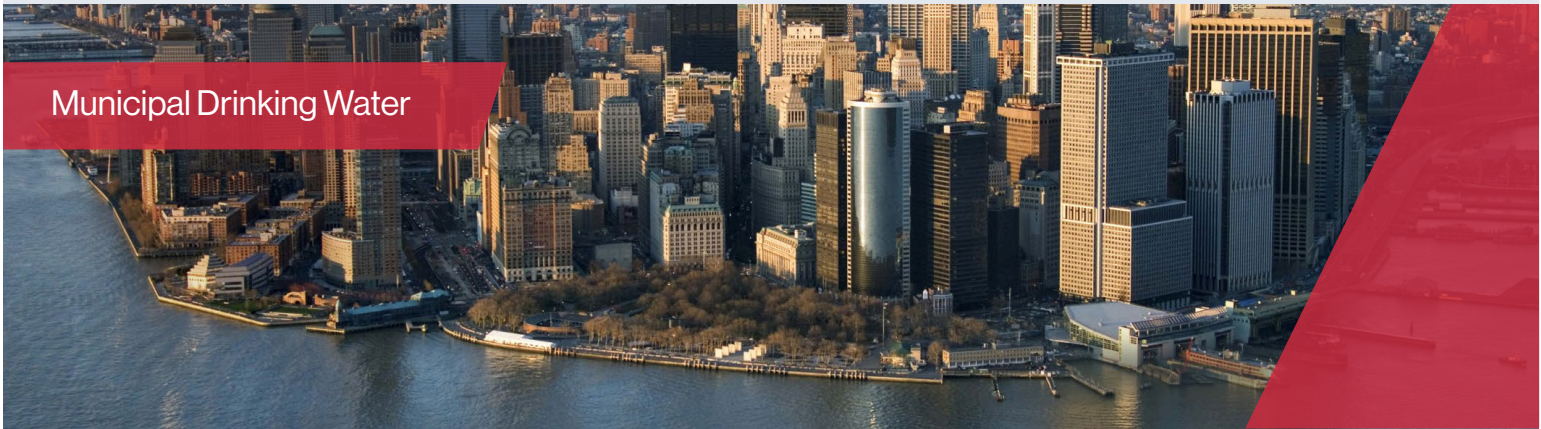


CASE STUDIES

Municipal Drinking Water



UV Water Treatment – NEW YORK CITY Drinking Water Facilities

PROJECT BACKGROUND

New York City, is made up of five boroughs: the Bronx, Manhattan, Queens, Brooklyn and Staten Island and is home to more than eight million people, making it the most populous city in the United States.

New York City (NYC) draws its drinking water from three protected surface water systems: the Catskill, the Delaware and the Croton watersheds. The majority of NYC's drinking water is supplied by the Catskill/Delaware watershed, located approximately 100 miles outside the city. Historically, NYC had not filtered the water from this system nor did they require any additional barriers to microbial contaminants due to the pristine nature of the watershed. The total area of both watersheds is approximately 1,972 square miles and contains 19 reservoirs and three controlled lakes.

In 2006, the United States Environmental Protection Agency (EPA) released the Long Term Enhanced Surface Water Treatment Rule (LT2ESWTR). This rule required unfiltered surface water plants to install treatment to inactivate *Cryptosporidium*. Engineers working on the Catskill/Delaware project evaluated a new filtration plant, but the cost of installing a two billion gallon per day (BGD) filtration facility was significantly greater than other alternatives. After evaluation of available technologies, it was decided that UV was the most practical and cost-effective solution.

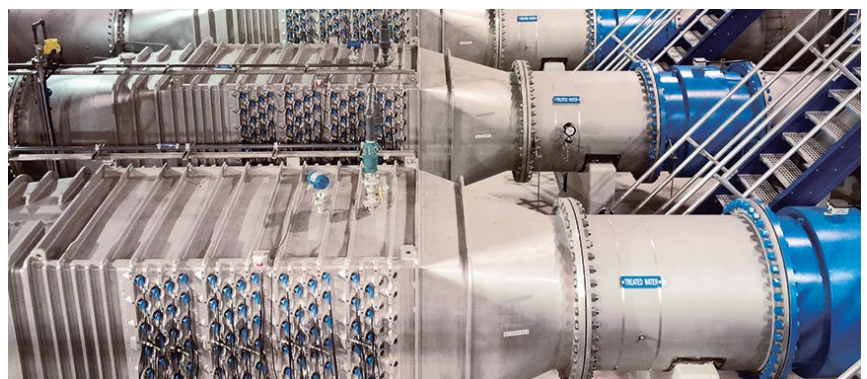
THE TROJAN SOLUTION

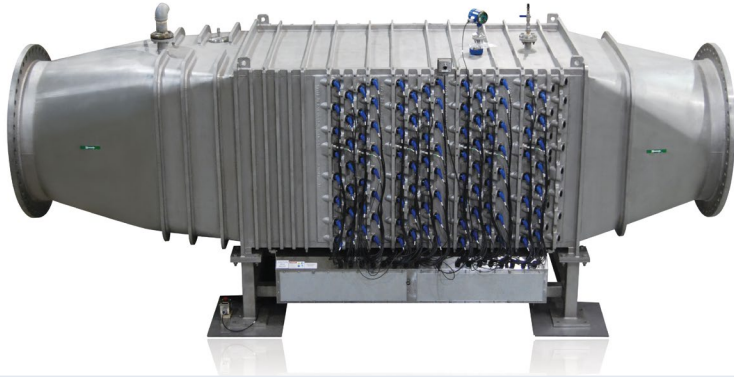
In 2003, after evaluation of available lamp technologies, NYC chose to design a low-pressure, high output (LPHO) lamp-based UV system over a medium-pressure (MP) lamp-based system. The LPHO units are capable of treating the water utilizing approximately one-third the power of MP lamp units. TrojanUV offered a high flow capacity LPHO lamp solution which minimizes electrical costs while maximizing water treatment efficiency.

CATSKILL/DELAWARE UV FACILITY

TrojanUV was selected as the manufacturer for the UV portion of NYC's drinking water project, and in 2009 and 2010, 56 TrojanUVTorrent™ UV units were delivered to the Catskill/Delaware UV Facility. Each unit is capable of delivering a 40 mJ/cm² dose to 40 million gallons of water per day (MGD). This requirement, set by the NYC Department of Environmental Protection, allows for the delivery of greater than 3-log reduction of microorganisms such as *Cryptosporidium* and *Giardia*.

The TrojanUVTorrent was custom-designed by Trojan's engineers and scientists in order to meet the challenging design parameters of this unique project.





Commissioned in the Fall of 2013, this facility officially became the largest drinking water UV facility in the world, with capacity to treat 2.02 billion gallons per day (BGD).

CROTON WATER TREATMENT FACILITY

TrojanUV was also selected to supply the UV equipment for the new Croton Water Treatment Facility. This facility has the capacity to treat up to 290 MGD of high quality drinking water. 20 TrojanUVTorrent UV units were supplied, each capable of producing a dose of 40 mJ/cm² to treat a flow of 30 MGD.

LIFE CYCLE ASSESSMENT

In separate work, Trojan assessed the relative carbon dioxide (CO₂) emissions associated with both MP and LPHO solutions through a joint project with the University of Western Ontario. It was estimated that for the Catskill/Delaware Facility, the low pressure solution would lead to the release of approximately 13,700 fewer tons of carbon dioxide (CO₂) annually than a medium pressure option (assuming that for typical conditions, the system operates at 70% of its peak capacity). Over 20 years, this equates to 274,000 fewer tons of carbon dioxide, making the TrojanUVTorrent the the best solution for NYC's emission goals. **(Figure 1)**

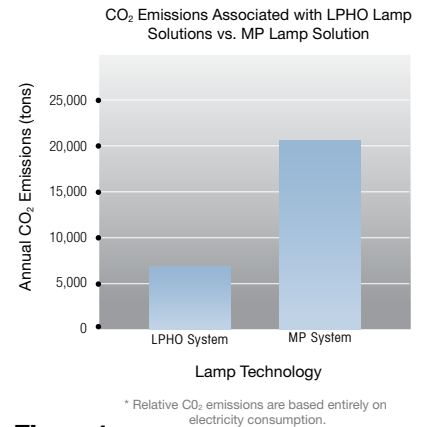


Figure 1.

SYSTEM DESIGN PARAMETERS

- CATSKILL/DELAWARE UV SYSTEM PEAK FLOW CAPACITY: 2.02 billion gallons per day
- CROTON UV SYSTEM PEAK FLOW CAPACITY: 290 million gallons per day
- TREATMENT REQUIREMENT: Minimum dose of 40 mJ/cm²
- TARGET REDUCTION OF CRYPTOSPORIDIUM: 3-log
- NUMBER OF UV UNITS: 56 Units (Catskill/Delaware), 20 Units (Croton)

TROJAN TESTIMONIAL

“The innovative equipment that Trojan developed and provided to the [Catskill/Delaware] project is impressive. This equipment is installed in the new disinfection facility and provides better quality drinking water to nearly 9 million people with a significant capital and operating cost savings to the City.”

Matthew Valade, P.E., Senior Associate, Hazen and Sawyer, P.C.

To learn more about the brands and affiliates of Trojan Technologies, please visit www.trojantechnologies.com