SPORTS FIELD AERATION
Practices & Benefits

By Dick Fluter

Why do we need to aerate? How important is it? How often? How deep? Deep tine aeration – coring or solid? Drill and fill aeration – How does it work? These are questions that we, as sports turf contractors, are answering numerous times throughout the season. Matt Johns, Communication Chairman for the PNW-STMA, asked if I would write an article on sports field aerating and the many options that were now available to field managers with the various types of equipment in the market place. This article will attempt to address some of these questions. The scope of the article will be limited to our experiences specifically with sports fields (we aerate over 300 sports fields annually).

The question is this – How important is it to aerate my sports field? The first three things that must be done to maintain the field are as follows:

1. Mow the turf.
2. Fertilize the turf
3. Water the turf (in many cases, summer irrigation is not possible, and this directly affects the quality of the turf).

Aeration is the next-in-line to make a difference on how well this field survives. Compaction is the biggest problem on both soil- and sand-based fields. A turfgrass plant that is never trod on and is growing in a healthy soil is, for the most part, healthy. The same grass plant that is continually being trod on, and thus having the oxygen supply squeezed out of the root system, is far from healthy. If there is a rest period during which the soil it isn't saturated, the grass will begin to recover. On the other hand, if this same plant is subjected to heavy play twelve months of the year – it is in desperate need of help. Field maintenance is a combination of many practices, and introducing air back into the root zone is a top priority. Thus the term "aerating" is derived from doing this very practice.

There are two excellent papers written by Tom Cook – Associate Professor of Horticulture at Oregon State University. I have listed theses titles at the end of this article. They deal with the total maintenance of both soil and sand based athletic fields and include recommended frequencies of aeration.

Often times the term 'aeration' goes hand-in-hand with the term 'coring'. With coring, an actual core of soil is removed from the soil. This is done by aerating with hollow tines. The tines are pushed into the soil and then retracted with the cylindrical plug that has been removed. This action not only reduces compaction but also introduces air into the root zone.

Normal shallow core aeration

(1-4 inches in depth) There are basically three types of aerators – the disk and drum type of aerators and those that are driven by a crank shaft.

1. Disk type of aerators: The disk type of aerator has tines attached to a heavy disk and as the machine travels a tine will enter the ground and remove the core. This type of machinery was all that was available for many years and was considered the standard. This type of machinery is moisture sensitive. The amount of penetration is drastically reduced if the field is moderately dry. When moisture conditions are ideal they can achieve great penetration – the only disadvantage is the possibility of tearing and lifting the turf as the core is removed. Tine sizes vary.

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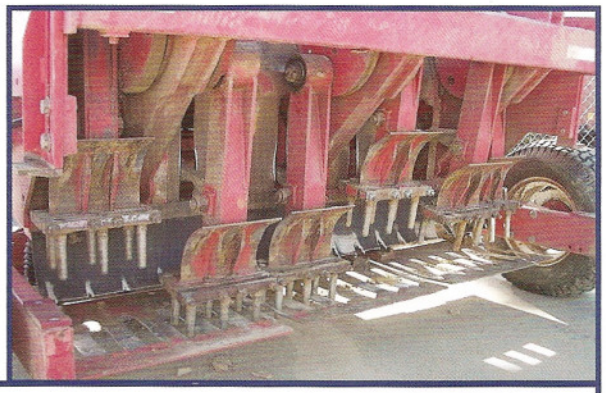

2. Drum type of aerators: These machines were introduced to initially combat the tearing of the disk machines. The tines are attached to a large radius drum and are allowed to pivot. Thus the tearing of the turf was reduced. The penetration into the soil requires ideal moisture conditions or very heavy down pressure.
3. The crankshaft driven aerators: These machines work on the same principle as golf course greens aerators. The aeration tines enter and withdraw from the ground vertically and thus tearing is minimized. The degree of penetration into the ground is directly related to the weight and the hydraulic down pressure that the machine can generate. These aerators usually have a closer hole spacing, consistently remove a more uniform core, and do not tear the turf. Even though these machines are slower than the disk and drum type of aerators, the quality of the job they do is worth the time differential.

<u>Slicing types or aerators that do not remove a core</u>

These machines do not remove any core, but with a twisting action loosen the soil and introduce air into the root system. They are a very good tool to use, in between the core aerations, to keep the water moving through the surface but do not eliminate the necessity to core aerate.

Deep Tine Aeration

In farming, there is a condition that is created called a "plow pan". This is a zone just beneath the plowing depth of a field. After repeated plowings the plow pan needs to be broken up with a sub-soiler to permit better water infiltration through the soil profile. Likewise, repeated shallow aerations (4 inch depth) will create an "aeration pan". Deep tine aeration will help eliminate this zone.

Deep soil tine aeration.

Deep Solid Tine Aeration

The name implies introducing air into the soil to deep depth; the name is appropriate because a solid tine is used. (The first machines that were developed did not do deep tine aeration but verti-draining). The tine enters the soil to a prescribed depth, and then has a shattering action within the soil – this is a forward and back action that occurs below the surface. This movement breaks up the compacted area, or plow pan concept, and permits water to better infiltrate the sub soil. Air does enter the soil through the opening caused by the solid tine, but the surface closes much faster than if a core were removed. The value of this practice is to mechanically loosen the deeper soil in order to enhance water movement. Deeper rooting will occur if excess water that is trapped in the root zone has the opportunity to drain. The average depth used for this practice is often based on the depth of

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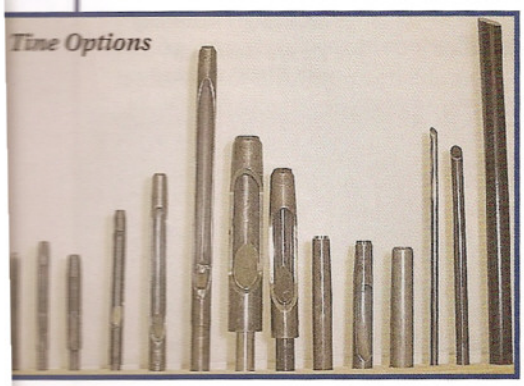
the irrigation system. If you consistently do this annually to a depth of 10-12 inches you will see good results.

Deep "Hollow Tine" Aeration

This operation involves actually removing a soil core. Most deep tine aerators have adjustments that can reduce the amount of shattering action as the tines enter the ground; therefore it is possible to use hollow tines to remove a core. Due to the power and weight of these machines, it is feasible to remove a soil core to a depth of 10" with a core diameter of up to 1-1/4 inches, depending upon the soil type.

Do sand fields need to have the soil in the lower profile loosened?

There is a tendency for even the best sand fields to become slightly cemented. The percolation rate of the sand is always greater after immediate installation because the turfgrass is not established enough to slow the rapid infiltration of water. Thus some of the fine particles migrate and fill in the voids. It is a wise practice to loosen these fields at least once per year. The average depth does not need to be much greater than 6-8 inches.


Tine Options

Tine options: There are almost as many tine options as you can visualize. Here is a picture of the variations that are available. The limitations are restricted as to whether or not your aerator can support the variations.

Drill aeration: This involves a machine with multiple small augers. The drill can go down to a depth range of 16-18 inches. The spacing between the augers is from 3-6 inches. These machines with draw the material up the auger shaft and leave it around the hole on the surface. Because the soil is removed there is a better tendency for the holes to remain open through the soil below the surface. The surface will close with normal traffic but the area 3-4 inches below the surface remains open.

McKay drill fill

Drill and Fill: This machinery drills a shallower hole usually between 8-9" in depth with a hole diameter larger than the deep drills. The size is generally 1" in diameter. Following the extraction of the soil, another type of material is placed in the open hole to ensure that the passage will remain open to the surface. This operation is used to change the soil profile characteristics. In reality, this procedure can introduce a firmness to the area – not necessarily because it is draining better, but because you are putting a material back into the holes that offers stability. However, when straight sand is placed back into the holes with the expectations that it will increase stability – we found this to be a misnomer. Sand will mix readily with the exisiting soil and stability is not realized. If a product such as a calcified clay or diatomateous earth is placed in the holes, the stabilizing effect is very notable.

Old aerator.

The importance of aeration cannot be denied. With the vast amount of equipment available – a person could become discouraged when all they have is an old-fashioned aerator sitting in the corner. That machine may seem like it isn't worth using. This couldn't be farther from the truth; any aeration is far better than none. On the other hand, if you choose to use a sports turf contractor, they may be using some of the best equipment available.

The information in this article only scratches the surface when it deals with the vast amount of equipment on the market for aerating and closely related practices. A recent article in the September, 2006 issue of the USGA Green Section Record, (a publication on Turfgrass Management) entitled "Customized Cultivation" by Bob Vavrek gives an extensive listing of the types of machinery and options available. The two publications by Tom Cook are as follows: "General Maintenance Strategies for Sand Base Athletic Fields in Western Oregon" and "Maintenance Standards For Soil Base Soccer Fields."

Dick Fluter, President of Pacific Sports Turf, can be reached at www.pacificsportsturf.com. ✦