

# **Everything You Wanted To Know About Aeration But Were Afraid To Ask!**

By Bryan Wood

Whether on sports fields, golf courses, or playgrounds, no turf area is immune to the devastating effects of compaction. If you have attended your favorite high school's Friday night football game and looked at the center section of the field, you may see some very sparse turf. Compaction contributes to this obvious high traffic problem and is easy to spot. Other compacted areas can be seen around the goal on a soccer field, the path that always appears between the same two bunkers every time people walk from their cart to the green, or just where people take that proverbial shortcut through the grass to the sidewalk. These are only the visible signs, just the "tip of the iceberg", of the compaction problems that are really present in your soil.

Now that you know it's there, it must be remedied. The primary means of relieving compaction is through mechanical cultivation, namely aeration. You can choose many methods of aerifying for the differing conditions and situations in a given area, and each will yield differing results. Which method is best: deep or shallow tine, coring or solid tines, slicing blades, or vertical linear aeration (deep power slicing)? How to choose what's right for you is the question we want to answer. Having been in the aeration business for over twenty years and having visited thousands of golf courses, athletic complexes, and sports fields in the U.S., Canada and Mexico, I have found that the problems are all the same and the options have clear advantages and disadvantages. Let's tackle some frequently pondered decisions.

## **DEEP TINE VS. SHALLOW TINE:**

The age-old question is, should I deep tine or shallow tine? Several years ago, Dr. Houston Couch of Virginia Tech spoke on the subject of deep tine aeration and I heard a golf course superintendent ask, "My old aerifier went three inches deep and the root system stopped there. My next aerifier went four inches deep and the roots stopped there. Now I started deep tine aerifying and my roots seem to be stopping there. What can I do now?" Dr. Couch looked perplexed and humorously responded, "And what's the problem with ten inch roots?" That little remark encompasses my view in a

nutshell. Given the choice, go deep. It's true that the root system usually does stop where the aeration tine stops. But at ten inches deep, the root system will support a healthy stand of turf. I have even seen ten-inch poa annua roots in golf course greens! With a deeper root system from deep tine aerification, irrigation intervals can be lengthened, fertilizer applications last longer, and more oxygen is introduced into the soil. Some other benefits to deep aeration should be mentioned. For example, some golf courses have completely amended the top 12 inches of their greens soil profile through the creation of deep sand tunnels from topdressing after using large tines and up to 1-1/2 tons of sand per thousand square feet! This amounts to virtually rebuilding the green from the inside out without taking it out of play and results in a savings of thousands of dollars. The old rolling type shallow aerifier is still cheap and fast, but there is minimal compaction relief and generally produces tufting around the holes. Now with the new designs of deep tine heaving machines that are faster than ever before (over two acres/hour), deep tine aeration is now even a more economically feasible option for multiple athletic complexes or golf course fairways. As a side note, before you start a deep tine aeration program, just make sure the irrigation lines and wires are deeper than then the aerifying depth. I've seen lots of "scenic fountains" pop up unexpectedly during deep aerification.

## **STRAIGHT UP AND DOWN (SUD)**

**VS.**

## **HEAVING ACTION:**

Another question to answer is whether to choose a machine with "straight up-and-down" (SUD) tine action or heaving action. I recommend a heaving action aerifier for most applications. Due to the SUD action of conventional aerifiers, compaction relief between the holes is minimal at best. SUD aerifiers, although still manufactured, are a bit out of date given the newer technologies available in aerifying. Even the vertical drilling machines produce little to no compaction relief between the holes. I recommend choosing an aerifier with a positive heaving action that breaks up the compacted soil *between* the holes. This introduces needed oxygen, will increase the total cation (kat-i-on) exchange capacity, and can improve drainage both horizontally and vertically throughout the soil profile. Plus, at the bottom of each stroke, the heaving tine is moving horizontally as it is moving vertically, thus having a slicing plus a lifting action to the turf. This type of action minimizes the creation of a hardpan layer caused by the traditional pounding action of the old SUD aerifiers. Rather than

compressing the soil and actually adding to the compaction problem, the process of “heaving” displaces the soil upward, raising the playing surface from “not noticeable at all” to “ $\frac{1}{2}$  to  $\frac{3}{4}$  of an inch”, depending on how the machine is adjusted. Matching the extent of the heave for the given soil conditions can be critical in producing good quality results. For example, after using needle tines, the putting surface should be smooth without using any topdressing and should putt smoothly even after using larger tines and a light topdressing.

### **SOLID TINE VS. CORING TINE:**

Here is another brainteaser question to answer. Should you use solid or coring tines? The answer depends on what you're trying to accomplish. Although solid tines are available in either SUD or heave action aerifiers, I recommend using a heaving machine when choosing solid tines because an SUD aerifier with solid tines can do more damage than good. To the good, SUD aerifiers with solid “shatter tines” will shatter the soil, but only if the conditions are desert like, rock hard, or bone dry. Consequently, the aerifier would have a hard time driving the tines into the ground to any considerable depth without causing undue damage to the turf and the machinery. SUD aerifiers with solid tines can be used successfully as a shallow pin spiker (possibly on hydrophobic greens or “in season” athletic fields) but are really only good for opening the thatch surface during high stress times allowing for quick water and air penetration with minimal disturbance to the surface or sub surface. Again, this is only opening the surface, not relieving compaction. Be careful not to use this method too much or an even more serious problem will develop. The SUD aerifier will create a “sheep’s-foot roller” effect and a really bad hardpan layer in the soil profile. I’ve seen these hardpan layers so severe that not only was there a toxic gas build-up underneath but the soil also had a toxic chemical layer. So when using SUD aerifiers, whether going deep or shallow, you should avoid using solid tines and stick to coring tines for compaction relief. Solid tines can effectively be used with deep tine “heaving-type” aerifiers with little or no damage to the turf and will relieve the shallow hardpan and toxic layer created by the SUD machines. With solid tines ranging from  $\frac{3}{16}$  -1 inch in diameter and 6-16 inches in length, the ground doesn’t need to be bone dry but only needs sufficient moisture for optimal penetration and compaction relief. You will need to be mindful not choose an aerifier that merely pokes a hole (deep or shallow) with no heaving action, as they are just “shatter tining” and can actually contribute to the compaction problem.

Turning to the subject of coring tines, you will find that almost all aerifiers offer some type of coring tine. Most people think you have to pull a core for thatch removal, but the process only provides 5% of the total thatch removal necessary. About 95% of thatch control is normally maintained by verti-cutting and topdressing, or in the case of athletic fields, physical destruction by player's cleats. On a golf course green, this important 5% less thatch removal done when using a solid instead of a coring tine can cause trouble during hot, high stress times when the thatch can become hydrophobic and repel irrigation water. Ironically, maintaining a certain amount of cushion, or thatch layer, is good and most athletic field managers would love to have some thatch in the middle of a football field. This helps protect the crowns of the plants plus keeps players from making a muddy "pig pen" of the field during wet conditions. The only other advantage in using a coring tine on an athletic field is to bring soil to the surface for topdressing, but even this usually doesn't outweigh the benefits of virtually no-mess solid tines. Just order a few extra tons of topdressing material to make up for not bringing up the extra soil. To reiterate, on golf courses one should add an extra verti-cutting and topdressing if opting for solid tine aeration. Your turf will love you for it, and the channels created with the deep tine make a permanent chimney of sand allowing water and roots to penetrate with ease and flourish.

## **VERTICAL LINEAR AERATION (VLA)**

**VS.**

### **RECIPROCATING:**

Another choice to consider for compaction relief is the relatively new method of deep power slicing, technically called vertical linear aeration (VLA). The soil loosening capability of this machine is similar to that of the deep tine heaving machines. The difference is in the consequences of the VLA's use of blades rather than tines. VLA's accomplish aeration by driving long 10 to 16 inch blades through the soil. They are mounted on a rotating shaft and powered by a chain drive from the PTO driven gearbox. These blades are offset in their mounting so as to penetrate the ground in alternating fashion and create a side-to-side "wave" action to loosen the turf. They do not bring any soil to the surface but do provide a considerable degree of compaction relief. VLA machines produce a continuous slit in the ground which are slightly more prone to drying or desiccation along the edges of the slice. As with most types of aeration, low mowing heights such as on greens or fairways will require increased irrigation during the healing

time. VLA machines can usually penetrate deeper in the same soil conditions than a reciprocating deep aerator can. Since this machine uses far fewer moving parts, it is easy and less expensive to maintain. I recommend this method for heavily compacted soils that may be extra hard or rocky and more difficult for a deep tine aerator to penetrate. These machines can also be equipped with a sand hopper that will gravity feed sand into the slits for improving the drainage.

### **ROLLING SLICER:**

The slicing roller, yet another aeration choice, sounds very simple...that's because it is. Slicing, although not really intended for compaction relief, can be beneficial to turfgrasses that produce stolons and/ or rhizomes such as blue, Zoysia or Bermuda grasses. By slicing the stolons and rhizomes, new mother plants are created that will send out new rhizomes and stolons with a vertical growth pattern. This also gets accomplished with V.L.A. and to a lesser degree with any of the aforementioned techniques. As far as loosening the soil, the effects are generally minimal. In fact, the compaction can be increased through the "sheep's-foot -roller" effect with extended use. Therefore, some kind of compaction relief program needs to be utilized. Some slicing models are designed with twisted or angled heaving knives to provide some compaction relief. These do have some loosening capabilities, but may cause damage to the turf. It is a cheap way to aerify if you can afford the healing time.

### **PREVENTATIVE VS. CURATIVE:**

I'm frequently asked how often one should deep aerify. The answer is really in understanding deep aeration as a means of *preventing* compaction rather than relieving it. As a golf course superintendent, I deep aerified greens every spring and fall and needle-tined greens during the summer months; I also deep aerified my Bermuda grass fairways during the summer, all with a deep heaving machine. In this way, the problems associated with compaction were greatly reduced and my turf generally flourished even in hot weather. If you are responsible for maintaining sports fields, you could adopt a program of deep aerating as often as desired. If you are working on a tight budget, this may determine the frequency of your aerification program. For example, if you own a machine, a program of on-going use doesn't cost much more than the occasional use, just additional topdressing, tines, and labor. If you choose the on-going program you will find that the tremendous savings in applied chemicals, irrigation water, and greens (or athletic field) rebuilding will more than offset the purchase price of a deep aerator! For

those with limited budgets, financing a machine is a solution to getting this regular usage and the accompanying savings. Many customers, however, hire a contractor to get the job done. They have a couple of reasons for contracting the job out: they are relying on experience of the personnel and want to see results before they make their purchase. Also, just a spring and/or a fall deep tine aerification program yields unparalleled results as compared to conventional aerifying and is very reasonably priced by many contractors. Be sure to choose a company who uses the best aeration equipment and employs experienced operators with the knowledge to make correct decisions for your turf conditions. Knowing the proper machine adjustments, hole spacing, tine choice, soil/ turf tolerance, and weather conditions will greatly impact customer satisfaction in terms of healing time and playability.

### **Oscillating Solid Tines: Such as the “Aera-Vator”**

While a little too aggressive for fine turf areas such as golf course greens, these types of machines are a good choice for fairway, rough, and athletic field applications. These machines do an excellent job of loosening the top 4-6 inches of the soil profile. They use only solid tines and don't pull out or destroy any of the existing turf. This type aerifier ranked among the highest tested for compaction relief in the top 5 inches in a University of Georgia study. They can also be fitted with a seed box for seeding while aerifying.

Although discussion of every brand and type of aerifier on the market is about impossible, I hope this overview will be helpful to you when making an aerification decision. Whether purchasing an aerifier or hiring a contractor, the proper machine and operator, combined with the proper tines or blades for the desired application, can make the difference between satisfaction and disappointment. Just remember, don't try too radical of an approach at any one time. The main thing to keep in mind for a successful, clean job of aerifying is not to force the machine beyond its capabilities and don't use too large of a tine or a spacing that is too close for the conditions. The soil didn't get compacted overnight and rarely can the compaction be completely alleviated in one treatment. The best route to optimal improvement is making all the right choices, and now, hopefully it is easier done than said.