

Paradigm SHIFT

Quietly and without fanfare, transmission designers are making significant improvements to their products and offering operators interesting opportunities. Toby Clark reports



Scania's Urban Tipper Concept uses a two-pedal Opticruise automated transmission

For heavy-duty applications, the focus of innovation is often the engine, with transmissions taking a back seat. But improvements are taking place not just to improve efficiency but also driveability – particularly centred on starting, stopping and manoeuvring.

The battle between manual gearboxes and AMTs (automated manual transmissions) is over, with only a few diehards sticking with the former. Indeed, ZF says manuals will have gone “by 2025” for mid-duty trucks. Meanwhile, there isn't a race to add ratios, as seen at lighter weights (Aisin now offers a 10-speed AMT for cars): trucks are fixed at 12 and 16 speeds.

That said, Volvo recently introduced two-speed crawler gears for its I-Shift AMT (*TE*, July 2016, page 16), with an extra-low option at 32:1 for precision manoeuvring off-road, even at extreme weights – impressively, using the standard clutch. Meanwhile, hydrodynamic or torque-converter transmissions (TCTs) are incorporating better electronics and even being combined with conventional gearbox mechanisms to improve efficiency.

ZF AS-Tronic was the first of the AMTs to make a splash, selling a million units

to date. Now its long-awaited TraXon, announced in 2012, has entered service on Iveco's latest Stralis XP tractor: Iveco calls it Hi-Tronix. TraXon's modules allow different clutch, PTO and hybrid drive units to be added to the basic AMT. Options include conventional single- and dual-plate dry clutches, or a double-clutch for seamless shifting. The latter, dubbed TraXon Dual, can make eight of its 11 shifts under load.

Other options include a PTO module and the WSK torque converter clutch, which adds 300kg but enables zero-wear take-off and includes a retarder. Meanwhile, a 120kW electric hybrid module incorporates energy recovery and electric stop-start, as well as the ability to boost engine torque.

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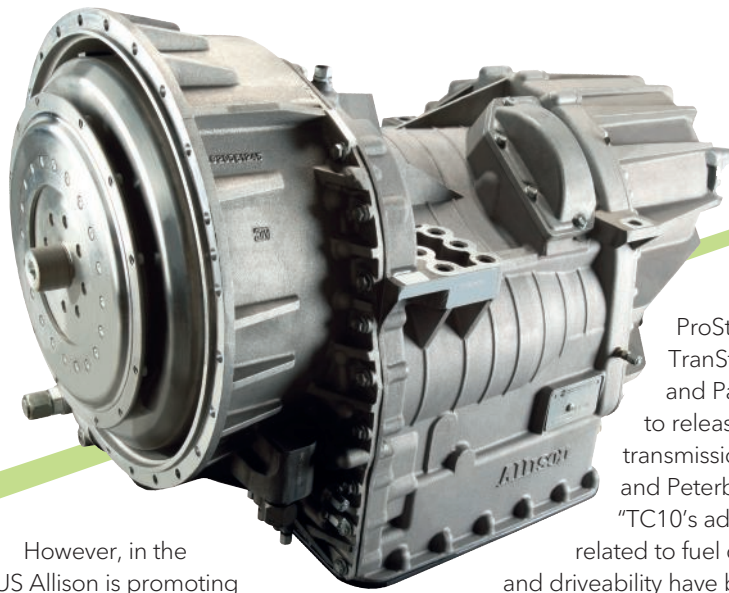
TraXon's maximum torque rating is a massive 3,500Nm at up to 940bhp; the ratio range is from 12.92-0.77:1 for the 12-speed; and ZF claims the highest overall transmission efficiency, at 99.7%. Its design incorporates GPS predictive shifting and a 'rock-free' mode. ZF has also demonstrated its optional 'crawl' function – which drives the vehicle slowly with the brake pedal released, as per a torque convertor – on a DAF-powered

VDL coach. Finally, 'manoeuvring mode' limits clutch engagement to enable precise forward or reverse movement.

Software is improving existing boxes, too. MAN's TipMatic 2 (AS-Tronic) features 'idle speed driving', designed to make low-speed manoeuvring easier and let the truck flow in jams. It allows the driver to proceed without touching the accelerator, the engine idling at 600 rpm. The box downshifts if it sees insufficient torque, and a firm touch of the brake pops the clutch.

Scania, too, has put thought into its clutch actuation and control. Its two-pedal Opticruise AMT has an electro-hydraulically actuated unit said to improve precision (*TE*, December 2014). The clutch engages fully at low engine speeds, using data from load and inclination sensors, while its 'manoeuvring mode' gives more sensitivity at low speeds.

Scania's manual gearboxes also have 'launch control', which maintains revs during takeoff, and a couple of optional clutch protection features. 'Clutch wear protection' limits engine speed to 900 rpm when taking off (but can be overridden) while a clutch overload warning alerts the driver if the clutch is being abused.



However, in the US Allison is promoting its TC10 as an alternative to manuals or conventional AMTs. Its 'blended architecture' combines a torque converter with a 10-speed twin-countershaft box having multiple wet clutches to deliver constant drive. The torque-multiplying effect lets it start with a relatively tall first gear (7.40:1) while maintaining a 0.86:1 overdrive top. Allison says some have documented 5% fuel improvement with TC10-equipped tractors over current manuals or AMTs.

The TC10 is suitable for engines up to 600bhp and 2,305Nm, and Allison is confident enough to give a five-year/750,000-mile warranty. It is currently

offered in Navistar's ProStar and TranStar trucks, and Paccar intends to release the transmission in Kenworth and Peterbilt ranges. "TC10's advantages

related to fuel consumption and driveability have been gaining interest from European manufacturers, but ongoing discussions cannot be disclosed," comments Allison marketing director Manlio Alvaro.

Nigel Marson, OE account manager at ZF, suggests that some of the push towards torque converters is coming from operators. "In heavy city operation, where the stops per km are high, we always go with TCT." The spectrum of driver skill level is also a factor, but he cites one home-delivery firm that recently moved from AMTs in its 3.5-tonne fleet to ZF 8HP automatics.

"Today's adaptive shift control means we can run the engine in the green band

Allison's TC10 is a heavy-duty automated manual mated to a torque converter for seamless start-up and shifting

more consistently. It's coming to the point that TCTs are saving clutch life and saving fuel." ZF's PowerLine eight-speed torque-converter unit is related to the 8HP but designed for commercial use, with PTO provision. Despite a dry weight of just 150kg, it is rated at 1,400Nm for vehicles up to 26 tonnes gcw.

Marson makes the point that on intercity routes an AMT performs well on the motorway, but in traffic congestion "you are reducing your clutch life". ZF's EcoLife six-speed TCT, largely used in coaches and city buses, will soon be available with stop-start, said to deliver fuel savings of up to 10% in urban use. The torque converter and lock-up clutch have been reinforced to handle the load.

More significantly, the converter design has also been changed to sustain oil pressure for longer when the engine stops and hence speed up gear engagement on start-up. The start-stop option will first be available for torque ratings up to 1,700Nm, but a planned increase to 2,300Nm may make it attractive for heavy coaches, tippers and larger distribution trucks. **TE**

ZF's TraXon AMT can be specified with modules such as a torque converter, a DCT clutch and an electric motor

