Preserving Lake & Pond Water Quality

By Holly Gibson and Matthew Trulio

An Otterbine vertical aerator, (left) oxygenates a pond at LeHigh Country Club in Allentown, PA.
Photo courtesy: Otterbine/Barebo, Inc.
Diffused air injection systems (below) send a stream of air bubbling to the surface from tubing or pipes placed at the bottom of the water feature.
Photo courtesy: EP Aeration.

Interspersed among the rolling fairways and sculpted greens at Latrobe Country Club in Pennsylvania are lakes and ponds. They add both form and function to the course; form, in that they are aesthetically pleasing, and function in that they provide irrigation water and a challenge for golfers. They also add a maintenance challenge for superintendent Jerry Palmer.

"I feel that pond management is just as important as turf management," says Palmer, who uses aerators from Otterbine/Barebo to maintain water quality in the course's water features. "From the start of my career in 1955, pond management was always something I was interested in. We use the water [in the ponds] for irrigation and, of course, every member that plays the course sees it."

Lakes and ponds have balanced ecosystems, just like turf. Just before dawn, water oxygen levels are typically at their lowest levels because aquatic plants ceased photosynthesis after the sun set. Plants won't begin recharging the water until the sun rises again. In a well-balanced pond, there is enough oxygen present in the water to support aquatic life. However, lakes and ponds can easily fall out of balance, especially in warm weather.

In the summer, thermal stratification is a fairly common occurrence, especially in relatively shallow lakes and ponds. The aerobic or epilimnion layer near the surface is the warmest part and contains the most oxygen. Algal blooms flourish in these conditions. As algae thrive, they block sunlight from pentrating the surface. This kills beneficial aquatic plants, which under good circumstances keep oxygen levels up in all water levels. The faculative or thermocline layer features rapid temperature drops and much less oxygen.

The anaerobic or hypoliminion layer at the bottom contains little or no oxygen. As fish and plants die, they drift to the bottom of the pond where they decompose. The decompostion process further robs the water of oxygen. The resulting organic matter is filled with toxic gases, such as methane and hydrogen sulfide. The "rotten egg" smell of hydrogen sulfide is characterisitic of a eutrophic pond. Nutrients released from the pond bottom can rise to the surface and trigger blooms of scum-forming blue-green algae. This dense filamentous algae not only looks unattractive, but it can cause havoc in irrigation systems if you are using the pond as a holding area for irrrigation water.

The Eutrophication Process

In all lakes and ponds, eutrophication is an ongoing process. In nature, the build-up of nutrients slowly transforms ponds into wetlands and then into meadows. Finally, the woodlands take over.

The eutrophication process can take many decades when ponds are undisturbed. Nutrients build up slowly. However, in highly maintained areas, fertilizers can mix with runoff water to quickly add nitrogen to pond water. The influx of effluent water also greatly adds to the water's nutrient level. Aquatic plants thrive on the nitrogen, growing rapidly.

A process that naturally takes many years can be accelerated to just a few years. Restoring a euptrophic pond to a healthy, clear body of water requires a combination of techniques. Aquatic herbicides, mechanical harvesters, water aerators, and plant-loving fish are a few of the alternatives to remove unwanted vegetation. Many water site managers choose an integrated treatment approach.

Aeration will help restore depleted dissolved oxygen levels. Nature aerates water with wind, waves, and rainfall. Wind whips oxygen into water at the surface and sends the aerated water crashing down. This circulates down, pushing the deep layers of water upward.

Water aeration systems are designed

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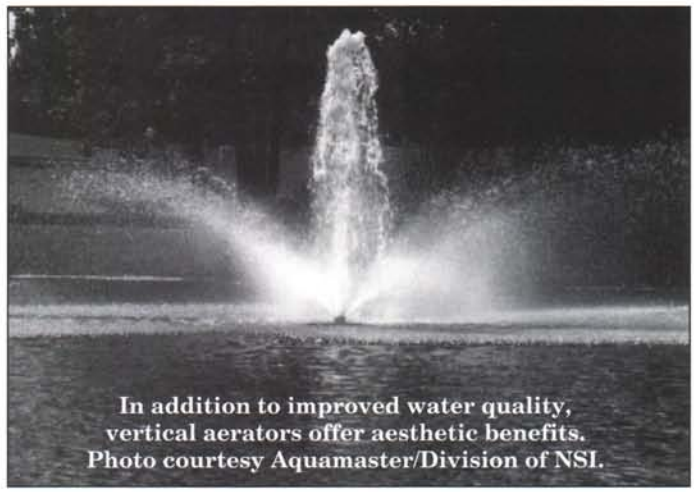
to assist nature in keeping water supplies adequately aerated. There are several aeration methods. The best method for your situation will depend on the size and depth of the lake, the local climate, and desired effect.

The primary water aeration methods are vertical aerators, horizontal aerators, and diffused air injection.

Vertical Aerators. The fountain displays you see in lakes and ponds are often the work of vertical aerators. While all fountains supply some amount of water aeration, only vertical aerators provide significant aeration. A pump pulls water from lower levels and sends it shooting into the air. As the water sprays in a pattern, it absorbs oxygen. As the water drops crash to the lake or pond surface, they penetrate the surface and create wave action. This further oxygenates the water.

"Our primary reason for using vertical aerators was to oxygenate the water," explains Larry Major, general manager of Moon Valley Country Club in Phoenix, AZ, which has six Air-O-Lator vertical units in a total of four ponds. Keeping the water oxygenated is particularly crucial for Moon Valley, as its ponds are home to bass, and aquatic-weed-eating Tilapia and White Amur, a variety of carp.



In addition to improved water quality, vertical aerators offer aesthetic benefits. Photo courtesy Aquamaster/Division of NSI.

"On two of the holes, the vertical aerators serve a secondary function—they let the golfers know where the water features are," notes Major. "Because of the way the course is laid out, you can't see the water hazards, but you can see the water thrown up by the aerators."

Vertical aerators are available in a number of sizes and they create a variety of water displays. The height and width of the water display will depend on the size of the pump and motor. You want an aesthetically pleasing pattern that will move the desired amount of water without spraying bystanders. Also, a curved pond or a lake with several "fingers" will need several aerators located through the body of water to give adequate circulation.

When Hunter Ridge Golf Course, a "development" course in Bonita Springs, FL, installed a Hardie Rainjet vertical aerator in a two-acre pond (used also for holding irrigation water), the course realized an unexpected benefit.

"The aerator throws water about 20 feet up in the air—you can definitely see it when you make the turn onto Hunter's Ridge Drive," says Ron Moore, superintendent of the 6,300-yard semi-private course. "As a result of the 'fountain' appearance the aerator creates, we have been able to sell a couple of lots."

Many vertical aerator manufacturers also make lighting kits you can attach to the units for night displays. Remember, the more elaborate patterns and lighting, the more electricity you will use. When you prepare a budget, keep in mind whether you are using the vertical aeration for pond maintenance, decoration, or both.

The sound of falling water can provide a soothing mask to other urban noise.

Another element to consider is timing. It is better, says Kevin Clunis, superintendent of Stillwater Country Club in Stillwater, MN, to address water quality before it becomes a problem. Last year, the club installed a Kasco vertical aerator in a 2.3 acre pond.

"Because the pond freezes in the winter, obviously we can't use the aerator year-round," says Clunis. "But we get it out there in the spring, as early as possible. You can't just throw a unit out there with wall-to-wall algae mats and except it to work overnight. You want to get it out early, before your problems start.

Although Clunis says the unit has cleared up 98 percent of the pond's algae problem, he still uses copper sulfate and Aquashade dye, which helps cut off sunlight that weeds and algae require to grow. "Plus the members like to see the blue water coming out of the aerator," he adds.

Many units have timers so you can program the aerator to operate overnight or at specific times. The sound of falling water can provide a soothing mask to other urban noise.

Horizontal Aerators. The main purpose of horizontal aerators is to circulate water beneath the surface. These units typically float on the surface and stay mounted in one location or circulate in a given area.

A submerged propeller sends aerated water to lower water levels. This oxygenated stream of water helps break up stratification by sending oxygentated water to the bottom and water with lower oxygen levels to the surface. This mixing keeps nutrients in suspension and

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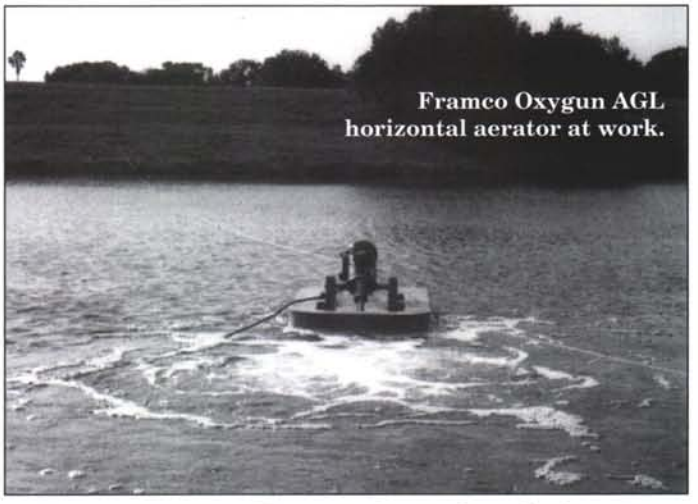
oxygen-rich water throughout the pond. These conditions favor aerobic bacteria and algae species. As these beneficial organisms feed on nutrients, they help prevent algae blooms.

The angle of the propeller and size of the motor will determine how deeply the aerator will circulate water. As a general rule, the larger the motor, the more water the propeller will move. Horizontal aerators also are available with decorative covers, such as rock-like structures. The covers make the aerators more aesthetically pleasing and discourage vandalism.



Framco Oxygun AGL horizontal aerator at work.

The pond or lake size will determine how many aerators are necessary to provide adequate aeration. Few lakes are perfect circles or ovals. For maximum benefit, you need to plan enough aeration for the entire area.

Diffused Air Injection. Diffused air systems work through a series of tubing placed at the bottom of the lake or pond. A series of emitters along the tubing break up the air stream into different bubble sizes. The larger the bubbles, the more surface disturbance will occur.

An air compressor located on shore generates an air flow that circulates through the tubing. As bubbles escape through the emitters, they oxygenate the water as they rise to the surface. The rising air also helps circulate the water, breaking down stratification.

For uniform aeration, the length and spacing of the tubing and the size of the compressor must be designed specifically for the pond you are treating. The cost of operating this type of system will depend on the size and depth of the pond. The deeper the pond, the more power it will take to send air upward.

Ozonation is a variation on diffused air injection. Instead of just injecting air through underground tubing, the system adds ozone. Ozone is an unstable gas that acts as a powerful oxidant. Its 03 configuration readily breaks down into 02, which we know as the oxygen we breathe, and the oxygen radical, which easily with other ions. This means ozone is capable of oxidizing many organic and inorganic components.

"Algae are funny little creatures," says Owen Stone, superintendent of the San Joaquin Country Club, an 18-hole, 7,900-yard course in Fresno, CA. "You never know where they're going to pop up. It used to be that the only thing we used to control algae was copper sulfate. We used to have to rake the algae out of the lake to keep it from getting into the irrigation system—we had a great filtration system but it was working overtime. But three years ago, we installed an ozone aeration system from EP Aeration in our upper lake, which is about 3-1/2 acres, and two years ago we put one in another smaller lake.

"For the first year in the upper lake, I went with just the system and didn't use any chemicals—and it went really well," he continues. "I would say it controls at least 80 percent of the algae. Now, I help it along with copper sulfate and Aquashade dye."

Making Choices

When you determine which system to use, evaluate not only how much you want to spend initially, but also how much you can afford for ongoing treatment. Then, prioritize your needs. Do you want a water display or a natural-looking pond? Do you need to maintain a fish population? Will golfers tolerate some level of floating algae?

Weigh these considerations when you shop for a system. Know the surface area, water depth, and design of your pond when talking to distributors about your options. If possible, bring a sketch of the pond with you when you talk to distributors. Addressing water quality today will save you serious headaches tomorrow. ❑

DONALD ROSS AWARD PRESENTED AT ASGCA ANNUAL MEETING

The American Society of Golf Course Architects presented the Donald Ross Award to its Executive Secretary, Paul Fullmer, during their annual meeting at the Maidstone Club, East Hampton, Long Island, NY on May 3-7. The award is bestowed annually to an individual who has made significant contributions to golf, specifically in golf course architecture.

Other highlights of the four-day meeting included: Past President Rees Jones, who moderated a panel on the "Historical Impact of Long Island Golf Courses;" President Tom Clark, who moderated a panel on "What's Next With Environmental Permitting?"; Former president Dr. Mike Hurdzan, who lead a panel on the "Audubon Cooperative Sanctuary Program for Golf Courses;" Financial sources committee chairman Brian Silva, who moderated "Where Will We Get Financing In The 90s?"; Alice and Pete Dye, who presented a professional development seminar on "The Ocean Course at Kiawah Island...The Ultimate Challenge;" and Mike Klemme of Golfoto, who presented a seminar on "Marketing—The Key To Growth."

PAGE COMPLETES CERTIFICATION PROGRAM

Donald Page, who is landscape manager of Harbour Ridge in Stuart, FL, has completed the Professional Grounds Management Society Grounds Manager Certification Program. He is the 29th person to do so since the beginning of the program.

The PGMS began this program to upgrade professionals and bring recognition of professionalism in the field. Applicants must be approved by a certification committee, pass an exam and complete a series of booklets on the various phases of grounds management.

MILLER APPOINTED MANAGER FOR SMITHCO

Emil Miller has been appointed marketing manager for Smithco. He will be responsible for all phases of marketing for the company distributors and end-users throughout 13 Southeastern states and the Caribbean area. He will also provide sales support services for distributors and participate in corporate new product development and introduction.