

The eyes have it

Another coach bolt is being screwed firmly into the coffin of the manual gearbox, with the arrival of predictive automated powertrains. Ian Norwell examines the technologies and some quite different approaches

Considering how recent the move to automated manual transmissions (AMTs) on heavy trucks has been, it's perhaps surprising that technology advances have not abated. Yet three of the truck OEMs and one of the major gearbox providers are all bringing forward major developments to their AMTs that will adjust ratio-shifting decisions by looking ahead to take account of the topography. In effect, all are addressing one of the last protests from those die-hards whose fingers just cannot be prised away from a manual gear stick: 'The truck can't see the road ahead'. Well, now it can.

And although there are significant differences from the developers, in terms of nuances of execution, their effects are broadly the same. A truck will be able to 'see' both ascents and descents sufficiently far in advance to make the best decisions not only over which gear to engage, but also when to push power, when to coast and when to engage retardation. As ever, improved fuel economy is the goal and claims are being made of between 3–5% gain.

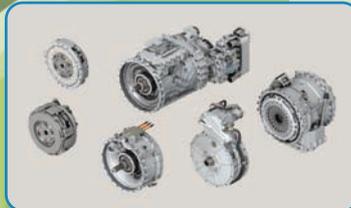
Different strokes

Looking at the detail, Daimler launched its new all-seeing transmission on the New Actros truck and it's available to order now. The fruits of early development were first apparent in 2009 when a GPS-based speed regulator was introduced on some of its Freightliner trucks in the US. However, the full-blown intervention, now available as 'predictive powertrain control', combines the existing adaptive cruise control with pre-emptive shifting.

Essentially, it uses GPS data to determine the position of the vehicle and the topography of the road ahead in real time, and so orchestrate the truck's attack on hills. For example, unlike standard 'blind' systems that cannot see ahead, this transmission will take an early single shift to use peak torque at the right moment, thus avoiding two ratio changes later.

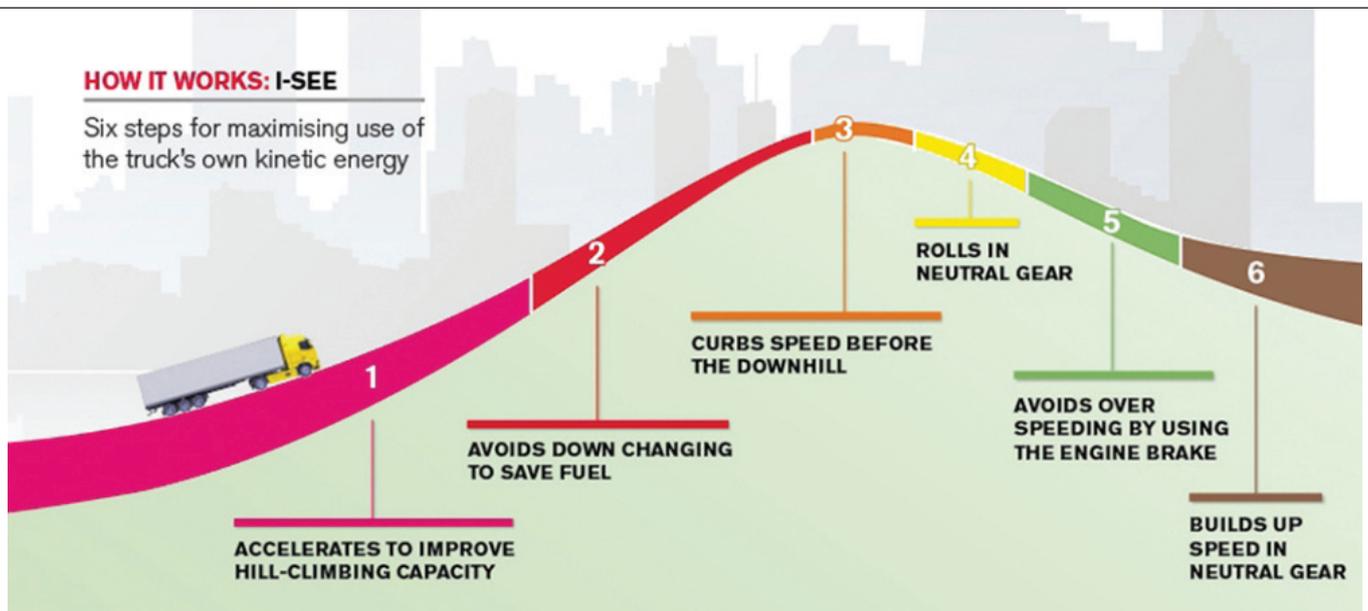
Meanwhile, Scania's Active Prediction cruise control, which also harnesses GPS data, has been available since early this year. Again based on locational information, the gearbox calculates the most fuel-efficient speed profile every second. Reading the road for up to 3km ahead (compared to Mercedes-Benz 4km), it identifies the severity of the ascent and where to deploy the power and shifts. An approaching descent will also be detected and retardation calculated.

Active at speeds greater than 60km/h, it will marginally override the set cruise speed to get a run at a hill. Strategies



GPS, tilt sensors and computer power: meet the new world





vary between truck models, according to engine rating, and it is also continually adjusted by payload.

Volvo has its own, somewhat different, take on the idea (Transport Engineer, August 2012, page 35) with its I-See. This also uses GPS data, but not to view the landscape, only to establish the truck's position. Using the gearbox's tilt sensor, it calculates gradients as it travels, reacting to them and storing data for future use. This means that, on its first time out for a specific route, the truck is learning and saving the information for the next trip on that road, rather than behaving optimally.

Set for a spring 2013 launch, this new transmission is mated to Volvo's already successful I-Shift automated box. However, without active topographical maps to prompt decisions, there is a concern that it may initially spend too much time learning and not enough doing, particularly for general haulage operators. On the other hand, fleet engineers who distrust the vagaries of satellite navigation may prefer to rely on this real-world data, which comes from the truck itself, not digitised maps.

Last, but certainly not least, comes the transmission specialist from Friedrichshafen, Germany – ZF. Likely to provide its technology to UK truck market leader DAF, as well as Iveco and MAN Truck & Bus, ZF will probably make the biggest impact in the long term, just by weight of numbers.

All-round transmission

Its new TraXon transmission, which will replace the popular and long-serving AS-Tronic from early 2014, uses a similar GPS system and gearbox control software to provide a PreVision function. But PreVision is only one element of a complete revision of this heavy truck transmission. With an eye to spreading the development costs as widely as possible, ZF engineers have constructed a modular offering, with a basic 12- or 16-speed range-change and splitter box that can take five different output options.

In keeping with ZF's position as a supplier of transmissions to cater for all, the new TraXon will also be available with a conventional clutch (automated, of course), a dual clutch, an engine-driven PTO, a hybrid generator or a torque converter fluid coupling. The dual-clutch module has the potential to turn in some of the best fuel figures, because it addresses the issue of lost momentum between shifts. As one of the clutches is always bearing the load, it leaves the drive effectively unbroken.

ZF's TraXon Dual can also allow longer rear axle ratios to be

specified to drop engine speeds in top gear. This would increase shift frequency in conventional single-clutch AMTs, which would need to react to mild gradients. But the dual clutch can cope with the increased shifting – under load and without torque interruptions – and deliver better economy, according to ZF.

If an unbroken drive is desirable when the demand is for traction, then, equally, the ability to break it by disengaging the clutch for short periods of coasting, is just as vital to make the performance figures for most of these new transmissions. Already with us as 'EcoRoll', from both Volvo and Mercedes-Benz, the ZF TraXon will join the freewheeling club, and all three will use it more intelligently than before, via the GPS link.

Transport Engineer tested the cooking version of EcoRoll on the launch of the New Actros last year. On a 228km (141 miles) mixed test route, 35km (21 miles) was covered in this coasting mode, meaning that 15% of the route was effectively free – or nearly free – with the engine reduced to tick-over. With the addition of a pair of GPS 'eyes', Mercedes' upgraded 'Anticipatory EcoRoll' must bring further economies.

From on-highway testing, Anders Eriksson, who was responsible for the development of I-See at Volvo Trucks, also claims "a 5% fuel advantage from the freewheeling mode". And he explains: "I-See works best in undulating terrain, with moderately long and steep slopes, where it ensures that you can freewheel for long distances, without using the engine."

The only truck maker not to use this coasting facility is Scania and it may be missing a trick, as the benefits are already clearly established. However, none of this comes free. Even though much of it is software-driven, the development costs must be recouped somehow. The bill from Scania is £480 when added to its existing 12-speed Opticruise gearbox. This looks modest, compared to Mercedes-Benz's £1,348, and the expectation is that Volvo's I-See will be even more.

ZF's TraXon is too far away to price, but one potential recipient, Daf's marketing director Tony Pain, doesn't expect an unseemly scramble for it. "The uptake for adaptive cruise control has been very small so far and we are not necessarily planning to offer the ZF PreView with our early Euro 6 DAFs when the TraXon transmission arrives," he asserts.

As ever, customer demand will drive the figures, but, if transport engineers are able to realise the 3–5% fuel advantage, it won't take them too long to get their money back. ¹¹