

ELIMINATING SLUDGE ISLANDS IN YOUR WASTEWATER LAGOON

by
Jim Dartez

Old municipal and industrial wastewater lagoons have the tendency to build islands of sludge at various locations around the lagoon. It is most common for older lagoons to build such islands wherever wastewater enters the lagoons. Of course, this is because the solids entering the lagoon have enough weight to fall out of the water as flow velocity is reduced, so the solids pile up just after entering the lagoon. Sometimes these sludge islands will build very near a surface aerator, because the violence of the aerator will either drop sludge out after lifting it, or because of the violent horizontal mixing of the aerator forms sludge piles near the aerator itself. Of course, sludge buildups along the bank are also very common because of the same horizontal mixing or due to predominant winds causing sludge buildup at the lagoon edges or banks.

Sludge buildup forces the water flow through the lagoon to “short-circuit,” or flow, more directly toward the outlet of the lagoon. This, of course, reduces wastewater residence time and shortens the effective life of a lagoon’s ability to meet state and/or federal effluent water quality requirements. See Figures 1 & 2.



Figure 1 – An Ohio facultative lagoon that is short circuited at its western inlet and it has developed sludge buildup on all its northern banks, as well as most of its other banks.



Figure 2 – An aerated wastewater lagoon where an island of sludge has been produced by the violent action of the nearby aerator.

In most rural communities that have used wastewater lagoons over the years, replacing them with on-line plants is seldom an option. Small towns do not commonly grow large enough to fund the high costs of modern activated sludge plants, or the personnel and equipment costs required to operate such plants. So, finding ways to lengthen the life of their wastewater lagoons, while meeting ever-increasing state and federal water quality standards, is a continuous effort.

Sludge buildup throughout a waste lagoon has been a primary problem since these bodies of water were developed. While facultative lagoons might work well for 20 to 30 years or so, sludge buildup, across the entire lagoon, will eventually begin to make the water quality leaving the lagoon less than desirable. It has been identified that from 30% to 60% of the sludge in wastewater lagoons, both facultative and aerated, is organic. Newer lagoon designs have been deepened in order to add surface aerators in attempts to allow aerobic microbes in the sludge to quicken the organic degradation process. Sadly, it is now known that these artificial aeration processes have not worked to reduce the organic solids found in wastewater lagoon sludges. So, the industry is still looking for a way for small communities to deal with the continuing need to treat their wastewater effectively.

Over the past 5 years a new type of subsurface aerator has found its way into the waste lagoon market. This unique technology has not only proven to be effective for aeration and improved organic sludge degradation, but it is also being used as a 'sludge island excavator.' The Lagoon Master Aerator, by Reliant Water Technologies, utilizes an airlift to make water move in a constant, forward direction – continuously. As long as the pressure of moving water is maintained, it naturally falls to the bottom and quickly has large areas of the lagoon's sludge

fluidized and activated. This continuous water movement not only “flattens” the bottom sludge into a blanket, or “carpet”, but new microbial activation degrades the organic sludge at the same time. A second blower, feeding 8 fine bubble diffusers on the bottom of the unit, are used on the Lagoon Master to provide approximately 15 lbs. of oxygen per hour, so it can quickly be supplied to the activated sludge. See Figure 3.

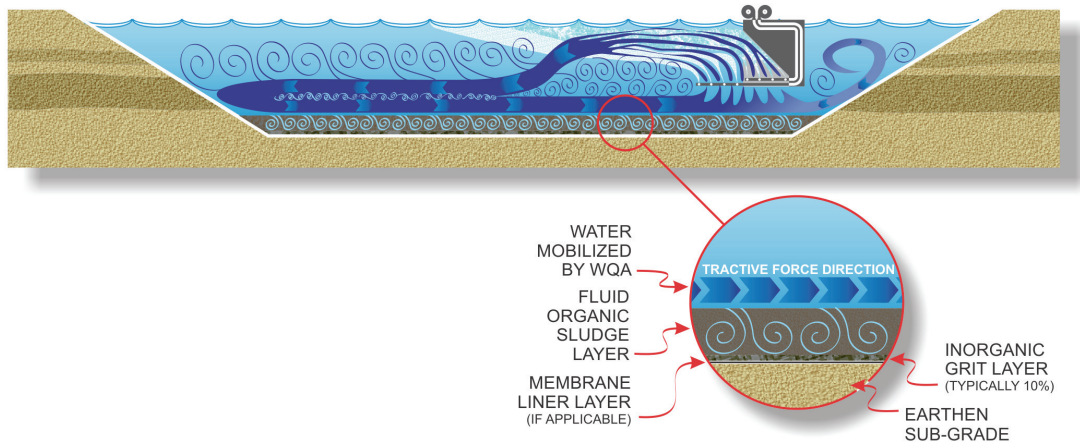


Figure 3 – The Lagoon Master Water Moving Aerator utilizes the weight of water and the pressure of an airlift to move water along the bottom of a lagoon. This constant movement activates the microbes in order to degrade the organic components within the sludge. Aeration is also added continuously.

It has been found that the water movement along the bottom of the lagoon, developed by the single 2 HP “water moving” blower, develops enough water velocity to actually excavate large piles of sludge. In a 60 acre lagoon, located in south Louisiana, a trial was run to see if a number of “sludge islands” could actually be collapsed by a Lagoon Master Aerator. See Figures 4 and 5.



Figure 4 – Numerous sludge islands at the inlet of a 60 acre wastewater lagoon in southern Louisiana.

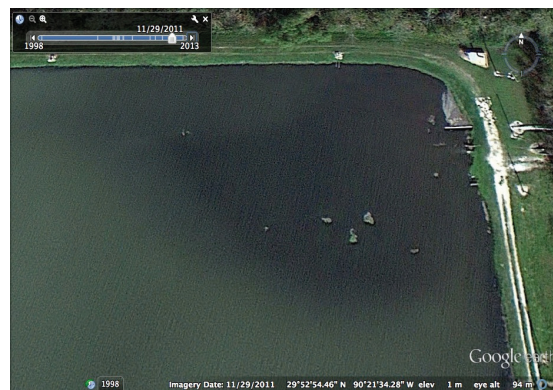


Figure 5 – A satellite view of the inlet corner of the same lagoon shown in Figure 4, showing numerous sludge islands. This photo was taken 5 months before the installation of the Lagoon Master Aerator.

At the time of installation of the Lagoon Master Aerator, it was “aimed” toward the islands. The developer of the aerator advises that this is the primary location of the first, or only, Lagoon Master – depending upon the size of the lagoon. This location of the first aerator, directly across the inlet flow of the lagoon, guarantees that the build up of sludge in that location will be moved into the rest of the lagoon and eliminate the possibility of short circuiting. Within 3 months following the installation of the aerator in the 60 acre test lagoon, the islands at the inlet of the lagoon disappeared. The continuous water flow at the bottom of the lagoon was strong enough to “chisel” away at the bottom of the inlet islands of sludge, thereby eventually collapsing them to be spread into other parts of the lagoon. See Figures 6 and 7.



Figures 6 and 7 – (L) The Lagoon Master Aerator that has excavated all the sludge islands at the inlet of the 60 acre wastewater lagoon in southern Louisiana. (R) A satellite view of the same inlet lagoon corner with aerator in place. No islands exist in this photo. (Note: Yes that is an alligator sunning on the left stanchion of the aerator.)

The common problem of wastewater lagoons building sludge at their inlets can be resolved without dredging or vacuuming sludge. A unique “water moving” sub-surface aerator can now be used as an excavator of sludge islands. At the same time, the Lagoon Master Aerator moves the collected sludge throughout the lagoon and forms it into a flat, fluidized blanket. This fluidization of the sludge “activates” the indigenous microbial populations in the sludge; and that biological activity is successful in completely breaking down the organic components within the sludge. Besides the elimination of the potential for short circuiting within the lagoon, the activation of the sludge increases the useful life of the lagoon. At the same time, effluent water quality is improved.

Jim Dartez is the President of Reliant Water Technologies and the patent holder of the the sub-surface Lagoon Master Aerator. Dartez has over 35 years of supplying monitoring and control systems, aeration and bio-augmentation products to the global wastewater markets.