluble) iron or manganese is present.
- Colloidal - small particles that are suspended in water and that are difficult to filter out. If the water has a red or black tint but particles cannot be seen and do not settle out after 24-hours, colloidal form is likely to be present.
- Particulates – larger insoluble mineral particles that precipitate out of water (you can see them). Particulates are visible in the glass, either before or after the water sits.

In a water distribution system, it may be possible that soluble and insoluble forms are found together. Water with soluble iron and manganese may contain insoluble forms that sloughs off the water pipes. Therefore, it is beneficial to test for both total and dissolved forms. The appropriate treatment technologies will depend upon the concentrations of iron and manganese, overall water quality (e.g., pH, temperature, etc.) and whether the iron and manganese are dissolved, colloidal, or particulate:

1. If the water is **highly colored and cloudy**, it is probably the iron and manganese particulates that sloughs off the water pipes. A good point of entry bag filter or cartridge filter should successfully remove the particulates.
2. If there are **both visible particulates and dissolved iron and manganese**, the water should first be filtered and then treated with an oxidation-filtration process or an absorption process with ion exchange (a water softener).
3. For **dissolved iron and manganese**, an ion exchange softener should help to remove it. Effectiveness may be limited to a few ppm (parts per million) of dissolved iron and manganese however, so you may have to work with the vendor to optimize the softener for iron and manganese removal. Another option is the use of a combination sediment filter followed by a polyphosphate cartridge. Using polyphosphate does not remove the dissolved iron and manganese but it prevents it from precipitating out of solution and it is typically suitable only for lower concentrations. Our design standards don't recommend polyphosphates for Fe/Mn concentrations greater than 1 ppm.
4. For **dissolved/colloidal iron and manganese** an oxidation-filtration process is probably the best bet. Filter media in this type treatment include birm, greensand, manganese dioxide and other catalytic filter media. Commercial brands may include Fleck, Filox, Clack MTM and others. An ion exchange softener may not be very effective because the very small colloids can affect the performance of ion exchange resins.

If possible, select a treatment unit certified by NSF, Underwriter's Laboratory (UL), or Water Quality Association (WQA) to remove the contaminant(s) you are concerned with. These organizations do not certify treatment units for all contaminants. If a certification is not available for iron and manganese, you may want to consult a drinking water treatment professional.

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