CARUS
WATER



Pre-Oxidation:
Control of Haloacetic
Acids (HAAs)

CAIROX® POTASSIUM PERMANGANATE
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 $CaCO_3$), 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 was evaluated for manganese, and taste and odor (T&O) problems.

CAIROX EVALUATION

The evaluation of CAIROX was conducted in the Spring and Summer (see Control of HAAs, Part I, Form 3503). Figure 1 shows the HAA levels (µg/L) and associated cost for CAIROX, Powdered Activated Carbon (PAC), and chlorine dioxide (ClO2) as dollars per thousandgallons of treated water1. By using CAIROX as the pre-oxidant (Figure 2), 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.

FIGURE 1: Pre-Oxidation with CAIROX®

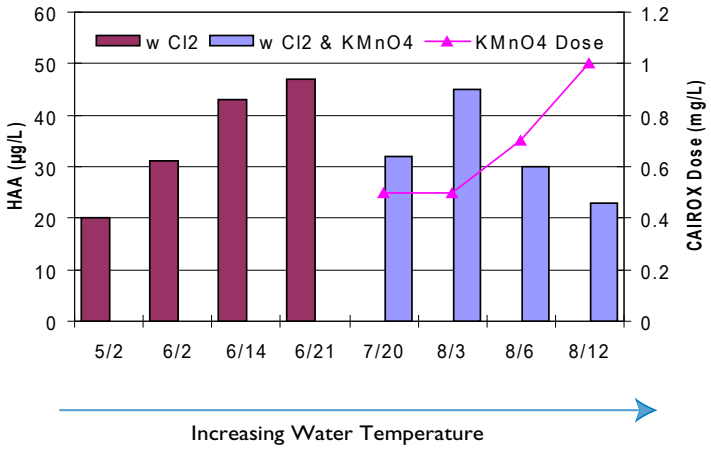
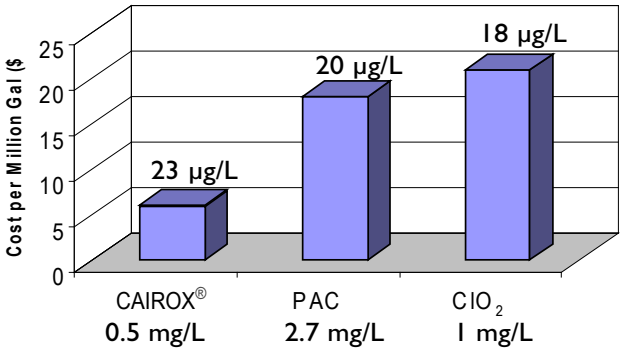


FIGURE 2: Pre-Oxidation with CAIROX®: Cost Effective Control of HAAs



CONCLUSIONS

CAIROX:

- Was the most cost effective DBP treatment evaluated
- 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
- Maintained sludge quality and prevented algae growth from appearing on the clarifier walls

For further information on CAIROX product characteristics and availability, contact Carus at 1-800-435-6856.



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CARUS VALUE ADDED

LABORATORY SUPPORT

Carus 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.

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

During its more than 100 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

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