

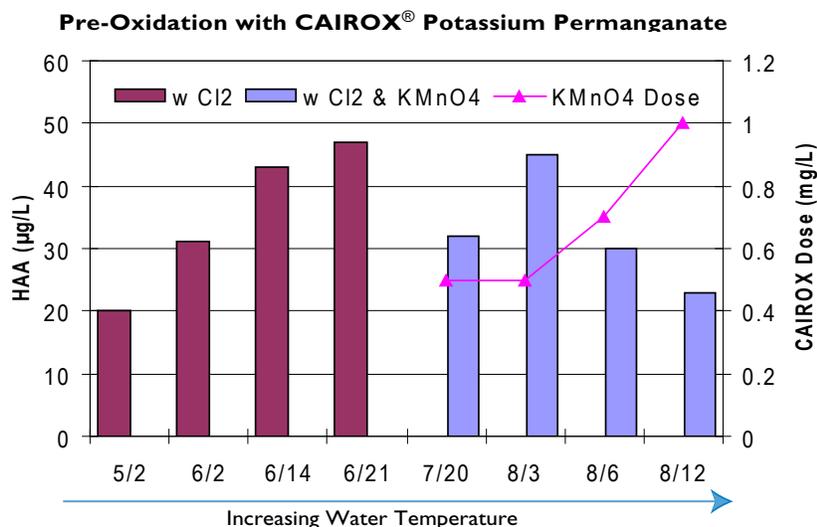


## BACKGROUND

The Carbondale Water Treatment Plant (Carbondale, Illinois) with a design capacity of 8 MGD and an average flow of 4.6 MGD draws its water from Cedar Creek Lake. Because of moderately high raw water TOC levels (4.3 - 6.5 mg/L) and low alkalinity (36 - 40 mg/L as CaCO<sub>3</sub>), Carbondale is required to attain 45 percent TOC removal under the Disinfection/Disinfection By-Product (D/DBP) Rule. Based on their HAA and THM formation potentials (80-200 and 140-260 µg/L respectively), effective treatment is required, especially during summer months when temperatures are high and DBP formation reaches its peak. Carbondale personnel investigated a number of treatment options to minimize DBP formation and proactively achieve the Stage 2 limit of 30 µg/L for HAAs. These options included replacing chlorine with CAIROX® potassium permanganate as the pre-oxidant. In addition to DBP control, pre-oxidation with CAIROX potassium permanganate was evaluated for manganese, and taste and odor (T&O) problems.

## CAIROX EVALUATION

The evaluation of CAIROX potassium permanganate was conducted in the Spring and Summer of 1999. By using CAIROX as the pre-oxidant, and still feeding chlorine above the sludge blanket, HAA levels were maintained below 30 µg/L even at elevated water temperatures, a result not obtained with chlorine alone!



## CONCLUSIONS AND OBSERVATIONS

CAIROX potassium permanganate effectively:

- Replaced chlorine as a pre-oxidant.
- Controlled HAA formation in the plant and distribution system.
- Lowered pre-aeration levels of THMs.
- Controlled periodic T&O and Mn episodes.

For further information on CAIROX® potassium permanganate product characteristics and availability, contact Carus Corporation at 1-800-435-6856



## CARUS VALUE ADDED

### LABORATORY SUPPORT

Carus Corporation has technical assistance available to answer questions, evaluate treatment alternatives, and perform laboratory testing. Our laboratory capabilities include; treatability studies, feasibility 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.

### ENGINEERED SYSTEMS AND EQUIPMENT SERVICES

Standard feeders are designed specifically for CAIROX® potassium permanganate. Various options and accessories are available to meet a wide range of applications. Carus offers custom-Engineered Feed Systems, pre-engineered and prepackaged systems through an equipment partner. 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.

### REFERENCES

1. Roth, J. G., Ozment, C.L., Stage 2 HAA Treatment Techniques, On-Line Trials and Costs, Presented at the American Waterworks Annual Conference, June 2000.
2. Ma, J., Herbert, D. Using Potassium Permanganate as a Pre-Oxidant to Reduce Disinfection By-Products, Presented at AWWA California WEA, Fall 2000.
3. Ma, J., Graham, N., Controlling the Formation of Chloroform by Permanganate Pre-oxidation-Destruction of Precursors, *J Water SRT-Aqua*, Vol.45, No.6, (1996)

### CARUS CORPORATION

During its more than 98-year history, Carus' ongoing reliance on research and development, technical support and customer service, have enabled the company to become the world leader in permanganate, manganese, oxidation, and base-metal catalyst technologies.

### ACKNOWLEDGEMENT

Carus Corporation would like to thank James G. Roth, Crawford, Murphy & Tilly, Inc., Springfield, IL and Colleen L. Ozment, City of Carbondale, IL, for their valued assistance in providing the information presented here.