“Improving Sewage Lagoon Performance Using Windmill Aeration”

There are a variety of technical means for aerating lagoons with most providing costly treatment due to the need for electricity. Most treatment technology provides effective surface aerobic treatment but fail to address the anaerobic conditions near the centre and bottom of the lagoon.

Demands on sewage lagoon operators are increasing daily. With increases in local population, changing legislation, deterioration of aging systems, and unusual weather are all factors affecting sewage lagoon performance.

Windmill Aeration Systems are a long accepted method of adding oxygen into standing water facilities. Traditional users are farmers who need clean aerated water for livestock watering and crop irrigation. Commercial fish farmers also use aeration windmills to provide them with aerated water in an economical way.

Newer users include rural municipalities who use aeration windmills to oxygenate their sewage lagoons thereby accelerating the degradation process. As energy costs continue to rise and environmental issues become more critical in the decision making process, the windmill aeration system becomes an increasingly more attractive proposition.

The typical facultative sewage lagoon operator uses a system of primary and secondary cells. Adequate oxygenation is an essential part of the degradation process. As more people are attracted back to the country by the cottage/acreage lifestyle this places an additional burden on the rural sewage lagoon. New lagoon installations are extremely expensive and communities are very receptive to any method which makes their lagoons more efficient.

Aeration windmills are a growing segment and provide benefits for lagoon operators, utilities and communities. The design of the Koenders windmills enables them to function in the lower wind speeds thereby providing the most consistent aeration. Whilst their competitors have larger cubic capacity aerators this does not enable them to match the overall aeration volumes of the Koenders product.

A recent study commissioned by Sask. H20 and conducted by Springboard West Innovations estimated that of all the facultative municipal sewage lagoons in the Canadian Prairie provinces 58% were at or over their permitted capacity. Pressures exerted by local growth, changing legislation, deterioration of aging wastewater systems, and unusual weather is putting ever increasing demands on these lagoons. Small municipalities are facing significant expenditures and loss of urban land area due to lagoon cell expansion.

Aeration facilitates wastewater treatment in a facultative lagoon by changing the bacterial population, which in turn, should speed up the process of reduction of BOD and suspended solids.

The aeration is provided by the installation of windmill-powered aeration systems into a primary lagoon cell. This added aeration increases the dissolved oxygen, enhancing microbial activity and improving the efficiency of the wastewater and sludge treatment. Increased aeration causes the bacterial community structure to shift from anaerobic and facultative to aerobic groups.

These aerobic micro-organisms speed up the treatment process, reducing the Biological Oxygen Demand (BOD), Total Suspended Solids (TSS) and nutrient levels, and reducing the loading of potential contaminants to the environment. The aerobic bacteria (measured using the HAB-BART test) in the Aerated Test Lagoon were 10 times higher than that in the control lagoon. The HAB-BART test is used to detect slimes, plugging, taste and odor, cloudiness. It can also detect the amount of aerobic activity on sewage lagoon sites.

Aeration has a significant impact on the heterotrophic aerobic bacteria (HAB) .There was a 54% increase in the HAB levels during the summer aeration period in the Test Lagoon, and a 10 fold increase during the increase during the winter aeration period. On the other hand, there was no significant change in the HAB populations in the Control Lagoon for the duration of the study.

In summary, the increased aeration produced a significantly higher and earlier HAB population which could lead to higher treatment capacity of the lagoon.

Aeration was Significantly Better at Removing Ammonia-Nitrogen and Total Nitrogen

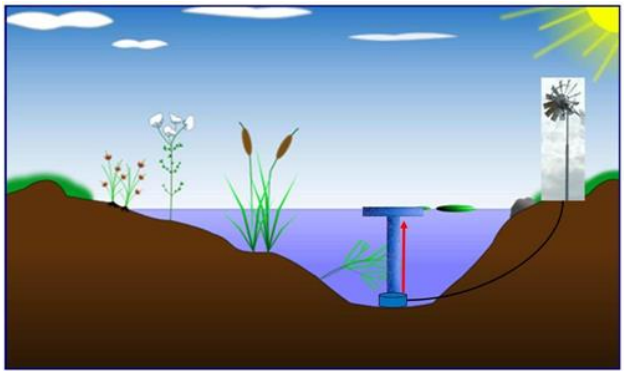
Test Lagoon	Control Lagoon
Ammonia-Nitrogen Removal	Ammonia-Nitrogen Removal
67%	37%
Total Nitrogen Removal	Total Nitrogen Removal
24%	15%

This system will help communities that have under-designed or over-loaded wastewater treatment lagoons to defer costly upgrades to their facilities. In addition, it demonstrates that aeration is as important and effective in winter months as it is in summer months, having an impact on water quality all year round.

Koenders Windmills are a;

Proven Technology	Work All Year – Through All Seasons
Energy Efficient	No Hydro Required
Low Maintenance	Environmentally Friendly
Very Cost Effective	Improve Dissolved Oxygen Levels
Continuous Operation 24/7	Increases the Reduction of BOD & Suspended Solids

Treatment is provided by the "bottom up" process of aeration into a lagoon cell



This added “bottom up” aeration process increases the dissolved oxygen, while enhancing microbial activity, and improving the efficiency of the wastewater and sludge treatment

For more information on how windmill aeration can improve your lagoon performance and to receive a copy of the Canadian National Research Council (CNRC) Study contact;

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References:

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