



Ozone is pumped into a pond to circulate the water column and increase oxygen concentrations.

POND AERATION

Do not overlook this tool to manage and improve water quality in your ponds.

by **JIM SKORULSKI**

POND AERATION is a tool that is often recommended in pond management programs. However, an incomplete understanding of the role of aeration in a pond management program can lead to large expenditures and disappointing results. What is the role of pond aerators in management programs, what aerator devices are most effective, and when and how should they be used, are all-important questions that should be understood before proceeding with an aeration system.

A basic understanding of oxygen's role in ponds and lakes is crucial. Dissolved oxygen in the water column is integral in many biological and chemical processes that keep the pond system in balance. Oxygen diffuses into the water column from the atmosphere and is produced by aquatic plants and algae. It is utilized by

bacteria during the decomposition of organic matter. Dissolved oxygen also drives chemical reactions that cause metals to precipitate out of the water and into the sediments, where they combine with phosphorus and other nutrients, making them unavailable. Low oxygen concentrations increase the activity of anaerobic bacteria that drive reactions that force the metals back into solution and allow nutrients to re-enter the water column. Lakes or ponds that are rich in nutrients are more susceptible to undesirable algae blooms. Anaerobic decomposition also creates methane and hydrogen sulfide gases that are responsible for noxious odors. Dissolved oxygen also is required by fish and aquatic organisms for survival.

Lakes and even shallow ponds naturally stratify by temperature during the season. Surface waters are warmest and

usually have the highest concentrations of oxygen. This upper layer in lakes is called the epilimnion. Temperatures drop, as do oxygen levels, in the deeper waters. The benthic layer is found at the very bottom of lakes and contains decaying organic material and sludge. Stratification is less pronounced in shallow water systems. Stratification may be disrupted, causing the lake or pond to "turn over" in the summer months. This action allows the oxygen-deficient water and nutrients to move to the surface, creating rapid and excessive growth of algae and sometimes leading to fish kills. Pond aeration is used to maintain oxygen concentrations throughout the entire water column.

Oxygen concentrations in the water column can be monitored with an oxygen meter, which measures dissolved oxygen (D.O.) at any depth in the

column. Oxygen saturation is dependent on temperature and can vary day to day. At 0°C (32°F) water is fully oxygenated, containing 14 mg/l dissolved oxygen. At 25°C (77°F) the oxygen content drops to 8.3 mg/l. Aeration can increase dissolved oxygen when levels become deficient. Maintaining D.O. levels at or near 5 mg/liter provides an aerobic environment. It is best to start the aeration before D.O. levels drop to very low concentrations and before an algae bloom occurs.

There are several types of aerating devices. Aerating devices create turbulence that allows the water to intermix with the atmosphere. Fountains are probably the most popular aeration devices seen in golf course ponds. The fountains circulate the surface waters that already have the highest concentrations of oxygen. But lowering a fountain's intake will improve its ability to circulate more oxygen-deficient water from deeper in the water column. Fountains are also popular with golfers for aesthetic reasons.

Pond bubblers are actually more effective aeration devices, as they circulate large volumes of oxygen-

deficient water deeper in the water column. The systems are relatively inexpensive and consist of a 1-1.5 hp electric motor, an air hose, and a diffuser unit. The diffusers are placed at the bottom of the pond to pump air that displaces up to 50,000 gallons of water to the surface per minute, where it is recharged with oxygen.

Ozone or activated-oxygen systems are also used to aerate ponds and lakes. These systems displace large quantities of water as well and may infuse free oxygen radicals into the water. The free oxygen radicals drive the oxidation reactions that make nutrients unavailable. The ability of the units to infuse the oxygen radicals into the water column is questioned by some. The units are also more expensive and may not be necessary for smaller pond systems.

Aeration by itself is not a "magic bullet" that will solve all your pond management problems overnight. Nutrient loading is still the critical factor that must be dealt with before a pond can be brought back into balance. Ponds overrun with algae and aquatic weeds may initially require chemical

treatment programs to bring the system into balance. A successful management program requires a complete understanding of pond ecology, a good monitoring program, and an integrated approach that utilizes all the cultural, biological, and chemical management tools available. Utilize the services of an aquatic management company to analyze your system and help determine what the best long-range approach might be. The North American Lake Management Society or Aquatic Plant Management Society can provide a list of management companies and other informational sources that are helpful.

Treat aeration as one of many tools available to manage water resources on the golf course. When used correctly, it may keep the pond in balance, help maintain water quality, and, indirectly, help prevent algae blooms from occurring.

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Pond aeration can be an effective tool but is not the magic pill in all cases. Use an experienced consultant or extension specialist to examine the pond and develop a comprehensive management program tailored specifically for the site.