

Milwaukee Water Works & Ozone

On April 7, 1993, the City of Milwaukee issued a boil-water advisory after the illness-causing microorganism *Cryptosporidium* passed through the city's drinking water treatment system and into the finished water. The advisory was lifted after 7 days, and the city embarked on an unprecedented and immediate \$89 million facilities renovation and upgrade to strengthen barriers related to source water protection, disinfection and filtration to ensure that such an event would never happen again.



To help find a solution, Milwaukee Water Works turned to the Water Research Foundation for help. With more than 100 ozone research projects, and over 150 available related resources, the Water Research Foundation offered a road map to a solution.

The decision was made to replace chlorine with ozone as the primary disinfectant, and by 1998, the change was complete at both the Linnwood and Howard Avenue Water Treatment Plants. This highly reactive gas destroys illness-causing microorganisms and harmful compounds (including *Cryptosporidium*), removes taste and odor compounds and reduces the formation of disinfection by-products. To expedite the project, the Department of Public Works used a design-build contract for the first time, completing the project within 17 months. At the time, the \$51 million project was the largest ozone retrofit in the world.

Since 1993, Milwaukee Water Works has invested \$459 million in water treatment, water quality monitoring, water mains and pumping facilities, real-time monitoring, customer service and security to ensure high-quality water and water service. The risk of becoming ill from ingesting Milwaukee water has been all but eliminated by an effective multiple-barrier process of source water protection, ozone disinfection, biologically active filtration and continuous water quality monitoring.

Today, Milwaukee Water Works is a national leader in providing high-quality drinking water and continues to partner with the Water Research Foundation. The events in 1993 led to improvements in water quality treatment processes, water quality monitoring and regulations to protect the citizens of Milwaukee.

"When our water comes out of the tap, it sparkles... and it sparkles largely because of the impact of ozone on that water quality."

— Carrie Lewis, Superintendent,
Milwaukee Water Works

Milwaukee Partnership with Water Research Foundation



The Water Research Foundation has been funding research on ozone for decades. Their research was instrumental not only in making the decision to use ozone as the solution in Milwaukee, but also in refining the process over the last 20 years.

One of the prominent Water Research Foundation ozone researchers, Gordon Finch (University of Alberta), pioneered work in inactivation of *Cryptosporidium* with various disinfectants. His work showed ozone to be a superb disinfectant effective against *Cryptosporidium*, providing a road map for how Milwaukee should implement ozone at its facility.

Finch's research also led to a reassessment of ozone effectiveness at cold-water temperatures (CT), leading to a significant recalculation of ozone CT targets for log inactivation of *Cryptosporidium*. This prompted Milwaukee to make adjustments to its process shortly after bringing full-scale ozonation treatment facilities online in 1998.

"It is worth every penny of our investment to have the Water Research Foundation's body of research at our fingertips when we need it."

— Carrie Lewis, Superintendent, Milwaukee Water Works

As a subscriber to the Water Research Foundation, Milwaukee Water Works has benefited over the years from timely and important research funded by the Foundation, which they have applied to numerous operations. The groundbreaking ozone research findings in the 1990s, and many more Water Research Foundation advancements over the last 50 years, have provided worldwide improvements in effective water management from all sources and for all uses, to the benefit of public health and the environment.

BY THE NUMBERS

Began operations:

September 14,
1874

Provides water to 860,000 people in:
860K
16 communities
3 counties

WRF Member since 1989

27 years

25

Participating utility on 25 projects, 14 related to Ozone or *Cryptosporidium*

Project Advisory Committee member:

21 PROJECTS

{9 of which relate to ozone or *Cryptosporidium*}

Principal Investigator on 2 projects

2

RESEARCH PROJECTS

