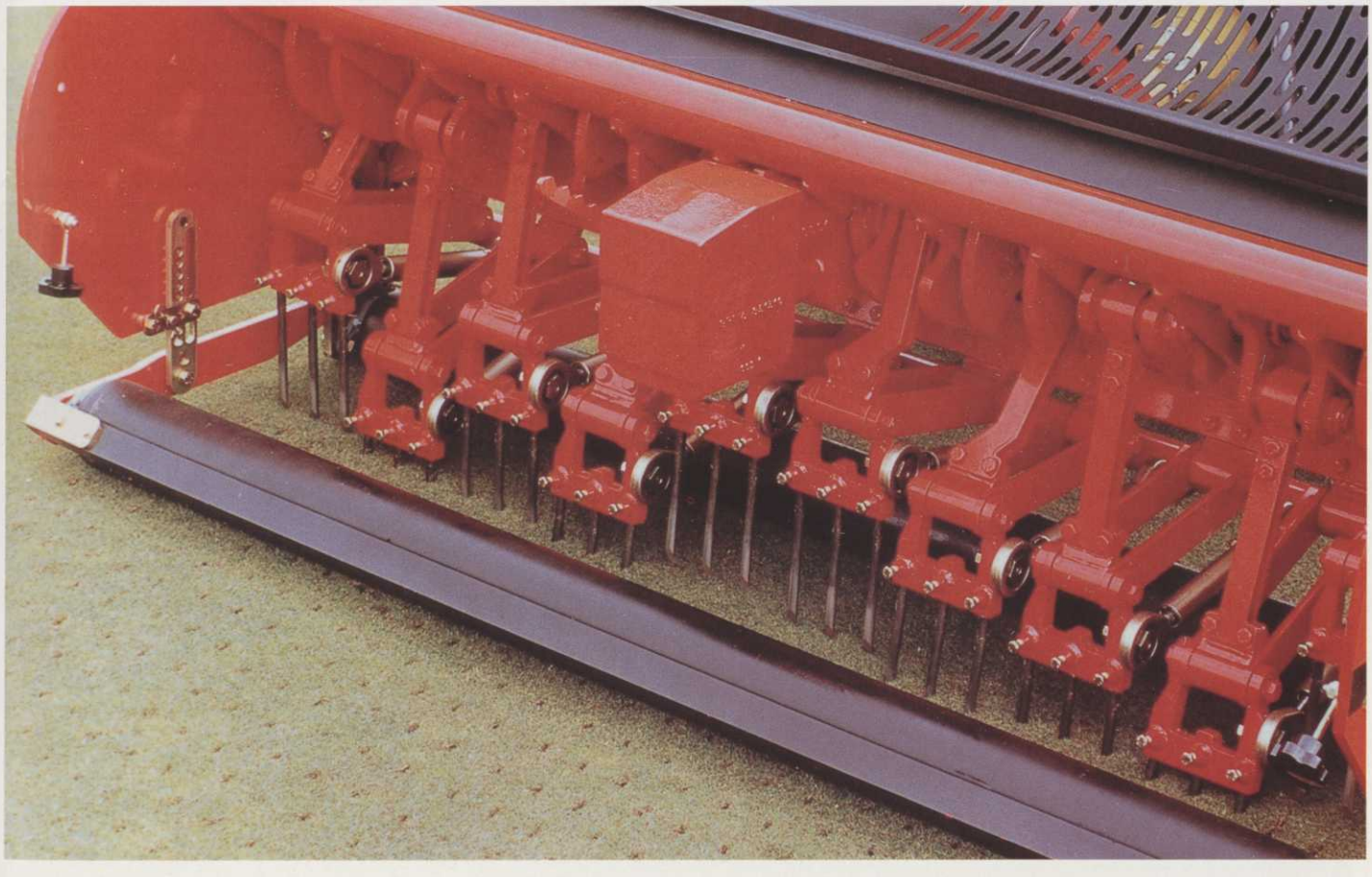
Roland Taylor looks back at the development or aeration and how machines have improved to tackle the task.

The tines they are a changing



Ever since man began creating and caring for natural playing surfaces aeration of the underlying soil has been an important issue. Unfortunately in the past, greens committees and players have been more concerned with what happened on the surface than problems underneath. They wanted nothing to hold up their play. This must have left many greenkeepers in a no-win situation. Only limited aeration, if any, was carried out, turf deteriorated and the golfers whinged.

The tines they are a changing

Another down side was that there were only limited funds available to buy equipment. One very small "plus" was that courses were not played at anything like the same level as today, so compaction was less, but it was still prevalent.

Unlike his predecessor, the modern greenkeeper is faced with a far greater problem. Keeping playing surfaces in top condition is becoming increasingly difficult. Changes in climatic conditions have led to excessive rain followed by scorching heat. Heavy use of the course and equipment plays havoc with the soil structure. To maintain some normality under the surface requires a great deal of skilful management.

To understand the problems of compaction it is necessary to look at the soil's structure.

It is made up of varying proportions depending on the location of some or all of the following; gravel, sands, silts, clays. Each of these constituents has a particle size and this is significant in respect of the air space. For example, clay is very small at 0002mm - this is so fine that the air space is minute and virtually impenetrable. Not only is the size important but the shape also plays a part - a perfect sphere is the ultimate. Large round particles make big spaces through which air and water can flow freely. In this ideal environment a thriving community of macro and micro organisms will happily beaver away breaking down organic matter so it becomes readily available to the plants. Roots can freely spread out to produce strong healthy leaf growth.

Unfortunately, all things in nature are not constant and the balance can quickly change. Pressure from above changes the particle shapes and compresses them against each other. The air spaces are drastically reduced and the flow of water slows down or even stops. Pools of stagnant water can form and the soil turns sour. Root growth is restricted and the absorption of nutrients virtually ceases. The plants fail to develop properly and become weak. Disease, weeds and unwanted grass species appear on the scene.

From this scenario it can be seen that keeping an open soil is vital to the well-being of all turf.

It basically consists of particles and the spaces between them. It is the latter that is important to plant growth because through these the water, air and nutrients travel. In addition they allow the roots to spread out. If these are restricted in any way the plants become weak and susceptible to all types of attack. Not a pretty picture.

Aeration will help to alleviate this problem and the first form of this treatment was carried out by hand-forking was carried with immediate results. Tines specifically for the task were introduced at the beginning of this century. These were solid, and even then it was recognised they had a disadvantage. The soil was displaced laterally and roots' development restricted. On clay soils the holes produced were liable to fill up with water.

To overcome this the hollow tine

was developed. While this went some way to eliminate the problems it also introduced new ones. The hole produced was larger in diameter and penetration depth was shallower. This allowed for the invasion of unwanted grasses and weeds.

Mechanisation brought with it the introduction of the slitting tine. Like a knife blade, this cut down opening up the soil and pruning the roots in the process, whilst causing very little surface disturbance.

Manufacturers were busily finding ways of making aeration as easy as possible, but the depth of penetration was limited. New steel manufacturing processes meant stronger tines. For penetrating the soil, crankshaft designs were introduced. These power-punched the tines below the surface. Six inches was about the norm at this stage.

What was needed was a machine that would go deeper and this appeared in 1980 in the form of the Verti-Drain. This piece of equipment operated at a far greater depth than anything previously and in doing so broke through any pan that existed. It also had another advantage, before being withdrawn, a heaving motion was introduced that broke up the compaction by lifting the soil.

This system is still very much at the forefront of aeration today and units are available that will go down 600mm (24"). It is critical that this type of operation is carried out by a trained specialist, as the correct penetration and speed of operation is important to the results both underground and on the surface.

Another method for dealing with areas of major compaction or panning is by driving a probe down into the soil. Then compressed air is pumped in causing an underground mini earthquake.

In recent years another power source has been introduced in the form of high pressure water particles that act like bullets. As they pass through the soil, a shattering effect is created. This is a relatively slow operation, especially if the penetration

The tines they are a changing

required is deep, but the one big advantage is that there is no surface damage, so play is virtually uninterrupted.

Organisations, manufacturers, scientists, agronomists and those involved in the day-to-day management of courses are continually seeking new ways of improving the methods used to maintain playing surfaces. This has led in the last few years to some alternative methods of aeration.

One of these, developed in the USA, uses the drainage system to blow or suck air and water down through the root zone. While this has the desired effect of putting these vital elements where they can be used by the plants, it does not relieve compaction so conventional forms of aeration also have to be employed. Here in the UK, some courses have taken up this system but the majority of installations are in sports and football stadiums.

Another recent introduction is a polymer solution, which is said to help to solve the problems of poor drainage and compaction.

It is applied as a high volume spray. As the liquid travels down through the soil the coiled molecules unwind and gather the soil and organic matter together into larger particles. This action opens up the air spaces and is claimed to break up compacted layers, thus allowing an increased flow of water and air into the root zone and below.

On modern courses aeration needs to be carried out regularly and at varying depths to avoid a pan developing. Some heavily used areas will need more frequent attention.

Out of sight does not mean out of mind. Soil needs working to keep it open and friable. The results of one's labours quickly become evident, likewise signs of neglect are very soon obvious and are a lot harder to eliminate. Prevention is better than cure.

There is plenty of equipment available for the modern greenkeeper.