

Aeration on the Effects on Microbes in a Lagoon

Quick Break Lecture

13 March 2009

Many lagoons are used to store and treat sanitary wastes from small communities. These lagoons are stagnant receiving no treatment for the waste waters within the lagoon since there is no need to be discharged. This is because evaporation and seepage at least equals in volume the septic wastes being fed into the lagoon. Such lagoons are relatively stagnant with natural treatment being restricted by the conditions in the lagoon. Any break down of the organics in such stagnant septic systems is likely to be by reductive fermentation with the products being hydrogen sulfide, volatiles, and natural gases. Under these smelly conditions are likely to occur from time to time as these chemicals move up through the water often as bubbles and foam. Natural winds can affect these natural activities by folding the surface waters into waves which then causes turbulence with oxygen from the air getting down into the upper layers of the water. Here the oxygen is rapidly used by the natural microbes to break down these organic septic wastes which are a good thing. The more the wind actions cause turbulence then the more these septic wastes are degraded and the natural lagoon is doing its job.

There are other ways to get oxygen into the lagoon to speed up natural treatment and these almost all involve the bubbling of air into the lagoon waters to increase the rates at which the microbes can degrade the septic wastes. Commonly oxygen is added to the lagoon water as compressed air that may be made electrically or mechanically. This air now bubbles up through the water with the nitrogen escaping but the oxygen becoming at least in part dissolved into the water. Here the dissolved oxygen becomes the “fodder” for the microbes that are now able to break down the septic wastes much more efficiently. Here the oxygen causes a more complete breakdown of the septic without the generation of offensive odors and black waters. In testing for this the HAB-BART tester is very useful because if it generates an UP reaction then the lagoon is working while a DO reaction means potential failure and complaints.

Septic waste lagoons can be stinky places at some times in the year and colourful at other times when bacteria generate red colors in the absence of oxygen. Aerating the septic lagoons whether with electrical compressors or windmills means that, regardless of the winds, oxygen is getting into the water and the microbes are breaking down the organics. This means that the lagoon can carry a greater load of septic waste since the microbes are being encouraged to work harder by the presence of oxygen and therefore purify the wastes. Aeration from even a single windmill can change the ecology of a lagoon from a stagnant pool of smelly water that changes in colors through reds and blacks during the year; to a clarifying pool of water that goes green with algal growth during the summer and remains stink-free the year round. Even in the winter aeration keeps the circulation of water going allowing oxygen to get in and microbes happy harvesting the septic wastes even when it is very cold. In the Antarctic Oceans there are many microbes that love to grow just under the ice at near freezing temperatures. We have the same thing in Saskatchewan!