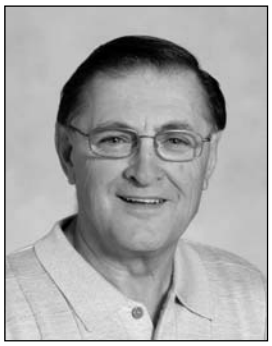
by Bert Zerr

# Council Grove water plant upgrades make ozone primary disinfectant

The city of Council Grove is located in Morris County, about 55 miles southwest of Topeka in the heart of Flint Hills country. Once a bustling rendezvous point on the Santa Fe Trail, Council Grove today attracts caravans of a different sort; tourists and history buffs eager to relive the trail days' spirit. That however, is another story. This article will focus on the latest Council Grove water treatment plant upgrades.

The primary water supply source is a 434 acre city-owned lake located five miles northwest of the city. Raw lake water gravity flows to the city water treatment plant which provides water to a population of approximately 2,320. In addition, water is supplied to a small part of Morris County RWD 1 through a wholesale meter.



*Bert Zerr*
*Consultant*

The original water treatment plant was constructed in 1933. Improvements were added in 1954, 1985, 1991, and 1999, all of which resulted in improved operations and water quality. None of the water plant's past improvements however, would allow for compliance with the Stage 1 Disinfectants and Disinfection Byproduct Rule (D/DBPR) as required by EPA. This rule required all public water supply systems to be in compliance by January 2004. This rule, along with the need to provide a second (backup) clarifier were both addressed in an inspection report by Kansas Department of Health and Environment (KDHE) in March of 2000. To their credit, city government officials and operations personnel began discussing possible methods to bring the plant into compliance. As a result, the city retained Professional Engineering Consultants, P.A. to evaluate the water treatment plant facilities to review available options.

City officials and personnel reviewed the options available and eventually chose to proceed with basically an overall plant upgrade which included the use of ozone as the primary disinfectant, replacing the existing free chlorine process. Chloramines (chlorine combined with ammonia) is being used as a maintenance residual (safety chlorination) in the distribution system. The project included a number of other upgrades noted as follows: 1) a new pre-oxidant and

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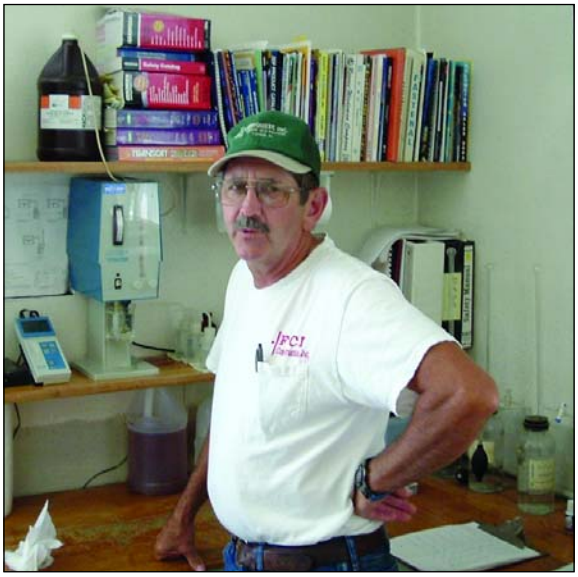
*The steel reinforcement is readied before concrete is poured to form the walls for the ozone generation area of the Council Grove water plant improvement project. CAS Construction, Inc. of Topeka was the general contractor.*

chemical feed building; 2) new rapid mix basins; 3) new backup basin for the solids contact basin; 4) improvements to the filtration process (air scour) and backwashing system; 5) upgraded high service pump systems; and 6) system control improvements and monitoring instrumentation.

**Why did the city chose ozone as the primary disinfectant?**

Free chlorine has been used effectively as the primary disinfectant in most public water systems for a number of years and for the most part, still is. The reason it has can be illustrated by the following excerpt taken from an article entitled "Drinking Water Quality" prepared by Professor Mel Suffet, Ph.D. with the UCLA in the Environmental Science and Engineering Program: "In the early twentieth century, drinking water disinfection dramatically reduced the occurrence of water borne diseases such as cholera and dysentery, and disinfection ranks with the discovery of antibiotics as one of the major public health accomplishments of the 20th century. In terms of risk, chlorination has allowed people to live long enough to worry about cancer." Unfortunately, when using chlorine to disinfect surface water, natural organic matter (NOM) in the raw water will combine with the chlorine causing disinfection byproducts to form.

Ozonation is used as a primary disinfectant for effective control of bacteria, viruses, Giardia and Cryptosporidium. Ozonation oxidizes harmful chemicals in the water; however, it can produce its own set of disinfection byproducts, such as bromate. Ozone treatment has the added advantage of removing compounds that cause earthy and musty tastes and odors due to the algae that grow in the lake. Controlling taste and odor was of major concern to city officials because of the many complaints from city residents during the past few years. Since changing to ozone, there have been no taste and odor complaints from city



*Jim Masters, Council Grove water suprintendant, pausing at his office desk, has been very pleased to date with the most recent TTHM and $HAA_5$ results, both of which were in the single digits, less than 8.0 parts per billion. His department is just beginning to monitor for bromate, one of the disinfection byproducts of ozone.*

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residents. Also, the users in Morris County RWD 1 who receive water from the city are much more appreciative of the improvement in water quality as noted by comments made by Shirley Hoch, office manager with the RWD. Ozonation generally costs more than the chlorination process but since ozone is very effective in reducing trihalomethanes (THMs) and haloacetic acids ($HAA_5$) as well as controlling tastes and odors, and after visiting with the neighboring city of Emporia, which has been using ozone for several years, Council Grove decided that ozone was the best approach to address drinking water treatment concerns.

*Council Grove water department staff members were very pleased that control supplier, R.E. Petrotti, Mission, Kan. suggested a creative way to reuse the old filter control panel which had been stored in a corner of the water plant building for a number of years.*

**What is ozone and how is it produced?**

Ozone ($O_3$), which consists of three oxygen atoms joined together into a singe molecule of ozone, is formed by applying electrical energy to the oxygen molecule within the ozone generators. Ozone-rich air is then bubbled up through the water in ozone contact chambers.

*The large capacity "Ozonia" ozone generator is installed in the finished Council Grove water plant, ready to go to work*

The water treatment plant upgrades have been completed and the "Ozonia" ozone generators have been on line for about two months. The 1.8 million dollar project which was awarded to CAS Construction Inc., Topeka, was funded with a revolving loan through KDHE. Jim Masters, Council Grove water superintendent, indicated that even though there have been some glitches; overall he is very happy with the water quality. He is especially happy with the control and monitoring equipment installed by R.E. Pedrotti, Inc., and is no longer hearing complaints about water quality. He stated, "People do not routinely contact you with positive comments when the water is good but you will always hear when the water is bad."

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