



The Use of Chemicals On and Around Sewage Lagoons: What's Effective? What's Legal?

Note in this photo how the duckweed blanket is covering nearly 100 percent of the surface area of the cells. This blanket forms a barrier that effectively blocks sunlight and stops algae from producing oxygen needed by bacteria to break down sewage. This can result in offensive odors, poor treatment and effluent violations.

The purpose of this article is to review what chemicals are effective and can legally be used in and around lagoons. I also will review how to properly use them. In no way am I encouraging systems and operators to use more chemicals, regardless of whatever maintenance problems anyone may have. In fact, in my opinion, chemical usage around lagoons is rarely needed. But sometimes, chemical use or treatment is the most sound, economical and effective solution. Should other options be looked at first? Of course. But often the only or best option is to use an approved chemical to solve a specific problem.

In all cases, systems should contact the Kansas Department of Health and Environment (KDHE) to discuss using chemicals to solve a particular problem. Such contact should be made prior to chemical use. Equally important is to follow all application instructions and dosage recommendations per the label on the package or container. Operators need to read the entire label to understand how the chemical can and cannot be used. Operators must be familiar with all directions, warnings and precautions found on the label. In fact, I recommend reading the label prior to purchasing or ordering any chemicals. Just because the manager at the local coop says a particular chemical can be used for a specific problem, still do your own research. During the

past several months, I have found two systems using a chemical to control duckweed that was recommended by the local coop. I easily found the label instructions on the Internet and neither was approved for use in water! I can't stress enough the need to read and following label instructions and restrictions.

Check this publication

Before going into a detailed discussion about chemical use, I first want to recommend a useful publication that I refer to frequently. It is entitled *Aquatic Plants and Their Control* (Publication C-667, August 2005). It is published by the Kansas State University Extension Service and is without cost online at www.oznet.ksu.edu. The brochure does an excellent job of helping identify various aquatic plants so you know the chemical you choose will provide effective control. It also discusses options other than chemicals such as prevention, mechanical/physical and biological control options. While I believe the publication was originally published for use on ponds, lakes, rivers, marshes and drainage ditches, it has applicability to sewage lagoons also.

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Cattails should never be allowed to overtake a lagoon cell as in this photo. They can cause many problems including excessive seepage due to their extensive root system. Cattails are also a preferred food source of muskrats.

Probably the most useful part of *Aquatic Plants and Their Control* is Table 1 on page 7. This table helps target and rate various herbicides that are available for use in an aquatic environment. The table lists eight (8) different herbicides and then rates them (poor, fair, good or excellent) for controlling specific plants. Those plants include common lagoon problems such as duckweed, cattails, willows and cottonwoods among others. I should mention that one of the chemicals listed is copper sulfate. KDHE strongly discourages, possibly even prohibits, the use of copper sulfate in lagoons for several good reasons. Therefore, copper sulfate should not be considered an option when controlling targeted plants around a wastewater lagoon.

I also encourage reading Table 2 on page 8 that reviews water use restrictions for various herbicides. Restrictions listed summarize effects on humans (drinking, swimming, fish consumption), livestock watering (dairy and meat), irrigation and agricultural spraying. While lagoons typically have long detention times that would meet most restrictions (measured in days after treatment before use of treated water), it is still an important consideration for which systems must account. Downstream water users should have assurance that water quality has not been adversely affected by the use of chemicals on a discharging lagoon.

Another problem is the use of chemicals to correct a seasonal turnover. Again, I would like to emphasize not to overreact during turnovers, which typically occur in early spring or late fall. Turnovers occur at times in the spring and fall when air temperatures vary widely.

Common aquatic plants that show up in lagoons and approved control options:

- ❖ **Cattails:** one of the best ways to control the growth of cattails, especially in the middle of a lagoon, is to maintain minimum water depths of three feet. Most lagoon cells that have at least three feet of water do not generally have cattail problems. The water depth is usually sufficient to prevent sunlight penetration that encourages cattail growth. However, cattails around the water's edge are very common and herbicides are an effective means to control them. The most effective herbicides to use are Glyphosate (Rodeo and others) and Imazapyr (Habitat). Both manufacturers recommend adding a surfactant with the herbicide so the solution adheres to the plants. Both herbicides are also effective at controlling woody brush and trees such as willows and cottonwoods.
- ❖ **Duckweed:** duckweed is pretty easily identified, as it is one of the few true floating plants found in sewage lagoons. Their root hairs extend down into the water to absorb nutrients to survive and multiply. My recommendation to any operator when dealing with duckweed is to not overreact. Persons who have operated a lagoon for several years know, based on past summers, that the duckweed will form a thick blanket that blocks sunlight and affects treatment, then control is needed. But in most cases, duckweed never forms a thick blanket and is blown to a corner of the lagoon on a windy day, causing no problems. If treatment is needed, recommended herbicides include Fluridone (Sonar AS and Avast), Diquat (Reward and Weedtrine D) and Imazapyr (Habitat). While each herbicide works differently to control duckweed, most operators report good control. It is also a good idea when treating a heavy duckweed blanket to not treat the entire area in one application. Instead, only treat a third to half of the surface area at a time, and then wait five to seven days for the next application. Otherwise, the die-off of the entire duckweed blanket will cause dissolved oxygen levels to drop dramatically, adversely affecting facultative bacteria breaking down organic matter.
- ❖ **Filamentous Algae** (often referred to as "horsehair" algae *Pithophora roettleri* that forms floating clumps): while not a real common problem on sewage lagoons, filamentous algae can, like duckweed, block sunlight and adversely affect treatment. Filamentous algae typically form dense, free-floating mats. See the referenced photo. This type of algae comes on quickly and can cover much of the surface of a cell in just a few days. Of course, the most effective chemical to use when controlling filamentous algae is copper sulfate, which KDHE prohibits. But there may be other solutions for controlling filamentous algae. I am currently assisting a small community with an aerated three-cell discharging lagoon that has these type algae on the second cell. KDHE has recommended, and we are trying, barley straw to control the algae biologically. The straw is suspended on the surface of the water; as it decomposes it produces hydrogen peroxide. Studies indicate that hydrogen peroxide is then toxic to algae. Hopefully this will be an effective solution for this small community. The use of barley straw may also translate to other discharging lagoons needing to reduce excessive algae in their effluent that can cause the lagoon to exceed their Total Suspended Solids (TSS) permit limit. Unfortunately, studies have shown that the treated water must be well oxygenated for the process to be successful. My next article in *The Lifeline* may discuss this treatment option in more detail, especially if effective.



Filamentous algae come in various forms, but this variety forms dense, free-floating mats that block sunlight and adversely affect treatment. It is more common in ponds and lakes than free-flowing water and can produce prolific growth in waters rich in nutrients, like sewage lagoons. In the case of the lagoon in this photo, the cell looked perfect four to five days before the filamentous algae appeared. Then it rapidly overtook the lagoon.

Typically, unseasonable warm days and cool nights can cause them. These air temperatures can also affect lagoon water temperatures, especially if the temperature of the water surface becomes lower than the temperature of water on the bottom of the lagoon. If that happens, the lagoon cell may actually flip, bringing with it solids resting on the bottom of the cell. Those anaerobic solids contain offensive gases such as hydrogen sulfide and

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methane and can cause odor complaints. Should that occur, then treatment may be needed.

The recommended treatment for a turnover is to add sodium nitrate to the affected cell. Sodium nitrate is readily available and comes in granular form, usually in 50-pound bags. When added to a lagoon experiencing a turnover, sodium nitrate provides additional oxygen that hastens the recovery. EPA recommends adding 100 pounds of sodium nitrate per surface acre and then subsequent applications, if needed, of 50 pounds per surface acre. The best way to add sodium nitrate is in the wake of a low-horsepower boat motor. Operators should take care when using a boat, not to stir up more solids on the bottom of the pond. Otherwise, the recovery and elimination of offensive odors may take even longer.

I would like to make one last comment about adding enzymes or biocatalysts to sewage lagoons. They are not needed! Raw sewage naturally contains the enzymes needed to promote and sustain good treatment and adding more is simply a waste of money. I have seen several small communities over the years spend thousands of dollars for such products with no improvement. If your system is



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This photo shows conditions typical during a seasonal turnover. Note the brownish-green color of the wastewater and the clumps of solids floating on the surface. Such conditions often result in offensive odors. Turnovers typically correct themselves in a week or two. But if complaints are being received, treatment with sodium nitrate can hasten the recovery.

seriously considering adding such chemicals then your supplier needs to provide two things: 1) an independent, third-party study showing the effectiveness of the product; and, 2) a list of other cities or sewer districts that have

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used their products and treatment dramatically improved (based on actual, verifiable data). Absent either the study or list and data, I would not buy any such products.

If I can ever be of assistance with the operation of a treatment plant or lagoon, please feel free to contact me at either 913-850-8822 or jeff@krwa.net. You may also contact the KRWA office at 785-336-3760. I am also available to discuss the use and effectiveness of any chemical prior to purchase. Again, make sure to carefully evaluate any chemicals that your system plans to purchase in order to make sure it will be use legally and that it will effectively control the targeted aquatic plants causing problems.

Jeff Lamfers began work for KRWA in November 2008. Jeff has more than thirty years of regulatory experience in the oversight and operation of water and wastewater systems with the Kansas Department of Health and Environment.



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