

# St Andrews builds for the future

The need for new greenkeeping facilities at St Andrews had been apparent for some time.

For more than 40 years, the staff looking after the original four courses on St Andrews Links had worked out of ageing buildings situated at the southernmost end of the Jubilee Course – the 18 holes laid out closest to the sea.

The result was that maintenance of St Andrews' four oldest courses, the Old, the New, the Jubilee and the Eden, involved crossing numerous fairways, public paths and tracks and even a now disused railway line, a situation far from ideal, especially during the run-up to important tournaments and championships.

The logistics problem was exacerbated further in 1972 and 1993 following the respective openings of the nine-hole Balgove and the 18-hole Strathtyrum Courses – both located inland adjacent to the Eden Course. The distance now being travelled from the existing Jubilee sheds to mow the most distant tees and greens was almost two miles.

"The facility had simply become inadequate for the staffing levels and the higher standards of maintenance demanded across the links," commented St Andrews Links Manager, Ian Forbes. "It was also in completely the wrong place to look after six separate golf courses."

A decision was taken by St Andrews Links Trust in 1993 to develop two new greenkeeping centres. One would replace the existing sheds to look after the Jubilee, the Old and the New Courses, the other would house the staff and machinery maintaining the Eden, Balgove and Strathtyrum Courses.

Because there was a pressing need for a brand new facility close to the latter three courses, it was decided that construction should start first on the all new Eden Greenkeeping Centre. But where should it be situated?

Initial plans drawn up in April 1994 by consultant architect, Fraser Smart, identified 10 possible locations for the new building. Six of these were quickly discarded as being unacceptable to either St Andrews or the local planners.

The remaining four sites were

then studied in detail with particular emphasis being given to their position in relation to the courses.

"Accessibility and the ease of serving the three courses were paramount in reaching the final decision," pointed out Ian Forbes. "However, selection of the best location from an access and operating point of view had to be set against the fact that this is a very sensitive area. Not only would the new greenkeeping centre be visible from the Old Course and the main road into the town, but it would also be close to the Links Trust offices, the Golf Practice Centre and the reception and ticket office for the three courses

roundings and the required traffic flow without detracting from the building's main function as a working greenkeeping centre.

"We needed to combine a low building, which would have minimum impact on the landscape, with a large internal volume to maximise the working space from an available floor area of 1,000 square metres," explained Fraser Smart. "This was achieved through the use of an asymmetric portal frame design which gave us a low eaves height, yet provided adequate internal headroom and plenty of useable space within the span of the building."

The major problem of low

centre which allows machinery to be driven from one course to another without hindrance.

Machines can also move smoothly from the roadway into the greenkeeping complex en route from the Eden to Strathtyrum or Balgove courses and vice versa. They can also leave the building by a different door to the one by which they entered.

From the beginning, the new Eden Greenkeeping Centre had to include three main elements: Storage for greenkeeping equipment, storage for buggies, and offices and facilities for greenkeepers, rangers and course orderlies.

Because the main workshop will be housed within the new Jubilee building, currently under construction, the Eden has minimal workshop facilities although there is a purpose-built separate covered storage area for fuel, soil and top dressing materials.

While the 'L-shaped layout of the main building has kept the individual internal elements separate, the greenkeepers are sharing rest and wash room facilities with the staff employed on the links to carry out support functions such as rangers, cleansing and waste management, painting and general repairs and maintenance. This integration is proving successful and has helped improve staff relations and the understanding of each other's role.

Concerns about the visibility of the Eden facility from other parts of the links were answered by a 2m high embankment built around virtually the complete complex. Part of this already existed following the excavations for the car park and golf practice centre in 1992. The remainder used soil excavated in preparation for the footings for the new building. This gave a fast, effective screen at considerable cost saving over the trees originally planned.

In designing the building, architect Fraser Smart included several interesting features. Ventilation is natural rather than mechanical combining air entry ducts beneath the eaves and louvered air outlets within dormers set into the roof at the same level as the top of the main doors. Apart from complementing the overall



A 2m high embankment around the facility provides an effective and economical screen. Air circulating through ducts beneath the eaves and in the roof provide five air changes an hour within the building

it would be serving."

While the introduction of a new working facility into the heart of an existing golfing centre brought difficulties of its own, the chosen location did help dictate the final design of the building. "Being adjacent to existing buildings and trees helped," pointed out architect, Fraser Smart. "There is no doubt that other sites would have had far more impact on the landscape."

Initial drawings of the new greenkeeping facility had followed a design which would sit comfortably among the existing architecture of the area, principally low, short span, pitch roofed farm buildings with gables. Once the final site was selected, the basic design and layout was altered to suit the immediate sur-

eaves is providing sufficient height for the movement in and out of the building of tall machinery such as tractors and digger-loaders. This was overcome by setting the main doorways into the roof, dormer fashion, with security provided by electrically-operated roller shutter doors.

The design and positioning of the building, its internal layout and main doorways were dictated by the traffic flow through the site and into the facility. Because the centre is serving three different courses – two in one direction, the third in another – it was necessary to plan separate routes into and out of the building and to the Eden, Strathtyrum and Balgove courses. This has been achieved successfully by installing a perimeter roadway around the

design, the resulting air circulation movement is said to give five complete air changes an hour within the building.

Because all of the washings go to soakaways, proper separation of grass, oil, fuel and silt is essential to prevent soil contamination and waste pipe blockage.

Oil and fuel is handled by three filtering chambers and there is also twin silt traps. Collection of grass clippings was considered a major problem and paid special attention by Fraser Smart. The solution was found in a specially-designed three-stage tumbling filter comprising three chambers of gradually increasing depth through which washings passed, depositing stray grass on the way.

The end result is clean water flowing to the soakaways, leaving grass behind in the regularly-emptied traps.

"In the Eden Greenkeeping Centre, we have a facility which has helped raise the all-round standards and efficiency of links maintenance," commented Ian



The main doors are set into the roof dormer-fashion to maintain a low eaves and building height in keeping with local architecture

Forbes. "From a greenfield site, it was up and running within the three months originally scheduled and was delivered within the planned budget of £525,000. At £400,000 for the building and

£120,000 for the associated services and roads, St Andrews has a cost-effective unit providing one of the best greenkeeping facilities in Europe."

● Next month, the Learning Experience considers the design, management and operation of St Andrews' Eden Greenkeeping Centre from the greenkeepers' point of view.

**THE ONE QUESTION I WOULD LIKE TO ASK OTHER GREENKEEPERS IS:**



"How would you go about getting an annual invitation to the Kubota Challenge?"

**Scott Ballantyne, Cowglen**

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# KUBOTA CHALLENGE

**After the debacle of '95 our boys improved in the '96 Kubota Challenge but they still didn't win. Scott MacCallum was there to support and record events.**

**H**aving carried the can for the horrendous showing in last year's Kubota Challenge when the BIGGA team came last for the first time in the history of the event it was with trepidation that I made my way to The Belfry for the 1996 event.

The news which greeted me when I arrived was extremely positive. We were in the final, having scraped through on count-back after tying four all with the secretaries. The stars were Raymond Day and Steven Heap who's big wins carried the day.

The other news was that the final had already started and every match was out on the course.

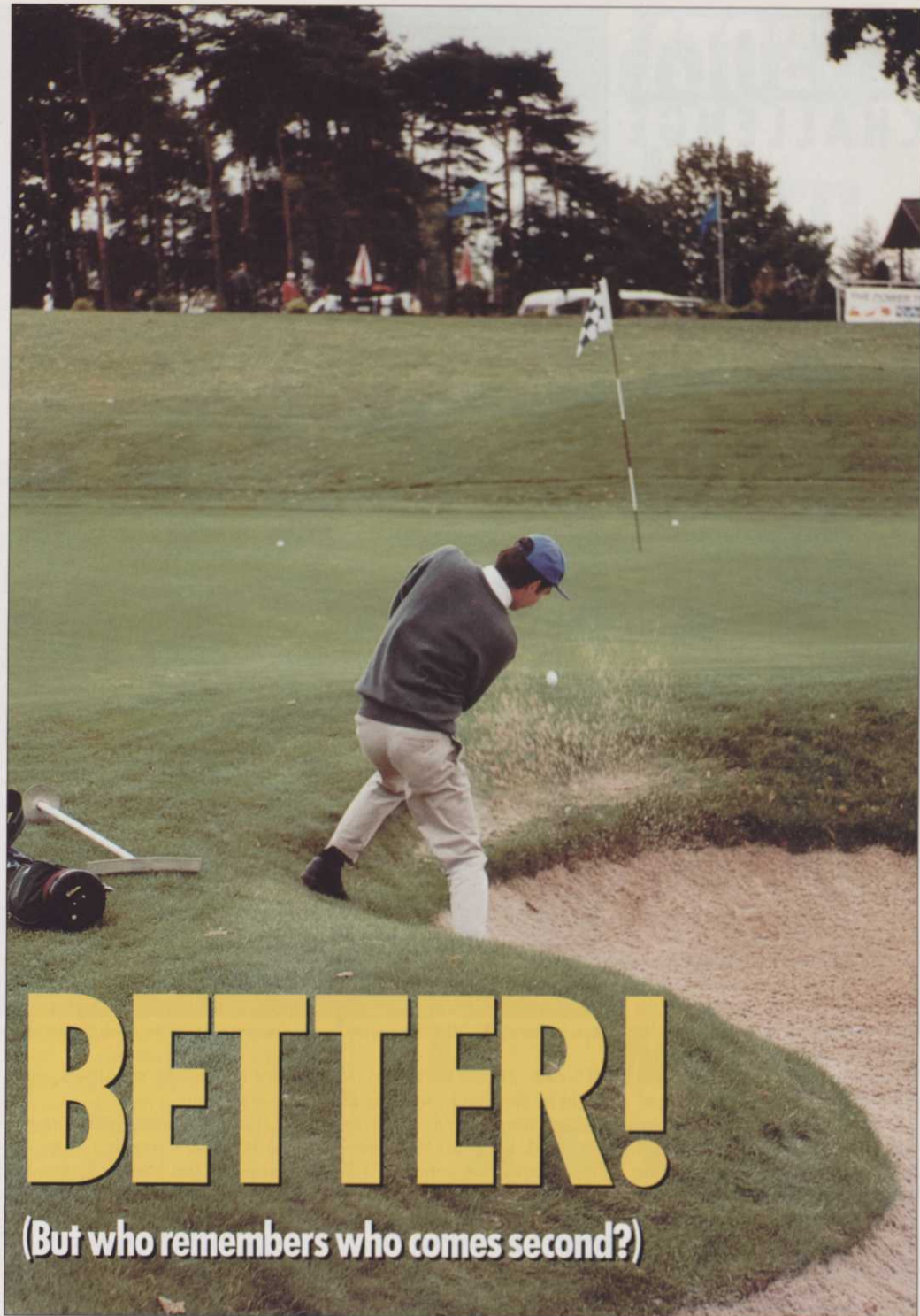
It appeared to me to be a desperate bid to avoid my evil eye after I had "cursed" our team last year and I was still thanking my lucky stars that I possessed a thick skin. It was only then that I discovered that a morning instead of an afternoon start had been adopted due to the hectic Belfry schedule and the traditional drive and chip would be later in the afternoon.

Hot footing it out in to the course and honing in on our lead man, Ray Day, I was about to learn that I was not going to see a great turn around in my own our team's fortunes. Good though our men were playing the defending Champions the EGU were a tough nut to crack and those in the early games who were receiving shots from our boys were certainly making them pay.

By the turn the writing was on the wall. We were well down and a collapse of Greg Norman proportions was needed by the men from Woodhall Spa to deprive them of the title.

Credit where credit is due our magnificent eight fought well but half a point from the first five games was a poor return and meant that the efforts of Neil Maltby and Steven Heap who produced maximum points over the two days and fought back to win their games in the final were in vain.

So who were our representa-



# BETTER!

**(But who remembers who comes second?)**

tives in this rare opportunity to represent the profession and how did they fare individually?

■ Ivor Scoones. The team Captain was seven down in the final at the turn. He found sand off the tee at the world famous 10th and BIGGA's photographer recorded his recovery over the water to rough on the right side of the green. He also recorded his mishit chip which left the ball in the rough. Unfortunately he put the camera down just as Ivor chipped in for an unlikely par.

■ Ray Day. Returned to the scene of his stag night a few weeks earlier and was the man on the match in the first round. He won 5&4 and was just one over par in difficult conditions in doing so. I

can only imagine that the celebrations of such a stunning display diluted his display in the final as he succumbed by two holes – although in mitigation, his opponent nearly holed his third at the infamous 18th from across the lake.

■ John Berry. Qualifying for the team by his stunning performance in the National Tournament at Seacroft but he perhaps peaked too early as he lost both his matches. The real tragedy was that he took souvenir pictures of the course during his round only to find he had no film in his camera.

■ Richard Barker. Nobbled Antony Bindley, his First Assistant at Kirby Muxloe, to get in the



**Above: Ivor Scoones collects his ball after chipping in at the 10th.**

**Top picture: Guess who!**

# KUBOTA CHALLENGE

team as a last minute reserve and give him yet another picture in the magazine. Unfortunately he too, despite having an excellent season, lost both of his matches. He did, though, go down the last in both of them.

■ **Scott Ballantyne.** Came from two down with two to play to grab the half point in the final and at least by the man to avoid the whitewash as we were already four nil down at the time.

■ **Roger Willars.** The only survivor from last year's humiliation. Won his first game but was the victim of a strange virus which affected his co-ordination the night before the final. At 2.30am he totally missed his mouth with a bacardi and coke, splashed it all over the bar and had to fork out £1.90 for a replacement. Remarkably his co-ordination returned sufficiently to make it to the first tee on the final but his brave fight came to an unsatisfactory conclusion on the 16th green.

■ **Neil Maltby.** Showed his team mates what conscientious professionalism can do by staying on soft drinks and being in bed by 10 the night before the final. He was rewarded by a 100% record and being the first greenkeeper to record a win in the final. He was also a star at the dinner because being from Doncaster he was able to translate the jokes of the excellent Duggie Brown, also from "Donnie", for the rest of the team.



Above: Neil Maltby, the first greenkeeper to record a win in the final. Below: At least we won the drive and chip!

■ **Steven Heap.** Carried on the form he showed in winning individual honours in the Hayter National Final at Fairhaven to also record full points. His 5&4 victory in the semi final along with Ray Day's similar victory margin helped

ensure that the countback went in our favour.

It was a marked improvement on last year's showing when we came last but bearing in mind it required a countback to reach the final there is improvement required to reach again the giddy heights when we won it five years in a row to '89 and three times in a row to '93. It is now three years since the cup has resided at Aldwark Manor the longest barren patch we have suffered in the event's 14 year history.

The one saving grace continues to be the drive and pitch where despite a severe handicap with regards to equipment we won convincingly. Behind the wheel of a Kubota our men are as at home as Chopin at the piano or Gazza in an early bath and, complimented by skill with the wedge that they hadn't displayed earlier, they

romped home with time to spare. The Kubota Challenge is a firm feature on the calendar and although there was a change this year with Brian Hurtley now enjoying his well earned retirement, Rene Orban took up the reins and immediately displayed a genuine feel for an event which should ensure it continues well into the next millenium.

All those, greenkeepers, secretaries English Golf Union and Golf Foundation representatives who have played since 1983 will certainly hope so.

**THE ONE QUESTION I WOULD LIKE TO ASK OTHER GREENKEEPERS IS:**



"How do you combat disease?"  
**Steven Heaps, Rothey Park**





## Education Update

BY KEN RICHARDSON

# Ecology on the course: always a lot to learn

Following on from the very successful, but tiring, regional finals of the TORO/Lely/PGA European Tour Student of the Year Competition and prior to the start of this year's Regional Supervisory Management Courses, in Scotland, I attended an interesting and informative seminar on golf course ecology, at the Royal Holloway College, University of London.

### Audubon International Golf Ecology Seminar 26 September 1996

Audubon International is the major ecological organisation in the USA.

Together with the United States Golf Association, they have initiated a Cooperative Sanctuary System which aims to encourage golf courses, in the USA, to operate to an ecologically responsible management plan.

The aims are to preserve biological diversity, reduce dependence on non-renewable resources, increase natural habitat and protect water quality and quantity.

The European Golf Association Ecology Unit, which was established in January 1994, was developed in recognition of the need for a coordinated European approach to environmental issues in golf. The EGA Ecology unit aims to establish a solid factual understanding of the environmental attributes of golf courses, to develop the environmental aspects of golf courses, to encourage a higher standard of environmental performance and to provide a contribution to environmental debate in Europe. The EGA Ecology Unit hopes to realise some of these aims by initiating its Pan European Environmental Management Programme for golf courses. There will be two key components to this programme:

a. *A Green Flag Campaign for European Golf Courses.* This will be in the form of a voluntary Environmental Management Programme based on the principles of the Eco Management and Audit Scheme and the highly successful Audubon Cooperative Sanctuary Programme. Golf Clubs which engage to improve their environmental performance

and implement Best Management Practice guidelines will be eligible for recognition in the form of a green flag award.

b. *An environmental dimension to the Ryder Cup.* The focal point for the launch of the Scheme will be a major public awareness initiative in association with the Ryder Cup at Valderrama, Spain, in September 1997. The aim of the campaign will be to raise the awareness of not only golfers and all those involved in the golf industry but also to show the general public that golf courses do have a major part to play in preserving the ecological balance by using best management practices on the golf course.

#### *Best Management Practice for the Protection of Natural Resources on Golf Courses*

Because of continuing public concerns, general awareness and media pressure, golf course management decisions of the future will have to be based on sound ecological practices. In many people's eyes, golf courses are gross polluters and energy wasters but those with a knowledge of turfgrasses can offer many positive aspects of golf courses and golf. Dr Charles Peacock, from North Carolina State University gave an example of how public perception can be influenced by the popular press printing ill informed and, sometimes, completely untrue information. The following information was printed in a newspaper in North Carolina:

"City sewage, industrial wastewater, farm fertilisers, livestock manure and lawn and golf course chemicals are changing the Neuse River, choking it with Nitrogen and Phosphorus".

When the reporter was questioned about research which showed that any of the river's pollution problems were associated with turfgrass or golf courses she admitted that she had made generalisations. However, the damage was done and the public linked pollution of a river to golf courses. To prevent this type of misinformation being published, golf course managers will need to be proactive and develop sound ecological management plans to ensure that the media and the general public do

not have any material to support the anti golf lobby.

How does all of this affect BIGGA, its members and all golf greenkeepers? Pressure from governments, the general public and pressure groups will not go away. The EGA Golf Ecology Unit initiative will make European Golf Courses think about and perhaps change the way that golf courses are managed. Golfers will expect to see courses managed in ecologically sound ways and golf greenkeepers will have to adapt their skills to meet these demands. BIGGA recognised the need to make greenkeepers more aware of the need for ecological management by the launch of its book *A Practical Guide to the Ecological Management of Golf Courses*, in cooperation with the Sports Turf Research Institute, inclusion of speakers at the National Education Conference and Seminar Programme giving

talks on ecological management and by commissioning a training video which will complement the aforementioned book. These initiatives should give greenkeepers the knowledge and skills needed to conduct an ecological survey, produce an ecological management plan and follow the greenkeeping practices needed to ensure that golf courses continue to be assets to the environment.

Many of the delegates at this seminar were from non-golf, environmental backgrounds and it was obvious that the message that golf courses could be great assets to the environment was not getting across. It can only be hoped that the efforts of the EGA, the Home Golf Unions, the R&A and BIGGA in educating golfers, greenkeepers and the general public make sure that the positive contribution that golf courses make to the environment is recognised.

**IF I WERE  
A WEED  
I'D BE  
TREMBLING  
IN MY  
ROOTS**



**JANUARY  
LAUNCH**

An excellent piece of farmland, a superb location and a supreme attention to detail have combined to produce a new course destined to be a winner. As Scott MacCallum discovered.

When the *Demand for Golf* was first published by the R&A in the mid '80s it was as if the starting pistol had gone in a great race for land owners and developers to produce the "biggest", the "best ever", the "most expensive" golf courses yet seen in the country.

With the benefit of hindsight the sight of white elephants and smell of burnt fingers were almost inevitable but it was easy to sympathise with those who tried and failed at the time.

To compete with the Turnberys, Wentworths, Sunningdales and St Andrews of this world with their rich history and world renown new courses used different tactics to attract members – most expensive memberships, big name designers, signature holes, five star clubhouses. All to grab publicity and entice golfers to part with their money and join.

The problem was that the investment required was colossal and the competition among new clubs huge and, ironically, no matter the quality of the final product many golfers would still rather become members of a traditional members' club given the opportunity.

Robert Knut is one of the new breed of golf developer who watched the banks and third parties move in to rescue magnificent, but failing, courses and paying a fraction of the initial cost to do so. He watched and he learned and he constructed proper business plans before beginning his own course.

Like many of its impoverished older colleagues The Oaks is an outstanding golf course and no expense has been spared. Unlike the others steps were taken to minimise the possibility of financial collapse.

For one thing The Oaks is sited just north of Selby, in Aughton, close to York, close also to the A1 and the M62.

"We counted the chimney pots," explained Robert. It's a nice way of saying that the demand was gauged before any other move was made.

"Primarily we thought we had a block of land which was suitable for a golf course with woods and some water and being situated where we are we felt that there was demand for another course around York.

"We knew we had to go to the top end of the market to compete

# From little acorns...

# THE OAKS

## has grown



The well maintained entrance

with the clubs which had big waiting lists like Fulford, Strensall, Ganton, Selby and Brough," he said.

"We were convinced that there is always a demand if the job is done right. You just have to avoid getting cold feet."

The feasibility study was so wide ranging it also took into account the fact that the Central Science Laboratories and the Ministry of Agriculture had relocated to York from London.

"We worked out how many of the staff were likely to be golfers and that they would require somewhere to play golf. It was one of the main reasons we decided to go ahead."

As it turned out the "new golfers to the area" would not have been required as around 85% of the membership has come from neighbouring golf clubs and the The Oaks opened with a full membership of over 640. They even have a waiting list. How

many new clubs could claim that within four months of opening the gates?

The course was built by Fox Plant, of Lincoln, a company which had built its own course near Birmingham about two years before.

"They were absolutely invaluable when it came to credibility for the course and when they began building they came in with a lot of equipment and it was built quickly," explained Robert.

"The grass seed was one of the biggest decisions we had to make and we looked at a number of golf clubs, visited the STRI and most of the major seed breeders at their own trial sites before making up our minds," said Robert whose family are also seed merchants.

"My brother, father and I went to Bingley twice and we each identified what we thought were the best grasses and we were unanimous each time. So in the end it was easy."

They went with Barenbrug in the end and have been impressed with the "hands-on" attention of Michel Mulder who frequently popped in on the course to check on progress of his grass.

"Being a specialist grass seed company as well as farmers ourselves made us look harder than some people would have done when it came to seed. We had contacts in the trade ourselves but the odd thing was that we had never dealt with Barenbrug," explained Robert.

The greens and greens surrounds were both sown with the same mix – 20% Lance, browntop bent; 40% Barcrown, slender creeping red fescue and 40% Baragreen, chewings fescue – to reduce the chances of invasion by poa and as an added insurance we had three men for three weeks



The team: Assistant Richard Webster, First Assistant Nigel Tate and Head Greenkeeper Philip Young

who spent all day on their hands and knees roguing poa by hand.

"We took the attitude that if we start as near perfect as we can we will try and keep on top of it. It's an on-going problem so we had a rule that every time the green was cut a dozen meadow grasses had to be rogued out.

"We decided not to go with dedicated rough mix – they went with fairway mix is 25% Bar-crown; 20% Barumba/Bargreen,

chewings fescue; 25% Barnica, chewings fescue; 20% Limousine, smooth stalked meadow grass and 10% Highland, browntop bent – because it allowed us more flexibility as to where to put the rough and meant less compaction at the sowing stage.

"We said from day one that we would reduce compaction and use light vehicles and special tyres."

"Trees have rough round them

so there is no strimming while wherever possible jobs can be mechanised.

The course was designed and constructed to be maintenance friendly and manageable by the full time green staff of three – Head Greenkeeper Philip Young, First Assistant Nigel Tate and Assistant Richard Webster.

"Philip and the team work on tees, greens, fairways and bunkers while we have someone in the summer months who does nothing but cut rough and semi rough. There is no strimming to be done. Trees all have rough up to the bottom of them while slopes are all shallow enough to allow them to be cut by ride-ons and all greens and tees can also be cut by ride-ons. We don't have steps up to tees because that creates wear areas and again the areas around them would have to hand cut."

Farm staff can also be brought in to assist in non-greenkeeping work like dyke building if the need arises.

Robert has brought some agricultural practices to the job of maintaining golf courses.

"On the measuring side greenkeepers have traditionally walked

up and down with a hand pushed fertiliser spreader and there is no proper speed monitor. The speed could vary depending up how tired he was that day. With proper speed recording equipment and doing it in a vehicle 100% accuracy can be achieved and the job done much quicker.

"My tractor man who does the spraying on the golf course can take the sprayer to within half an inch of a green and you can do a job in four hours what it would take three days to do by hand."

They use liquids on The Oaks because of the accuracy it affords and because they can tailor a liquid by adding iron, sulphur or any of the trace elements and applying them in one application.

"I am absolutely delighted with the way the golf course and the club has established itself so quickly – we already have 39 single figure handicappers in the club one of the highest number in the area," explained Robert, whose bid to become one of them, admittedly from a standing start, is hampered by an inability to find time to play on his own golf course.

You can be sure that like the famous trees which share the club's name The Oaks will be become ever more impressive with time and become an established part of the golfing community of the area.



Rough is allowed to grow around trees to ease maintenance

## EQUIPMENT INVENTORY

- Two 6x4 John Deere Gators
- One John Deere 2243 Diesel Greens Mower
- One John Deere 2243 Petrol Greens Mower (Tees and Approaches)
- One Toro Reelmaster 6500-D Fairway Mower
- One Sabo Roberine Continent 400-3D Triple Mower
- Three Ransomes Greenspro 22 Hand mowers
- One Lastec F Deck Articulator
- One Huxley TR 84 Three gang Hydraulic Reel Mower
- One Wessex Trailed Rotary Mower
- One Kubota L4200 4WD Tractor
- One Massey Ferguson 1210 4WD Tractor
- One Blec Top Dresser
- One Techneat six metre sprayer
- One Kubota LA680 Loader

# ENGINES

By Roland Taylor

**B**ecause engines are, in a majority of cases, only component part of any piece of mechanised equipment – albeit the most vital one – their importance is often taken for granted by end users.

Only when they refuse to respond to the turn of the ignition key do they come under the spotlight. The modern engine is required to produce sufficient power to drive sophisticated transmission systems, hydraulics and cutting mechanisms. Development and technology over the last two decades have produced a compact, lightweight power unit, which has a cleaner and more efficient internal combustion process than its predecessor. However, this method of producing power still has a long way to go and in the meantime will continue to be one of the top items on the environmentalists' 'clean up your act' list.

## Quality standard

It was back in the seventies that we began to see changes in engine design – these were mainly in small industrial units many of which were fitted to lawn mowers. Engine manufacturers, including some UK companies, had been supplying this market for a number of years, but it was the entry of Japanese companies that was to play a major part in it at this stage. What they bought to the marketplace was not so much innovation, but quality. Using the latest in precision manufacturing they produced extremely high quality engines. As a result, other manufacturers soon realised they had to respond quickly to the situation. This meant considerable investments in engineering processes and machine tooling. Unfortunately, as with the motor cycle industry, it heralded the demise of UK small engine manufacturers. The

over all outcome was that the quality of engines, regardless of where they were produced, greatly improved.

Throughout this period an increasing number of companies began producing outdoor-power-equipment, especially grass cutting machinery. Each new product launch set the competition the challenge to improve the concept further. Engine producers were under pressure to come up with new innovations such as increasing power output, but not weight or over-all dimensions. It is during this period we see some big changes.

## All-round better starting

Early two-stroke engines had been anathema in the industry. They were often inefficient, difficult to start and keep running for long periods. The development of equipment that required this type of engine such as chain saws, brushcutters and hedge trimmers demanded changes. Today, the modern two-stroke is found on a wide range of machinery and gives very few problems.

With the introduction of electronic ignition contact breaker points were eliminated and the engine's performance and starting was dramatically improved. On larger machines electric starters were soon fitted as a standard feature.

## Diesel development

One of the biggest changes was on the diesel engine front, especially the single cylinder air cooled units. Up to this point they had been heavy cumbersome units that were ideal where a steady output was required. On machinery, especially rotary mowers, they failed to respond fast enough when placed under load. The advent of a small fuel injector and redesigned combustion chamber, plus the use of lightweight alloys, eventually produced an engine that was on par with its petrol cousins.

Mainly because of the savings in fuel costs, increasing numbers of commercial users were demanding diesel powered machines and twin and triple cylinder water-cooled engines began appearing on larger grass cutting equipment.

Today, turbo-charged units are begin to appear as a result of manufacturers requiring high engine output without increased weight or dimensions. A super turbo-charger can be a mechanical unit or is more likely to be driven by the exhaust gases. These pass through an impeller which drives a compressor to produce the necessary pressure that is required to deliver fuel into the combustion chamber.

## Legislation calls the tune

In recent years legislation, especially in America and some countries in Europe, has meant engine designers have had to find ways of reducing exhaust emissions, noise and vibration without affecting performance. Not an easy task, as the levels of these three factors are being continually reviewed and reduced. This again has led to a host of new developments.

## Design

Most single cylinder petrol engines now have overhead valves. This configuration not only reduces the over-all size of the unit, it is said to also enable the fuel/air mixture easier access to the cylinder and likewise the burnt gases can escape faster – both contributing to a more efficient performance.

## Lower emissions

The combustion process in itself is very wasteful and a lot of unburned fuel is passed into the atmosphere in the form of gases. These are Carbon Monoxide (CO), Hydrocarbons and Nitric Oxides (HC+NO). Reductions in their levels will depend on:

1. The efficiency of the engine's carburettor system. Rich fuel mixtures mean higher levels of emissions. Unfortunately lean mixtures result in loss of power and starting problems, so designers have had to find a fine balance between the two on the latest models. Poorly maintained or worn engines will also be emitting high levels of emissions.
2. Fitting a catalytic converter will reduce emission levels. These are becoming more commonly available for smaller engines, but are at present a relatively expensive addition. There are a number of

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# 1997 STYLE



Smokeless two-stroke oil only produces water vapour and carbon dioxide. The problem of noxious oil smoke is eliminated

types available and these generally resemble either a tight coil of corrugated cardboard or a sponge. The idea is to produce the biggest surface area possible in a small space. Ceramics or stainless steel forms the base structure to which is applied a coating of precious metal. Once the catalytic converter reaches operating temperature it incinerates the emissions turning them into non-polluting compounds.

3. In the case of two-stroke engines there are now available smokeless oils. These are produced from a gas. When the oil/petrol mixture is burnt in the combustion chamber it reverts back to its original form and is emitted from the engine as water vapour and carbon dioxide.

## Noise

Improved exhaust systems, sound proofing materials and engine speed have a bearing on the amount of noise produced. Many manufacturers are now putting larger power units on machines so that even when under load the engine is working well within its capacity, thus keeping the noise emitted to a minimum. Incidentally this can also affect the amount of vibration produced.

## Vibration

Synchronised balanced engine

components plus specialist mountings reduce the levels of vibration from an engine. On small power units fitted to chain saws, brushcutters and hedge trimmers, improved damping systems provide extra operator comfort.

All this mainly applies to new engines and equipment so what about all those machines that are already in operation?

There are a number of things that greenkeepers can do that will not only contribute towards a cleaner environment but help towards getting the optimum performance from their equipment with the minimum of engine downtime.

## Re-powering equipment

The engine's performance is at the heart of any piece of equipment's performance. When this starts to deteriorate it can have the following affects:

- There is marked difference in the quality of finish
- Operations take longer
- Starting becomes difficult
- Fuel and oil consumption increase
- Emission levels rise
- More pressure is placed on the machine's other components
- The risk of a breakdown at a critical time is greatly increased
- Costs rise, frustration increases and efficiency declines.

At this stage there a probably

two courses of action that could be considered. Firstly the machine is replaced with the latest version, but funds may not be available for this solution. An alternative answer is to fit a new engine, but before taking this route there are a number of factors that need to be considered.

What is the condition of the rest of the machine? It is pointless to replace the power unit then find other components, transmission drives or cutting mechanism breakdown because they too are worn out.

The unit you are considering using will need to fit into the existing engine compartment without major modifications. Engine suppliers usually have list of suitable replacement power units plus any modification kits that may be necessary.

The advantages of taking this course of action are:

1. The latest model of engine is installed with all the latest benefits. It will carry a warranty.
2. Compared with replacing the whole machine it will be a very much less costly exercise.
3. The efficiency and performance of the machine is greatly improved.
4. The chances of any downtime are reduced.

Anyone contemplating fitting a new power unit should consult their local engine supplier who

can not only advise on the best course of action but also may have some attractive packages to offer.

## Other environmentally friendly actions

- Maintaining equipment, especially engines, to the highest of standards will always pay dividends.

- Air filters. A dirty or blocked air filter makes the mixture richer and as a result exhaust emission rises dramatically. Fuel consumption rises and starting becomes difficult whilst performance deteriorates. Therefore, clean air filters regularly, especially in dry dusty conditions.

- Fuel. Use the correct two-stroke mixture. Clear up any spillage immediately as these are one of the worst forms of atmosphere pollution. Ensure carburettor settings are regularly checked as these are vital to maintaining the lowest levels of pollution possible.

- Oil. Keep at the correct level and change at the recommended intervals. Oil contributes towards keeping the engine running at the correct temperature. Use a smokeless oil in two-stroke mixtures.

- Cooling systems. On air-cooled engines the fins around the cylinder head need to be kept free of debris as blockages in these cause the engine to run hot and produce more pollution. Units, especially diesel, are generally water-cooled and the radiators on these need to be kept free of grass clippings and dirt.

- General. Regularly attend to any components that require greasing, oiling or adjustment. It reduces any strain placed on the power unit. In addition to reducing pollution, this is good machinery management and makes for a more efficient and productive operation.

The race is on to find an alternative to the internal combustion engine, but in the foreseeable future it is likely to continue as the major source of power for most professional amenity equipment. However, whilst the basic principle is unlikely to change, man's ingenuity will continue to find ways of refining the process and design of engines to meet the demands and requirements of both the legislators and users.

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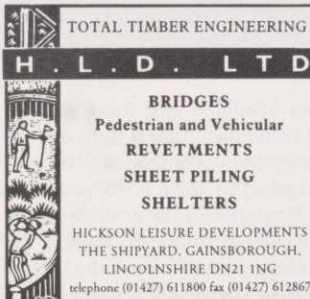
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