# SAN DIEGO PLANT CUTS THM LEVELS IN HALF

***When San Diego's Otay Water Treatment Plant needed to reduce THM levels, Evoqua provided an effective solution with chlorine dioxide.***

The 34 MGD Otay Water Treatment Plant in San Diego, California serves a population of approximately 200,000. It is a conventional treatment plant that uses coagulation, flocculation, sedimentation, filtration and disinfection. The plant receives raw water from two different sources – imported water from the Colorado River and runoff water from three local reservoirs.

With the introduction of EPA's Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR), regulations became more stringent for Trihalomethanes (THM) and Haloacetic Acids (HAA). As a result, the current method of chlorine disinfection was no longer an effective solution and the plant decided to pursue a new DBP control strategy.

## Complying with Stage 2 DBPR

Although the system had been compliant under the Stage 1 DBPR, the utility realized it needed to change its primary disinfection agent in order to comply with Stage 2 DBPR. Strict water conservation in its reservoirs created a high potential for producing DBPs (disinfection byproducts) with the current method of chlorine disinfection, due to high levels of total organic carbon (TOC) in the raw water entering the plant. The utility looked at several options when determining a replacement for chlorine disinfection.

"We looked at ozone, but because of the bromide levels in lake water serving our plant, there was concern of bromate formation, a regulated disinfection byproduct" Jim McVeigh, Senior Water Operations Superintendent for San Diego's Otay Water Treatment Plant, says. "We also looked at UV, but For UV to be effective you need to have fairly clear water. And although UV is an effective disinfectant, it does nothing to oxidize the water."

Chlorine dioxide ($ClO_2$) was selected as the most effective solution based on its ability to provide pre-oxidation and disinfection, while preventing the formation of THMs and HAAs.

## Millennium™ III Chlorine Dioxide Generators

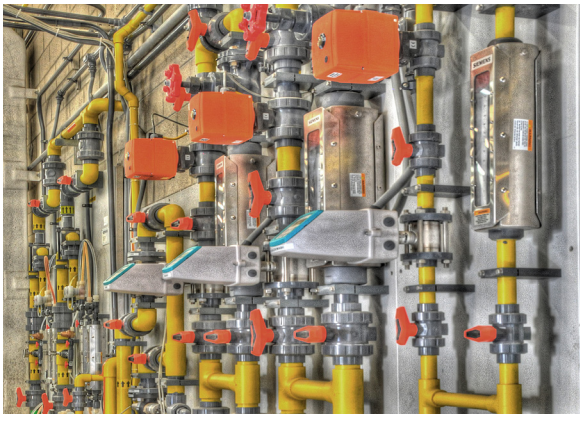
The utility installed Millennium™ III Auto Series Chlorine Dioxide Generators from Evoqua Water Technologies. The self-tuning, automatic generators produce chlorine dioxide in a two-stage reaction process under vacuum conditions to ensure maximum yield efficiency at 95 percent.

**Customer**
City of San Diego

**Scope of Supply**
Millennium III™ Auto Series Chlorine Dioxide Generators

**Application**
$ClO_2$ injected for pre-oxidation and disinfection for drinking water treatment

**Customer Benefits**
THM levels reduced by more than half, major nitrification issues solved, and coagulation improved



Millennium III $ClO_2$ Generators provide pre-oxidation and disinfection at the Otay Water Treatment Plant

Chlorine dioxide is applied to raw water as it leaves the reservoir tower outlet, before the water is pumped approximately 1,700 feet to the plant. At the front end of the plant, $ClO_2$ levels are continuously monitored while the plant's SCADA system performs a real time computational analysis of giardia disinfection to provide the correct $ClO_2$ dosage. The system consistently provides a 1.2 log disinfect rate, which is approximately twice that required by regulation.

### DBPR Compliance

Chlorine dioxide, used for pre-oxidation and disinfection, oxidizes the THM precursors, which are then removed or reduced during coagulation, settling and filtration prior to final chlorination. The new process has resulted in significantly decreased TTHMs in the finished water. Since the adoption of $ClO_2$, the Otay water treatment plant has reduced THM levels by more than half.

***"The switch to chlorine dioxide has been what has allowed us to comply with the Stage 2 DBPR."***

"We're well into compliance even on our lake water," McVeigh says. "In 2015, when we were on lake water the entire year, even in the warmest water months, our worst THM season, our THMs were in the 60s (ppb). "In a comparable year, without chlorine dioxide, they would have been between 120 and 150 ppb. The switch to chlorine dioxide has been what has allowed us to comply with the Stage 2 DBPR."

### Improved particle removal/nitrification issues solved

McVeigh states that, now with good $ClO_2$ oxidation just prior to coagulation, operators see better treatment with chlorine dioxide, especially with the harder-to-treat lake water.

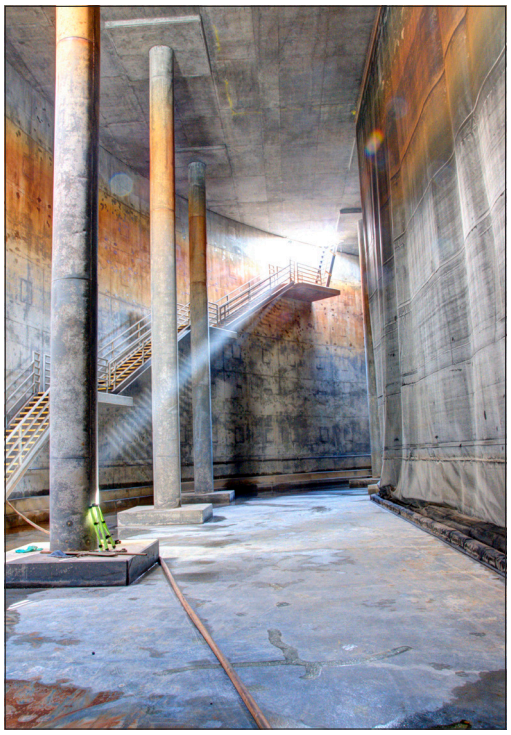
"We get better coagulation in general and better particle removal because the oxidative power of chlorine dioxide is materially effecting the particle contaminants in the water and making them coagulate better."

In addition, the small amount (0.2 - 0.3 mg/L) of chlorite ion residual remaining after filtration aids in reducing nitrification in San Diego's distribution system.

"Since we began feeding chlorine dioxide there have been no major nitrification issues in that part of the city's distribution system served by the Otay plant," McVeigh says. "Previously, we had to do a lot of flushing, but since our chlorine dioxide system has been up and running we haven't had a speck of problems with nitrification."

**Millennium™ III Chlorine Dioxide Generation Systems**

- Safest, most reliable solution
- Chlorine dioxide yield efficiency at 95%
- Complies with NSF 61 standards for drinking water applications



The West Clearwell serving the City of San Diego's 34 MGD Otay Water Treatment Plant.

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