

Cinderella comes to the ball

They may live in the shadow of engines, but with Euro 6 a done deal, transmissions are stepping up to the plate in the search for fuel economy. Ian Norwell reports

With fuel-friendly Euro 6 engines now fully in service, AMTs (automated manual transmissions) have been keeping up the pressure on their manual rivals. But for the next revolution, engineers have been eyeing up the component between the two – the clutch.

AMTs have dramatically extended clutch life, to the point where friction plates are not the fast-moving parts they once were. And, as the software improves, even bastions of resistance, like the muck-away and construction sectors, are falling for their blandishments. Why? Because handing over shift control to an automatic system not only saves fuel and clutches, but also takes away the potential shock delivered by a size 11 boot.

However, while converts are flocking to AMTs, other developments are also in train – some taking time to come to fruition and others whose fuel-economy credentials are difficult to assess. At last

year's Volvo FH driving introduction, for example, Astrid Drewsen, product manager for drivelines, justified yet another delay to its I-Torque launch, saying: "We wanted to make sure it is absolutely right." Glad to hear it, and you would expect nothing less, but an additional year shows just how hard this next hurdle – a twin clutch system (TC) – is to clear.

Yet the prize of uninterrupted torque during gear shifts – replicating torque converters' fluid couplings – is the big win here and it is coming. Volvo's I-Torque name may have been parked, but its I-Shift Dual Clutch is now due out this autumn for Euro 6 D13 engines at 460, 500 and 540bhp. In operation, two input shafts and a dual clutch allow two gears to be selected at once, with the intelligence in I-Shift determining which is active. Shifts are expected to be seamless.

Dissent in the ranks

Meanwhile, as a supplier to several major truck brands, ZF brings much more volume with the TC version of its TraXon box. Not

everyone is taking the bait. Ron Borsboom, chief engineer at DAF, is unconvinced, seeing the system as offering insufficient benefits to justify the extra cost or weight. Another dissenting voice comes from Bernd Maierhofer, R&D director at MAN Truck & Bus. He doesn't believe that TC designs are the way

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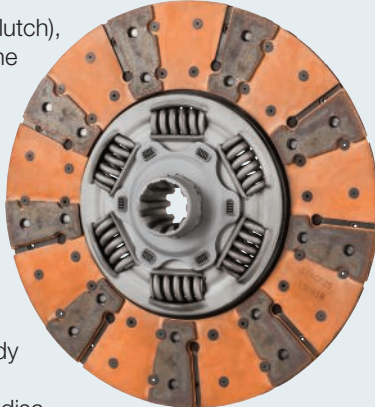
Bullet-proof materials

Until Voith's TRC (turbo retarder clutch), or a similar device, pensions off the conventional unit, it's with us in virtually every mainstream truck gearbox – even if subject to less wear and tear than before AMTs.

However, it is entirely possible that advances in materials might render clutches bullet-proof, and change perceptions about which way to go.

Some manufacturers are already making them sturdier. Eaton, for example, has developed a clutch disc – admittedly for heavy-duty applications – with ceramic facing to extend component life. “Our cushioned ceramic clutch discs, for manual transmissions, feature a ceramic facing instead of traditional organic materials,” says Artur Koba, the firm's product and strategy manager for trucks. “That makes them more heat-and wear-resistant than conventional clutches.”

His view: the new clutch meets the requirements of any commercial vehicles subject to frequent stop-start driving cycles under high loads.



Passenger-carrying technology?

Buses and coaches have been big beneficiaries of transmission innovations, but it seems city buses have yet to feel significant change. Norman Thomas, UK product engineering manager for Volvo Bus, says that its I-Shift transmission has been very successful in the heavy coach market. “The shifting efficiencies of our heavy truck gearbox and controls readily adapt to long-distance coach work, with just minor software tweaks,” he says.

However, the stepless shifting of a traditional hydraulic torque converter automatic is still the staple for city bus operators, whose passengers have come to expect the comfort. “Even AMTs cannot offer the uninterrupted torque that avoids city bus passengers head-nodding between gear shifts,” explains Thomas.

He also predicts that Volvo's dual clutch design is unlikely to make it into coach chassis, as it is too long. Maybe one of the other designs that offers no torque interruption will eventually make it into city bus operations? In an ultra-conservative market, that could take a long time.

forward for trucks. “The extra gear pathways engaged over longer periods will inevitably damage fuel economy,” insists Maierhofer.

He concedes that unbroken torque may improve journey times marginally, while also increasing comfort and saving gearshifts, but he suggests the losses outweigh any advantages. So don't expect a TC from MAN anytime soon.

It's all about gvw. Daimler's Canter was the first commercial vehicle with a TC in the form of its Duonic six-speed box, which uses two wet

clutches. That unit is claimed to be wear-free and to last the life of the truck. But this is at 7.5 tonnes, where the incremental losses suspected by MAN's Maierhofer are of little moment. The capital costs are also not serious, if real benefits are to be had. The Duonic (standard at 7.5 tonnes) adds up to €2,500 on other models. Volvo's I-Shift Dual Clutch will add £3,400 to the list price. With I-Shift already a benchmark, that would pay for quite a few friction plates.

Another approach

Meantime, transmission specialist Voith has developed a novel way of handling power transfer from engine to gearbox. Its turbo retarder clutch (TRC), jointly developed with Mercedes-Benz (*Transport Engineer*, July 2014, page 18) for heavy haulage, may well see action in other transport sectors. Martin Becke, head of engineering for automatic transmissions and start-up systems, says: “It is suitable for all applications with high loads to a dry clutch, and for vehicle segments in need of sensitive manoeuvrability.”

He also cites the municipal sector – traditionally a big user of torque converter automatics. With a fit-and-forget approach, Voith's TRC mated to an AMT looks like the dream ticket. A non-wearing dry clutch coupled to a hydrodynamic clutch for starting away, added to the now proven effectiveness of an AMT, seems ideal for consigning worn friction plates to the stillage of history.

Possibly the shyest debutante at the ball is Allison's TC10 twin-countershaft gearbox, which eliminates torque break between shifts using an assembly of seven wet clutches. It's had a nine-year gestation period, but extended demonstrations in US fleets have reportedly gone well. TC10 is finally being delivered in Navistar trucks and Allison is now “working with OEM partners” looking at the European market. In the meantime, the firm has added FuelSense to the TC10 tractor transmission, and other boxes in its line-up. A fuel efficiency package, using Allison's ‘fifth generation’ smart controls, it can be tailored to specific applications and duty cycles.

Which will capture the imagination of fleet engineers and hence the market? Who knows? With the inevitable further refinements to AMTs, Voith's TRC is a powerful contender for the neatest package. The twin clutch camp has yet to prove the kit's fuel economy and all of them have to offer a return that stacks up against the extra investment.

Many could also be victims of their predecessors' success. Current levels of refinement in Volvo's I-Shift, Mercedes' PowerShift3 and ZF's offerings across several brands are very good. To capture the attention of fleet engineers, the first to effectively relegate the clutch to a passive, non-wearing device, could scoop the pool. 