

James de Havilland takes a closer look at the intricacies of current machinery

The anatomy of...

New Holland T4000 Series tractors with SuperSteer

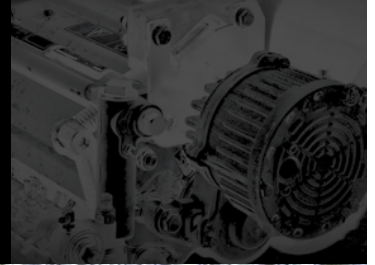
A tight turn, maybe, but how clean on fine turf? As tractors employed on fine turf grow in power and physical size, it is inevitable that there are downsides. Increased weight is one and the damage a big tractor can inflict on turf another. Is the New Holland SuperSteer™ system at least a partial solution?



Seen from above, this early promotion shot of a New Holland TNF orchard tractor clearly shows the advantage of SuperSteer. T4000 series models are developed from the TN series and are now offered with factory fit Trelleborg low ground pressure tyres.

Step-by-step Analysis...

New Holland T4000 Series tractors with SuperSteer



SuperSteer on the right has a pronounced effect on the agility of the tractor but the front tyres retain relatively flat contact with the ground, even at full lock.



Pictured on a lower powered Boomer compact tractor, SuperSteer is now a widely available feature on New Holland tractors. Note axle movement across the front of the tractor.



Viewed at full lock from above, note how the front wheel remains 'flat' at full lock. This is claimed by New Holland to help SuperSteer deliver a clean turn on fine turf.

At the tail end of 1997, New Holland launched the TNF orchard tractor series in the UK. Offered in power variants of a nominal 65, 75 and 95hp, the TNF series could well have slipped by unnoticed.

But the tractor had some standout features. These included a purpose built cab with air conditioning, electronic rear linkage control, compact dimensions and a relatively 'light' all up weight of around 2,850 kg including fuel and driver. But the real headline grabber was its SuperSteer front axle. Without brakes, this gave a TNF tractor a turn radius of just 3.3m.

By mid-1998, the tractor specialists at New Holland had been working away to find a far wider market for the TNF series, its 'orchard' designation quietly sliding in the UK. It was realised these tractors were well suited to other duties to include grounds maintenance, greens work and general amenity duties. It did not take long for the TNF to become a strong seller in these sectors.

At this point it is all too easy to go into a bit of product history and development and confuse the issue

in the process. But in brief, the TNF spawned a whole new family of tractors which essentially became known as the TND/S, with standard and SuperSteer models. Fast forward to 2010, and the TN series has now evolved into the T4000 range. These are offered in nominal 65hp, 78hp, 86hp and 97hp versions, with SuperSteer remaining a unique New Holland specification offering.

So what is SuperSteer and is it just about a tight turn?

The SuperSteer idea came from the design of the Canadian Rockies railway wagons where the bogies were designed to swing the body away from the cliff face on tight bends. In 1994 SuperSteer was originally conceived for what used to be Ford 70 and Fiat G Series from 170 to 240hp series tractors. The aim was to allow these big tractors to turn tightly in agricultural row crop work, reducing the size of headlands and thus increase crop growing area. The system worked so well it was 'scaled down', finding its way onto the TNF and subsequently virtually all tractor series in what is now the New Holland product line.

But all SuperSteer systems are not the same. On the TNF the system was linked to an extremely advanced traction management system that not only ensured optimum stability in steep terrain but also ensured the front wheels were free to turn in a tight turn with no drive once a fixed steering angle was passed. More on this later, but it is a key New Holland argument that a SuperSteer axle is less likely to mark the turf in a tight turn than a conventional four- or two-wheel drive axle.

On T4000 tractors, the front wheels on SuperSteer have a 76° turn angle. To put this into context, a 55° turn angle is considered good on a conventional driven front axle. Two-wheel drive tractors have a yet tighter turn angle, but still not as tight as SuperSteer.

This tight angle is achieved by turning the wheel hubs through 55° and swinging the axle in the direction of the turn by 21°. Look at SuperSteer in action, and you can see the axle move across the front of the tractor as it turns. This is achieved without extra rams, the rear pivot mount system of SuperSteer simply allowing the axle beam to move over as more lock is applied.

It is this lateral movement that helps to prevent the edge of the front tyres 'biting' into the ground surface, New Holland not needing to add a camber to the hub to enable the wheels to clear the body of the tractor as the lock is increased. This is further helped by the forward mounting of the axle, more of which later.

Another issue is that a conventional front four-wheel drive axle operates with a lead of 1-6 %; in other words the front wheels will turn up to 6% faster than those at the rear. When working on turf in four-wheel drive this lead can cause the front wheels to grab the turf, resulting in surface damage. To prevent this, operators should always avoid engaging drive to the front axle.

T4000 SuperSteer tractors have zero lead. So the tractor can be left in four-wheel drive. Big deal? Well on a flat surface yes. But on turf that is slippery and on a slope, all-wheel drive can help reduce the chance of surface damaging wheel slip.

So does SuperSteer work? If you compare the turn tracks made between a conventional four-wheel drive New Holland T4000 with its 55° turn angle and a SuperSteer alternative, you will see the latter actually leaves far less of an impression. So yes, SuperSteer does

appear to offer not just a tighter turn but a cleaner one too.

There are other details regarding SuperSteer and traction management. These are outlined separately.

OK, so it's manoeuvrable. But how heavy is a T4000 SuperSteer tractor?

If you take a peek at the spec sheet for a T4000 tractor, you will see a ROPS SuperSteer model will weigh in at up to 2,700kg, fuelled up and with the operator. Cab models are around 250kg heavier. Spread this load across four good turf tyres, and the tractor's foot print should be reasonable. But, of course the key to minimum compaction on a T4000 is in the type of turf tyre and its inflation pressure.

From the softest Galaxy "turf special" to the Nokian TRI 2 and Trelleborg T404 radials, which can be used as low as 6 to 10psi, the ground pressure range will be approximately within 1psi of its inflation pressure. Considering a person pushing a hand mower across the greens is reckoned to exert approx 10psi through their shoes, that is not bad.

What is often overlooked, however, is front ballast. When working with mounted kit it follows that you will typically need to put on some weight at the front of the tractor to prevent it being too light over the front.

With T4000 SuperSteer, however, the tractor has a 400mm longer wheelbase than its conventional four-wheel drive alternative.

This extra length has a noticeable impact upon the stability of the tractor with a heavy load on the rear linkage. In many cases, you may not need front weights. So the 240kg weight you save on a two-

wheel drive T4000 may actually not be an issue in the real world. As an aside, SuperSteer tractors are well suited to working front mounted PTO driven mowers; maximum front hydraulic lift capacity at the link ends is 1,275kgs.

Summary

New Holland SuperSteer is available on tractors developing from 45 to 250hp.

On New Holland Boomer compact tractors the Sensitrak™ control system that looks after the driveline is not as advanced as it is on the T4000; you have to manually engage two- or four-wheel drive, with drive to the front axle mechanically de-coupling when the steering angle exceeds two-thirds lock.

But in all cases the SuperSteer axle option enables tight turns to be made with a reduced risk of marking the turf.

As to the T4000 as a tractor, it comes in a variety of specifications with a choice of mechanical transmissions. These start with 16x16 Shuttle Command 30/40kph offering, topping out with a 44x16 Dual Command with creep speed options. You can also choose between mechanical or electronic rear linkage control, higher capacity MegaFlow™ hydraulics (100 lpm total flow) and... well the list goes on.

One option, however, that really does seem to be worth looking at is SuperSteer. It is only offered on New Holland models and it is one that has seen many a TNF/S tractor employed on golf courses and in amenity and groundcare applications over the years.

If you need clean, tight turns, SuperSteer is certainly worth a look.



New Holland Trophy Cabinet

The New Holland Super Steer and Auto 4WD system have won many awards for technical innovation and satisfied users from Machinery judges at Shows and exhibitions around the world.

- Sitevi - Supersteer & Auto 4WD system1997 - TNF
- EMIA Supersteer & Auto 4WD system.....1997 - TNF
- SIMA - Supersteer & Auto 4WD system1998 - TNF
- Agritechnica Show "Tractor of the Year"1998 - TNF
- FIMA - Saragoza-Supersteer & Auto 4WD System1998 - TNF
- AGRIBEX - Auto 4WD System1998 - TNF
- Royal Highland Show Supersteer & Auto 4WD systemTNS/TNF
- Royal Agricultural Society of England, RASE G/70series1998
- ASAE (North America) Technical Innovation.....1999 - TNF
- Royal Agricultural Society of England, RASE2000 Silver
- Supersteer & Auto 4WD system front axle, TNF- TNSmedal
- Lincolnshire Agricultural Society -2000 - TNS
- Supersteer & Auto 4WD system
- Royal Welsh Agricultural Society -2000- TNS
- Supersteer & Auto 4WD system



SuperSteer and Traction Management

Standard equipment on the T4000 Super Steer tractors is an automatic four-wheel drive control system which is the default mode when the driver switches on the ignition. Although there is also a manual override switch for permanent 2wd or 4wd mode, the operator can in effect just let the tractor manage the system. The system employs a microprocessor to monitor axle speeds and gradient to engage the four-wheel drive system and engages only when:-

- slip on the rear wheels exceeds 5%. The system engages the four-wheel drive clutch at speeds up to 15 kph. When slip reduces four-wheel drive will disengage.

- if the steering angle is below 50° and the slip is above 5%, the four-wheel drive will stay

engaged even if the steering exceeds 50°.

- if the slip exceeds 30%, and the forward speed is less than 15 kph, four-wheel drive will be engaged even if the steering exceeds 50°.

- if the tractor is being pushed down a slope with a gradient greater than 10% by a loaded trailer, the rear wheels may break traction. This will cause the front wheels to speed up in relation to the rear. When this difference in speed reaches 15%, four-wheel drive will be engaged. When level ground is reached four-wheel drive will disengage.

- above 15 kph four-wheel drive will be temporarily disengaged.

When both brake pedals are pressed together, four-wheel drive is engaged to provide four wheel braking.

New Holland offers its T4000 series tractors with a conventional driven front axle. SuperSteer variants having a longer wheelbase which in turn could mean less ballast would be needed up front.