Everything you wanted to know about . . . turf aeration

By Bryan Wood

No turf area is immune to compaction's devastating effects. Whether it's between the hashmarks, a goalmouth, or just a shortcut everyone takes through the grass, the damage from compaction is very easy to spot. When you see these visible signs of compaction they are just the “tip of the iceberg” and very likely there are similar problems present in your soil.

The primary means of relieving compaction is aeration. You can choose many methods of aerifying for the differing conditions and situations in a given area, and each method will yield differing results. What is best? Deep or shallow tine, coring or solid tines, slicing blades, 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 more than 20 years and having visited thousands of golf courses, athletic complexes, and sports fields in the US, Canada, and Mexico, I have found that the problems are all the same and the options have clear advantages and disadvantages.

Deep or shallow?

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 one attendee asked, “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 10-inch roots?” That little remark encompassed my view in a nutshell. Given the choice, go deep. It's true, the root system usually does stop where the aeration tine stops. But at 10 inches deep, the root system will support a healthy stand of turf. I have even seen 10-inch poa annua roots in golf course greens! Irrigation intervals can be lengthened, fertilizer applications can last longer, and more oxygen is introduced into the soil by using deep-tine aerification. Before you start a deep-tine aerification program just make sure the irrigation lines and wires are deeper than the aerifying depth. I have seen lots of “scenic fountains” pop up unexpectedly during aerification.

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 2 acres/hour), deep-tine aeration is now even a more economically feasible option for multiple athletic complexes.

Due to the straight up and down (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 heave action that breaks up the compacted turf between the holes. This introduces needed oxygen, will increase the total cation 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.

Solid or coring tines?

Solid tines are available in either SUD or heave action aerifiers. I recommend the latter because of the minimal damage with maximum results of a heaving machine. Using solid tines with a SUD aerifier can do more damage than good. With SUD aerifiers, solid “shatter tines” will go straight in and out of the ground and can only shatter the soil if the conditions are desert like, rock hard, or bone dry. 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. Obviously solid tines on a SUD machine are not a good choice for extended usage.

Because none of the S.U.D. aerifiers have any type of positive heave action, solid tines in these types of machines can only be used successfully as a shallow pin spiker (possibly on “in season” athletic fields), but are really only good for opening the thatch surface during high stress times. Again, this is only opening the surface, not relieving compaction. Be careful not to use this method too much or you will have a “sheep's-foot roller” effect and create 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. With solid tines ranging from 3/16 to 1 inch in diameter and 6 to 16 inches in length, the ground doesn’t need to be bone dry but only needs sufficient moisture for optimal penetration and compaction relief.

On 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.

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 pigpen 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.

Another relatively new aeration choice for compaction relief is deep power slicing that is accomplished by driving long 10 to 16 inch blades through the soil. These blades 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 to create a side-to-side “wave” action to loosen the turf. These blades do not bring any soil to the surface but do provide a considerable degree of compaction relief. This type of equipment produces a continuous slit in the ground and is slightly more prone to drying or desiccation along the edges of the slice. This type of vertical linear aeration (VLA) machine 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.

A slicing roller 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 bermudagrasses. 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 VLA and to a lesser degree with any of the aforementioned techniques. As far as loosen the soil, the effects are generally minimal. In fact, the compaction can be increased through the “sleep’s-footroller” effect with extended use. Therefore, some kind of compaction relief program needs to be used. Some methods 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.

**How deep?**

I'm most 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 in spring and fall, fairways in summer and needle-tined greens during the summer months. In this way, the problems associated with compaction were greatly reduced and my turf generally flourished even in hot weather.

Sports field managers 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 top-dressing, tines, and labor. If you choose the on-going program you will find that the tremendous savings in applied chemicals, irrigation water, and greens rebuilding will more than offset the purchase price of a deep aerator.

For those with limited budgets, financing 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 want to see the finished results and are relying on experience of the personnel 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.

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 hopefully it is easier done than said.

Bryan Wood is president of Commercial Turf & Tractor, Chillicothe, MO, which specializes in contract aerification services.
Getting ahead of field design and construction

BY JIM PUHALLA

If you are a sports field manager, grounds supervisor, or administrator in charge of sports fields, you may ask “Why should I care about principles of design and construction?” That’s a fair question. Hopefully, your fields have already been designed (and constructed) by people with sound knowledge of these principles who designed a facility that is easy to keep playable.

However, many of the daily challenges you face in preparing your fields for competition are profoundly affected by the decisions made by its designers sometime in the past. The more you know about how these decisions were made (and about errors which were made during the design process), the better prepared you will be to take the steps necessary to adequately support competition.

For example, field managers will be able to make better decisions about field renovation and/or maintenance based on a sound knowledge of field design. If a baseball field skinned area drains toward the outfield grass, the challenge would be to keep a lip from forming in that area so water can flow freely into the grass. If the skinned area drains toward the foul lines, then the grass in that area must remain flat for water to flow off the playing surface.

Many field managers are intimately involved in the process of designing and constructing new sports facilities. Under these circumstances, you have the option of simply leaving this work to professionals hired for the purpose. However, it’s worth considering that if these people make mistakes (and, sadly, sometimes they make serious ones), you will be the person responsible for cleaning up after those mistakes, sometimes for years to come.

If, on the other hand, you have taken time to familiarize yourself with the basic principles of field design and construction, you will be in a position to ask questions, make suggestions, and warn against errors. So the time invested in learning as much as you can about the design and construction process will pay huge dividends in time, money, and headaches.

Here are some of the most common design errors and solutions.

1. Incorrect Field Contours
* Sports field contours are expressed as percentage of slope. Any slope that is less than 1% (except baseball/softball infields which should be .5%) or more than 2% is considered to be incorrect. The preferred slope for sports field grass areas is 1.25% to 1.75%. Baseball or softball field skinned areas should be between .5% and 1.75%.
* A baseball or softball infield should never be the lowest point on the field but rather the highest point to enhance surface drainage.
* If the contour is not even and consistent, it is incorrect. A field with a 1.5% slope
should be graded evenly with an 1/2-foot difference in grade over a span of 100 feet.

2. Failure to Isolate Fields as Drainage Units
   * No field should be expected to drain away more water than what falls on it. Even if a field is built with correct contours, water running onto the field from another field or an adjacent area can seriously compromise playability in rainy conditions.
   * The preferred design isolates each field as an individual drainage unit by using swales and/or catch basins around the field, or by making the field higher than its surroundings.

3. Insufficient Clearance Around Field
   * Fields that are designed or constructed with insufficient clearance will have inherent problems: out-of-bounds areas may be too small for the safety of players, spectator areas may be cramped or unsafe, and surface drainage around the field may not work as intended.
   * Consider space requirements in the planning stages. Make sure there is enough space around each field before construction begins to prevent it from being "locked in" by other fields, parking lots, roads, buildings, etc.

4. Failure to Provide Sufficient Access
   * A well-designed sports field includes access roadways for players, spectators, maintenance equipment, and heavier renovation equipment including large trucks.
   * Parking lots should be centrally located to provide easy access, especially for elderly and handicapped fans.

Surveying and designing

In designing a field for reconstruction, the first step is to perform a topographic survey including spot elevations, dimensions of the field, and other structures in and around the field like fences, catch basins, swales, etc. (Surveying an existing field can be done by anyone who has experience using a level.) In planning for the reconstruction of an existing field, it’s helpful to shoot the elevations of the key points on the field; simply shooting on a grid pattern will miss the most important points that are critical to good playability.

For an existing baseball infield, be sure to take measurements to the backstop, dugouts, fences, and other structures. Shoot elevations at critical points, like home plate, pitcher’s plate, the bases, and the fence line. Make sure to survey the outfield on a grid pattern even if you’re planning on reconstructing the infield only. The outfield grade dictates what can be done to fix problems in the infield. Include the fence line and foul territory in your survey.

If you’re surveying an existing football field, shoot elevations every 10 yards down the center of the field and 40 feet increments toward the sidelines. Include at least 20

Who’s telling your story?

Your work results in more available oxygen and fewer allergens, noise reduction and lower cooling bills, thicker turf that filters pollutants and landscapes that increase property values. There are endless environmental, economic and lifestyle benefits that green spaces provide—yet consumers don’t know about them. They don’t understand the true value of your products and services.

Join us in telling the whole story of what you do. Project EverGreen is an organization dedicated to educating the public about the value of green spaces and encouraging responsible practices.

To make a contribution or find out more, call 877-758-4835 or visit www.projectevergreen.com.
feet outside the field to make sure the grade will carry water off the playing area. In my experience, a crowned field may need the addition of 4 inches of soil from the center of the field to the hash marks to reestablish the crown. Follow the same procedure for all rectangular fields establishing a grid starting at the center line.

Many people assume football fields are crowned down the center when in fact many fields are built with a side-to-side slope. This design works as long as someone doesn’t try to recrown the field. Adding soil along the center line of a side-to-side sloped field will cause the upper half of the field to become muddy in rainy conditions because the additional soil leaves the upper half of the field level or with very little slope.

When designing a new field it is wise to hire a professional surveyor to do the topographic survey. Property lines, utilities, structures, and other limits of construction must be shown on the plan. Simple grid patterns used by the amateur surveyor will not locate these items accurately like the total station instrument that professional surveyors use.

The Mete-R-Matic XL makes top dressing simple and fast

The new Mete-R-Matic XL, specifically designed for sports turf, features the same technologies that made the Mete-R-Matic III the leading top dresser on turf. The patented Chevron belt allows you to accurately and evenly distribute material, regardless of moisture content. The ground drive system assures that your material will be spread evenly, regardless of vehicle speed. Plus, the XL features a larger, 2.25 cubic yard hopper so you get the job done fast. For more information, a demo, or to learn more about top dressing, call 1-800-679-8201.

Circle 155 on card or www.oners.ims.ca/5063-155
**HUSTLER SUPER Z 26-HP**

Hustler Turf Equipment's Super Z now features a 26-hp Kawasaki liquid-cooled engine with no mules drives or gearboxes, the vertical crank means simple, direct-drive to deck. Engine sits lower in frame for better center of gravity and performance on slopes. Also features SmoothTrak twin-lever steering with automatic parking brake.

Hustler/800-395-4757
For information, circle 066 or see http://www.oners.ims.ca/5063-066

---

**BOBCAT DOZER BLADE**

Bobcat Company now has a new 96-in. dozer blade model that fits large-frame Bobcat loaders, enabling the machines to excavate and grade more material. There are more than 60 versatile attachments compatible with Bobcat compact equipment. The 96-in. dozer blade complements the 80-in. and 90-in. dozer blade attachments; the 1,500-lb., six-way adjustable dozer blade features an all-cast design for strength and a reversible three-piece cutting edge for extended life.

Bobcat/901-241-8700
For information, circle 067 or see http://www.oners.ims.ca/5063-067

---

**MAINTENANCE CATALOG**

Tomark specializes in field maintenance equipment. A wide selection of traditional maintenance equipment along with many hard-to-find or one-of-a-kind products sets Tomark Sports apart, says the company. Find quality products at competitive prices in both the Baseball/Softball Catalog and Multi-Sport Catalogs.

Tomark/800-999-1844
For information, circle 068 or see http://www.oners.ims.ca/5063-068

---

**EXPECT MORE**

from Your Weather & Turf Management Systems

![Image of Lightning Football System]

**WEATHERBUG OFFERS...**
- 27 weather data parameters from your site
- Active alerts based parameters you define
- Composite Maps that include current weather, current weather contour, NEXRAD radar, current satellite info, and lightning for better analysis and forecasting
- Historical data
- Lightning forecasts and strikes data
- All on one easy-to-use web interface that can be accessed by any PC with an Internet connection.

WeatherBug, owner and operator of the largest weather network in the world, is proud to offer the most comprehensive weather and turf management solution available.

Call us today to learn more about the cost-effective program used by NFL and MLB franchises to better manage their venues. It will change the way you operate your facility.

Contact Stuart Margel at 1-800-544-4429, ext. 4117 or e-mail smargel@ews.com.

Circle 156 on card or www.oners.ims.ca/5063-156

---

http://www.sportsturfmanager.org • STMA

SPORTSTURF 37
BROYHILL'S ACCUAIRE
This core aerator's FlexWing design allows it to follow the contour of the ground, providing even penetration. The solid steel frame and extra-wide racks add weight to maximize core depth in all types of soils. Equipped to use slicer blades or core spoons, the AccuAire is available in 69 or 93 in. Units are equipped with a hydraulic lift, and hook up easily to utility vehicles equipped with hydraulics or three-point hitch. Broyhill/800-228-1003, x34
For information, circle 061 or see http://www.oners.ims.ca/5063-061

TORO PROCORE
The Toro ProCore 660 aerator, with a 60"-in. width, can cover up to 1.5 acres an hour with 5-in. hole spacing. Designed for large areas, the 680 aerator has 80 in. aeration width for up to 2 acres per hour performance. Both units are tractor mounted and feature the triple belt design for durability and performance in tough soil conditions. Toro/800-803-8676
For information, circle 060 or see http://www.oners.ims.ca/5063-060

FIRST PRODUCTS’ VC-60 VERTI-CUTTER
This unit is designed for continuous heavy-duty operation on all sports fields and all types of turf. VC-60’s feature a patented swing hitch that allows you to verti-cut around objects while turning without tearing established turf. Cutting depths are adjustable in the field, without tools, using quick release pins on 3/16-in. increments. First Products/800-363-8780
For information, circle 062 or see http://www.oners.ims.ca/5063-062

CYGNET TURF travels the country stripping and installing sports fields with its patented equipment. In addition, we’ve also supplied the following teams with our sand-based sports turf:
- CHICAGO BEARS PRACTICE FACILITY
- MINNESOTA VIKINGS PRACTICE FACILITY
- INDIANAPOLIS COLTS PRACTICE FACILITY
- ST. LOUIS RAMS PRACTICE FACILITY
- BALTIMORE RAVENS PRACTICE FACILITY
- SOLDIER FIELD
- KANSAS CITY ROYALS
- CLEVELAND BROWNS
- TOLEDO MUD HENS
- CINCINNATI BENGALS

So whether it’s your turf or ours, call CYGNET TURF when it’s time to install!
Phone: (419) 354-1112
Farm: (419) 655-2020
Fax: (419) 352-1244

Circle 164 on card or www.oners.ims.ca/5063-164

TURF: I”upmenf
Phone: (419) 354-1112
Farm: (419) 655-2020
Fax: (419) 352-1244

Circle 164 on card or www.oners.ims.ca/5063-164

SPORTSTURF • http://www.greenmediaonline.com
26th Annual International IRRIGATION SHOW
PHOENIX, ARIZONA
NOVEMBER 6-8, 2005

- Exhibition: World's largest ALL-IRRIGATION display!
- Education Courses for working professionals
- Certification Exams: earn special designations for your expertise
- Technical Sessions present the latest irrigation concepts
- Business Seminars help you build your business
- Industry Tours provide a close-up look at regional irrigation
- New Product Contest features the latest products
- Networking Opportunities: this is where it happens!

Sun-drenched Phoenix is where the irrigation industry will gather in November! See what's new, talk to pros from all over the world, take home new skills, new ideas and new contacts!

Irrigation Association®
6540 Arlington Boulevard • Falls Church, VA 22042 USA • +1.703.536.7080 • +1.703.536.7019 fax

For more information...Fax this form to +1.703.536.7019 today or visit www.irrigation.org

☐ Send me information about attending the world's biggest irrigation show, including the education and certification programs that will be offered.

☐ Send me information about exhibiting.

Please print legibly in dark ink

Name ________________________________
Title ________________________________
Company ____________________________
Mailing address ________________________
City ___________________ State __________
Zip/Postal Code ________________ Country (outside US) __________
Email _______________________________
Telephone ___________________________ Fax ____________________
**SISIS ROTORAKE TM1000**

SISIS has developed a tractor-mounted, PTO-driven deep de-thatcher/linear aerator with a working width of 39 in., and with floating unit to follow ground contours. With the collector box fitted, the TM1000 will work to a depth of 1 in., or without collection to 2 in. Operating depth is simple and quick to set. A range of blades is available to suit various requirements.

SISIS/864-462-5772
For information, circle 063 or see http://www.oners.ims.ca/5063-063

**WIEDENMANN’S TERRA SPIKE XF**

This deep aerifier can aerify at a depth of 8 1/2 in. at the speed of a shallow aerifier. The exclusive twin drive transmission can produce square hole spacing of 2 1/2 in. and 5 in., with a forward travel speed of 1.2 and 2.4 mph respectively. The quickset feature of the central depth adjustment and the central angle adjustment allows depth and angle adjustments to be performed on the fly. The shock absorbing systems, VibraStop and PowerPack, remove any vibrations resulting from the high aerification speed.

Wiedenmann NA/912-790-3004
For information, circle 064 or see http://www.oners.ims.ca/5063-064

**FREE PAINT GUN WITH QUALIFYING PURCHASE**

The B200 – Simply the best “all in one” Athletic Field Maintainer, ever!

“The KROMER’s great design, durable construction and extremely low maintenance has proven to be one of our best purchases...”

Robert Hudzik
Stadium & Athletic Field
Supervisor
Penn State University, PA

441 S. Fretz
Edmond, OK 73003
Office: 405.359.3775
Toll Free: 888.287.9657
Web: airfieldsystems.com

**The game must go on.**

No more wet, muddy or frozen fields. Ever. Whether you play on grass or artificial turf, the Airfield’s sports drainage system is for you. We move water 13 times faster and reduce irrigation requirements by up to 70% over any other system, with a Gmax rating up to 16% lower for enhanced player safety. And if that wasn’t enough, our Airforce system keeps your field cool during high temperature play and warm to prevent snow and ice buildup. With all that you have going on above your turf, isn’t it time you thought about what you have going on beneath it?

Circle 166 on card or www.oners.ims.ca/5063-166

**SPORTSTURF • http://www.greenmediaonline.com**