

# Aeration

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by

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Our subject this morning is 'Aeration' or as the Americans will have it 'Aerification'.

There is still much to be learned about the subject. A lot of what is known is hard to prove. It is often difficult to judge precisely where the fact begins and theory ends. What we can say, is that most experts agree that opening up the turf surface with machinery of one type or another is beneficial and there are two main reasons for such action.

Firstly, it is necessary to maintain good drainage conditions and secondly, to ensure an adequate amount of air in the top soil, so that the grass roots can breathe and grow.

Perhaps we should look at the second point first and it is necessary to understand immediately that, by permitting the entry of air into the soil, a gaseous exchange takes place and by this process the grass roots take in oxygen and expel carbon-dioxide. Accumulations of carbon-dioxide in the soil can considerably restrict root growth and can completely prohibit, or at best limit, the intake of water and nutrients.

Regularly aerated turf will readily allow the entry of water and the importance of this is apparent in summer months, when, during a period of hot dry weather, it is essential that the up take of water by the roots is greater than the loss of water from the grass leaves by transpiration or evaporation. If this does not occur, browning off can take place and eventually grass may even die. By thoroughly aerating the area at the browning off stage, thus permitting the entry of oxygen, the normal intake of moisture by the roots then becomes possible once again and, often without artificial watering, the results can frequently be seen in less than a week by the grass's return to normal colour.

At other times of the year, failure to carry out a programme of aeration in wet Autumn and Winter months can lead to an entirely different problem. In such conditions, surface sealing can often occur, due to the compacting effect of players' feet and heavy maintenance machinery on greens and fairways. Under these conditions water can be prevented from percolating, will remain on the surface, preventing the exchange of gases and could lead to the incidence of moss or the build up of fibrous growth. A programme of aeration is then necessary. If steps are not taken to relieve the compaction, the development of a fibrous matt could take place, restricting the amount of air, moisture and nutrients available to the grasses and creating conditions in which certain diseases can thrive.

So there we are, aeration firstly to allow the intake of air and secondly to permit the percolation of water away from the surface.

In both cases there is a choice of machines and a choice of tines to fit into them.

The days when the ordinary garden fork was the greenkeeper's only means of working any type of area are happily left behind us.

Once it became evident that turf benefited from this type of treatment, machines were invented and developed to assist the greenkeeper in his work. These machines progressed from manually propelled and horse drawn implements to the independently powered and tractor mounted machines of the present day.

Most modern machines are offered with interchangeable alternative types of tines and such tines fall generally into three main categories, even though variations may occur in the depth, thickness, diameter or shape offered by different manufacturers. The three categories are the Round Pointed Solid tine, the Flat Bladed Slitting tine, usually chisel shaped, and the Hollow Tine, for extracting a core of soil.

I would like briefly to discuss these in a little detail.

The Round Solid Tine, though extensively used and useful at certain times, can under certain conditions present compaction in the actual wall of the hole which it produces. Our Company, for one, have found in recent times a general move away from this tine, which has been used for several years for general maintenance aeration. The Round Solid tine will always be invaluable

in dry, hard and severely compacted conditions when penetration with any other shape of tine, to any appreciable depth, is found impossible. It is often found however, that after using a Solid tine several times under such conditions, and penetration and conditions thus improved, an alternative tine may then be selected as more beneficial and, if this alternative tine is used regularly, should avoid the recurrence of the original compacted state.

There has been a general swing, therefore, away from the Solid tine in favour of the Slitting tine, for general maintenance aeration, particularly on what we will call outfield areas such as golf fairways, football pitches and similar surfaces.

The Slitting tine now tends to be first choice for general use therefore, since less compaction is evident in the walls of the hole which it produces. This hole has a much larger wall area than that produced by the Solid tine and will therefore permit the intake of a greater volume of air and moisture. A further side benefit of this tine is that during its use, a certain amount of root pruning takes place, encouraging new growth along the sides and into the depth of the hole. The value of the flat bladed slitting tine on fairway areas is in the deep uncompacted slit which it produces, capable of assisting percolation of a large volume of surface water, which can be extremely valuable during periods of excessive rainfall and during winter months. The use of the slitting tine before artificial watering on greens, or before a fertiliser dressing is applied, can ensure the maximum effect by providing access to the root system. This will increase the efficiency of fertilisers and dressings rather than leaving them to the elements on the surface, where evaporation and decomposition can respectively occur.

The third type of tine is the Hollow tine which removes a core of soil and is principally for the relief of severe compaction, and for the introduction of a sand to a heavy soil or a loam to a light soil when a soil exchange is necessary to improve general conditions. The cores which are extracted, can be removed and sand or loam brushed or luted into the holes for maximum benefit.

The aeration value of the Hollow tine is less than that of the Slitting tine, and if Hollow tines are used at the wrong time and in the wrong conditions then a hole can be produced with heavily compacted walls which take quite a time to break down.

Additionally, too much hollow tining can cause the playing surface to become too soft, it may cause irregularities in levels and can encourage invasion of the turf by useless grasses and weeds. In England, I think it is safe to say that hollow tining is generally reserved for cases where the soil has become particularly compacted and is slow draining, or where it is necessary to work large quantities of top dressing into the surface for one reason or another. It is fairly common practice in England that on an 18 hole Golf Course, 6 greens are hollow tined each year. In other words each green is hollow tined only once every three years.

Once again use Solid tines when conditions are hard and difficult. Hollow tines for very severe compaction or for introducing large quantities of top dressing, Slitting tines for maintenance aeration, and regular use of these can reduce the frequency of use of the Hollow tine. Choosing the right conditions for use of tines is very important. Particularly so in the case of the Hollow tine. If it is too dry and hard, full depth penetration may well be impossible. If it is too wet, clean ejection of the core may not be possible and if the Hollow tines become completely filled and tightly packed with soil then it virtually becomes a solid tine of very considerably greater diameter. Most manufacturers will, I feel sure, confirm that a very large proportion of complaints received, in connection with the non-ejection of cores, can be put down not to the design of the tine but to its use in the wrong conditions.

## **Fairways**

Most of our talk up to this point has referred mainly to the aeration of greens, but we should stress here that of equal importance is the aeration of fairways, if we are to achieve benefits in increased absorption and consequently improved growth and wear resistance.

This must be achieved with a minimum of interference with play. Penetration by suitable implements down to 4 in. or so is common practice on good outfields, but for more troublesome soil conditions, deeper penetration of 6 in. to 9 in. is necessary. In order to break the compacted layer below, a shattering effect must be produced, with the minimum of surface disturbance, and the application of conventional round section solid or hollow tines, even if made of sufficient proportions, would not produce broken holes due to the sideways displacement of soil into their walls. Observation of the results produced by flat bladed tines in general purpose aerating machines has led to adoption of the larger flat tines. These are capable of producing either a deep cultivating and shattering effect with some surface disturbance, especially where the root growth

is poor, or by using a chisel shaped tine producing a rather less deep but uncompacted hole of large area, below the surface, and clean at the entry under almost any condition. This latter tine is therefore usable on a regular maintenance basis.

Now to the choice of machinery for carrying out a programme of aeration and many of the available machines were on display yesterday, where everyone had the chance to discuss the merits of each item presented with personnel from their manufacturers or distributors.

The choice of machinery however can depend upon many factors. Firstly whether the turf to be treated is fine, as on greens, or outfield type as on fairways. Secondly the depth of compaction to be relieved must be known. Thirdly the labour, or power units, which are available for operating the aerators should be considered. Next, the time allocated for the job and therefore the speed at which it must be carried out and, of course, there is the problem which we all have, how much money is available.

Now depth of penetration is very important indeed. It is not always sufficient simply to open up the surface since, if this is done on an area suffering from sub-surface compaction, it can very easily provide conditions which we see all too often these days. I mean the conditions where water, since it cannot percolate to a lower level, or to the drains, remains on the surface. The shallow roots have no holding properties and the sportsmen slide or slither about, or on the golf green the pitch of the ball takes out a piece of turf. So often, damage is caused to the turf which is not easily repaired during the playing season. But how often has one seen a course looking immaculate at the beginning of a season deteriorate very quickly. How often one has taken a plug of soil from such grounds and found two or three inches down, dusty dry soil, although water is lying on the surface.

Depth of penetration then is a prime consideration. It is not sufficient to simply penetrate into the compacted layer. One must get beyond it. Often, an existing drainage system may be a limiting factor in this respect and in due course, one can visualise under-soil heating providing the same problem on a bigger scale.

#### **Available machines**

As you will have seen, the machines available today are many and varied. From the simple, to the sophisticated, from the hand tool to the tractor mounted machine, from British to American to E.E.C. Manufacture.

Machines producing a clean vertical hole without surface disturbance are obviously very desirable. This particularly applies on fine turf areas such as golf greens. On fairways, some slight disturbance can be acceptable and quickly restored by the use of drag mats, flat harrows, rakes or even gang mowers. It can be expected that there will be disturbance on an area being treated for the first few times. Until it has been aerated and a good root system developed, sufficient to give it hard wearing, holding properties, it may be necessary to explain to the uninitiated that the long term benefits from a programme of aeration are often achieved, only if one is prepared to accept that conditions which have deteriorated over a number of years, cannot be restored to perfection overnight. What we are trying to achieve therefore are deep holes, with uncompacted side walls, which permit the entry of air into the soil, increase the absorption of moisture by the roots, encourage quicker and deeper root growth, make the introduction of suitable dressings easier, to assist the formation of a natural percolation system down to the drainage layer, and, in all, establish and maintain a turf which is resistant to drought and wear.

Before closing, a brief mention of surface aeration which can be considered a subject in itself. We referred earlier to the build up of excessive fibre in certain conditions. This can develop to a degree when it comes to resemble and act as a thick mat or sponge, preventing water and dressings access to the soil below.

At that stage a mechanical rotary blade type scarifier is essential to remove the excess fibre, to ensure that there are good conditions and space for new growth to develop, rather than the dead spongy surface on which no golfer can give of his best.

Gentlemen, we are all concerned with growing that of all things greener grass, which is often so difficult to grow correctly, at the time and of the type which is required, yet, leave a piece of virgin soil and see how quickly grass will establish itself on it. As manufacturers we are always delighted to hear from you and to assist in any way we can, through our distributors when necessary to fully appreciate local conditions.

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