

The first of a new series in which James de Havilland takes a closer look at the intricacies of current machinery

# The anatomy of... a Greens Mower

The John Deere 2500 greens mowers have a great deal in common, but are very different mowers...

Built around essentially the same running gear as the established John Deere 2500B greens mower, the 'hybrid' 2500E is now a well established model in the UK. Here we take a closer look at both models, outlining what they share and where they differ.



## Step-by-step Analysis...

### John Deere 2500 greens mowers



Brushless reel motors are well proven and liked for their ability to deliver precise cut speeds. As with all greens mowers, Deere places great emphasis upon quality of cut. Note the roller brush; users can specify a range of cutting unit options.



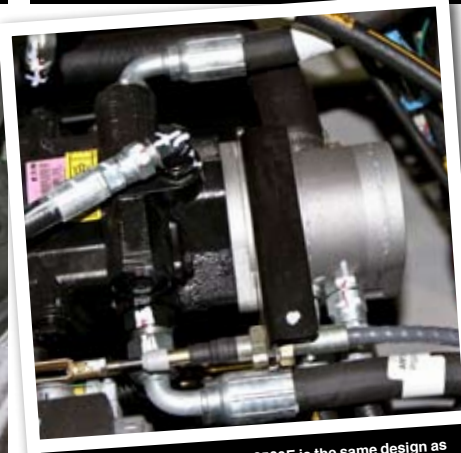
From the operator's point of view, there is little to tell the 2500B and 2500E apart from the seat. The latter mounted on a sloping rail to raise it as it is adjusted back. Steering column adjusts for reach.



At a modest 2,250 engine rpm, the powerful alternator on the 2500E will deliver enough 'juice' to power the cutting units at the desired cutting speed. In work, the engine can be throttle back, cutting noise and fuel consumption.



Below the command arm is a small cubby which can have a net cover. Greens mowers are designed to be light and compact, but a bit of storage space never goes amiss. Users can choose between smooth and tread pattern tyres.



Traction motor pump on the 2500E is the same design as used on its all-hydraulic sibling, the 25000B...

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**Calling the hydraulic-electric John Deere 2500E a 'hybrid' mower is somewhat misleading. Most of us associate the word 'hybrid', at least in the automotive sense, with a vehicle that has an engine with a large battery pack to power electric drive motors.**

The engine provides generating power to keep these batteries topped up, chiming in when either more 'oomph' is required or when the batteries are in need of a charge.

The John Deere 2500E is different; a powerful 48 volt, 90 amp alternator directly powers the cylinder electric motors. There are no batteries involved and drive to the wheels is via conventional hydrostatic drive.

It is important to get this point established from the outset as there are still those who think the 2500E carries a heavy battery pack. In fact the 2500E and all hydraulic 2500B are pretty similar weight wise, the 'electric' models having a weight penalty of perhaps 22kg or so.

### The electric advantage

Because these two greens mowers share the same cutting units, chassis and engine, John Deere is well placed to argue the case for and against electric drive. On the downside, current electric systems do add a bit of extra weight and it is fair to say there is better industry wide expertise in the understanding of hydraulic drive systems.

On the plus side, the electronics and components used on the 2500E are now well proven. If something goes wrong, swapping failed components is not difficult. There are no hydraulic fluids to deal with either. But this is not as important as the way in which the 2500E cuts grass.

"With a greens mower, the priority is quality of cut," said Henry Bredin, John Deere's UK Product Market-ing Manager - Turf Equipment.

"When we talk to customers about the 2500 series this is our starting point. The fact we offer electric cylinder drive on the 2500E

is important. We can demonstrate the system works well and can reduce operating costs. But quality of cut remains the most important issue".

So does the 2500E do a 'better' job than the hydraulic 2500B? Short answer. No. More considered answer is that the 2500E may offer some advantage. The cylinder speed can be precisely matched to the job in hand and full motor torque chimes in as soon as power is applied. This ideal for mowing as it ensures a cutting unit is up to speed pretty much as soon as power is switched on.

"Although we can argue the merits of electric over hydraulic power we tend to look at more obvious advantages," added Henry.

"A key feature of the 2500E is that it can be operated with the engine running at a reduced speed. This cuts noise and vibration and, of equal importance, can reduce fuel use too".

It is always difficult to say by just how much any given 2500E will save on diesel, but Deere suggest



... the 2500B having three independent pumps to power the cutting units, the raise lower function and steering respectively.  
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Both 2500 models have Command Arm diagnostic and more advanced 'under hood' diagnostic system. Light pulses will flash in a set sequence to identify key faults, such as a faulty engine glow plug.



A common control theme is part of Deere's design, the command arm retaining a yellow colour for throttle controls and orange for engaging drive. General ergonomics of Deere mowers is well liked by operators.



Separate travel pedals feature on both the 2500B and 2500E. As with any item of kit it can take a while to get used to different control types, particularly is you are used to a 'heel and toe' pedal design.



As with most manufacturers, John Deere makes subtle design tweaks to its mowers year on year, the catcher mounts...



... of 2010 model year 2500 mowers having been refined to ensure even less weight is passed back to the units when the catcher is full.

fuel use can be cut by up to 30% when compared to the 'B' model. In practice, the 2500B hydraulic motors need the engine to spin at rated speed of 3,000rpm for the hydraulic pump to deliver the right flow.

On the 2500E the alternator generates enough juice to spin the cylinders at the right speeds with just 2,250rpm engine speed. The only time the operator will want to apply full throttle on an 'E' is when travelling between the greens, the traction motors demanding full flow if the top travel speed is to be achieved.

**So what else is different?**

The back lapping procedure differs slightly between the 2500B and 2500E. In broad outline, the hydraulics on the 'B' relies upon a micro valve to prevent the cylinders stalling when the back lapping paste is applied. No extra intervention is required on the 'E'.

Is that it? Well pretty much, yes. The 'E' does not need any special tools to look after and can be treated pretty much the same as a

'B'. The only caveat is when it comes to pressure washing. Electronic systems of any type are not over fond of moisture.

**Summary**

John Deere charges a premium of around 6% for its 2500E. In practice, most operators suggest this is worth paying not just for the 'E' offering potential savings in operating costs but also for the way in which the mower operates.

Downsides to 'E' ownership? Deere is candid enough to admit that they have learned a great deal since they introduced the 2500E into Europe in 2004, early issues causing dealers and Deere, at Langar, more than a few headaches. But the 2500E is now a well refined product, and an ideal alternative to the 2500B.

"We offer end users a choice. The 2500E may not suit some golf courses. But where these mowers have been in use for a number of years, feedback has been positive. Those that have an 'E' are unlikely to buy a 'B' at replacement time," said Henry.

**To back lap or not to back lap**

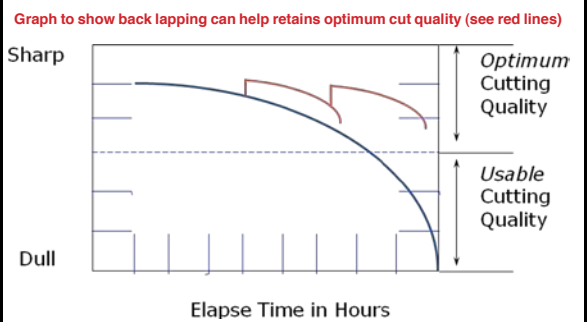
There are those who suggest back lapping is a shortcut to destroying the relief grind on a fine turf mower and, as such, something to be avoided at all costs.

John Deere suggest back lapping can be a useful tool in helping to keep a cylinder sharp, and judicious back lapping can extend the period between needing to regrind.

"A relief grind is used by all the key fine turf mower manufacturers," says Henry Bredin.

"At John Deere we see back lapping as a useful tool to help keep cylinders and bottom blades sharp.

"It is not an alternative to spin grinding and maintaining a relief. In practice, a light back lap may extend the period that a cutting unit will deliver a premium quality of cut. Back lapping is not designed to restore a cutting edge to a blunt cylinder and bottom blade".





**Cutting units. Set up to cut exactly level**

John Deere will set the cutting units of its 2500 series greens mowers in the factory so they run exactly parallel to the ground.

This is critically important in ensuring each unit will cut at exactly the same height as its neighbour and ensure an even cut height across the working width of the mower.

In practice, it may be necessary to fine tune the units that have been in service for a while, fine parallel adjustment being built in to each unit.

It is a small detail, but Deere claim this enables a 2500 mower to deliver a top class cut even when the cutting units have been in service for several years.



ABOVE AND LEFT: John Deere 2500 greens mowers come in two variants, the 'conventional' all-hydraulic 2500B and 'hybrid' 2500E. This uses a 48 volt alternator to drive brushless electric motors to power the units. The wheels use the same hydraulic system as 2500B.



Slight unit offset from the centre line is designed to help counter the 'triplex ring'; alternating the direction when doing the clean up cut will ensure the unit's wheels do not follow the same path each time the green is mown.

**Outline specifications:  
John Deere 2500B and 2500E greens mowers**

Type	JD2500B	JD2500E
<b>ENGINE</b>	Yanmar IDI Diesel TNV70-XJGM	Yanmar IDI Diesel TNV70-XJGM
Power	14.6 kW (19.6 hp) @ 3,000 RPM	14.6 kW (19.6 hp) @ 3,000 RPM
Number of Cylinders	3	3
Displacement	784 cc	784 cc
Fuel capacity	29.9 litres	29.9 litres
<b>WEIGHTS AND DIMENSIONS</b>		
Wheelbase	129.5 cm	129.5 cm
Tread Width	101.5 cm	101.5 cm
Turning Radius, Uncut Circle	45.7 cm	45.7 cm
Weight (less fuel and operator)	637.3 kg	659 kg
<b>CUTTING UNITS</b>		
Number	3, Patented offset design	3, Patented offset design
Size	56 cm (22 in)	56 cm (22 in)
Back lapping	On Board Micro with speed control	Variable adjustment
Clip Frequency	0.71 mm/kmh (0.045-in per mph) with 11 blade reel; 1.14 mm/kmh (0.072-in per mph) with 7-blade reel	0.71 mm/kmh (0.045-in per mph) with 11 blade reel; 1.14 mm/kmh (0.072-in per mph) with 7-blade reel
Front Rollers	Optional, smooth, grooved or spiral	Optional/smooth, machined grooved, or spiral
Cylinder diameter	12.7 cm (5 in)	12.7 cm (5 in)
Bottom blade adjustment	Blade-to-cylinder	Blade-to-cylinder
Height of Cut	2.0 – 19 mm (5/64 – 3/4 in) or 16 – 32 mm (5/8 – 1.25 in)	2.0 – 19 mm (5/64 – 3/4 in) or 16 – 32 mm (5/8 – 1.25 in)
Number of Blades	7 or 11	7 or 11
Cylinder speed	User preference	User preference