by Charlie Schwindamann

Reducing algae growth in wastewater treatment

Reducing total suspended solids (TSS) in wastewater effluent from lagoons is important to maintaining good environmental water quality. It is good to periodically review information on how to reduce algae in wastewater stabilization ponds without the use of chemicals or fish.

The most important thing to know is that algae growth requires carbon, nitrogen, other nutrients and sunlight similar to that required by any other plant life. The best way to reduce algae is to remove one or more of these requirements for growth. Several tools will be needed for a wastewater utility operator to be better able to accomplish this.

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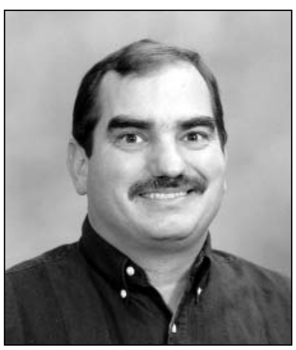

First, regardless of the system design (mechanical or lagoon), an operator should use a dissolved oxygen (DO) meter and a pH probe as the very basic tools for proper operations. Dissolved oxygen will vary due to water temperature and loading. The level for discharging should be at or near the saturation level or 14.6 ppm at 32 degrees Fahrenheit and 8.1 at 80.6 degrees Fahrenheit. The pH of incoming domestic sewage is normally between 6.8-7.6, however it can be as high as 9.5 due to algae reactions in the cells.

It is preferable to remove nutrients through the natural process of the lagoon or mechanical treatment plant operation. This can be achieved by longer detention times, better aeration which allows for the bacteria to decompose more of the nutrients. Increased detention time in a lagoon system can be achieved by several means including:

- adding larger primary cell, baffle walls,
- changing the piping to reduce short-circuiting,
- adding aerators to provide the bacteria more oxygen.

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Detention time can be increased in mechanical plants by controlling the return of activated sludge and wasted activated sludge.

For most lagoon systems, the problem is short-circuiting. Many have the inlet pipe in the center of the cells. Most lagoons are now designed to allow longer detention times by having the inlet and outlets at opposite corners of the cells. Older systems can correct this to some extent by adding baffle walls or if repairs are needed, the piping can be changed.

An example of a system's open structure that allows effluent to flow over the top of the weir plates directly from the top of the cell.

The next consideration may be the depth of where the final effluent pipe is discharging. Algae usually grow in depths of 12-18 inches. If the discharge pipe is in this area it could allow algae to be discharged causing high total suspended solids in the effluent. Most systems are now designed to have variable or multiple depths for discharge. The lowest depth KDHE regulations allow is six inches off the pond bottom to avoid pickup of deposits and to prevent erosion. Most systems have the lowest about two feet above the pond bottom. Many systems have the open structure that allows the effluent to flow over the top of weir plates directly from the top of the cells. An example of this is shown in the photo on the previous page. This does little more than keep large debris from the effluent pipe.

Another method of controlling TSS in lagoon effluents is rock filters. I have never seen an example of this system. The design would need to be specified by a professional engineer. Such filters have rocks of various sizes starting at five inches and graduating down to a two-and-a-half-inch size. The rocks filter algae and other matter as water passes through them.

Barley straw will also reduce algae growth in lagoons. The city of Enterprise has used this along with grass carp to reduce the algae mats in their final cell. A fact sheet is available online at http://ohioline.osu.edu/a-fact/0012.html or search for “barley straw” + algae reduction to find the site or others that may address the topic. The amount of straw needed is .025 pounds per square yard of surface area or about 107 pounds per acre. It should be pulled apart and then weighted so it sinks below surface. The city of Enterprise uses orange plastic snow fence to rap the loose straw. An operator could also possibly use cut-to-length plastic mesh used to wrap large 500-pound hay bales. Do not place bundles deeper than six feet. The best time to apply is April and again in about four months. None is needed over the winter months.

The last and least advisable method would be to remove sunlight. This could only be achieved by adding a cover that completely or partially covers the final cell. There are several manufacturers of these fabric covers. Natural covers such as duckweed can be used, but can be very difficult to control, and would probably migrate to other cells causing other treatment problems. The worst of which would be algae blooms that could occur in the receiving stream affecting the natural process of the stream.

KRWA is available to provide assistance with community wastewater treatment issues. Call KRWA at 785/336-3760 or e-mail KRWA at krwa@nvcs.com. I would be pleased to provide assistance or attend a city board or council meeting for a good discussion.

The “before” photos on the next page were originally reproduced in the November 2004 *The Kansas Lifeline*. The effluent structure “before” picture contrasts with the “after” picture, taken after a new operator worked to correct the situation. Now an operator can walk up to the structure and look in to check the system’s effluent. The “before” influent structure photo shows how deep the weeds were before the new operator began work. The “after” photo shows how it looks now. This is a great improvement and shows that a little pride in one’s work and extra time spent makes the system easier to operate.

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***Left:** Effluent structure photo "before" shown in September 2004 photo. **Right:** Effluent structure "after" photo taken when a new operator had the time to clear the structure of vegetation in order to be able to actually look in to check the system's effluent.*

***Left bottom:** Influent structure photo "before", again shown in September of 2004. The weeds were nearly as tall as the pipe rail around the structure. **Right bottom:** The "after" photo of the structure with weeds cut allows for much easier operation of the system.*