REVITALIZING A HOG WASTE LAGOON

by

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A North Carolina hog grower with a brood barn of 200 full grown sows contacted Reliant Water Technologies to see if we could assist him with one of his waste lagoons. All of his lagoons were identical, measuring only .05 acres in size, and designed to be 8 feet deep. When we arrived at the farm all of the lagoons looked like the one in **Figure 1**. The lagoon that he chose for us to work with was located closest to the barn, and his goal was to use the water on the surface of the lagoon as wash-down water for the barn. Because the sludge was breaking the surface of the lagoon there was a very unpleasant odor emanating from the lagoon. Due to problems with the plumbing to the other lagoon, all hog waste would be directed to the trial lagoon during the trial period.

Figure 1 – Small hog lagoon in North Carolina. Sludge in the lagoon reached all the way to the surface of the lagoon when we arrived.

Reliant Water Technologies specializes in rehabilitating waste and fish farming lagoons with the use of two patented products. One is a very unique water moving aerator and the other is a poly-microbial, specialized bacterial mix that was initially developed for use in eliminating organic solids in packaged wastewater plants used on offshore

production platforms and ships. Reliant uses the two products globally for the revitalization of aged waste lagoons of all types. Together, the two products can bring old lagoons back into compliance, sometimes following years of non-compliant operations.

The plan was to locate the Reliant Model WQA aerator on one end of the lagoon and allow for the forward flow of water from a coarse bubble airlift to 'push' the water forward. This constant forward pressure utilizes the weight of the water to continuously move the upper level solids throughout the lagoon. Eventually, within a week the solids will be moving as a fluid bed of sludge well below the lagoon surface. With this sludge movement, the trapped ammonia and nitrogen gases are released from the sludge and oxidized in the water column, thus, almost completely eliminating odor from the lagoon. At the same time, the natural facultative bacteria in the sludge, will be in a more friendly gas free environment, and can once again begin to be the digestion agent for the organic sludge.

Because of the large amount of sludge in the subject lagoon, Reliant used its patented sludge digestant, Sewper Rx, to assist in breaking down the sludge. This bacterial mix is commonly used in activated sludge wastewater plants for the reduction of sludge to be hauled, thereby saving the plant over 60% of its sludge hauling costs and tipping fees. Sewper Rx was used on this project in order to assist in obtaining a quick result in eliminating enough sludge to provide a sludge free water column from which to draw the barn's wash-down water.

As the ultimate objective was to use the lagoon's water for wash down of the barn, and taking into consideration the negative results of highly contaminated water to the livestock, it was determined that we would use a private laboratory to provide us with water quality data every 7 to 10 days, for 60 days, on the lagoon water. The parameters that were measured were total suspended solids, BOD, ammonia, nitrogen, and phosphorus. *Eschricia coli (E. coli)* colonies were also measured. The sludge blanket depth was measured before the aerator was turned on and again at the 60 day point. While we did not have an automated way to measure odor, 3 people on the project used a 0 to 10 scale for that measurement, with 0 denoting no odor and 10 being recognized as the very strong odor at the start of the trial.

One problem that we had was not having deep enough water within which we could float the Reliant Model WQA aerator. This unit requires 5 feet of water to float, so a small crane with a mud bucket was brought to the site and a 10' x 10' x 6' deep hole was dug in the sludge on the end where we would place the aerator. The withdrawn sludge was returned to the lagoon along the side banks. The aerator was put into the water on one end of the lagoon on November 16 and turned on. Fifty pounds of Sewper Rx was added immediately after aerator initiation. Twenty five pounds of the granular product was poured into the water directly in front of the aerator. This would distribute the bacteria well out in front of the aerator. The other 25 lbs were spread in the water along the bank on the opposite end of the lagoon. **Figure 2** shows the placement of the aerator in the lagoon.

Close observation was kept on the odor in the lagoon for the first several days. Within 36 hours there was no real odor emanating from the lagoon. After that time, the only odor witnessed was a somewhat 'musky' smell; but, it was not as strong and repugnant as when the aerator was put into place. Everyone gave the odor a rating of 1 to 2 in our non-analytical measurement scale. The solids in the lagoon were measured with a Sludge Judge® just prior to the aerator being turned on.

Figure 2: Reliant Model WQA Water Moving Aerator located in one end of the hog lagoon. Photo was taken approximately 15 days after aerator startup.

Within the first 3 weeks of the trial startup the sludge had visibly fallen below the surface of the water. There was a huge amount of foam at various places on the water's surface around the lagoon. This was an expected occurance because of the very high amounts of ammonia and nitrogen that had been in the water. Eventually, the foam diminished; and, at the end of the two month trial, the lagoon's appearance was far different than when we arrived. See Figure 3. Thirty days after the trial began, another 25 lbs of Sewper Rx was added in front of the aerator.

Figure 3: Appearance of the hog lagoon after 60 days of the trial. Note that no sludge is breaking the surface and that all shoreline sludge and foam are no longer present.

One of the more interesting, -and important, - results of this trial, was what the Model WQA aerator and Sewper Rx proved very successful in improving the water quality of the surface water throughout the lagoon. **Figure 4** is a 60 day graph of the measured ionic components of the water. In every case the reduction of these water quality parameters was reduced a minimum of 50% in the water column above the sludge. It should be remembered that, throughout the trial, the daily waste of 200 full grown sows was still entering the lagoon.

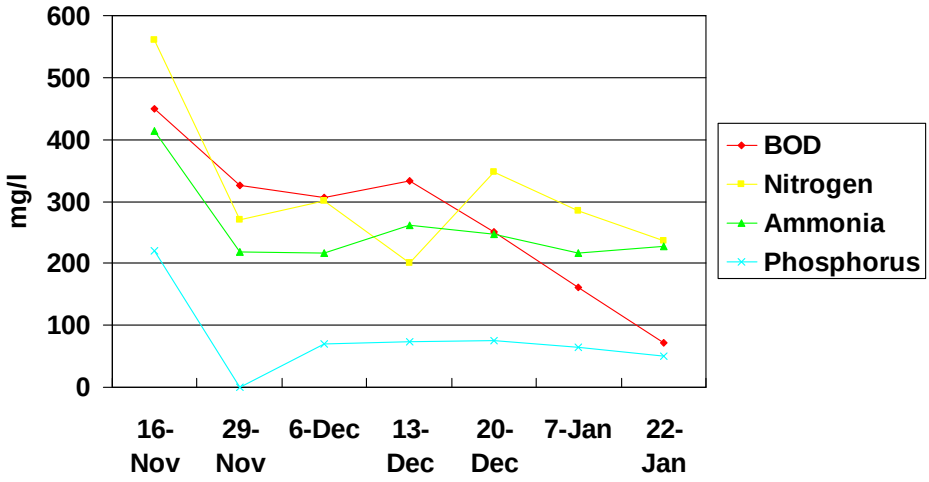

Figure 4: Water quality data of the surface water of the hog lagoon during the 60 day trial. In every case, the reduction was at least 50%, with nitrogen and phosphorus exhibiting close to an 80% reduction

The physical measurements were also impressive. The total suspended solids was 3250 mg/l at the beginning of the trial and 60 days later it was reduced to 110 mg/l. The *E. coli* colony counts were 69,910 colonies per 100 ml of lagoon water at the beginning of the trial, and were reduced to 21,105 colonies per 100 ml by the end of the trial – a 70% reduction. In interpreting the *E. coli* results one should remember that the hogs continued to use the lagoon throughout the trial. The "average" sludge depth was reduced 6 inches over the same period of time. This latter measurement is subject to interpretation. While it is apparent that the sludge had retracted below the surface during the trial, it is our opinion that most of the reduction in sludge depth was due to the movement within the sludge caused by the constant, slow pressure of the moving water caused by the aerator. This allowed for the gases within the sludge to rise into the water column and oxidize, while at the same time, dropping the sludge lower into the water. But we also know that some sludge was digested by the Sewer Rx bacteria during the trial because sludge level reduction continued after the trial.

This trial of a new method of improving the water quality, reducing odors and reducing the sludge in a North Carolina hog lagoon proved successful. Two key factors to consider in this trial are (1) that it was run during the winter months, normally a time when bacteria are not as aggressive in organic consumption in cold water, and (2) the lagoon continued to be utilized by 200 full grown sows throughout the trial. While certainly not to be considered water capable of being released into the environment, the water quality of this lagoon's surface water was clean enough to be used for wash-down purposes of the hog pen waste troughs. This saved the farmer precious groundwater to be used for other purposes.

For further information on this article and the products used for this trial, contact Jim Dartez at 504-400-1239 or jdartez@reliantwater.us.com.