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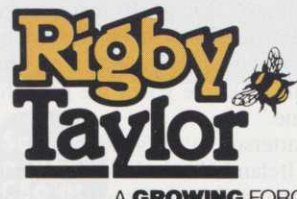
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options:
 "The first consideration should be soil type. When putting forward a specification, I always like to visit the site, and get a feel for the course. I can also obtain a soil analysis where necessary," he states.

"The next question to ask is about the type of course being planned – will it be a private course with limited membership, or a pay-as-you-play public course, where harder wear is anticipated, in which case a ryegrass-based mixture may be more appropriate?"

"Environmental considerations are also very important. In all cases, the relevant local authority, as well as environmental groups, will be keen to see native wild flora and grasses sown, in the roughs and areas surrounding the course.

"Most course managers and greenkeepers want a good, strong rooting, close-knit sward that is quick to establish, and able to withstand likely wear in both the summer and winter seasons."

He says a typical fine turf mix for golf greens would contain between 70 and 80 per cent fescues, and 20 to 30 per cent browntop bent grasses, depending on such variables as soil and climatic conditions, the amount of likely use and wear, and type of course being planned.

The fescue content of the mix can be made up of chewings fescue, with a proportion of slender creeping red fescue to help give a good coverage. A blend of two bent grasses can be included, to encourage better all year round performance.

The top-rated cultivars of both fescue types will withstand close mowing at 5mm on greens; mixing them combines the greater drought tolerance of the slender creeping red fescue with the greater disease resistance of the chewings fescue.

For golf tees and fairways, the slender creeping red fescue content can be increased, and the bent grass content reduced accordingly, to provide a more hard-wearing sward that will recover quickly from damage caused by divots or heavy traffic.

"Seed mixtures have several advantages over individual cultivars as long as they are carefully selected, and can be blended to provide everything the course requires, from a smooth putting surface to an even fairway," adds Jonathan.



Jonathan Franks and course manager Robert Brewer on one of the Duke's Dene greens

One of the newest golf courses currently undergoing the final stages of construction in the south-east of England is Duke's Dene Golf Club, at Halliloo Valley, Woldingham in Surrey.

Set in an attractive valley covering around 160 acres of chalky North Downs farmland close to the M25 corridor, Duke's Dene is the first golf course development in Europe by the Japanese company Mizuno-Gumi Co.

The architects are David Snead and Bradford Benz of California-based Bradford Benz Golf Course Architects. Of over 100 golf courses they have designed around the world, this is their first course in the UK.

The planned 18-hole, par 71 championship course of 6417 yards was entirely sown from June onwards by landscape and golf course contractors Brian D Pierson of Wimborne, Dorset, using two special British Seed Houses mixtures, one for the greens, and one for the tees and fairways.

These were based on blends of chewings fescues, slender creeping red fescues, and browntop bent grasses, and were accepted by the architects as the best option to provide the fine grass types required by a championship course, and to blend in with the existing natural environment.

Newly-appointed course manager Robert Brewer, who was previously assistant course manager at Sunningdale, has been impressed with the look of the new course in the short time since his appointment in early September.

His is a unique view, too – he holds a pilot's licence, and was able to take his own aerial photographs of the whole course soon after he started work.

"The greens germinated within two weeks, and good coverage was achieved within six to eight weeks," he says.

"The tees were quick to establish, too. Our only problem has been the fairways, but that's been due to irrigation problems and the dry summer – now solved by our new underground reservoirs.

"Quick establishment on the greens means we have been able to prevent the spread of *Poa annua*. On the fairways, regular mowing means the grass is now beating down the natural weed population.

"We've had to spray a selective herbicide on all the fairways, and we will be reseeding specific areas in the spring, but otherwise it all looks fine.

"Basically I want grass that will help the ball sit up well on the fairways, and be hard wearing enough to cope with trolleys and other heavy wear. On the greens, it has to withstand regular mowing and give a good, true putting surface – simple, really!"

There are also plans to sow an area of wildflowers, close to the 8th and 17th tees, again using a British Seed Houses wild flora seed mixture. This is designed to help preserve and enhance the natural landscape, particularly those areas which had to be cultivated during the ground preparation phase.

"We have adopted a deliberate policy on the valley sides to leave the natural vegetation intact, including a good percentage of the existing wild flora," says Robert Brewer.

"We will also be planting around 2500 trees and shrubs, as well as 10 mature trees over the winter. Once this has all been done, we will have a much better picture of what the course will look like when we open for business in June."

● Dr David Patterson, a turfgrass breeder at the Northern Ireland Horticultural and Plant Breeding Station, will be talking about plant and grass breeding in a seminar at BTME on January 26, 11.30-12.00.



Sky high: Robert Brewer's unique view of his course

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What do the 'Dances With Wolves' film set, the River Plate Stadium in Buenos Aires and the Weston Hills Country Club golf course in Florida, home of the Honda Classic, have in common? They all use Green Lawngr turf paint.

Turf paints, of course, are not new to the turf industry. Recently, however, improvements in the quality, durability and economics have made turf paint use more consistent and reliable. And with golf club members, influenced by the lush courses they see on TV, demanding a uniform green colour all year, despite our climate, more and more greenkeepers have started looking at turf paint to keep golfers quiet. Turf paints can also be used to cover up scars caused by oil and fuel spillages, disease, drought or heavy use.

Agronomically, turf paints are not harmful to the turf (unlike ordinary paint which has additives that can destroy grass). Turf paints are specially developed coloured latex coatings, with the better brands formulated to allow water and air to pass freely through the colour coating and not affect the turf vigour. A superior turf paint will also bond onto the grass itself and not wear or rub off onto clothing or skin, even when used on a high traffic area.

MAKING YOUR

Green Lawngr, made in the United States by Becker-Underwood, is the brand leader in this area. Many greenkeepers are also adding it to their divot mix since unrepaired divots can detract from well maintained turf.

This product is one of the diverse range of products distributed in the UK by Reading-based Amenity Technology, a new golden key member of BIGGA's Education and Development Fund.

"Painting turf will never be an alternative to good horticultural management and fertility programmes," says Carl Crome, Amenity Technology's managing director. "However, in certain sit-

uations when green turf is a must and difficult to achieve, a high quality turf paint is a solution which must be considered."

Adapted for Europe

Amenity Technology was set up in 1993 by Crome, ex-Rigby Taylor, EnviroGreen and Maxwell Hart. His aim was simple: to make available to British and European greenkeepers products that weren't already available to them as they strived to enhance the appearance of their courses and improve playing surfaces. He would do this by (a) importing some of the best products from places like the United States, Canada and Sweden and (b) by

having 'European versions' of other useful products manufactured here.

As well as making greens greener, Amenity Technology can also make water bluer. Amenity Technology is also distributing Becker-Underwood's Lake Colourant Water Soluble Packets, a highly concentrated blend of dry-flowable colourants that have undergone strict environmental testing at an independent laboratory. The water can still be used for other purposes such as irrigation without discolouring turf, concrete or other surfaces.

Another Becker-Underwood product that is also available in convenient water soluble packets is Define, a drift control adjuvant designed to keep fertiliser and pesticide sprays "on the mark". Define was developed in the USA to help reduce spray drift while crop-spraying from planes, an activity which has been outlawed in the UK. But if it can help prevent chemical trespass when it's being used by aerial equipment, it

Amenity Technology is always being asked by companies around the world to take on new products. But Carl says they probably take on only about 10% of these products because many of the ones they're offered are not right for the industry, they are too close to what is already available or they are totally unsuitable for European courses. However, he stresses he is always on the lookout for new products or ideas for new products.

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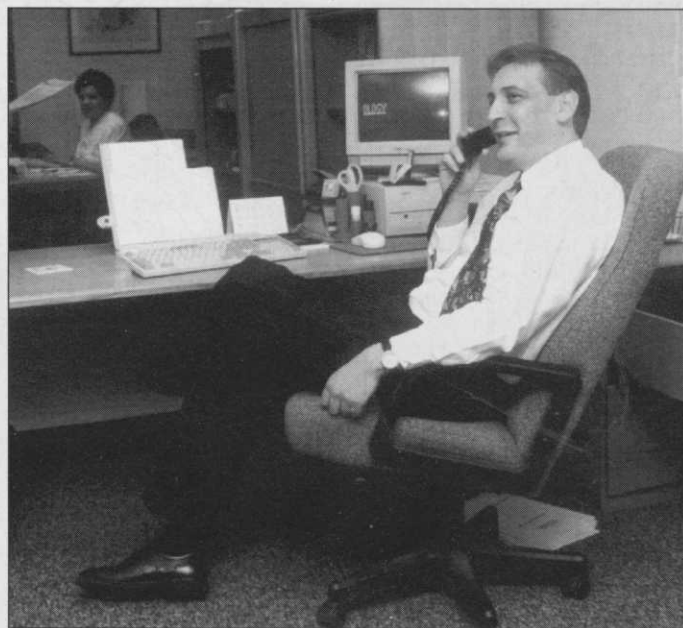
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Amenity Technology's Carl Crome: "I see the management of golf courses becoming more professional"

should work even more effectively on the ground. It works by standardising the droplet size.

An example of a UK product being distributed by Amenity Technology is Turfex Traditional, which is being relaunched at BTME this month. Manufactured and developed by Service Chemicals, the Daventry-based company behind Turfex, this concentrated wetting and penetrating agent has been specially formulated for use on all types of turfgrass suffering from dry patch, drought stress, compaction and surface flooding.

To complement this product, Amenity Technology, which operates through a network of well-known local dealers, has Go Green which combines all the benefits of concentrated liquid iron for green-up with a wetting agent. Another complementary product is the Spraywet wetting agent tablets, with each 250 gram tablet capable of treating 6-7 average size greens with a normal water pressure of 60-90 psi.

A new Service Chemicals product is Sward, a blend of polyalkoxylate surfactants for use with selective herbicides, mosskillers, fungicides, earthworm control products, insecticides and growth retardants. Whilst adjuvants (materials which may be tank mixed with pesticides to improve performance but have no pesticidal activity themselves) have been available in agriculture for many years, these materials are new to the amenity turfgrass market.

From Sweden, Amenity Technology is bringing the Hio hole-cutter. "It's three times as expensive as the cheapest holecutter on the market but it will last five times as long," claims Crome. "And it now comes with an

unconditional offer of a guarantee against manufacturer's defects. That means that if a greenkeeper breaks his Hio (excluding shell blade), all they have to do is phone us with the part number and we will dispatch a replacement part to them free of charge." He also says it cuts holes in seconds, not minutes, because the hammer and single shell are incorporated in one and you don't need additional tools, such as mallets.

'I see greenkeepers having offices instead of sheds'

From Canada, Amenity Technology brings the Bayco range of golf course accessories. These include ball washers, flags, rakes, ball retrievers, tee markers and signs.

Other products on their books include Scuttle, a non-hazardous rabbit and deer repellent suitable for protecting turf and trees, the US Golf Hole Target ("which is ideal for putting greens as it prevents erosion and desiccation of the soil around the top of the hole") and the DTC-3 Spray Tank Cleaner which has been specially formulated for pesticide spray tanks.

"These products do not just make the greenkeeper's life easier, they enable him to maintain the course to a high standard as levels of play increase towards the year 2000. In fact, the need for half the products greenkeepers currently use – eg the expensive use of fungicides – and most of the products we sell, is a direct result of the increase in the amount of play on courses. The grasses now are under much more stress than

when I entered this industry 18 years ago. So there is far more need now for more unique products, such as turf paint because grass has been damaged under stress or vandalised," says 38-year-old Crome.

"The greenkeeper is under a lot more pressure to maintain a surface with a lot less available time to do the job. Therefore there is a need for these kind of products to be used to enhance courses. Also, greenkeepers are under more pressure to present a course well as the appearance of the course is becoming as important as the playing surfaces."

The future today

Amenity Technology markets these products under the slogan "The Future Today", so we asked Carl how he sees the future of greenkeeping.

"I see greenkeeping becoming more and more of a profession. I see the management of golf courses becoming more professional with greenkeepers given realistic budgets and using computers as much as greens machines. I see greenkeepers having offices instead of sheds, and becoming as highly regarded as course superintendents in the United States. I see education levels going up and as these go up the professionalism of the whole industry will increase. I also see more and more specialist products for solving one problem rather than one product that solves everything."

He also sees the use of pesticides being severely restricted over the next decade. "The products we distribute strengthen the grass against the problems which require pesticides to solve them, such as Go Green which will give

an effective degree of preventive control against fungus attack or Turfex Traditional which assists dew dispersal, thus restricting disease development."

Amenity Technology will be launching many of these products – eg Sward, Turfex Traditional plus a new drencher gun and a new liquid fertiliser, Pro Tein – at this month's BTME in Harrogate. Carl believes the future of trade shows lies with BIGGA and the Institute of Groundsmanship, which organises Saltex at Windsor. And he is convinced one 'umbrella' show organised by an outside company, such as P&O Events, would be a mistake. "The idea of having the BTME in Harrogate in January coupled with Saltex in Windsor in September is perfect, covering the north and south of the country. There is no need to have an additional show in London. Also, I don't see why people outside the industry should benefit. Any profits that are obtained by the show organisers should be put back into the industry for the education of greenkeepers and groundsmen – as BIGGA and the IoG do."

Amenity Technology's support for the Association extends beyond exhibiting at Harrogate and advertising in *Greenkeeper International*. After only two years of trading, it has given £3,000 to BIGGA's Education and Development Fund.

Explaining why he did this, Carl said: "We believe in supporting and educating greenkeepers for the future because as the products we are introducing to the marketplace become more technically advanced the greenkeeper will need to be better educated to maximise the use and the advantages of these new products."



Top honours to the greenkeeper whose courses never close

This year's ICI Premier Greenkeeper of the Year is 50 years old and works on municipal courses – which he is never allowed to close. David Walden scooped the award – and a trip to America – after beating off four other regional winners in the national final at Aldwark Manor.

But he very nearly missed out on this prestigious title. He hadn't thought about entering the competition, which is now in its fifth year, because he mistakingly thought it was aimed at young greenkeepers working at posh private courses.

"The East of England section hadn't entered anyone for about three years so the secretary rang me up late one Sunday night and said, 'Look, someone's got to go in for it, I'm proposing you to do it.' I said, 'OK, put my name forward, I don't care,'" said David, still gobsmacked by his success. "I never thought it would happen to an ordinary greenkeeper. But I'm glad it has because I think that it will change a lot of people's attitudes towards the competition. I'm sure a lot of people will be thinking now: if he can do it, well I can."

David, who is married with three sons, started greenkeeping 21 years ago after ten years working on a farm and four years working as a forestry and landscape operator with the Peterborough Development Corporation. When the PDC had a golf course built in 1973, they advertised for a head greenkeeper and

David Walden will be giving a talk on aeration at the Cambridgeshire College of Agriculture and Horticulture, Landbeach Road, Milton, Cambridge, on February 14. There will also be talks on John Deere Machinery, Barenbrug Seeds, Hardi Sprayers, turf maintenance and irrigation equipment. For tickets and further details call Martin Crimmins on 0223 860701.

David persuaded them he was the man for the job. During his eight years as head greenkeeper he helped build a new 18-hole course and a 12-hole pitch and putt course, and was given the title of golf course superintendent. In 1988 the PDC started winding down its operations and putting everything out to tender. Nene Valley Golf Services won the contract and took on all the old staff who wanted to join them.

David kept his title and the responsibility for the two public courses – Thorpe Wood and Orton Meadows. He has also helped build two private courses – 18-hole Elton Furz and nine-hole Eyebury, which opened last spring. All of the 18-hole courses have a staff of five including a head greenkeeper. The nine-hole course operates with two greenkeepers, one of whom, Graeme MacDonald, is the head greenkeeper.

David believes his award is a tribute to his

entire team. "I'm only as good as my staff. They've done it as much as me because there are some days I can't get out on the golf course because I'm bogged down with other things, such as keeping up with the latest legislation for this, that and the other."

But he is still very much a hands-on course manager. He says he has to be: "Everybody's on 20 days holiday a year and I've got four staff at college for 33 days a year each, so it's virtually one man off all the time, so I do have to get out there mowing etc." He savours these moments. "Sometimes it's nice to get out on a machine and let the drone of the engine outdo the drone of the telephone," he says.

This winter the staff on his public courses, which attract more than 60,000 rounds a year each, have been busy reshaping bunkers and aerating. The bunkers had to be reshaped and revetted because of the build up of sand in the adjacent mounds – nearly 2ft of pure sand in some cases. They have also been continuing their intensive aeration programme which includes hollow-coring and Verti-draining all 36 greens and then following this up six weeks later with a vibrating mole-plough. They also Verti-drain the walkways twice a year.

Even before his success in this competition, David had a busy winter planned. As chairman of BIGGA's East of England section and secretary of the local IoG section, he is heavily involved in organising their winter lecture



Pictured left: A view across David Walden's Thorpe Wood golf course. Pictured right: Roger Mossop, marketing manager for Zeneca Professional Products, with Stefan Antolik, runner-up. Thirty eight year old Stefan, head greenkeeper at Cooden Beach GC, Bexhill-on-Sea, East Sussex, wins a weekend for two in London including tickets for a West End show. Third prizewinner is 36 year old Tom Murray, head greenkeeper at Ratho Park GC, Midlothian. He wins a weekend for two at Aldwark Manor. The other two regional winners are Mark Webb, from Alresford GC, Hampshire and Paul Pearse, from Stockport GC, Cheshire.



designed Thorpe Wood looked in superb condition for both of the course visits involved in winning the ICI Premier Greenkeeper of the Year Award. After being nominated by their sections, 24 courses were inspected and the head greenkeepers/course managers interviewed. From these, five regional winners were found and their courses underwent another inspection, this time by ICI's Richard Minton and Scottish Region chairman Gordon Moir, the head greenkeeper at St Andrew's Eden course. The final hurdle on the way to the coveted title was an hour-long interview at Aldwark Manor with the candidates being quizzed by a four-man panel – Minton, Moir, ICI's (now Zeneca's) marketing manager Roger Mossop and BIGGA's executive director Neil Thomas. Points gained from this performance were added to those scored by the presentation of the course, maintenance facilities and records.

David scored exceptionally well in all areas. And the judges praised Thorpe Wood's appearance. "The course was well presented and maintained to a very good standard," said Mossop. "The sheds on the course were tidy, organised and the machinery well maintained. The course records, filing, compliance to HSE etc were also excellent. Bearing in mind that the course our judges visited was one of his pay-and-play courses, it was a true testament to David's greenkeeping and course management. He could have nominated one of the private courses which were under less pressure."

"I think we present the course as good as a lot of people present private courses," said David proudly. "But there's a lot more maintenance work goes into it because you're always combating wear, compaction, you've always got to be changing holes and tee markers (daily in the growing season), pushing people into different areas, raking bunkers daily, and switching greens daily," he added without once sounding as if he was complaining.

As Roger Mossop says: "David's enthusiasm is infectious. Here is a man who loves his job and has the full support and backing of his employers. This co-operation had obviously been earned by the respect they had for David's work."

"The fact that David had the experience of all aspects of the duties of a golf course superintendent as well as overseeing both private and pay-and-play courses certainly helped his case."

"The other feature of David's career that impressed me was that from humble beginnings he has worked hard to obtain the necessary qualifications via day-release, night school, and even correspondence courses. This at a time when many individuals would have switched off."

"As an added bonus David is very active within BIGGA and the IoG. All in all it was a unanimous decision, David fits the bill ideally and was a deserving and comprehensive winner of the ICI Premier Greenkeeper of the Year Award."

programmes. This month (January) he is going to Elmwood College for two weeks as part of his second year of distance learning to gain an HNC in greenkeeping and golf course management. And now in February he is off to San Francisco to attend the GCSAA show. It will be the second time he has attended this exhibition as he went to the one in New Orleans in 1992.

While he is away, he won't have to worry about his staff taking the decision to close the course. It's forbidden.

"We are not allowed to close the courses. Not even if there's frost or snow. I've seen them playing in 6in deep snow. After that they usually stop coming and the course closes itself. Most people will only play in so much. Of course you always get the odd idiot..."

But they're still allowed out, even if they're going to do more damage than the £8 green fee they're paying.

"The bosses will not close it for the simple reason that once you start closing golf courses people tend to look out the window and think 'Oh they'll be closed, we won't go there'. So they always keep Thorpe Wood and Orton Meadows open because people will think 'Ah, they're always open, we'll go there'. And, if when they get here the conditions look too bad and they don't want to play, they could then be tempted to spend that £8 in the shop."

Despite this, the Peter Alliss/Dave Thomas

Could you be the next winner?

The annual search for a Premier Greenkeeper will continue with several modifications this year.

In future, the competition will be to find the Zeneca Premier Greenkeeper of the Year. The prizes for the winning head greenkeepers/course managers will remain the same, that is, a first prize of a trip to the GCSAA conference and exhibition in the USA, a second prize of a weekend for two in London and tickets for a top West End show and a third prize of a weekend for two at Aldwark Manor.

However, an additional prize of £500 will be awarded to the winning greenkeeper's team. Nominations for the competition may be from golf clubs, greenkeeping teams or individual greenkeepers and nominations must reach BIGGA headquarters by May 31 1995. Regions will then select three representatives to go forward to the final stages of the competition. Each of the three courses in each region will be

visited by a representative of Zeneca Professional Products together with a BIGGA regional representative and they will select the five finalists. The finalists will have their courses reassessed by a Zeneca representative and a member of the BIGGA Board of Management before the final interview stage at Aldwark Manor. The final will take place at Aldwark Manor on December 4 1995.

Remember, the competition is to find the greenkeeper who gets the best from his course with the facilities that he has available and aims to recognise services to the greenkeeping industry.

If you are a course manager or head greenkeeper, a member of a successful greenkeeping team or a golf club that thinks their greenkeeping team deserve recognition then *enter now*. Write to Ken Richardson, education officer, BIGGA HQ, Aldwark Manor, Aldwark, Aine, York YO6 2NF.



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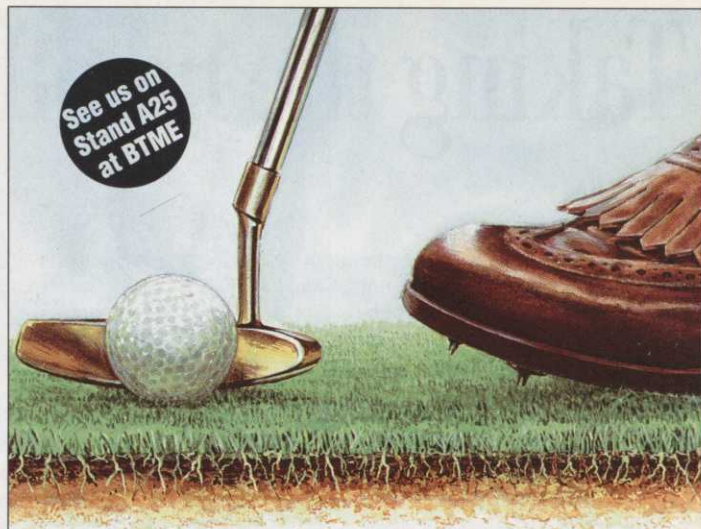


Before you decide which topdressing to use, you've got to understand why you are topdressing in the first place, says John Hacker of Professional Sportsturf Design

Applying bulky topdressings to golf greens has become common practice on most golf courses. As all greenkeepers know, there are three main reasons why topdressings are applied to the greens: to level the putting surface; to help dilute and keep well aerated the surface thatch layer; to replace and improve the existing rootzone.

With the emphasis on fast putting surfaces, topdressing cannot only level the putting surface and give a consistent roll across the green, but also speed up the pace of the green. Light topdressings during the year can help increase green speed as well as help dilute thatch. Thatch, as we all know, is becoming a major problem on many courses, partic-

ularly those with very acidic rootzones. The development of thatch is not down to one particular problem, but is a combination of an acidic rootzone, high fertilisation, reduced microbial activity and vigorously growing grasses. In addition, the rate of water movement down to the drains has been rapidly reduced on soil-based greens due to compaction caused by heavy use, particularly during the wet winter months. The reduction in water flow has meant that the surface remains wetter longer which in turn reduces advantageous microbial activity and leads to the increase of organic matter at the surface. The rate of water infiltration is also closely associated with the rainfall of any particular golf course and its natural rate of evapotranspiration. This would lead us to believe that thatch may be more of a problem in the wetter and colder northern/western parts of the UK and less of a problem in the warmer, drier southern

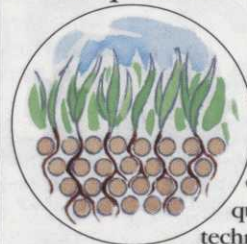


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and south eastern parts of the country. Given that thatch is not caused by one particular problem, topdressing can help by keeping the thatch layer more aerated and less wet, which encourages more microbial activity and therefore more natural breakdown of surface organic matter.

Topdressings can also be used to change the surface pH of the green in a slow but consistent way either up or down. As implied earlier, thatch is not always a problem on every course in the UK. Some courses I have visited do not have a thatch problem and this is normally associated with naturally free draining greens having a pH in the region of 6.5 to 7.2.

Topdressings can also help improve the existing rootzone albeit rather slowly. With long hollow tines, the concept of rootzone or soil exchange has been understood for many years. This allows us to change the rootzone by deep coring and removing the existing soil slowly over a period of time. Suitable topdressings are then applied to replace the material removed. There are a number of problems with this procedure in that it does depend on what is beneath the improved layer as to how effective it is. For instance, if a green is hollow cored frequently at the same level a pan may develop at that level causing a reduction in water flow to the drains below. In another instance, hollow coring over heavy clay subsoil may only lead to a greater depth of wet rootzone if the water only sits on the impervious clay beneath. So it is important that the green as a whole is looked at to make sure that water can enter freely into the surface and also drain freely away from the base. It is very easy to create a perched water table where water sits in the sandy topdressing layer over the top of an impervious base. It is not unknown for greens with this problem to shake like a jelly when walked on during the winter period when they are effectively full of water. The outcome, as we all know, is a shallow rooted green usually with a thick thatch layer which therefore foot-

prints badly giving a poor putting surface. The sward is usually composed of *Poa annua* and is therefore more subject to fungal disease attack.

Physical properties

So now we have considered the reasons why we apply topdressings, what are the physical properties required of a topdressing? Golf green topdressings today are primarily composed of sand particles with small amounts of silt, clay and organic matter added to help retain water and nutrients. In an ideal world the topdressing should match precisely the existing rootzone. For greenkeepers with new greens composed of ideal rootzone material then it is easy to match the topdressing with the existing rootzone. Clearly, this is of no benefit when the existing rootzone may be a heavy clay loam which has compacted over a number of years and is in effect fairly impermeable. To enable rapid infiltration of rainwater and to prevent interlocking it is important that topdressing or rootzone for that matter, has most of the particles in two adjacent sand band ranges. Examples of rootzones available on the market today include the following:

% PARTICLE SIZE (mm)								
Code	>2	2-1	1-0.5	0.5-0.25	0.25-0.125	0.125-0.063	<0.63	O.M
1	2	6	29	55	6	T	4	6
2	0	1.9	9.3	37.9	38.9	5.8	6	NK
3	T	0.8	9.6	58.1	27.2	2.2	2.1	NK

Code Key:

1 Fen Turf Dressing
2 Martin Bros
3 Rufford Topdress

T = Trace
NK = Not Known
O.M = Organic Matter

The analyses above are taken from a range of topdressings supplied by each of the suppliers mentioned

At present it is not common practice to undertake hydraulic conductivity readings on topdressings, but this may be important in the future as the particle ranges within each of the bands above can vary dramatically. So although there may be a certain percentage of sand within say the medium band, how much is at the top end of that range or at the bottom end of that range? In addition, sands can be different shapes (rounded/angular) and this can affect how they interlock and therefore drain. So there is still some way to go on achieving uniformity and consistent performance of topdressing materials.

In addition to the physical properties of the topdressings the chemical attributes must also be considered. It is not common to undertake nutrient analysis on topdressing materials, but it is assumed that nutrient content of these products are going to be low. It is not uncommon though for greenkeepers to see a greening up response to the application of topdressings, although it is not clear whether this is nutrient within the topdressing or the effect of the previous tining operation encouraging natural breakdown of the surface thatch. There is no doubt though that any topdressing material containing organic matter or soil will have very small proportions of the macro and micro nutrient, particularly iron which some sands are naturally coated in. Perhaps the major point to consider is the lime content of any topdressing. A high pH topdressing may or may not have a high lime content. However, a topdressing with a high lime content will retain a high pH for some considerable time depending upon how much lime it contains. A common source of lime within a topdressing is shell which is found in seashore sands or sea-dredged sands. In the short term, the problem with sand containing a high lime content is the effect it might have on the disease 'take-all patch'. This has been shown to be promoted by a change in the surface pH of the green and, of course, is extremely damaging to bent grass swards.

Nowadays it is assumed that topdressings are sterilised. This is to kill weed seeds and harmful fungi. In addition, the sterilisation act usually burns off excessive moisture, thereby reducing the water content of the topdressing and making it easier to apply. Sterilisation is probably one of those areas which has not been seriously looked at in a production sense. For instance, we do not know how much weed seed or harmful fungi might be present in any individual source of rootzone material. It is generally assumed that sand is inert, although we have recently seen the effects of dry patch disorder which have been associated with fungal depositions on sand

grains. It is certainly more likely that weed seeds will be present within any topsoil and to a lesser extent the organic matter used to mix with the sand. It is likely that every topdressing is going to be slightly different and so sterilisation is probably a safe bet. Clearly, it is very important that we do not apply weeds to the surface of our greens inadvertently and especially not pernicious weeds. While it is possible to control broadleaved weeds, weed grasses such as *Poa annua* could easily be brought in with an unsterilised topdressing. This is certainly an area where further work could be undertaken by each manufacturer on its own source material to determine the needs of that particular product.

Choosing suppliers

After stating the need for suppliers to be vigilant over the material they use and how they process it, which suppliers should you use? I suppose we can divide suppliers into three categories, those that have their own sands, those that have their own sand and soil and those that have their own soils. In addition there is the middle man who does not have any raw material himself but buys in both sand and soil and mixes them as a service to the greenkeeper prior to selling them with a small profit for that service. There are, as most greenkeepers know, a number of well known sands used throughout the UK. These include sands such as Leighton Buzzard, Kingsley Washed, New Platt Wood, White Moss, Chelford and a number of others. The reason the sands are considered good is they are uniform, plentiful, accessible and in the particle ranges required for golf greens (medium/fine, medium/coarse). There are of course a lot more quarries around the country, some of which will also contain sand suitable for application to golf greens. Some courses themselves will be able to quarry their own sand and apply it to the greens as they have done for many many years.

If you are considering buying your topdressing material from a supplier there are a number of questions which you should ask of that company:

- Has the company a reputation for producing consistent materials?
- Can they provide you with full