

Aeration and Topdressing:

Applying Technology To Reduce Disruption

Aeration and topdressing are two of the most disruptive cultural practices in turf management. The fact that rebuilding, the alternative to aeration and topdressing, is considerably more expensive and disruptive is often overlooked or simply not understood by athletes and golfers. Since these practices take some extra explanation to turf users, it is important to maximize their benefit.

Meanwhile, manufacturers are working on ways to speed up or reduce the disruption caused by aeration and topdressing. More attention is being paid to the depth and pattern of aerators in order to get the most out of each aerification. Machines to collect or pulverize aeration cores have been introduced. New and existing methods of aerating without producing cores are being examined more closely. Solid tines, colter blades, vibratory plows, and even jets of water may all have a role in aeration in the future.



HydroJect 3000 Aerator by Toro uses jets of water to cultivate rootzones.



Ryan 48-inch Lawnaire for three-point hitch tractors.

Topdressers have also been refined to increase their speed and cause less disruption in play. Rotating brushes have been incorporated to force material into the turf stand where it won't disrupt use of the surface. In addition, many machines feature brushes or drags to work the material down to the soil surface. Effort has been taken to reduce the footprint and wear of topdresser tires. Emphasis is being placed on making the machines easy to load and of sizes appropriate for specific sites, such as greens, fairways, and sports fields. By keeping the center of gravity of topdressers low, manufacturers provide machines with greater stability on slopes and mounds.

To make aeration, and especially topdressing, available to a greater number of athletic facilities, contractors have begun to specialize in these services. In eight hours, a contractor can recondition all greens and tees on an 18-hole golf course using the latest equipment and trained crews. Larger areas, such as fairways, stadiums, practice fields, and parks can be brought back to top condition by a contractor with a minimal amount of disruption to play or other scheduled maintenance. Golf courses, parks, or schools which either can't justify the cost of equipment used only a few times a year or don't have the necessary staff can now benefit from aeration and topdressing.

The need for reconditioning can also be quantified today. Universities are now utilizing diagnostic equipment for measuring surface hardness, water infiltration, root depth and density, and other soil characteristics to study the effectiveness of aeration and topdressing. They are beginning to provide some valuable information regarding different methods and the frequency required to maintain healthy turf under heavy use.

Furthermore, some of the diagnostic equipment is now available to turf managers. By testing these areas every few weeks and maintaining records of soil conditions, turf managers can accurately

gauge the frequency needed to keep these areas in shape. By comparing their records to use levels, such as rounds or games played, they can stay a step ahead of compaction. They can also track the effects of weather conditions, irrigation, and different sports on turf rootzones. Finally, they can pinpoint problem areas and adjust maintenance levels accordingly.

A certain amount of background is necessary to fully grasp aeration and topdressing. Aeration is widely recognized as a way to relieve soil compaction and improve soil texture from the surface. By creating channels for air, water, and nutrients in the rootzone, turf managers realize a long list of benefits. Among them are greater depth and density of roots, improved infiltration of water and fertilizer solutions, a small yet helpful reduction in thatch, and a softer, more resilient surface for footing or ball bounce.

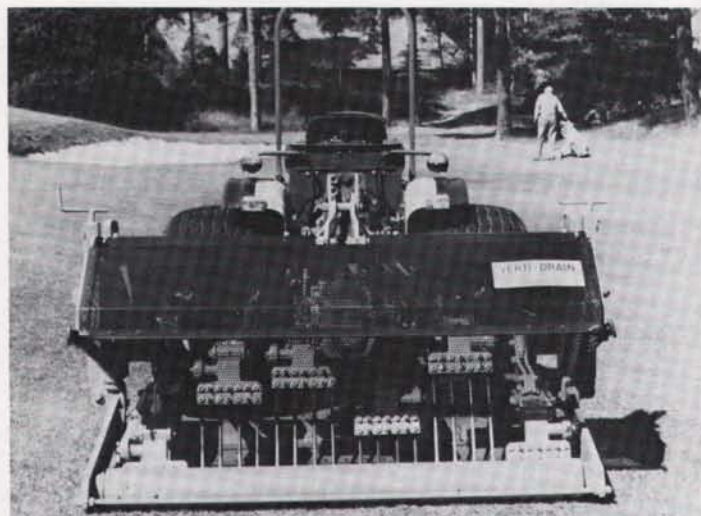
"We know that shoot growth is reduced 50 to 75 percent in compacted, oxygen-deficient soils," says Dr. Mike Agnew of Iowa State University in Ames. Turf growing in compacted soil doesn't begin to approach its potential for root and shoot development. Aeration more than doubles the plant's ability to recover from traffic and other related stresses. Few cultural practices can provide this degree of improvement.

Agnew adds that the benefit of shallow cultivation (less than four inches) is limited if the soil below this level is poor. "The core holes provide a port or entry for air, water, and nutrients, but only to the depth of the tines," he points out. For this reason, Agnew sees increased interest in aerators that reach depths of ten inches or more.

On the other hand, he does not want to draw attention away from conventional aeration. "Superintendents and sports turf managers should aerify at least once a year," Agnew states. "Five or six times a year may be needed for heavily used sites. Practice fields generally require more aeration than game fields. Since most of the players' time is spent on practice fields, that is where the turf manager needs to focus maintenance."

Concern over creating a hardpan layer at the depth of tines after frequent aeration is currently being addressed by researchers at various universities across the country. Research by Dr. Martin Petrovic at Cornell University in Ithaca, NY, and Dr. Paul Reike at Michigan State University in East Lansing has established that tines create certain types of compaction after repeated use.

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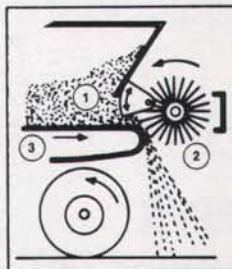
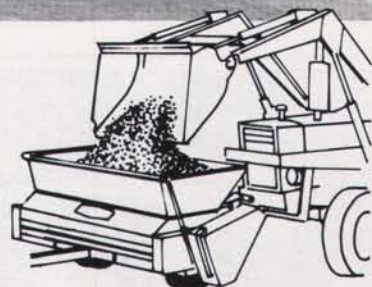
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Studies to clarify the effects of different types of aeration devices are now being conducted by Dr. Robert Carrow at the University of Georgia in Experiment, GA. "One of the biggest hurdles we have to overcome is realizing that all types of cultivation create some degree of compaction in the soil," states Carrow. "We need to look at the net benefit to make sure that the amount of compaction relieved is greater than the amount of compaction caused by the machine."

Until Carrow's results are published later this year, he advises turf managers to alter the depth of tines between aerations. Preliminary observation indicates that the benefits of conventional aeration can be increased by periodic deep aeration. This suggests that more than one type of aerator may be needed for a comprehensive cultivation program and that tine depth adjustment is an important feature of aeration equipment.

Topdressing improves and strengthens some of the benefits of aeration while smoothing the surface and amending poor soils. Broken-up aerator cores are essen-



Sand Tote by Star City Fabrication improves handling and transportation of topdressing materials.

tially a type of topdressing. By mixing core material with thatch, conditions for soil microorganisms improve within the thatch layer. This leads to more rapid decomposition of thatch and may eliminate the need for clipping removal after mowing.

Agnew advises that any topdressing should closely match the soil on site. Topdressing with a different soil mix will create layers in the rootzone that can ham-

per drainage, irrigation, and rooting.

"Both the soil and topdressing should be tested beforehand," he warns. "Once you find the right topdressing, stick with it. When you buy topdressing, make sure you order enough for the entire year and store it on site. Don't get in a position where you have to change topdressing in the middle of the growing season."

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topdressing you will need during the year, it takes 30 cubic yards of material to apply a 1/4-inch-thick layer over one acre. To apply the same layer on a 5,000 square foot green requires almost four cubic yards. A baseball field would need almost three yards for the infield and 30 yards for the outfield. A regulation football field would require nearly 40 yards.

Agnew points out that topdressing is most cost effective for the high-wear areas of sports fields. You may only need to topdress between the hash marks on a football field or the goal areas of soccer fields. This further strengthens the case for matching the topdressing to the field soil.



Core Harvester attachment for Cushman Turf Truckster.

You don't want different soils within the same irrigation zone.

The most notable departure from matching soil with the topdressing is when a turf manager wants to amend an existing soil with sand. This is where many people get into trouble, says Agnew. "You can't sand topdress twice a year," he points out. "What you'll end up with is a layer of sand, a layer of thatch, a layer of sand, etc. A thatch layer can develop in a matter of weeks on top of the sand you put down. To keep up with the thatch, you need to aerate and lightly topdress on a three- to four-week basis. This requires a major commitment on the part of the superintendent or sports turf manager."

The value of sand in preventing compaction and improving drainage is widely recognized. Agnew stresses, however, that any sand should be tested for size, as well as water- and nutrient-holding capability, before it is applied to turf areas. "I'd rather see turf managers use topdressings containing approximately 80 percent sand, ten percent soil, and ten percent peat than straight sand," he adds. "These provide some margin for error."

Properly selected sand topdressings can

be dragged into core holes following aeration to improve compaction resistance. Core aerators can remove anywhere from two to 15 percent of the old soil, depending upon the diameter and pattern of the tines. If this soil is replaced by dragging sand into the core holes, a small degree of amendment is possible. Repeated aeration and sand topdressing are necessary to achieve any significant improvement.

"Initially, you may not see much of an improvement," Agnew admits. "Once you start topdressing with sand, you have to continue on a regular basis to get the

intended results. Remember, aeration is a necessary part of topdressing."

Turf managers and contractors are discovering that sand tends to settle into core holes following irrigation. As this occurs, topdressing may need to be reapplied to fill the holes to the surface. Once filled, the core holes do not collapse as they would without topdressing. These important pathways for air, moisture, and roots remain open to extend the benefit of aeration.

As pointed out in the June issue of *Golf & SportsTURF*, maintenance of sand-based

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rootzones is quite different from that of soil-based rootzones. Sand does not retain moisture or nutrients as well as clay or loam soils. Adjustments in maintenance and irrigation levels will be necessary as the sand portion of the soil increases. However, a gradual change to sand may be more manageable than switching from soil to sand by reconstruction.

"The cost of reconstruction being what it is, more and more golf courses, schools, and parks are willing to try renovation through aerification and topdressing," says Bill Stark, president of Turf Renovation, Inc., in Cortland, NY. Stark was formerly superintendent at Bellview Country Club in Cortland and started his business after realizing the potential for aeration services in his area. "Renovation requires a lot of material handling, specialized equipment, and labor. Since we have the equipment and staff, we are more efficient."

Stark has renovated more than 300 greens with a VertiDrain deep aerator. "We go over the green twice with solid tines, then pull 5/8-inch cores on a third pass and topdress," he explains. "The results have

saved our customers thousands of dollars." He also uses aerators made by Toro, Olathe, and Salsco (now Ransomes) and a turf conditioner by Yeager-Twose. "We match the equipment with the job to gain the greatest efficiency."

David Bouck, president of Golf Course Services in Hudson, FL, is another former superintendent who has built a business on aeration and topdressing. "During the busy season, superintendents can't afford to disrupt play in the daytime for aeration," Bouck points out. "We can get on the course in the evening and renovate greens and tees without disrupting play. We use lights if necessary. By the following morning, the course can open as usual, without missing a round."

Toro has taken a different tack to reduce the disturbance created by aeration. It has developed an aerator that uses jets of high-velocity water to slice through subsurface soil without disturbing the playing surface. The HydroJect 3000 has 11 nozzles spaced three inches apart. Blasts of water create channels in the soil between four and inches deep. They also fracture and lift the soil so roots can penetrate more deeply into the rootzone.

Research by Dr. Jeff Nus at Kansas State

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University has shown that vibratory plows and colter blades can also provide substantial improvement in soil aeration and structure. He discovered this when testing machines designed to inject synthetic polymers below the turf surface. "Our choice of methods to cultivate turf rootzones from the surface may grow in the coming years," Nus admits.

As the results of recent research projects start to surface, the indications are that

topdressing should be done in conjunction with aeration. Both need to be carried out relatively frequently in high-traffic turf areas to provide a significant and lasting effect.

Diagnostic equipment can now measure the effectiveness of aeration and topdressing. As a result, turf managers know how often they need to cultivate their rootzones and can better manage the disturbance such practices produce. ☺

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