By Jeff Lamfers, KRWA Consultant

Dealing with Lagoon Turnovers and Associated Problems

Typical municipal lagoon experiencing a spring turnover. Notice the floating solids collecting in the corner of lagoon and brownish-green color of wastewater. This is actually a new lagoon that is rather lightly loaded and does not receive any industrial wastes.

It is not uncommon this time of year for municipal waste stabilization ponds to experience problems with offensive odors. Odors can be a general nuisance with lagoons and can occasionally result in complaints. This spring also seems to be unique as a larger than usual number of ponds are experiencing odor problems. The initial reaction is to conclude that these lagoons are experiencing odor problems due to turnovers caused by the long, cold severe winter we just had. And that may be the case in many instances. But to be sure, other factors need to be examined, such as organic and hydraulic loading, excessive sludge accumulation, poor mixing and the mode of operation used during the previous fall and winter months.

If a lagoon is properly designed and well operated, odor problems are usually just a temporary problem likely caused by a seasonal turnover. Such turnovers last a couple of weeks at most and occur in the early spring after ice melts off the surface and in late fall when surface water temperatures are dropping. Unfortunately when a turnover occurs, it usually brings septic solids on the bottom of the lagoon to the surface. If a lagoon experiences odor problems that last longer than 2-3 weeks or occur at other times of the year, then a seasonal turnover may not be the cause. Many times in such cases, the lagoon is overloaded and will likely require upgrading or expansion to solve the odor problems. In such cases, the lagoon is also usually experiencing problems meeting permit effluent limits.

If a lagoon is properly designed and well operated, odor problems are usually just a temporary problem likely caused by a seasonal turnover.

The easiest way to resolve odor problems is to switch to operating the lagoon cells in parallel. In parallel operation, all raw flow is split between the first two cells, thereby reducing the loading rate on the first cell. In some severe cases, totally isolating the primary cell may be needed by diverting all flow to the secondary cell. If operating a two-cell system that discharges, this may not be possible as discharging from a cell receiving raw sewage is not recommended. Usually treatment is not sufficient when raw flow is routed through a single cell.

Another way to resolve offensive odor problems is to recirculate some of the pond effluent back to the affected cell. Usually, the lagoon effluent is of good quality and high in dissolved oxygen and the type of green algae needed to effectively treat wastes and help the cell recover. I know of several systems that have tried this on an experimental basis and found it to be very effective. In fact two systems have

The easiest way to resolve odor problems is to switch to operating the lagoon cells in parallel. In parallel operation, all raw flow is split between the first two cells, thereby reducing the loading rate on the first cell.

actually installed a permanent pump and piping from the effluent box back to the influent box so that effluent can be recirculated by simply turning on the pump. Another possibility is to use a portable pump and pump wastewater out of the affected cell, spraying it across the surface of this same cell. This can help some in providing needed oxygen, but usually is not as effective as recirculating effluent.

Surface aerators or chemical treatment?

Several manuals recommend installing surface aerators temporarily to help boost the concentration of oxygen in the affected cell and eliminate the odor problems. I find this is rarely done usually because most lagoons do not have electrical power on site unless they already have aerators or an influent pump station. Also, purchasing aerators is more expensive than most other options. Regardless, this is an option to consider if you have access to surface aerators that can be purchased or rented from another nearby system.

If the odor problem is severe, applying a chemical to the lagoon may be necessary. Typically I do not recommend systems add chemicals of any kind to lagoons, as they are not needed. However, adding the chemical sodium nitrate to a cell experiencing a seasonal turnover may be necessary to help it recover. Sodium nitrate is a source of additional oxygen that helps the bacteria restore the equilibrium needed between the bacteria, algae, and incoming raw sewage. EPA recommends adding an initial application of 100 pounds of sodium nitrate per surface acre or 200 pounds per 1.0 million gallons of wastewater in the cell. A repeat application of 50 pounds per surface acre is then recommended if wastewater in the cell does not show signs of recovery within five to seven days. Usually, an operator can tell if the cell is improving if a slight green color starts to develop.

Sodium nitrate is a fertilizer sold at many coop elevators and comes in granular form. The best way to apply is in the wake of a motorboat. Burlap gunnysacks can be pulled

This lagoon cell is experiencing a turnover and lacks the desirable sparkling green color found in a well-operated system. Note the wastewater has a very dark brown color, some white foam developing in the stone rip-rap and very little wave action.

Note the effluent from this discharging lagoon. If recirculated back to the first cell, it could help in the recovery from a seasonal turnover. The effluent contains an abundance of desirable green algae and high levels of dissolved oxygen.

behind the boat, allowing the sodium nitrate to dissolve and disperse throughout the wastewater. One system even constructed a small circular cage framed with steel and covered with fine mesh screen. The cage was then equipped with two small plastic pontoons so the device would float. Sodium nitrate was then poured into the cage and the device pulled around behind their boat. The advantage to using a boat is that the sodium nitrate can be applied more uniformly to all parts of the cell. The disadvantage is that the motor prop can suspend anaerobic solids resting on the pond bottom, thereby actually making odor problems worse temporarily. However, this is usually not a major issue if a small horsepower motor is used and low speeds maintained. If a boat is not available, the sodium nitrate can be mixed as a slurry with some of it added at the influent box and the rest added around the periphery of the cell.

Finally, each system needs to evaluate its own situation before deciding how to respond to a seasonal lagoon turnover. Sometimes the best solution is to do nothing! If the lagoon is located outside of town in a direction that does not result in the odors being blown into town, then no action may be needed. My standard recommendation is that a response is only needed if the system is receiving complaints. Turnovers typically last a short time and should not adversely affect effluent quality. In the case of a spring turnover, once sunny days and warmer temperatures prevail, most cells recover in short order without any assistance. However if odor complaints are received, I suggest considering the aforementioned solutions.

If I can be of further assistance regarding the operation of your lagoon, please to not hesitate to contact me. I can be reached by phone at 913-850-8822 or by email at jeff@krwa.net.

Jeff Lamfers began work for KRWA in November 2008. Jeff has more than 30 years of regulatory experience in the oversight and operation of water and wastewater systems with the Kansas Department of Health and Environment. He is a graduate of the University of Kansas with a degree in Environmental Studies with an emphasis in aquatic biology.