AN AEROBIC LAGOON FOR SUCCESSFUL WASTE DISPOSAL

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(NOTE: The following material on the Ambassador College lagoon system was presented at the 2nd International Poultry Liter and Waste Management Seminar at Texas A & M, College Station, Texas, in October 1968.)

Some weeks ago Dr. Howes visited the college campus where I work. In touring the grounds, we passed the college sanitation facility at which point the conversation switched to the lagoon, its function and success.

In beginning stages of planning the College, much discussion and study was directed in choosing a location. After somewhat lengthy deliberations, it was decided the location would be in a nicely wooded area of East Texas. This site had been used for a large annual Church Convention for several years. Some of the present installations could be altered and utilized by the College.

Sanitation facilities in use were septic tanks and drainage tile. The area was full of springs which caused the ground to be semi-saturated most of the time and limited the capacity and effectiveness of the present system. It was operational, but seemed likely to be inadequate.

Pressure to begin the College urged the decision to open with present facilities. It wasn't long before sanitation became a growing and "smelly" problem.

Several types of sanitation systems were considered. The College, like most others in beginning stages, had its growing pains. Economics was an important and needful consideration; however, not to sacrifice quality. An aerobic oxidation lagoon, it was thought, would best fit our needs. Lagoons were relatively new to this area. However, in Kansas, Pennsylvania and some other areas, the aerobic lagoon systems were quite popular. Reports showed them to be effective, efficient and economical to install and maintain. We decided to use this system.

The layout of our campus is of such a nature that we could take advantage of the natural terrain. Considering the slope of the landscape aided in selecting location for construction of the lagoon. Natural drainage from all parts of the campus provided excellent fall for carrying waste materials to the lagoon. This eliminated the need for purchase of expensive and sometimes troublesome pumps.

The size of the lagoon would be determined, of course, by the amount of material to be handled. We needed capacity to handle approximately 250 people on campus over a 24-hour period and 400 students during the day for a period of 8 hours. Here is a quote used to guide in calculating the size of pond needed. "Aerobic ponds are designed to be aerobic throughout their depth, and unless they are mixed, they must be loaded at less than 20 lb. Biological Oxygen Demand (BOD) per day per acre to remain this way. When operated as unmixed ponds, they are valuable mainly as disinfection devices in which coliforms die away with the passage of time. Unmixed aerobic ponds may be constructed to have depths of 4 to 5 feet and to operate at detention periods in excess of 60 days."

Dimensions of the lagoon were determined based on the average daily volume. It was built to the following standards:

Volume: Not to exceed an average of 30,000 gallons per day (maximum of 60,000 gallons per day), average determined by measuring an average of the total daily waste discharges over a period of thirty (30) days.

Quality:

	NOT TO EXCEED		
	Monthly Average	24 Hr. Daily Composite	Individual Sample
Item:			
BOD	20 ppm	25 ppm	30 ppm
Suspended Solids	20 ppm	25 ppm	30 ppm

The above is a guideline that could be followed for any size operation. If the soil is sandy, a sealing type mud should be put in the bottom of the ponds. Barite, or driller's mud, worked into the bottom is good for this purpose.

Now that we had the pond, the next step was to charge it. Mr. Walter Klepfer, now a College employee, had been doing experimental work with soil bacteria privately for about 16 years. He observed, through experimenting with manure piles, compost piles, lignite deposits, etc., that certain types of the bacteria present caused a much faster rate of decomposition. This, of course, is common knowledge. However, he went on to select out those desirable types. His primary objective of developing this "culture" was to assist in farming operations.

He was later hired by the College to work in the Agriculture Department. The department began growing this bacteria in a large 5,000-gallon cement tank. To culture the bacteria successfully, it was necessary to feed it. This was accomplished by periodical applications of non-debittered brewer's yeast and sugar. The culture was used (and still is used) to spray on pastures and crop land. This helps restore soil micro-organisms that have been destroyed by improper farming methods. It proved quite helpful to speed the decomposition of chicken litter when applied directly to the floors of the houses, and to help speed up the making of compost.

When an aerobic lagoon system was adopted for the College, Mr. Klepfer recommended the bacteria culture be used to charge it. The culture had worked well to dislodge wastes in his own, and neighbors', disposal systems. In fact, usage of this culture helped keep the College septic system functional until the lagoon was completed. The culture has worked satisfactorily in the lagoon.

The oxidation pond is rectangular in shape, approximately 40 x 70 feet; 2,800 square feet; and 16,800 cubic feet. It successfully handled 350 people the first year; approximately 500 the second year.

The plans of this sanitation system call for all material to pass through a chopper before it is deposited in the lagoon. For several months the lagoon operated successfully without installation of the chopper. The fall of the land was such that it caused the material to tumble to the point of breaking into fine particles. The bacteria had no problem in completing the job of decomposition. Later, however, we installed the chopper to conform to state recommendations. It has proven to be an additional aid to digestion.

As the College grew, so did the volume of material dumped daily into the lagoon. When the lagoon would become overloaded, we would broadcast yeast and sugar on it, which would speed up the multiplication of the little "dung-eaters." Within a 24-hour period the balance was usually recovered. The original lagoon was designed to handle the wastes from 550-650 people. It was handling more than its supposed capacity before expansion was necessary. Installation costs of this type lagoon system will vary some according to layout. Ours cost around $18,000.

Expansion was achieved by the installation of a second lagoon adjacent to the first. An overflow pipe from the first is connected to the second lagoon. As excess digested liquid accumulates in the second pond, it is pumped off to be used for fertilizer. Some is applied by tank trucks and some is pumped direct to the fields through an irrigation line.

This year's first cutting of hay at the College was produced from a field fertilized with the digested liquid, which was applied through an irrigation sprinkler. This particular field is divided by the College airstrip. No liquid was applied to one side, while readily applied to the other. The fertilized section outproduced the other 3:1. We had an abundance of rain, so increase in production from moisture received by application of the liquid would be small.

Many ask if anything other than bacteria can live in the lagoon. As an example of some of the "life" in our lagoon, we have bacteria and our largest digestor is "George," an alligator.

Much information is available on lagoons, both general and technical. Books are regularly being published on the subject. One of the outstanding books is Advances in Biological Waste Treatment, sponsored by the Manhattan College, New York, published in 1963 by the McMillan Company, New York. In the back of this book is a bibliography which gives many sources of helpful material.

Waste control is a national problem. The conclusion of a conference on biological waste treatment several years ago was that the solution of the waste problem was to utilize natural microbiological processes.

Senator Jennings Randolph of West Virginia was a speaker at the National Pollution Exposition and Conference held at the Astrohall in Houston, Texas in April of this year. He spoke to 2,000 conference delegates from all across the nation. Never before had such a broad-based conference on pollution control ever convened. He had this to say: "Only recently have we become acutely aware of the fact that we are exceeding nature's ability and capacity to reprocess the kinds and quantities of wastes which are being produced."

An assistant Surgeon General of the United States, Dr. Richard A. Prindle drove this point home: "The deterioration of our environment is a problem so vast and urgent that anxiety about it must not be confined to elected officials, professional health workers and conservationists. Every level and facet of citizenry is affected and must be concerned."

This includes everyone of us here, our families, our communities and the institutions we represent.

Natural microbiological processes alone will never solve the colossal waste disposal problem of this nation and the world. But--sample aerobic lagoons do comprise one important link in the chain of needed answers and solutions.

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