The Art of Aerification

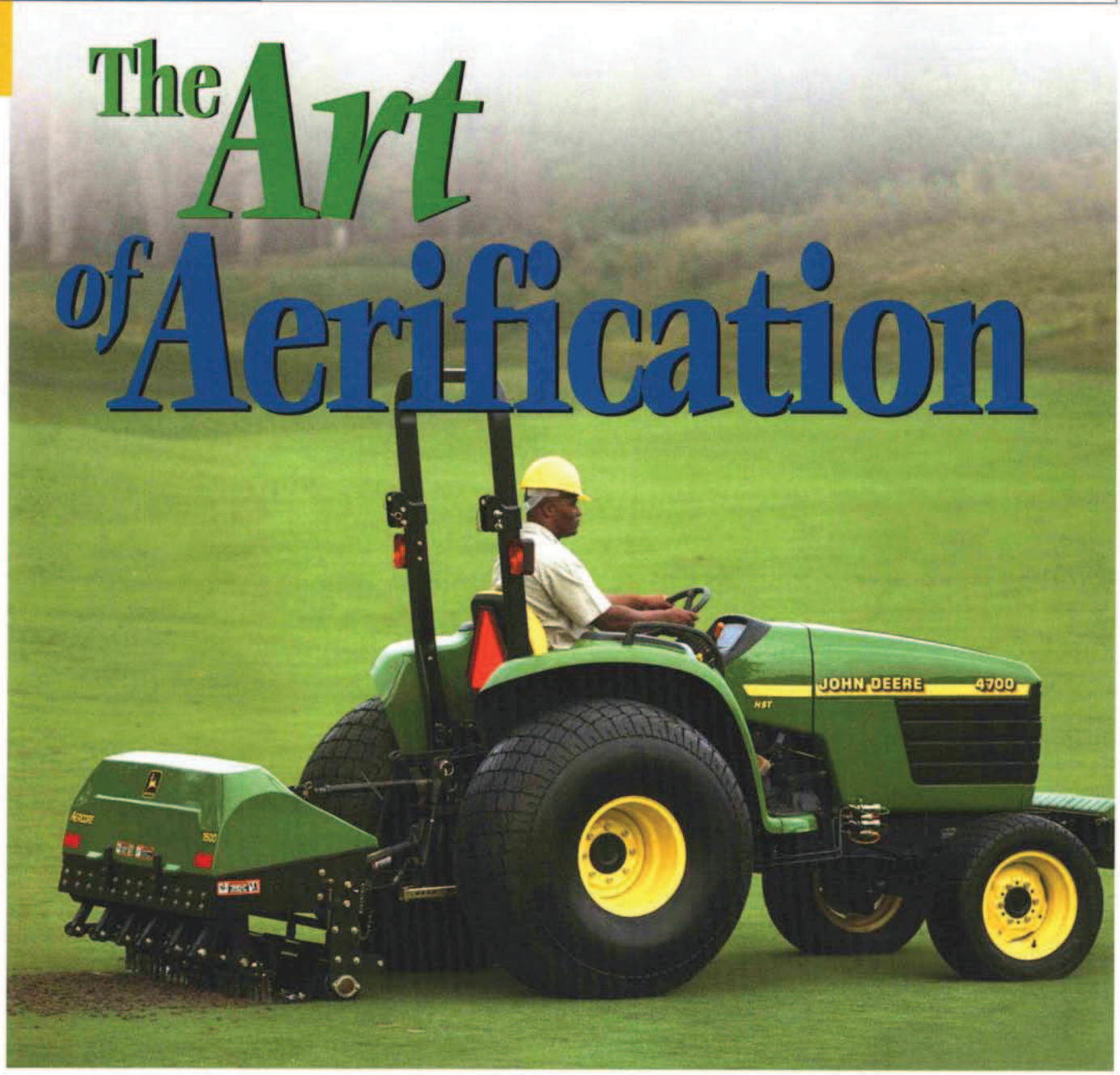


Photo courtesy John Deere & Co.

By Dr. Joesph M. Vargas, Jr.

Turfgrass needs oxygen to survive and thrive. This concept is usually lost on most, with the exception of turfgrass managers. The very idea earth could compact to the point it becomes unhealthy for turfgrass is unthinkable to the average person. Over a period of time, however, and with the passage of enough foot traffic and heavy mowing activity, soil will compact. In good soil, grassroots receive oxygen provided by tiny pockets of air trapped between soil and sand particles. Compaction removes these pockets in the upper 19 mm to 38 mm (0.75 in. to 1.5 in.) of soil. This is even more of a problem if the local soil contains a lot of clay, which allows even less air and water to enter the earth.

Aerification is the answer to this problem. By creating air space through a concentration of holes or punctures in the top inches of the turf's surface, compaction can be alleviated. Acting as pores, which penetrate deep in the soil, aerification provides a number of benefits, including:

- Improved water absorption and movement in the soil.
- Improved oxygen absorption and movement in the soil.
- Release of toxic carbon dioxide from root respiration and other sources.
- More effective placement of fertilizer.
- Decomposition of left over thatch particles.
- Loosened soil.
- Improved germination of reseeded and overseeded turf.
- Revitalized, deeper, healthier root systems.
- Improved success at introducing topdressings.
- Removal of organic matter.

Photo courtesy John Mascaro, Turf-Tec International

Aerification has been a part of turf maintenance for a long time. This West Point Aerifier was patented in 1946.

Photo courtesy Broyhill Company

Standard core aeration improves both the absorption and movement of oxygen and water through the soil, improving turfgrass health.

The art of turfgrass aerification includes a variety of approaches, including hollow tine, solid tine, deep tine and water injection aerification. Determining which to use depends on the ultimate goal. If you are looking to change the composition of soil and sand in a green, hollow tines should be used, as the process removes soil plugs from the earth, as opposed to spiking the soil downwards to make a hole. Understanding aerification methods and choosing the right approach is key to achieving the best results for your turfgrass needs.

Hollow tine aerification

Hollow tine aerifiers insert hollow tines into the soil, removing soil plugs and in the process, some of the accumulated thatch (the layer of living and dead organic matter occurring between the green vegetation and the soil surface). Tines 12.7 mm (0.5 in.) long and 50.8 mm (2 in.) apart will remove approximately five per cent of the thatch. Core spacing varies depending upon the make and model of equipment being used, although the more cores removed per square foot the better the cultivation.

The cores removed are often matted back into the turf to aid in thatch management when used on fairways or soil greens. If thatch is the turf problem, thick-bladed vertical mowing machines are preferable to aerification.

When hollow tine aerification is preformed on greens, the cores are normally removed and sand added to the holes. Unfortunately, in the process of doing this, golf course members may mistakenly believe the aerification and topdressing operation was a failure, as all the holes were not completely filled to the top. This is actually not necessary for the operation to be successful.

Hollow tine aerification is best performed during active turfgrass growth. It is, however, a method resulting in the most surface disruption.

Solid tine aerification

Solid tine aerification has gained in popularity over the last decade. It was originally called 'shatter core' aerification, because

The Hole Story

The History of the Aerifier

Photo courtesy John Mascaro, Turf-Tec International

By John Mascaro

Soil cultivation has been around since the invention of the plow. Solid steel spikes were thrust into the soil to create channels for the penetration of turfgrass roots.

In 1936, Tom Mascaro and his brother Tony formed a topdressing business, selling their father's spent mushroom soil to golf courses. During the depression, when people stopped buying mushrooms, he and his brother continued their business, seeking a source of good organic material to create topdressing. They invented a leaf gathering machine that, when mixed with soil and composted, would produce saleable topdressing.

When Dr. Fred Grau, an agronomist for the United States Department of Agriculture (USDA), saw the leaf-collecting machine, he was impressed. He remarked what was really needed was a machine to tear up bluegrass fairways. So, the brothers embarked on a quest to make a machine that would do just that, while leaving the fairway playable. In 1945, Tom was tinkering with a ban saw and a metal pipe. In the process, he cut the pipe in such a way that it looked like a long tablespoon. Inspiration struck. They mounted the spoon on a disk and when it rolled over the soil, a small plug of earth was removed, leaving behind a hole. This design was perfected and named the 'aerifier.' Their company, West Point Products, in West Point, Penn., patented the aerifier in 1946 and copyrighted the name. It became an immediate success.

Superintendents recognized the potential and immediately used them on their golf greens. The 25-mm (1-in.) spooned aerifier was used for several years until Tom Mascaro made a smaller self-propelled machine called the GL Aerifier, with a choice of 12 mm or 19 mm (0.5 in. or 0.75 in.) spoons. This removed the soil cores and aerated the ground, but did not disturb the surface of the green as much as the 25-mm holes. It too became an overnight success.

Around 1958, the vertical punch cultivator hit the marketplace, and because of the clean stroke of the camshaft, the puncher began to gain market share. By the mid-1960's the market contained approximately 50 per cent punchers and 50 per cent aerifiers.

Today, there are many different methods for relieving soil compaction, however, there is only one aerifier. And now you know the 'hole' story.

During his long career, Tom Mascaro invented over 100 turf-related products, receiving many honours, until his death in 1997. Among them were the United States Golf Association's (USGA) Green Section Award and the Golf Course Superintendents Association's (GCSAA) Distinguished Service Award, one of the industry's highest honours. At Penn State University, in University Park, Penn., the Mascaro/Steiniger Turfgrass Equipment Museum was named in honour of Tom Mascaro and his long-time friend, Eb Steiniger.

John Mascaro, Tom's son, is president of Turf-Tec International of Coral Springs, Fla. He is a member of the Golf Course Superintendents Association of America's (GCSAA) Historical Preservation committee and writes the John Mascaro's Photo Quiz for Golf Course Management *magazine. He can be reached via www.turf-tec.com.*

the insertion of the solid tine into the soil caused the earth to fracture, in addition to making a hole. An advantage of this type of aerification is there is no clean up afterwards as is the case with the cores created by hollow tine aerification. During solid tine aerification, the soil is driven down into the earth, making it less disruptive to the surface.

There are many variations of solid tine aerification. Small solid tines (6.35 mm to 9.5 mm [0.25 in. to 0.37 in.]) can be used with little disruption to the surface. They can also be used during the summer months, preferably during the cool part of the day, to relieve compaction or allow oxygen to enter the rootzone. These smaller solid tines can be used once a month to aerify the clean up pass on the perimeter of the green. This will eliminate the wear caused by mowing the clean up pass.

Deep tine aerification

Deep tine aerification is accomplished using 12.7-mm (0.5-in.) to 9.5-mm tines that are anywhere from 203 mm to 304 mm (8 in. to 12 in.) in length. This technique has the advantage of penetrating deeper into the profile, and is especially effective on soil greens topdressed with sand. The solid deep tines go into the underlying soil layer, which aids in making channels for better water movement down through the profile. The advantage is these aerifier holes in the underlying soil tend to remain open for many years. It is common to see turfgrass roots growing to the bottom of these holes during the cool spring weather.

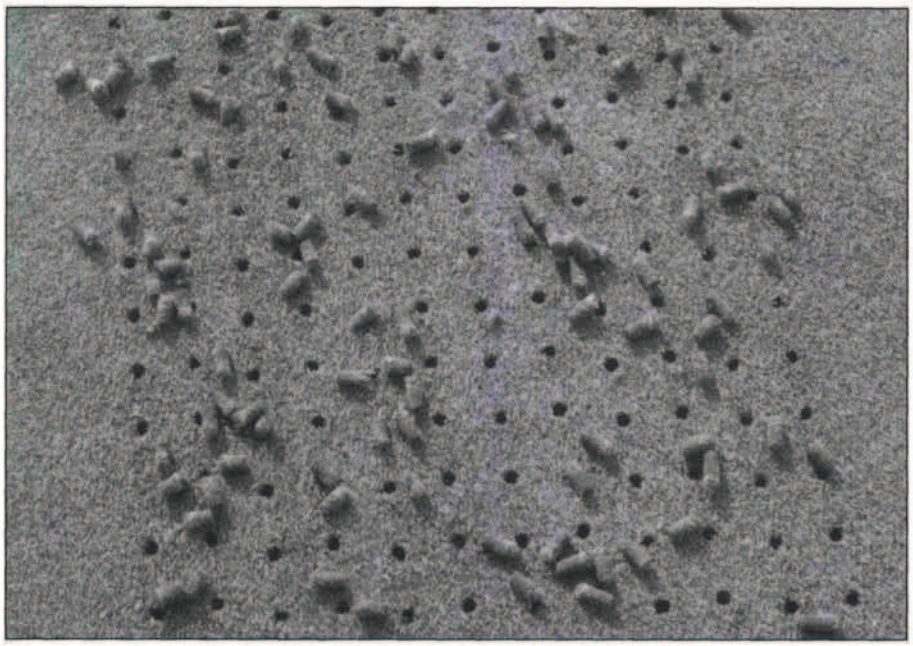
The best time to deep tine aerify greens is in the fall, as it is very disruptive to the putting surface. By doing it in the fall, the surface has time to settle over the winter. Deep tine aerification of fairways in the fall has also become a popular practice.

Water injection aerification

The hydroject uses streams of pressurized water to make holes. The holes are not very large, simulating those made by 6.35-mm (0.25-in.) tines. The key difference is the injector holes normally go deeper into the soil profile. Like solid tines, the hydroject can be used in warm weather during the cool part of the day. The best results have been obtained when the hydroject is used every other week throughout the season. Typically, one set of nine greens is done one week and the second nine the following week.

The art of timing

Determining the best time to aerify depends largely on the species of grass you are trying to maintain. Generally, the best time to aerify is in the spring, as



By creating air space through a concentration of holes in the top inches of the turf's surface, problems such as soil compaction can be alleviated.

this allows for better rooting during the cooler weather when you are preparing the turf for the summer stress period.

Creeping bentgrass (Agrostis palustris)

The best time to aeriate for creeping bentgrass is the beginning of the heavy annual bluegrass seeding period. This gives creeping bentgrass a competitive advantage over annual bluegrass, as the latter does not produce any new roots during this time, as most of the plant's energy goes into seed head production. The only species producing new roots is creeping bentgrass, which will fill the aerifier holes.

Opening up the turf canopy at this time will not result in the germination of any annual bluegrass seed that may be brought to the surface because the soil temperatures are too cold. Following standard tradition, creeping bentgrass greens are often aerified right after Labour Day when temperatures are ideal for annual bluegrass germination. Annual bluegrass is classified as a winter annual, and as such germinates in the late summer or early fall.

Annual bluegrass (Poa annua)

The best time to aerify annual bluegrass greens is following the massive seed head production period in the spring. During this time, annual bluegrass has not produced any new roots and normally has only a couple of weeks for new root initiation before the warm soil temperatures limit their production. You can, of course, aerify annual bluegrass greens in the fall, introducing new annual bluegrass plants into the green.

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