

# Pre-Oxidation with CAIROX<sup>®</sup> Potassium Permanganate: Control of Haloacetic Acids (HAAs) Part I

## Case History

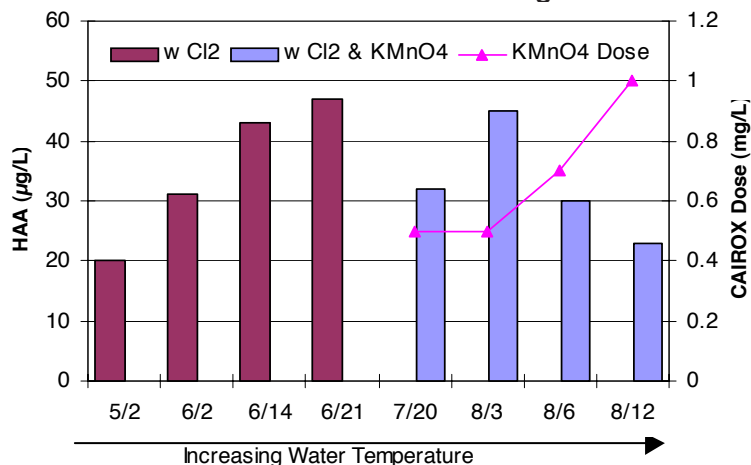
### Background

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% 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<sup>®</sup> potassium permanganate as the pre-oxidant. In addition to DBP control, pre-oxidation with CAIROX<sup>®</sup> was evaluated for manganese, and taste and odor (T&O) problems.

### CAIROX<sup>®</sup> Evaluation

The evaluation of CAIROX<sup>®</sup> was conducted in the Spring and Summer of 1999. By using CAIROX<sup>®</sup> 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<sup>1</sup>.

**Pre-Oxidation with CAIROX Potassium Permanganate for HAA Control**



### Conclusions and Observations

CAIROX<sup>®</sup> 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<sup>®</sup> potassium permanganate product characteristics and availability, contact Carus Chemical Company at 1-800-435-6856.

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## LABORATORY SUPPORT

Carus Chemical Company 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. 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.

## 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 CHEMICAL COMPANY

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

## ACKNOWLEDGEMENT

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