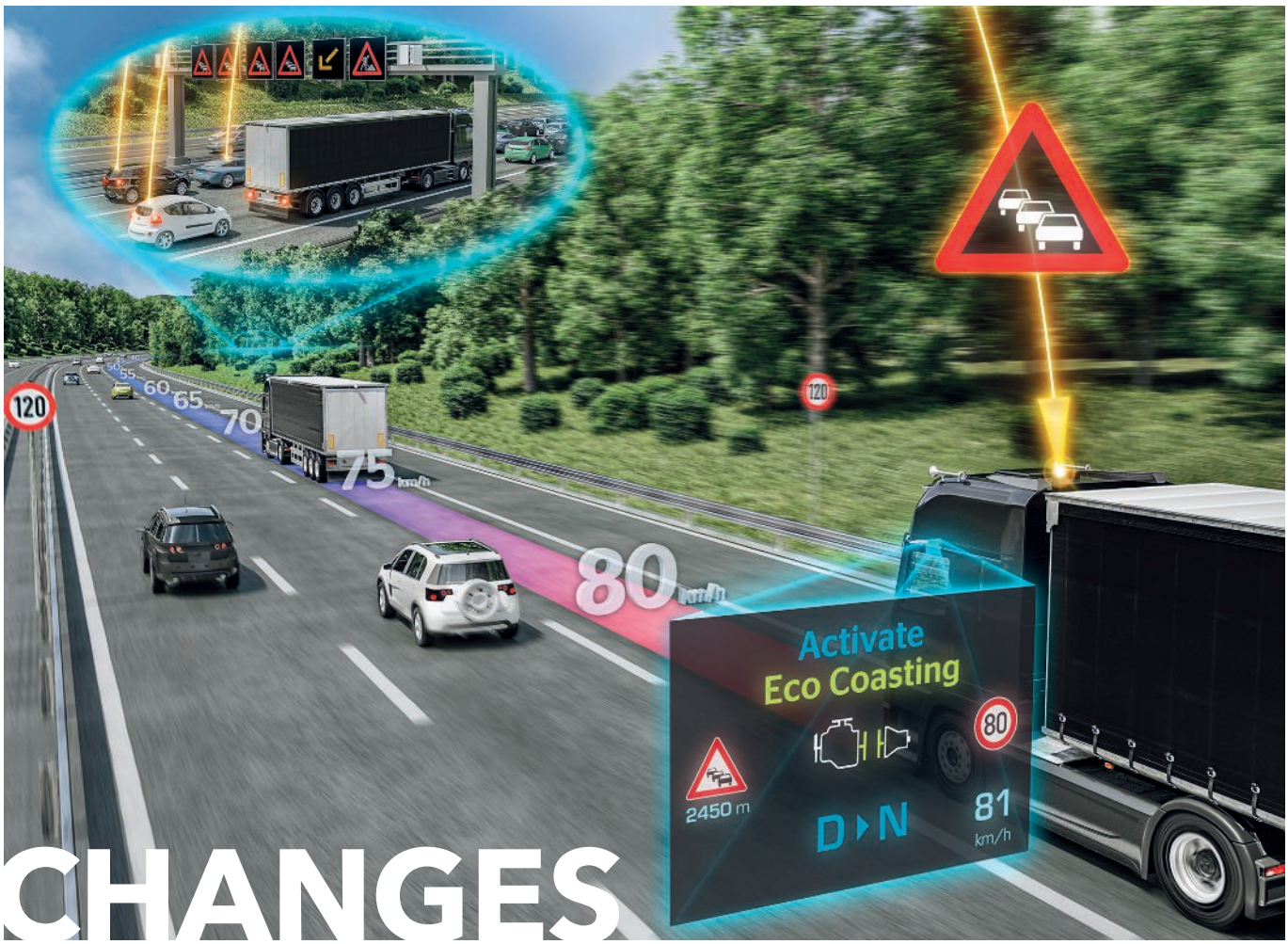

CHANGES FOR THE BETTER

Out with gearsticks, in with connected smart transmissions and predictive shifting, as automated manual transmissions conquer the CV world, reports Richard Simpson

Conventional stick-shift gearboxes have long disappeared from PCVs (passenger carrying vehicles) and are a distinct rarity on virtually all heavy trucks, excepting some specialist types (see also *https://is.gd/umesuw*).

So the automated manual transmission (AMT) is here to stay. And one of the reasons for that is that it has been continuously improved since its first shaky introduction in the 1980s.

While the less said about the first generation of AMTs the better, the technology underwent a great leap forward with the introduction of Volvo's acclaimed I-Shift (pictured, p34). It appeared in 2001 in trucks, and 2004 in coaches and buses. It was genuinely automatic in operation, lacking a clutch pedal and being able to select the appropriate ratio by analysing information about vehicle speed, acceleration, weight, road grade, and torque requirement harvested from other systems on the vehicle. The I-Shift's own electronics establish the correct ratio for the situation, and the corresponding gear is engaged via pneumatic actuators. In some applications, the driver can override or anticipate the I-Shift's decision, while in others (more usually passenger-carrying) he or she cannot.

The software can be programmed to adapt an all-purpose transmission to a variety of duties through different shift strategies, such as holding lower gears for off-highway operation, or softer shifting in buses and coaches. So fine is the control it asserts over the rest of the driveline that I-Shift dispenses with the transmission's synchro gears; engine and road speeds always match, without mechanical intervention. Even slicker changes are made possible by the addition of a dual-clutch option.

Other vertically integrated manufacturers followed suit, and proprietary manufacturer ZF joined the party with its AS-Tronic in 2003, which was found first in IVECO and subsequently DAF and MAN models.

Further refinements have followed, most notably in 2012, when Mercedes-Benz introduced Predictive Power Control. This uses 3D mapping and the truck's GPS to determine the contours of the road ahead, and select gears

The next step is harvesting real-time information (such as traffic) from other vehicles on the road, combining it with route data and sending it to vehicles via a wireless network, enabling connected vehicles to see conditions on the route ahead

accordingly, while taking factors such as the truck's weight into account. Besides choosing the correct gear (and throttle) settings for ascents, the truck can also decide to activate its EcoRoll function when it reaches the summit. That allows it to coast down a gentle incline to gain momentum for the next climb, or select a lower gear to maximise retardation. This system, which now has counterparts on other manufacturers' trucks, can generate fuel savings of up to 3% on rolling terrain.

WHAT'S NEXT?

An obvious step would be to kill the engine altogether when the truck is coasting downhill, as fuel is wasted idling it, although this would probably necessitate switching systems that are currently engine-driven, such as steering and air compressors, to independent power. This avenue is currently being pursued by transmission firm Eaton in North America.

In Europe, Continental provides predictive drivetrain control to truck manufacturers: its so-called 'static eHorizon' uses topographic data provided by mapping company Here Technologies, which is involved in supporting development of autonomous vehicles. The next step is 'dynamic eHorizon': it will harvest real-time information (such as traffic) from other vehicles on the road. That will be combined with route data and sent to vehicles via a wireless network, enabling connected vehicles to have a view of conditions on the route ahead, and adjust their gearshift and coasting strategies accordingly. Besides optimising gearchanges, the system will also be able to warn the driver about unexpected obstructions such as a traffic jam around a corner (pictured p33).

FILLING THE GAPS

There are a small number of situations where AMTs struggle, notably where very fine clutch control is required. These challenges are being met in a variety of ways. For instance, ZF's TraXon, the modular AMT that has succeeded the AS-Tronic, boasts a number of options, including programmable software to aid low-speed shunting, and 'rocking out' a truck that has become stuck in mud. There's a torque-converter option, too.

But, in an admission that there are times when only a manual clutch will do, Scania recently introduced what it dubs the 'clutch on demand': a manual pedal that restores control to the driver's left foot when required, but otherwise allows the vehicle's Opticruise in-house AMT to do its own thing. As such, it must be seen not as a reversion to manual technology, but as another nail in the coffin of the stick-shift box. Clutch on demand allows Opticruise to be used on vehicles that would otherwise require a traditional manual box; for example, concrete mixers. These often have to run the engine at high speed to ensure that the PTO-driven body can discharge its payload, while the vehicle inches along chuting concrete into a trench.

Scania is, of course, a leading advocate of predictive maintenance. And it seems that ZF will be going the same way. From 2019, the TraXon transmission will be able to predict when it needs a fluid change or new clutch plates – allowing for timely workshop interventions before failures.

Rather than develop its own system, automatic transmission manufacturer Allison has instead offered data connection capabilities to all leading telematics providers in North America: a market where full automatics are not unusual even in mainstream trucking operations. (Here in the UK, they are mainly confined to buses.) Two years ago, the American manufacturer claimed that its Fuel Sense Max software was responsible for returning an 8% fuel saving when installed on an Optare Metrocity bus equipped with an Allison xFE transmission. The software exploits optimised gear ratios to deliver proportionally longer transmission lock-up times and using higher ratios to reduce engine speeds.

Voith is on the fuel-saving trail, too. The latest incarnation of its long-running bus transmission, DIWA.6, is claimed to save 5% on fuel consumption compared to its predecessor, thanks to a number of factors. They include reduced working pressures, a more refined automatic neutral shift facility that reduces the time the bus is idled in gear, and Voith's SensoTop topography-sensing gearshift programme. And DIWA SmartNet is Voith's predictive maintenance tool.

In summary, transmission developments these days spring from silicon rather than steel: software, big data and connectivity lead the way. TE