

# Alternative Power or Compromised Power?

James de Havilland charges up and shops around for alternative power mowers.

As the smell of freshly mown grass mingles with exhaust fumes and the aroma of hot hydraulic oil, it is all too easy to forget that it need not be like this. Electric powered mowers have been around for almost as long as those with an internal combustion engine, but their use has typically been confined to tending suburban household lawns.

When Ransomes introduced its all-electric E-Plex greens mower back in 1997, the company suggested that this model could well herald a new approach to golf course mowing. Although many commentators focused upon the mowers quiet running and low emissions at the point of use as key environmental benefits, it was the fact that the mower dispensed with hydraulics and, with it hydraulic oil, many saw as a key benefit.

By removing the risk of oil leaks, the Ransomes E-Plex looked set fair to revolutionise ride-on greens mowing. Hot oil kills grass, whether it is a conventional mineral oil or a synthetic or vegetable based 'bio' oil. An E-Plex has no hydraulics to fill with oil, so a leak, even if they are increasingly rare on modern conventional alternatives, can never happen with an E-Plex.

Eight years on and the E-Plex has morphed into the Jacobsen E-Plex II. Increasingly popular, a battery powered E-Plex certainly does the job, but these mowers do not suit every course, battery capacity meaning that in some situations they are compromised.

Cold mornings and aging battery packs sometimes make a mockery of claimed battery endurance times, and the thought of a stranded E-Plex is something that has put off some potential buyers.

This is not to suggest the E-Plex is too compromised for serious consideration. Courses that want the E-Plex to work will make it work and no doubt there are readers who will either be converts themselves or know someone that is. But battery power will always have its detractors, which in turn means ride-on electric greens mowing has yet to win as many users as it deserves.

Jacobsen are not resting on its E-Plex laurels, however, and have added the battery powered E-Walk to its range. For some, this pedestrian greens mower will prove a more tempting proposition, not least because it allows



Originally introduced by Ransomes, the E-Plex was the world's first all-electric, battery powered ride-on triple greens mower. The latest variant has evolved into the Jacobsen E-Plex II, with some of the early models' wrinkles ironed out. A key feature of all variants is quality of cut; it is this that should see it considered above the fact that it does away with an engine and hydraulics. Up and running following an overnight mains charge, this mower has won many over to electric power. E-Plex II prices start at £20,949.

a toe to be dipped into electric mowing waters without committing too much capital. Of equal importance, this particular mower could win sales through its mowing ability alone, more of which later.

What could further help the 'electric' mowing case is the latest John Deere 2500E. Where the E-Plex has a pack of batteries, the John Deere Tri-Plex greens mower has a nominal 20hp three-cylinder diesel powering a 48 volt, 90 amp alternator. This provides enough juice to spin the three electric motors powering the cylinders, conventional hydrostatics providing drive to the two front wheels.

At first glance, this combination of diesel power, hydrostatics and electric motors may seem a bit baffling. Why go for electric motors to drive the cylinders but stick with hydrostatics for the wheels? The short answer

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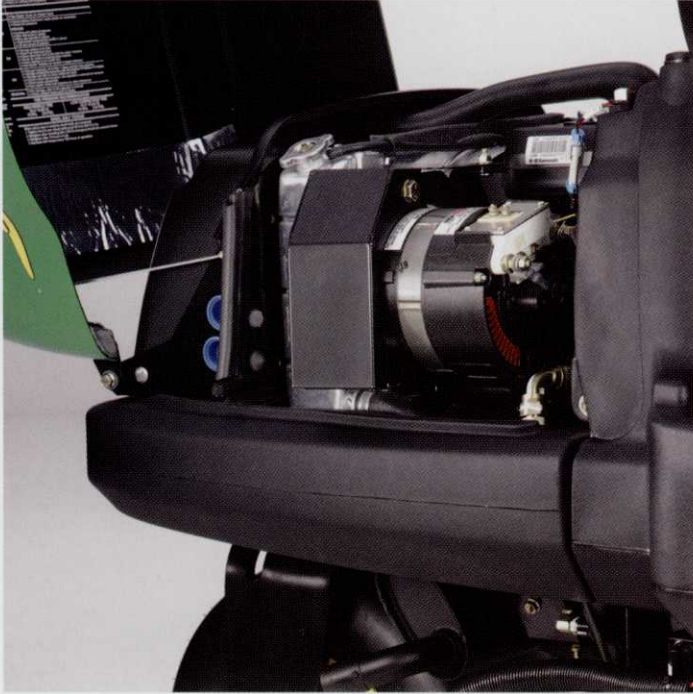
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With its 20hp three-cylinder diesel powering a 48 volt, 90 amp alternator, the John Deere 2500E is a 'hybrid' alternative to the full battery powered Jacobsen E-Plex II. By sticking with hydrostatic drive to the traction motors, Deere has managed to keep much in common with the 'conventional' Tri-Plex 2500A, yet still offer many of the benefits of electric mowing. Deere had orders in the UK and Eire running into double figures for this new mower prior to its BTME launch in January. Will such early success see a hybrid fairway mower coming next?

is not the one provided by Deere, but pretty obvious to anyone who knows the existing 2500A Tri-Plex diesel; the two mowers share the same basic layout, enabling Deere to keep its 'electric' version well priced.

Sticking with hydrostatics to the wheel motors should not compromise the mower's ability to minimise leak related problems either. Deere suggest research in the USA has shown 90% of all hydrostatic greens mower oil leaks come from the circuit powering the cylinders, or reels if American terminology is your bag. From this it should follow that the Tri-Plex 2500E should be considerably less likely to drop hot oil than a more conventional design.

### QUALITY OF CUT

Maintaining a quality of cut on the greens is of course critical. Electrically powered cylinders arguably have an advantage in this respect, and for two reasons. First, it is easier to ensure an electric motor spins at a fixed speed than one powered by hydraulic flow. A consistent cylinder speed is critical as it delivers the required number of cuts per metre. Both the Jacobsen E-Plex II and the John Deere Tri-Plex 2500E benefit from advanced control of the cylinder speeds.

A second point, and one that some would consider pedantic, is cylinder acceleration. An electric motor has the ability to develop its maximum torque at a low speed, and reach its full operating speed almost as soon as it receives power. It will take a hydraulically powered motor a bit longer to get up to full speed.

Although it is tempting to add 'so what' to this, remember consistent mowing quality calls for a fixed number of blade strokes per metre. If the green is mown from the moment power is sent to the cylinders, an electric drive will have cut the green at the desired rate of cut just that much sooner. There are those that argue that using electronics and electric motors will give the precise control over cut quality that is just not possible with hydrostatics.



The new John Deere 2500E is the golf and turf industry's first hybrid greens mower, combining conventional diesel power with electric motors. One design aim was to eliminate 102 potential hydraulic leak points by removing all hydraulics from the cutting unit drive circuit. The 2500E is equipped with three 56cm (22in) seven- or 11-blade cylinders. All 2500A attachments are compatible with the 2500E to include greens tender conditioners, rear roller power brushes and vertical cutting units. Prices from £22,378 with 11-blade cylinders and grooved front rollers.



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## Alternative Power or Compromised Power?

### THE FUTURE

Greens mowers are the ideal target for electrification. A critical issue is that the power needed to drive the cylinders is relatively modest and, where electric motors also power a ride-on mower's traction wheels, demands on the system remain relatively low when compared to a fairway mower.

It is spreading the acceptance of electric motors to other items of mowing equipment where the challenge lies, and it is here where John Deere's 'hybrid' approach could well be exploited further. If the Tri-Plex 2500E proves a success, then encouraging sales will almost certainly see other models follow. The trick is predicting when.

### WHAT ABOUT LPG?

Liquefied petroleum gas, typically as propane, is a well established alternative fuel to petrol. Golf carts converted to run on gas are now well established. With regard to mowers, there are a number of amenity users using gas powered machines, with Ransomes offering a gas powered Highway 2130 triple to meet their specific demands. But LPG is losing its edge in the UK. For a start, it is likely to become increasingly costly, as reserves prove harder to find.

Then there is the issue of its 'environmental' impact. It now appears that LPG burnt in an internal combustion engine produces more harmful emissions than originally suggested, albeit when measured from the tailpipe of a road vehicle as opposed to a mower or buggy.

LPG has its place, but it is currently unlikely to usurp either diesel or petrol as a primary fuel for internal combustion engines. Hybrid and electric power look like safer long term bets.



Powered by four 12V DC batteries, the Jacobsen E-Walk offers a fully adjustable forward speed, allowing total control over the clip rate. This, together with a choice of five bed knives, should enable the E-Walk to suit specific requirements. Anyone looking into electric mowing could do well to consider a mower like this as a first step. Getting everyone interested in a switch to alternative power is a key to enabling new technology to succeed. E-Walk prices from £5439.



Dramatic progress has been made in the production of diesel engines over the last few years with new models being quieter, smoother, more efficient, yet still complying with tough emissions legislation. One such engine - a 25hp water-cooled 3-cylinder Lombardini - is at the heart of Etesia's new ride-on rotary mower, the Hydro 124DN. This latest 124cm tractor has the powerful delivery necessary to achieve the high output and efficiency of a mower which, depending on conditions, is capable of working fast at speeds of up to 16km/h.

### ENVIRONMENTAL ISSUES

Year round play brings with it increased levels of soil compaction. Compacted ground means increased surface water run off. A modest spill of oil is now increasingly likely to be washed from turf into surface water and go on to form a disproportionately huge oil slick. Everyone then shouts 'pollution' and demands an instant fix. No wonder so many courses now specify new mowers with a factory fill of biodegradable oil.

It is tempting to now diversify into the merits of various types of biodegradable oils. As many a Course Manager will know, the rape based vegetable hydraulic oils used in some mowers have proven less able than conventional mineral based fluids to do the job reliably. There are, however, biodegradable synthetic oil alternatives to vegetable based oils, but these are costly and often overlooked as a result.

For those that have 'fallen out of love' with bio oils, any 'electric' or 'hybrid' mower has to be worth investigating. But for those looking for a cracking good greens mower should give these machines a chance as well. Electric power has a great future in golf course mowing, and not just because it is perceived as offering 'environmental' benefits.

There are those who will argue electric power's corner solely on environmental grounds. This is a bit tricky to square as electricity needs to be generated, so an electric powered mower is certainly not 'carbon neutral'. There are those who can also argue that a diesel mower can be run on biodiesel, and it is this approach that will have the greatest impact on reducing global warming. So perhaps the future could see more hybrid mowers being developed, with power generated by a diesel running on a 'green' fuel.



## We like to make a point about our new 2500E Hybrid Powered Riding Greens Mower. 102, to be exact.

There is always a better way. Take our new 2500E Hybrid Tri-Plex Greens Mower. By coming up with an industry exclusive design that drives the cutting units with electric reel motors, we've eliminated 102 potential leak points by removing all hydraulics from the cutting unit drive circuit which mean less potential for damaged greens. As the industry's first hybrid greens mower, the 2500E is more than just an electric mower. It operates on a diesel engine, not a battery, so it can be used for greens mowing with all attachments, even verticutting. Since the 2500E is not dependent on battery power for run time, it can keep the same frequency of clip on every green and complete an unlimited number of greens. To see the difference a 2500E can make on your course's greens, call your local John Deere dealer today. [www.johndeere.co.uk](http://www.johndeere.co.uk)



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# How Low Can You Go?



Stella Rixon, STRI Turfgrass Agronomist for the South East, gets her ruler out and explores the changes in grass growth and cutting heights over the past two years.

With an ever increasing demand for Augusta quick greens all year round, the STRI has been carrying out a countrywide survey to record present day cutting heights on golf courses around the British Isles. Height of cut information on greens, tees, collars, fairways and rough was collected by STRI agronomists visiting over 850 courses, distributed throughout Scotland, Ireland, North and Southern England. The courses varied in type from links, heathland to parkland and from pay-and-play to The Open venues. The survey ran from June 2002 to June 2004 so that we have two complete years of data, enabling a comparison to be made from year to year.

**TABLE 1: MAXIMUM, MINIMUM AND AVERAGE CUTTING HEIGHTS FOR 850+ COURSES AROUND THE BRITISH ISLES.**

Area	Summer (Apr-Sept)			Winter (Oct-Mar)		
	Min	Max	Average	Min	Max	Average
Greens	2	8	4.62	3	8	5.67
Tees	4	13	11.34	6	20	12.26
Collars	5	27	11.24	7	18	11.59
Fairways	6	30	15.16	10	25	15.89
1st rough	20	100	40.54	19	100	42.42
2nd rough	25	125	60.71	25	125	66.93

## A GOOD DEAL OF VARIATION

The range of mowing heights for each area of a course varied quite widely. The maximum and minimum cutting heights found in each turf area, and the calculated average over all courses is shown in Table 1. As you can see variations were quite extreme for some parts of the course.

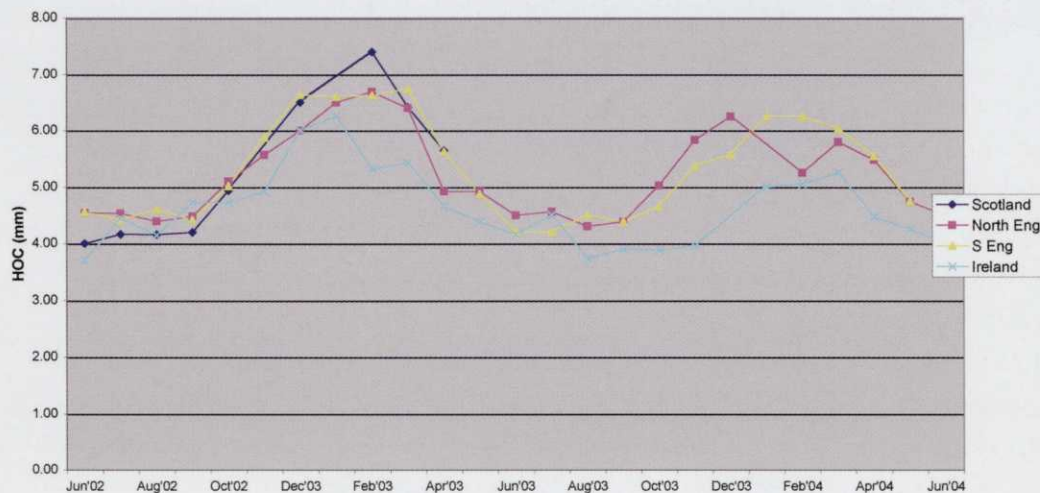
It was interesting to compare data from different areas of the country - a summary table (Table 2) is given. The one trend clearly shown was that Ireland had consistently lower mowing heights on greens, as demonstrated more clearly in Graph 1. This is due to a prevalence of USGA specification, close-mown, creeping bent greens.

With the exception of Ireland, all other areas had a similar average greens height of cut, i.e. winter and summer combined. However, perhaps not surprisingly, Scotland showed the greatest drop between winter and summer heights. The data collected suggested that slightly longer cutting heights were maintained through the colder Scottish winters but shorter greens heights were found during the summer - perhaps due to less heat stress compared to more southerly climates?

Ireland and Scotland also tended to have shorter mown fairways than courses throughout England, both through the summer and winter. This is likely to be due to the predominance of bent grass on Scottish fairways and the high number of tight mown, USGA style courses in Ireland. This grass species can withstand shorter mowing heights without suffering from drought stress. Finally, Scotland also appeared to maintain shorter grass heights on tees, both in summer and winter and, once again, Scottish tees tend to have a high percentage of bent grass.

As well as location, I also looked at whether there were any differences in heights of cut on different course types - i.e. comparing data for parkland, heathland, links/seaside and moorland/upland courses. This analysis showed that lowest summer greens heights were found on links/seaside courses and the highest found on parkland courses, although there was only an average difference of ~0.2mm. In winter, this observation was reversed with parkland and heathland recording the lowest greens heights and links/seaside and moorland/upland retaining cutting heights up to 0.5mm higher. However, we cannot be certain that this depicts an accurate picture as the data collected was predominantly from parkland courses and some of the other types e.g. moorland/upland were poorly represented.

**GRAPH 1 Comparison of Average Greens Height around the British Isles**



**GENERAL DOWNWARDS TREND?**

Perhaps most significantly, the data collected showed that the average height of cut for greens, tees and fairways reduced over the period of time from June '02-'03 to June '03-'04. Granted that we have only two years of data but this does seem to confirm the perception that there is a general trend to lowering cutting heights, particularly with respect to greens.

However, before we draw any premature conclusions we should look at how the weather in each year affected mowing heights.

**THE WEATHER EFFECT**

We might expect that cutting heights are adapted according to weather conditions such as cold, drought, rainfall, etc. Therefore, I analysed the data to see which of these factors had the greatest effect on the mowing heights recorded.

**DROUGHT**

June to Sept '02 was a good growing summer, whereas June to Sept '03 was very hot and dry, therefore you might have expected more generous cutting heights in the latter to compensate for the drought conditions. This was true for the tees and fairways but greens were actually cut lower. Obviously, greenkeepers would have been relying heavily on their irrigation systems for maintaining the greens turf, whereas tees and fairways could not be irrigated to the same extent, if at all.

According to the Meteorological Office records over the last 30 years, average UK temperatures usually peak in the month of July. However, over the last four years we have experienced equal or greater temperatures in August. Despite this, our survey shows that greens were being mown at their shortest in August of both years, '02 and '03, when temperatures reached their highest.

For instance, in the hottest month through the survey, August '03, when temps hit 16.5°C, we recorded the lowest average greens cutting height of only 4.19mm. No doubt the warm temperatures combined with summer fertiliser and irrigation were promoting rapid growth at this time but the sudden and severe heat stress took many greenkeepers unawares.

**TABLE 2: SUMMARY OF AVERAGE CUTTING HEIGHTS FOR DIFFERENT AREAS (\*ONLY SMALL DATA SET FOR SCOTLAND).**

	Scotland		North England		South England		Ireland	
	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Greens	4.43	6.31	4.64	5.99	4.67	6.07	4.22	5.07
Tees	9.76	11.51	11.16	12.32	12.17	13.12	11.16	12.71
Fairways	13.72	14.11	15.43	16.48	16.35	16.40	13.59	15.23

Perhaps the sunshine was also bringing out more golfers and therefore pressures to maintain fast greens were greater?

**WINTER WEATHER**

Winter of '02/'03, November to January, was fairly wet, with an average rainfall over the UK of 397mm (111%) over the three months and a mean temp of 5.3°C. The same period in '03/'04 was similarly wet with 375.7mm (110%) over the three months and the same mean temperature. Despite this, the average greens, tees and fairways height all came down in height slightly in winter '03/'04 compared to the previous one.

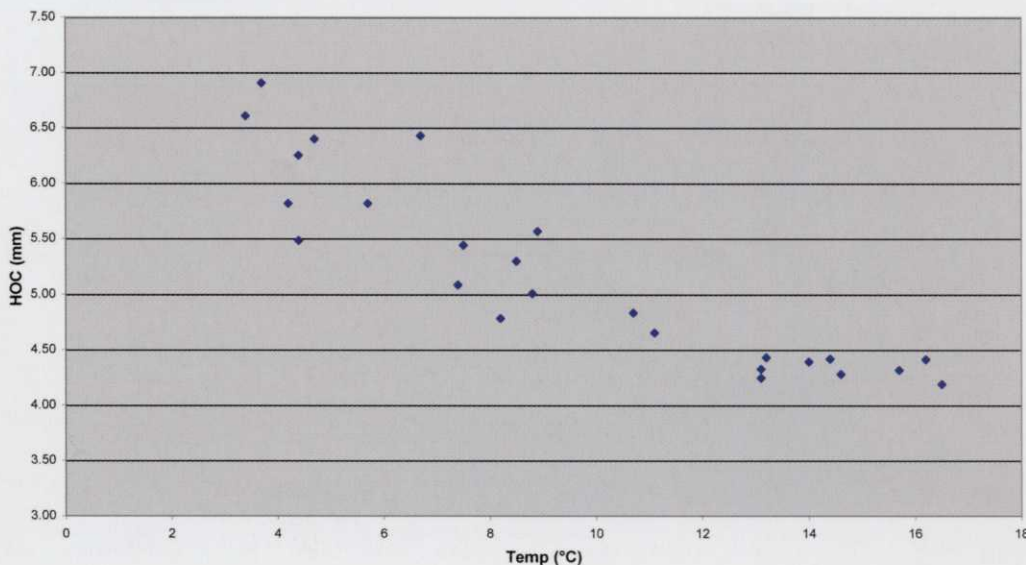
**CHANGEABLE SPRING WEATHER**

January to May '03 was a generally dry spring. The year started cold before becoming unseasonably warm and dry - many eastern and southern parts received less than 50% of their average rainfall in February and March and the UK average for April was down to only 75% of the 30 year average for this month. In contrast, January to May '04 was wetter, in particular the best growing month, April, which received an average of 138% of its usual precipitation. Therefore, the slightly lower cutting heights recorded on greens and tees in spring '04 might be expected, as growth was more vigorous.

In contrast, fairways in spring '04 were slightly higher than in '03. These areas tended to be hit hard by 2003's drought and in many areas the soil was still notably dry below the surface, despite winter rains. As a consequence, numerous courses were still struggling with notably thinned fairways and moss invasion as a legacy of the drought and therefore this increase in height was likely in response to this.

**GRAPH 2**

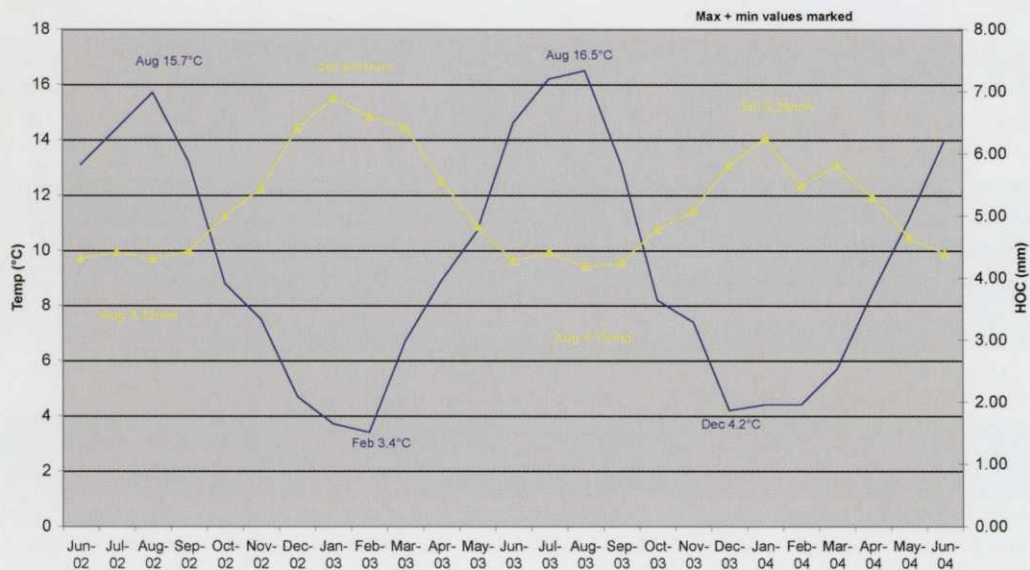
**Relationship between Temperature + Greens Height of Cut**





**GRAPH 3**

**Average UK Temperatures and Cutting Height of Greens**



Looking at the reduction in greens height of cut through February to June '03 compared to the same period in '04 we can see that for 2003, cutting heights were steadily reduced over this time. However for 2004, greens heights actually increased from February to March before steadily coming down again.

**SUMMARY OF WEATHER EFFECT**

It seems temperature governs greens cutting heights more than any other factor. Whereas there was no obvious relationship between rainfall and greens cutting heights, there is a good negative correlation with temperature. This trend is strongest in warm temperatures, i.e. everyone is cutting at their lowest in the summer months but mowing heights vary more widely in colder periods.

Analysis of the data shows that above 13°C, greens are reaching their lowest mowing heights, which vary very little around an average of 4.33 mm (S.D. 0.93). However, at temps less than 10°C, HOC tends to vary much more, around an average of 5.61mm (S.D. 1.78). For instance, in the coldest month through the survey, February '03, when the mean UK temp was only 3.4°C, green cutting heights ranged from five and eight.

There is not the same clear relationship between temperature and cutting heights for tees and fairways; frequently these areas tend to be mown at a relatively similar height year round with little difference between summer and winter.

**FOOD FOR THOUGHT**

The skill of greenkeeping is to adapt constantly to the weather and changing environmental conditions and alter management accordingly. As

the survey indicates, this is happening up to a point. Greenkeepers are responding to changeable spring conditions and cold temperatures. This is probably an easier call to make as clubs tend to accept less than perfect conditions through the winter months. Come the summer the golfers want excellence and this is reflected in the sustained short mowing heights, particularly on greens.

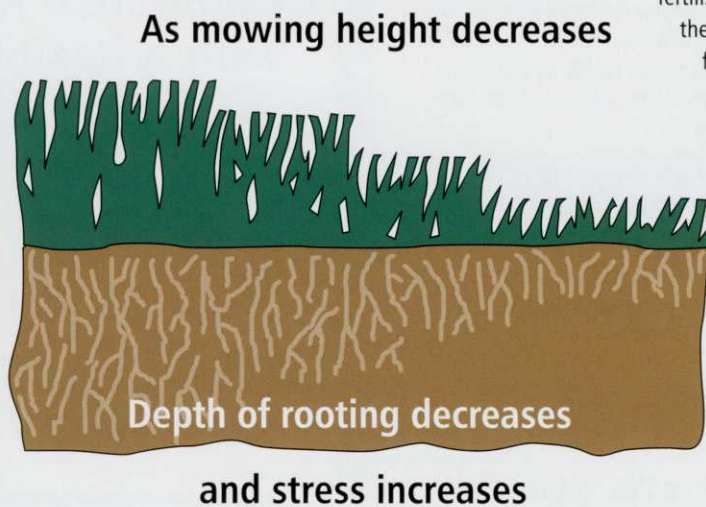
A quick lesson in physiology: As we all know, the green leaves of a plant are its powerhouse. It is here that the magic of photosynthesis occurs. The sun's energy is harnessed and combined with carbon dioxide and water to produce food in the form of sugars. These sugars are then transported around the plant and used for energy and as building blocks for growth. Of course, the roots are important for taking in water and nutrients to add to these sugars to form complex molecules such as proteins, etc but ultimately, it is the shoots which feed the plant.

This is why plants die without sufficient light - irrelevant of how much fertiliser/water they were given. Furthermore, the roots can only grow with the shoots feeding them; therefore the length of the roots is directly linked to the amount of leaf matter on the surface.

So you can see it is very easy to get into a vicious downwards spiral - the shorter the cutting height = less green matter = less growth = less roots + weaker plant = less drought, disease and wear resistance.

This was clearly shown in the drought of 2003 when many courses lost grass cover on surfaces, but most commonly on irrigated greens, as opposed to non-irrigated fairways. This should be a warning. Just

because turf is growing vigorously, does not mean it can withstand shorter heights. Most importantly, let Mother Nature be your guide as opposed to the golfing calendar.





# Golf Finance

## Finance for Machinery

Ian Henderson, Managing Director of Golf Finance Ltd on funding of Mowers and other Grass Machinery.

**Q. How many Golf Clubs use finance for the funding of mowers and other grass equipment?**

A. "The majority of Golf Clubs, whether Members Clubs or proprietary businesses use finance, when acquiring new machinery. There has been a very big change in attitudes towards finance in the past 10 years with most clubs now very comfortable with all forms of structured funding".

**Q. There are several forms of finance talked about, such as Lease, HP and Contract Hire. What is the best type of agreement for a golf club?**

A. There are great benefits to members clubs with either leasing or contract hire. With this type of agreement the club can spread the vat over the life of the agreement, rather than having to pay it all up front as with Hire Purchase. With the current vat de-minimis in place the savings made in spreading the vat can go a long way to offsetting the interest charges on the agreement.

For proprietary clubs or clubs who are out with de-minimis, hire purchase is a good alternative.

**Q. You mentioned Lease and Contract Hire, what is the main difference between these products?**

A. Lease, or Finance lease to give it the correct name, is where the club agrees to hire the equipment over a set period, of say 3 or 5 years. At the end of this time the club effectively own the full value of the asset. If the club choose to sell the equipment or trade the machine back in, they would benefit from a 100% rebate of sale proceeds. If the club choose to retain the machine after the primary rental period a small "secondary" or "peppercorn" rental is normally paid on an annual basis. With Contract Hire, or Operating Lease the machine is simply returned to the supplier at the end of the period. It is fairly common to have a maintenance schedule built in with a Contract Hire agreement, which gives the club a one stop shop.

**Q. Over how many years do Golf Clubs normally finance their mowers?**

A. With the quality of machines which are produced by the main manufactures today, it is quite common for clubs to finance mowers over anything up to 7 years, sometimes longer for a small or 9 hole course. The average is 5 years, which allows a manageable cost annually, but avoids any large repair bills and maintenance charges.

**Q. Golf Finance talk about "Cashflow Matched Finance", what exactly is this?**

A. Every club is different. We understand the income cycles within clubs vary, depending on the geography, the time of year when subscription payments are collected and visitor income levels. By studying these details we can design a package which is suited to each clubs cash flow. This avoids collecting large direct debits when the club has little or no income.

**Q. How do you manage to stay ahead in this competitive market?**

A. As independent brokers we will negotiate the package for the club which is the best suited, and most competitive given the circumstances. Whether the deal is for a £3,000 hand mower or a £3 million pound mortgage we have a range of funding partners with whom we have worked for many years and are always keen to do business in our market place.

**Q. How does a club go about arranging finance through Golf Finance?**

A. Our details are in the buyers guide in Greenkeeper International each month, or you can visit our website [www.golffinance.co.uk](http://www.golffinance.co.uk) and email an enquiry, or simply call us on 01620 890200.

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