

## **Sodium Carbonate Peroxyhydrate: A Multi-Purpose Aquatic Tool**

Sodium carbonate peroxyhydrate has been registered in California as an algaecide and oxidizer since early 2006. The most common brand names are PAK 27, Phycomycin and GreenClean. It is an attractive alternative to traditional copper based algaecides because it breaks down quickly into sodium carbonate, water and oxygen. It is formulated as a flaky granule or liquid which is applied by broadcasting it over the surface of the water within the target area. Clean Lakes Inc. (CLI) has applied sodium carbonate peroxyhydrate as a control agent to correct various unique aquatic problems, some of which are outlined below.

The first is as an algaecide to control blue-green algal (cyanobacteria) blooms in an 864 surface acre drinking water reservoir in the San Francisco Bay Area. CLI applied 44,000 lbs of PAK 27 at a rate of 6.25 lbs per acre foot to a depth of 8 feet. The treatments required the use of two boats, each equipped with CLI designed eductor application systems. The boats were capable of carrying 2000 lbs. each per application run. Each boat was required to make 11 runs to cover the entire reservoir. The



locations of the treatment were recorded via a GPS system, which allowed the treatment tracks to be overlaid onto an aerial image used for post treatment reporting. The treatments were completed in approximately 9 hours, start to finish. Post treatment efficacy was excellent.

The second control effort using sodium carbonate peroxyhydrate was for the elimination of odor problems in a recycled water reservoir south of Los Angeles. The problem occurred in late October 2009, when wind and temperature changes combined to cause the reservoir to turn over and release hydrogen sulfide gas into the atmosphere. The resulting “rotten egg” smell caused loud protests for nearby residents and the threat of fines from the Regional Air Quality Control Board. In mid-November, CLI was brought in to apply sodium carbonate peroxyhydrate as an oxidizing agent to eliminate the hydrogen sulfide. CLI applied 14,000 lbs using two boats. The application took approximately 4 hours. The odor problem was gone within eight hours of the start of treatment.

The third control effort was the result of a sewage spill in a brackish water lagoon system bordering San Francisco Bay. This was caused by a pipe break that leaked approximately 49,000 gallons of raw sewage into the lagoons. Initially, CLI was brought in to do independent, third party sampling and monitoring. The results showed high nutrient levels which resulted in a planktonic algae bloom accompanied by high coliform counts. After discussions with various

consultants and CLI staff Pest Control Advisors, it was determined that a sodium carbonate peroxyhydrate treatment would eliminate the blue-green algae and as an added benefit it had the capability to oxidize the coliform. On September 1, 2010, CLI applied 10,000 lbs of GreenClean to the lagoons using two boats. The treatment took approximately 4 hours, the next day the algae bloom was gone and the coliform counts returned to safe levels within a week.

The fourth control effort took place within a 39-acre lake located in the San Francisco Bay Area. The primary purpose of the lake is to store storm water runoff and provide irrigation. Water from the lake travels 1.5 miles downstream to the start of Barker Slough, a tidal slough in the Cache Slough Complex of the delta. Barker Slough is tidally connected to Lindsey Slough, Cache Slough, and the Sacramento

River. The lake is also the source water for the North Bay Aqueduct (NBA), which is part of the California State Water Project. The NBA serves over 400,000 people in Napa and Solano County.

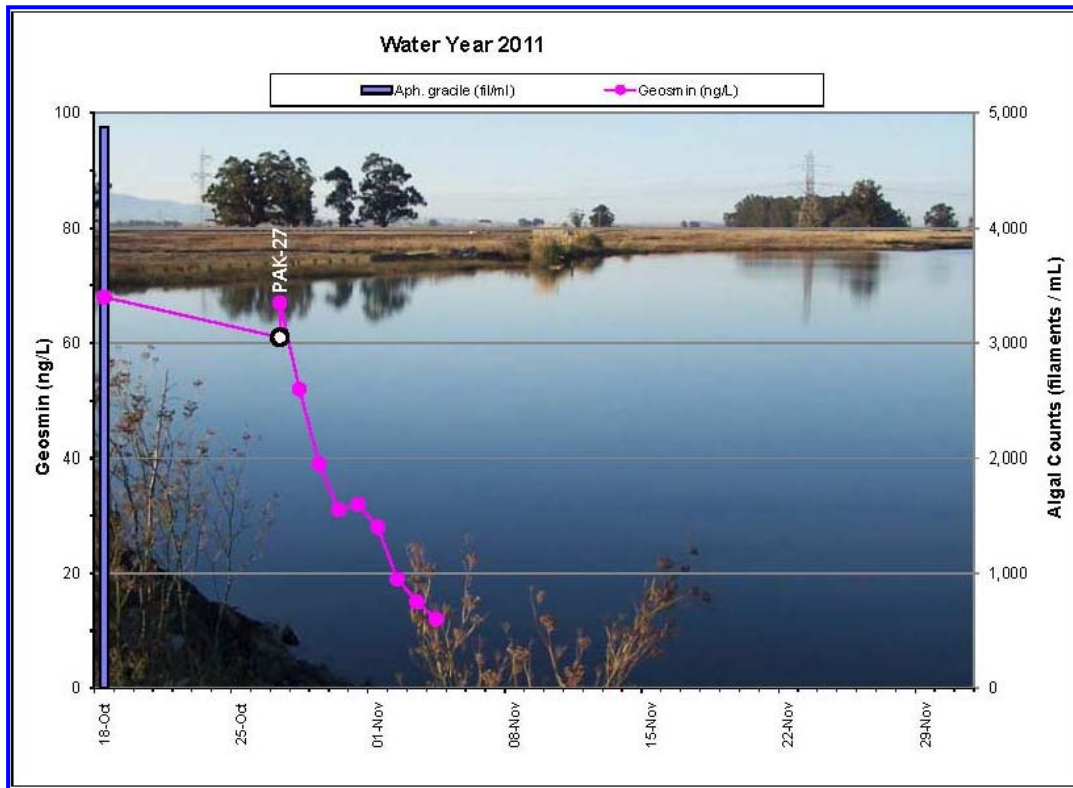
Nuisance growth of blue-green algae within the lake has caused severe degradation of downstream water quality and negative impacts on the beneficial uses of the lake in recent years. For example in

February 2009, a major blue-green algae bloom occurred in the lake, which resulted in substantially elevated levels of taste and odor compounds in the NBA, specifically elevated levels of Geosmin. Geosmin concentrations exceeded 400 ng/L in the NBA. Consumers can taste Geosmin down to 5 ng/L and begin to complain at 10-15 ng/L. In February 2009, hundreds of customer complaints occurred within the cities of Vacaville, Fairfield, Vallejo, Benicia, Napa, and American Canyon. Every city listed had to switch water sources or use emergency sources. Press releases were issued by several cities, informing the media and residents about the major impact on their water quality. The NBA was shut down for seven weeks, until the system could be completely flushed.



To prevent this from happening again CLI developed an Aquatic Pesticide Application Plan (APAP) to comply with the Water Quality Order No. 2004-0009-DWQ, Statewide General National Pollutant Discharge Elimination System Permit for the Discharge of Aquatic Pesticides for Aquatic Weed Control in Waters of the United States, General Permit No. CAG990005, adopted by the State Water Resource Control Board on May 20, 2004. After the APAP was approved, CLI began Sodium Carbonate Peroxyhydrate applications to the Lake. The protocol required the customer monitor for NBA Taste & Odor and Phytoplankton. If high counts are observed CLI is called in to eliminate the threat. The results and accompanied graph (below) of one of the latest treatments was that Geosmin levels were lowered from around 70 ng/L to 12 ng/L, and A. Gracile counts were not detected in any samples after the PAK-27 treatment. PAK-

27 was very effective at eliminating the blue-green algae of concern, and Geosmin levels have steadily declined since the treatment.



Sodium carbonate peroxyhydrate is extremely short lived. Therefore, applications are best performed start to finish, without interruption. As a result, CLI has developed an application system that has the ability to address large problems in a timely manner and comply with all NPDES requirements. When properly applied, sodium carbonate peroxyhydrate has proven to be an effective and versatile tool capable of solving a variety of aquatic problems.