REFLECTING BACK AND LOOKING FORWARD

"It was 20 years ago to-day" as the famous Beatles song goes but it truly was when BIGGA was born and David Golding, GTC Education Director takes time out to reflect on the momentous day and how greenkeeping, and in particular how greenkeeper education, has changed

1st August 1987, the day BIGGA commenced with full time staff (2), a landmark day and one that many people should be proud of. Too many to mention by name and sadly some no longer with us to celebrate the progress the association has made.

Progress was rapid in the early years, mainly due to the support from the Home Unions, the R&A with funding, but also a number of dedicated greenkeepers.

From 1912 there have been greenkeeping associations striving to gain credibility with employers and from the 111 members who formed the Golf Greenkeepers Association (GGA) to the approximate 5,500 greenkeeping members of BIGGA today, we must never lose sight of what brought those 111 together back in 1912 - education!

The Scottish Golf Greenkeepers Association, later to be renamed Scottish & International Golf Greenkeepers Association (SIGGA), the British Golf Greenkeepers Association (BGGA) and the English & International Golf Greenkeepers Association (EIGGA), all played an incredible role in the education of greenkeepers. Then many of the movers and shakers for the sector got together in the mid-80s and the formation of BIGGA came about in 1987.

The first formal greenkeeping course was offered by Langside College only because members of SIGGA persisted in wanting a specific sports turf course and qualification. This doesn't seem all that long ago and when I read that there are too many qualifications in sports turf I reflect on the battles we have had to gain national recognition for our specialist sector! A certain GTC was also plugging away in the background with the Home Unions and other bodies meeting to discuss golf course development including greenkeeper training.

On the appointment of Neil Thomas, the GTC also started to develop into an employer led body, and more importantly a voice at national meetings where the content and structure of greenkeeping qualifications were being discussed and developed. The influence of the media and the demand for quality playing surfaces has certainly helped the development of the sport.

So what has really changed since the formation of BIGGA and the reformed GTC in 1993?

Communication: The R&A document circulated in 1998 to all Golf Clubs identified communication as a priority area for the GTC and BIGGA to address and I have seen huge improvement. Specialist courses organised by BIGGA and the GTC approved training providers has seen competent greenkeepers being transformed into excellent professional communicators. Our colleges were very good at delivering the turf theory however, it was only when HG's started to demand better communication training that things started to improve. In fact many Head Greenkeepers then became involved in the training sessions themselves.

Employer body support: I am possibly best placed to comment on this area having worked for BIGGA from 1989-1993 and with the reformed GTC administrating a Board and technical committee funded by golfers through a per-capita levy, currently 11.15p.

The R&A have been great supporters of the work of BIGGA and the GTC but a recent decision stopped their match funding of the per-capita levy, preferring to consider special projects, has focused the remaining funding bodies on the aims and objectives of the GTC.

The fact that the English, Scottish and Welsh golf Unions collect the levy from the golfers and BIGGA contributes the same from its members, shows a commitment from both the employers and employees at golf clubs.

In simple terms, the Government want industries to take the lead on qualifications content and structure, health & safety guidance, apprenticeship frameworks and the GTC does all of these and more!

This work is carried out much in the same way as it has since 1912 with specialists and representatives giving their time working to ensure quality standards, information and the sharing of best practices are available to both employers and employees. The government challenge the education and training providers to meet industry requirements and provide courses to suit learner and employer needs.

The GTC has tried to promote a partnership approach with Awarding Bodies and its Approved Training Provider network and this continues to be a great strength for our sector. The sector has a small range of sports turf qualifications ranging from vocational (work based) to a Degree and a respected apprenticeship scheme. All of these formal qualifications are supported by short courses, certificates of competence, workshops and seminars.

The suppliers: If you want to aerate deeper, faster and with no disturbance to the surface, the machine is on the market and this analogy is true in so many areas of turf maintenance. Credit to the companies who have courted the views of the operators. True, we have seen some gimmicks along the way but in the main the equipment, machinery and suppliers of turf care products have really come up with the goods.

In summary, I truly believe greenkeeping and golf has come an incredibly long way in a relatively short space of time and the GTC, including BIGGA, must look forward to the challenges ahead just as those 111 members back in 1912 must have done.

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Another busy month in the Education and Training Department followed the reorganisation of the office, the introduction of a new database, the installation of a new telephone system and the introduction of a new member of staff. Rachael Duffy joined the department in June and has been busy learning her new role and fitting in a week working at The Open. Sami has been working on the Environment Competition and preparing the Continue to Learn brochure. I have been concentrating on the SMS and starting my handover to Sami. Yes, it's really happening, I'm taking early retirement from the end of September.

TORO Student of the Year Competition

I joined George McDonald, Trevor Chard, John Pike and Robert Jackson, from Toro, and Archie Dunn, Tony Smith, Jeff Mills and Gavin Robson from the BIGGA Board to judge this year's competition - travelling over 1000 miles and interviewing candidates from around the UK and Ireland. The standard of this competition gets better each year and we had a very difficult job selecting the eight candidates to progress to the Final at BIGGA HOUSE on September 17.

The finalists are: Neil Plenderleith from Oatridge College; Jamie Duncan from GOSTA; Lewis Birch from Askham Bryan College; Stuart Ross from Pencoed College; Richard Oakley from Bridgwater College; Avon Bridges from Oaklands College; Greg Knight from Writtle College; Simon Lambert from Plumpton College. Congratulations to all eight finalists and commiserations to those not selected.

BIGGA Golf Environment Competition

With entries up on previous years, the 2007 BIGGA Golf Environment Competition looks to be one of the most successful competitions for some time as many more golf clubs want to show how much work they have done to become "greener". The judges at STRI have been busy sifting the applications and clubs should be hearing shortly if they have progressed to the next stage and been selected for a visit. Final judging will take place in late Sept/early Oct and prizes will be presented on Tuesday, January 22 during Harrogate Week.

BIGGA/GCMA Safety Management System

After a long wait, the BIGGA/GCMA Safety Management System has finally gone live on the Internet. I have noticed that an increasing number of golf clubs have logged onto the SMS website and I hope that it is proving to be useful. BIGGA members can access the SMS through the BIGGA members' area and GCMA members can access the SMS through their library area. Non-members need to join one of the Associations to gain access.

The SMS contains a massive amount of information that can help you to produce a Safety management System for your golf club. Moreover, it contains a range of links that allow you to search the 'net' and find additional information on golf course risks. The SMS also links other BIGGA resources such as the Training and Development Manual and the Machinery and Work Equipment Training and Assessment Manual.

Continue to Learn 2008

The preparations for the Continue to Learn 2008 programme, supported once again by the GTC, are almost complete. Copies will be distributed in the October edition of GI when you will see a varied and challenging week of Workshops and Seminars has been designed. The programme will also be available on the Harrogate Week website *www.harrogateweek.co.uk*

STRI Training Courses

The STRI has released their programme of training courses for the autumn. Of special interest to greenkeepers are:

Understanding the Science and Management of Your Golf Course, November 5 – 8, 2007 at STRI, Bingley - Module One: Greens Construction and Irrigation; Module Two: Grasses for Golf Courses; Module Three: Nutrition – How to feed your golf course; Module Four: Turfgrass Pests, Weeds and Diseases. Each Module lasts for one day and costs £150 + VAT per person per day. STRI subscribers £135 per person per day. Book all four modules and receive 20% discount

November 21 – 22. 2007 at STRI, Bingley - Integrating Ecology into Golf Course Management – A Practical Approach; Introducing Rough; Scrub Control; Woodland Management; Heathland Management; Water Feature Management; Waste Management and Energy Efficiency. The course lasts for one and a half days and costs £195 + VAT per person (£175 + VAT for STRI subscribers).

More information can be found on the STRI website *www.stri.co.uk*

VANESSA DEPRE UPDATES US ON MEMBERSHIP MATTERS

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New Approvals System

At BIGGA Headquarters we have decided to speed up the approval of new BIGGA members by approving them in house. Normally it would take up to 28 days for new members to be approved. Now we are aiming to approve new members in five days.

The rest of this month's members will be included in September's GI

www.bigga.org.uk

SCOTTISH REGION		
Jim	Christison	East
Stuart	Diamond	Ayrshire
Scott	Dunbar	West
Douglas	Greenshields	East
Scott	Macfarlane	Central
Neil	Mclean	North
Jose	Morales	East
Michael	Murray	Ayrshire
Graham	O'connor	West
Joseph	Smith	Central
Ryan	Stott	North
Ross	Taylor	East
Joe	Thomas	East
John	Thorburn	West
Greg	Springthorpe	East

NORTHERN REGION		
James	Beattie	North West
Adam	Britchford	North West
Paul	Brownbill	North West
Tim	Collins	North West
Steven	Cunliffe	North West
Neil	Davey	North West
Grant	Dougherty	North West
Daniel	Gale	North Wales
Graeme	Mutch	Sheffield
James	Parker	North East
Neil	Peters	Sheffield
MIDLAND		
James	Hampson	Midland
Iain	Hardaker	Berks/Bucks & Oxon
Neil	Harris	Midland

GRANULAR AND FOLIAR FERTILISERS IN TURFGRASS MANAGEMENT

By Tim Butler

CONTINUE TO LEARN

Golf course greens are an extreme example of a stressed setting. It is important to remember that about 75 per cent of shots are made on the green, yet a green takes up about two per cent of the landmass of a golf course (Rogers, 2006, Pers., Comm.).

On a green, the grass blade is severely reduced by regular mowing. In addition, when the blades are cut and removed, the ability to recycle the valuable minerals contained therein is eliminated. Thus understanding the nutritional requirements of turfgrass is among the most important factors in their successful culture. Correct nutrition is essential for the plant to carry out physiological processes and for maintaining high quality.

The aim of fertiliser application, along with other maintenance practices, is to produce an adequately dense and vigorous turf, which is tolerant to wear, withstands adverse weather conditions, is not prone to diseases, contains few weeds and is aesthetically pleasing.

For highly maintained turfgrass areas, there is an ever-growing selection of products available in both granular and liquid forms and it is easy to become over-loaded with information regarding the various formulations. In the past, granular fertilisers were the main option available to greenkeepers and course managers, as limited liquid formulations were available.

GRANULAR FERTILISERS

Solid fertilisers are dry particles that generally range in size from 0.85 to 4.75mm. The fertiliser material may be crushed, granular, prilled or crystalline and usually, to ensure uniformity, the largest-sized particles are not greater than four times the sieve size in processing that holds about 90 per cent of the product (Crum, 2006, Pers., Comm.).

The granular size is usually quantified using the size guide number (SGN). Generally a SGN under 100 is used on greens, and a size guide number between 125 and 150 on fairways.

Granular fertilisers can be homogenous or non-homogenous. A blended fertiliser, containing mechanically mixed fertiliser products, is an example of non-homogenous. Such products could include a fertiliser that had, for instance, a nitrogen source mechanically mixed with phosphorus and potassium sources to give a complete fertiliser. Such fertilisers often have different colour prills, which vary in size, and problems with segregation of the various prill sizes can occur. When different nutrient sources are combined to give a single granular prill containing all of the nutrients, then a granular homogenous product is produced.

Several forms of granular fertilisers exist, including cold water-soluble, hot water-soluble, and coated materials. Common examples of water-soluble fertilisers include ammonium sulphate, ammonium nitrate and urea. Such liquid fertilisers should not be confused with true foliar fertilisers, which are chelated with amino acids (Vargas, 2006. Pers., Comm.).

Water-soluble fertilisers are very commonly used in turfgrass nutrition. The 'little and often' policy is often used with these sources, since the nutrient content will only last a short length of time. Probably one of the main problems with these fertiliser types is their leaching potential, particularly under heavy rainfall. Slower release products include IBDU, sulphur-coated ureas, polyon and polys products. These products have gained momentum in their use, and many golf course managers use such products particularly during spring and early autumn as a means of ensuring a constant controlled supply of nutrients to the sward. Quick release or foliar products at low rates frequently complement these products.

FOLIAR FERTILISERS

Although turf managers have been practising foliar feeding for some years, there has been a dramatic increase in foliar fertilisation on greens, tees and fairways in recent times, with many managers integrating foliar feeding with granular nutrient programmes. In foliar fertilisation, the fertiliser elements applied to turfgrass leaves are absorbed through tiny cracks or pores in the leaf surface in the wax layer. These pores are very small tubes, and are lined with water. They are called transcuticular pores.

Foliar fertiliser does not penetrate the stomates of leaves. The inner walls of the stomates (water control valves for leaf cooling) are covered with globs of wax, to repel outside water from entering the stomates themselves. Kopec (2001) reported that as the number of stomates increases so too may uptake of larger size chelates such as iron. This is due to the fact that more micro-pores are present between the stomates, as their numbers increase and permeability increases (Kopec, 2001).

Two primary forces regulate the movement of nutrient ions in solution; one is chemical and the other is electrical. Ions move down the chemical gradient from a higher to a lower concentration to reach equilibrium. Ions also tend to be transported most easily against an electrical gradient, when their electronegative potential is low.

Some turfgrass professionals feel that they have more control over their grass growth when using foliar fertilisation and the use of fertigation as a means of applying foliar fertiliser has gained publicity. Other potential benefits of foliar feeding include:

- Rapid greening
- Reduction in leaching potential
- Low cost per unit of nutrient
- Ability to spoon-feed the turf
- More-even grass growth
- Useful when plant is under stress, such as from heat

Probably the two main drawbacks to the use of foliar fertilisation are the cost of the specialized equipment needed and the amount of labour required. Unlike granular fertilisers, in particular slow-release products, foliar fertilisers need to be applied on a frequent basis, since applying large amounts of N, P, and K in a foliar feed will likely burn the foliage.

Common practice among managers when using foliar feeding is 'little and often', with rates as low as one-tenth of a pound of nitrogen being applied every couple of weeks in some situations.

RESEARCH

A lot of confusion currently exists regarding the amount and speed of foliar nutrient adsorption after application. Some turfgrass managers believe that they should irrigate the turf shortly after spraying the nutrients to prevent burning. However, the question remains: Are you actually washing off some of the applied nutrient that has not yet been absorbed? Work at Clemson University has shown that 55 per cent of 15N-urea applied was absorbed by tall fescue and Penncross creeping bentgrass.

Research into foliar absorption rates of macro- and micro-nutrients over time on both bentgrass and annual bluegrass swards is being carried out by Michigan State University, in conjunction with the University of Nebraska and Clemson University. I have been involved in this research under the direction of Professor Kevin Frank at Michigan State University. The study involves using products containing nitrogen sources including ammonical nitrogen, nitrate nitrogen and urea. It is being carried out over a prolonged period and so far shows that a high proportion of nutrients applied are absorbed within the first six hours. Further research will hopefully give a better indicator of exactly when the majority of applied nutrients are absorbed.

Many conflicting reports have been released on the topic of foliar versus granular fertilisation. Research carried out by Bigelow et al (2003) at Purdue University in a trial evaluating nutralene (slow-release fertiliser) versus urea applications showed on numerous occasions that the granular product gave better colour and quality compared to the urea. In this experiment nutralene was applied monthly at 0.5lbs N per 1000sq ft and urea was applied every 7-10 days at 0.125lbs N per 1000sq ft to a mature Pennlinks creeping bentgrass green. Liu et al (2006), in an experiment at Clemson University, reported better turf quality in a sward treated with foliar fertilisers compared to granular fertilisers, with the same N input for each.

In my opinion, foliar fertilisation is a very useful tool to turfgrass managers, particularly for applying iron, urea and ammonium nitrogen as well as magnesium and potassium. Foliar feeding will yield excellent turfgrass quality, however complete replacement of conventional fertiliser programmes (water-soluble and controlled-release products) with complete foliar programmes may be questionable.

It is true to say that the use of granular fertilisers, in particular quick-release products, can be wasteful, as shown by a report suggesting that foliar feeding urea accounted for 95 per cent of plant use compared to about 10 per cent plant use from applications to the soil. Complete removal of granular products from a management programme may reduce nutrient concentrations contained with the turfgrass rootzone dramatically over time and leave a very low reserve for the plant to use if needs be. Thus, at present, the use of foliar feeding with some strategic use of granular fertilisers appears to be best.

ABOUT THE AUTHOR

Tim Butler is currently studying for a PhD in Sportsturf Science at both University College Dublin, Ireland, and Michigan State University, USA.

Pictures: Courtesy of Professor Kevin Frank, Michigan State University

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HOW TO TURN YOUR WORST HOLE INTO YOUR BEST

By Simon Gidman

If members at a golf club were asked which was the worst hole on their course, most would come up with a different one and most would probably base their views on the hole they played the poorest, and who can blame them.

As an architect my views are perhaps slightly different.

But firstly, what constitutes a poor hole in the first place? Is it one laid out in dull surroundings, one on flat land, one without bunkers or other features. It could be all of these but it doesn't have to be. I know of many golf courses set among dreary surrounds, others laid out on featureless terrain, and others with no bunkers at all; and many of these are fine courses.

No, what constitutes a bad hole is one that sets no challenges for the golfer, one that requires no thought as to how it is played, in other words, one poorly designed. Anybody who has attended the Golf Course Design workshop at Harrogate knows the emphasis that we lecturers place on the three philosophies of golf course architecture, penal, strategic and heroic – probably to the slight bewilderment of our audience! But these philosophies are the main ingredients of our business.

The beauty of golf, at least from the architect's point of view, is that through the use of these philosophies, we set the challenges for the golfer. Without them you have a poor golf hole, one that will lack challenge and interest. It will be bereft of hazards, artificial or otherwise, and if you include limited visual interest, poor detailing and poor maintenance in the brew, then you have a bad golf hole.

The process of change comes first with a complete reassessment, not only of the hole in question, but of the whole course in its entirety. It is a gross mistake when redesigning an individual hole, to take that hole in isolation and not to review the remaining golf holes on the course. Ideally no two challenges should be repeated on a golf course and hence it is vital to know and understand the rest of the course. Repeat the same challenges as on other holes and frankly any improvements are fairly superficial.

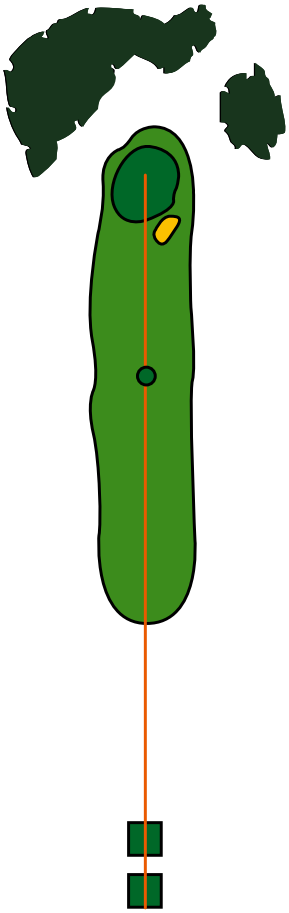
As an example of change, review the plan of above (fig.1). The hole is one of barely 290 yards but as can be seen both from the plan and the photo there is very little else of interest. The tee shot only requires a straightforward drive and a chip to a rather dull looking green – not much decision there! The green itself is barely 300m2 but at least in its favour it is fairly flat and there are a decent number of pin positions on the green – even if the putt itself is not that interesting. So, a fairly innocuous challenge. Furthermore the green as one would expect was of the "push up" type using local clay topsoil and is thus closed for large parts of the winter.

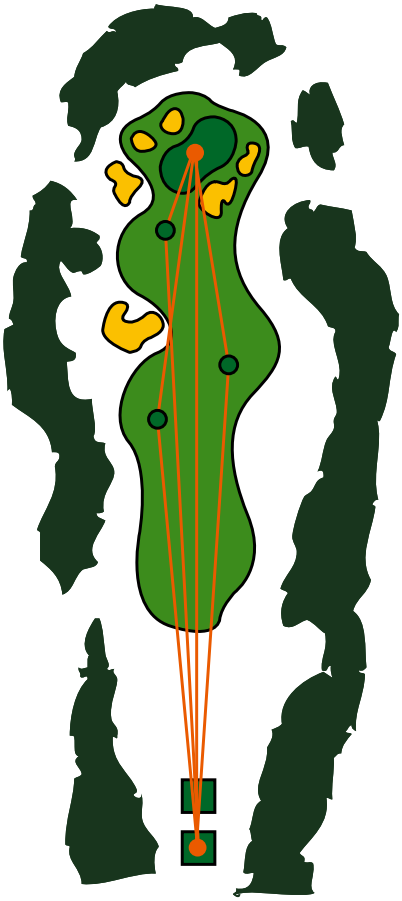
A hole with few recommendations!

However the hole has potential.

Short par 4 holes can be great holes. They can create so many options, both for the high as well as the low handicap golfer and distance off the tee is not a prerequisite to success. They give the golfer the opportunity of either playing short and chipping up to the green or, for the more adventurous, an opportunity to go the for the green for a birdie of eagle. Strategic golf!

In the revised design (fig.2) I have suggested a number of alterations. To start with I have placed a bunker at about 230 - 245 yards, just to the left of the fairway. This bunker is a real nuisance as it asks the longer hitter to decide whether to play over the bunker and reach the green or to play short and be conservative. The "soft" drive is the one to the right but the revised angle of the green makes a shot into the green difficult – and it doesn't need another bunker at this point to challenge the golfer any further! For the average golfer the angle of the green determines that the drive be played to the left of the fairway in front of the fairway bunker. But if you play short of the fairway bunker then obviously you have a longer second shot into the green – albeit not significantly longer. I considered the possibility of water but frankly water set half way up a slope rarely looks good and it certainly wouldn't have done in this instance.





The green has been raised by about 0.6 metre partly to emphasise the pitch shot into the green but also to allow greenside bunkers to be set into the slope of the green – and for them to be visible from the fairway. Around the green, the bunkers are sited, 1) to emphasise the best angle into the green, 2) to defend the right side of the green and 3) to improve the overall visual setting of the hole. One cannot completely change the aspect of any hole but you can at least improve it and mounding and good bunkering provides the hole with visual interest and dynamism.

At this particular golf club all the greens are being reconstructed in phases, to USGA specification and to appropriate dimensions. 300m2 is far too small for modern day play and while the general flatness of the green maximises pin positions, nevertheless the green presents few challenges. For a short par 4 to retain the interest of the golfer throughout it must have a putting surface to match. I am not a great believer in the extreme gradients and slopes that one sees occasionally on new greens. Tiering is fine and even tiers that might fall from front to back are perfectly acceptable on a short par – particularly if the architect is trying to encourage more of a chip and run shot to the flag. For this particular green I wanted the option of both a pitch shot if the pin was placed at the front half of the green, and a pitch and run shot if the pin was placed to the rear. I eventually settled on a green of about 480m2 which rose from the front to the middle (for the pitch shot) and then fell away from the middle to the back (to encourage a pitch and run shot). Furthermore I wanted to discourage still further the shot from the right, so in addition to the bunkers guarding the right of the green, I graded the back of the green both tilting away from the approach but also with a slight right to left slope. Nasty eh! These gradients also provide good competition pin positions. All these design intricacies are illustrated on a detailed scaled plan, usually 1:200 and it takes experience and a considerable amount of skill to replicate what is on the plan, onto site, and anybody who has witnessed quality shapers at work will marvel at the accuracy that can be achieved by skilled drivers with tilt buckets. These people can comb your hair with their buckets if you ask them to – not that I would advise it – and every inch of detail shown on the plan can be reproduced on site. To some extent it doesn't matter how good the architect is or the plan is, if the shaper is not up to scratch then the green will never work – good shapers bring a green to life!

So, we've redesigned the hole, prepared detailed designs and reconstructed the green to a decent specification but it's still only partly complete. As you can see from fig.1 tree planting is fairly limited and a hole like this needs trees –however small they are when they first go in. We have increased the planting considerably and also included for carefully placed individual trees (planted as extra heavy standards) at about 230 yds to the right and 260 yds to the left.

And now comes final part of the jigsaw – the maintenance regime. Whatever potential a golf hole may have on plan or even during its construction, the full promise of a golf hole only materialises during maintenance. As most of the readers of this article will know bringing on a green from seeded, bare earth, to a finely polished surface requires great care with new diseases to confront and new maintenance regimes to incorporate. I have not met a greenkeeper yet who has not enjoyed the experience of bringing on a new green from construction and equally haven't thoroughly enjoyed the challenge.

So, after about two months of discussion and planning, a month or so of construction and six months of maintenance the new hole is ready. The hole has been redesigned with a new green and construction, additional mounding, five new bunkers, reshaping of the fairway and extra tree planting. No longer is the challenge rather uninspiring fayre. Now the golfer has to stand on the tee, make a decision of how best to play the hole and hit it accordingly. It also looks a lot better too. All this and no water!

Simon Gidman is an internationally renowned Golf Course Architect, *www.gidmangolf.co.uk*

Manufactures, including Stihl and Husqvarna, will always recommend their own brand two-stroke oils. In the past, it could be argued that any 'quality' alternative could be used, but these days it can pay to stick with the oil recommended by the manufacturer, particularly with Stihl 4-Mix and Husqvarna E-tech power units. Why? Simply because the power units are tested with these oils, different additive packages within modern oils helping to meet certain engine features

DIFFERENT STROKES FOR DIFFERENT FOLKS

By James de Havilland

The engines that power brushcutters, and increasingly other items of kit like hedge trimmers and blowers, continuously evolve. Modern two-strokes seem to get quieter, smoother and more fuel-efficient almost year on year, and there is also a choice of true four-stroke and 'hybrid' two/four-stroke power to consider.

True four-stroke engines in this category are no longer big news, but there is still reluctance to buy into these engines among professionals. The reasons why can include power delivery and costs; four-stroke power doesn't come cheap, with a brushcutter of say £400 competing with a two-stroke equivalent that could be perhaps £100 or more cheaper for the same power and performance.

That said, a four-stroke powered brushcutters tends to be cheaper to fuel with the added advantage of doing away with the need to pre-mix the fuel. Having the lubricating oil in a sump, however, poses its own set of problems. Forget to check the oil or neglect change intervals and the engines longevity is compromised. Some engines also need to be stored horizontal to avoid the problem of oil filling up the cylinder; this can lead to some frustration when the machine refuses to turn over, let alone start.

It is also clear that a significant proportion of professionally operated four-stroke brushcutters are fuelled with a two-stroke petrol mix. It is too risky to have different fuels in use when the brush cutter fleet is made up of two- and four-stroke powered machines. This may be at odds with the aim of cutting down emissions as oil in the mix will increase a four-strokes emissions, but practicalities take priority. In fact many dealers suggest running a four-stroke brushcutter on a two-stroke mix is a good idea as it helps keep the engine lubricated if the sump oil level drops below optimum levels.

A useful compromise are 'hybrid' engines that run like a four-stroke but are lubricated like a two-stroke. Now well established in the market, pre-mix four-stroke motors, such as the Stihl 4-Mix offer the fuel economy of a four-stroke with the ease of care associated with a two-stroke. For many they are a happy compromise between the two.

Emissions and the future

Emission wise, two-strokes struggle to match both conventional and pre-mix four-strokes because even the best engines are unable to have as clean a combustion cycle. It is just a factor of their design. Pre-mix

four-strokes are cleaner running, but as they rely on oil in the fuel for lubrication it follows that they too will not match a 'pure' four-stroke for cleanliness.

Emissions are important as these determine how modern engines are designed. In some instances, modern clean running units are actually more fuel-efficient and powerful than the 'dirty' designs they have replaced; a case in point are modern automotive diesel engines. But this is not quite the case in all engines, particularly small petrol power units where carburettors have to be used.

Manufacturers have cleaned up smaller engines by refining combustion chamber and port designs plus fitting tamper proof, precision engineered carburettors. But this can only go so far. Although there are those who suggest two-strokes are likely to be phased out because they will never be clean enough, talk of their demise is misleading.

Honda have long championed four-stroke power, the company offering this type of power unit in traditional two-stroke sectors, such as outboard motors, long before anyone else. The company was among the first to put a four-stroke engine on a brushcutter too, the company's current UMK 435 model featuring a 1.6hp power unit that is a true four-stroke designed to operate on straight petrol. It is priced around £420 inclusive

Certain applications may see the gradual phasing out of two-strokes, as is already tending to be the case with pedestrian mowers. But two-stroke chainsaws and professional brushcutters are a long way from being confined to the history books. Legislators may well set out the emission rules and targets but they cannot ban a certain type of power unit if there are not alternatives to viably replace them.

Two-stroke engine exhaust catalytic convertors, incidentally, can make working with this type of power unit less unpleasant. They are not really aimed at cutting emissions in the same manner as automotive systems.

The right oil

Two-stroke oil is one of those subjects that is often discussed but frequently ignored. Quality 50:1 two-stroke oil is far removed from 'traditional' mineral based 25:1 oils. Modern two-stroke oil formulations mix well with unleaded petrol and will clean, lubricate and cool an engine that may be running at speeds in excess of 14,000 rpm. Older mineral oils could separate out of the petrol mix if not agitated and is would not be suitable for use in a modern close tolerance, high speed two-stroke power unit.

The problem is that there are some low purchase cost oils on offer that claim to offer modern 50:1 oil advances but are inferior to branded alternatives recommended by engine manufacturers. In some cases, these low cost oils are pretty similar in specification to the 40:1 oil developed as an alternative to 25:1 mineral oils commonly used into the early 1980's.

In a 'low-tech' two-stroke, these 'cheaper' oils may well be acceptable. Use them to lubricate a modern professional brushcutter or chainsaw, and the oil will not be up to the job. The engine may not seize and it could appear that all is well right up until the engine starts to misbehave. But signs of poor oil performance can include smoke in the exhaust emissions, residues forming around the silencer outlet, uneven idling, hot running leading to fuel vapour lock and poor starting from hot.

When buying two-stroke oil, it is important to check its specification meets the demands of the engine it is to lubricate. Where possible, stick with the same brand for the life of the engine. Although there are those who argue otherwise, it also pays to buy 'quality' petrol. The additives present in brands like Shell and Texaco do differ to those used by some supermarkets. Although these are designed to improve a car engine performance and particularly keep fuel injection systems clean, a decent petrol may improve hot starting performance and engine idling because it is less liable to 'go off'. On the flip side, using higher-octane super unleaded petrol with a will not bring any benefits.