

Municipal Drinking Water Treatment for Iron and Manganese Removal

Technical Brief

Technical Summary

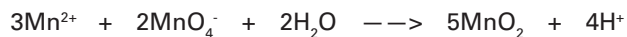
Permanganate is used in the iron (Fe) and manganese (Mn) removal processes in both surface water and ground water systems that employ filtration. Permanganate oxidizes soluble iron and manganese to insoluble precipitates. The precipitates are removed from the water supply in the clarification and filtration processes.

Factors that affect removal efficiency include water chemistry, pH, temperature, and application point. Reaction times are rapid under normal conditions of temperature and pH. Generally, temperatures <35°F, and pH values <5.5 require reaction times longer than two minutes. In most cases, 5 to 10 minutes of reaction time is sufficient.

Application

Oxidized precipitates are removed more easily in hard water than soft water. Sufficient time (approximately 30 minutes) is required for coagulation of the oxidation by-products. The preferred location for feeding potassium permanganate is the point that gives the longest contact time ahead of coagulation, usually at the intake of the plant.

Chemistry



Dosage

1 mg/L of soluble iron requires 0.94 mg/L of potassium permanganate.
1 mg/L of soluble iron requires 0.84 mg/L of sodium permanganate.

1 mg/L of soluble manganese requires 1.92 mg/L of potassium permanganate.
1 mg/L of soluble manganese requires 1.71 mg/L of sodium permanganate.

Facility Requirements

Proper feed equipment specially designed to handle permanganate is recommended and available from Carus. For proper removal of Fe or Mn, the utility must have filtration or coagulation/filtration to remove the MnO_2 and $\text{Fe}(\text{OH})_3$ formed during oxidation. In addition, alkalinity and hardness > 50 mg/L are recommended for proper coagulation of these precipitants.

Benefits

Permanganate quickly oxidizes Fe^{2+} and Mn^{2+} in most cases without pH adjustment. The freshly precipitated iron or manganese floc will further adsorb metal ions and organic compounds while enhancing the effectiveness of the coagulation process.

Permanganate also:

- helps control tastes and odors,
- aids in the coagulation process, and
- acts as a substitute oxidant to chlorine in a disinfection by-product control program.

References

Knocke, W. R., Van Benschoten, J.E., Kearney, M., Soborski, A., Reckhow, D. A., Alternative Oxidants For The Removal of Soluble Iron And Manganese. AWWA Research Report, (March 1990)

Ficek, K. J., Manganese Removal Using Potassium Permanganate in Low pH, Low Hardness Waters. AWWA Annual Conference, Washington D.C., (1985). *Carus Form CX #3004*

For further information on CAIROX® potassium permanganate or CARUSOL® liquid permanganate product characteristics and availability, contact Carus Chemical Company at 1-800-435-6856.

CARUS CHEMICAL COMPANY

Other Applications

- Taste & Odor Control
- Iron & Manganese Removal
- Biosolids Odor Control
- Arsenic & Radium Removal

Carus Value-Added

LABORATORY SUPPORT

Carus Chemical Company has technical assistance available to answer questions, evaluate treatment alternatives and perform laboratory testing. Our laboratory capabilities include; Feasibility Studies, Treatability Studies and Analytical Services.

FIELD SERVICES

As an integral part of our technical support, Carus provides extensive on-site treatment assistance. We offer full application services, including technical expertise, supervision, testing, and feed equipment design and installation in order to accomplish a successful evaluation and/or application.

EQUIPMENT SERVICES

Standard feeders are designed specifically for CAIROX[®] potassium permanganate. Various options and accessories are available to meet a wide range of applications. Custom-Engineered Feed Systems are complete, pre-engineered and pre-packaged systems. They provide efficient, dust-free methods of storing, mixing, and feeding CAIROX[®] potassium permanganate. System designs are customized to meet specific applications and customer needs.

CARUS CHEMICAL COMPANY

During its more than 90-year history, Carus' ongoing reliance on research and development, as well as its emphasis on technical support and customer service, have enabled the company to become the world leader in permanganate, manganese, oxidation, and base-metal catalyst technologies.



Carus Chemical Company
315 Fifth Street
P. O. Box 599
Peru, IL 61354
Tel. (815) 223-1500
Fax (815) 224-6697
Web: www.caruschem.com
E-Mail: salesmkt@caruschem.com

The information contained is accurate to the best of our knowledge. However, data, safety standards, and government regulations are subject to change; and the conditions of handling, use or misuse of the product are beyond our control. Carus Chemical Company makes no warranty, either express or implied including any warranties of merchantability and fitness for a particular purpose. Carus also disclaims all liability for reliance on the completeness or confirming accuracy of any information included herein. Users should satisfy themselves that they are aware of all current data relevant to their particular uses.

