



It is perhaps surprising that a company which is found all over the world has a worldwide workforce which numbers a mere 380.

"This is a business where you need warehouses, research stations and a sales force. We have about 60 people on the research side. To produce the seed we contract farmers to use their fields and have fieldmen who monitor quality and advise the farmers on chemical usage. The farmer is happy because the better quality the crop the higher his price," said Michel.

As more of the top rated varieties are produced the more the price to the end user will come down.

"In five to ten years time our varieties will be affordable to clubs in each budget category and everyone should benefit from the quality up-grade," explained Michel, who added that Barenbrug produces a combined 60,000 tonnes of seed a year worldwide in both agriculture and amenity sectors – that's three and a half million golf greens!

Grass breeding is an industry where the ability to see into the future is extremely important and there are a number of areas where Barenbrug is conducting research.

"Our biggest challenge is to producing varieties which are going to cope if, under legislation designed to protect the environment, the

use of fertilisers is restricted. We are also spending a great deal of time looking at disease and how it will affect grasses in drought conditions.

"When I visited our breeding stations recently I didn't only see all the new varieties being tested but them all being tested against all the known diseases," revealed Michel.

While there is much being done worldwide the UK arm of Barenbrug is also making major strides.

"In '92 we had a turn over of £1 million and a staff of ten people. We finished last year with a turnover of around £5 million and a staff of 24 and our aim for the year 2000 is to have a turnover of £7.5 million and a staff of around 30," said Michel.

One of the key members of staff doesn't appear in those statistics however. Mungo the cat is a permanent resident in the warehouse and does sterling work in ensuring it remains vermin free.

"Mungo is extremely popular and colleagues even come in at Christmas and New Year to feed him," said Michel.

As is inevitable such growth means that accommodation which, at the beginning, was more than spacious enough soon becomes cramped and Barenbrug UK is in the process of addressing that particular problem.

"July 1 sees the start of work on our new offices on our Bury St Edmunds site. Greenkeepers and groundsmen visit us when we talk about breeding programmes and producing cultivars but at the moment we cannot accommodate the groups of up to 30 that we would like."

"It's been needed for a while but the last thing a seedsman does is put money in an office," joked Michel, of the half a million pound investment, which will see a two phased development including additional warehouse space, office accommodation and a custom build presentation room.

Barenbrug's Golden Key sponsorship has come about through the company's desire to be closer to the end user and will compliment the existing programme which has involved taking groups of greenkeepers to the research station in Holland and working closely with individual greenkeepers in the UK.

"There are not many weeks when Michel and I do not visit a golf course and they are occasions when we are always learning from them. It is important to speak with greenkeepers and listen to their views," said John.

One of those with whom Michel has a close relationship is John Philp at Carnoustie.

"With Carnoustie hosting The Open in 1999 we feel that we are preparing for The Open together," said Michel.

Michel and John both stressed, however, that Barenbrug has the philosophy, that the golf course just around the corner is just as important as the big name venue and that is always key to the thinking.

BIGGA's 10th Anniversary Golf Tournament proved a spectacular success and a fitting tribute to 10 years of progress for both the Association and the greenkeeping industry as a whole.

A total of 22 teams drawn from within the industry arrived at Aldwark Manor, home of BIGGA's Headquarters, for the event and when the last putt disappeared it was to be irrigation water and not champagne which was sprayed in celebration.

The reason? The winners were Watermation with their team of Managing Director, Ray Lewis; UK Distribution Manager, Joe Turner; Turnberry Hotel's Course Manager, George Brown, and Hankley Common's Course Manager, Ian McMillan. They shot a fine 58 to just edge out British Seed Houses who had also broken 60 in the Texas Scramble format tournament.

As well as the golf, visitors were able to view BIGGA's Internet site which was available to view on screens set up in the hotel. There was also a putting competition which offered another chance of clinching a prize.

On hand to present the prizes was Rory Underwood, England's all time top try scorer who had earlier shown himself to be a fine golfer as a member of the Guest's Team. He closed the prize giving with a few tales from the England dressing room.

The course was looking its best for the occasion and George Brown paid tribute to Richard Gamble and his team by saying that, coming from Turnberry, it was nice to putt on good greens for a change!

The win for Watermation was

Golf Day makes tenth birthday event a swinging success

TEN out of ten



cause for a double celebration for the Aldershot-based company as Ray Lewis had earlier been presented with Golden Key plaque by BIGGA's National Chairman Pat Murphy.

It was also the ideal occasion to present plaques to both John Bradley of Barenbrug and John Walker of Ritefeed and welcome them into BIGGA's Golden Key programme.

Following the presentations there was a magnificent barbecue prepared by staff of Aldwark Manor.

■ Pictured right: Brin Bendon, of Vector Training, explores BIGGA's Internet site.



Golden Key presentations:
BIGGA Chairman Pat Murphy presents plaques to John Walker of Ritefeed (left), Joe Turner and Ray Lewis of Watermation (above) and John Bradley of Barenbrug.



PHOTO FILE
 Pictures by
JENNY PANTON



Left: The winning team is presented with the glassware by Rory Underwood. From left, George Brown, Rory Underwood, Ray Lewis, Ian McMillan and Joe Turner

Below: Rory Underwood with the British Seed Houses team which came so close



Roger Mossop, of Miracle Professional, and Gordon Child, National Vice Chairman, tackle the putting competition



Above: The barbecue in full swing



Left: Aldwark Manor Head Greenkeeper, Richard Gamble, rests after he and his team prepared the course so excellently

Taking control of events

The control of Substances Hazardous to Health Regulations require that an employer must make a suitable and sufficient assessment of the risks associated with substances used in his work place (Regulation 6).

To comply with this regulation, the first thing that we must determine is what substances we have actually on site. It is essential that we decide what chemicals we are using, or are going to use in the future, and discard any substances that are now surplus to requirement. The substances that we no longer plan to use must be disposed of in the correct manner. They must not be tipped down the drain or thrown in the general household or site rubbish unless there are specific instructions on the package or with the substance that say otherwise.

After having decided that substances we are likely to use in our day to day tasks and what we have on site we must ensure that we have product Health and Safety Data Sheets for these substances. The suppliers of these substances are under a legal obligation to provide these data sheets and they must be available for every substance used. The Health and Safety Data Sheets will give information pertaining to the substances properties, be they hazardous or otherwise, the manufacturers address

and telephone number, the procedures to follow in case of emergencies and how to dispose of the substance and its packaging.

Once all the Data Sheets have been obtained then the next step is to look at the factors involved in the actual use of the substance. Where will the substance be used? Will it be used in the workshop or will it be used on the course net to a free flowing stretch of water? How often and how many people will use or be in contact with this substance? Is it only the Head Greenkeeper or is it to be everyone right through to part time assistants and possibly holiday staff or work placements. What precautions do we take before, during and after the use of the substance? Where do we store it before use and how is the substance or its packaging disposed of?

All these points have to be considered and in essence this is what an assessment actually entails under the COSHH Regulations.

The points mentioned above have to be taken on their merits and then

we can determine what exactly is a suitable and sufficient assessment.

If the substance is extremely hazardous, ie. weed killer or battery acid then the assessment would have to be more in-depth than an assessment for, say, a tub of general purpose hand cleaner. You would have to consider details such as limiting access to the substance, substituting for a less hazardous alternative, using in well ventilated areas, what training is required

to use the substance safely and keeping records in order that only fully trained operators can use the substance. The last resort in protecting ourselves and our employ-

ees from hazardous substances should always be the use of Personal Protective Equipment (PPE) ie. the use of goggles, gloves, boots, masks, breathing apparatus, chemical resistant clothing etc. PPE should be used where other forms of controlling the hazardous substances are inadequate and PPE should be chosen with regard to not only what it is to be used to protect against but also who is to use it.

Records of the COSHH Assessment

need to be kept and also need to be easily accessible in case an emergency situation should arise. This is important due to the fact that if medical treatment is required then the medical staff would know that the substance was, what chemicals are contained in it, who manufactured it and also how to contact the manufacturer.

A COSHH Assessment sheet is self explanatory: Starting with the assessment number, then the Job Description. Then list the substances we are using for the job. How often and for how long we do the job. What control measures we are currently using to protect operators. Then we need to show our assessment of the type of exposure operators using the substance would be subjected to, eg. splashes, inhalation etc.

Finally if we feel that we could do more, then this becomes the Action Required to reduce the risk further.

To enable us to carry out this assessment the Health and Safety Data Sheets for the substances used, must be used to allow us to identify what control measures the manufacturers recommend, eg. good ventilation, good hygiene practices, etc. This should tie in with the control measures in use, if not should become Action Required.

Further information on training courses and consultancy contact ATB Landbase Training Services (Jean John on 01282 617466 or Tony Rees on 01686 622799).



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AMENITY TECHNOLOGY

Cecil George goes back to the beginnings of the Open Support team and recalls some of the memorable moments on its way to Royal Troon 1997.

Another Open Championship, another Support Team!

Let's go back to when it all began St Andrews Open Championship, 1984, before the amalgamation of the Associations.

The Scottish and International Golf Greenkeepers, through Walter Woods, got the chance to be involved in The Open. Bunker raking at the Open Championship had been inconsistent – it had been left to the Championship clubs to keep the bunkers in order. The R&A wanted a quality job yet at some courses “yoppers” and other odd-bods were hired to the detriment of the bunkers. Walter noticed this and saw the opportunity to rectify the matter. Before the 1984 Open he suggested that qualified greenkeepers should look after the bunkers. He could, of course, have involved his own staff but felt that his men were out early in the morning and evening doing their general work along with all the added extras The Open brings to the already overworked staff.

Walter proposed that SIGGA could be the people to carry out the duties of bunker raking throughout the tournament, free of charge. He did, however, ask that the R & A provide a tent where the greenkeepers could meet, have a place to report to, organise the bunker rakers and rest. Walter also mentioned that if anything untoward happened, such as inclement weather, vandalism or assistance required, there would be a glut of experienced greenkeepers on hand for any eventuality.

His words have come true on many occasions, none more so than when the heavens opened up in 1988 and Lytham St Annes became the second flood. Saturday's third round was postponed until Sunday and Jimmy MacDonald used the greenkeepers to sweep the water off the green for the rest of the day and most of that night.

At Royal Birkdale in 1991 my old friend, Tom O'Brien, had a green badly damaged by vandals. The greenkeepers again came to the rescue in assisting to rectify the damage and so allowing play to start as per the R & A programme.

Many interesting, or should I say “weird” happenings, have taken place year after year. When



Ian MacLeod after raking the bunker Nick Faldo managed to find on the first morning of the 1996 event

OPEN. memories

we started the luxury of sleeping in a bed was limited to the lucky few who could cram into two six berth caravans. I wasn't one of the lucky ones who was allocated a bed, I and a few others slept on the floor. I still remember marks on my side from the time I woke with a pain in my side and on examination I had a black and blue patch which I could not explain. The next night I again felt something pressing on my sore bit. Being a little less inebriated than the night before I realised there was the connection for a gas pipe sticking into my side!

At Turnberry in 1986 we bor-

rowed a perfectly good big tent from Jimmy Kidd, of Gleneagles, which held about 30. I won't go into the erection of the tent, Head Greenkeepers know everything! What some don't know they invent and the first attempt at putting up the tent was a fiasco.

The site was nearly in George Brown's back garden and let's say it was soft stony ground! The pegs were only half in the ground and I have to say there was an excellent bar run by the Turnberry Hotel staff, for the staff and after an evening of tripping over the guy ropes and generally giving the tent abuse, it partly col-

lapsed in the night.

The next morning at 5.30am I was standing outside the tent shouting out names of greenkeepers to be on the 1st tee for 7am. I could not ask Scott MacCallum to print the utterances that came from the tent!

It was at Turnberry in '86, on a suggestion from Chris Kennedy, of Wentworth, that we started sending a bunker raker with each match. This was a great success and the format has not been changed since.

From Turnberry to Muirfield 1987 and we still worked out of the two caravans and the big tent

OPEN memories

was still our main dormitory. We had been asking through the old greenkeeper magazine for volunteers to rake bunkers at The Open and had had some response from both our sister Associations and we always had the few stalwarts from England who took a holiday and assisted in the bunker raking. In 1987 for the first time we saw quite an increase from south of the border and one in particular was Richard Heaslip. He came on his motorbike with his own tent. The weather was gales and lashing rain in July even to us was unexpected. Again the big tent came down and I remember Richard standing looking at his gear lying all over the place and soaking wet. Still, The Open went on and the greenkeepers did their share of clearing up.

This was one of the years when our tent in the village was back to back with the stewards tent. We formed a lasting friendship with the Stewards the first year at St Andrews and some of us still meet in the Stewards tent at the close of each day's play.

At Muirfield in '87 there was still no distribution of shirts, waterproofs or umbrellas though we did get the meal tickets which was excellent. However, the amount of food some of the lads put away we would have to give them an abundance of tickets to stove off their hunger.

The Swedish greenkeepers at this time were some of our stalwarts in particular Carl, Einar and Jan. I think Einar had a bed somewhere while Carl and Jan slept in their car. One morning at Muirfield the East mist crept in from the sea and the greenkeepers started arriving in small groups. I looked out of the caravan window and the two huge Swedes seemed to appear like the Vikings of old coming from their long boats for a bit of rape and pillage instead of a bit of rake and bevy!

The Swedes always gave me food for thought. Why do the biggest men always take the small plastic rakes?

It is pleasing to hear that the Swedish Greenkeepers Association is now involved with a support team at the Swedish Open. I am sure anyone who wants to assist need only contact Stig Pers-



Above: At least you get a good view...
Left: Blending in with the crowds



son and his or her wish will be granted.

Reverting back to St Andrews '84 and Jimmy Neilson, of Murrayfield, was the President of the SIGGA. He tells me all they had in the tent was a bar, of course, and six promotional advert stands. After the first practice day our tent was transformed, lovely tables and chairs and even a carpet. The recliners and furnishings were borrowed or something (!) from a certain hotel in St Andrews. Walter said the Manager was a sympathetic friend.

As all of you who have raked bunkers at the Open will know rotas are drawn up, and there is a list of instructions. You have to keep to the ropes, only speak when spoken to, assist the lady scorers and make yourself "inconspicuous". The last time at Royal Troon, Alex Robertson, of Grangemouth, made himself so inconspicuous that he was reported missing by one of the chappies on the intercom. Chris Kennedy went out to see where Alex had gone to find Alex sitting inside the rope with his faithful rake beside him. Chris asked where he had been, "Here" was the reply, "Just making myself

inconspicuous!" Since then we have walked with the scorer and the person carrying the scoreboard.

This turned out to be a godsend especially in wet and windy weather where we, being the improvisers and forward thinkers of the golfing fraternity have assisted boys and girls to hold the score boards up in strong winds, shelter the scorers with umbrellas from the rain while at the same time keeping a professional eye on the golfers and how many strokes each takes, in particular, when a pro is out of sight of the scorer.

Our professionalism came to the fore at Lytham last year when Duncan Smith, of our support team, was called in by the R&A to assist in a rather awkward situation. The pro, Des Smyth, had been in a bunker but had miscalculated his score for that hole. Duncan said "Yes, he had raked that bunker and yes, the pro's score was wrong". So with the greenkeeper's assistance all was put to right. This should be a lesson to all of us who are involved in the Support Team, always remember "Big Brother is Watching You!" If you are lucky enough

you might, like Jimmy Paton, be rewarded with a set of irons. Mark Calcavecchia thanked Jimmy then gave him the set of irons from his bag. I was always envious of this show of generosity, the most I ever got from a pro was a handful of banana skins from Paul Azinger at Muirfield '87 when he was leading going into the final round.

We have greenkeepers from all over the world visit our marquee. Some of them have raked bunkers last year at St Annes with two young men from Augusta out doing their bit. The Swedes are always present, Welshman John Rodgers, reported in from Thailand and there were lads from Germany, France, Spain, Canada, USA, Japan, New Zealand, Australia and South Africa and these were only the greenkeepers I remember speaking to.

Harry Diamond always has a story to hand and last time we were at Royal Troon he and I were asked to go down to Norman Ferguson's house to invite him up to the tent for the reception BIGGA was giving for the Press. We got down to Norman's to find him out in his garden lifting his early tatties. "No panic here" Harry said, "That's Norman - cool, calm and deliberate in the middle of the Open Championship."

Don't be like a young greenkeeper at Muirfield in 1987. He came into the Portakabin, threw his rake with disgust in the corner and said, "Tomorrow give me the clubs and give that sand-martin I was out with the rake and I'll return a better score than he put in today!"

See you all doon at Troon soon!

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Dream team head into first

Billy McLachlan and his team are well prepared for this month's Open Championship as Scott MacCallum discovered when he paid a visit a month before the big week.

Preparing an Open Championship venue would be a dream for many greenkeepers but with only one Open a year, and a set rota of venues, it is an ambition which remains unfulfilled for most.

Not so Billy McLachlan who, at the age of 33, is the man charged with ensuring Royal Troon is at its perfect best for the visit of the world's top golfers in the third week in July.

A local man, Billy joined the staff at Troon in 1982 working under Norman Ferguson and took over from Norman at the beginning of '94 with The Open Championship looming over the horizon.

If he is daunted by the prospect of having his work on show to thousands of spectators and billions of television viewers across the world, Billy does a good job of hiding it. Blessed with the matter-of-fact demeanour which prevents many Scots from getting above themselves, Billy is taking everything in his stride.

One of his master strokes, however, had nothing to do with the golf course but, along the lines of Kenny Dalglish, Alex Ferguson and Roy Aitken (hopefully!), has been in a great new signing.

Now I don't believe Jim Devlin cost Billy a huge transfer fee – and not because he arrived under the Bosman Ruling – but Jim has quickly proved that he's worth more than his weight in gold.

Previously the Course Supervisor at three of Troon's Municipal courses, Jim joined Royal Troon as Billy's Deputy in December of last year.

He brought with him a wealth of experience and ability which was identified when he was a finalist in the Miracle Professional Premier Greenkeeper of the Year competition in '96.

"It is fortunate that we have got together this year and have started to change a few things. It actually looks as though we have changed them for The Open but they would have been done any-



Billy McLachlan, fourth from left, Jim Devlin, second from left and the Troon team

way," explained Billy, speaking from the maintenance unit which itself shows signs of a recent significant overall and Jim's influence.

Jim reinforces the point by adding, "We are trying to get the course to a standard where it is going to be like it all the time and it just happens that it looks as though it is being done specifically for The Open."

The talents of Billy, Jim and the rest of the team combined with a new watering system should ensure a true test for the world's best golfers and provide sufficient rough to make The Open field think twice. In 1989 when Mark Calcavecchia defeated Greg Norman and Wayne Grady in the first ever four hole play-off, you may recall a lack of water kept rough down to a minimum ensuring that



Jim on the "postage stamp"

the course was less fierce than it was originally intended to be

"There were certain things we were doing which we were quite happy with and wanted to keep going and other things which Jim brought in and we thought were good ideas.

"Many of these were just small. Things going on a different times and different materials that Jim had used but I hadn't," explained Billy, for whom the '97 Open Championship will be the third on which he has worked.

The approach is obviously to the liking of the R&A which has been happy to allow Billy and his team to get on with their work.

"They visited last August and on the strength of that we have tightened four fairways and David Boocock, the R&A agronomist, visited in March and he was happy with the way things were looking.

"If they were here all the time we would be wondering if they were worried about us but they are quite happy to let us get on with it," said Billy.

"They could see that we were on the right tracks," added Jim.

Among the major tasks that the team has carried out has been the revetting of 62 of the courses 84 bunkers and the relaying of the path on the course's most famous hole – The Postage Stamp.

"We lifted all the sleepers and relaid them so that they were horizontal to the hill and not running down the hill. We're pleased with the way it looks," said Jim.

Billy visited Royal Lytham last

year during The Open to get a flavour of how the Championship went and spent time in the company of Jimmy MacDonald MBE, whose major championship experience is second to none.

"Jimmy was a great help and despite being busy took time to talk to me. I've also spoken to George Brown at Turnberry and, of course, Norman Ferguson and been given some excellent advice."

A month before the Sunday when the players start to arrive and begin practising the course looked immaculate and more than capable of hosting The Open then and there.

"The idea of the Championship is that you have the course in such a condition that all you need is a final tweak to get it to where you want it. The last thing you need to be doing is sitting three weeks before it and wondering what we need to do it get it



ready. You want it to be there early so that you can keep it bubbling over ready for that final tweak," explained Billy.

The two men obviously have a very good rapport and think along the same lines on what they want to achieve.

"We've had our greens down for a little while now so it's not a case of drastic cutting on the day. It's just that final adjustment and we are quite close now," said Jim.

"We're trying to do a week's work every day at the moment. We want to get it right and we

Open with confidence

Scenic pictures by BRIAN MORGAN



have the bodies to do it," said Billy.

"If you start worrying about it that's when things start to go wrong and you start thinking about things you haven't done rather than concentrating on things you have," said Jim.

The course was closed on June 29 and prior to that, on June 15, member's guests were also stopped.

The greenkeeping team has had to work closely with the outside contractors brought in to erect all the tents and stands which go together to create the

modern day Open venue.

"We marked out tracks for them all with a yellow line so we could keep the mess where we wanted it and to begin with everyone stuck to these but as we are getting nearer the time more people are around and just nip in here and there. A few weeks ago it didn't bother us but nearer the time there isn't enough time to repair damage," said Jim.

"When I went to Lytham last year I learned that that they stopped visitors but not member's guest and the course was as busy

as ever so we made the decision to stop member's guests," said Billy.

The 12 man Troon Greenkeeping team works very much as a unit and everyone has a say.

"We've tried to ensure that it is not a one man or a two man show here. Everyone is involved and if any of the guys comes up with an idea we'll sit and listen. None of us is so big headed or selfish to say it's our way or nothing. I'm sure Billy would have the whole team with him at the prize giving on the Sunday afternoon if he could," said Jim.

"Don't remind me," says Billy, as he contemplates the most public part of the job of an Open course's Head Greenkeeper. "I'll probably trip up walking onto the green."

It is perhaps the one thing which crystallises the scale of the event for Billy who has grown up watching, and, as "one of the boys", working at Open Championships.

"Jim and I have talked about it and it is one of those things that if you did start to think about it from early in the year you could get quite worried. But you tell yourself that you will do your best and the Championship will be here and gone. All you can do is try your best.

"If you thought too deeply into it and worried about all the

things you needed to do and the number of people out there watching you'd end up jumping off Ailsa Craig out there. You have just got to get on with it," said Billy.

"Good weather, nothing unforeseen, no problems. That'll do us. It's not a lot to ask for. Is it?"

No it isn't. But you can't help thinking if it doesn't quite happen like that Billy, Jim and the team will be able to handle themselves whatever is thrown at them.

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A Salt on Larne's 7th Hole

The Bell Hole at Larne may only be 105 yards long, but its sheer physical position, bounded by the Irish Sea and with a carry across rocks from a high tee, make it intimidating.

But for head greenkeeper, Davie Craig it's not keeping the ball on the green that's the problem, it's maintaining its sward. Sea-spray can completely burn-off the bents and fescues he tries to establish.

Last spring he'd almost given up hope of ever having a resilient grass cover. Now, twelve months on, he claims that the Fortiva treated seed which he bought through JA Humphrey Agriculture has transformed the green into the best it's been in 20 years.

"I was resigned to the STRI's view that it would be better to move the green," he says. "However, we've now got a good sward with no sign of damping-off or fusarium.

"Having used seaweed extract prior to overseeding, I'm very impressed with the result," says Davie.

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By Dr Steve Baker, Senior Research Officer, The Sports Turf Research Institute

The "speed" of the putting surface is one of the most important factors influencing the playing quality of golf greens. On a slow surface that five foot downhill putt may look relatively easy, but on a fast putting surface misjudgment of the line can easily mean that the ball finishes four feet past the hole. Faster greens undoubtedly increase the challenge for the golfer and do help identify the better players. As such, faster greens should be an objective in turf management but not at any price. Too often pressure is put on greenkeeping staff to reduce cutting height in the quest for faster greens when turf conditions are not suitable for closer mowing.

In this article I would like to consider some of the factors that influence green speed in the light of research results from around the world. If we can identify the main turf characteristics controlling the speed of putting surfaces we can use this information in our management strategies without the recourse to substantial reductions in cutting height which, in the long term, will do far more harm than good.

MEASUREMENT OF GREEN SPEED

Several methods have been used to measure green speed including pendulum arrangements, in which an arm is released from a fixed height so that it strikes the ball in a similar manner to the golfer's putter, and also a variety of ramps. Usually the distance rolled is measured. The international "standard" however has become the Stimpmeter. Originally developed in the 1930's as a wooded ramp by E.S. Stimpson, the current version consists of an aluminium bar 0.91m long with a 145° V-shaped groove extending its entire length. It has a ball-release notch 0.76 m from the tapered end which rests on the ground. In use, the ball is placed in this notch and the angle of the Stimpmeter is gradually increased until the ball starts to roll. The ball-release notch is designed so that the ball will always be released when the Stimpmeter is raised to an angle of 20° to the horizontal.

FACTORS INFLUENCING THE SPEED OF PUTTING SURFACES

To use the Stimpmeter it is best to find as flat an area near to the centre of the green as possible then to roll at least three balls in one direction followed by the same number of balls in the opposing direction. If the green is flat you can calculate the green speed from the average distance travelled in each direction. If however the green is sloping and downslope reading is more than about a third higher than the upslope value, use of a straightforward average of the upslope and downslope readings will exaggerate green speed. To compensate for the effects of slope, green speed can be calculated as: Green speed = 2 x Upslope reading x Downslope reading Upslope reading + Downslope reading

FACTORS INFLUENCING GREEN SPEED

■ **Grass type** There is work from the United States to show differences in green speed in relation to species and cultivar selection and in work at the STRI we have found similar effects. Tests, averaged over five dates, indicated that ball roll distance ranged from 1.57 m for annual meadow-grass to 1.96 m for slender creeping red fescue (Fig 1). Chewings fescue, which also has fine needle-like leaves, also gave high values of ball roll while browntop and highland bent gave intermediate values.

■ **Rootzone composition** Rootzone composition has little direct effect on green speed and work on a trial at Bingley with different rootzone mixtures showed no significant effect of rootzone composition except during wet

conditions. In wet weather distance rolled on those mixes with the highest content of soil (50% soil: 50% sand) was 10-15% lower than on mixtures with 95% sand or more, mainly because of the slow clearance of surface water.

The indirect effects of rootzone composition may be more significant. There is a better chance of maintaining a fine bent/fescue sward on for example a links course than on a heavy clay soil which is likely to become dominated by annual meadow-grass. The difference in grass type associated with the contrasting rootzone materials may well have implications on green speeds that can be achieved.

■ **Fertiliser input** Succulent growth associated with high nutrient levels will inevitably slow down a golf hall. On an STRI trial with topsoil, USGA and pure sand rootzones, ball roll in July 1990 for example decreased from 1.62 m to 1.27 m on the topsoil area as nitrogen application increased from 35 to 635 kg/ha per year. On the pure sand rootzone the roll length decreased from 1.82m to 1.33m as the nitrogen input changed from 35 to 410 kg/ha per year, but there was a slight increase in distance rolled at higher nitrogen rates, possibly because the turf was weakened at these very high rates of fertiliser application.

The effect of other nutrients are likely to be smaller and are less well documented. However in the same trial described above we found some reduction in green speed on sand constructions as phosphate levels