



Providing Treatment Solutions for Air, Water, & Land

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The Oxygenator

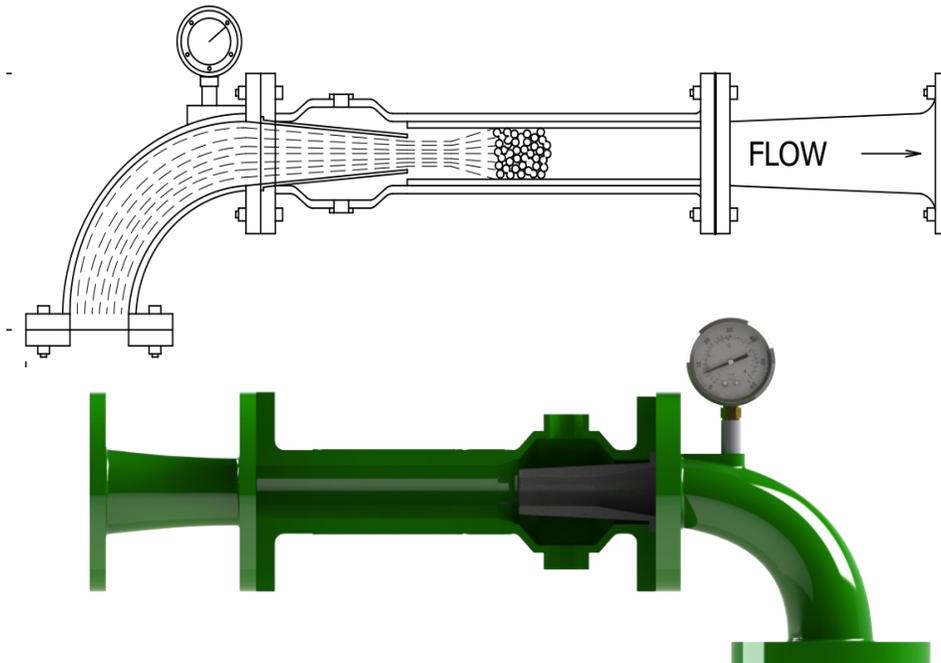
A better way to aerate lagoons and ponds
and pretty much anything else



Theia Water offers a simple solution for aerating and mixing lagoons, ponds, and lakes as well as tanks and other storage structures. The Oxygenator aspirates ambient air into wastewater increasing DO and ORP. Water passing through an Oxygenator nozzle creates a low pressure area (vacuum) and it is this vacuum that draws in outside ambient air into the device. A portion of the oxygen in the air is absorbed by the liquid and is transferred as dissolved oxygen (DO). However, when the discharge piping from the Oxygenator is submerged in a tank or lagoon, an additional portion of the "entrained" air will also be absorbed into the wastewater in much the same way as a diffuser would transfer oxygen based on depth of release and the partial pressure. This is a hybrid aeration device using both a Kinetic Transfer and a Buoyancy Transfer modality to add DO to wastewater.

This design offers a number of advantages that are especially significant for Lagoon and Pond applications . Lagoons are often difficult to deal with because of the massive mixing requirement relative to the aeration. The Oxygenator system can draw water from one location and push it a significant distance. The system can be set up with a moving discharge on a small float where only hose or pipe is out on the lagoon while the critical portion is safe on dry land. The system can provide mixing in shallow lagoons without disturbing the bottom (if desired) and without presenting any danger to the liner on the bottom.





Efficient Oxygen Transfer: The Oxygenator offers a transfer efficiency similar to that of fine bubble diffusers. As water passes through the nozzle, it is driven to saturation level for dissolved oxygen. After this transfer, there is still more than abundant oxygen in the water such that the level leaving the nozzle can be as high as 15 mg/l. This supersaturated water leaves the nozzle with 4-5 PSIG of mixing energy remaining. Thus, in a large body of water like a lagoon, this highly oxygenated water can be mixed with anoxic or less oxygenated water to add even more dissolved oxygen.

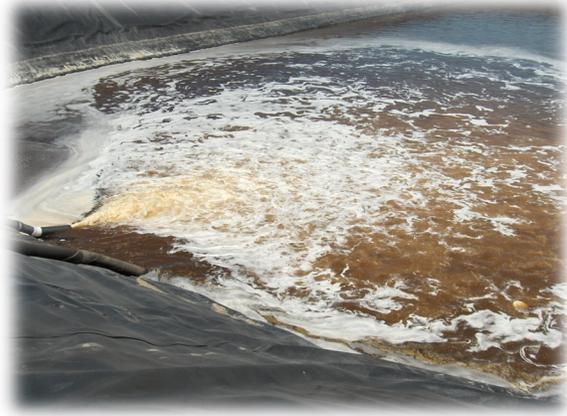
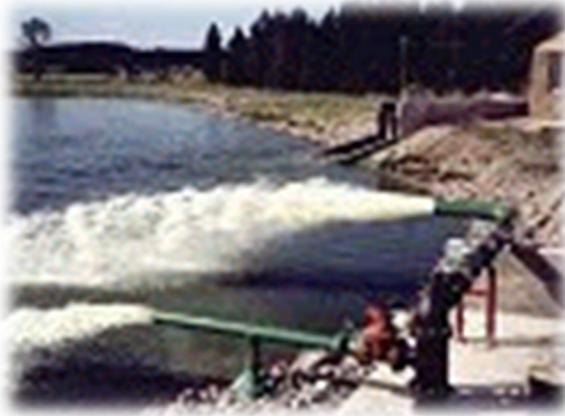
When compared to surface aerators, our system typically represents 25-40% of the power required. That is, we offer a 60-75% reduction in power use.

Wastewater Conditioning: The Oxygenator can be used to strip compounds like CO₂, VOC's and even ammonia while directly oxidizing compounds like Hydrogen Sulfide, Iron, and Manganese. By stripping CO₂, the system will naturally increase the pH of the water while allowing for more sizeable colonies of bacteria.

Process Control and Predictability: The engineered nature of the aeration design utilizing the Oxygenator system affords the operator a more consistent and definable process. This process is easier to measure and control. The powerful mixing component of the Oxygenator generates a homogenous DO level throughout the lagoon or pond and allows for measurements to be more precise.

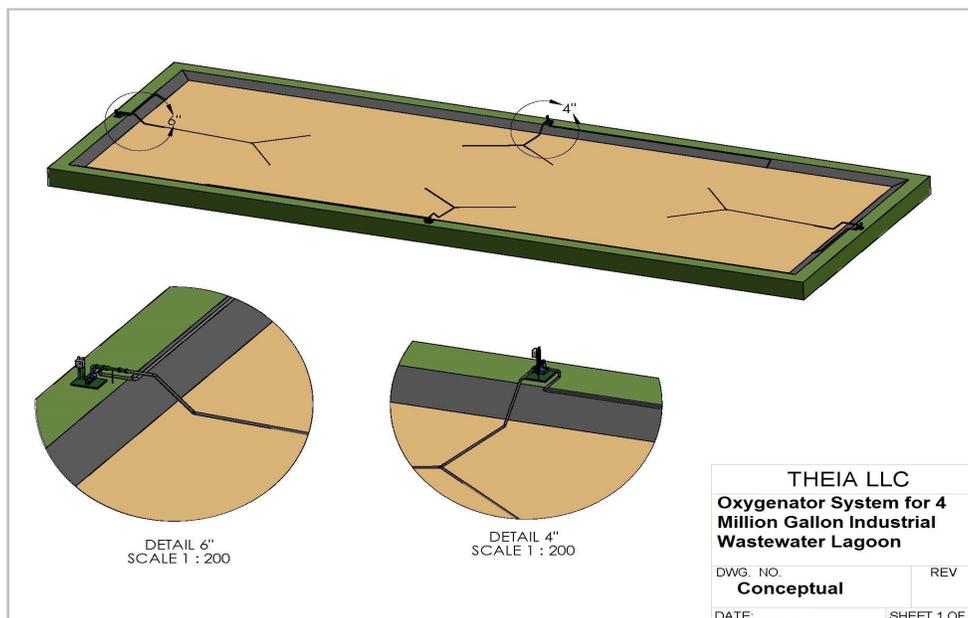
Once the DO level is better known, the operator can *control the process* and reduce power use by shutting off equipment when not needed. Additionally, if there is an anoxic component to the treatment, the wastewater is not over-oxygenated leading to issues.





Mixing & Equalization: The kinetic energy of Liquid discharged from the oxygenator is used for mixing and equalization of the contents of the pond, lake, or lagoon to prevent stratification and stagnation. The intakes into the pump are configured so that the most anoxic liquids at the bottom of the lagoon or pond are pumped into the oxygenator and are discharged at the top of the pond. This bottom to top pumping and discharge affords the highest oxygen transfer, bringing the water with little or no oxygen directly to the source. This step not only spreads the oxygen around but makes the oxygen transfer that much more efficient eliminating the resistance that submerged aerators face.

This mixing can be designed based on the application at hand. Unlike surface aerators, this mixing energy can be imparted without risking damage to the liner. In the case where the customer wants to allow a sludge blanket to build up on the bottom, the design can accommodate this requirement.





Maintenance: The Oxygenator System is very simple and requires limited maintenance. The Oxygenator nozzle itself does not require maintenance and the motive force is typically a centrifugal wastewater pump. Centrifugal pump maintenance is a somewhat standard practice in the industry and spare parts are typically readily available. Additionally, Theia will work with you and your team to select pumps that are to your liking. While we can provide you with options on the pump design, if you have a specific type or brand of pump, we will work with you to accommodate that request .

Another significant advantage of the Oxygenator is that the key components are external to the process and nothing is submerged. Because the pump is accessible, routine maintenance (lubrication, belt tensioning, and belt wear inspection) is quick and easy. The only items that are submerged or out on the lagoon itself is the inlet and discharge piping and hose. This is not the case with surface aerators.

Safety: Surface Aerators need to be out on the body of water and are usually tethered to shore. Retrieving them if required can be dangerous to personnel. These units often flip over and the maintenance crew needs to go out on a boat to right them and potentially pull them out. Even pulling them out of the lagoon can be treacherous. Theia's Oxygenator system is operated and maintained from the safety of dry land.

