cleanwater1

CASE STUDY

CITY OF NASHVILLE

How Nashville Metro Water Used Next Generation Microclor® Technology to Improve Safety and System Resilience

OVERVIEW

The City of Nashville is widely known as the "Heart of Country Music" and is the capital of the state of Tennessee. In recent years, the Nashville Metropolitan area has surged to over 1.8 million people. Growth in the downtown area is approaching 25% per year.

Nashville Metro Water Services, a department of the Metropolitan Government of Nashville and Davidson County, is charged with providing drinking water to over 190,000 customers in Davidson, Rutherford, and Williamson Counties. It does this through a distribution system consisting of more than 3,000 miles of water main, some five feet in diameter.

They manage two water treatment plants, with a combined capacity of 180 million gallons of water per day (MGD), that serve the city of Nashville. The K.R. Harrington and the Omohundro Water Treatment Plants are in North Nashville along the Cumberland River.

Omohundro Water Treatment Plant

The plants were built in what was once the outskirts of town. Like thousands of other water treatment plants across the country, they are now located in the heart of a major metropolitan area.

Both water treatment plants utilize gas chlorine for disinfection of the drinking water. Omohundro, the older plant, commissioned in 1889 and listed in the National Registry of Historic Places, relied on 90-ton railcars for chlorine gas delivery and storage while the newer K.R. Harrington Plant received truckloads of 2,000-pound gas cylinders.

SITUATION

Both of Nashville's water treatment plants are increasingly vulnerable to major floods, having experienced a five-hundred-year flood as recently as 2010. In order to reduce the risk associated with gas chlorine and improve overall operations, Nashville Metro Water embarked on a complete overhaul of their treatment system to move from gas chlorine to on-site hypochlorite generation (OSHG).

OSHG systems utilize electricity, salt brine and softened water to electrolytically generate ~ 0.8% (8,000 ppm) sodium hypochlorite. At 0.8% the OSHG generated sodium hypochlorite is non-hazardous, unlike industrial strength bulk-delivered sodium hypochlorite which is roughly 12.5% concentration and very corrosive.

APPROACH

The primary goals for the project were:

- To improve public safety by eliminating the risk of exposure from transporting gas chlorine by railcars through a densely populated area
- To improve system resilience and enhance overall treatment operations.
- Conversion of the disinfection system had to be done without shutting down operations of either plant.

After a detailed review of OSHG options, site visits, engineering reviews and other operational due diligence, three Microclor® MC-2400 OSHG skids were selected for each facility. The Microclor® MC-2400 is designed to produce the equivalent of 2,400 pounds per day (PPD) of chlorine gas equivalents each for a total of 7,200 PPD of free available chlorine (FAC) per Nashville site.

CHALLENGES

Both plants faced two primary challenges: constructing a temporary disinfection system to continue daily water production as well as overhauling the dated gas chlorine system inside a limited footprint with no room for expansion.

The complexity and scope of the project required the work of numerous engineering firms with the project being constructed in multiple phases over two years. PSI Water Technologies, a cleanwater1 company, was integral to the effort by providing expertise in the design, construction and operation of a temporary disinfection system.

The system was composed of a set of bulk hypochlorite dilution panels, negating the need for a plant shutdown. By designing a system that automatically diluted 12% liquid bulk hypochlorite to 0.8% hypochlorite, PSI was able to utilize the same storage tanks and metering pumps in both the first and final phases of the project. Following the construction and implementation of the temporary system at each site, the gas chlorine systems were decommissioned and removed.

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"The conversion from gas chlorine to the Microclor® on-site generated hypochlorite went smoothly with the added benefit of the operations staff becoming enthusiastic supporters of the systems after over 40 years of gas chlorine operation."

Glen Doss, Metro Water Services Treatment Plant Manager, Nashville, TN

RESULTS

- **The introduction of the Microclor® OSHG system increased internal water plant safety and the safety of neighboring residents.**
- **The elimination of the extremely hazardous gas chlorine and subsequent conversion to OSHG enabled them to delist from the Federal Risk Management.**
- **The Microclor® OSHG systems could operate if an individual cell failed. The vertical cell configuration immediately and passively vents by-product hydrogen coupled with the inherent resiliency of a multi-cell design which allows the system to operate if an individual cell fails.**
- **The new smaller, vertically-oriented cells can be fully cleaned and drained in-place, resulting in a smaller installation footprint and only a fraction of the operator's time needed for maintenance and cleanings.**

CONCLUSION

By replacing gas chlorine with on-site hypochlorite generation, Nashville was able to improve the safety and longevity of its water plants to accommodate the growth of the "Heart of Country Music" far into the future. Following the installation, Glen Doss, Treatment Plant Manager stated, "The last gas chlorine railcar left to large applause."

MC-2400 OSHG Skids