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MANAGEMENT
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TOOL TEST
Fairway Mower Evaluation

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volume 3.6
December 2001 - January 2002

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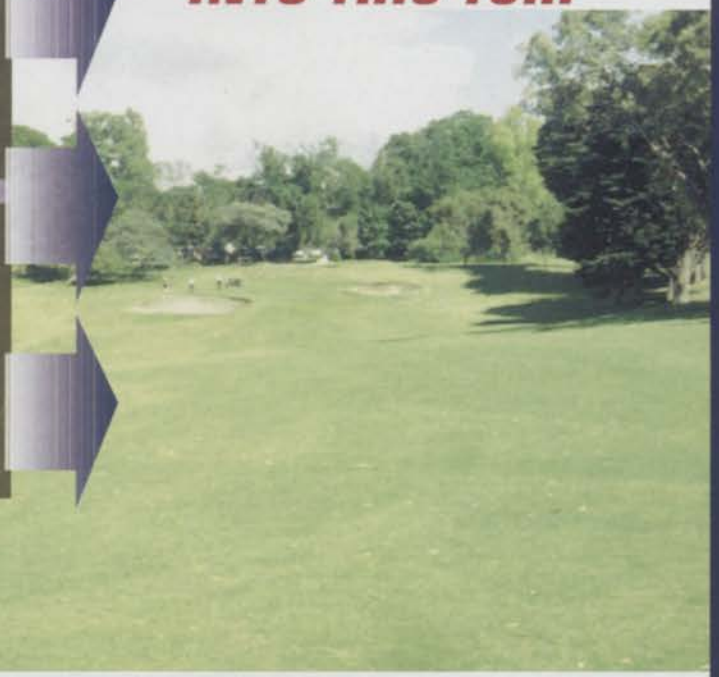

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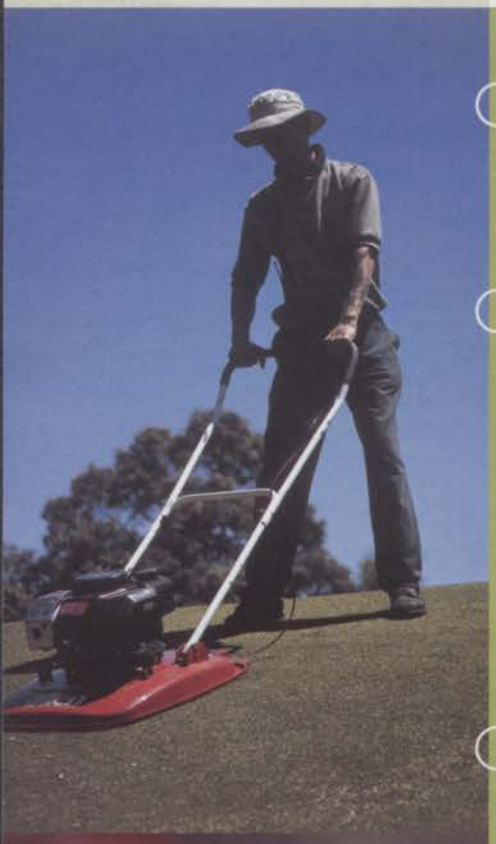
contents



cover

Roller from mower. Image supplied by John Deere
Course Quantity Officials at the Holden Australian Open
Photo courtesy: Allsport

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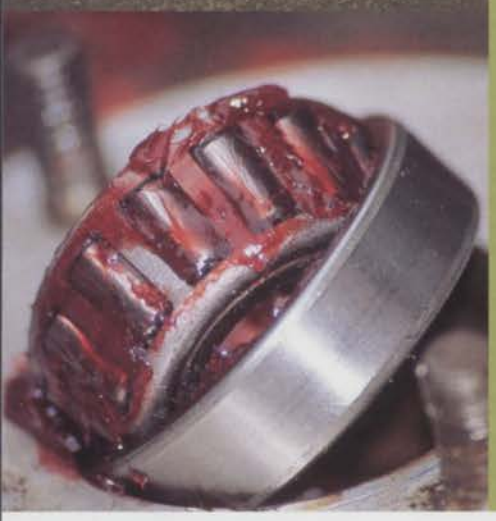

in every edition

Grease Monkey II

In this, the second 'Grease Monkey' edition of Australian Turfgrass Management (ATM), fairway mowers are put through their paces by an expert team of evaluators at the Indooroopilly Golf Club. The TOOL TEST series is drawing favorable reviews from our readers and if you are looking at purchasing a fairway mower any time soon, it is worthwhile reading what your peers have said.

With interest rates at all time lows and only glimpses of the bottom in site, there has never been a better time to consider the range of equipment financing products that are on offer to help you run your equipment more efficiently. The benefits can be numerous and this month in REVIEW we take a look at your options.

Also, regular machinery writer, Scott Nesbitt explains how 'treating it right' can make a huge difference to the operation and long-term performance of your machines running on two-stroke engines and in TECH TALK, Industrial Chemist, Rolland Parker defines the many specifications and performance requirements of different greases to make it easier for you to 'get what you need'.

In RESEARCH, Todd Bunnell from the Clemson University investigates the risks and benefits associated with undertaking various methods of renovation on bentgrass putting greens in summer and in NEWS, we catch up with the John Deere Course Quality Officials that helped the Holden Australian Open run so smoothly at The Grand.

With this being the last edition of ATM for 2001, I would like to take this opportunity to thank everyone who has been associated with the magazine and in particular special thanks must go to our many trade supporters and writers who have helped us achieve and maintain such a high standard. It has been great fun and I look forward to doing it all again next year.

The February 2002 edition will kick-off with a 'forum section' so if you have a comment or view on the industry that you would like express, take some time over Christmas to put pen to paper and send it in.

All the best for Christmas and the New Year

Regards

Phil George


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EDITOR


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President's Pen

Mark Couchman, AGCSA President

This year has certainly flown by and the festive season is upon us once again.
I suppose that for the most of us this time of year can be quite onerous and stressful by virtue of the fact that mother nature has a way of keeping us on our toes when all around us are full of the festive spirit.
I certainly hope that the "Big Red Fellow" is kind and thoughtful for all and sundry.

November has been a busy month for the AGCSA with a Board meeting, incorporating a State President's meeting being held in Melbourne over the extended weekend of the 15th to 17th of November. Many issues were raised and fruitful discussion has resulted in some further moves toward Association's agreeing in principal to take a united front on some of the issues that currently face us. Some of the issues are; member management and retention, educational events, collation of both state and national historical records and promotion of the profession.

On Wednesday the 20th of November, the AGCSA were invited to present a paper to the national conference of Golf Club Managers held in Melbourne. Coupled with this was the opportunity for the AGCSA to meet informally with the national executive of the Golf Club Managers Association. This can only be viewed on the positive light in which it was intended.

At the time of writing, one issue that seems to have raised some concerns for people throughout the golf industry is the use of unregistered or agricultural generic type chemicals. I mention this for two reasons and they are as follows:

1.People who see the need to use such products can be placing themselves in a vulnerable position in relation to the manner and/or rate in which they are being applied/used and of course in some states of Australia this can have quite dramatic legal ramifications.

2.The use of agricultural products or even the purchase of product through agricultural distributors is in actual fact robbing the turf industry of sales. By this I mean that, even if they are turf products they are recognised as sales in an agricultural market. This deprives the turf industry of recognition and the companies that provide new products are ultimately deprived of resources to develop new product as sector sales show that the agricultural market is growing and that the turf market shrinking. Therefore, companies see more merit in developing new product for the agricultural market.

Next time you are about to purchase product think about the industry that we work in and the one that needs all our support.

Once again a very Joyous Christmas and a Happy and Prosperous New Year to all our readers, supporters and your families

Good Reading.

Mark K. Couchman

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TOOL TEST: Fairway Mowers

Indooroopilly Golf Course

For this edition of TOOL TEST we travel to the expanses of the Indooroopilly Golf Club in Brisbane for a thorough inspection of the John Deere 3235-B Lightweight and the 4wd Toro Reelmaster 6500-D Fairway Mowers.

Both machines compete in a relatively similar market segment but they do have different specifications. The John Deere 3235-B could be described as a 'light-weight' fairway mower whereas the Toro 6500-D is a 'mid / heavy-weight' machine that is 4 wheel drive and has greater horsepower (refer to table 3).

Textron Turfcare were invited to take part in the evaluation but they declined.

EVALUATION PROCEDURE

Each of the two fairway mowers were evaluated and assessed on their performance in two different categories;

1.Serviceability

2.Operator use and Performance

A group of four Turf Technicians were selected from within the golf turf industry and as a group, they were asked to carry out and comment on a range of different service requirements on each of the machines. These areas included: Access to drains and filters, greasing, cutting head removal, backlapping and cutting height adjustment. Each technician was required to conduct a thorough inspection of each machine, give the machines a score out of ten in each category then provide some comment to justify that score.

The Turf Technicians were:

- Lindsay Blanch (President, Qld Turf Technicians Association) – Technician, Hyatt Regency Coolum.
- Gary Butcher – Technician, Lakelands Golf Club.
- Steve Blyth – Technician, Indooroopilly Golf Club.
- Danny Dwyer – Technician, Indooroopilly Golf Club.

Four experienced Machine Operators were asked to assess each fairway mower from the perspective of ergonomics and how 'user friendly' the machine was when cutting and transporting between fairways. As was the case with the Turf Technicians, the Machine Operators were asked to score the machines for comfort, access to controls, visibility, cutting greens and transport.

The Machine Operators were:

- Jeff Gambin (AGCSA Board Member) – Golf Course Superintendent, Gold Coast Burleigh Golf Club.
- Pat Pauli – Golf Course Superintendent, Horton Park Golf Club.
- Brett Morris – Golf Course Superintendent, The Brisbane Golf Club.
- Bob Cray (President, Gold Coast Ground Staff) – Trinity Luthern College.

Table 1: Average Scores for Serviceability

	Access to Drains and Filters	Greasing	Cutting Head Removal	Backlapping	Cutting Height Adjustment
JOHN DEERE 3235-B Lightweight Fairway Mower	6.25	8.25	7.0	8.75	8.0
TORO Reelmaster 6500-D 4wd Fairway Mower	5.50	8.0	8.5	8.75	7.50

SERVICEABILITY

Toro Reelmaster 6500-D 4wd Fairway Mower

All Technicians cited difficulties in accessing the oil filter and the hydraulic filter and consequently, the Toro 6500-D scored poorly for 'Access to Drains & Filters'. However, the fuel and air filters were easy to get to and the Technicians did suggest that access would be improved by turning the sump around.

The 6500-D scored an 8 out of 10 for 'Greasing". All points were accessible but the ones on the 'rams' could be missed. The Technicians gave excellent marks for 'Cutting Head Removal'. The comments and high average mark indicates that they were all very happy with the system but special comment was made on the use of a bolt attaching the cutting heads to the arm in preference to a pin and the 'quick release motor' is a great idea. Gary Butcher suggested that the motor would be better located on the inside of the front cutting heads to reduce the possibility of operators damaging them. The others tended to agree and all shared their "how on earth did they (operators) break that?" stories.

Easy and straight-forward is all the Technicians had to say about 'Backlapping' and a score of

8.75 demonstrates fairly clearly their level of satisfaction. Opinions were a little more mixed when it came to 'Cutting Height Adjustment'. Some had no problems with it at all but others were less impressed and felt that not having the ability to flip the cylinder without taking it off would cause problems if you didn't have a hoist.

The general comments again revealed their dissatisfaction with the placement of some of the filters but overall they were full of praise for this machine. One comment worth mentioning was that the "areas where debris can accumulate has been greatly reduced from previous models"

John Deere 3235-B Lightweight Fairway Mower

Although the John Deere scored slightly higher than the Toro for 'Access to Drains & Filters', the Technicians had similar concerns with access to some of the filters (fuel filter in particular), and were concerned that the oil filter would drain onto the cutting reel lift arm. The Technicians would also prefer that the hydraulic drain plug be internally threaded.
The evaluators had no problems at all with any

of the greasing points and the machined scored well as a result.

However, 'Cutting Head Removal' caused a few more problems. In fact, taking the heads off was no problem at all but getting them back on again was hard for one person and could be made much easier by simplifying the attachment mechanism of the cutting unit to the carry frame.

The John Deere 3235-B scored excellent marks (8.75) for 'Backlapping', and one Technician said, "this is still a good, solid and straight forward system". This machine also scored well in the 'Cutting Height Adjustment' category and it appeared as though the ability to 'flip' the cylinders was the big winner.

Overall, the Technicians felt that the John Deere 3235-B was easy to maintain and operate but did suggest that the hydraulic hoses would be hard to get to without ramps and a hoist and felt that these hoses needed to be better protected. On the front cylinders, this could be achieved by housing the motors on the inside of the head.

OPERATOR USE AND PERFORMANCE

Toro Reelmaster 6500-D 4wd Fairway Mower

The Toro 6500-D scored an average mark of 7.75 for 'Comfort'. The Machine Operators were impressed with the high back on the seat that offered great back support and the good range of seat adjustment. The pedals and joystick controls were easy to operate and the canopy was considered as "essential" in Queensland especially. One operator found that the 'control light' was obstructed from view and suggested that it be located onto the steering wheel. All operators were happy with the configuration of the controls and as a result, this machine received exceptional marks for 'Access to Controls'. The small toggle switch

Table 2: Average Scores for Operator Use and Performance

	Comfort	Access to Controls	Visibility	Cutting Fairways	Transporting
JOHN DEERE 3235-B Lightweight	7.75	8.0	8.5	8.5	8.5
TORO Reelmaster 6500-D	7.75	8.75	8.0	8.5	8.5

used to raise cutting units and the hand brake control drew special praise and the fact that the bonnet needs to be opened with the ignition key was identified as an excellent safety feature.

The 'quick release' mechanism on the hydraulic motors didn't escape the attention of the Machinery Operators who also thought that the drink holder was a great idea but felt that the 'storage box' could be a little bit bigger.

Visibility from the seat of the Toro 6500-D was not as good as it was on the John Deere 3235-B. The evaluators thought that the speedometer was good to help maintain a constant cutting speed but the steering wheel would need to be made of glass if you wanted to see it! Also, the Machine Operators all made mention of the fact that the center front cutting head was completely obscured from view but one put this in context with what he felt was a "nice solid, strong chasis construction".

The jury is still out on the issue of which machine delivered the best quality of cut but marks of 8.5 out of 10 for both the John Deere and Toro indicates that any difference is minor. Although one Operator found that the rear flaps on the cutting heads kept falling down, all were very impressed with the cutting speed of the Toro which, would put its productivity somewhere near the top of the class.

Table 3: Vital Statistics

	TORO Reelmaster 6500-D 4wd Fairway Mower	JOHN DEERE 3235-B Leightweight Fairway Mower
Engine	Kubota 4 cylinder, turbo diesel 42.5hp net @ 3000rpm. Liquid cooled	John Deere series 220, diesel,liquid cooled. 32 @ 2800rpm
Traction System	Servo-controlled hydrostatic system driving double planetary gear reduction front wheel drives. Rear axle coupled to hydrostatic transmission via overrunning clutch for full time 4wd	Servo-controlled hydrostatic pump with wheel motors
Ground Speed	0-16.1 km/hr Forward/0-6.4 km/hr Reverse	0-17.6km/hr Forward 0-6.4 km/hr Reverse
Cutting Unit Drive System	Reel motors with quick disconnect. Cutting units can be driven from either end.	Tandem-gear pump Direct-coupled hydraulic gear motor
Steering System	Power Steering	Power Steering
Brakes	Individual, totally enclosed, multi-disc, wet brakes and parking brakes on front traction wheels. Hydrostatic braking through traction drive	Disk Brakes, 2 callipers
Tyres	Front Drive Tyres: 29x14-15 Rear Steering Tyres: 20x10-10	Front Drive Tyres: 26.5x14-12 Rear Steering Tyres: 20x10-8
Weight	1497 kg 4wd 1451kg 2wd	1355 kg (wet with cutting units)
Cutting Unit	11-Blade	10-Blade (5,8&10 blade ESP & 7 blade 32in cutting unit options available)
Dimensions	Width of Cut: 2.44m Transport Width: 2.13m Operational Width: 2.79m Height (without ROPS): 1.34m	Width of Cut: 2.54m Transport Width: 2.20m Operational Width: 2.79m Height (without ROPS): 1.38m
Warranty	2 year or 1500 operational hours	2 year (power train)

In 'Transport' the Operators found the machine to have plenty of power and speed and although it braked well, all found it to be a little bouncy and felt it to be slightly 'front heavy'.

General comments indicated that although not standard, the rear roller scrapers and canopy (standard in Qld only) were a 'must'. All evaluators commented on the solid construction of the Toro and felt that its extra power made it a very versatile machine.

John Deere 3235-B Lightweight Fairway Mower

Although the John Deere 3235-B scored a 7.75 out of 10 for comfort, comments made by the operators suggest that it should have scored higher. Although a higher back would have made it even better, one operator described the seat as 'state of the art' and all were happy with the range of adjustment offered.

The John Deere also polled well when it came to 'Access to Controls'. The operators appreciated the similarities and consistency with other John Deere machinery they had operated and although the foot pedal was a little small, they liked the fact that they could make most of their routine checks from the one position. Operators were comfortable with the 'Backlapping' controls and liked the 'reel to bedknife' system of adjusting the cutting quality.

This machine scored outstanding marks for 'Visibility'. Operators described the vision as 'excellent' and were able to see all three front

Table 4: Comparison of Prices (include GST)

	TORO Reelmaster 6500-D 4wd Fairway Mower	JOHN DEERE 3235-B Lightweight Fairway Mower
Machine as tested with features fitted as 'standard'	11-blade cutting units, Wiehle Rollers, Rear roller scrapers, ROPS + seat belt, Canopy	10-blade ESP cutting units, Spiral grooved front rollers, 2 post ROPS + seat belt.
List Price	$81,105.00	$69,866.00
Optional Extras	•2wd - subtract $4,955.00 •Dethatching reels (set of 5)-$17,930 •Basket Kit (set of 5)-$3,500	4wd-ad $5,002 4 post ROPS conversion kit & canopy - $1413 Light Kit - $517 Arm rest kit - $445 Bar Gauge - $102 Tournament Knife - $151 Hydraulic diagnostic kit - $464 Grass catchers & mountings - $1507 Fairway tender conditioners with rear roller power bush - $2,787 each (5 required) Bumper kit - $79 Smooth rear roller scrapers - $282 (for set of 5)
Estimated cost of parts for 1000 hours of operation	$646.00	$1,452

cutting heads and although the engine canopy was described as being slightly 'bulky', part of both rear cutting units were still in view. One operator said he felt as though there was nothing in front of you and anticipated advantages when it came to following contours and patterns. The small foot deck was great but one evaluator felt that it had a bit too much 'flex' (i.e. could be stronger).

Like the Toro, the John Deere 6500-D scored excellent marks for 'Cutting Fairways' and 'Transport'. It drew favorable comments from all operators in relation to its ability to cross cut stripes and patterns (due perhaps to the spiral front roller), and to cut at a range of speeds (including high).

Terms such as "fast", "stable" and "smooth" were used to describe its handling but the fact that it doesn't fold up any where near as tightly as the Toro could have implications for some facilities.

In general comments, the operators consistently made reference to the 'White Box' enabling the quick and easy detection of problems which for smaller operations in particular would be a great time saver. They also made mention of the good definition to the cutting and the lockdown speed control. Although the screen is located behind the seat, which makes cleaning more of a chore, one operator made the observation that servicing looked relatively simple and appreciated the ability to 'flip' the reels for easy height adjustment. However, the foot and hand brake were identified as 'clumsy' and one operator was just about driven mad by a 'rattle' that we think was coming from the flaps on the cutting heads.

Acknowledgements

Special thanks must go to the Indooroopilly Golf Club for making their facility available to Australian Turfgrass Management Magazine as a venue for this evaluation. In particular, thanks to Peter Sawyer (GCS) and Bronwyn Cocks for their assistance and patience on the day.

Also, thank you very much to John Deere and the Toro Company for their interest and participation.

Finally, many thanks to our panel of evaluators who donated their time and effort.

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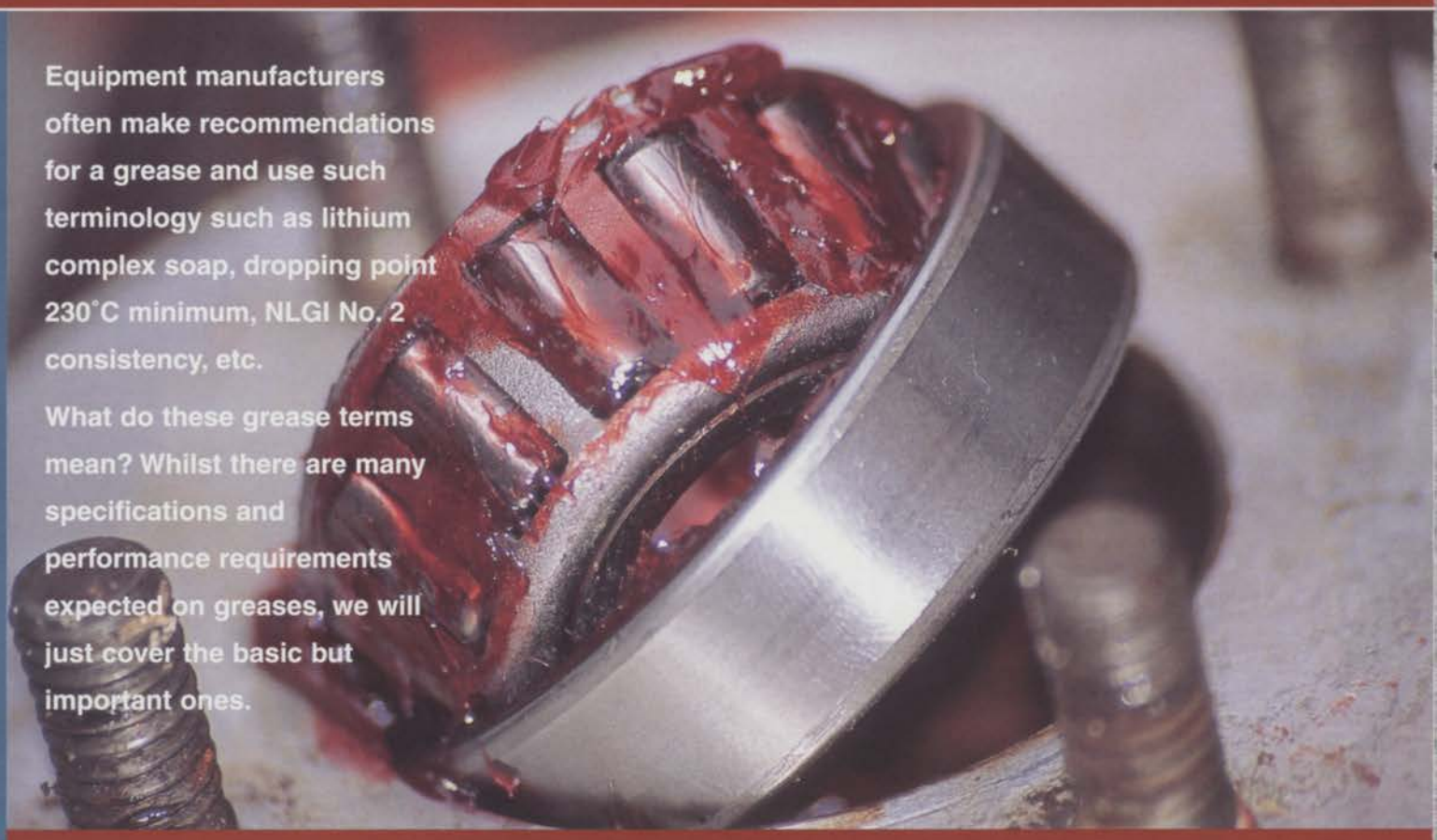


Equipment manufacturers often make recommendations for a grease and use such terminology such as lithium complex soap, dropping point 230˚C minimum, NLGI No. 2 consistency, etc.

What do these grease terms mean? Whilst there are many specifications and performance requirements expected on greases, we will just cover the basic but important ones.

By definition, grease is a fine dispersion of an oil-insoluble thickening agent (usually a soap) in a fluid lubricant (generally a mineral oil). Additives are used in greases to improve a property already present in the lubricant or give it properties not naturally possessed.

Each grease thickener has its own characteristics and benefits. There is no right or wrong thickener and its choice is usually based on the grease application. The most common greases manufactured now are thickened with lithium simple and lithium complex soaps.

Whilst thickening agents impart many properties to a grease, the main one is dropping point (fig.1). The dropping point of a grease, is that temperature at which the grease passes from a semi-solid to a liquid state. The dropping point is a qualitative indication of the heat resistance of grease on applications where a semi-solid lubricant is required. Please note that the dropping point is not the recommended operating temperature which is usually much lower. For example, a lithium simple soap thickened grease may have a dropping point of 195˚C but its recommended maximum service temperature is 160˚C.

The NLGI Grade of a grease is a measure of its consistency on a scale (fig. 2) from 0 to 6. Penetration is a measure of consistency of a grease to determine its plasticity. Penetration, with respect to a lubricity grease is the depth (in tenths of a millimetre) that a standard cone penetrates a sample of the grease under prescribed conditions of weight, time, and temperature. A NLGI No. 2 grease is normally recommended for vehicle wheel bearings and a stiffer NLGI No. 3 grease would be more suitable for chassis applications. For low speed applications, a softer NLGI No. 1 grease may be recommended.

Another important characteristic of a grease is base oil viscosity. When pressure is applied to a grease, oil is released to lubricate and give the desired performance. For very high speeds, a low viscosity oil is required in the grease with a high oil release. For low speeds, a high viscosity oil is needed because it will support high loads,

low oil release characteristics. For example, electric motor bearings would use a grease with a base oil viscosity of 100 cSt @ 40°C (ie ISO VG 100 viscosity grade). Large paper mill bearings would use a grease with a base oil viscosity of 460 cSt @ 40°C (ie ISO VG 460 viscosity grade).

Grease additive technology is a sophisticated science that the type of additives used can influence the structure of the grease (ie consistency, oil separation, dropping point, etc). Additive types and amounts will vary according to the application to which the grease will be subjected.

Some of the more common types of additives are anti-wear, extreme pressure, corrosion inhibitors, anti-oxidants, tackifiers, and dyes.

The effectiveness of additives in greases is confirmed by the laboratory tests outlined in the physical characteristics of the grease. For example, extreme-pressure (EP) properties can be measured by the Timken Tester (fig. 3), or the Four Ball EP Tester which can also measure anti-wear properties. Other important laboratory tests that are conducted on greases are Oil Separation, Wheel Bearing Leakage (fig.4), Rust Prevention Rating, Copper Strip Corrosion, Roll Stability, Water Washout Tendency and Oxidation Stability.

Roland Parker
(B.Sc (Pure and Applied Chemistry)
Technical Manager, Wynn's Australia Pty Ltd

Fig: 1 Dropping Point

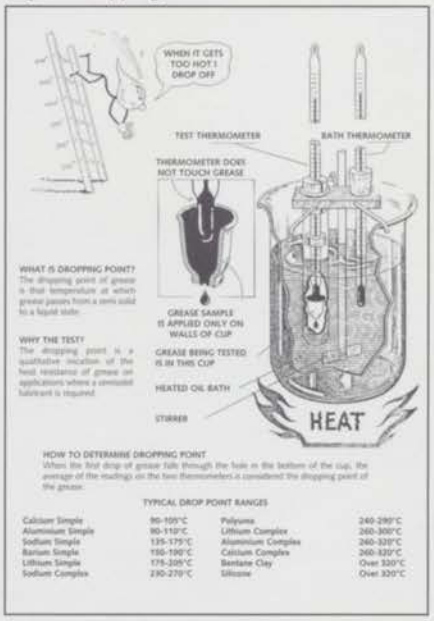


Fig: 2 NLGI Grade

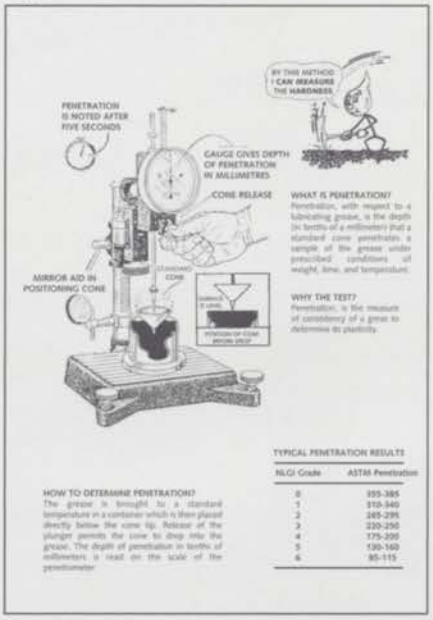


Fig: 3 The Timkin Tester

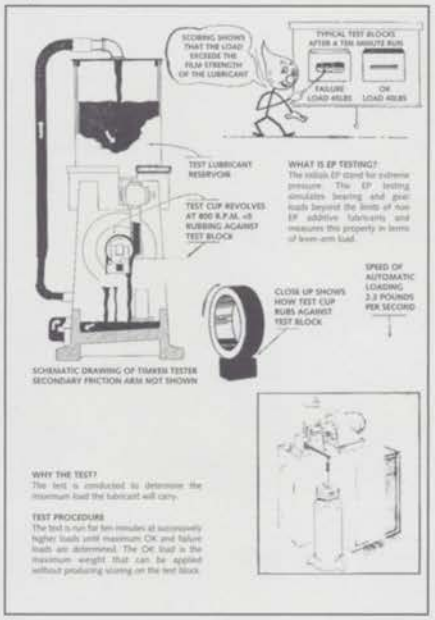
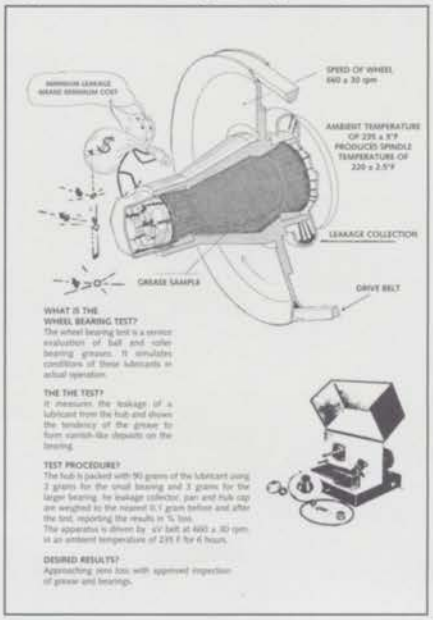
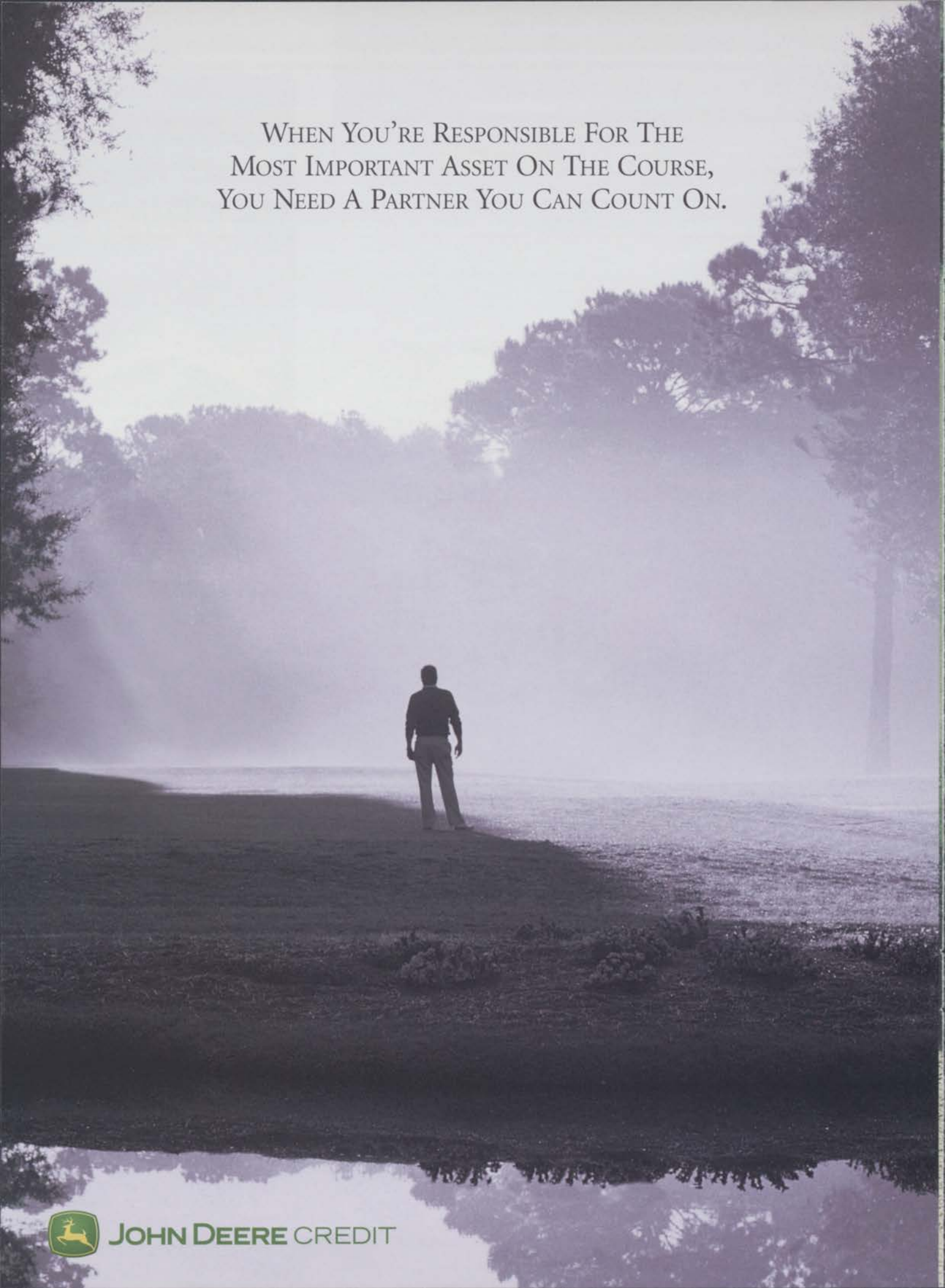


Fig: 4 Wheel Bearing Leakage

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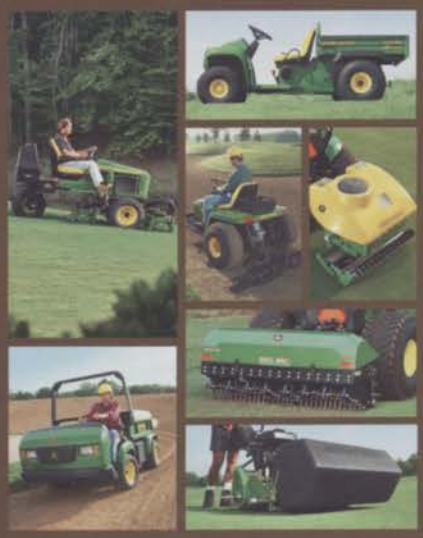

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Equipment Financing –

One of the most important aspects of managing a business in today's commercial environment is giving sufficient focus to the underlying cost structure of the organisation. This focus should not only be on the minimisation of costs, but wherever possible, should also look to increase productivity and convert the business's variable costs into long term fixed costs. The area of asset acquisition and the on-going cost of ownership is an area where some sections of the golf and turf industries have not kept abreast of developments in the wider business community.

Whether your club is private or public, city or country, the pressures on capital are the same - there never seems to be enough! The fall in the Australian dollar over the past couple of years has resulted in the purchase price of everything from golf cars to turf maintenance equipment increasing in price by 20%, or more. This increase in equipment purchase prices, has led many clubs to review their equipment replacement policy and decide to "make do" with their existing equipment for another year or two. This in turn means that equipment performance and course presentation will suffer, breakdowns may well become a way of life and maintenance and associated ownership costs will escalate.

All this at a time when golf is enjoying unparalleled popularity and competition amongst clubs for players is at an all time high.

Leasing offers a solution for:

- The unavailability of capital for replacement equipment;
- Improvements in productivity; and,
- Moving the variable cost of equipment ownership to a known fixed operating cost.

As leasing finances 100 per cent of the value of the equipment, there is no equity or initial capital requirement by the lessee. This enables lessees to utilise their capital resources to improve course or club house infrastructure or undertake other necessary capital-intensive projects.

Leasing, especially if the lease structure includes the maintenance of the equipment for the term of the lease, not only allows you to take full advantage of technological advances in equipment at predetermined intervals but also provides a known fixed cost of equipment "ownership" for the term of the lease.

Leases are normally written on a fixed interest rate basis (of particular relevance at the moment when interest rates are the lowest they've been for 20 years), with monthly payments predetermined and fixed for the term of the lease. This facilitates accurate budgeting and cash flow planning. Fixed lease payments also provide a hedge against inflation as the asset's cost and monthly repayments are fixed at today's prices.

Sources of Leasing Finance

The finance arms of the major trading banks are the main players, however, their product offering is usually confined to the low risk finance lease product that doesn't necessarily

What Are Your Options?

BY ROB GOULD

suit everybody's needs, especially as they don't offer a fully maintained option.

There are a number of specialist financiers and brokers also operating in the market who in general are able to offer the full range of products. In order to offer leasing alternatives to purchasers of their equipment, recently we have also seen a number of the equipment manufacturers establish, either in their own right or in association with third party financiers, in-house branded leasing operations.

Most industry specific financiers (the specialist financiers and the equipment suppliers in-house leasing operations) offer leases in unmaintained, partially maintained or fully maintained structures. Services most often offered as part of the maintained variants are maintenance and comprehensive (fire and theft only) insurance.

Leasing options available

There are basically two types of leases available:

(a) Finance Lease – generally available from all financiers.

Under a Finance lease the risks and benefits of the lease remain with the lessee. The lessee sets the residual/future value (i.e. the estimated value of the equipment at the end of the lease term) and guarantees this value to the financier.

There are a number of options available to the lessee when the lease expires:

- Depending on the condition of the equipment it can be re-leased, normally at a reduced lease rate.
- Purchase the equipment at the residual value (plus GST) and continue to operate it.

- Purchase the equipment at the residual value (plus GST) and then on-sell it.
- Trade in the equipment on newer models under a new lease term.
- Return the equipment to the financier and pay any shortfall between the equipment's residual value and its market value.

(b) Rental/Operating Lease – generally available from equipment suppliers and some independent financiers.

Under a Rental/Operating lease the risks and benefits of the financing arrangement remain with the financier. The financier sets the residual value based the lease term and annual usage parameters supplied by the lessee. The lessee simply operates the equipment for the term of the lease and then returns it to the Lessor at the end of the lease period. Invariably, monthly payments under a rental/operating lease arrangement are considerably lower than under a finance lease as the financier, being a specialist in this area, normally has a ready market for used equipment and is therefore prepared to set a far more aggressive residual value than the lessee will set under a finance lease.

Operating leases are the most widely used form of finance for motor vehicle fleets.

(c) Seasonal Lease – Available from some equipment suppliers and independent financiers.

A seasonal lease is one that is constructed to take account of the lessee's cash flow. Monthly payments are structured in such a manner that they are low in those months when course usage is lower, increasing in those months when

The following table provides a comparison of indicative monthly lease rates for an $83,600 Fairway Mower leased over 48 months. The finance lease assumes a residual value of 20% of the initial purchase price.

	Maintained Finance Lease	Unmaintained Rental	Maintained Rental
Monthly Lease	$1,560.00	$1,429.10	$1,307.00
Maintenance	$207.00		$207.00
Insurance	$97.00		$97.00
Total Monthly	$1,864.00	$1,429.10	$1,611.00

Note: the above lease rates exclude GST.

The table below provides a comparison of indicative lease rates for a Golf Car costing $8,500 leased over 36 months. The finance lease presumes a residual value of 25% of the initial purchase price.

	Maintained Finance Lease	Unmaintained Rental	Maintained Rental
Monthly Lease	$229.50	$218.15	$196.50
Maintenance	$30.00		$30.00
Insurance	$11.00		$11.00
Total Monthly	$270.50	$218.15	$237.50
Total Daily Cost	$9.01	$7.27	$7.92

Note: the above lease rates exclude GST.

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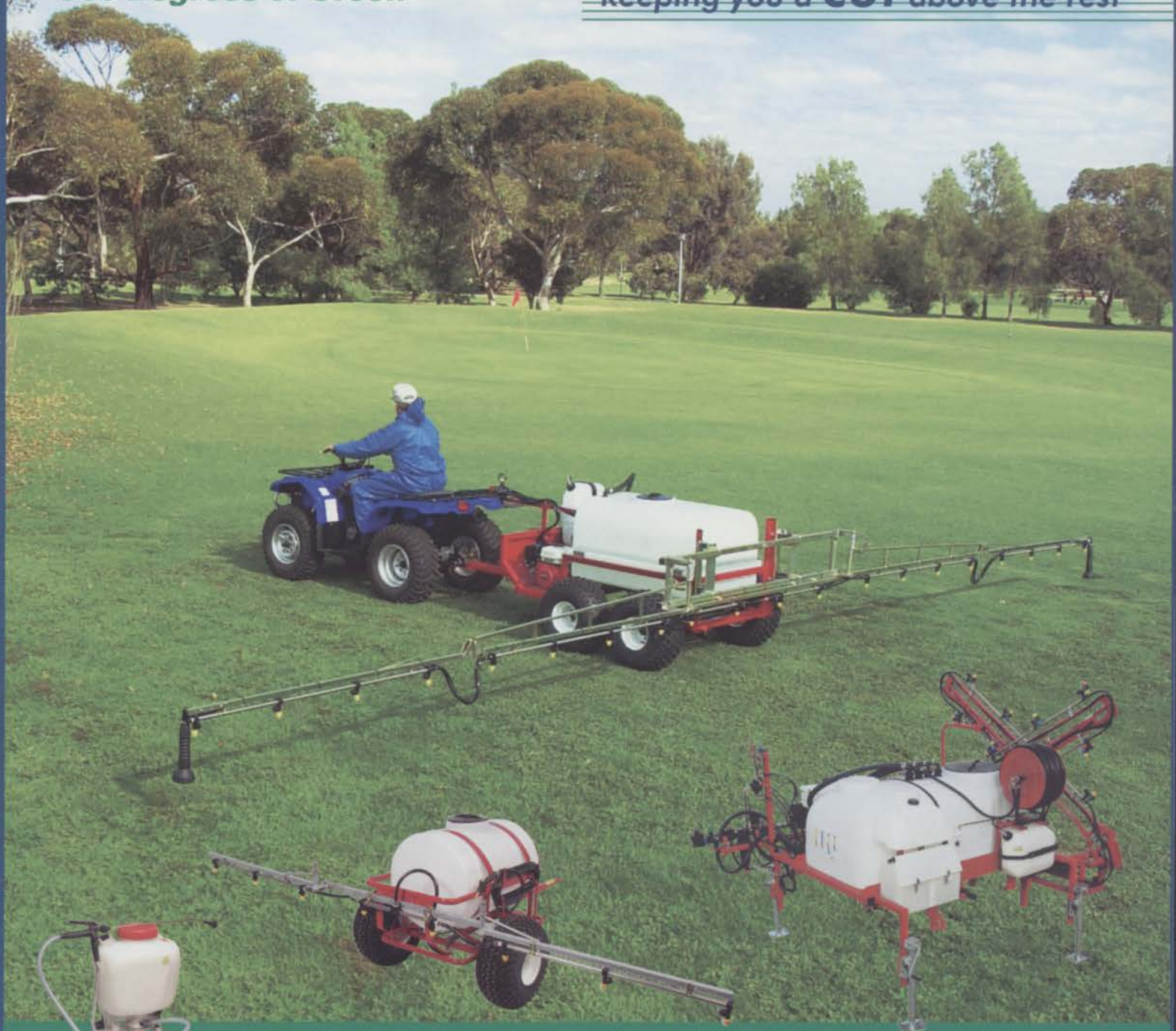

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Under-servicing or inappropriately performed preventative maintenance can lead to poor productivity

patronage and cash flow is higher. Seasonal leases are generally based on rental/operating lease financing arrangements where the financier retains the risks and benefits.

Importance of maintenance

Under-servicing or inappropriately performed preventative maintenance can lead to poor productivity as a result of component failure and the unavailability of equipment while repairs are carried out. The inclusion of preventative maintenance within the lease structure spreads the cost evenly throughout the term of the lease and ensures that all preventative maintenance is carried out in line with the manufacturer's recommendations by trained technicians. Also, the inclusion of maintenance within the lease structure will generally result in lower lease payments, as the future value of professionally maintained equipment is generally higher than that of equipment where some doubt exists about the quality of the preventative maintenance it has received.

Most equipment suppliers and specialist financiers offer a maintenance option (the inclusion of preventative and remedial maintenance within the lease structure) with their leases. This is especially the case under the rental/operating lease structure where ensuring that the equipment is well maintained during the lease term guarantees maximum market value at lease end. The inclusion of the maintenance option within the lease structure will generally mean that the financier will be prepared to accept a greater risk on the future value of the equipment and set a higher residual value than would otherwise be the case, which in turn will result in a lower monthly lease rate.

Additional potential cost savings

- Many clubs have a mechanic on staff to carry out maintenance on their equipment. Often, this mechanic is under utilised and the total cost of employing this staff member exceeds the cost of including maintenance within the lease structure.
- The inclusion of the fully maintained option within the lease structure will eliminate the need to tie up further capital by carrying a variety of spare parts in stock. And as many clubs have found to their dismay, the need to write off several hundreds or thousands of dollars worth of spare parts when equipment is replaced, will be a thing of the past.

Sale and Leaseback

Clubs with a need to undertake capital works should consider the sale and leaseback of their existing equipment in order to receive an injection of available capital.

Many financiers are prepared to buy a club's entire maintenance fleet for an agreed value and lease it back to them over a period commensurate with the remaining economic life of each piece of equipment.

The benefits of a sale and leaseback to the equipment operator are:

•They receive an immediate cash injection that can be used elsewhere in improving course presentation or club infrastructure.

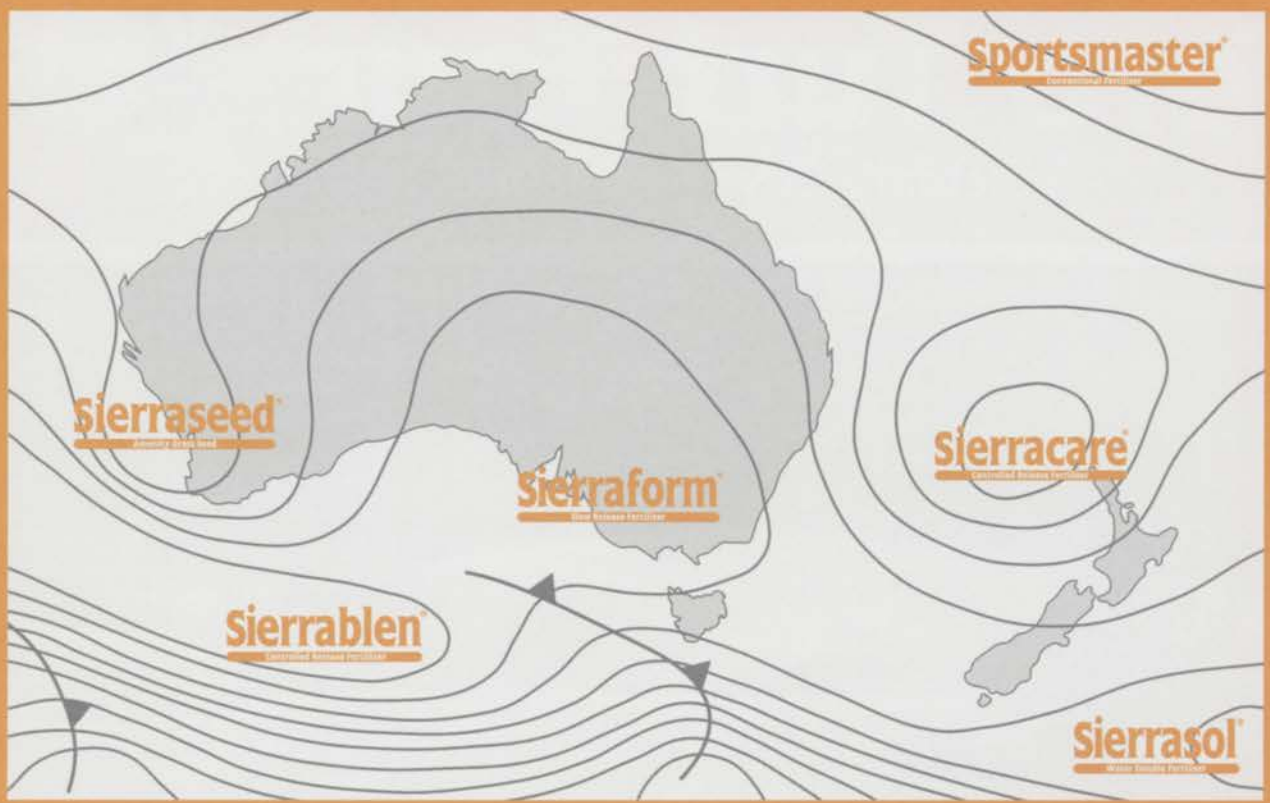
•The cost of operating the equipment moves immediately from being an unknown variable cost, to known fixed cost.

•If the leaseback includes the maintenance option, immediate savings may be realised in reducing staffing costs and costs associated with holding spare parts.

•Equipment that is nearing its "use by" date can be replaced immediately thereby providing the club with the benefits resulting from using the latest technology.

The aim of this article has been to provide readers with an understanding of the various leasing options available for the financing of capital equipment and the benefits available from financing new equipment requirements via leasing rather than the traditional method of obtaining new equipment in the golf and turf industries which, is outright purchase.

Rob Gould is the CEO of Wheelease Pty Ltd, an independent financier to the Golf and Turf industries.



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Toro Turf Tour

Location: Sanctuary Cove Residential Resort

"The fairway mower allows me to mow right up to the edge of the green. I don't need a Surrounds mower anymore."

"Downtime is simply not an option"

TORO

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Built in the late 1980's, Sanctuary Cove Residential Resort sits on 500 hectares of lowlands, pine plantation and cattle grazing land that runs adjacent to the Coomera River. It encompasses four man-made harbors, residential facilities, retail infrastructure, a health and fitness centre, a five-star hotel and two championship golf courses managed by Golf Course Superintendent Andrew Baker.

Culminating in becoming the first Australian Resort to be awarded 'Certification' with the Audubon Cooperative Sanctuary Program and taking out the prestigious AGCSA Claude Crockford Environmental Award in June last year, Andrew and his staff of 20 have made a commitment to 'environmental best practice'

In reference to this commitment, Andrew Baker said, "The cornerstone to achieving our environmental objectives and preparing a golf course that is in keeping with a world class facility is making the right choice when it comes to our selection of maintenance equipment and irrigation products".

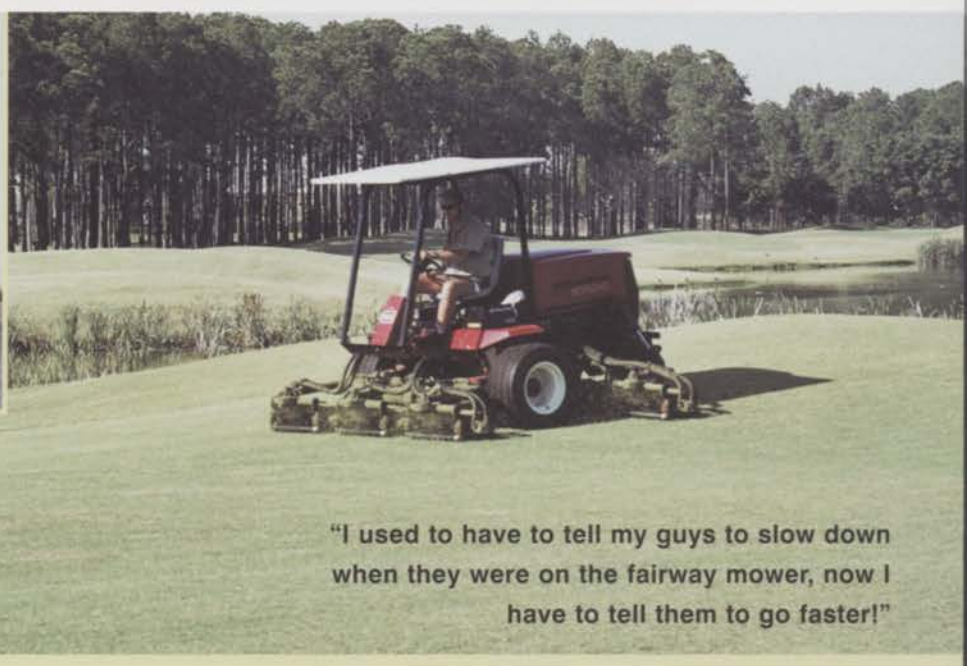
It should come as no surprise then, to know that Andrew runs a fleet of Toro equipment that includes Reelmaster 6700D Fwd Fairway Mowers, Reelmaster 4000D Rough / Fairway Mowers, Reelmaster 3100P Greens Mowers, Reelmaster 1000 Walk Behind Mowers, Groundsmaster 3250D and 2300D Rough Mowers, a Multipro 1100 Turf Sprayer, Sandpro Bunker Rakes and a Toro Rak-o-vac.

Spend any time at all with Andrew and you soon realize that this is a man big on efficiency, which seams to explain his gushing enthusiasm for his new Reelmaster 6700D 4wd Fairway Mowers. This is what Andrew had to say.

"The 6700 is an amazing machine, it has a hydrostatic drive that is calibrated with the cutting units which adjust to your groundspeed. That means that the quicker you go, the faster the cutting cylinder spins so there is no reduction at all in the quality of cut. I used to have to tell my guys to slow down when they were on the fairway mower, now I have to tell them to go faster! It's a strange feeling to have to tell them that but the fact is, I know the machine can do it and the quicker they get around the course, the higher my productivity becomes. I know for a fact that having to cut in and amongst play reduces our efficiency by as much as 60%, its absolutely critical to stay in front of play and no other machine can give me that ability".

"The other thing that I love about the 6700 is its supreme 'hold-down' and maneuverability which means that it can handle sloping and contoured surrounds. The guys can mow right up to the edge of the green. I don't need a surrounds mower anymore which basically means that I have done away with the need for two extra mowers, what club couldn't do with that?"

"Toro fleet at 5am"



"I used to have to tell my guys to slow down when they were on the fairway mower, now I have to tell them to go faster!"

The impressive fleet of machinery at Sanctuary Cove is financed with the help of the operational leasing options that Toro offers in partnership with GE Capital Finance. Most of their equipment is under a two or three year rental agreement which means that the operation is not burdened with ownership and benefits from timely equipment acquisition & replacement.

In discussing the operational lease arrangement, Andrew Baker said, "What I love about this is that I can keep all of my gear within the warrantee period and life isn't complicated by the frustration of owning a machine once its efficient life is over. Including Hope Island, I've got three golf courses to run and 'downtime' is simply not an option (refer to table one). What this leasing arrangement gives me is the piece of mind to know that if I do have a problem, Toro will be on my doorstep with a replacement machine the very next morning".

Other benefits of the operational leasing options include the fact that the lease payments are fixed, they can be coordinated with fluctuations in cash flow and they provide a hedge against inflation.

Table One: Mowing Schedule for all three golf courses (The Pines, Palms and Hope Island)

LOCATION	TOTAL AREA (ha)	DESCRIPTION
Greens	4.2	Greens cut & holes changed everyday
Fairways	70	Cut everyday between October & April
Tees	6	Cut four times per week

To stay on top of such a hectic schedule, Andrew uses a Toro Site Management System with GCS for Windows. It allows him to maintain a full inventory of stock and machinery running costs and holds all details on his staff such as what tasks they have been assigned to, how long various tasks are taking and how much they are being paid per hour.

Essentially, what the GCS for Windows system allows Andrew to do is generate a work order for every job on the golf course whether it be mowing fairways or greens, or repairing divots and hand weeding. Ultimately, the system means that Andrew can accurately allocate a cost to every task that is performed on the golf course.

Andrew said, "If I want to know how much it cost me to mow greens last month, a couple of clicks on the mouse and the information is right there in front of me. One of the real values of a system like this is that I can closely monitor the cost of certain tasks which often provides the supporting information that a Superintendent needs to help justify things such as a new staff member, the adoption of a new management practice or the purchase of a new machine. For example, if my operators feel that we need a new machine to cut roughs, I can quickly justify or verify this opinion by accessing information that may very well demonstrate increasing costs of fairway cutting and then develop a new model inputting information relating to a new machine and then compare the two. Sometimes it makes good business sense to purchase a new machine, sometimes it doesn't."

Making sure a machine is used and maintained correctly is the key to maintaining maximum productivity and at Sanctuary Cove, Andrew and his staff have developed and implemented a system that has reduced their costs of breakdown and repairs from $178,00 to just $100,000.

A comprehensive list of routine checks and considerations has been formulated for every piece of machinery in the shed. This list is mounted onto a clipboard and when not in use, it sits on the operator's chair. Each morning, the operator assigned to that piece of equipment must work through and sign-off on the list then post the document in the 'out-tray' before leaving the shed. When the operator returns they must repeat the procedure to ensure that the machine is ready to go the next morning and as Andrew says, "It makes sense, there is just no excuse for running out of petrol these days".

Continued next page

Toro Turf Tour

Location: Sanctuary Cove Residential Resort

"The Toro Network LTC System allows me to water less not more"

"Water is one of the resorts most valuable resources that must be protected, conserved and used efficiently"

Step one in adopting a more environmentally friendly style of management and achieving certification with the Audubon Cooperative Sanctuary Program was the completion of a detailed environmental audit. This reinforced the notion that water was one of the resorts most valuable resources that must be protected, conserved and used efficiently.

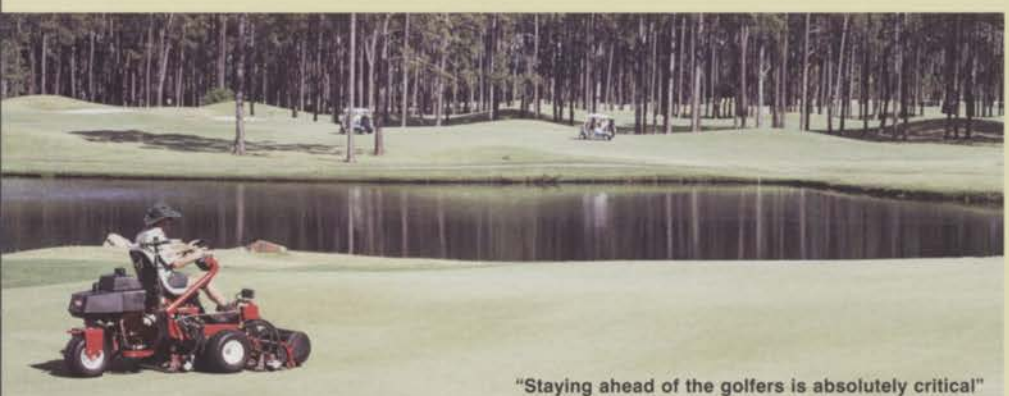
Rated by the Australian Golf Union as "Australia's most challenging" the Arnold Palmer designed The Pines Course, employs a Toro Network LTC System to feed 1400 Toro 670 heads and approximately 100 Toro 650 heads for greens.

Features of the Toro 650/670 Series include;

- Three standard pressure regulation settings available to ensure consistently accurate performance – regardless of elevation.
- Three body styles/activation types available to fit every application: Electric VIH, Normally Open Hydraulic VIH, and Check-O-Matic.
- Manual control at the sprinkler, On-Off-Auto.
- Bowl-vented discharge, which minimizes the differential pressure required for regulation and ensures positive valve closure.
- Time-proven gear-drive design.
- All internal components serviceable from the top of the sprinkler.
- Large selection of nozzles available.
- Durable engineering, plastic and steel construction.

The Toro Network LTC System incorporates site-specific information related to factors such as grass type, soil type and slope which the system then overlays against evapotranspiration data to schedule exactly how much water each area of turf requires and in Andrews own words, "This system allows me to water less, not more".

Toro Australia wishes to thank Andrew Baker and the staff at Sanctuary Cove Residential Resort for their support and patience in allowing us to bring you this information. The next edition of TORO TURF TOUR will feature in the April 2002 edition of *AUSTRALIAN TURFGRASS MANAGEMENT Magazine*.



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AGCSATech : Update

By John Neylan

DUSTING AS A MANAGEMENT TOOL

Over the past 18 months or so, I have seen several situations where thatch accumulation on greens has got out of control and is causing numerous problems. Where there has been an excessive accumulation of thatch, there has been; poor infiltration rates; wet surfaces; soft and slow putting surfaces; increased incidence of disease; poor root systems and black layer.

Dusting or very light topdressings on a regular basis is a cultural practice for the control of thatch that is gaining increasing acceptance. In my experience, regular dusting has been demonstrated to be the most effective method of thatch control. Recently, when inspecting golf courses with the new bentgrasses, both Superintendents were employing a program of regular dusting. The result was to provide a consistent blend of sand and organic matter without obvious layering occurring. The result is a more uniform profile that provides better pore space continuity and the associated benefits of improved air and water movement into the root zone.

Regular dusting has been demonstrated to be the most effective method of thatch control

Thinking back to last summer, greens that were thatchy, literally cooked with a combination of wet weather followed by high temperatures.

Thatch management is always being discussed and it is one of the basic precepts of turf management, so why is it still an issue? In my recent experiences, the predisposing factors have been;

1. Failure to recognize that excessive thatch accumulation is a problem.
2. Failure to cope with the thatch accumulation associated with modern bentgrasses.
3. Failure to renovate appropriately due to playing pressures and possible disturbance to play. Also, associated with this is the failure to renovate at the most appropriate time of the year.

Research by Nickson (ATM 2.4, 2000) demonstrated that dusting provided significant benefits compared to the more traditional twice a year renovation of scarifying, coring, and heavy sandings. He dusted every 2 – 3 weeks at one litre of sand / m^2 . Work by Rieke indicated that an application rate of 0.06 – 0.11 cubic metres per 100m^2 was effective.

In an open forum discussion at a recent VGCSA seminar, the benefits of such a program were again confirmed. There is still a need to hollow core to break up any organic layers that may occur (due to missed dustings because of weather, equipment breakdown etc) and the vertidrain is used to control any deeper soil compaction. In many respects, heavy scarifying can potentially be eliminated with grooming/dethatching to control grain.

WATER TESTING

As we approach the summer months and irrigation becomes a critical aspect of turf management, water testing and water quality is being considered by many turf managers. Whether the water source is from bores, creeks, rivers, on-site catchment, or recycled wastewater, it is important to have some knowledge of its quality. Salts, nutrients and other constituents affect its quality and ultimately its impact on the turf and soils. Many turf managers undertake water tests, however the terminology on the reports is still causing some confusion. What are the terms and what do they mean?

Salinity: Salts are always present in water and is the single most important factor affecting water quality. The salt content is made up of cations (Ca^{2+}, Mg^{2+}, Na^{+} and K^{+}) and anions (Cl^{-}, bicarbonate and sulfate). Salinity is an indication of these ions in the water.

Salinity is measured as;

Electrical Conductivity (EC) expressed as deciSiemens/metre (dS/m) or sometimes as **microSiemens/centimeter (µS/cm).**
The EC of water is measured using a conductivity probe that has two electrodes. The meter measures the electrical current conducted by the ions in solution between the two electrodes. There is a direct relationship between the salinity of the water and the ability to conduct an electrical current.

Salinity can be expressed as **Total Dissolved Solids (TDS)** and **Total Soluble Salts (TSS)**. For most purposes the EC is converted to TDS (expressed in **milligrams/litre**) by multiplying by 0.6. That is;

EC (dS/m) x 0.6 = TDS(mg/L).

Milligrams per litre is also the same as **parts per million (ppm)**.

328 and Tifdwarf "off-types" at the Lakelands Trial Site

Bicarbonate (HCO_3) and **Carbonate (CO_3)** are both anions with carbonate only occurring when the pH is greater than 8.3.
Both combine with calcium and magnesium to be precipitated as insoluble carbonates.
This reduction in calcium and magnesium has the effect of increasing the relative sodium concentration and therefore affects the sodicity of the water. The impact of bicarbonate and carbonate on sodicity is determined by calculating the **Residual Sodium Cabonate (RSC)**.

The **RSC = (HCO_3 + CO_3) – (Ca^{2+} + Mg^{2+})** where the ions concentrations are recorded in **milliequivilants per litre (meq/L)**.
Milliequivalents per litre (meg/L) is calculated as follows:

$$\text{Meq/L} = \frac{\text{Mg/L}}{\text{Equivalent Weight}}$$

The **equivalent weight** for several ions is as follows; Calcium (Ca) = 20, Magnesium (Mg) = 12, Sodium (Na) = 23, Bicarbonate (HCO_3) = 61, Carbonate (CO_3) = 30.

Hardness is determined in many water tests and is a calculated value based on the calcium and magnesium concentrations and is expressed $CaCO_3$. The implications of hard water are; reduces soap and detergent lathering; causes scale accumulation in sprinklers and pipes; combines with pesticides when mixing.

The **Sodium Adsorption Ratio (SAR)** is a calculated value that indicates the potential sodic effects that the water may have on the soil. The SAR is the ratio of sodium ions to calcium and magnesium ions in solution. It is calculated as follows:

$$SAR = \frac{Na^{+}}{\sqrt{\frac{Ca^{2+} + Mg^{2+}}{2}}}$$

Where ions concentrations are in meq/L.
The **SAR** and **RSC** are used together to determine the **sodicity class** of irrigation water.

There are many other ions measured in irrigation water and they are usually expressed as milligrams per litre (mg/L). Milligrams per litre is also equal to parts per million (ppm).

Whether it is a water test or soil analysis it is important to have some understanding of the terminology used. It is also important to have a water test done prior to the start of the irrigation season so that you know what you are dealing with.

TRIAL SITE AT LAKELANDS GOLF CLUB

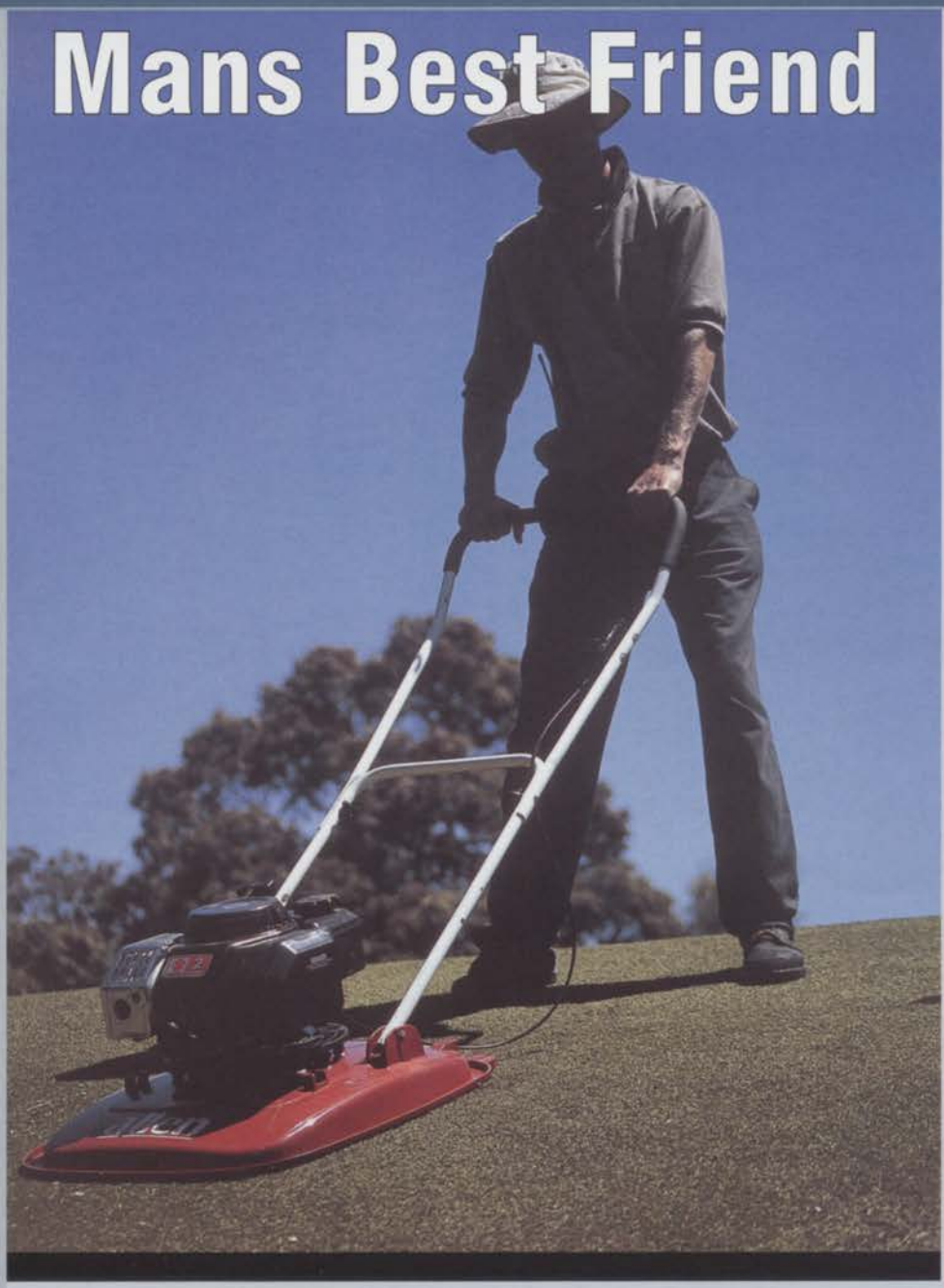
The trial plots are now well established at Lakelands Golf Club and being maintained at the appropriate cutting height. That is, at greens height (3mm) or fairway height (8mm). Assessments have been undertaken in October and November and the results are as follows (see chart below)

The 328 and Tifdwarf off-types have been planted and various characteristics are being measured. The grow-in rate is being determined by measuring the weekly rate of stolon extension. Other characteristics to be measured will include internode length, density, and how prostrate the growth habit is.

Variety *	Quality **		Density		Colour	
	Oct	Nov	Oct	Nov	Oct	Nov
Santa Ana	7.5	7	7.5	7	6.5	6
Legend	7	6	7	6	7	7
Plateau	6.5	6.5	7	6.5	7	7
GreenLees Park	5.5	5.5	6	6	6	5.5
Wintergreen	6.5	6.5	7	6.5	6.5	6.5
Tifton 328	6.5	6	7	6.5	6	6
CT2(GN-1)	6.5	6.5	7	6.5	6.5	6.5
Conquest	6.5	6.5	6.5	6.5	6.5	6.5
Supersport	6	6	6	6	6	6
Princess (Seeded)	6	5.5	6	6	7	6
Mohawk (seeded)	5.5	5	5	5	6	6
Sydney(Seeded)	5.5	5	5	5	6	6

* Grasses at fairway height (8mm) only
** Quality ratings 0 = worst, 9 = best
Density ratings 0 = worst, 9 = best
Colour ratings 0 = no green, 9 = very dark green

Making an Old Dog, Mans Best Friend



The two-cycle (two-stroke) engine is like an old dog. It's been around for 100 years. It can stink. It will snarl and snap. It can be an ill-tempered beast that won't obey your desires. Or, like a good hound, it can be a trusty companion and helper as you roam the golf course taking care of chores. Its behavior depends on whether you feed it well, keep it clean and give it a good home.

Two-cycle engines are found on hand-held equipment – string trimmers, power blowers and chain saws. Occasionally you'll find a two-cycle walk-behind lawn mower or on a specialized piece of equipment like a post-hole auger. Your golf course may have two-cycle engines in golf carts. If you like to have vehicular fun off the golf course, you'll find two-cycles powering snowmobiles, smaller boats and "personal watercraft" such as jet skis, some motorcycles and even aircraft – ranging from radio-controlled model planes to ultra-lights.

Many landscape professionals assume two-cycles are balky things that can't be trusted to start easily, idle smoothly, or keep running. But the fact that people trust their lives to a two-cycle engine when they take off in an ultra-light demonstrates that these quirky little engines can be tamed and trusted.

There are no special secrets to handling two-cycle, but there are a few common practices that are worth adopting as habits of operation and maintenance. These good practices will become more important in the years ahead, because two-cycle design changes being forced by pollution-control laws are likely to further emphasize them. The little engines are changing in ways that will make care and feeding even more critical to their value as helpers on the course.

Ups and Downs

The two-cycle is called that because to produce power, the piston needs only two journeys through the cylinder bore – one up, one down. The engines used in cars and trucks need twice as many trips to produce one power stroke, and is called a four-cycle. Despite making twice as many power strokes at a given rotating speed, the two-cycle doesn't produce twice the power of a four-cycle. But, it does produce twice as many exhaust pulses, so it sounds as if it is running twice as fast.

The two-cycle is suited for high-speed operation because it needs only 3 major moving parts – the piston, connecting rod and crankshaft. The piston, as it moves up and down, serves to control the flow of air-fuel mix into the cylinder and the release of exhaust. A tiny bit of oil is mixed into the fuel, so all the internal pieces are bathed in a lubricating mist. The oil is burned along with the fuel and helps produce the characteristic gray exhaust plume that marks a two-cycle. By contrast, a four-cycle needs a bewildering array of valves, levers, camshafts and more to control intake and exhaust, and a complex pumping and plumbing system for lubrication.

Design simplicity and high operating speed give small air-cooled two-cycle engines a superb power-to-weight ratio that suits them well for hand-carried tools and light vehicles.

However, simplicity has a dark side – pollution – that threatens the two-cycle's future. The problem lies in the fact that during the piston down-stroke, two incompatible things happen in the cylinder: The hot exhaust gas is moved out at the same time a cool supply of fresh air moves in. These two incompatible 'blobs' of gas can't be separated by a solid wall. Some exhaust gas remains behind to weaken the potential power from the fresh fuel charge. Worse, some unburned fuel and oil leaves with the exhaust. This discharge of raw hydrocarbon vapor and particles is amongst the most reviled mobile-source air pollutants on the planet.

Honda is working on resolving the emissions problems of the two-cycle engine with this design that adds an external valve (yellow object in photo) to resolve the mixing of exhaust and intake gases that in large measure produce unwanted pollution.

BY SCOTT NESBITT

A United States Environmental Protection Agency action in October 2001 set up new standards that raise the emissions bar extremely high. Major technical changes will be needed to permit continued U.S. use of two-cycle motorcycles, all-terrain vehicles and snowmobiles. Comparable rules are popping up all over the developed world. A World Bank report in July 2001 said a leading cause of premature deaths in South Asian cities is the air pollution from the inexpensive two-stroke motor vehicles that are commonly used in developing countries. Legislation to follow? The annoying exhaust bark and intake growl of two-cycles has also spawned laws in various U.S. cities, based on noise pollution.

The hand-held equipment currently sold incorporates technical changes adopted to meet the regulations and more changes are in the pipeline. While some manufacturers, notably Honda and Ryobi, have developed four-cycle engines for string trimmers and power blowers, the bulk of manufacturers are building modified two-cycles that meet current regulations. In development are many different designs aimed at meeting future

standards. It is likely that these future products will need special care and feeding. It's worthwhile to start adopting today the operating and maintenance habits they will call for.

Care and Feeding

"Barking" and "growling" were traditionally ignored in two-cycle design. Minimalist mufflers and air intakes noise control saved a lot of weight. New designs increase the size and weight of these external parts. To keep total engine weight about the same, designers have reduced the weight of core components like cylinders, crankshafts, starters, etc. This shift has serious impacts on operation and maintenance.

Newer engine designs typically squeeze more power from each cubic centimeter. This is done with a leaner fuel mixture and higher engine speed; both result in higher engine heat loads. This means some new practices for operators and technicians. Carburetor passages are physically smaller, with higher precision needles. They are less tolerant of particles coming in with the fuel, so the filters are much better. Partial blockage of a fuel passage can 'over-lean' an already lean-burning engine, causing destruction through under-lubrication and excess heat. Change the fuel filter often. Fuel can't be allowed to linger for months in the tank and evaporate into solids that will load up the filters. Get in the habit of emptying two-cycle hand-held fuel tanks when a unit will be in storage more than a week.

The cooling system has a higher load. So attention must be paid to keeping air intake screens free of debris. Cooling fins, on both the

This particular engine suffered from overheating and too much oil, which locked up the piston rings, allowing blowby that caused the streaks down the cylinder walls. The engine seized up on the job.

fan and cylinder, should be cleaned more often. That means opening up the shrouds more often to blow away chaff. The higher heat and speed demand better spark plugs. The electrodes are more likely to burn away, opening up the spark gap. This can lead to harder starting. It can also alter the ignition timing because it may take longer for an electron charge to build enough to jump a larger gap. Altered timing can change power output and increase engine heat production. So check, re-gap and replace spark plugs frequently. On daily-use machines, this may mean monthly plug checks. When you do this, make sure the engine is cool to avoid stripping out the plug threads in the cylinder head.

It may be worth considering switching to synthetic lubricants for two-cycle engines? Many users have experienced extended engine life with these products. A significant advantage is that a single batch of synthetic fuel-oil blend can serve a wide range of different two cycle engines which may call for fuel-oil blends ranging from 16:1 up to 100:1.

Beside simplifying inventory, the synthetics seem to leave fewer deposits in the critical piston ring area. A seized piston ring is often fatal to a two-cycle engine, so preventing that is usually worth the higher price of the synthetic lube.

Keep it fast

Newer engines get more power per cubic centimeter, but they often have less "flywheel effect" than old designs. Equipment operators need to learn to keep engine speed up. When using a brush blade, for example, it's best to take many small high-speed bites rather than trying to "lug through" with a steady cut. It's imperative to frequently sharpen chain saw chains and brush blades, to reduce the engine load and allow higher operating speeds.

The mechanisms downstream from the engine, items like the gear heads in string trimmers and clutches on chain saws, should be checked for proper operation. Any binding or maladjustment should be cured in the interest of safety, reducing engine load and permitting full-speed operation.

Throttle cables and linkages should be checked frequently to verify that they are pulling the carburetor fully open. Air filter elements should be checked and changed more often to allow the free flow of air into the engine. And the muffler system should be frequently checked for blockage.

Carburetor fuel-mixture adjustment is one of the more critical elements to two-cycle operation, since it controls both the leanness of fuel and the quantity of lubricant. Each machine will have a specific system for adjustment. Some will permit no adjustment, while others will. Read the operating manual and follow it strictly.

Store it right

Storage is an important issue for two-cycles. Some are showing up with catalytic converters. These platinum-bearing, ceramic honeycomb exhaust filters have been used on cars for decades. They make unburned fuel molecules combine with oxygen, to eliminate troublesome emissions. But the converter, which looks like a regular muffler, is more fragile because of the internal ceramic honeycomb. It retains its heat longer after the engine is shut down. The extra heat may be enough to start a fire by inadvertently storing a hand-held power tool in a position where the converter contacts flammable materials.

Assess the storage setting for your two-cycle equipment to eliminate wood, grass clippings or any other potentially flammable materials. Train operators to store the equipment so fuel left in the tank can't inadvertently dribble onto the muffler or converter. Also, be careful of wildlife, particularly insects. For some reason, spiders seem to take a special liking to two-cycle engines. Some species like to build nests in the exhaust outlets, causing a clog. Operators have received painful stings. Whatever the reason, take some extra time to verify there's no fauna cluttering up the storage area.

Goodness knows the little pups with two-cycle engines are enough responsibility for anyone.

Scott Nesbitt is a regular machinery writer for Golf Course Management Magazine and Australian Turfgrass Management Magazine

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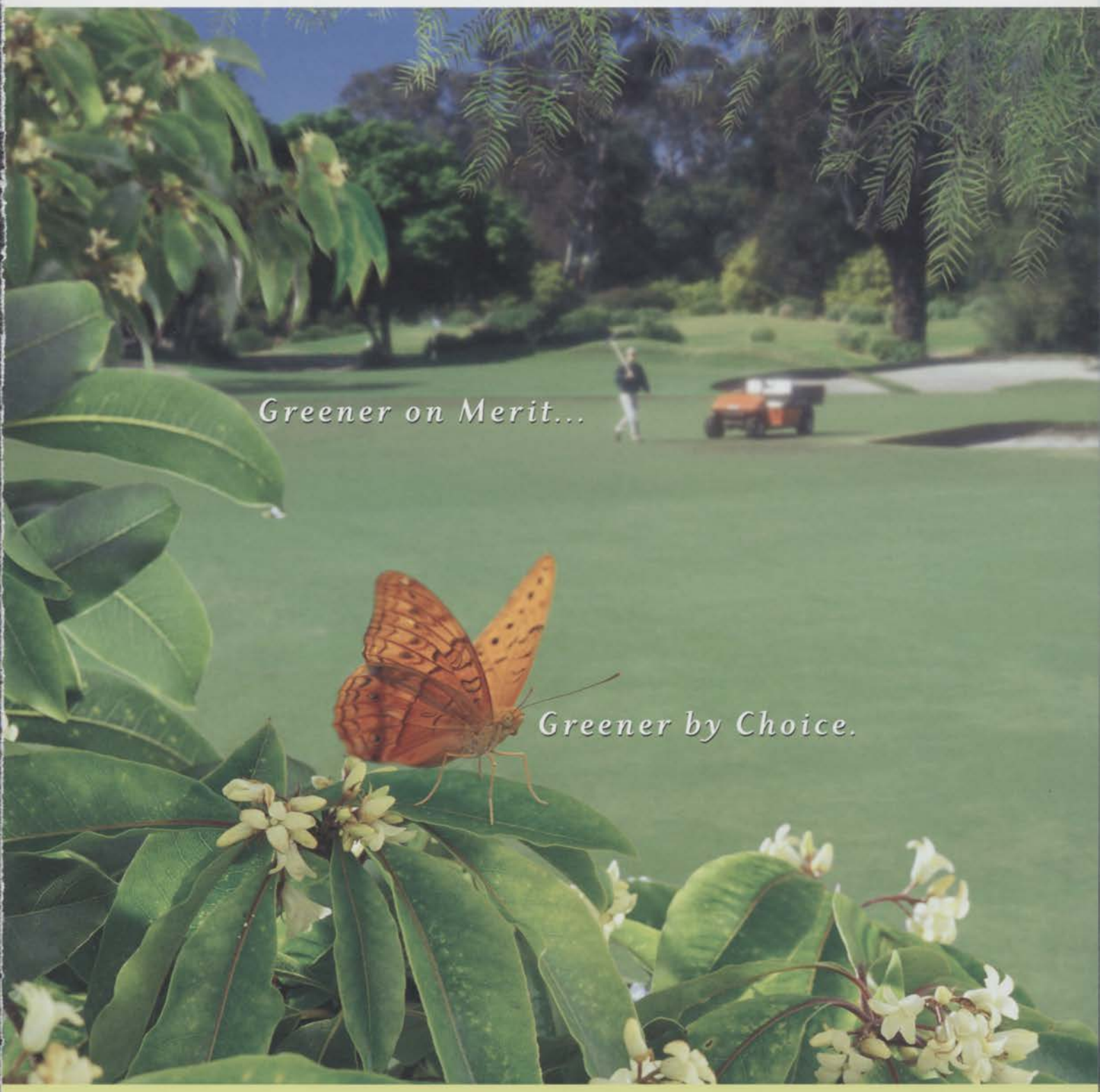

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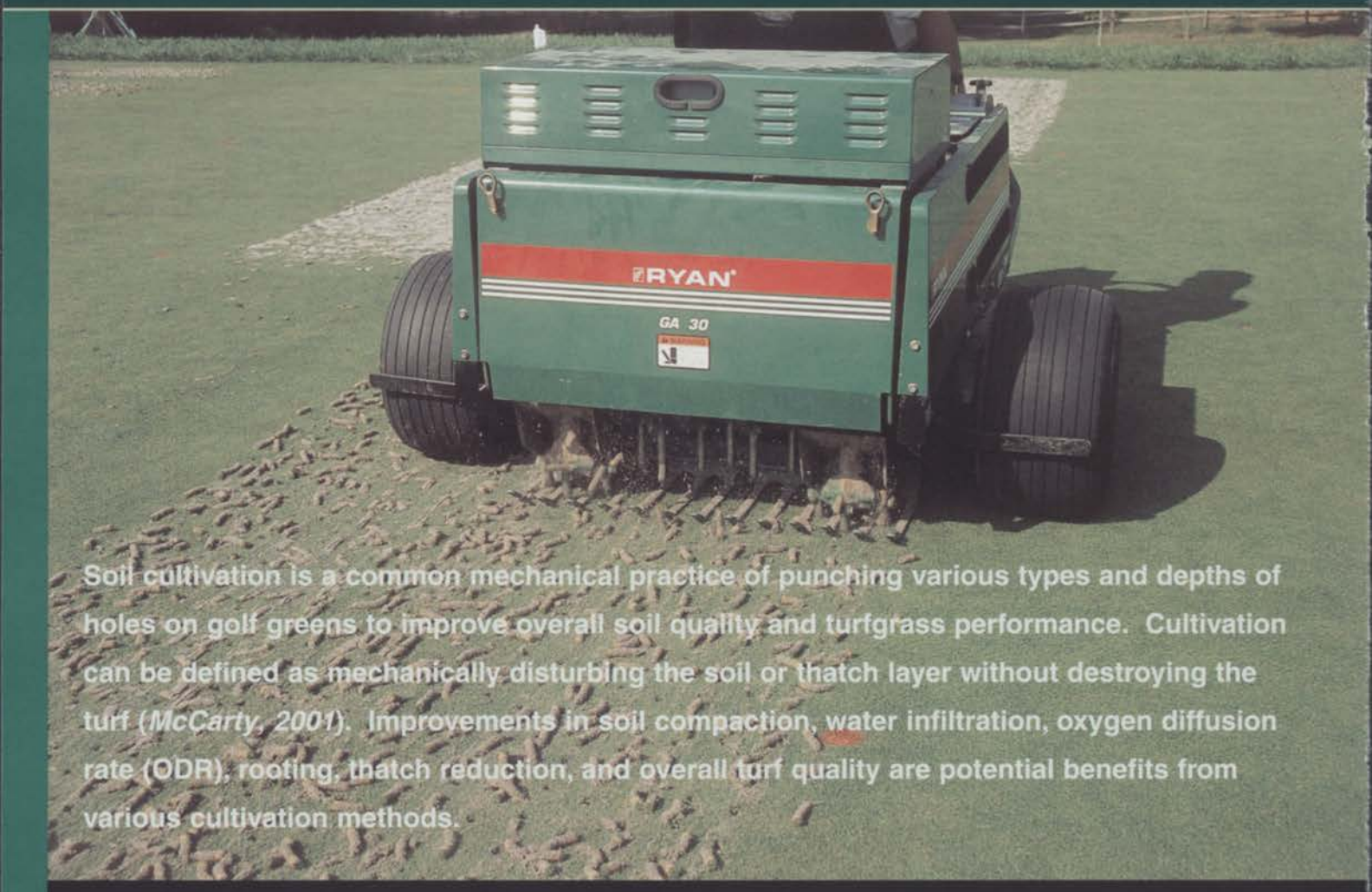
SUMMER BENTGRASS CULTIVATION: Risk or Reward?



Soil cultivation is a common mechanical practice of punching various types and depths of holes on golf greens to improve overall soil quality and turfgrass performance. Cultivation can be defined as mechanically disturbing the soil or thatch layer without destroying the turf (*McCarty, 2001*). Improvements in soil compaction, water infiltration, oxygen diffusion rate (ODR), rooting, thatch reduction, and overall turf quality are potential benefits from various cultivation methods.

Bentgrass cultivation has traditionally been performed during spring and fall months for optimum recovery and limited turf injury. Summer cultivation is often avoided for fear of excessive physical turf injury and desiccation on bentgrass. However, the importance of maintaining a quality soil atmosphere with adequate soil O_2 and prevention of other problems such as localized dry spots and hydrophobic soils have stimulated usage of summer cultivation on highly trafficked turf.

Cultivation options are numerous with differing tine diameters, depths, and methods. Commonly used cultivation practices include: conventional depth (9 cm) with either hollow tine (CHT) or solid tine (CST); deep depth (20 cm) with hollow tine (DHT) or solid tine (DST); pressurized water injection systems (RZI); and other methods such as less destructive star tines (ST) and needle tines (NT). (*see over page*).

Previous research has demonstrated variations in soil aeration status with differing cultivation practices (*Rieke and Murphy, 1989*). Over a 10 year study, Engel and Alderfer (1967) noted a 20% increase in ODR with spoon type cultivation. In contrast, Petrovic (1979) found a vertical operating hollow tine had no effect on ODR. The removal of soil by the CHT reduces soil strength and relieves compaction, thus increasing the potential to improve soil oxygenation (*Murphy et al., 1993; Wiecko et al., 1993*).

B. TODD BUNNELL AND BERT McCARTY

Tines used for summer cultivation study at Clemson University during the summer of 1999. Treatments: CHT – conventional hollow tine, CST – conventional solid tine, ST – star tine, NT – needle tine, DHT – deep hollow tine, DST – deep solid tine, and RZI – root zone water injection (not included).

Surface hardness measures the impact absorption characteristics of turf (*Lush, 1985*). Rogers and Waddington (1992) found impact characteristics of turf are determined by soil water content, soil compaction, and surface type. Previous research has found CHT treatments to reduce surface hardness (*Baker and Richards, 1993*).

Turf performance following cultivation is an additional area where previous research is contradictory. Cultivation methods are both injurious and beneficial to turf. *Murphy et al. (1993)* showed cultivation improved overall turf quality, with best quality following treatments of CHT. Benefits seen with cultivation practices improved soil physical properties, hence improving turfgrass quality. In contrast, other research has shown cultivation in the fall and spring to be injurious to turf (*Engel and Alderfer, 1967; Cooper and Skogely, 1981*). Limited research has been performed on turf performance following summer cultivation techniques. The objective of this study was to evaluate soil gas levels, water infiltration, soil hardness, and turf quality of two creeping bentgrass varieties, 'Penn A-1' and 'Crenshaw", following differing summer cultivation techniques.

RESEARCH APPROACH

The study was performed in July and August 1999 on Clemson University's two-year old 85:15 (V: V) sand: peat 'Crenshaw' and 'Penn A-1' creeping bentgrass research green (*USGA Greens Section Staff, 1993*). The grass was maintained to golf course standards including daily mowing at 4 mm, irrigation applied twice weekly at 1.9 cm per application, standard fungicides applied every 14 days for disease control during spring and summer months, and yearly application of 390 kg N ha^{-1}.

Treatments were applied on two bentgrass cultivars, 'Crenshaw' and 'Penn A-1' creeping bentgrass on 16 July 1999 (*Table 1*). Treatments were applied and soil cores removed from plots receiving a hollow tine treatment. Square spacing between cultivation holes was 7 cm for each treatment. Each plot was divided into strips consisting of a topdressed plot and non-topdressed plot. Topdressing was applied the same day of cultivation treatment applications with a layer of 0.6 cm medium/coarse (0.5 – 1.0 mm diameter) sand and brushed in.

Soil gas levels, water infiltration rates, and soil hardness were evaluated through 30 DAT (days after cultivation treatment). Soil gas levels were measured with a portable infra-red gas analyzer able to draw a constant flow of 0.1 L s^{-1} (*Soil Scientific, model #1810-2772, Deep River, CN*). Soil gases measured were O_2, CO_2, H_2S, and CH_4. Gas levels were measured at 15 and 30 DAT at two depths (9 and 20 cm) and recorded at 1200 and 1500 h.

A double ring infiltrometer (*model 13a, Turf-Tec, Coral Springs, FL*) was used to measure infiltration rates at 15 and 30 DAT. The infiltrometer was forcefully placed into the turf at the depth of 2 cm. Infiltration time (s) was recorded when water vacated the center ring and rates were converted to cm h^{-1}.

A Clegg Impact Soil Tester (*2.5 kg model, Lafayette Instrument Co., Lafayette, IN*), was used to measure surface hardness. The Clegg Hammer is a widely accepted method of measuring hardness or impact characteristics of turf surfaces (*Lush, 1985*). Two readings were taken per plot every 15 days, readings were also taken 2 days following irrigation to maintain uniformity in soil water potential. Units were recorded in CIV's (*Clegg Impact Value*) and converted to gmax (peak deceleration) using the following equation, (*Bregar and Moyer, 1990*).

$g_{max} = 10(CIV)$

Table 1. Summer cultivation treatments used in this study including abbreviations, tine dimensions and manufacturer.

TREATMENT	ABBREV.	TINE TYPE	TINE DIAMETER (CM)	TINE DEPTH (CM)	†MANUFACTURER
Conventional Hollow	CHT	Hollow	1.6	9	JRM, Inc.[3]
Conventional Solid	CST	Solid	1.6	9	JRM, Inc.[3]
Deep Hollow	DHT	Hollow	1.6	20	JRM, Inc.[3]
Deep Solid	DST	Solid	1.6	20	JRM, Inc.[3]
Root Zone Injection‡	RZI	N/A	0.08	9	John Deere[2]
Star-Tine	ST	Solid	1.25	9	Right Angle Tine Co.[1]
Needle Tine	NT	Solid	0.75	13	Sisis, Inc.[4]

Turf quality was measured weekly on a 1-9 scale, with 9 = best quality turf. A minimum acceptance level was 7. Turf quality included color, density, uniformity, and overall plant health.

SUMMARY OF RESULTS

Soil Gases

Soil CO_2 was reduced as a result of cultivation in the 'Penn A-1' cultivar experiment. Specifically at 9 cm depth, CHT and ST, and NT reduced soil CO_2 from the untreated by 33, 21, and 25%, respectively at 15 DAT (*Table 2*). Conventional ST did not reduce soil CO_2. This may be attributed to a larger redistribution of sand from the solid tine resulting in a compaction zone surrounding the cultivation hole, hence possibly slowing O_2 diffusion. At the 20 cm depth, CHT and DHT both reduced soil CO_2 by 24% (*Table 2*). Carbon dioxide reductions were not evident in the 'Crenshaw' cultivar experiment (*data not shown*). This may be attributed to lower CO_2 concentrations in plots not receiving cultivation. Reductions in soil CO_2 allow for an increase in O_2. Oxygen levels were increased at 9 cm by 1% following CHT treatments in both cultivars at 15 DAT. Oxygen differences were not observed at 20 cm with any tine treatment. Additionally, no measurable CH_4 or H_2S levels were detected in either experiment.

Table 2. Soil O_2 and CO_2 following differing cultivation treatments on 'Penn A-1' creeping bentgrass.

	TREATMENTS‡							
Response	UNT	ST	CHT	CST	DHT	DST	RZI	NT
15 DAT†:								
O_2 (%)								
9 cm	20.08bc	20.20ab	20.32a	20.22ab	20.18ab	20.08bc	20.00c	20.22ab
20 cm	19.95a	20.07a	20.05a	20.08a	20.08a	19.98a	19.95a	19.88a
CO_2 (%)								
9 cm	0.92ab	0.73cd	0.62d	0.75bcd	0.83abc	0.93a	1.01a	0.69cd
20 cm	1.19a	1.02ab	0.91b	0.95ab	0.91b	1.08ab	1.01ab	0.96ab
30 DAT†:								
O_2 (%)								
9 cm	19.95abc	20.00ab	20.05a	19.98ab	19.78bc	19.78bc	19.73c	19.95abc
20 cm	19.95a	19.83a	19.92a	19.97a	19.70a	19.70a	19.88a	19.85a
CO_2 (%)								
9 cm	0.72abc	0.68bc	0.58c	0.66bc	0.83abc	0.94a	0.91ab	0.70abc
20 cm	0.74a	0.83a	0.88a	0.82a	0.96a	0.96a	0.79a	0.88a

† Within gases, depths, and DAT (Days after cultivation treatment), means followed by the same letter are not significantly different according to Fisher's LSD (0.05) test.

‡ Treatment abbreviations: UNT-untreated, ST-star tine, CHT-conventional hollow tine, CST-conventional solid tine, DHT-deep hollow tine, DST-deep solid tine, RZI-root zone injector, and NT-needle tine.

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At 30 DAT, CHT increased O_2 and decreased CO_2 levels compared to RZI and DST at the 9 cm depth in the 'Penn A-1' cultivar experiment. Results found at 15 DAT were not seen at 30 DAT. This suggests cultivation benefits on soil oxygenation may only persist for 2 to 3 weeks.

Gas levels were influenced greatest by CHT, ST, NT, and DHT treatments in the 'Penn A-1' plots. The prudent watering of the research green and quality of construction material likely did not allow for toxic gas build-up and low soil oxygenation. Future research should investigate summer cultivation on older compacted, highly trafficked, and/or poorly drained golf greens.

Surface Hardness

Surface hardness was reduced by cultivation treatments. In the 'Penn A-1' cultivar experiment, g_{max} was reduced with DHT, DST, CHT, and ST treatments by 19, 16, 11, and 9% at 15 DAT, respectively (*Table 3*). In the 'Crenshaw' cultivar experiments, g_{max} was reduced at 15 DAT following all treatments except RZI. Deep HT, DST, and CHT treatments reduced surface hardness by 22, 19, and 16%, respectively (*Table 4*). Surface hardness reductions with DHT, DST, and CHT are attributed to the greater degree of surface disruption and core removal as well as greater subsurface fracture. A study measuring soil strength provided similar trends with CHT reducing soil strength, although DHT and DST were not included (*Murphy et al. 1993*).

Tine effects at 30 DAT were similar to effects at 15 DAT. In the 'Penn A-1' cultivar experiment, all treatments except NT, RZI, and CST reduced surface hardness compared to the untreated (*Table 3*). Deep HT, DST, CHT, and ST reduced surface hardness by 15, 12, 8, and 7%, respectively. In the 'Crenshaw' cultivar experiment only the CST and RZI treatments did not reduce surface hardness from the untreated at 30 DAT (*Table 4*). Surface hardness reductions for DHT, DST, CHT, NT, and ST treatments were 18, 15, 11, 6, and 5%, respectively. The RZI never reduced soil hardness in either cultivar experiment. In our study the RZI only reached a depth of 9 cm, therefore creating very little subsurface fracture and surface disruption.

In both experiments, CST did not reduce soil hardness compared to the untreated plots. This may be attributed to creating a zone of compaction from a large soil void without the removal of a core or subsurface fracture. Other treatments not removing soil, such as DST and NT, reduced soil hardness due to deeper tine penetration. Therefore, depth of tine penetration and core removal possibly impacted surface hardness.

Conventional hollow tine (CHT) treatment on 'Crenshaw' creeping bentgrass 1 week following cultivation.

Conventional solid tine (CST) treatment on 'Crenshaw' creeping bentgrass 1 week following cultivation.

Needle tine (NT) treatment on 'Crenshaw' creeping bentgrass 1 week following cultivation.

Infiltration

Differences in water infiltration at 15 DAT occurred in both experiments. Infiltration rates increased 51, 37, 33, and 34% following DHT, CHT, DST, and NT, respectively in the 'Penn A-1' cultivar experiment at 15 DAT (*Table 3*). In the 'Crenshaw' cultivar experiment, highest infiltration rates of 33, 32, and 24% again followed DST, NT, and DHT treatment, respectively at 15 DAT (*Table 4*). Deep tine cultivation with DHT, DST, and NT fractures the soil, creating macropores and allowing for greater infiltration of water.

By 30 DAT, only hollow tine treatments still influenced infiltration rates. In the 'Penn A-1' cultivar experiment, CHT and DHT increased rate of infiltration by 58 and 40%, respectively at this time (*Table 3*). In the 'Crenshaw' cultivar experiment, CHT had 40% greater infiltration (*Table 4*). Prior research performed on sand based soccer fields noted highest infiltration rates following CHT applications (*Canaway et al., 1986*). Hollow tine treatments may have attributed to higher infiltration rates at 30 DAT by reducing compaction compared to solid tine treatments (Murphy et al., 1993).

Table 3. Soil hardness as measured with a Clegg impact hammer and infiltration using a double-ring infiltrometer following differing cultivation methods on 'Penn A-1' creeping bentgrass.

	TREATMENTS‡							
Response	UNT	ST	CHT	CST	DHT	DST	RZI	NT
15 DAT†:								
Soil Hardness g_{max}	99.6a	90.8bcd	88.9cde	92.0abc	81.1e	83.7de	98.4ab	93.9abc
Infiltration cm h^{-1}	147.9b	158.2b	202.8a	148.9b	223.8a	196.4a	144.0b	198.2a
30 DAT†:								
Soil Hardness g_{max}	96.5ab	90.0cde	88.4de	93.1bcd	81.9f	85.2ef	100.7a	94.6bc
Infiltration cm h^{-1}	158.8c	172.8c	251.2a	158.8c	221.5ab	164.9c	155.9c	178.5bc

† Within DAT (Days after treatment) and variables, means followed by the same letter are not significantly different according to Fisher's LSD (0.05) test.

‡ Treatment abbreviations: UNT-untreated, ST-star tine, CHT-conventional hollow tine, CST-conventional solid tine, DHT-deep hollow tine, DST-deep solid tine, RZI-root zone injector, and NT-needle tine.

Turf Quality (TQ)

Previous research indicates cultivation can be injurious to turf (*Cooper and Skogely, 1981*), while others indicate cultivation benefits TQ over time (*Murphy et al, 1993*). A variety of treatments used in this study were injurious to TQ during summer months, except RZI and NT.

Unacceptable TQ (<7) was observed with CST on the 'Crenshaw' cultivar experiment throughout the experiment's duration. Injury also occurred with DHT treatments, reducing TQ to 7. Other treatments reducing TQ at 7 DAT compared to the untreated were ST, CHT, and DST, however they were above the minimal acceptable level.

Table 4. Soil hardness as measured with a Clegg impact hammer and infiltration using a double-ring infiltrometer following differing cultivation methods on 'Crenshaw' creeping bentgrass.

	TREATMENTS‡							
Response	UNT	ST	CHT	CST	DHT	DST	RZI	NT
15 DAT†:								
Soil Hardness g_{max}	103.30 a	92.8 c	86.6 de	91.1 cd	80.8 f	83.4 ef	100.5 ab	95.1 bc
Infiltration cm h^{-1}	172.8cd	166.2d	203.8abc	186.2bcd	214.9ab	229.8a	169.4d	227.4a
30 DAT†:								
Soil Hardness g_{max}	102.3 a	97.1 bc	91.3 de	98.7 abc	84.0 f	86.5 ef	101.5 ab	95.9 cd
Infiltration cm h^{-1}	194.6c	197.3c	291.9ab	225.0bc	246.9bc	255.6bc	207.7c	217.1bc

† Within DAT (Days after treatment) and variables, means followed by the same letter are not significantly different according to Fisher's LSD (0.05) test.

‡ Treatment abbreviations: UNT-untreated, ST-star tine, CHT-conventional hollow tine, CST-conventional solid tine, DHT-deep hollow tine, DST-deep solid tine, RZI-root zone injector, and NT-needle tine.

Similar trends were found on 'A-1' plots. Turf injury occurred at 7 DAT with ST, CHT, DST, DHT, and CHT, however, these were acceptable. At 14 days after treatment, CHT, DHT, DST, and CST again reduced TQ, but only unacceptable TQ followed DHT, DST, and CST treatments. At 21 days after treatment, DST, DHT, and CST, continued to reduce TQ, however only CST was unacceptable.

Aggressive cultivation techniques, such as CST, CHT, DHT, and DST, accelerated heat and drought stress causing thinning and loss of overall quality. These treatments possibly caused turf desiccation and/or severe turf bruising. In contrast, non-aggressive treatments such as NT and RZI resulted in excellent TQ compared to other treatments because of the minimal surface and shoot disruption, thus possibly reducing turf damage and desiccation. Topdressing had no impact on any responses.

CONCLUSIONS

Short-term benefits of cultivation on plant and soil characteristics were seen with the use of various cultivation techniques.

Overall, summer cultivation practices with most treatments improved soil gas levels, soil hardness, and water infiltration up to 30 DAT. Greatest impacts were evident with CHT, DHT, NT, and ST. Turf quality was impacted by cultivation treatments. Unacceptable TQ was found with DHT and CST treatments in both experiments at 14 DAT. Newer and less aggressive techniques such as RZI, ST, and NT did not reduce turf quality, with the RZI having limited impact on surface hardness, gases, and infiltration. Star tine and NT treatments decreased soil CO_2 and surface hardness, with NT also increasing water infiltration. The objective of summer cultivation is to open the soil for increased oxygen diffusion, water entry and short-term alleviation of surface hardness without turf injury.

Best results were found with ST and NT treatments during summer months. Improved soil properties with no turf injury were achieved with these cultivation techniques.

Todd Bunnell and Bert McCarty are Researchers at the Clemson University, Clemson, SC, USA

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DAVIS CUP TRIUMPH FOR STRATHAYR

The StrathAyr team discuss the new court with members of the Davis Cup Squad

160 modules were brought into Rod Laver Arena to create the grass surface

Although the Australian Davis Cup Team fell short of achieving victory over the French in this months historic final, the week was a huge success for Tennis Australia and Melbourne based innovators, StrathAyr Turf Systems who together formed a partnership to bring grass court tennis to the Rod Laver Arena.

Constructed last March in modules* and established under glass house conditions for much of the winter, 18 semi trailer loads transported the 160 modules from StrathAyr's Seymour property over four days commencing on Monday 12th November to create a temporary grass surface at Melbourne's Rod Laver Arena.

Prepared and maintained in-situ, the court was ready for a 'bruising' practice schedule that commenced on Monday 26th November then hosted five tough Davis Cup rubbers that resulted in a 3-2 victory to a French side spurred on by a small but vocal band of supporters.

Understandably, the court was clearly worn by the final matches but the court held together well and provided a great surface.

StrathAyr have attracted their fair share of criticism over the last 24 months but this couldn't have gone better.

**The modules include a metal drainage base (manufactured by Preston Engineering), loam soil and Legend couchgrass. The soil is 1500mm deep and is reinforced with ReFlex mesh elements. Each module is 2.4m x 2.4m (6m2), 200mm deep, and weighs 1.7 tonnes.*

NEW APPOINTMENT FOR ASPAC

Melbourne based ASPAC Golf and Turf announce the appointment of Mr Steve Lewis as company sales manager.

Mr Lewis has over 20 years hands on experience in the turf industry, both in a mechanical and sales capacity, and will assist in managing the companies growth in Victoria with its range of wholegoods, hire equipment and will fit parts. Future expansion into Southern NSW and the ACT is planned.

Mr Lewis will be continuing with the high quality cylinder grinding service that many Melbourne based clients acknowledge as the best in the industry.

Anyone wishing to contact Mr Lewis can call him on 0419 009 234, 03 9796 4254, or faxed on 03 9708 6702.

BREAKIN AT TEXTRON

On the night of Sunday 25th November, the main wharewhare facility for Textron Turfcare in Sydney was raided by thieves who made away with equipment worth **$250,000** which included the following items:

Ransoms 728/72" O/F Rotary 4WD	S/N 946706 0734
Ransoms 728/72" O/F Rotary 4WD	S/N 946716 0229
Jacobsen GKIV + Greensking (D) Greens Mower	S/N 62289 02266
Jacobsen GKIV + Greensking (D) Greens Mower	S/N 62289 02281
Jacobsen GKIV + Greensking (D) Greens Mower	S/N 62289 02269
Jacobsen GKIV + Greensking (D) Greens Mower	S/N 62289 02284
Ryan Mataway Aerator (S/P) 544283A	S/N LM 9800
Ryan Lawnaire IV Aerator (S/P) 544863B	S/N 509475
Ryan Ren-O-Thin IV Dethatcher (S/P) 544865B	S/N 509088

Also taken was an Isuzu 250 Tray Truck, white, drop down ramps, Chassis No. JAAN PR71 LX71020P5, Engine # 4HG1706376, Registration # WOZ 257

Anyone with any information on the above should contact Textron Turfcare on 02 9724 0344.

COURSE QUALITY OFFICIALS DO A GRAND JOB

The AGCSA and John Deere teamed up to provide Course Quality Officials at the Holden Australian Open at the Grand Golf Club in November. Stuart Appleby, winner of this years' Holden Australian Open made a special effort to thank the Course Quality Officials and was quick to praise the condition of The Grand and the groundstaff headed by Course Superintendent, Rodney Cook. This was the sixth consecutive year that the AGCSA has provided Course Quality Officials and the first year that John Deere has sponsored the AGCSA at the event. Greg Clark, Manager Golf and Turf stated that John Deere was "proud to be associated with the AGCSA and the Holden Australian Open," and added that," John Deere is committed to assisting the AGCSA in promoting the profession of turf management."

Over 65 volunteers from all around Australia took part in the CQO program, which sees a volunteer paired with each group to repair divot marks and bunkers. The CQO program provides a valuable opportunity for groundstaff in particular to see a premier golf course in tournament condition. The CQO marquee at the open has now become a focal point for Golf Course Superintendents and staff during the Open. The AGCSA is proud to have the support of John Deere for this important event in the AGCSA's calendar.

Course Quality Officials with 2001 Holden Australian Open Winner Stuart Appleby (centre) and Golf Course Superintendent Rod Cook (bottom right)

JOHN DEERE TEAM CHAMPIONSHIP, AUSTRALIAN FINAL A RESOUNDING SUCCESS

On Wednesday and Thursday the 3rd and 4th of October, the finalists from dealer-run John Deere Team Championship events made their way to Queensland to compete for the ultimate prize – the chance to play in the John Deere World Team Championship event to be held in November at Grayhawk Golf Course in Scottsdale, Arizona.

Teams arrived early and met at John Deere Head office for a welcome presentation and brief tour of the facility. Immediately following lunch, teams were bused to the Gold Coast, direct to The Glades for a practise round, after which everybody was transferred to the Radisson Palm Meadows Resort to get ready for dinner.

Pre-dinner drinks on the terrace overlooking the pool, were followed by a three-course meal, during which Chuck Greif, Golf & Turf Division Worldwide Market development and International sales Manager gave a brief overview of the history of the John Deere Team Championship in the USA. Mark Couchman, President of the AGCSA spoke briefly about the appreciation of the AGCSA for John Deere's support of the industry through its donation of US$25 for every team that competed at the local level. Paul Bevan, facility Manager from The Glades discussed the history of the Club, and Chief Agronomist, Colin Thorsborne talked about the layout, format, and nature of the course itself.

Thursday began with breakfast at 6am, and everyone made it to the bus for a 7am departure for The Glades. After a little practice time, competitors made their way out onto the course for a shotgun start. Teams came in at around 12.30pm where everyone enjoyed a BBQ lunch, and the presentations were made. Winning teams were as follows:

Everybody thoroughly enjoyed themselves, and the day was considered an enormous success with all teams vowing to compete again next year.

Logan City Golf Club - Winners of the 2001 JD Team Championships

John Deere would like to thank all teams who competed in the first John Deere Team Championship event ever to be held in Australia. A big thank-you also to the Clubhouse and maintenance staff from The Glades Golf Club for their assistance in running the Australian final, without whom it would not have been possible.

For information on how to compete in next years event, please see your local John Deere Golf & Turf dealer.

RESULTS

1st Place	Logan City Golf Club, QLD
2nd Place	Tallwoods Golf Club, NSW
3rd Place	Lake Karrinyup Country Club, WA
Longest Drive on the 15th hole	Peter Ingram from Gold Creek Country Club
Straightest Drive on 8th hole	Shane Casley from Mooroopna Golf Club
Nearest the Pin on the 3rd hole	John Woodsell from Mooroopna Golf Club
Nearest the Pin on the 5th hole	Peter Fielding from Mooroopna Golf Club
Nearest the Pin on the 17th hole	Steve Drummond from Logan City

TOUGH PUTT! (OLD NEWS BUT AWESOME PHOTOGRAPH)

On Sunday the 29th of July the Joondalup Golf Course and surrounding suburbs experienced 160mm of rain during a 6 hour period from 4.30pm – 10.30pm.

According to local records this was a one in one hundred year event.

As you can see by our annual rainfall chart 10-20mm is generally regarded as a normal amount for this time of year.

The erosion to the 5th Quarry green as seen in the picture was a result of a large quantity of surface water, which shed off the 5th Quarry fairway draining to the lowest point, the right hand side of the green down into the bottom of the quarry.

With the green obviously out of play a temporary green was utilised closer to the tee.

During the following week a 30 tonne excavator was used to break up a heap of limestone rock in the bottom of the quarry. This was then compacted into the eroded face along with eroded material at the bottom of the Quarry.

Once this was completed the approach to the green was re-contoured to divert any future surface water.

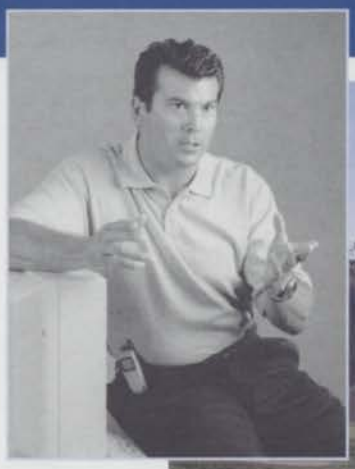
Approximately 100m^2 of the green's surface was returfed using bentgrass from our nursery green allowing the green to be brought back into play 3 weeks after the initial damage.

We are still well down on our average annual rainfall of 880mm.

So believe it or not we need a lot more rain, (but not all at once!).

Rob Macdonald standing where the 5th green used to be

Who Says You Need a Million Dollar Budget To Upgrade Your Irrigation System?



Televised tournaments have created high expectations. Players, club managers, greens committees – everyone wants a course that looks like Pebble Beach, but without the big expense.

That's where Hunter Golf comes in. Hunter specializes in helping you upgrade your course with top-of-the-line retrofit equipment. And we're ready to work within your time frame – whether it's five months or five years. Switch out a few inefficient heads and replace them with reliable Hunter rotors. Add Hunter field controllers with a field maintenance radio...when your budget allows. Or install an easy-to-use Hunter central control system...in affordable stages.

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TWO NEW MACHINES FOR HYDRO TURF

Over the last 11 years, Hydro Turf has gained valuable experience in the operation and application of the Toro Hydro Ject, covering NSW, SA, VIC & QLD. In addition, they offer a 2-rig service, which enables a golf course to be aerated in one day.

They now have two new Hydro Jects which enables Hydro Turf to continue to provide premium performance, usually delivering depths to 200mm (8"). Their own evidence shows that this depth for new root growth is achieved within two weeks. The Hydro Ject is traditionally used shortly after renovation but, more recently, there is a trend to use this service as part of a renovation process. For further details please visit Hydro Turf's website: www.hydro-turf.com.au or contact Wally Bowkun on 0412 834 751.

PATON FERTILIZERS MULTIAGRI RANGE

Paton fertilizers new multiagri range is the best of both Worlds in plant nutrition. Offering a combination of Conventional/regular fertilizers and controlled release fertilizers.

Only premium raw ingredients and polymer coated 3-4 month controlled release fertilizers are combined to offer 50% of the nitrogen and 50% of the potassium in a controlled

situation. Therefore providing both the nitrogen and potassium over a 3-4 month period.

There are 5 multiagri blend choices in the range and all contain complete trace elements.

Multiagri 12 - contains higher potassium for flowering and fruiting plants

Multiagri 17 - contains higher nitrogen for strong leaf growth

Multiagri 18 - contains a balanced nitrogen to potassium ratio with additional iron. Excellent for turf, parks, lawn and australian native plants

Multiagri 20 - contains a balanced n:p:k and is ideal for landscaping situations, establishment and maintenance of gardens

Multiagri 24 - contains higher nitrogen and iron for spring and summer needs with turf, parks, lawns and australian native plants

Whatever you are looking for in plant nutrition paton fertilizers multiagri range will suit your needs at a competitive price.

HYDROFLO L

Scotts Hydraflo L

From the makers of leading controlled release technologies such as Osmocote, Contec and Poly S, comes Hydraflo L – a unique technology that is best described as a controlled release wetting agent.

The active ingredient in Hydraflo is characterised by its reliable performance, plant safety and long term performance.

By combining just enough short chain polymeric wetters with Hydraflo's exclusive long-term polymeric compounds, immediate wetting is apparent, along with the long-term activity that most soil wetters lack.

Low technology soil wetters use simple detergent chemistry that does more harm than good to the soil environment. These wetting agents are environmental pollutants that are easily leached from soil, and like a detergent they wash the goodness from the root zone on their way through. Due to it's no leaching chemistry, Hydraflo's long chain polymeric wetter works to keep the goodness in the soil, balancing air and water by freeing soil pores spaces.

Hydraflo L can be applied as a blanket treatment once a season at higher rates of application. Spot treatment is also made easy with Hydraflo II, Scotts granular soil wetting agent formulation.

For more information, contact the technical sales representative from your selected Scotts distributor: Evans Turf (NZ), Globe, Maxwell and Kemp, Southern Turf Specialists, Turf and Irrigation) .

TOP DRESSER - TERRA TOP 400

Turf Link Australia announce the release of the Terra Top 400 top dresser, manufactured in Germany.

The Terra Top 400 was designed to cater for golf courses and contractors involved in green renovations and scheduled maintenance practices.

The TT400 is a robust tractor mounted 3 point hitch (standard) or trailed (optioned) Top Dresser which is ideally suited for fine turf applications. The PTO driven feeder delivers top dressing material through a simple mechanical gate which meters the application rate to a rotary brush which ensures even distribution and direct placement.

The hopper has been designed to cope with wet materials, a heavy duty agitator combined with a steep sided hopper ensures that the hopper empties effeciently.

A mesh screen is fitted to the top of the hopper and also acts as a safety guard.

Options include hopper extension kit increasing capacity to 0.8 cubic meter, hydraulic meter gate to regulate application rates and adjustable draw bar four low ground pressure tyres on floating axles.

The TT400 is available for demonstrations and for further infomation please contact:

Mike Pauna at Turf Link Australia Pty Ltd, ph: 0414 821 694.

JACOBSEN LF-2500 LIGHTWEIGHT FAIRWAY MOWER

TEXTRON GOLF AND TURF PRODUCTS

The LF-2500 lightweight fairway mower pampers turf and delivers a precision, 98-inch-wide cut with its classic now Jacobsen reels. It's light enough to leave virtually no footprint. Five steerable cutting reel unit sclosely follow ground contours and "float" to prevent scalping.

Wide, high-flotation tires increase traction on steep slopes and reduce compaction. For a smooth, professional finish, 22-inch counterbalanced reels provide consistent, even cutting performance. While gentle on turf, the LF-2500 is very productive thanks to a 31-horsepower Kubota diesel engine, a 98-inch cutting width and a 7.5-mph mowing speed.

contact Textron Turfcare: 02 9724 0344

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Noxious Weeds of Australia

by W.T.Parsons & E.G.Cuthbertson

John Neylan

Even though the Internet has become such a big part of our lives and the perception that it will be our primary source of information, I must admit that I am still an unashamed book lover. There is nothing like the feel of a book, flicking through the pages and grabbing it off the shelf when in search for information. While the Internet at present provides grabs of information it can be a very convoluted route to find the relevant information. Well written and research books provide most of the information on any given topic and by using the index will quickly provide the required information and solution to a problem.

I have been given this book to review and I will be rapt to place them on my bookshelf.

NOXIOUS WEEDS OF AUSTRALIA:

Noxious weeds of Australia is written by two of Australia's foremost weed experts. It was first published in 1992 and has been out of print since 1996. This edition is not a complete revision, however, there is updated information on the proclaimed noxious weeds and the legal requirements for their control in each state. There is also updated information on the appropriate control measures.

Most golf courses as well as many other large facilities have non-turf areas that need to be appropriately managed. It is in these areas that proclaimed weeds can become established and a source of ongoing infestation. It is a legal requirement that these weeds be controlled.

Noxious weeds of Australia contains information on over 200 species, including descriptions, life cycle, habitat and maps of their occurrence. It is very will illustrated with colour photographs and illustrations.

I strongly recommend that any turf manager interested in weed control purchase this excellent reference.

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GCSAQ

Merry Christmas one and all and best wishes for a safe and happy festive season.

The year rolls on out and before you can blink the new one is already lining up ahead of you.

In Queensland we have endured a long dry spring with a few isolated heavy rain patches to keep some colour in the grass.

The John Deere International Teams Challenge went very well at the Glades Golf Club over 2 days with some great organisation, a fabulous venue and a magnificently presented golf course testing the skills of teams from around the country. Colin Thorsborne, the Glades chief agronomist, really did a great job setting up a very testing course. Eventual winners were the team from Logan Golf Club, Qld with Tallwoods Golf Club NSW and Lake Karrinyup Country Cub in WA filling the places. Congratulations to all involved. Greg Clarke and the John Deere Organisation are to be commended on a well-run event that really opened up some eyes over the course of events to the role the superintendent actually plays in a golf club.

Kelly Hyland from Royal Queensland Golf Club and Rod Cook from the Grand Golf Club are recovering from the Australian PGA Championship and The Australian Open respectively. Congratulations on a job well done. Also, well done to all those Course Quality Officials who did such a sterling job at the Open. It has become a tradition of its own and is certainly a great way to see the course from the players point of view inside the ropes.

In November we also had the Turf and Irrigation sponsored field day featuring Terry Woodcock speaking on a variety of turf related subjects at Southport Golf Club. This was a well-attended and informative session with the usual Southport Golf Club high standard of service in evidence. Thanks go to Turf and Irrigation for sponsoring the day and providing an opportunity to wish retiring 'sales guru' Barry Harkin all the best for his future though I am pretty sure he won't stay still for long. Barry came up to Queensland in 1993 and started up Turf and Irrigation Pty Ltd virtually out of the back of a ute. He has provided Superintendents of South East Queensland with a valuable service and built T&I into a strong player in the turf supply market. Barry didn't let the side down after the educational session by shooting a score in the low to mid hundreds just to prove his annual Bradman's trophy win was no fluke.

The gala event of the spring was the Annual Queensland Golf Industry Awards at which the PGA, QGU, Womens Golf Queensland, Secretary Managers Association and the Queensland Golf Course Superintendents Association presented awards to high achievers in our industry. This years event was held in Brisbane at The Greek Golf Club on a beautiful balmy night. The Golf Turf Apprentice of the year was awarded to Mr Angus Mahoney of the Brisbane Golf Club, the Superintendents Environmental Award

was won by Mr Andrew Baker of Sanctuary Cove (also this years AGCSA Claude Crockford Environmental Award Winner). The turf industry company of the year was awarded to Barry Harkins' T&I Pty Ltd and the Superintendents Achievement Award was fittingly presented to Mr Rod Cook of the Grand Golf Club, a very popular and deserving choice. Once again it was a great night of awards, good food, catching up with people in the industry and some outstanding entertainment especially from Sergio Garcia's Sports Psychiatrist and the table centers were a work of art, not to mention Rod's controversial speech!

Another well-attended and important Spring function was the launch of the Queensland Turfgrass Foundation at the Redlands DPI research station. This group has been established by a cross industry steering committee with the aim of promoting turfgrass research and education in Queensland by creating greater awareness of the benefits of these activities. It is also intended to serve as a focus for raising money to support these activities. The program for the day included talks by Keith McAuliffe, Don Loch and the Hon. Henry Palaszczuk MP Minister for Primary Industries QLD. This was followed by a tour of the facilities with plots dedicated to Water Use studies, Turf Varieties and chemical testing. Any turf managers interested in playing a role in this foundation should contact Jon Penberthy on 0411 602 974.

Finally to the Superintendents social event of the season, the Christmas Party at Wet & Wild. This year our sponsor was Scott's Fertilisers and it was great to see plenty of people support this much-anticipated 'Big Day Out' with the family. Once again the 'Superintendents Speed Slide Challenge' was underway. Results are yet to be announced as some of the lab results from the swabs have gone missing in mysterious circumstances. A full report in the next edition of ATM but once again breakfast was a highlight on the day thanks to head chef Richard James looking resplendent in his life saving outfit. Speedo's will do that for a man!

Upcoming events are the February Fire Ants seminar and possibly a tour of the new Broadwater Golf Club at Springfield.

All the best for Christmas

Jon Penberthy
President, GCSAQ

NSWGCSA

Since my last report very little rain has been recoded in most areas of NSW and many Superintendents find themselves under pressure with water supplies and water systems stretched already.

We could be in for a long, hot summer?

Those of us who attended the roving workshop at Ryde Parramatta Golf Club were all in agreement that the day was well run, and we left with the desire and knowledge of how to get more efficient use of the 24 hours per day and most importantly to find the balance between work, family and leisure. No doubt all Superintendents will be very busy in the coming months, however the presenter on the day really stressed the need for all of us not to become totally consumed by work alone (food for thought).

The NSW Golf Association recently approached our Association seeking some assistance in providing some consultancy to a small golf course just west of the Blue Mountains, the initial contact has been made by "Bo" Boyd from Blackheath Golf Club who very generously gave up his time to help the "battling" club, many thanks "Bo".

The EPA and the NSW Farmers Federation are at "loggerheads" over the proposed introduction of new legislation regarding the "NOTIFICATION OF NEIBOURING PROPERTIES"; this involves any application of a pesticide and could certainly change the present situation that governs our responsibilities.

Both parties are seeking the support of the NSWGCSA which puts us in a difficult position. Anyone seeking more information on this very complex issue should contact the AGCSA, EPA, Farmers Federation or myself.

The Board of the NSWGCSA has finalized our schedule of events for 2002, it will be a great 12-months of 'living and learning' so make a new years resolution and "get to more field days".

Have a great Christmas and New Year.

Martyn Black
President, NSWGCSA

GCSAWA

Well, the warmer weather is here and renovation is alive and well in WA. Most supers are cleaning cobwebs from their scarifiers and coring machines in readiness for the usual Spring assault. This time of year I'm sure we all feel sorry for the poor golfer trying to hole his pressure four-foot putt across what resembles the rough side of a ryvita biscuit!

A few courses here in WA have already started to feel the "knock on" effect of the September 11th tragedies. Bookings at many of the resort courses are down with overseas visitors reluctant to fly here to enjoy our golf courses. I'm sure it's the same story all around Australia.

Round 9 of the John Deere Super Series was played at Sea View GC and host Super Owen Oberg presented the course in its usual superb condition. The proximity of Sea View to Cottesloe Beach also provided some added sights to enjoy. Mark Rodoreda produced "shot of the day" by managing to hit the Cottesloe Surf Club Clubhouse from the 6th tee, a cover drive Mark Waugh would have been proud of. Rob Macdonald, now relieved of his Presidential duties, stormed home with 22 points to win the day after predicting the result before teeing off!

The final round and series finale was held at Joondalup on Melbourne Cup day. Rob Macdonald presented the course in pristine condition and gave us a taste of true championship golf. One of our "interstate impostors" Greg Clarke from John Deere burnt the course up with a fabulous 25 points to claim the day. I'm sure Clarky with his "handicap" was a great asset to the team representing Australia in the John Deere World Team Championship.

The final results of this years Super Series is as follows:

WINNER 2001 SUPER SERIES
Jeff Austen - El Caballo Resort - 93 points

Runner Up (again)
Jeff Lane - Gosnells GC - 91 points

3rd Place
Travis Baker - Marri Park GC - 90 points

4th Place
Allan Devlin - Secret Harbour GC - 86 points

TRADE CHAMPIONSHIP
Dixie Joy - Christchurch Grammer - 92 points

Runner Up
Matthew Day - Nuturf - 91 points

3rd Place
Frank Griffin - Australian Turf Ind. - 90 points

4th Place
Andrew Newman - Tyco Flow Control
86 points

Congratulations to all the winners and special thanks to John Deere and CJD Equipment for their continued support for this popular event... 2002 promises to be even better.

The GCSAWA recently received a government grant of $19,800 from The Advisory Coucil on Waste Management. This was one of 15 successful grants awarded and is a reflection of the professional attitude of the association. Our involvement in this project can only enhance out pro-active reputation in this important environmental topic. This grant will fund a waste classification audit for golf courses in the Perth metropolitan area and record the amount and type of waste produced at these clubs. This will then be used to effectively measure waste reduction and recycling objectives.

Congratulations to Matthew and Samantha Day on the safe arrival of their baby daughter, Ashleigh. As I keep telling you mate, with kids, the first 20 years are the worst!.

The festive season will soon be upon us and I look forward to seeing all of you at our two Christmas functions. I wish all our state members and other AGCSA colleagues all the best for Christmas and a healthy and happy 2002. Please send us some rain!

Allan Devlin
President, GCSAWA

VGCSA

In my last report I can remember writing about possible water restrictions being implemented in Victoria if we didn't experience decent spring rains. Well I'm happy to report good falls have been recorded during October and early November for most parts of the state, filling dams and hopefully averting the need for restrictions.

The VGCSA's most recent meeting was held at the picturesque Heritage Golf Club on October the 15th. The theme for the day was "Greens Renovation Practices". I would like to thank all our guest speakers in Mick Russell, John Neylan, Phil Ford, David Nickson and Mark Gahan. A special thank you to Bill Walmsley from the New Zealand Sports Turf Institute who also spoke on the day. It is interesting to note that over the past eighteen months these educational type format meeting's have all been very popular and this meeting was no different with over seventy people in attendance. An integral part of these days is the course inspection which always generates plenty of discussion and our host Superintendent for the day, Sam Myott is to be congratulated on the condition of the course.

With Christmas fast approaching our final meeting for the year, scheduled for December 10 at Patterson River Country Club has a stronger emphasis on social activities. The structure for the day will be similar to last year with golf available from 1.00 pm followed by dinner. Our guest speaker will be visiting American Mr. J Michael Henry from the University of California speaking on the California method of Greens Construction.

VGCSA meeting venues for 2002 have all been finalized and are as follows (please note that these dates will be published on the 2002 ATM Yearly Wall Planner):

February 11 - Monday
Anglesea Golf Club

April 29 - Monday
(AGM)Metropolitan Golf Club

July15 - Monday
(Sec/ Man)Barwon Heads Golf Club

August 19 - Monday
Shepparaton Golf Club

October 21 - Monday
Flinders Golf Club

December 9 - Monday
Latrobe Golf Club

Turf Research Golf Day
Venue and date to be confirmed.

In closing I would like to wish all readers a safe and happy Christmas and I would particularly like to thank all the VGCSA's sponsors for their support over the past twelve months.

John Geary
President, VGCSA

SAGCSA

With another year nearly gone and Christmas around the corner, I hope that everyone has had a good year and is enjoying the festive season. We have just held our annual Christmas picnic in the Belair National Park and yet another great day was had by all. Many thanks to Bryan, Colleen and the girls for all their efforts in organising the day.

Our last S.A.G.C.S.A meeting was held at the Willunga golf course. This consisted of 9 holes of golf followed by a course inspection of the back nine and two newly constructed greens. After this John Cox, gave us a demonstration of the "Enviromist" spray systems and the three point linkage, quick hitch system. John also had on display a range of other products available from John Cox Agencies which included safety equipment. After lunch Paul Cameron (Assistant Superintendent, Willunga G.C) gave us a presentation on his recent trip to the United States. Paul worked at the Kingsmill Resort in Virginia and also at Twin Eagles Golf Club in Florida over the last year as part of his Rotary Internship he was awarded in late 1999. Well presented and well done Paul.

After a year of unseasonal wet weather in Adelaide and suburbs where the rainfall was at least 3 to 5 inches above average and more so in the hills, we are all hoping for a milder summer compared to last years hot, dry season.

Shawn Standfield
President, SAGCSA

TGAA (Vic)

As we are well into the summer season the spring rain is continuing to cause preparation problems.

We really need the rain but this weekend cycle is playing havoc with cricket competition.

The soccer at the MCG verses France was excellent but the rain didn't help the spectacle.

The new committee are mapping their action plans and preparing the coming years development.

With new people on the committee comes new ideas and we are looking forward to Twilight Jazz at the Zoo early next year. A family affair with a talk on horticultural management techniques at the Zoo along with guided tours. Bring along the family, a picnic and enjoy the evening.

Book in early for the turf conference in Brisbane in June. A general turf stream will be offered with a range of topics for all.

The course in farm chemical use will be offered during the new year so any member

who would like to achieve this certificate please notify Simone.

We wish you well in the New Year with all your turf endeavours.

Rob Savedra
President, TGAA (Vic)

TGAA (ACT & surrounding region)

Firstly I would like to say happy New Year to all you turfies out there & best wishes for the next 12 months. The arrival of summer in the area was somewhat late with November having some of the lowest temperatures ever recorded for that month. Good rainfall during this early summer period was blessed by most greenkeepers with the exception of those of us attempting to encourage couch growth.

Many golf course superintendents in the district are now breathing a little easier after the completion of final rounds in Club Championships & Open tournaments, they can now concentrate on maintaining their playing surfaces to a suitable playing standard during the unforgiving summer.

Studying students and apprentices relieved to have the extended break over Christmas & New Year are soon to return to their classes. Students studying the Level 5 Certificate in Turf Management previously completed the unit Plant Products & Treatments & are currently studying Design of Irrigation & Drainage Systems. The Canberra Institute of Technology (CIT) is currently searching for outstanding students in their final year of turf management as prospective hopefuls for the 2002 Study Award. Those students who apply themselves have the opportunity to receive this prestigious award & win an expenses paid trip to the next AGCSA Turfgrass Conference.

The AUSTEP seed trial located at the CIT Weston Campus is going well with assessment of sites to be recorded during the next 12 months. The Open day held on the 17th October was successful with an informative & productive discussion taking place. Another past get-together that went rather well was the annual Christmas party. A good time was had by all and it was a shame for those of you who missed out.

An Up-date on some previously mentioned important dates:

19th February – Social Bowls evening & BBQ to be held at the Brumbies Sports & Social Club.

24th July – Mid-year Seminar, Turf nutrition.

Keep you eyes out for the latest up to date information.

Till next time, agrostologists.

Justin A K Haslam.

Committee, TGAA (ACT & Surrounding Region)

TGCSA Report

Our Association Welcomed John Neylan – AGCSA to our last seminar at Riverside Golf Club on 31st October. Although member support was down on average, John presented a very informative paper on:

1)Weed Lifecycles

2)Chemical and Biological Control

3)Mode of action

The seminar was followed by a course walk with Riverside Golf Club Superintendent Greg Newton. Thanks to Greg and Riverside Golf Club for a great day.

The Port Sorrell end of year Machinery – Industry Golf Day is shaping up to be the most successful day on our turf calendar, so don't miss out on some great trophies and giveaways. Results will be published in the next edition of ATM.

Preliminary arrangements are under way to hold a turf seminar over 2-3 days in the New Year, 2002. The seminar will attract some quality guest speakers, 9 hole golf tournament and other fun activities.

With the National Turfgrass Conference closing in quickly, now is the time to remind club managers and board directors of the importance of attending these extremely worthwhile events and don't miss our on the early bird savings.

Our next event will be in February 2001, so watch out for more information on this event.

Phil Hill
TGCSA President

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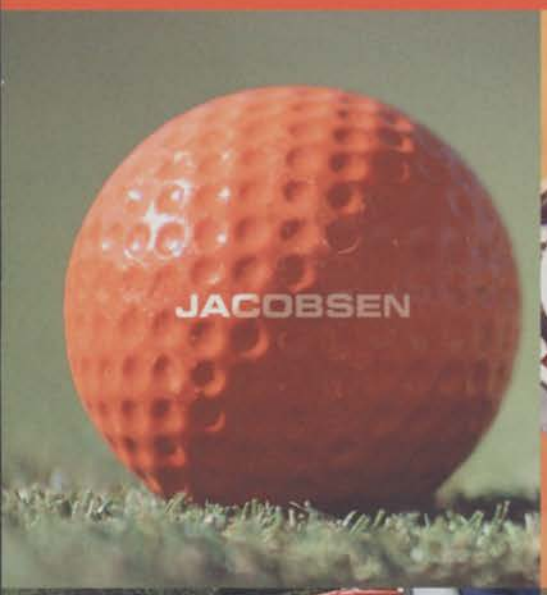

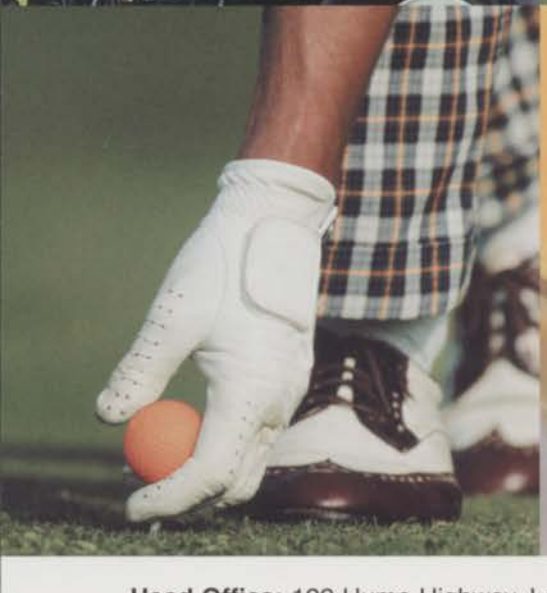

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