



Using Catalytic Chlorine Dioxide to Eradicate Legionella in a Cooling Tower

May 2009, Downtown Dallas, Texas

The Issue: The cooling tower in the photo tested positive for Legionella from July 2007 through May 2009. The HVAC system consists of two 400 ton Carrier centrifugal chillers and a two cell-induced draft galvanized cooling tower. The system volume is 3,600 gallons. The chillers and cooling towers are both located at the top of the building where sunlight promotes algal growth in the sump. The system has been on a routine protocol of bromine everyday (solid tablet feeder) with supplemental dosing of a non-oxidizing biocide twice per week. Despite the algae in the sump, the tower was one of the cleanest Advantage Water Engineering had ever seen prior to the trial. In fact, Don mentioned that it looked like the tower had been cleaned prior to going into this trial. "Based on the cleanliness of the system, it was hard to believe there was a chronic Legionella problem." All efforts to eradicate Legionella from this system in the past failed, including the Wisconsin protocol, which utilizes a very high dosage of chlorine (50ppm) for three consecutive treatments. (See chart below.)

The Solution: A CLO₂IX[®] Portable Catalytic Chlorine Dioxide 0.5 Lb/day production system was brought to the roof. City water for the unit was supplied through a garden hose. A 1/2" PVC hose was run from the unit into the tower sump. The Chlorine Dioxide was fed just above the suction line in the tower basin. A timer and solenoid valve were used to ensure that the Chlorine Dioxide unit ran only while the chillers were on line. The cooling tower was treated for 11 hrs/day over 8 days at a Chlorine Dioxide feed rate sufficient to produce 0.4 mg/l of Chlorine Dioxide in the chilled water return line at the nominal system flow rate. At this concentration, it was observed that the algae turned from green to brown.

Periodic samples were taken to look for residual Chlorine Dioxide values at 4 sample points in the system to monitor progress. Those 4 sample points included the cold deck, hot side of the heat exchanger, cold side of the heat exchanger, and the hot deck. After the 8-day feed cycle, residual Chlorine Dioxide was detected at all sample points, and the CLO₂IX[®] Portable system was taken off-line. 72 hours later, a water sample from the bulk cooling water was sent out for Legionella testing. It was then observed that the algae had returned to a healthy green color.

The Legionella test results were negative, demonstrating this cooling tower was free of Legionella for the first time in two years. Where prior application of chlorine, bromine, and non-oxidative biocides failed to eliminate Legionella, the application of Chlorine Dioxide using the CLO₂IX[®] Portable Catalytic Chlorine Dioxide system was a success.

Water Treatment Company:

Advantage Water Engineering, LLC

Founded: 1997

Contact: Don English, Owner

Website: <http://awengineering.com>

Advantage Water Engineering has experienced consistent double-digit sales growth.

"The key to our success is our infinite flexibility. We listen to our customers and provide solutions tailored to their specifications. The variety of customer requirements, combined with our customized solutions, results in no two systems that look alike."

Don English



Historic Test Results and Corrective Actions:

Date	Result	Corrective Action	Result
July 2007	120 cfu/ml	Feed bleach to obtain 50 ppm chlorine residual for a three day period. Sampled two days after bleach feed	1 cfu/ml
June 2008	320 cfu/ml	Feed liquid bromine product for a three day period. Sampled two days after bromine feed	3 cfu/ml
Oct 2008	16 cfu/m	Increase feed of maintenance biocide.	No resample taken
Dec 2008	200 cfu/ml	No corrective action taken as no SeroGroup 1 were detected	
May 2009	60 cfu/ml	Chlorine Dioxide for one week. Sampled three days after Chlorine Dioxide feed was stopped	Legionella not detected



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Why did Advantage wait so long to try Chlorine Dioxide?

"We were very apprehensive of Chlorine Dioxide but intrigued by its potential applications. The apprehension was primarily due to the negative propaganda spread by big water treatment companies and a few horror stories which seemed to resonate through the industry. After using the CLO₂IX[®] unit, we are very comfortable with its ease of use and safety "

"Quite frankly, we have been waiting for the right system. Most of what we saw out on the market was either too large, complicated, or used a three product approach (bleach, acid, chlorite). We also looked at Chlorine Dioxide as a pre-made product but were not comfortable with shelf life and safety of handling."

"We like the resin concept and are comfortable with it. Since the resin handles the acid side of the equation, it mitigates all risk, making this Chlorine Dioxide generation method much more palatable and portable. We like (the portable system) and can move it around to use it."

"I feel very comfortable with the CLO₂IX[®] unit, and both my customer and I are very happy with the results. We will be incorporating CLO₂IX[®] in our offering to this market."

Conclusions:

- Even in a clean cooling tower, chlorine, bromine, and non-oxidizing biocides are not enough to kill Legionella in the bulk solution.
- Even in a clean cooling tower, biofilm exists, because Legionella does not exist without biofilm.
- Chlorine dioxide absolutely removes biofilm, proven by the absence of Legionella.
- Even in a clean cooling tower, there is the ability to save energy costs by removing biofilm.
- Most cooling towers are not clean at all, as demonstrated by the amazement at the cleanliness of this one, even with the presence of algae.
- Chlorine Dioxide is not only effective on biofilm, it is also effective on algae.

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