

Granular Activated Carbon System Provides Emergency Solution to Combat Algal Toxins

Owasco, NY

PHOTOS COURTESY OF TIM SCHNEIDER, OWASCO LAKE WATERSHED INSPECTION PROGRAM





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Nestled in the Finger Lakes region in upstate New York, the town of Owasco is a popular vacation spot. With about 4,000 residents, the town, along with the nearby community of Auburn, relies on Owasco Lake for its drinking water.

In 2016, Owasco and Auburn detected algal toxins in their finished water for the first time. Algal toxins can be released when blue-green algae blooms, made up of cyanobacteria, form on lakes, streams, and ponds. These blooms are more likely to form as water temperatures warm by late summer and early fall. Cyanobacteria release toxins into the water which can cause allergic reactions, respiratory symptoms, liver and kidney failure, or even death for livestock, pets, and humans.

“Everyone was taken off guard,” said Chad Johnson, civil engineer at GHD

Consulting Services, an engineering firm brought on to address the issue. “No one had ever seen it before.”

The detection in 2016 was almost severe enough to prompt Owasco to issue a “Do Not Drink” order to the community, said James Gray, regional sales manager at Calgon Carbon. The town looked to GHD to recommend a solution for an emergency project to remove the algal toxins for the 2017 summer season. GHD specifically focused on the removal of microcystin, one of the more common and harmful algal toxins.

With the busy summer tourist season quickly approaching, GHD contacted Calgon Carbon.

“The biggest factor in choosing Calgon Carbon was that this was an emergency project,” Johnson said. “It typically takes

a few years to study, design, and build a big treatment upgrade. We only had a few months to get it designed and a couple months to get it installed.”

Working with a company that was familiar with algal toxins was important to Johnson. Since algal toxins are a new challenge for the Finger Lakes region, some local vendors were not able to provide the expertise the town was looking for. However, Calgon Carbon could provide case studies for how they had assisted other communities in other states that were dealing with algal blooms, demonstrating the company’s familiarity with the topic as well as its successful results.

TAKING GAC FOR A TEST DRIVE

GHD first contacted Calgon Carbon looking for samples of powdered activated

CYANOTOXIN CASE STUDY MICROCYSTIN-LR

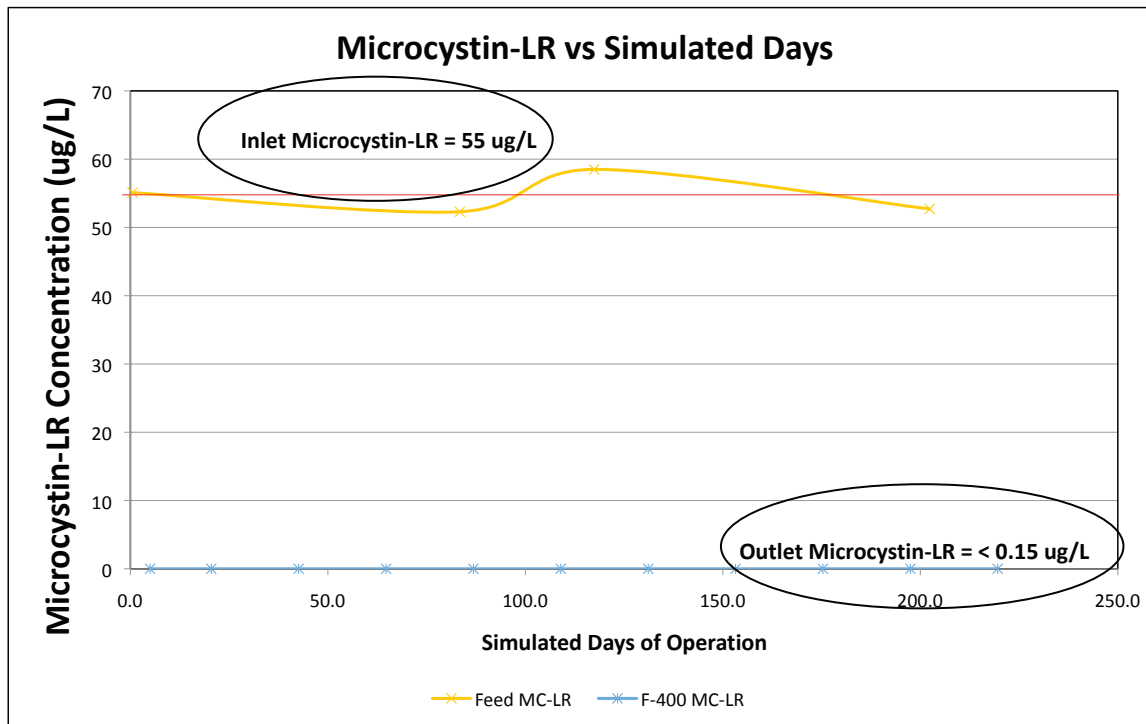


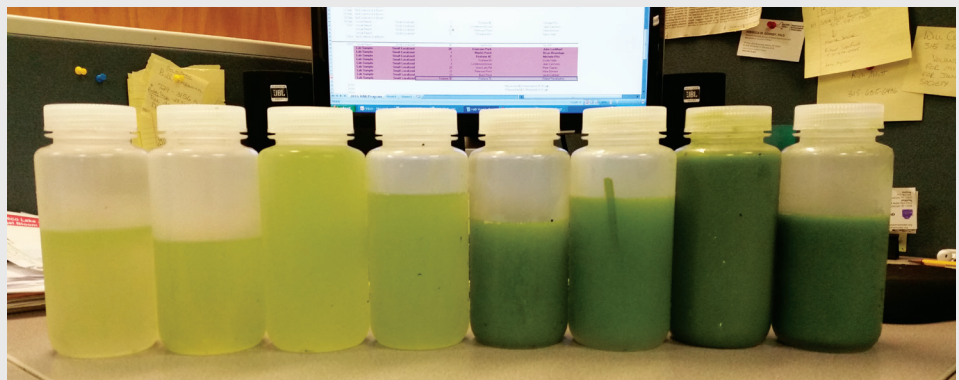
Figure 1: Laboratory column testing demonstrates FILTRASORB's ability to completely remove Microcystin-LR.

carbon (PAC). However, since PAC requires an operator to manually dose the powder, it is best suited to treat smaller algal blooms that are detected well before the toxins reach the utility's raw water intakes. For Owasco's position, Calgon Carbon recommended granular activated carbon (GAC). Besides removing algal toxins, GAC would also remove taste and odor issues in the water, along with total organic carbon and disinfection byproducts. Most importantly, once installed, GAC is always online providing a protective barrier against any unforeseen contaminants that might pop up with little or no warning. This is unlike PAC, which is only dosed when a contaminant has been detected. Calgon Carbon pointed out that there had unfortunately been cases where, by the time the algal toxins were detected, it was too late to dose PAC.

"GAC was the best option because we could buy it in tanks that Calgon Carbon manufactured and it's a good fit for Owasco's specific treatment plant," Johnson said.

GHD decided to initially rent Calgon Carbon's Model 10 adsorption system with FILTRASORB GAC and the system was put online in 2017. Renting the equipment allowed GHD to continue testing to ensure the system was working, while also accommodating the community's need without immediate capital expenditure.

"Really, no one was as familiar with al-



The Owasco Lake Watershed Inspection Program collected samples in 2016 of blue-green algae, also known as cyanobacteria. Image provided by Tim Schneider, Owasco Lake Watershed Inspection Program.

gal toxins or gave us the same customer experience or the economy that Calgon Carbon did," Johnson said. "It was a no brainer for us. Calgon Carbon could provide actual technical evidence that their product worked."

Johnson said he appreciated that the company was able to put him in touch with the technical resources he needed to verify if the treatment system would function properly.

"Calgon Carbon is good at directing you to who you need to talk to in their organization to get the answers you want and the customer service you need," Johnson said.

RESULTS

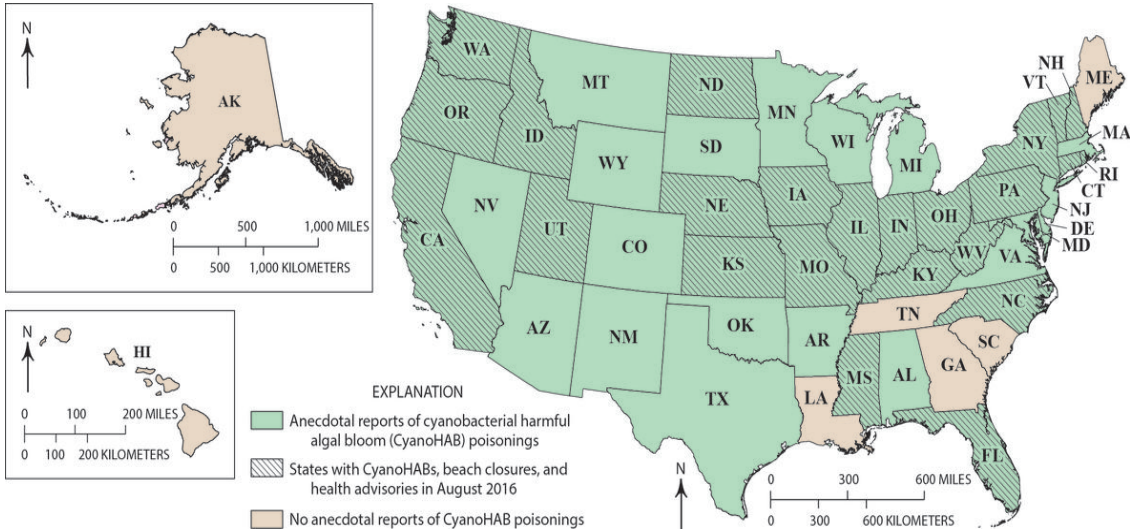
After four months of running the temporary system, GHD determined it

was effective and the town of Owasco purchased the Model 10 system in March 2018. "The system was effective and wasn't too much extra work for the operators," Johnson said. "It was also the cheapest option for the town to work in as a permanent upgrade."

The town of Owasco experienced a less severe case of algal bloom over the summer of 2017. However, the algal toxins were still detected in the lake's raw water. As with the testing phase, GHD found the Model 10 system effectively removed the algal toxins without negative impacts, such as corrosion.

"We detected algal toxins in the raw water and saw that GAC was removing it," Johnson said. "It was very effective."

HARMFUL ALGAL BLOOMS IN THE US



<https://www.usgs.gov/news/science-harmful-algae-blooms>

In August 2016, nineteen states had toxic algal and health advisories for cyanobacteria.

ABOUT ALGAL TOXINS

Algae occur naturally in both marine and freshwater. Nurtured by sunlight, warm water temperatures and a food source (typically phosphorus), algae can bloom on water surfaces. Harmful algal blooms can cause a variety of problems to the environment, as well as pose a threat to human health. People coming in contact with water contaminated with algal toxins experience flu-like symptoms and/or skin rashes.

Of particular interest to water and health experts is blue-green algae, also known as cyanobacteria. There are over 3,000 known species of cyanobacteria and they can

tolerate a wide range of environmental conditions. While not all of these species produce toxins, those that do can produce a variety of harmful substances, including hepatotoxin, neurotoxin, dermatotoxin, cytotoxin and endotoxin – all of which impact the human body and its organs in a harmful and sometimes fatal way.

Of these toxins, the three most widely recognized as being linked to human health issues are:

- Microcystin-LR (hepatotoxin)
- Cylindrospermopsin (hepatotoxin)
- Anatoxin-A (neurotoxin)

Microcystin-LR has been widely detected in

North and South Dakota, New Mexico, Arkansas, and the Pacific Northwest, as well as in the Great Lakes region and other states. Other cyanobacteria, such as Cylindrospermopsin and Anatoxin-A have been discovered from Florida to Nebraska to Washington state.

The ability of GAC to protect against algal toxins while simultaneously addressing other critical challenges, such as carcinogenic disinfection by-products, volatile organic compounds, endocrine disrupting compounds and many others, makes the treatment a uniquely effective and affordable solution for municipal water providers.

