AUSTRALIAN
Turfgrass
MANAGEMENT

ISSN 1442-2697

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John Deere *Salute*

"NEWCASTLE GOLF CLUB"

Located at the mouth of the Hunter River at Fern Bay is where you will find the internationally renowned Newcastle Golf Club. Not only is it ranked as Australia's number thirteen course by Golf Australia, it has also received an International Honourable Mention in the top 100 courses in the world. As a true championship style course, Newcastle Golf Club is the host of several leading tournaments such as The Australian Futures Championship for Trainee Professionals and Australian Senior Amateur Championship.

Arial view of the course

Maintaining these world-class standards for the last seven years has been superintendent Guy Thomas. Guy describes the course as a natural wonderland, carved out of a forest of Eucalypts and Angophoras, abounding in native flora. It is also the home to wide array of wildlife, including kangaroos, wallabies, koalas and echidnas.

In addition to maintaining the course, Guy and his crew have been working hard to return Newcastle Golf Club to its design roots, by restoring some of the original features from Eric Apperley's course design from 1936. Over the last two years, nine bunkers that were originally planned, but never constructed have been added to the course layout and two greens per year are to be rebuilt to bring back their original design features.

Earlier this year, Guy had the opportunity to travel to the USA to participate in the events surrounding The John Deere Classic. As part of the experience, Guy not only had the opportunity to play the Deere Run facility in tournament condition as part of the Superintendent Pro-Am, but also had the chance to join course superintendent Chris Hague in setting the course for the PGA Tour event. "Being a part of the whole event was a fantastic experience. Seeing how Craig was able to communicate with his crew effectively to get the job done was great". Also as part of the trip, Guy travelled to the John Deere Production facilities and the Turf Care Headquarters and while in North Carolina spent time with Paul Jett, Superintendent at Pinehurst Resort and Country Club, host of the 2005 US Open. "It was an amazing experience to tour the course with Paul and see the challenges that he faces and the changes that are occurring to set the course for a US Open".

In order to maintain a world-class standard, Guy and his crew require a world-class maintenance fleet, consisting of John Deere Lightweight Fairway Mowers, Surrounds Mowers, Front Mowers, Bunker Rakes and Compact Utility Tractors. "Performance was the main factor when selecting an equipment supplier. I was really impressed with the John Deere Lightweight Fairway Mowers climbing ability, which tackled our rolling topography with ease. And with the addition of the spiral rollers, we are able to maintain and excellent quality of cut". Service was also a big factor in selecting the fleet, and Sharpe's Tractor Centre have set a high standard in this area. "It's great to have a dealer locally that we can rely on for parts and service. Like any course, keeping downtime to a minimal is essential, and Sharpe's Tractor Centre have played a big part in helping us achieve that".

John Deere looks forward to continuing it's relationship with both Guy Thomas and the Newcastle Golf Club and congratulates Guy and his crew on the world-class nature of the facilities they maintain.

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Photography, Phil George.

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Going Too Far

Last edition, I profiled the preparation of Victoria Golf Club for the 2002 Holden Australian Open and described the 6,219m layout as "Hard and Hungry". I wasn't meaning to put the mozz on anyone but what happened on day one of our national event was an embarrassment for Australian Golf and a slap in the face for all Australian Golf Course Superintendents.

I have been in contact with the club and respect the fact that they need to conduct their own thorough review before talking publicly about "what actually happened", but does it really matter? The fact is that someone stuffed up and in front of the world and in perfect conditions day one of the Australian Open was cancelled because the greens were un-playable.

Having someone to blame isn't going to help much at all but hopefully, this fiasco will help temper a preoccupation that some Golf Administrators, Superintendents and Golf Course Architects seem to have with serving up courses capable of beating professional golfers into submission. I am all for providing them with a challenge and I understand the difficultly in trying to provide some degree of protection to a short course, but if I want to see someone shoot 85 I will just go out and have a game myself.

Regards

Phil George
Editor

PHIL GEORGE
EDITOR

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President's Pen

Mark Couchman, AGCSA President

The AGCSA is pleased to announce Mr. Steven Potts as the new Chief Executive Officer of the Association. Steven commenced duties on the 18th of November and comes to the AGCSA following a very successful term as the CEO of Skiing Australia Limited. In his role at Skiing Australia, Steven had many roles and responsibilities including:

- Management
- Sports Development
- Event Management
- Public Relations and Communications
- Marketing, Sponsorship and Fundraising
- Finance and Administration and;
- Human Resource Management.

Steven has also had success in previous positions he has held with both La Trobe Shire Council (Business Unit Manager – Leisure Centre and Aquatic Facilities) and La Trobe University (Sports Centre Manager).

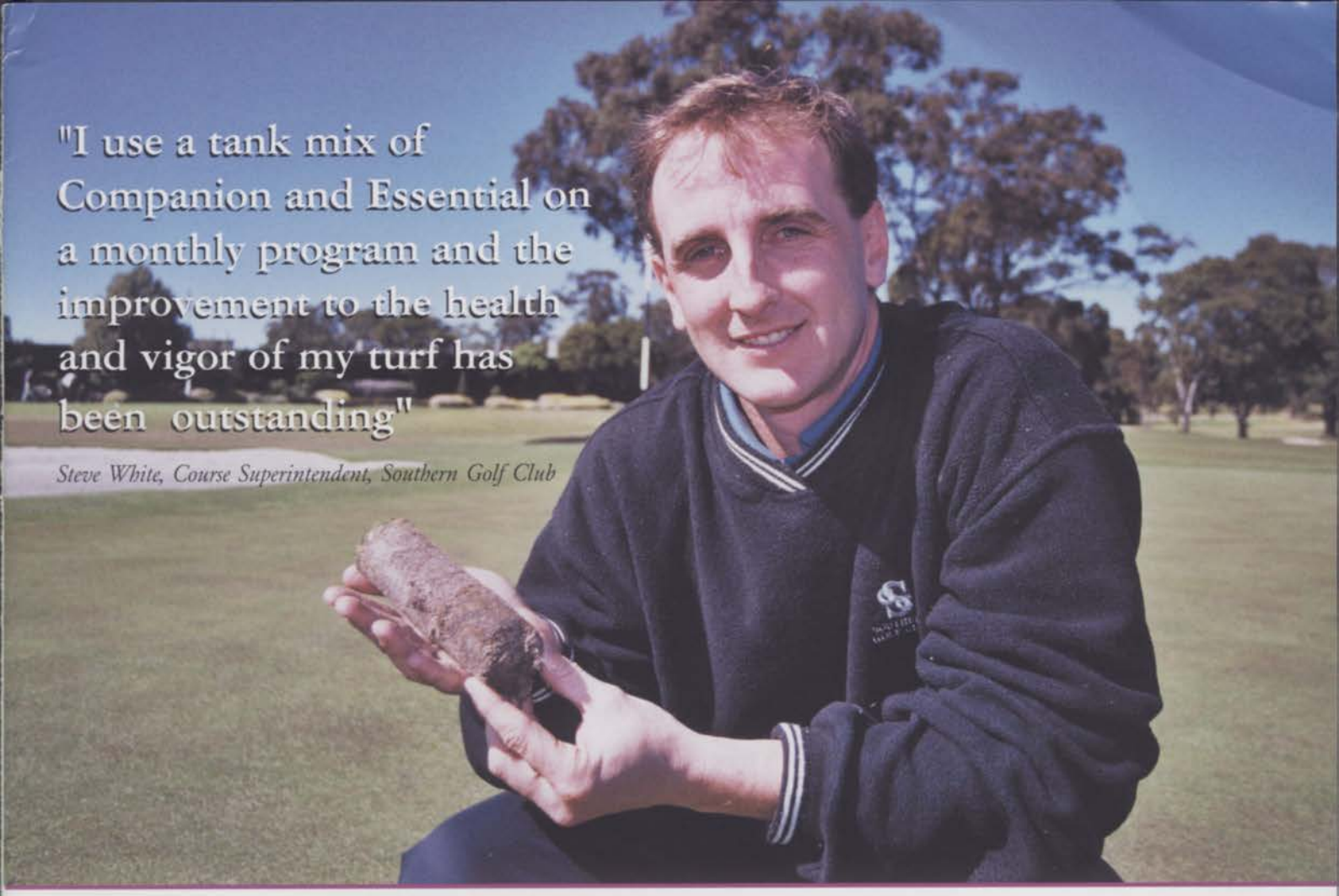
The position of CEO at the AGCSA is one that Steven is looking forward to and he relishes the challenges that the position has to offer.

The drought currently being experienced throughout Australia is certainly affecting many turfgrass managers, with many facilities now experiencing substantial turfgrass losses and/or drastic reduction in surface quality. Water management and prioritisation of usage is certainly a management skill that sometimes goes unnoticed by many end users of facilities. Water quantity is one issue that we are all facing, however, the quality of water is something that should not be overlooked. As water supply decreases the quality (salts etc.) increases therefore water sampling is something that managers should consider to ensure that the water they are using is good, or alternatively remedial action can be taken to avoid the affect of poor quality water. AGCSAtech can certainly help people in this regard so please contact John or Andrew at AGCSATech to help you through these trying times.

The AGCSA is now well down the track in relation to preparation for the 2003 National Turfgrass Conference and Trade Show. Registration forms will soon be forwarded to all parties and as was the case last year people will be able to create their own personal conference itinerary. So get your registration forms back early to avoid missing out on sessions, not to mention the cost savings.

As this edition of the magazine coincides with the Christmas and New Year I would like to take the opportunity of wishing all our member readers, a happy and safe Christmas and a prosperous new year.

Mark K. Couchman
President, AGCSA
Golf Course Superintendent, Tewantin-Noosa GC



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Toro Turf Tour

Location: Victoria Golf Club

Ian describes the GR Flex-Head walk behind mowers as "just sensational".

Ian Todd (GCS) on the Toro Workman 2110.

TORO

www.toro.com.au

On the eve of the 2002 Holden Australian Open, as this article goes to press, Golf Course Superintendent Ian Todd and the dedicated maintenance team at Melbourne's Victoria Golf Club will be adding the final touches of colour to a historic golfing masterpiece and will be strapping themselves in for the ride of their lives.

If the truth be known they are probably feeling as much relieved as they are excited as preparation for an event such as this takes not weeks or months, but years.

Like most championship courses, Victoria has undergone a number of changes to help restore the courses true character whilst maintaining relevance to the long-hitting modern game.

Numerous bunkers have been realigned and indeed new ones have been added but more significantly, the tees on holes 5, 9 and 18 have been pushed back to lengthen the holes and bring the original bunkers back into play. Many other tees have been extended by just a few meters to make sure that the course plays to its full 6,219m. The likes of Stuart Appleby are already predicting that a score of ten under par would be good enough to win, history will be the judge. As I peer into the gloom, a hot northerly doesn't seem likely but by God I hope we get one - that will really sort them out!

Spend some time with Ian Todd and you come to know him as a pretty shrewd operator who quietly gets on with the job. It comes as no surprise then to learn that Ian's tools of choice are manufactured by Toro.

Ian's arsenal includes 2 x Reelmaster RM 6500-D mid-weight Fairway Mowers, 6 x Greensmaster GR 1000 walk-behind greens mowers, 2 x Greensmaster GR 3000 series Greenmowers for tees, 1 x Reelmaster RM 3100 Side Winder used on surrounds together with a Toro Sand Pro for bunkers and a TD 2300 Top Dresser.

In addition to this, Toro have come to the party by loaning the club an additional RM 6500-D Fairway Mower, three GR Flex-Head walk-behind mowers described by Ian as "just sensational", two additional GR 3000 series Greens mowers and three Workman 2110's. Ian said that this is the kind of quality service that he has come to expect from Toro and was full of praise and thanks for their support and for the efforts of Victorian representative Alan Phillips in particular who, "just couldn't do enough".

By now, Ian will have the greens cutting height down to about 2.2mm and throughout the tournament they will be double-cut every

morning, then cut once more late in the afternoon. A 'crack' team of six guys are dedicated to cutting greens only with the walk-behind mowers and have come to know every intimate detail of their beloved putting surfaces that if nothing else, have stood the test of time (all but two greens are original). Ian believes that this knowledge is critical as he will rely on his staff to recognize even the slightest signs of stress. Ian anticipates that the greens will be rolling about 12 feet from the Stimp Meter but will use this measurement as a guide only.

Fairways and surrounds will both be cut daily at a height of 9mm with the 6500-D Fairway Mowers that have demonstrated themselves to be highly efficient and are nimble enough to get around all but the smallest of surrounds that will be cut with Triplex's that will also clip the greens approaches to a tidy 4mm.

Santa ana tees will be cut daily at 6mm and throughout the tournament the numerous bunkers will be maintained by hand.

One of the real hero's in all of this will be Turf Technician, Andrew Dawson who was busy wiring up the new amenities facility when I met him a couple of weeks ago and was clearly 'busting' to get under the machines. Andrew is a man of many talents but few words. When asked about what would be his greatest challenge during tournament week his answer was simple and to the point, "to keep everything sharp".

Ian's management style is best described as 'minimalist'. Pests and diseases are treated chemically only when it is absolutely necessary and the turf is fertilised on a 'needs basis'. Ian said, "We like to let Mother Nature take her course and I honestly believe that the turf performs better because of it".

A cornerstone of this management style is the ability to carefully manage irrigation and for that, Ian relies on a Toro LTC 2000 central controller supported by 20 Toro Network 8000 Satellites located throughout the course that give him the level of precision required.

Feeding a mixture of Toro 690, 650, 730 and 780 Electric Valve in Head (EVIH) sprinklers, the

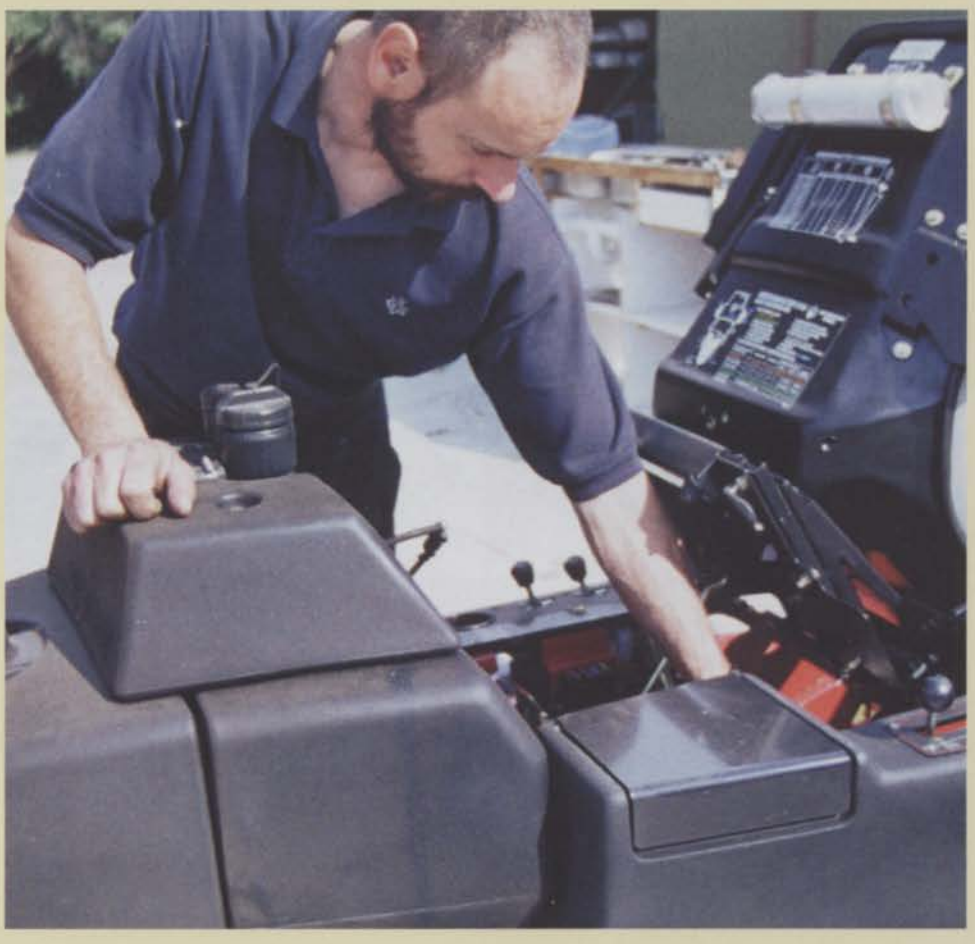
Toro Machinery Victoria Golf Club

Reelmaster RM 6500-D mid-weight fairway mower	x 2
Greenmaster GR 1000 walk-behind greens mower	x 6
Greenmaster GR 3000 series Greenmowers for tees	x 2
Reelmaster RM3100 Side Winder for surrounds	x 1
Toro Sand Pro for bunkers	x 1
TD 2300 Top Dresser	x 1

On Loan from Toro

RM 6500-D Fairway Mower	x 1
GR Flex-Head walk-behind Mowers	x 3
GR 3000 Series Greensmower	x 3
Workman 2110	x 3

Andrew Dawsons major challenge will be to "keep everything sharp"



Continued next page

Toro Turf Tour

ABOVE: Fairways will be running. LEFT: The Toro LTC 2000 central controller supported by 20 Toro Network 8000 Satellities.

system allows Ian to be very frugal with his water use. Ian said, "What I love about this system is it allows me to water less, not more". The fairways bare testament to that and I can tell you, they will be running!

Water management is becoming a huge issue for golf course management and it is interesting to note that Victoria Golf Club is participating in a study that is scoping the potential to service clubs located in the 'sand-belt' with recycled water generated either through 'sewer mining' or 'at source recycling' technology. The club is hoping this project will net positive results and anticipate that they will be using recycled waste water within the next five to ten years.

In anticipation of a highly successful 2002 Holden Australian Open, Toro Australia and *Australian Turfgrass Management (ATM)* magazine wish Ian Todd and the staff at Victoria Golf Club the best of luck.

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TOOL TEST: Turf Utility Vehicles

Following the realization that the old 'Posties Bike' just wasn't the answer when it came to transporting staff and equipment around a golf course, turf utility vehicles have become an essential piece of equipment in almost every turf shed.

Efficient transportation isn't the only task that this range of equipment performs. Capabilities now extend to an ability to haul or carry large loads and power a range of equipment that includes top-dressing units and spray equipment.

With this distinction in mind and considering the range of Turf Utility Vehicles currently available to turf managers, when *Australian Turfgrass Management* (ATM) magazine traveled to the Glenelg Golf Club in Adelaide to take on the task of evaluating this range of equipment they were divided into two groups.

Group 1, consisted of 'heavy-duty' vehicles with high horsepower and hydraulic capabilities and included:

- **Cushman Turf-Truckster**
- **John Deere ProGator 2030**
- **Toro 3300-D Workman**

Group 2, whilst having significant capacity to tow and carry loads, on golf courses they are principally used to efficiently move staff and tools. For the purpose of this evaluation, Group 2 included:

- **Toro 2110 Workman**
- **John Deere 4 x 2 Electric Gator (E-Gator)**
- **Cushman Commander 2200SE**
- **Club Car Turf 272**
- **Club Car Turf 2**
- **Kawasaki Mule 3000**

Please note that E-Z-GO and JSB Equipment (Alke Work Vehicles) had hoped to be involved but circumstances prevented them being able to have units available for testing.

EVALUATION PROCEDURE

Readers must note that in one day, on one golf course it is simply not possible to thoroughly evaluate every machine under all possible conditions and for the full range of potential uses and circumstances. Readers must be sure to view the results and comments within this report in that context and if further clarification is required, readers are encouraged to contact the relevant manufacturer.

However, what we did try to achieve was a simulation of various conditions and uses that would allow the evaluators to assess and compare their suitability for various tasks and performance in a number of categories.

Each of the five evaluators was first required to drive all eight Turf Utility Vehicles (unloaded) over a course that required the operators to navigate downhill sections, long straight runs, loose gravel and sand, uphill climbs and a

section that required manoeuvring through trees and shrubs. This course terminated at a storage shed where machines were loaded with a number of 20kg bags. Once loaded (Group 1 machines – 300kg, Group 2 machines-150kg), each evaluator took each machine over an abbreviated course to assess their performance when loaded. Upon completion of these activities, each evaluator spent time looking at each machine to consider things such as;

1. Comfort
2. Access to controls
3. Visibility
4. General Construction
5. General Maintenance, and
6. Overall performance on the evaluation course

All evaluators were asked to score each machine with a mark out of 10 (10 being the highest mark possible) and were required to provide some brief comments to support their assessment.

The evaluators who kindly volunteered a full day to the task included:

- Dr. Manfred (Fred) Zockel, B.E. (Hons), M.E., Ph.D., F.I.E.Aust., F.R.S.A.C.P.Eng., currently Visiting Research Fellow in Mechanical Engineering, University of Adelaide.
- Daryl Sellar – Golf Course Superintendent, Glenelg Golf Club
- Erik Schipholt – Turf Technician, Glenelg Golf Club
- Steven Newell – Golf Course Superintendent, Kooyonga Golf Club
- Stuart Gillespie – Golf Course Superintendent, Riverside Golf Club

In addition to work as a visiting consultant to the South Australian Centre for Manufacturing and as an Associate Professor in Mechanical Engineering at the University of Adelaide, Dr Fred Zockel, has, over the past 25 years consulted to nearly 250 companies on noise control, engines and on product and process design. Dr. Zockel offered his time and experience to lead our team of evaluators and we were honored to have him involved.

As indicated by the very strong marks that all machines scored across the board, (see Table 1) a detailed dissection of how each machine compared to the other would seem a little pointless.

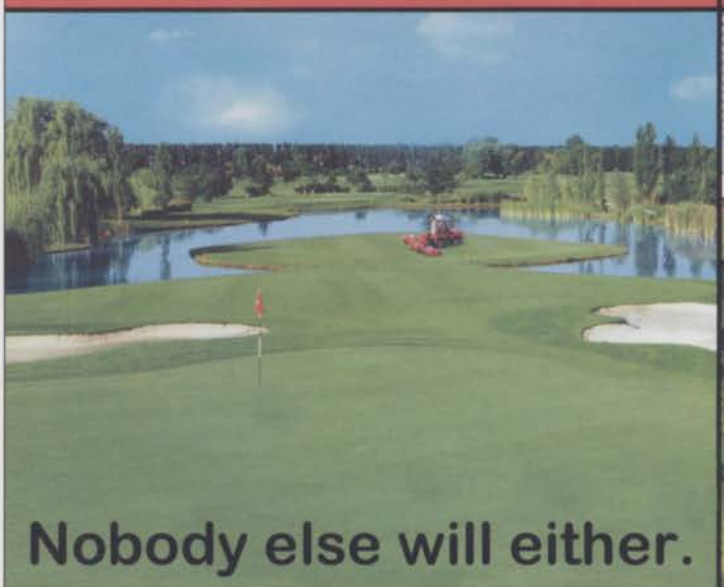
Instead, I have summarized consensus comments made by the evaluation team.

Table 1: Average Assessment Scores for Group 1

	Comfort	Controls	Visibility	General Construction	General Maintenance	Overall Performance on Evaluation Course
Cushman Turf-Truckster	7.2	6	8.6	8	7.4	6.8
John Deere ProGator 2030	7.2	8	8	7.4	8.6	6.8
Toro Workman 3300-D	7.8	7.4	8.6	8.2	7	7.8

Can you see where the Antonio Carraro tractor has been on this golf course?

ANTONIO CARRARO



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Cushman Turf-Truckster

John Deere ProGator 2030

Toro Workman 3300-D

Cushman Turf-Truckster

Evaluators were universally impressed with the solid construction of the Cushman Turf-Truckster and were literally 'excited' by the massive storage compartment underneath the front bonnet. The Truckster also has the longest wheel base of the three machines in this category which gave it a smooth ride over undulating ground. Evaluators were less impressed with the positioning of the handbrake which seemed to get in the way of operators trying to get on and off the machine. Most were also critical of the gear lever that was positioned on the dash. This seemed to cause some shifting problems but like many things, this would probably just take some "getting used to". The 'high' and 'low' gear ratios certainly gave the full range of speed and its ability to 'crawl' is likely to suit some applications. Evaluators assessed the machine as easy to service and found they had good access to various service points.
At 85db(A), the Truckster was the quietest vehicle in this category.

John Deere ProGator 2030

With such a forward driving position, the John Deere ProGator 2030 has an excellent turning circle but it seems that the trade off was a rather 'bumpy' ride. Having said that, more than one evaluator commented that the seats were comfortable. The configuration of the dash impressed all evaluators as did the access to controls that were described as straight forward. All evaluators felt that a 5-gear transmission was 'over-kill'. Most said that even when loaded they only ever had to use gears 3, 4 and 5 and some indicated that a high and low ratio would be more appropriate. Evaluators were happy with the large cargo box and solid frame construction but we less impressed with the plastic body and guards that needed to be stronger.

Toro Workman 3300-D

Evaluators indicated that the Toro Workman 3300-D offered a very smooth ride and adequate turning circle and all seemed impressed with the simple grouping of controls on the centre console but were a little disappointed that the controls for the hydraulics were located behind the operator. Storage is very poor and foot space is limited but evaluators agreed that the seats were comfortable and apart from a difficult to reach dipstick, access to service points was relatively straight forward. As with the ProGator 2030, this machine has ROPS. This is a good safety feature but can cause problems if required to operate around low hanging branches. A number of operators commented that the Toro Workman 3300-D handled the load easily and all seemed comfortable with the range of control that the transmission offered. Also, operators were very impressed with the cargo box that offered access from the sides as well as the rear and found that the adjustable steering column helped them find a comfortable operating position.

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Group 1

Chart 1: Recommended Retail Prices for 'Heavy Duty' Vehicles

	DETAILS OF MACHINE AS TESTED	COST (INCLUDING GST)
Cushman Turf-Truckster 4-wheel Diesel TEXTRON GOLF AND TURF PRODUCTS	Fitted with PTO, Short Box, Auto tailgate release, Hydraulic box lift, Remote hydraulics. 4-wheel Petrol version fitted as above is also available ($34,144)	**$36,883**
	Options:	
	ROPS	$1,034
	5th wheel ball hitch	$1,424.50
John Deere ProGator 2030 2WD Diesel JOHN DEERE	Fitted with Cargo Box. Please note a 4WD version (from $45,363) is available. Contact manufacturer for further details.	**$40,290**
	Options:	
	Tailgate Release Kit	$297
	Turn Signal Kit	$264
	Armrest Kit	$105
	Attaching parts for Vicon Spreader	$1,730
	Work Light Kit	$339
	Hydraulic Auxiliary Kit	$1,069
	Power Bed	$1,766
	Throttle / Governor Control Kit	$493
	Fifth Wheel Hitch	$416
Toro Workman 3300 2WD Diesel TORO	Fitted with Full Bed and Side Kit. Please note a 4WD version is available. Contact manufacturer for further details.	**$38,000**

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Group 1

TEXTRON

TORO

Chart 2: Statistics of 'Heavy Duty' Vehicles

		CUSHMAN TURF-TRUCKSTER	JOHN DEERE PROGATOR 2030	TORO WORKMAN 3300-D
POWER	Engine	Perkins 103-10 diesel, 3-cylinder, 4-cycle, liquid-cooled	Yanmar, 3-cylinder, 4-cycle diesel, overhead valves	B&S Diahatsu, 3-cylinder, inline vertical, 4-cycle, liquid cooled, counterbalanced diesel engine
	Horsepower	22.3 @ 3,200rpm	23.5 @ 3,450 rpm	26.5 hp governed to a speed of 3,600 rpm
	Torque	39 ft. lb. @ 2,900 rpm	45.5 lb. ft. @ 2,400 rpm	–
	Displacement	954 cc	1006 cc	950 cc
	Governor Type	Mechanical centrifugal	Mechanical centrifugal	Mechanical centrifugal
	Air Cleaner	Self-cleaning centrifugal precleaner with paper cartridge	Canister type with secondary filter	Remote mounted, heavy-duty 2-stage air cleaner with evacuator
	Lubrication	Full pressure lubrication with spin-on filter	Full pressure lubrication	Full pressure lubrication with spin-on oil filter
	Ignition	IDI Diesel	IDI Diesel	IDI Diesel
	Fuel Type	Diesel	Diesel	Diesel
	Fuel Capacity	24.6 L	30.3 L	26 L
	Fuel Filter	Prefilter, water separator, final filter	–	–
TRANSMISSION/ DRIVE TRAIN	Type	4-speed truck manual transmission with low-low (creeper) 1st gear. Synchronized in all forward gears.	5-speed syncromesh	3-speed syncromesh
	Differential Lock	Standard, hand operated	Standard, hand operated	Manual engage rear differential lock
	Ground Speed	Low Range 1st gear(2.8kph) 2nd gear(5.2kph) 3rd gear(7.1kph) 4th gear(10.1kph) Reverse High Range 1st gear(5.5kph) 2nd gear(10.3kph) 3rd gear(14.1kph) 4th gear(20.0kph) Reverse	1st gear (4.5kph) 2nd gear (7.4kph) 3rd gear (12.7kph) 4th gear (24.1kph) Reverse (5.8kph)	Low Range 1st gear(4.5kph) 2nd gear(6.9kph) 3rd gear(11.9kph) Reverse(4.3kph) High Range 1st gear(11.6kph) 2nd gear(17.7kph) 3rd gear(30.5kph) Reverse(11kph)
BRAKES		Heavy-duty hydraulic 200mm duo-servo, self-adjusting brakes on all wheels, with dual master cylinder and remote trunk-mounted master cylinder reservoir.	4-wheel hydraulic drum Hand actuated parking brake actuates rear brake shoes	4-wheel hydraulic, dual safety circuit, self-adjusting drum; 180mm diameter front, 200mm on rear 2WD models; 200mm diameter on all wheels on 4WD models. Hand actuated parking brake actuates rear brake shoes
SUSPENSION		*Front:* Double A-arm independent front suspension with two spring-over-shock absorbers. *Rear:* Heavy-duty multiple leaf springs with shock absorbers.	*Front:* Dual leaf springs and shocks *Rear:* Dual leaf springs and shocks	*Front:* Independent "A" frame control arm, dual progressive coil springs, and dual shock absorbers with anti-sway bar. *Rear:* DeDion axle (weight carrying axle is independent of transaxle), leaf springs, and dual shock absorbers.
STEERING		14.1 ratio Saginaw power steering and 14-inch steering wheel	Hydrostatic power	Power assist, 3 position tilt, 13.5-inch steering wheel.
DIMENSIONS	Ground clearance	190mm	178mm	170mm
	Overall Height	1.3m, 1.9m with ROPS and cab	1.95m	1.91m
	Overall Length	2.9m	3.285m with cargo box	3.16m w/o bed
	Overall Width	1.6m	1.586m	1.47m
	Wheel Base	2.2m	1.676m	1.78m
	Weight	727 kg	985kg with cargo box (145kg)	635kg dry weight without flatbed
RATED CAPACITY		1,293kg total includes 91kg operator, 91kg passenger and loaded attachment	1,056kg total includes 91kg operator, 91kg passenger and loaded attachment	1,134kg total includes 91kg operator, 91kg passenger and loaded attachment
AVAILABLE ATTACHMENTS		Top Dresser, Core Harvester, Spray Unit, Envirojet	TD100 Top Dresser, HD200 Sprayer, Cargo Box, TC125 Turf Collection System	Vicon Spreader, Core Harvester Adapter, Spray Systems (manual through to pro-control systems)

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Group 2

Table 2: Average Assessment Scores for Group 2

	Comfort	Controls	Visibility	General Construction	General Maintenance	Overall Performance on Evaluation Course
Toro Workman 2110	7	7.6	8.6	7.4	7.6	7
John Deere E-Gator	7	7.4	9.2	7	N/A	7.4
Cushman Commander 2200 SE	7	6.4	8.2	7.2	7	6.8
Club Car Turf 2	6.2	6	8.4	7	6	6.2
Club Car Turf 272	7.2	6.4	8	7	6.2	6.4
Kawasaki Mule 3000	7	7.2	7.2	8	7.2	7.2

Toro Workman 2110

Toro Workman 2110

Most evaluators found that the Toro Workman 2110 gave a fairly comfortable ride and they felt that there was plenty of power, even when loaded. However, the throttle control was not very responsive and the machine did have a tendency to 'surge'. Evaluators felt that the engine was noisy compared to some of the others but were a huge rap for the plastic tray/ cargo box that looks to be very durable and doesn't rattle. Also, the electric tray lift was welcomed and most evaluators considered these to be essential. All controls bare the forward / reverse switch were easily accessible and although the glove box is a little average, evaluators were impressed by the good under seat storage and the holder for phones / two ways on the dash. Overall, evaluators were happy with the general construction (cargo box in particular) and good access to all service points except the oil filter but some described the plastic guards and bonnet as 'flimsy'. The short nose on the vehicle allowed excellent visibility. The reverse alarm was excessively loud and some operators were a little concerned that driver warnings cautioned against using the unit being used only on slopes less than 12 degrees?

John Deere E-Gator

John Deere E-Gator

The John Deere E-Gator uses the balloon tyres as the only form of suspension at the rear and this resulted in a pretty hard ride.

Some evaluators felt that the tray was too short considering the overall length of the vehicle and although seats were comfortable and access to controls was judged as excellent, dash storage was considered poor and the large wheel arches restricted the position of the left foot which could result in some operators leaving it outside of the vehicle which is very dangerous. As with the Toro Workman 2110, evaluators were generally happy with construction but were a little disappointed in the bonnet and guards.

The lack of an electric lift on the machine tested was disappointing but evaluators were very impressed with the noiselessness of the electric machine and felt that it would be ideal for work close to golfers and residential areas.

The E-Gator was very responsive to the throttle and seemed to handle the 150kg load without any problems.

Cushman Commander 2200SE

Cushman Commander 2200SE

Evaluators were very impressed with the easy on/off access to this machine and felt that the dash storage and drink holders were good and felt that leg room was sufficient to allow for a comfortable ride but all commented that the steering wheel was 'high' and felt awkward. In general the machine was found to be very easy to operate and although the bench seat is a little narrow and causes the operator to slide on slopes, it is handy if you need to carry three people.

Operators were impressed with the lightweight construction and although the machine offered good access to service points, most felt that the hour meter should have been on the dash. When loaded with 150kg, the Cushman felt a little sluggish and became light in the steering (wheel base is long and tray is positioned a long way back) but all were impressed with the hydraulic tray lift. Similar to the Toro Workman 2110, safety charts on the dash indicate that the machine should not be operated in the rain or on slopes with an incline greater than 14 degrees.

Technically, this would limit its use on golf courses which is a little confusing? In summary, excellent as a general run-about and people mover but not ideally suited to heavier golf course work.

Club Car Turf 2

Club Car Turf 2

Evaluators generally felt that the Club Car Turf 2 was easy to get on and off and aside from the high steering wheel that obstructed view of controls, the high driving position offered good vision. Evaluators were unimpressed by the fact they had to remove the seat to fill the fuel tank but they did like the good leg / foot room and excellent dash storage. Although noisy, operators left that the aluminium tray was up to the job, most felt that the machine handled the load OK, all commented on the engine being relatively quiet but most felt the wheels were too small and the ground clearance not great enough. As with the Cushman Commander 2200SE, the general consensus was that the Club Car Turf 2 was ideal for people moving and general course maintenance jobs but not as well suited to heavier work

Club Car Turf 272

Evaluators all commented that the contoured seats and comfortable driver position made for a smooth ride but that the ROPS and long nose did obstruct visibility a little and the steering was a little heavy making it a touch awkward where tight manoeuvring was required. Some were concerned that the non-slip surface on the rounded step-up bar had already worn off what was a new machine and most felt that it its 'bark was worse that its bite' when it came to noise and the corresponding power. Having said that most felt that it handled the load OK but didn't think it would be wanting too much more. On this machine, again the fuel fill was under the seat and the dipstick was pretty tough to get to but most evaluators felt the aluminium tray and construction was adequate for most golf course applications.

Club Car Turf 272

Kawasaki Mule 3000

All evaluators were very complimentary on the solid construction and excellent access to all servicing points and were highly impressed by the 'sealed' glove box and ample under bonnet storage. The Mule hauled the 150 kg with no problems at all but each of the 5 evaluators felt that it was just too highly powered and too quick to be used safely on a golf course. In the words of one, "this will be ideal for some but I just wouldn't be comfortable to have just anyone from my crew behind the wheel of this". Some felt that the roll cage was over-kill and that the tyres were too aggressive for turf and for a tray of that capacity, you really do need a power lift. All controls were easily accessed but for some reason the fuel guage is under the seat. Overall, the evaluators felt this machine was very well engineered and built but were worried about the speed and power.

Kawasaki Mule 3000

Dr Fred Zockel made the following summary on Group 2 Turf Utility Vehicles:

All the light duty vehicle had centrifugal clutches and infinitely variable belt drives. This allowed two pedal operation with the engine being started when the accelerator is pressed. Forward and reverse are selected in all but one vehicle by turning a lever under the seat.

The engines are all mounted under the tray which can be quite a dusty environment. However, not all units have air and oil filters. Fuel tanks are accessible from the side or under

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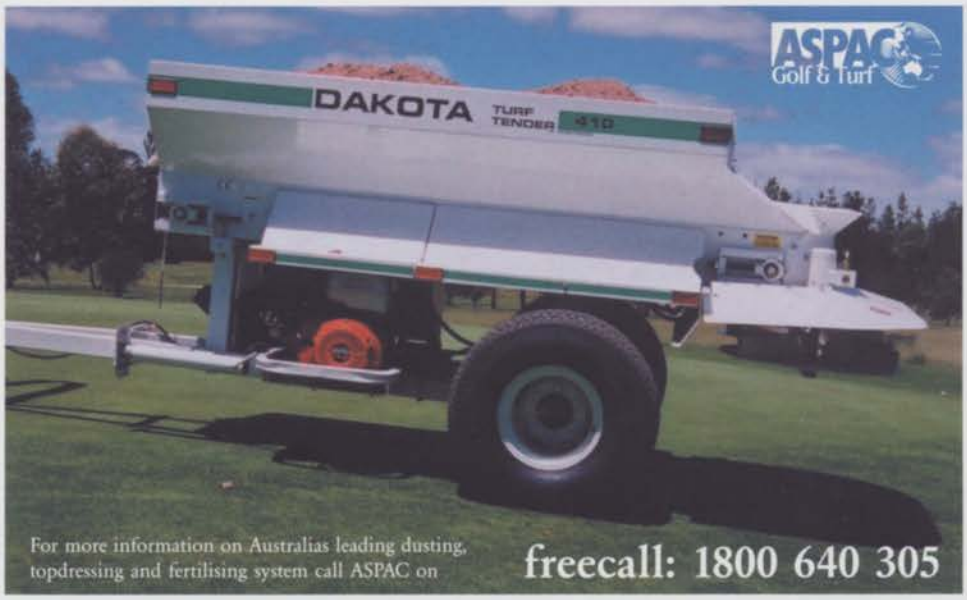

the seats. Storage for paperwork is mostly inadequate although one had a clip on the steering wheel.

The trays without power lifts were difficult to lift even with only 150kg load and required two people. The locking mechanisms both up and down were cumbersome and in some cases I would consider them unsafe because one has to reach under the tray while lifting the tray to prevent it from falling. Although steel and aluminium are more robust materials than plastic, some operators preferred the plastic because it does not rattle.

All seating positions are high relative to the fascia of the car. This gives the passenger the feeling of being exposed although the brakes are mostly not severe enough to throw the person forwards. The two pedal control also means that going down hill the engine is switched off and one relies entirely on the limited brakes. The pedal position also makes it difficult to use the left foot for braking if one attempted to keep the engine running.

From the perspective of design engineer I feel that there is considerable room for improvement in all the vehicles tested in both the ergonomics areas of access, controls, storage as well as in maximising the load space.

I have enjoyed being involved in this exercise and thank you for the opportunity.

ACKNOWLEDGEMENTS

Special thanks must go to the Glenelg Golf Club for making their facility available to Australian Turfgrass Management (ATM) magazine as a venue for this evaluation. In particular, thanks to Golf Course Superintendent, Daryl Sellar and his staff for their assistance and patience on the day

Also, thank you very much to Textron Turfcare, Toro Australia, John Deere, Club Car and Kawasaki for their interest, good spirit and participation.

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

Chart 3: Statistics of 'Light Duty' Vehicles

	TORO WORKMAN 2110	JOHN DEERE E-GATOR	CUSHMAN COMMANDER 2200SE	CLUB CAR TURF 2	CLUB CAR TURF 272	KAWASAKI MULE 3000
Engine	2-cylinder B&S Vanguard	Wound direct drive, 48 volt with 8 Trojan T-105 or T-145 batteries	Twin-cylinder, 4-cycle, overhead cam, pressure lubricated, air-cooled	Kawasaki 4-cycle, OHV, 351cc, single cylinder, air-cooled, pressure lubricated, spin-on oil filter	Kawasaki 4-cycle, OHV, 351cc, single cylinder, air-cooled, pressure lubricated, spin-on oil filter	Kawasaki 4-stroke, liquid-cooled OHV V-twin, 617 cc.
Horsepower	16	3.8	11.0	11.0	11.0	20
Transmission	Continuously variable belt drive	Continuously variable belt drive	Continuously variable belt drive	Continuously variable belt drive	Continuously variable belt drive	Continuously variable belt drive
Ground Speed	25.6 kph	25 kph	24.1 kph	24 kph	30.4 kph	40 kph
Brakes	Front: 20.3cm self-cleaning hydraulic disc brake Rear: hydraulic drum brake	Dual rear wheel mechanical drum, auto adjusting	Auto-adjusting, dual rear-wheel mechanical drum brakes with non-asbestos linings.	Rear-wheel mechanical drum or 4 –wheel mechanical drum	Self-adjusting, dual-circuit, four-wheel hydraulic drum	4-wheel hydraulic drum; self adjusting
Suspension	Front: torsional independent "A"-Frame. Rear: Active In-Frame suspension	Front: Independent, spring-over shock, single A-Arm Design	Heavy-duty leaf springs with hydraulic shock absorbers	Front:Independent leaf spring with dual hydraulic shocks Rear: Multi-leaf springs with dual hydraulic shocks	Front: Independent A-arms w/coil over shocks Rear: Multi-leaf springs with dual hydraulic shocks	Front: Independent MacPherson Strut type.Rear: Semi-independent De Dion axle with leaf springs and hydraulic shocks.
Frame	Steel unibody	Steel unibody	Tubular steel	Aluminium I-Beam	Aluminium I-Beam	
Fuel Capacity	26.5 L	N/A	22.7 L	26.6 L	26.6 L	20 L
Tires	Front: 20x10-8, 4-ply Rear: 22.5x10-8, 4-ply	Front: 22.5x10-8, 2PR, hi flotation turf Rear: 25x12-9, 2PR, hi-flotation turf	18x8.5-8, 4-ply	Front: 18x8.5-8, 6-ply Rear: 18x8.5-8, 6-ply	Front: 23x10.5-12, 4-ply Rear: 23x10.5-12, 4-ply	Tubeless, 23x11-10
Ground Clearance	165mm	170 mm	134.6 mm	114 mm	168 mm	184mm
Cargo Bed Volume	409.2 L	322 L	373 L	432 L	367.7 L	443 L
Cargo Bed Capacity	567 kg	409 kg	544 kg	363.2 kg	363.2 kg	363 kg

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Chart 4: Price Category of 'Light Duty' Vehicles

	DETAILS OF MACHINE AS TESTED	COST (INCLUDING GST)
Toro Workman 2110	Price is for machine as tested **Options:** Electric Lift Kit	**$13,000.00** $600.00
John Deere E-Gator	Unit as tested. **Options:** Front bumper Bedliner for steel box Rear hitch Receiver hitch Windshield kit Hitch drawbar kit Horn kit Rubber floormat Cup holder Heavy-duty front suspension kit Front brush guard Front fender brush guard Power lift kit	**$17,646** $204.50 $412.50 $58.00 $103.00 $341.00 $44.00 $156.00 $108.00 $77.00 $201.00 $205.00 $160.00 $1,109.00
Cushman Commander 2200SE	Fitted with wrap around bumper, headlights, horn, trailer receiver hitch,hour meter, fuel gauge, electric dump bed lift **Options:** Sun Canopy An electric Cushman Commander 2100 SE available ($13,640)	**$14,245.00** $385.00
Club Car Turf 2	Fitted standard with headlights, radio/beverage holder, diff guard, hour meter / fuel guage, heavy duty front bumper, turf tyres and charger with electric units. Accessories for the Turf 2 and Turf 272 include: hydraulic or electric cargo bed lift kit, canopy top and windscreen, driving range protective enclosure, driving range ball picking units and attachments, drop-in drinks units, lockable glove box, mirrors, full weather enclosures and lockable tool box's	**$15,632.10**
Club Car Turf 272	Fitted standard with headlights, radio/beverage holder, diff guard, hour meter / fuel guage, heavy duty front bumper, turf tyres and charger with electric units • Please note that other in the range include: Turf 1-gas ($13,099.90), Turf 1-elec ($13,136.20), Turf 2-elec ($15,855.40), Turf 6-gas ($20,020.00), Turf 6-elec ($19,948.50), * Also, note that AGCSA Members are elligable to a 10% discount	**$18,339.20**
Kawasaki Mule 3000	Mule 3000, price is as tested •Please note that a smaller (286 cc) Mule 550 is available at $11,990. Two larger Mules (3010 and 3010 Diesel) are also available at $19,290 and $21,190 respectively. Available accessories include: windscreen, fabric or hard roof, tow hitch and turf/hard surface tyres.	**$16,390**

By John Neylan

RESULTS OF TURFGRASS VARIETY ASSESSMENT AND RESEARCH WORKSHOPS

During September, the AGCSA conducted workshops at its trial sites at Kingston Heath GC, Glenelg GC and Lakelands GC to inspect and assess the various turfgrass variety trials being undertaken.

As part of the workshop, the attendees were invited to assess the variety trials for turf quality and density. The participants did this without having any knowledge of what the various varieties were so that the assessments would be as objective as possible. The plots were rated on a simple scale of 0 to 5, with 0 being the worst and 5 being the best. Once the plots were assessed the participants were then given plot plans identifying the various cultivars. At Kingston Heath GC both the bentgrass variety trial and the bentgrass collection were assessed, at Glenelg GC the bentgrass variety trial was assessed and at Lakelands GC the warm-season grass collection was assessed.

The workshops had several objectives;

1. To allow turf managers to view the trials.
2. To demonstrate how the trials are assessed.
3. To compare our assessments with those of turf managers so as to provide a benchmark for what the practitioners determined to be the better varieties.
4. To discuss the results of these trials as well as other AGCSA trials.

There was a large amount of data collected from the assessments, which has been statistically analysed and some of the results are presented below. In the analyses, we have independently analysed each assessor's results as well as pooled all the data where appropriate. The statistical analysis also provides us with an indication of the variation between assessors and to some extent what cultivars are more difficult to assess either due to the variation between replicates of the same cultivar or uncertainty as to the merits of a particular cultivar. The assessor's data is also compared with our own results at the time of the workshop assessments. (figures 1 and 2)

Top: AGCSA's Andrew Peart with Commonwealth Golf Club's Mark Prosser(GCS)
Bottom: Trial assesments at Kingston Heath Golf Club

KINGSTON HEATH GC BENTGRASS VARIETY TRIALS

The data collected has been analysed (tables 1 and 2) and the following conclusions are made;

1. The cultivars Penn-A1, Penn-A2 and Penn-G2 were the top ranked for turf quality.
2. The cultivars Penn-A1, Penn-A2 and SR 7200 were the top ranked for turf density.
3. Penncross as the benchmark cultivar had the poorest quality and density.
4. The cultivars Penncross, Pennlinks had the highest coefficient of variation which indicates an uncertainty in the assessors mind as to what is considered a good quality surface. Whereas, Penn-A1, Penn-A4 and Penn-G2 were obvious "stand-outs" and very consistent between the replicates.
5. While different assessors may have assigned higher or lower ratings to individual plots they were generally consistent (i.e. they were either low or high for all plots) across all plots. Despite the differences in the absolute numbers, the relative rankings between cultivars was relatively consistent between assessors.

Table 1: Kingston Heath Golf Club - Workshop 10th September 2002
Average scores for quality from each assessor

VARIETY	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	AVG	CV%
Penncross	2.0	2.0	3.3	1.0	2.3	3.7	2.3	2.7	3.3	2.5	3.0	2.3	1.7	3.5	1.0	2.4	34.7
Egmont	3.0	2.7	3.7	2.3	3.0	4.3	2.7	2.2	3.3	2.7	2.7	3.3	3.0	3.9	3.0	3.1	18.9
Penn A1	4.0	3.7	4.7	3.3	4.0	5.0	4.3	4.0	5.0	4.0	4.0	3.7	5.0	4.2	4.0	4.2	12.3
Penn A4	4.0	4.0	4.5	2.5	4.0	4.0	4.5	3.3	4.5	4.0	4.0	4.0	4.0	4.3	3.5	3.9	13.4
Penn G2	3.7	2.7	4.0	2.0	3.3	4.0	3.3	3.3	4.0	3.5	4.0	3.3	4.0	3.9	2.3	3.4	18.9
Penn G6	2.7	3.0	4.0	2.0	3.0	4.3	3.3	2.7	3.3	2.5	3.0	3.0	3.0	4.3	2.0	3.1	23.1
Cato	3.3	2.7	4.0	2.0	3.3	5.0	2.7	3.2	4.0	3.0	2.7	3.3	4.0	3.9	1.7	3.3	26.1
Pennlinks	2.3	2.3	3.0	1.3	2.3	4.0	2.3	2.7	3.3	2.5	2.3	2.7	2.7	3.5	1.0	2.6	29.2
L93	3.3	2.3	3.7	2.7	2.7	4.7	3.0	2.8	4.0	2.7	3.0	2.7	3.3	4.0	2.0	3.1	23.0
Dominant	3.3	2.3	4.0	2.3	3.3	4.7	3.3	3.3	4.0	3.0	4.0	3.0	3.3	4.1	2.0	3.3	22.4
SR7200	2.0	1.7	3.3	3.3	1.7	3.0	1.7	2.0	2.0	2.7	3.3	2.0	1.7	3.9	2.3	2.4	31.8
LSD (P<0.05)	0.7	1.2	0.7	1.4	0.8	1.0	1.3	0.7	0.7	0.7	0.8	0.8	0.9	0.7	1.5	0.4	

A1, A2,..... = Assessor 1, Assessor 2 etc.
CV% = Coefficient of variance
LSD = Least significant difference

Table 2: Kingston Heath Golf Club - Workshop 10th September 2002
Average scores for density from each assessor

VARIETY	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	AVG.	CV%
Penncross	2.3	1.7	3.3	0.7	2.0	2.7	2.3	3.0	3.3	2.5	2.3	2.3	2.3	3.0	1.0	2.3	31.7
Egmont	3.0	2.7	4.3	1.0	3.3	4.0	3.3	3.0	3.7	3.0	3.7	2.7	3.3	3.9	3.3	3.2	23.4
Penn A1	3.7	3.7	5.0	2.0	4.0	5.0	3.7	3.8	5.0	3.5	4.0	3.7	4.7	4.1	4.7	4.0	18.8
Penn A4	4.0	4.0	4.5	2.0	4.0	5.0	3.5	3.8	5.0	3.8	4.0	4.0	4.0	4.0	4.0	4.0	16.7
Penn G2	3.7	3.0	4.3	1.7	3.7	4.3	4.0	3.2	4.3	3.0	3.7	4.0	3.7	3.8	2.7	3.5	19.9
Penn G6	3.0	3.0	4.3	1.7	3.0	4.7	3.0	3.0	3.3	2.7	2.7	2.7	3.7	3.9	1.7	3.1	26.2
Cato	3.0	3.0	4.3	1.3	3.0	3.7	3.0	3.3	4.0	3.2	2.3	3.0	4.0	3.6	2.3	3.1	23.4
Pennlinks	2.7	2.7	3.3	1.0	2.0	3.0	2.3	3.0	3.7	2.2	2.3	2.3	3.0	3.6	1.0	2.5	30.5
L93	3.3	2.7	3.7	2.3	2.7	4.3	3.0	3.0	4.3	2.8	3.0	3.3	4.0	3.7	2.3	3.2	19.5
Dominant	3.3	2.7	4.3	1.7	3.3	4.3	3.3	3.5	4.0	3.0	3.7	3.0	3.3	4.1	2.3	3.3	21.3
SR7200	2.3	2.3	4.7	3.3	3.7	4.0	4.3	3.5	4.0	3.0	5.0	2.3	1.7	4.7	3.3	3.5	27.7
LSD (P<0.05)	0.8	0.8	0.9	1.3	1.0	1.2	1.1	0.3	0.7	0.6	1.0	1.1	0.8	0.7	1.5	0.4	

Figure 1: Kingston Heath GC - Turf Density

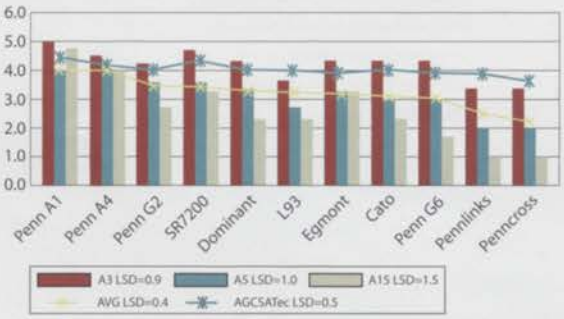
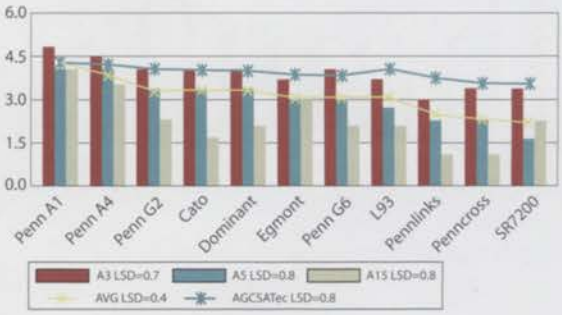


Figure 2: Kingston Heath GC - Turf Quality



GLENELG GC BENTGRASS VARIETY TRIALS

The data collected has been analysed (table 3) and the following conclusions are made;

1. The cultivars Penn-A1 and Penn-A2 were the top ranked for turf quality, however, for several assessors there was no statistical difference between varieties.
2. Penncross as the benchmark cultivar had moderate quality and density and was certainly not the worst of the varieties.
3. The cultivars Penn-A1 and Penn-A2 were the top ranked for turf density.
4. There are two "cultivars" from Royal Adelaide GC, one of which rated significantly lower than the other for turf quality. That is, RA1 ranked less than RA2. This would appear to relate to the source of the material which was taken from two distinctly different areas of the golf course. RA2 from the shaded, closed in 11th green and RA1 from the more open 4th green and tends to reflect the different species and types of bentgrass in each green.
5. The cultivars RA1, Heritage and Egmont had the highest coefficient of variation, which indicates an uncertainty in the assessors mind as to what is considered a good quality surface. Whereas, Penn-A1 and Penn-A4 were obvious "stand-outs" and very consistent between the replicates.
6. While different assessors may have assigned higher or lower ratings to individual plots they were generally consistent (i.e. they were either low or high for all plots) across all plots. Despite the differences in the absolute numbers, the relative rankings between cultivars was relatively consistent between assessors.

Table 3: Glenelg Golf Club - Workshop 24th September 2002
Average scores for quality from each assessor

VARIETY	A 1	A 2	A 3	A 4	A 5	A 6	A 7	A 8	A 9	A 10	AVG	CV%
Penncross	2.7	2.8	2.7	3.0	3.0	2.8	3.5	4.0	3.3	2.8	3.1	13.8
Egmont	3.0	2.5	2.0	1.0	2.8	2.0	1.0	4.0	3.0	1.5	2.3	42.2
Penn A1	4.3	4.0	4.0	4.3	4.0	4.5	3.7	4.2	3.7	4.2	4.1	6.7
Penn A4	4.7	3.5	3.7	4.3	3.7	4.0	3.7	3.8	3.7	3.5	3.9	9.8
Penn G2	3.0	2.7	2.3	3.2	3.0	2.2	2.7	3.3	3.7	2.5	2.9	16.6
Mix	2.3	2.8	2.0	2.9	2.9	2.7	2.7	3.3	3.0	2.3	2.7	14.4
Cato	3.0	3.3	2.5	4.0	3.0	3.8	3.8	3.8	3.5	2.8	3.3	15.1
Pennlinks	3.0	2.8	3.0	3.0	2.9	3.2	3.2	4.0	3.7	2.8	3.2	12.1
L93	3.0	3.0	3.3	4.0	3.6	3.3	3.0	4.5	3.7	3.2	3.5	14.2
Dominant	3.3	3.0	3.0	4.3	3.5	3.2	3.5	4.5	3.3	2.8	3.5	16.1
RA1	3.7	2.5	2.0	2.7	2.0	2.2	2.0	3.0	2.0	2.2	2.4	23.0
RA2	3.7	3.2	3.0	3.7	3.2	3.7	3.5	4.3	3.3	3.0	3.5	11.7
Mariner	2.7	2.8	3.3	3.7	3.2	2.7	2.7	4.2	3.0	2.8	3.1	16.1
Heritage	2.0	1.8	1.7	2.3	1.8	1.7	1.7	2.8	2.3	1.7	2.0	20.0
LSD (P<0.05)	0.9	0.6	0.7	NS	0.5	0.9	0.5	NS	NS	NS	0.5	

A1, A2,..... = Assessor 1, Assessor 2 etc.
CV% = Coefficient of variance
LSD = Least significant difference

LAKELANDS GC WARM-SEASON GRASSES

At the Lakelands GC site there are a range of warm-season grass varieties in large, single plots with no replicates and maintained at either greens height (2.6 mm) or fairway/surrounds height (7 mm). The attendees were again asked to rate the plots and the results for the grasses being maintained at greens height are detailed in figure 4. The results are an average of the 25 individual assessments. It is important to note that the results include two bentgrass varieties (Penn-G2 and Penn-A4) and the results reflect the turf quality post-winter.

CONCLUSIONS

The results from these workshops indicate that;

1. The assessments undertaken by a broad group of turf managers indicated that the better varieties are readily identifiable.
2. The results from these independent assessors are in accordance with the results of our own assessments.
3. Where the qualities of a particular cultivar are not well defined or obvious, the variation in the assessment results reflects this uncertainty. This in itself probably tells us something about the consistency of the variety and possible reaction to different microclimates on a particular site.

Figure 3: GLENELG GC - Turf Quality

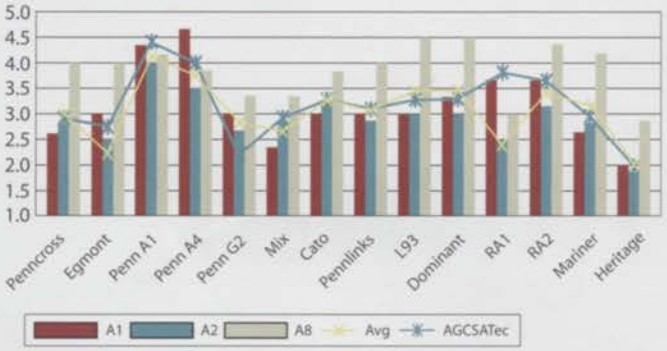


Figure 4: Average for turf maintained at greens height (2.6mm)

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Summer Turf Quality Decline and Root Dieback Related to Limited Carbohydrate Availability in Creeping Bentgrass (*Agrostis Stolonifera*)

Creeping bentgrass grows most vigorously when temperatures range from 15 to 24 oC, but often suffers quality decline and root dieback during hot and humid summers (Carrow, 1996). Maintenance of high quality turf in cool-season grasses under heat stress may largely depend on the availability of carbohydrates because they provide the energy and carbon skeleton for plant growth and development (Hull, 1992). Nonstructural carbohydrates in plants are considered as the energy reserve to be used under stress conditions and have been widely used as a physiological measure of stress tolerance (Beard, 1973, Watschke et al., 1972, 1973; Howard and Watschke, 1985, 1991; Hull, 1992).

Our studies conducted in controlled-environment growth chambers have found that carbohydrate availability decreases with increasing temperatures (Liu and Huang, 2000; Xu and Huang, 2000a,b; Huang and Gao, 2000; Liu and Huang, 2001). The decline in carbohydrate availability for creeping bentgrass is associated with decreases in root growth (Carrow, 1996; Xu and Huang, 2000a,b; Sweeney, et al., 2001), tiller production, and leaf growth (Xu and Huang, 2000a,b; Xu and Huang, 2001). Carbon allocation to roots in creeping bentgrass is also inhibited by heat stress, which could cause root dieback (Xu and Huang, 2000b).

We also conducted a two-year field study and examined whether summer decline in turf quality and root dieback is related to carbohydrate availability under field conditions during summer months. Two creeping bentgrass cultivars, Penncross and L-93, which are widely used on golf greens in the United States, were examined in our study. Grasses were managed under USGA-specification putting green conditions with daily irrigation and mowing at 4-mm height.

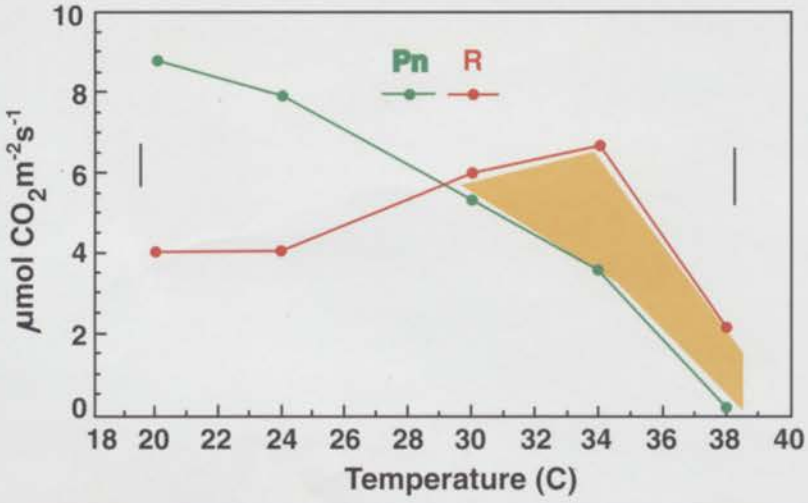
Root production and mortality were monitored using the minirhizotron imaging technique during 1997 and 1998. In both years, total root length and number were highest in August and then decreased in September for all four cultivars. From July to September, the length and number of newly produced roots decreased while those of dead roots increased. The ratio of dead roots to live roots in length and number increased in late summer for all cultivars. While the differences in total root length and number among cultivars were not consistent between two years, Penncross consistently had more dead roots, fewer new roots, and higher root mortality compared to L-93. The results indicate that summer root decline of creeping bentgrass resulted from both decreased new root production and increased root mortality, which could be associated with high soil temperatures during the summer. Variation in root production and mortality may contribute to the differences in shoot summer performance of the two cultivars.

Turf quality and the content of total nonstructural carbohydrate (TNC), reducing sugars, sucrose, and fructans in shoots and roots, as well as carbon allocation to roots were evaluated from May to November in 1999 and 2000. Turf quality of L-93 and Penncross declined from May and reached the lowest level in August and September, and recovered in October. The content of TNC, sucrose, and fructans in both shoots and roots exhibited similar seasonal pattern as turf quality for both cultivars in both years. Reducing sugar content decreased during the summer, but did not show recovery in October, except in shoots of L-93 in 2000. The decreases in carbohydrate content were more pronounced in roots than in shoots for both cultivars in both years. Carbon allocation to roots also decreased significantly during summer months for Penncross. L-93 had better turf quality than Penncross from May to November. Cultivars differences in carbohydrate content were not consistent for different fractions of carbohydrate and different times of the year. Our results demonstrated that the decline in carbohydrate availability in shoots and roots, particularly in roots, and limited carbon allocation to roots during summer months could contribute to the decline in turf quality and root dieback of creeping bentgrass under field conditions.

Aldous and Kaufmann (1979) suggested that decline in carbohydrate content in roots appeared to be related to cessation of shoot growth at supraoptimal temperatures for Kentucky bluegrass (*Poa pratensis L*). Others have also reported decreases in TNC content during summer for creeping bentgrass (Sweeney et al., 2001) and other cool-season turfgrasses (Youngner et al. 1978). The decline of carbohydrate content in both shoots and roots during summer may result from an imbalance between carbon production in photosynthesis and consumption in respiration (Carrow, 1996; Huang and Gao, 2000; Liu and Huang, 2001; Xu and Huang, 2000b). Liu and Huang (2001) reported that photosynthetic rate decreased while respiration rate increased and photosynthesis exceeded respiration rate during summer months for both L-93 and Penncross under putting green conditions similar to the present study. Carbohydrate consumption to production ratio was several times greater under heat stress than under optimum temperature conditions (Huang and Gao, 2000; Xu and Huang, 2000b).

In another study conducted under field conditions, we found that Low mowing height at 3 mm caused decline in turf quality and photosynthetic capacity, to a greater extent for heat sensitive 'Penncross' than heat tolerant 'Crenshaw'. Turf quality decline under low mowing height was attributed mainly to reduced leaf areas that are otherwise available for photosynthesis. Decreases in canopy

Canopy photosynthetic rate and respiration rate in response to increasing temperature Penncross



Carbohydrate production (photosynthesis) decreases while consumption (resiration) increases with increasing temperatures, leading to the decline in carbohydrate availability.

photosynthetic rate and increases in respiration rate likely contributed to lower turf quality under close mowing conditions, especially during summer months for the heat sensitive cultivar.

Low mowing height reduced turf quality during summer.

In summary, maintaining positive balance of carbohydrate production and consumption and carbohydrate accumulation would help plants to survive hot summers. This could be achieved by modifying cultural practices, especially mowing height. Mowing the grass at a reasonably high height during summer months could alleviate summer bentgrass decline. Reducing mowing heights during the summer should be avoided from the standpoint of carbohydrate production.

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Dry Spots Cause Hydrophobic Soil

Dry patch, hot spots, or localized dry spots (LDS) are terms used to describe the occurrence of an irregular area of turfgrass that for no apparent reason begins to show signs typical of drought stress. One of the first symptoms of drought stress in turfgrasses is the loss of plant rigidity to the point that "footprinting," or the inability of the plant leaves and stems to return to an erect or normal position following compression by footsteps. Footprinting is often followed by a dark blue-green color of the leaves and stems, which is usually followed by severe wilting and eventual death of the tissue. What is most perplexing to superintendents is that LDS symptoms may occur even after normal irrigation or a good rainfall.

The first thing to remember is LDS can be the result of many things. For example, excessive thatch, compacted soil, insect or disease damage and even something as simple as poor irrigation coverage. One cause of LDS is the presence of hydrophobic or water repellent soil. This is often less evident than the other causes listed, but is a common occurrence on many putting greens. Therefore, it's important that the superintendent try to determine the cause of LDS before starting on a treatment program. In the case of diagnosing the presence of hydrophobic soil, there is a simple procedure the superintendent can use. First, intact soil cores about 12 cm deep should be taken from the area in question and allowed to air dry for several days. Once fully dry, this might take up to a week, lay the soil core horizontally on a bench and starting from the top, place small droplets of water on the surface of the soil in 1 cm increments. If the drop does not penetrate within 10 seconds, the soil should be considered hydrophobic. The longer the drop stays on the surface before penetrating the soil, the more hydrophobic it is. In most cases, a new sandy root zone mix will allow droplets to penetrate almost immediately. In some severe cases of water repellency, droplets may not penetrate for 10 minutes or even longer.

Figure 1. Water droplets sitting on the surface of hydrophobic soil.

Figure 3. Scanning electron micrograph of soil particle taken from a nonhydrophobic area. Note the absence of organic coating.

Figure 2. Scanning electron micrograph of soil particle taken from a hydrophobic area. Note organic coating which is believed to be responsible for water repellency.

The question is often asked, what causes a once non-hydrophobic soil to become hydrophobic? There are many possible causes of this phenomenon.

In terms of golf greens and similar areas, researchers have shown that soil particles, particularly sand particles taken from a water repellent area have a partial to almost complete coating of an organic material over the surface of the particle. When this material is allowed to dry, as it often does between irrigations or rain events, the organic compound becomes very water repellent. The source of this coating is the natural decomposition of soil organic matter. It is in fact, the final product of the decomposition process. Because of the many benefits, we would not want to stop or interfere with the normal decomposition of organic matter. Thus, in most cases, we must learn how to manage water repellent soils.

What is the most effective management practice in combating LDS caused by hydrophobic soil? The most common and effective practice is the use of wetting agents. Currently there are over 50 products available in the United States. Most likely there are many to select from in Australia as well. Before, discussing wetting agents further, it is important to know that in most cases water repellency does not extend deeper than the top 5 cm of the soil. On occasion, it may be found as deep

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as 10 cm or more, but this is uncommon. The water droplet test will help determine how deep the condition extends. The depth of hydrophobicity is important to know since the goal is to get the wetting agent to that area of the soil. Next, in most cases, the degree or severity of water repellency varies across the green. In some areas the soil may wet partially while in other areas the soil will not wet at all. This creates the occurrence of LDS. To try to "even out" or obtain more uniform wetting of the soil throughout the green, it is suggested that the entire green be treated with a wetting agent. Research at the university of Georgia shows this will not cause the "less" hydrophobic areas to hold too much water, thus resulting in nonuniform wetting of the green. A wetting agent will not allow the soil to hold more water than its normal field capacity. Often it is necessary to spot treat the most severely affected areas. Again, this will not result in those areas holding "too much" water.

Finally, with all the wetting agents on the market today, superintendents want to know which one is best? This is very difficult to answer. Our research shows that wetting agents do differ in various ways. Which one is best, depends on one's perspective. For example, we know they differ in the following ways: potential to cause phytotoxicity, duration of effectiveness, available formulations, ease of handling, shelf life, cost, availability and technical support from the manufacturer. Certainly, there is evidence that they differ in performance depending on the degree of soil water repellency. They may even differ in performance depending on the amount of thatch/mat or organic matter present. Unfortunately, because there are so many wetting agents being sold and the characteristics of any given green or hydrophobic area are so varied, it is impossible to single out one wetting agent as the "best." It is recommended that the superintendent ask the manufacturer for university data to support any claims being made. In addition, until more information is available on specific wetting agents and how they might compare to each other, the superintendent should talk to peers to find out what products have worked for them and then try various products until the right one is found for their particular situation.

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Maintenance Facilities

Roland Taylor looks at the improvements made in the modern day machinery workshop and looks at the whole issue of machinery maintenance

The workshop area turned out to be a corner of the machinery store. The floor was earth, which had dried out to a dust and the only light was from one florescent tube so a great deal of the area was in shadow. A small bench was set against the wall, so obviously, a lot of the work had to be carried out on the floor. There was a heater, but judging by its size. the heat it emitted would barely take the chill off on a cold winters day. Old half-dismantled machines, that had clearly seen better days, were littered around the perimeter. What little space there was, would be almost completely taken up if a machine were brought in for repair. Containers full of black sludge and fuel were heaped in one corner. The air was rancid with the smell of burnt oil and earthiness and the overall appearance was a place where you would not want to linger in, or worse carry out any service work.

No, this is not the first chapter of a Dickensian novel, it is a slightly over the top description of the type of machinery storage cum workshop, that could be found not so many years ago. Thank goodness those days have passed and today the picture is generally completely different, although having said that, there maybe some elements of the scenario still about.

Over the last two decades considerable changes have taken place in both the golf course and outdoor power equipment industries. In the former, we have seen considerable growth and with it a higher profile that has placed greater demands on all those involved in course management. Part of this has been in the machinery sector, where their upkeep is critical to a smooth operation. This has led to more

The modern day workshop is a highly technical place

Having accessible storage is a huge advantage

courses now carrying out all their service work with dedicated staff and workshops.

On the manufacturers' front some of the big names have been merged, while other companies are becoming well established. The dealerships have also changed with quite a number of previously well-known names falling by the wayside. Others have grown larger.

There are now fewer firms around specialising in the professional equipment sector. This has led to some suppliers having to sell direct and find service outlets to cover warranty, plus service work.

What is even more of a concern, is that fewer people are coming into the business to be trained as service technicians.

What are the benefits of a good service programme?

Obviously, it is necessary to keep equipment running and producing an optimum performance with minimal downtime, but there are other reasons.

Safety is a very important one, especially as television advertising encourages the public to make claims for any injury. Badly maintained machinery is dangerous. The Health & Safety Provision and Use of Work Equipment Regulations under Section 6 maintenance states:-

1. Every employer shall ensure that work equipment is maintained in an efficient state of working order and good repair.

2. Every employer shall ensure that where any machine has a maintenance log it is kept up to date.

The regulations also cover routine and planned preventive maintenance.

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Another Section, which applies to a workshop, is lighting. The guidance here is that any place where work equipment is issued should be suitably and sufficiently lit. Lighting should be adequate for the needs of the task.

Electrical safety also requires careful monitoring. Earth leakage circuit breakers (ELCB) or residual control devices (RCD) should be fitted to all hand-held electrical equipment. All portable electrical equipment must be PAT tested and carry a certificate. The equipment should also be marked stating the date and signature of the tester. A competent person who has been trained in this field should test the equipment. Electricians should be members of the Electrical Contractor Association ECA and or NIC, EIC. These units require regular checks to ensure they are still operational. Charging batteries needs to be done in a well-ventilated area, away from any possible source ignition. Cleaning solvents and petrol should be stored in the correct containers and in a cool environment. Make sure any protective clothing, gloves and eye protectors are readily available.

Health and Safety reports show that back injuries are involved in a high percentage of accidents. This is often due to incorrect handling of loads.

In a workshop environment it could be due to lifting a heavy unit onto a workbench. The installation of hydraulic workbenchs, suitable for lifting all the machines in the fleet to a comfortable working height, will reduce the possibilities of a strained back. This will also improve the working conditions considerably and speed up repair or servicing operations.

Another reason for regular maintenance is investment care - well looked after machinery can command a higher trade-in value. There is reputed to be a course, in the States, where the workshop resembles an operating theatre and the equipment is looked after to the highest of level. As a result when they replace machines there is a waiting list for the old ones - the prices they command justify the care and attention the workshop and operators lavish on their fleet.

Exhaust pollution is very much under the spotlight and engine manufacturers have to comply with stringent legislation regarding the levels emitted by new power units leaving their factories. Once out in the field it is up to users to ensure that their equipment is correctly serviced if low levels are to be maintained.

Two other areas of benefit are better management of costings and greater control of day to day course management.

For those considering carrying out all their own servicing what is involved? A starting point is to carry out an analysis of the total maintenance costs the previous two years. It is also a good idea to try and identify the amount of down time and the reasons for it.

The big question is, would there be enough work to keep a dedicated service technician fully employed? This is an important factor, bearing in mind modern machines are becoming increasingly more sophisticated. The person will need an extensive knowledge and be able to work on a wide range of systems, including all types of engines, modern hydraulics and electronics. With his or her extensive knowledge and expertise they will not be happy if they are expected to carry out mundane work, outside their sphere, to fill in time.

Setting up a workshop will entail considerable investment, so every avenue needs exploring. The right working conditions are critical for both efficiency and harmony. The building should have plenty of both natural and artificial light and enough space to comfortably work on the largest unit is a must. Restricted access makes for all kinds of problems. Cleanliness is paramount when dealing with modern engines and precision components, such as fuel injectors and hydraulic systems. To clean these items to the high standard necessary will require a special washing unit.

A hard surfaced area outside with adequate drainage is needed. Here machines can be cleaned down using a pressure washer before going into the workshop. For those courses deciding to set up a full operation, there will be a large shopping list, including grinders, tools, drills welders and electrical/electronic testing equipment.

At this point the question arises, is it worth it. If the answer is no, what are the alternatives?

A regular daily and weekly maintenance programme is a must, so a special bay or area should be set aside where this can be carried out. This will require facilities making draining and replenishing oil fast and easy. An air compressor would be ideal for blowing dust and dirt from around cooling fins of engines and hydrostatic drives, or inflating tyres. Other items should include, a comprehensive set of tools, spanners, grease guns, fast moving replacement parts, instruction manuals and fuel storage facilities.

As far as breakdowns, major servicing, overhauling or regrinding are concerned, a local specialist can be sought, who has the qualified staff to carry out this type of work. This could work well if a service contract is drawn up between both parties, so everyone knows exactly what is expected of them. When deciding on a suitable partner, in this venture, an assessment should be made of their service facilities and staff, as to whether they are adequate for carrying out the work you are likely to require.

An important aspect in any arrangement is that both parties work well together, so that each understands the others requirements and needs.

For clubs, service contracts can be a positive way forward. A major benefit is that they do not have to make a considerable investment in specialist workshop equipment and buildings. In addition, there is not the problem of having to find qualified staff from what amounts to a small pool of experts that is gradually disappearing.

Modern machinery requires less maintenance than in the past, but when things go wrong it is often far more complex to deal with. Keeping ahead of these developments is down to specialist technicians with the right testing equipment.

From the service outlet's point of view, by being tied into a contract they can ensure there are trained staff, tools and equipment to cover every eventuality.

What worked a few years ago may not be ideal or adequate to meet today's demands. For those clubs large enough there are distinct benefits having their own service departments. Smaller clubs can, by forming a close liaison with a local service outlet, also enjoy certain advantages. It is to everyone's benefit to work together to keep machinery on the move.

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Dream Machines

As computers entrench themselves more deeply into the golf course industry, it appears the day may come when digital devices will control the equipment maintenance side of the business.

In a fantasy of the future, one sees that each piece of equipment would bear a unique bar coded identification label and an on-board diagnostic computer. Each time a vehicle came back to the shop, a scanner would read the bar code, download hour meter readings, and receive alerts from the onboard computer. This would all be done by an automatic wireless link.

The system would cover everything from the smallest string trimmer to the units in the golf car rental fleet and the biggest fairway mowers.

The system would alert technicians when any machine needed attention. Anything from a tire with a slow leak to an overheating hydraulic system or leaking cooling system, or just a routine service and maintenance work-over.

The computer would generate a pick list of parts needed for the job, and pinpoint the shelf location where they can be found. A technician working on the machine could add additional parts dictated by his inspection of the machine. He might speak the name of the needed parts into a microphone, and the computer would translate that information into part numbers. Any part not on hand would be automatically ordered.

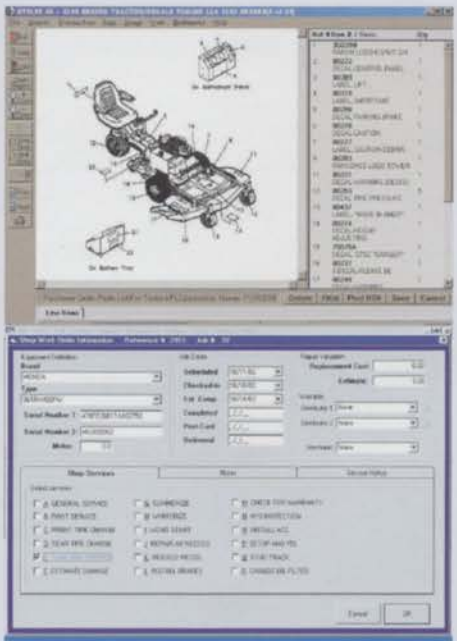
The computer dream machine would search among various vendors for the best price and/or fastest delivery of the parts, and would automatically place the orders. The next morning, all the needed parts would be on hand; either picked from the shelves or delivered by express service. There would be no parts orders unfilled or back-ordered.

The technician could look up any needed service manuals in the computer, get details of repair and setup procedures, and could search for the latest service bulletins relevant to the specific job on the specific machine.

In this dream scene, every unit in the equipment fleet would have maximum uptime. Fleet size would be reduced because no just-in-case spare machines would be needed. Each

machine would last longer, thanks to superb maintenance. The expense of installing the system and training the technicians would be quickly recaptured, if only through reducing downtime caused by malfunctioning machines.

This dream system is far from reality, but some pieces of the system are falling into place. Savvy service shop managers can start preparing for this super-efficient system by understanding some of the lessons that have been learned by service dealers in the turf equipment business, where dealers have spent the last two decades perfecting the art of computer-assisted service department



Computer assisted manuals and service orders

management and inventory control.

As an industry, computer inventory control is most advanced at the giant retailer level. Wal-Mart has become a world power in mass merchandising by having each sale transaction quickly become part of a chain-wide inventory control system that produces prompt refilling of store shelves as inventory flows out the door.

The automotive service industry is also highly advanced. Since most new cars have on-board diagnostic computers, and most service and parts departments are integrated into a central computer that in turn works with the manufacturer's computers to keep inventories updated.

This digital integration goes under the general rubric of Electronic Data Interchange (EDI). It can function fairly smoothly in an auto dealership where there is a single brand of product, so there's only one supplier for the dealership to work with. There is also a certain predictability to the flow of parts that will be needed during the course of a year. Larger auto dealerships also have a "critical mass" of business that makes it sensible to invest in employee training and computer hardware and software that gets the job done.

At these larger businesses, the dream scenario is not often seen, for reasons that also apply most strongly to the golf course business. One primary stumbling block is the diversity of equipment suppliers and aftermarket suppliers present in the business as a result of the traditional distribution systems that have served the industry mightily for many decades.

A typical golf course might have one brand of greens mowers, but a second brand for aerators, a third for fairway mowers, and a fourth for mowers used in the roughs. Golf cars may come from a fifth vendor, while string trimmers and chain saws from a sixth. Then there may be two or more local auto supply stores that provide common service needs such as lubricants, filters, and universal parts such as fuel line and fan belts. Now toss in a variety of suppliers for the wide range of chemicals used in course maintenance, from fertiliser to cleaning supplies and you have a very complex supply and service matrix.

A golf course with a club house and dining facilities will also have a variety of vendors for food, beverages, table supplies, produce, meats, etc. Then there are office supply vendors and still more suppliers for the pro shop. Expand the course into a resort, with swimming pools, tennis courts, lodging and the list becomes endless.

Each of these suppliers has an investment in its own software and hardware for receiving and shipping orders, and its own personnel and systems. Many still use the telephone and paper-and-pencil to receive orders. Others will accept faxes. Others may accept email orders. At the highest levels, some may have direct integration so that major customers can interface computer-to-computer and implement true business-to-business EDI.

A large operation may be able to have one or more staff members entirely devoted to ordering and receiving supplies.

The sticking point in integration is the issue of data entry. When a technician writes down the part numbers needed for a machine, will that act of data entry flow directly to the point of action the supplier's order filling system or will it have to be written down again and again

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An early first step is to keep parts inventories in a computerized database

as the order moves upward through the information-interchange system. Also critical is the downstream flow, alerting technicians that the required part is not in stock, so the technician can seek the part from an alternate source, or put the service job aside and turn to other work.

Also critical is holding down shipping costs. Budgets are quickly destroyed when a computer automatically orders a $2 part that requires $20 for overnight shipping, when that part might have been more sensibly included with a larger order that will bear a lot lower per-item freight cost. Human common sense handles such situations well, but computers are not easily taught how to make "cost be damned" judgments in cases where lack of that $2 part is going to tie up dozens of workers and a massive project for several days unless it arrives by overnight express.

As an industry, outdoor power is currently focusing on building the EDI links between the manufacturers and their regional distributors. The distributors, in turn, are looking downstream to establish links with their retail dealerships. Most advanced in this process are broad-line manufacturers like John Deere, Textron and Toro. They cover almost the entire range of commercial and consumer products. Their dealers are more able to handle a single equipment brand, and thus build their in-house computer management systems to integrate with their original factory system. A high volume of transactions with a single vendor is a pre-requisite for setting up a true EDI system.

That transaction volume is a big obstacle on the road to having a golf course interface directly with the equipment manufacturers. The concept of having a regional distributor for equipment has held up well over the last few decades of change in the business world, mostly because having a local distributor provides fast parts delivery and a local source of knowledge. Despite the ubiquity of overnight express services and fast telecommunications, the concept of factory-direct-to-user supply chains has still not become the dominant business model.

Given these realities, what can a golf course shop supervisor do to get ready for the future?

An early first step is to keep parts inventories in a computerized database that can ultimately be transitioned into an EDI system. Computers are cheap these days. Bar-codes are almost universal on parts packages and the parts themselves, and this makes it cost-effective to let the computer automatically enter data as parts and supplies move onto the inventory shelves and then out to the service shop. Of special importance is that staff become comfortable with the computerized control and become confident enough to trust it.

A second step would be to begin tracking machine service records with the computer. This further spreads use of the computer as a shop tool. Experience shows that technicians quickly start to like the computer when they find their work simplified by having parts on the shelves when needed.

A third phase is to start working with individual vendors to develop parts ordering systems that reduce the number of times a part number must be written down by another person. Also, establish whether or not vendors are equipped to handle faxed orders instead of requiring phone orders; this allows the golf course maintenance shop to send a parts order any time, day or night, without being put on hold. It also requires that the person doing the ordering gets the correct numbers written down, and that requires good service manuals.

For those willing to make the investment, there are a number of computer programs available that provide a complete 'blow-up' of the equipment and its part numbers, and allows recording of the part number with a simple click of the mouse. There are also software programs that provide brand-to-brand crossover information, so you can know that the Ransomes grease seal on your shelves also fits the Toro mower deck spindle that's under repair.

A step beyond this phase is to start using on-line Internet based parts ordering systems offered by aftermarket parts suppliers who may be your preferred local vendor for filters, tires, bearings and other easily-interchanged parts. These sites are often the most cost-effective and time-effective source for ordering larger quantities of commonly-used parts and supplies.

The goal with all these steps is to reduce the time spent in a chair ordering parts, and increase the time spent actually at the workbench in the shop.

Taking progressive steps toward increasing computer use in service parts ordering and inventory control has the advantage that the individual shop can "eat the elephant one bite at a time," and can stop at any stage where there's a balance between time savings, equipment cost and efficiency in the system.

Also, any steps taken in the real world today will help pave the path toward adopting newer and better systems as they become available, or as suppliers start to demand that the end-users like golf courses conform to advanced electronic systems being adopted higher up the line.

Of special importance is that staff become comfortable with the computerized control and become confident enough to trust it.

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NEW BOSS AT THE AGCSA

The Australian Golf Course Superintendents Association (AGCSA) has pleasure in advising Members of the appointment of Mr Steven Potts as the AGCSA's new Chief Executive Officer. This appointment follows an extensive process of reviewing, short listing and interviewing the numerous applications received.

Steven comes to the AGCSA following a very successful term as the CEO of Skiing Australia Limited. In his role at Skiing Australia, Steven had many roles and responsibilities including:

- Management
- Sports Development
- Event Management
- Public Relations and Communications
- Marketing, Sponsorship and Fundraising
- Finance and Administration and;
- Human Resource Management.

Steven has also had success in previous positions he has held with both La Trobe Shire Council (Business Unit Manager – Leisure Centre and Aquatic Facilities) and La Trobe University (Sports Centre Manager).

Honorary positions with organisations such as Royal Life Saving Society and the Australian University Sports Federation are just two of many other honorary positions he has held.

The position of CEO at the AGCSA is one that Steven is looking forward to and he relishes the challenges that the position has to offer.

Steven commenced at the AGCSA on 18th November 2002 and was able to meet many members and supporters at the Australian Open Golf Championships later that week.

Steven is looking forward to getting "stuck-in" to a comprehensive review of the associations strategic plan and taking member services and support to the next level.

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CQO'S ON THEIR TOES

Over 70 turf managers volunteered their time during the 2002 Australian Open at the Victoria Golf Club to participate as AGCSA / John Deere Course Quality Officials (CQO's) responsible for maintaining bunkers and repairing fairway divots throughout the tournament.

There is no shortage of bunkering at Victoria so CQO's were kept on their toes and many returned to the AGCSA tent with some pretty high scores (number of bunkers raked).

Obviously it was a very disappointing start to the tournament and as turf managers we all knew exactly what the groundstaff at Victoria must have been going through and how they must have been feeling.

Despite all of this there was a fantastic atmosphere in the AGCSA tent and thank you to all those who in dropped in to say hello (catch up on gossip!) and have a drink.

Many thanks to John Deere who again supported the event with hats and shirts – we look forward to Moonah Links for next year.

Andrew Newell and son team up at the open.

Rohan Fort

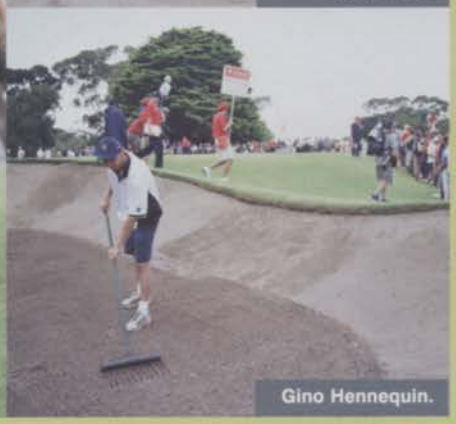

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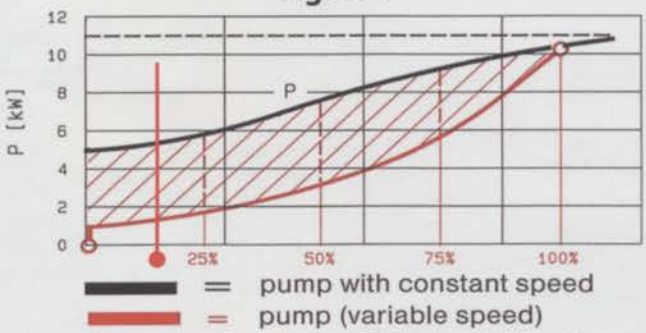
Figure 1



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How the Hydrovar reduces maintenance cost.

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Oasis Turf recently expanded its business into the Queensland turf market. With a factory located just out of Brisbane, 25 Station Ave, Darra, Oasis can service the Gold Coast, Brisbane, Sunshine Coast and surrounding areas effectively. Oasis Turf brings to the Queensland market the highest quality liquid and slow release turf fertilisers, along with a large range of chemicals, seed wetting agents and accessories. The exclusive distributorship arrangements which Oasis has with Growth Products, Lebanon Turf Products and PGG Seeds will give turf managers a greater choice of products for their turf. Mark Kidd has been appointed as Oasis Turfs Sales Representative and he can be contacted on 0412 612 636.

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Riverside, CA USA –August 2002 Agri Pacific, Inc has been designated as export distributor for Advanced Microbial Solutions (AMS) turf product line, SuperBio. Agri Pacific Inc. is a U.S. based exporter that works with many U.S. manufacturers to introduce their products into the international market. AMS develops and manufactures bio-products and processes to meet the current and emerging needs of our defined markets. SuperBio is a unique product line that is highly effective in improving agriculture yield, quality of lawns, gardens and golf courses, and also aids in wastewater treatment and biological remediation. The products Agri Pacific will distribute are SuperBio Microbial Blend, SuperBio T&O Blend, and SuperBio T&O + Calcium. Benefits of these products are that they enhance the fertilizer/plant food by making it more available for the plant's use; it loosens soil and improves soil percolation. This improves the absorption of moisture and strengthens the plant's root system causing flowers and plants in most cases to have larger blooms, larger leaves and longer bloom periods. SuperBio products are environmentally safe (100% indigenous). AMS is a leader in innovative biotechnology. Contact Agri Pacific to find out more about the SuperBio products and how they can improve your plants, flowers and turf.

Visit Agri Pacific at www.agripacific.com or email sales@agripacific.com with any questions or comments or contact Agri Pacific, Inc. Riverside, CA USA
Phone: (001) 909-343-2100
Fax:(001) 909-343-2110

EFFLUENT ON TAP

On Wednesday13th November, Barwon Water and the Barwon Heads Golf Club officially 'turned the tap' on the new pipeline supplying the course with treated effluent water.

After years of battling drought, Barwon Heads Golf Club have put in place a facility to 'drought proof' the Club which has constructed a large storage facility to take treated effluent water from the Black Rock Treatment Plant.

This continues Barwon Water's strategy of encouraging and promoting the reuse of treated effluent water.

The AGCSA in partnership with the Barwon Heads Golf Club and Horticulture Australia are undertaking monitoring trials to ensure that the treated effluent water has no deleterious effects on turf quality, soil or ground water.

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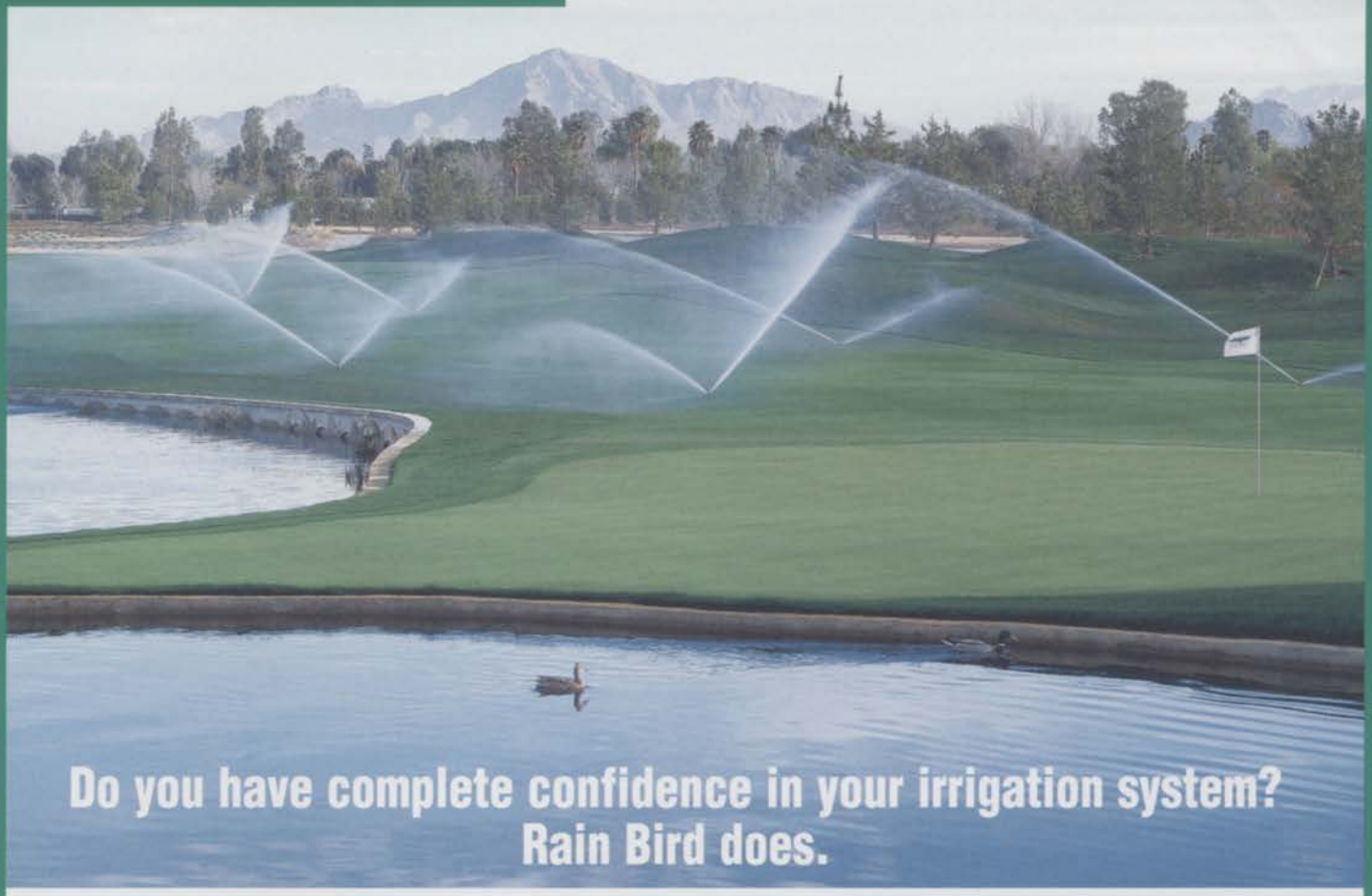

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JOHN DEERE

WYNNUM GOLF CLUB TAKES OUT 2002 JOHN DEERE TEAM CHAMPIONSHIP AUSTRALIAN FINAL

The first week in October saw the culmination of the 2002 John Deere Team Championship golf event. Twelve teams from all over the country converged on The Glades Golf and Spa on Queensland's Gold Coast to compete in a unique team scramble event, with the winner earning the right to represent Australia in the John Deere World Team Championship final at Scottsdale, Arizona in the USA.

This year marked the second running of this tournament in Australia, but the concept has been alive in the USA for the past 15 years. Developed as a way of building relationships within the golf and turf industry, the tournament brings together the 4 main decision makers within a golf club – the club captain/president, the club manager, golf professional and course superintendent. This unique team composition provides each participant with an opportunity to get to know the other decision makers in their club and familiarise themselves with the roles they each play within the organisation.

Regional qualifying events, hosted by John Deere Golf and Turf dealers, were held around the country between July and September, with the first two teams at each event qualifying for a place in the national final.

The events of the Australian final teed off on Wednesday 2nd October, with all participants having the opportunity to play a practice round at The Glades and familiarise themselves with the course layout. That evening, John Deere hosted a jacket and tie function, which included a company profile on John Deere covering its history and diversity, as well as John Deere's commitment to the Golf and Turf Industry. Several guest speakers from within the Golf and Turf fraternity were also involved. Paul Bevan, Facility Manager at The Glades provided an insight into the history of the venue and Jeff Gambin, representing the AGCSA, spoke of the appreciation the association has for John Deere and their commitment to the industry through efforts such as their contribution of US$25 for each team participating at the regional qualifiers of this tournament.

The teams awoke to a magnificent Queensland spring morning to begin preparations for the 8am shotgun start that commenced the 2002 national final. The standard of play from all teams was excellent and more importantly, the spirit that the event was played in was tremendous. After the round, the teams were treated to a sumptuous buffet lunch, followed by the presentation ceremony. The final results were:

1st Place	Wynnum Golf Club, Qld
2nd Place	Royal Fremantle Golf Club, WA
3rd Place	Cypress Lakes Golf and Country Club, NSW

Wynnum Golf Club will be joined by Bill Heraghty, from their local John Deere Golf and Turf dealership BHM Machinery, to form a five member team to represent Australian at the world final in the USA. Last year's Australian Champion, Logan City Golf Club, finished second at the world final in the USA, so we are hoping the guys from Wynnum can go one better this year.

John Deere would like to thank all the teams that competed in the John Deere Team Championship and look forward to seeing them all at next year's event. A big thank you also must go to the staff at The Glades Golf and Spa for their assistance in running the national final. The hospitality and facilities that were provided were first class and were thoroughly enjoyed by all of the finalists.

If you would like any further information on the John Deere Team Championship, please contact your local John Deere Golf & Turf dealer by calling 1800 800 981.

Members of the team from Wynnum Golf Club with Rod McDonald - John Deere Commercial Equipment Manager(left) and Bill Heraghty - BHM Machinery(right).

AGRICHEM APPOINTS NATIONAL SALES & MARKETING MANAGER

Owen McCarron has been appointed National Sales & Marketing Manager with Agrichem Manufacturing Industries, effective November 1, 2002.

Agrichem Manufacturing Industries has appointed a national sales & marketing manager as part of an ambitious plan to expand in all sectors of Australia's crop nutrition market.

Owen McCarron, the company's regional manager for southern Australia, will be promoted to the role with effect from November 1, 2002.

Chief executive, Gary Atrill, said the appointment would enable Agrichem - Australia's pioneer of fluid fertiliser technology - to fast-track the development of several key markets, particularly broadacre.

"Our strategy is straightforward - we want to consolidate the company's record growth rate of recent years and continue building on our position of leadership.

"To succeed, we need to commit more resources to the area of business development and product marketing.

"This appointment will also create opportunities for our existing sales force across the country.

"By moving Owen into a national role, we can give more ownership and responsibility to our area managers," he said.

In the new position, Mr McCarron would report directly to Mr Atrill who, as CEO, also had a seat on the management board of Agrichem.

"Owen will become the key national contact for Agrichem with our area managers providing sales and technical support at a local level," Mr Atrill said.

Mr McCarron, who had been with Agrichem for six years, said he would continue to reside in Shepparton, Victoria, but planned to spend one week a month working from the company's head office in Brisbane.

Despite the death of former Agrichem chief, Frazer East, earlier this year, Mr McCarron said the outlook remained very positive and true to Frazer's vision of leadership for Agrichem in the plant nutrition field.

"Our success stems from the strong relationships we've forged with farmers, researchers, resellers and the wider rural community.

"Our first quarter results to September are in line with budget, which is a good outcome in view of the national drought," said Mr McCarron.

For more details, contact Agrichem's toll free number 1800 654 758 or visit www.agrichem.com.au

TURF EXPERT TO VISIT AUSTRALIA

Professor Emeritus Brian Holl, from the University of British Columbia, Canada, will be visiting Melbourne from mid February to the end of April of 2003. Professor Holl's turf research interests includes the management of turf and plant-microbe interactions on sand-based turf, plant breeding of fine fescues and use of biosolids as organic amendments in sand-based turf production. He currently is Director and senior consultant with Lamorna Enterprises Ltd, a private company offering agronomic research and consulting, and professional development training.

Whilst in Melbourne, he will be based at the University of Melbourne's Burnley Campus in Richmond, Victoria and working with Associate Professor David Aldous on issues relating to microorganism (MO) activity associated with sand-based greens, as well as the measurement of (MO) activity that ay be associated with the addition of organic type turf products. Professor Holl will also participate in an industry seminar in April of 2003.

Further information on Professor Holl's visit can be obtained by e-mailing David Aldous on daldous@unimelb.edu.au or fax 61392506885.

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Doug Robinson,
Managing Director of Pacific Golf Operations Pty Ltd

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EARTHQUAKE

ASPAC Golf & Turf

ASPAC Golf and Turf announce the release of the Earthquake, a new style of broad acre decompaction that makes deep tine aeration, turf moling and deep ripping virtually obsolete.

A real feature of the earthquake is its ability to penetrate and shatter even the hardest soils through the sequential action of the 25cm or 38cm blades (depending on the model) providing consistent full width soil shattering with zero surface disruption.

"Never before has a deep decompacter been effective on hard soils without bouncing, having minimal effect or breaking down due to hard going" says Martin Eade of ASPAC Golf and Turf "and by way of proving how effective the Earthquake is we invite all who have a demonstration to select their hardest toughest ground for evaluation... the harder the better"

So far the Australian experience has been very promising with the Earthquake achieving maximum depths in every situation, in any hardness and importantly effectively shattering to the required depth.

The Earthquake 150R comes with a standard 2 year warranty, a commitment that comes from experience in Europe with a contractor machine there decompacting 38000 acres to date without a breakdown!

For free product video, or to book a demonstration on your turf contact ASPAC Golf and Turf on 1800 640 305.

EARTH QUAKE

RONDÒ HAS ARRIVED: ANTONIO CARRARO'S STAR PRODUCT FOR MAINTENANCE

Rondò

The name Rondò evokes many things: a rhythmic musical style, a poetic metre, an architectural pattern...and from now on it's also the name of a new Antonio Carraro creation.

The Rondò is the new model in the range of multifunctional machines that have been specifically designed for the maintenance of private and public green areas and for the cleaning of urban spaces.

Rondò is a compact, articulated vehicle with four equal wheel drive and comes in two versions: K.333 (30 HP) and K.327 (22 HP).

The official presentation of this new design and technology prodigy will take place at the Galabau Fair in Nuremberg (Germany) from the 18th to the 21st of September 2002.

720 EYE ARMOUR

Aerodynamic design features combined with hi-tech, futuristic grilamid frame material, and incorporating 720's unique "Double Impact Lens Systems TM ". 720 Eye Armour is conceived, designed, tested and perfected in Australia.

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Chipco

Chipco" have announced the launch in Australia of the No 1 curative Pythium fungicide in the United States. Chipco Banol has been available for around 20 years to US turfgrass managers and provides the highest levels of Pythium control in the market. It is a rapidly absorbed, systemic fungicide that is distributed throughout the plant providing fast effective control. Additionally, it is also extremely active in a preventative control program.

As well as providing high levels of control of a key turf disease, Chipco Banol has the full support and backing of Chipco, the world's leading Turf Protection Company. It is also eligible for the soon to be announced Chipco Credits rewards program.

For more information on Chipco Banol, Chipco Credits or any other Chipco product talk to your Chipco distributor or call Chipco direct on 1800 223 002

SIMPLOT ADDS SIGNATURE TO NEW FERTILIZER RANGE

Simplot Signature SERIES

Simplot Partners commitment to the Australian turfgrass industry has again been highlighted by the launch of its new speciality fertilizer range the " Simplot Signature Series". This range of products has been designed and manufactured in conjunction with Australian's leading research and development chemists. Combined with formulation know how and turfgrass management expertise the "Simplot Signature Series" is the premium fertilizer range of choice for superintendents and turfgrass managers.

The key to the " Simplot Signature Series" range comes down to one word, Quality. All aspects of the product range from packaging, presentation and support will lead the industry in growing and maintaining quality turfgrass. While quality is the key, pricing remains competitive against all other products.

Simplot Partners and its exclusive chain of distribution invite all to experience the difference "the series" will offer, and watch your course become a Signature.

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BAYER

state REPORT

GCSAQ

Dry conditions persist across the state and it seems the situation has become drastic enough for mainstream media to take an interest as the many and varied stories on drought in the bush would indicate. At least it lets people understand the problem is wide spread and not just affecting their own backyards.

Recent events in South East Queensland have been the AGCSA workshop at Lakelands Golf Club where Dr. Don Loch, Mr. Peter Sawyer and host Superintendent, Mr. Stephen Marsden, gave excellent presentations on turf research and the maintenance differences in some of the new greens varieties now being introduced in Queensland. We were able to have a look at the turf trial plots and go through an evaluation process that made you think about what is now available. This day was also an opportunity to meet Andrew Peart, who ran the day very successfully.

The John Deere Teams Championships have been run again with great success, Queensland state winners Wynnum Golf Club went on to win the National Title with McLeod Golf Club, one of four to tie for second place in the state round, also featuring in the shootout at the Glades. This event is certainly rising in stature over the years and is eagerly awaited and competitively contested. Can't wait for next years contest. Brisbane Golf Club was the venue for the state round and was again immaculately presented by Superintendent Brett Morris and his staff. We are now waiting for Jason Adams to put his teams' slide show presentation of his trip to the States together for our next field day.

On Monday November 11th a large field of teams headed to Northlakes Golf Club at Mango hill to compete in the first Turf Research Fundraising Event our Association has staged to raise money to put into the ongoing efforts to come up with a greens turf to take us into the future. The day was sponsored by Turf & Irrigation and also Twinview Turf and featured guest speakers, golf, prizes and great food.

The Queensland Golf Industry Awards night at the Brisbane Greek Club saw awards presented to the high achievers in the Golf Industry from the PGA, QGU, Woman's Golf Queensland, Secretary Managers Association and our Superintendents Association. Winners on the night were:

- Turf Industry Apprentice of the Year – Scott Walker, The Grand Golf Club.
- GCSAQ Recognition Award – Dr. Don Loch, D.P.I Redlands.
- Superintendents Environmental Award – Mr. Stephen Marsden, Lakelands Golf Club
- Superintendents Achievement Award – Mr. Kelly Hyland, Royal Queensland.

2002 Turf Industry Awards Night. From Left: Ross Bishop, Manager Royal Queensland Golf Club. Kelly Hyland, Superintendent Royal Queensland *(Superintendents Acheivment Award)*. Dr. Donloch, D.P.I. Redlands *(Superintendents Recognition Award)*. Jon Penbethy, President GCSAQ

2002 Turf Industry Awards Night. From Left: Richard James & Rod Cook (The Grand) admire steve Marsden's (Lake Lands) trophy for the Environment Award.

Well done to all the award winners, very well deserved and a great opportunity to recognise the efforts of all those who really put the effort in.

The Wet and Wild Christmas Party will have been run by the time you read this so I will report on that next time. I would like to welcome on board our new AGCSA Chief Executive Officer Steven Potts and wish him all the best in the job ahead. We, as an association, are all keen to see him continue the progress of the AGCSA.

Just as a footnote, how lucky was the Gold Coast Indy race? The only day it has rained all day for a year and it happens on a race day, life can be fickle can't it? At least the tourists got a wash while they were here.

Jon Penberthy
President, GCSAQ

NSWGCSA

Unfortunately not much good news for NSW since the last edition. More than 90% of the state has now been officially drought declared.

Many Superintendents have had to limit their water regimes to greens only and with no rain forecast at the time of writing it looks as though we are in a very difficult summer.

It is in trying times like these that you need to have support from all facets of your club from the playing membership, who will have to accept sub-standard surfaces in many instances, to the board of committee who should understand that planning of certain events such as construction may need to be put on hold till the drought breaks and most important of all, a harmonious relationship with your CEO or Secretary Manager or owner can help us survive the tough circumstances some people find themselves in.

Invariably, the best run courses are those where all these elements are working together and there is mutual respect for each others talents. Staff morale is very important to the success of any operation; and we should be striving to have good lines of communication with all the people that influence our working lives.

It has been brought to my attention that contractors are still approaching clubs in NSW via the CEO or Secretary Manager, the usual theme being that the club will save tens of thousands of dollars by going down this path. I urge all those people who have been approached to do some research of their own, because there are many examples in Australia where not only has the quality of the golf course suffered but it has proven to be FALSE ECONOMY on a grand scale.

Now unfortunately; something to put all the above into perspective!

It is with great sorrow that we learn of the death of Shane Foley from the Lakes Golf Club, who was killed in the Bali bombings. We pass on our deepest sympathy to all his family and friends. Shane was a fine Australian who was just promoted to Assistant Course Superintendent upon the retirement of Peter Brown, and he was also recently engaged to be married. It is quite bewildering that Shane along with so many others could be cut down in their prime. Personally, I hope and pray that the cowardly, sub-human bastards that committed this outrage meet with a slow and painful death real soon.

Martyn Black
President, NSWGCSA

PS: Keep your chin up fellas, and keep fighting the good fight.

VGCSA

The middle of spring in Victoria this year is presenting all in the growing industry with a tough season due to drought conditions throughout the state. In the Metropolitan area we are right on the edge of water restrictions not to mention the district areas that are experiences compounded conditions due to 5 dry seasons.

With a drought in the for front of everyone's mind the VGCSA is currently participating with the VGA Turf Advisory Board on trial work with many new varieties of warm season grasses. This is being put together with the help of Don Loch from Qld Dept of Horticulture and Richard Forsyth at Metropolitan GC with many us very interested to see what transpires.

Education

The VGCSA is now canvassing for the Colleges to nominate their trainee of the year in Turf.

We encourage Superintendents to remind their apprentices that this award is now being advertised in the hope that all the education providers will put up a nominee.

Spring Meeting

Flinders GC hosted the October meeting with numbers a little down but the course was up to expectations.

Guest speakers for the day were Mark Costigan enlightening us on how to make our dollar go further with "Salary Packaging" and Terry Tuckfield presented her typically insightful presentation on "Management in a Small Team Environment".

The last meeting for the year will be held at La Trobe GC with Mick Hyatt Course Superintendent. This is our gathering run more on a social basis with afternoon golf and dinner. Mick is going to drag himself there after a recent hip operation, so do your best to get along and make the day a success.

Finally on behalf of the VGCSA I would like to congratulate Rob Savedra who has recently handed over the reins of the TGAA (Vic) to Anthony Henry. Rob was very committed to his roll and leaves the TGAA in good shape.

Michael Picken
President, VGCSA

SAGCSA

I would like to take this opportunity to thank Euan Laird on the fine job he has done as CEO of our Association for the best part of a decade, we in South Australia have found Euan to be a great help and thoroughly professional in all out dealings over the years, we wish Euan all the best for his future endeavours.

Our last meeting was held on October 31st at Blackwood Golf Club with yours truly as host superintendent. The day consisted of some early birds playing nine holes of golf, with Richard James from Kooyonga Golf Club winning the prize on the day A very good effort considering Richard had only one dry grip left in his bag after a sprinkler jet scored a hole in one down his bag on the first tee.

The meeting continued with 35 members gathering at the worksheds at 9am before going on a course inspection which included recently completed fairway drainage work, as well as recent row plantings with Santa ana couch into new and existing fairways. The course inspection was broken up with a presentation from Mr Ray Ledger from the EPA on current and proposed regulations on waste water management for golf courses, with a question and answer session following. This tied in with the new washdown bay/chemical storage and handling facility recently completed at the Blackwood Golf Club. A BBQ was enjoyed by all for lunch down at works facilities where the new SAGCSA sponsorship banner was unveiled for the first time. This new direction for our association has been enthusiastically received by the industry in general and if the early indications are anything to go by the classic "win/win" scenario will be achieved, for both the companies wishing to achieve greater exposure in the turf grass industry and having a relevant and financially secure association which both brings together and represents our members best interests. Our first gold sponsor Aquatek Irrigation Consultants delivered a short company profile to the gathered members and outlined there companies focus and direction for the turf industry.

In conclusion I wish all turf managers throughout the industry a kind summer season with all indicators pointing to an extreme summer both in climatic conditions and our all important water quantity and quality, now as much as anytime realistic members and committees wouldn't be too much to ask for Christmas now would it?

Peter Harfield
President, SAGCSA

GCSAWA

The rain we all hoped would down this spring didn't arrive and a long hot summer awaits us here in the west. From all reports it seems we are not the only state to be experiencing drought conditions and my sympathies go to those Supers affected by lack of moisture.

It was remiss of me to forget to report in the last issue the induction of Geoff Osborne as a life member of our association. Geoff has been responsible for the construction of 3 of WA's finest golf courses, Sun City, Joondalup and Araluen. His management techniques and maintenance of these courses have always been world class and many Supers have gained valuable industry knowledge from following Geoff's ideas. He has always made himself available to assist other colleagues and his support to the association has been invaluable over the years. Congratulations Geoff, you are thoroughly deserving of this recognition, we appreciate your involvement and support.

The Super Series is shaping up for it's final round at the superb Joondalup Resort on Melbourne Cup day. Both the Supers section and the trade have a few contenders who can still win this years title.

Congratulations to Darren Wilson, formerly 2IC at the Vines, who is the new Super at the Wembley Golf Complex. Darren has a big challenge ahead of him at one of Australia's busiest golf courses. I'm sure he will rise to the challenge though and take Wembley to the next level. Darren will of course be joining Matthew Day, formerly State Manager for Nuturf, who recently took up the job as the General Manager of Wembley. What a formidable combination!

Our Christmas festivities will soon be here and the usual bowling night is planned at the Rosemount Bowl. This is always a great family evening and a visit by the "man in the red suit" will be the highlight. May I take this opportunity to wish all our state and interstate colleagues the very best for the festive season and for a great 2003. Lets hope we get a better hand dealt us with weather next year, we certainly need a break after the last 2 years.

Allan Devlin
President, GCSAWA

TGAA

It's been an interesting start to the cricket season with very strong winds and showers making it almost impossible to keep those covers on the wickets!

The new committee has been working hard to put together an action plan for the year ahead. We have put together events for 2003, they are as follows:

17th January	- The Zoo Jazz night for TGAA members and families.
1st April	- Occupational Health & Safety Morning, location TBA.
16th July	- Cricket Wicket Seminar to be held at Docklands Stadium again.
26th August	- AGM, location TBA.

I hope everyone can make an effort to attend these events and make them successful.

I would like to wish everyone a very successful and stress free cricket season. On behalf of the TGAA committee I would like to wish everyone a very happy Christmas and safe new year.

Hope to see everyone at Holmesglen TAFE on December 4th for our seminar on New Turf Construction Techniques and break up BBQ after.

Matt Scott
Committee, TGAA

TGAA (ACT & Surrounding Region)

The Christmas break and the New Year is always a hectic time for all and I wish everybody a merry Christmas & happy new year. With only a matter of months before the next mid – year seminar, the association asks all members & delegates who attended the 2002 seminar & have not yet returned their questionnaires, to do so as soon as possible. Recent feedback concerning a possible 2 day national seminar has been encouraging, although the more members that express their views the more convenient we can make it for you & the better we can serve our members.

If there are any qualified greenkeepers out there, or if you have recently completed a trade certificate in turf management, you may be interested in continuing your studies or improving your qualifications. The Canberra Institute of Technology (CIT), School of Horticulture in Weston is considering offering Level 4 Certificate in Horticulture (Turf Management) in 2003. The future of the course is dependent on the number of enrollments so don't leave this opportunity until its too late. The CIT is also giving the chance for those who have recently completed the level 4 certificate to express their interest in obtaining a diploma in turf management.

In local news, the annual ACT TGAA Christmas party will be held on the 6th of December at Queanbeyan Golf Club, we hope to see you there. On the 28th of January, the TGAA in conjunction with Globe Australia, will be holding an afternoon seminar on seed & nutrition. For more details contact Stuart Millar on (02) 9522 0000. If there is anybody who is interested in sending an article or even a small snippet for publication in the quarterly newsletter, all submissions will be considered. Please contact Bruce Davies on (02) 62074623 or Gary Dawson on (02) 62074624.

Till next time, agrostologists

Justin A K Haslam
Committee, TGAA (ACT & Surrounding Regions)

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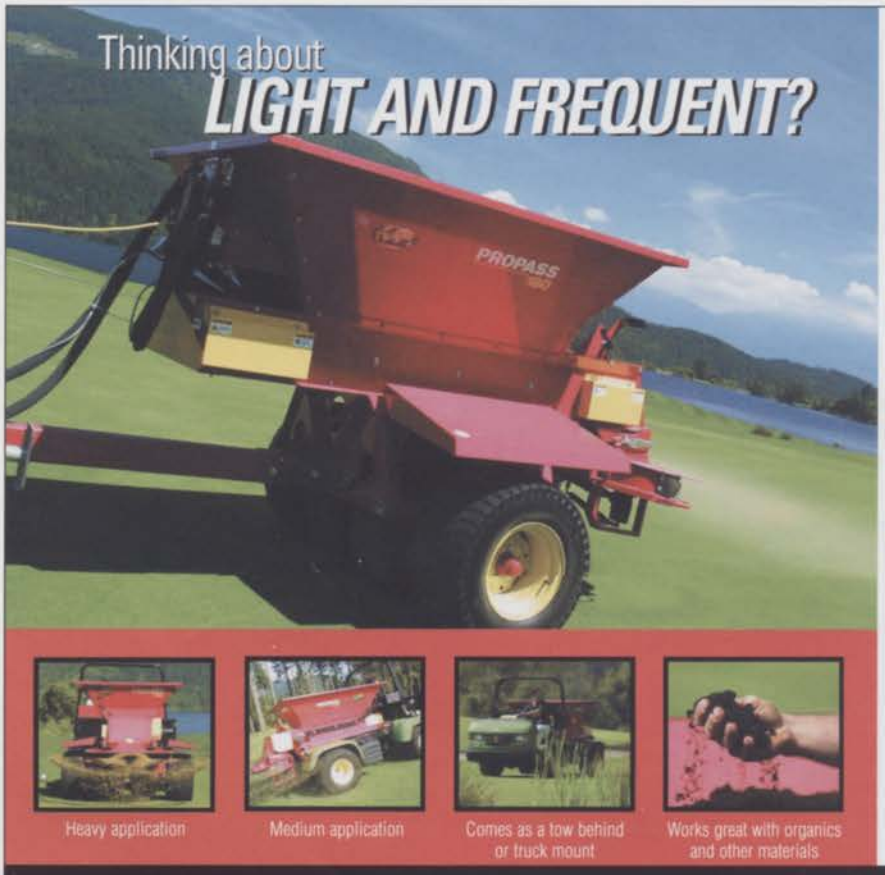

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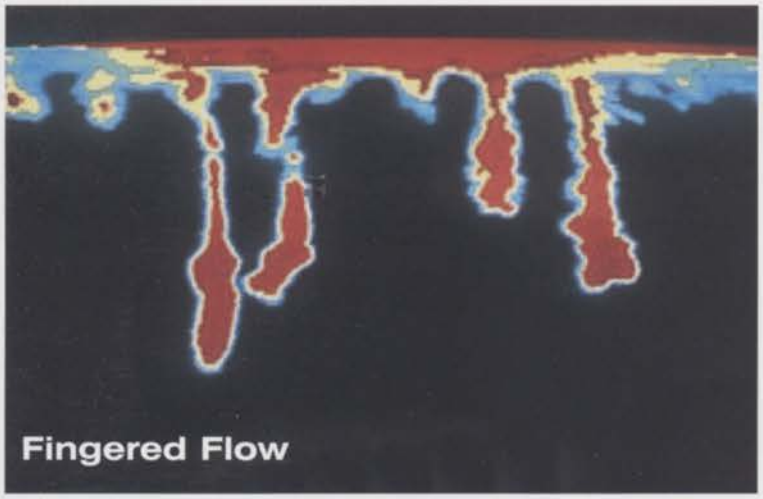
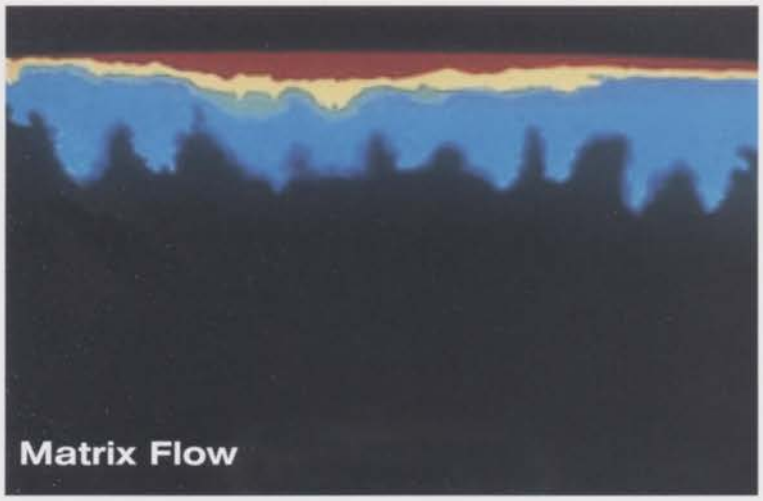
PRIMER® 604

Matrix Flow Soil Surfactant





The Only Product Proven by Independant University Research to deliver *Matrix Flow*

PROVEN

- Australia's Proven Performer
- Matrix Flow
- Prevention of Dry Patch
- Promotion of turf uniformity
- Guaranteed Performance When you Need It.

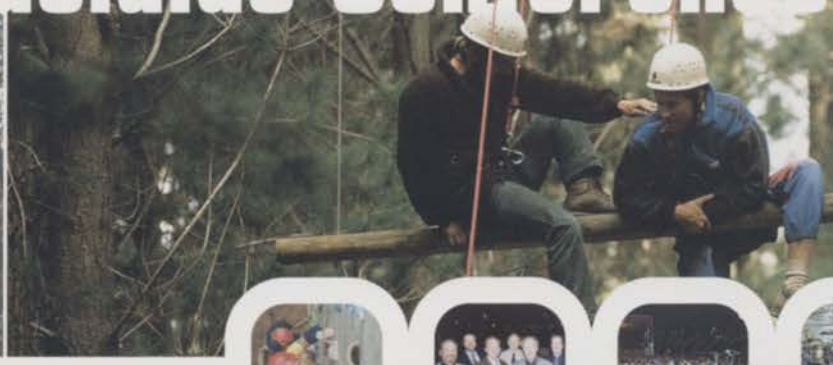
Nuturf®

360 Degrees of Green

Unit 2B 3 - 9 Birnie Ave LIDCOMBE NSW 2141 Ph:1800 631 008 Fax: 1800 809 456 Website: www.nuturf.com.au

Adelaide Conference

coming soon



Golf & General Turf Streams

19TH AUSTRALIAN TURFGRASS CONFERENCE

Adelaide Convention Centre

"Innovation, Imagination and Communication"

June 23 – 27 *(2003)*

Are you up to the Challenge?

FEATURING:
- Team building and Communication
- Mystery Cocktail Reception
- AGCSA Golf Championships at Royal Adelaide Golf Club
- AGCSA Corporate Cup at The Grange Golf Club
- 2 Day Trade Show – 5,000 Square Metres
- Workshops, Keynotes presentations and Open Forums
- Two Conference Streams: Golf Course Management and General Turf Management

OPEN FORUMS:
The Golfing Experience in 2020
Survival Skills for Superintendents towards 2020
Balancing Work, family and leisure

IMPORTANT SESSIONS ALSO INCLUDE:
Golf Course Ecology
The Golf Course as a Model for Environmental Sustainability
Native Grass Establishment and Maintenance
Turf Management for Shade
Turf Physiology 1 and 2
Habitat Management
The use of technology in Golf Course Construction

OLD FAVOURITES
Biologically based weed management
Managing Problem Staff
Organic Products – What's the hype about?
Turf Tour – Glenelg Golf Club, The Grange Golf Club, Kooyonga Golf Club

19th Australian Turfgrass Conference