

Aerator Efficiency

Recently, the technologies of diffused air and airlift aeration have resurfaced amidst claims of greater efficiency and increased utility savings to farmers. Both are relatively old technologies and are quite effective in certain applications. Unfortunately, these applications do not include aerating densely stocked, shallow aquaculture ponds with large surface areas.

Diffusor aerators consist of an air blower attached to a diffuser hose(s) which rest on the pond bottom. Small bubbles come up from the hose and rise to the water's surface mixing or de-stratifying the water from top to bottom. These systems work best in deep ponds (10 -20 feet) where the bubbles have the greatest retention, or hang time in the water column. Diffusers are frequently used in waste water lagoons which are typically much deeper than aquaculture ponds. Diffuser hoses can clog from the inside due to airborne impurities which are pumped into the system via the blower. Slime and calcium carbonate can clog the outside of hoses. Depending on water quality and pond conditions, the hoses may need to be cleaned one a month to once a year. Although diffusers circulate water vertically, they do not effectively circulate water horizontally over the pond's surface. This would create the need for more hoses to keep water moving throughout the pond. In addition to cleaning, diffusor hoses must be removed from the pond before seining.

Airlift pump aerators also use air from a blower which is piped through tubing to a vertical length of floating PVC pipe. The floating pipe is anchored to the pond bottom. Air is forced through a hole in the pipe (near the bottom) which forces air and water through the top of the pipe at the water's surface. A 90 degree fitting directs the water flow at the top of the tube. Airlift systems can provide strong de-stratifying current by moving large volumes of water under low head pressure. Similar to diffusers, airlift devices produce bubbles which float quickly to the surface in shallow ponds. Many airlift tubes may be required throughout a large pond to provide adequate water aeration and circulation. The airlift pipes, anchors and air supply tubing would have to be removed before seining.

Boyd and Ahmad (1987) conducted a study at Auburn University comparing various types and name brands of both tractor driven and electric aerators. Tractor driven paddlewheel aerators produced among the highest Standard Oxygen Transfer Ratios (SOTR). SOTR is the pounds of oxygen the aerator will transfer to the water in one hour. Although tractor driven aerators are not very efficient from an energy use standpoint, they can be effective in low dissolved oxygen, emergency situations. During the tests, the top rated electric paddlewheel aerators had the highest Standard Aeration Efficiency (SAE) of all the electric devices (4.2 - 4.8 lb O₂/hp-hr). SAE is the pounds of oxygen transferred per horsepower hour. These tests included two diffuser systems, but did not include airlift pumps, presumably because they are considered circulation and not aeration devices.

Based on their history, both diffused air and airlift aeration systems would be best suited to small, deep ponds where seining is not required for fish harvest. Advances in technology may make these devices more appropriate to large pond aquaculture in the future. We'll keep you posted!

Forrest Wynne, Aquaculture Extension Specialist

