

BACKSEAT DRIVER

Rear steer on rigid trucks has been around for a few years now, and has been widely adopted by those parts of the industry where tight access is a daily obstacle. Options are far more limited for semi-trailers, finds Lucy Radley

Rear-steer options for semi-trailers may involve turntables controlled from the fifth wheel using rigid bars, or cable-based systems working on similar principles.

Fully hydraulic steering systems as used on multi-axle low loaders by the likes of Nooteboom and Broshuis are commonplace; many offer the facility to manually override the system using a handheld remote. This means that the axles are temporarily controlled electro-hydraulically by a second driver for manoeuvring at slow speeds, switching back to hydraulic-only for full-speed driving. But there are systems out there that are fully electro-hydraulic, controlled by ECUs via sensors on both steering axles and fifth wheels. Two such systems are profiled here.

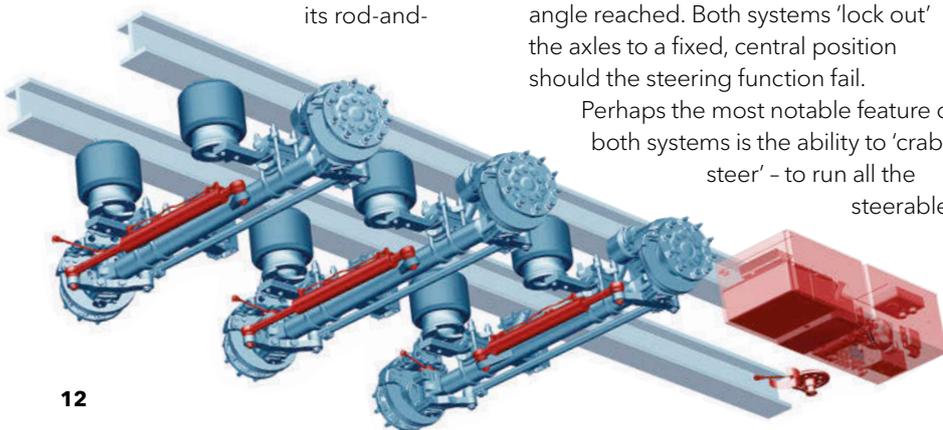
The mechanical basics are common between both platforms. Electro-hydraulic steering only turns the wheels themselves, unlike its rod-and-

turntable-based mechanical counterpart. This is done by small hydraulic rams slung from and lying parallel to the existing axle and attached to a steering knuckle at the end. The pressure needed is supplied by an electro-hydraulic pump, powered itself either by deep cycle batteries attached to the trailer chassis or directly via the tractor unit through an additional electrical suzie.

CONTROL

To control all of this, two contactless magnetic angle sensors are used, one in the trailer kingpin, and another on the command-steered axles themselves. The first measures the angle of articulation between trailer and tractor unit as the combination turns, sending that data as a signal to an ECU located somewhere on the trailer chassis. This then calculates and controls the hydraulic action needed for the wheels to turn, the second sensor again measuring the angle reached. Both systems 'lock out' the axles to a fixed, central position should the steering function fail.

Perhaps the most notable feature of both systems is the ability to 'crab steer' - to run all the steerable



axes parallel to each other, but not necessarily to the trailer chassis. As in other cases, this is achieved by manually overriding the system using a handheld remote control box, and can be useful in two ways.

The most obvious application is as a means of getting out of trouble. Even with the help of rear steer, it is very easy for drivers to find themselves wedged hard up against a wall or other obstacle, especially when manoeuvring in tight spaces. By using the remote, the driver can turn the trailer wheels in the opposite direction, enabling the operation to continue while at the same time running the trailer away from the problem.

The same functionality can be used to provide flexibility to position the rig where parking is difficult, or, in the case of a low loader with a driver's assistant, steered through routes which could not be accessed in the normal way.

One system is Dutch firm VSE's Electronic Trailer Steering (ETS) system, pictured left and p14. Its UK agent is Leicestershire-based steering solutions specialist IMS Group. The product is aimed squarely at the urban distribution market, with the goal of enabling maximum-length trailers to replace their



REAR-STEER TRIPLE

Kilkenny, Ireland-based animal feeds manufacturer D Walsh & Sons Manufacturing is using a Volvo FH 6x2 tractor unit to haul a Muldoon tandem rear-steer trailer (pictured above). Muldoon's Sidewinder steering system comes in mechanical or hydraulic versions; it is said to offer much manoeuvrability for restricted space deliveries of animal feed and agricultural supply products.

In Essex, Green Recycling always ordered 8x4 hookloaders. However, these vehicles' telematics data demonstrated that they only spent 2% of their lifetime off-road, which has driven a shift from 8x4 double-drive specification to 8x2 rear-steer/lift axle on a new Scania P 360 XT rigid. Similarly, Green Recycling has taken the opportunity to amend the wheelplan and improve manoeuvrability of its refuse collector by switching from 6x4 double-drive to 6x2 rear-steer, of which it ordered a Scania P 280 6x2 XT rigid. Both were delivered by Scania dealer TruckEast. Managing director Rob Smith explains: "We have seen so many advantages of the vehicles already. Our drivers appreciate the extra manoeuvrability, and eco-mode makes driving more relaxed."

To the west, Plant Speed of Bristol uses heavy haulage equipment for cost-effective transport solutions. A new 32-tonne, rear-steer 8x4 Mercedes-Benz Arocs 3246, equipped with crane and Andover beavertail body from City West Commercials, is described as a 'Swiss Army knife' of a truck, capable of undertaking all sorts of tasks. Says managing director Paul Lomas: "We didn't need double-drive. Instead, we wanted a vehicle that's economical to operate and agile - the sites this truck has to access can be quite tight, so the rear-steer axle is a big help."

smaller urban-specific counterparts, thus reducing the number of vehicles and deliveries needed. The model has also been applied to agricultural bulk deliveries, with similar results (see also box, right).

"VSE is about getting bigger stuff into smaller places," contends IMS Group's sales and marketing manager Ben McEvoy. "If you looked at VSE alongside a single-bar turntable system, then it is more expensive, but this isn't about making a trailer steer." The theory is that operators can save money by, say, replacing three 10-metre urban trailers with two 13.6-metre tri-axle equivalents. In one example project involving retailer Argos, operated out of its Wincanton Logistics-run Bridgewater RDC in 2013, payback was achieved in just 26 weeks, the company claims.

"That was the first system we fitted in this country, and we got a 13.7-metre trailer - tri-axle configuration with the centre and rear steered - into the same place they used to deliver with a 10.5-metre urban," according to McEvoy. This was done in conjunction with the depot's driver-trainer, as obviously a change in mindset was needed. While drivers can just be left to work out how the new trailer moves for themselves,

skill transferral will be far easier with some kind of initial guidance. "When it's configured correctly with VSE, the trailer will follow the same line as a drawbar combination, and that's a change which isn't always easy to mentally transpose."

While all three axles can be steered, McEvoy says his company doesn't necessarily promote that, as the cost can outweigh the benefit - literally. "A two-steered system weighs less than 200kg, so it's super light," he explains. "When you go to three axles, that goes up to around 450kg, because you need a bigger locker for the additional batteries." The locker he refers to is mounted forward of the axles, and contains all the equipment necessary for the system to work.

A VSE ETS system with two steered axles costs around £12,000, against closer to £4,500 for a turntable-based mechanical equivalent, with a fully hydraulic system coming out somewhere between. Payback or not, it's still a large cash outlay.

The case for purchase includes a maintenance benefit, McEvoy argues. "To start with, an electro-hydraulic system needs very little maintenance," he says. A hydraulic system needs regular bleeding where VSE doesn't,



and the only extra greasing required is to the knuckle joints on the axles themselves.

"But the big thing is that VSE is massively intelligent; it's programmable based on the specific operation," he continues. "For example, a T-junction is effectively 90°, but you can tell the system not to turn until you reach 30° of articulation. So you can retard the steering to give you a good balance between your cut-in and your swing-out."

PRODUCT ALTERNATIVE

The second example is the EF-S electronic steering system from another Dutch manufacturer, Tridtec, pictured above (inset), which is aimed at two sectors. The first is low loaders, where the need for low neck height rules out the use of a mechanical system; an added bonus is that the extra pipes and maintenance associated with traditional hydraulic set-ups are no longer needed. Then there are those applications where weight sensitivity and limited space along the chassis make mechanical options of limited use, such as milk tankers on farm runs and bulk transport.

There are several differences between the VSE and Tridtec systems, the main one being that EF-S is not recommended for urban distribution applications. "If you have plenty of space and 22.5in wheels, why spend three times the money for electro-hydraulic instead of a turntable system," asks Carlo Dobbelaar, Tridtec technical sales

manager. "A mechanical solution is cheaper and works with any tractor - there's no need for an extra electrical connection."

That aside, the Tridtec offering has a different design philosophy. Because one of its main selling points is the ability to fit on chassis where space is very limited, the layout of EF-S is such that it comprises a group of small components, as opposed to having one large locker containing everything. "Steering valve blocks, for example, are units you can put closer to the axle, then use hoses to reach the cylinder," Dobbelaar explains. "The downside might be that you need more pipeline to do this, but having three lines from the main unit straight to the back is relatively easy to build."

Tridtec also offers a choice of two different cylinder rods to turn the wheels. The double rod end is for single-tyred applications, and is easiest to fit. It is mounted on the kingpin arms of the axle then attaches to the axle beam using clamps. With this rod, the sensor needed to determine steering angles is fitted to the steering knuckle. But for applications involving twin-tyred axles, where available space is reduced, a single rod end is mounted to the axle at one end, and then to the back of the kingpin arms at the other. With this version, a device within the cylinder itself measures the

position of the piston head.

The final difference is in how the steering angles are calculated and executed. EF-S includes a hydraulic accumulator which stores enough pressure to enable an immediate response when the vehicle starts to turn. As a result, steering starts from zero degrees articulation. Says Dobbelaar: "If the steering reacts more quickly, then, in general, it will be smoother. If you have a delay, it could mean that friction starts to build up, putting the joints under more pressure." EF-S is usually set using Ackermann steering geometry based around a centre point. [TE](#)

ANALYSIS

It's difficult to know whether these electro-hydraulic systems are worth pursuing from an operational perspective. Certainly the low loader use case seems to stack up, as currently such trailers need both full hydraulic and electro-hydraulic elements to be of greatest use; using one of these systems would reduce that to electro-hydraulic alone.

But for the other applications suggested, both VSE ETS and Tridtec EF-S seem, dare it be said, like overkill. There are advantages, granted, but ultimately only the operators concerned can decide whether they're prepared to swallow the not inconsiderable upfront cost of electro-hydraulic over a simple self-steer system or one of the other solutions available.

-Lucy Radley