



LAGOON SLUDGE TESTING

Benefits and Treatment Methods for Your System

By Keith Hegney, NDRWSA Wastewater Technician

Most wastewater lagoons are designed for a certain amount of sludge storage, so sludge is typically not a daily concern for an operator. Even if it is not required, it is important to know what the rate of accumulation of sludge is, so you can calculate retention time and budget for future prevention of buildup, dredging expenses and the prevention of problems caused by excessive sludge.

The accumulation of the sludge that settles at the bottom of a lagoon cell can be calculated by measuring the overall depth from the surface of the water to the lagoon bottom (liner) and subtracting the depth from the surface of the water to the top of the sludge. There are a few different methods of sludge testing that NDRWSA has available for your system. Sludge testing provides great information about the health of your lagoon cells and can save your system thousands of dollars in the future if treated properly. However, troubleshooting lagoon issues are not straightforward and the biological and chemical processes involved are numerous and complex to correct issues in your lagoon.

DISCOVERY METHODS

If the results of the lagoon sludge sampling show excessive sludge buildup, sludge will need to be treated or removed. There are not many options for wastewater sludge treatment or the removal of the amount of sludge accumulated over time. If an excessive amount of sludge has built up over



time and cannot be corrected by biological or mechanical means, the removal of sludge is most likely your only option. The most frequent problems in lagoons are elevated BOD, TSS and ammonia, and high or low pH levels. Also, intense odors from a lagoon can be an issue if not treated properly.

- **Sonar Depth Finder:** Often used by recreational boaters and fishermen, a sonar depth finder emits a high-frequency signal to determine the depth. The Power Vision Dolphin drone, which is the device used by NDRWSA to assist communities in North Dakota, is equipped with sonar and 4G televising capabilities. This drone, unlike the traditional sludge testing means, allows us to collect sludge depths safely on the water's edge in a very timely manner. (Note: This method can only be used when the original cell depth is known at the time of sampling.)

- **Sludge-Judging:** This is a popular method and uses relatively inexpensive equipment. It gives good results and allows the operator to take depth measurements and collect core samples to calculate sludge mass at the same time. A sludge-judge is a long, two-inch diameter clear PVC pipe with a flap foot valve, which is slowly lowered into the lagoon. When the valve reaches the sludge layer, the liquid level inside the pipe will drop relative to the water level outside the pipe and the depth can be recorded. Alternately, the pipe can be pushed through the sludge layer to the floor of the lagoon, and sludge depth can be measured from the core sample. This method can be used year-round using a boat or drilling holes through the ice.

LAGOON PROBLEMS

To further explain issues a lagoon may endure, the following are the most common problems noticed by a city's public works department:

- **BOD (Biological Oxygen Demand):** High effluent BOD concentration causes incomplete wastewater treatment or high sludge accumulation.
- **TSS (Total Suspended Solids):** High TSS levels are usually caused by high algae or sulfur or by organic overloading.
- **pH Levels (acidic or alkaline):** High pH is always due to extensive algae growth and the lack of oxygen. Levels of pH in a wastewater lagoon systems vary. Readings can change over the course of the day, at different depths and temperatures and even across the lagoon pond itself.
- **Ammonia:** Promotes algae growth in bodies of water. It is converted to nitrite and nitrate through aerobic biological activity, which depletes dissolved oxygen (DO) in water.
- **Odor:** Odor in lagoons is always due to low oxygen conditions. Lagoons tend to release strong odors after winter, when the ice melts and releases the stored BOD and it is oxidized.

TREATMENT METHODS

Luckily, there is help available to maintain your lagoon's sludge levels to a "manageable" level. **Bio-Enzymes and Microbes:** Bio-Enzymes and Microbes, which consume sludge, can be added to your system as a preventative measure to remove sludge and grease. Over the course of time, the sludge will decrease as the enzymes do their job. This option is the best economical resource and is pro-active for lagoon sludge control.

- **Aeration and Mixing:** Aeration can play a very important role in lowering your lagoon's sludge levels. When you aerate a lagoon, you are putting more oxygen



Mayor Chuck Tollefson, Surrey and Keith Hegney, NDRWSA.

in the water. Aeration and mixing are also a great method for reducing the pH levels and the removal of algae. Strong and heavy mixing will re-suspend the settled solids and force them with the DO and allow for efficient aerobic digestion (the process designed to reduce the volume of sewage sludge and make it suitable).

- **Dredging:** Dredging is normally the last resort. If a system allows excessive sludge to build-up and form, this is usually the most expensive means for sludge removal and can cost thousands of dollars. Keep in mind this will remove the sludge that is already in your lagoon, but will not solve the problem that created the sludge in the first place.

If you would like any more information on sludge testing and possible treatment ideas for your system, as we strive to make your system our #1 priority, NDRWSA is more than willing to assist in your needs. Please call 701-258-9249 or 1-800-391-695 and schedule a visit from one of our knowledgeable staff.