

# The Physics of Aeration

In his last article, before his death, Jim Arthur explores the history of vertidrainage and the best aeration practices.

One might have thought that everything that needed to be said about aeration of golf courses had been written. Maybe, but obviously it has not all been read by all!

Clearly all good greenkeepers and perhaps most mediocre ones will accept that one cannot successfully manage any turf subjected to traffic without aeration. The old true story of what course management at all levels is up against bears repeating - for the umpteenth time! In my presence, many years ago, an irate peppery member accosted the respected Head Greenkeeper about slits in the green. "Can't you leave the greens alone for five minutes," he complained. The response, made in a measured and polite manner was: "Certainly sir, if you stop playing on them."

Aeration is primarily, of course, to correct the consolidation caused by traffic, both pedestrian and machines, and with ever increasing play, this has never been more intense. Such compaction destroys soil structure; reduces pore spaces, which roots as well as air and water occupy; impedes drainage; discourages root growth, causes stagnation and moss invasion but above all it encourages that age old enemy of consistent all year round good playing conditions, *Poa annua*.



Wiedenmann's Terra Spike XF is now a regular on many golf courses

This is acceptable where there is little or no winter golf, tell me where that is, save on courses where tarting them up in summer to produce those shaved, overfed and watered monstrosities - the Green is Great School pampering the professionals and so admired by many television viewers. *Poa annua* is really good for less than half the year and too often is unplayable in late winter.

The mark of excellence is to play to full greens all year round. In passing, we do seem to have progressed from my early advisory days, when it was standard practice on many inland courses to switch automatically to temporaries in late autumn and not to go back until just before Easter. Then of course few played winter golf except on links and heathland.

Of course, deep frequent regular aeration is probably one of, if not the most, important routine management tools but there is much more to it than merely sticking holes in the turf. For one thing there are very varied



Toro's ProCore 648 can aerate 18 greens in just over seven hours according to the company

types of 'hole makers' and it may be helpful to discuss what tines should be used where, when and how deep.

Perhaps the most misused form of aeration is hollow tining. The first tine to extract cores of soil was designed and produced by Paul's of Paisley in 1919. It was a great improvement on the old solid tining by hand forking which compressed the soil laterally, even if it did break up compacted layers and improve stratified soils, showing root breaks at changes in the soil structure derived from changing the type of top dressing. In passing, deep sections taken with a hole cutter reveal the past history of any green as effectively as the examination of annual rings exposed when trees are cut down.

Aeration was always recognised as vital, even a century ago.



Terrain Aeration's Airforce ride-on Terralift machine at work at Sherwood Forest Golf Club

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Until the entry of Wm. Hargreaves into the manufacturing of aeration machinery - he started Sisis in 1932 - such work was slowly and laboriously carried out by hand. Long lines of stalwart greenkeepers progressing backwards over greens in a rhythmic pattern of thrust, lever and withdrawal.

This is exactly the pattern on which the vertidrain was designed by the de Ridders in 1980. Though few remember it, I am proud to have been the introducer of this now universally used and valued deep aerator - with the help of a small plant hire firm, Charterhouse, who then had a small factory a mile or so from where I then lived. I well remember getting the first few courses, including Sunningdale and Walton Heath, to aerate all their greens.

Let us revert to the problems of aeration and especially the limitations of hollow tining. More harm than good results in using hollow tines at the wrong season or for the wrong reasons. You may guess that I use hollow tines only for specific reasons. Used at other times or as a routine hollow lining often does far more harm than good. I am naturally a great advocate of the benefits of aeration and also believe that what is discovered, as the best programme for one course is not necessarily the best for another.

What then are the snags as opposed to the benefits? First and foremost is that hollow lining was invented 85 years ago as a soil exchange procedure. When greens were unimproved and generally on heavy soils, it made sense to extract a small percentage and replace it with sandy compost. On sandy soils, e.g. links and heathland and on perched water table sandy rootzones, one certainly does not want to remove physically ideal rootzones. It is not only very wasteful even if cores are broken up and brushed back in, but alters the consistency of rootzones.

A second problem is that the holes are necessarily large. If they were not, breakages of very thin tines would be prohibitively expensive. These large holes provide ideal invasion points for weeds but especially for *Poa annua* to enter erstwhile tightly knit turf that effectively barred seeds getting a foothold. Far too often I have seen previously 'pure' bent/fescue greens spotted like dominoes with small seedling *Poa annua* growing in every tine hole - yes even years ago at St. Andrews' Eden Course, when unadvisedly hollow tined in spring, just when *Poa* is starting to seed vigorously.

If you must hollow tine for soil removal reasons, it must be in winter, given suitable soil and weather conditions. One sees greens being intensively shallow hollow tined prior to overseeding with bents and fescues. Yet the optimum conditions for establishing introduced seed are exactly the same as for *Poa annua* to gain a foothold.

I often question the cost effectiveness of such overseeding programmes, special cases excepted, and often they are counter productive in 'letting in the *Poa*' as many an old links greenkeeper told me so many years ago - just as true today. All in all, there are so many



An early Sisis tractor mounted aerator. Scant protection from the elements both above and below



Sean Reilly, Loch Lomond Golf Club, tackles compaction with a S500 pedestrian aerator manufactured by Dennis of Derby

snags, including poor depth because hollow tines are structurally weak and snap if too 'pressurised' that I would reserve hollow lining only as a rare part of a soil exchange programme.

It is unproductive to compare aerators because the only criterion is that they should be capable of piercing very deep without damaging the turf or the tines. The main requirements with aeration are to carry it out frequently, regularly, periodically and at varying depths. Aerating at the same depth all the time risks creating a 'plough pan' - a consolidated level just below the depth of aeration, which has to be broken up and lifted by deep vertidrainage.

If you want to explode air under the surface, inject high pressure water by jets or even, in extremes, correct compaction by lifting, rebuilding and relaying, then used in conjunction with tried and tested deep solid/slit lining - never on its own - then I am the last to object.

Remember however that one always has to achieve a balance of depth with minimum disturbance to surfaces; maximum air exchange, which is why slits are favourites with their greater soil/air interface, and frequency, with some of the members getting hot under the collar over marks on putting surfaces which cannot affect their putting for more than a few hours. As with all things in greenkeeping there are more ways than one of achieving the desired aim.

There are no set rules, only predictable results from specific actions, which have to be balanced, good against bad. All I ask is that all those making decisions know what the downside is. I can but repeat that good greenkeeping is common sense, it is not rocket science and is based on botany with a little physics and no chemistry. Aeration is physics! Get stuck in there!



The Verti-Drain 7521, manufactured by Redexim and distributed by Charterhouse Turf Machinery