

Truck transmissions running at STGO gross weights take a lot of punishment and they need skilful handling. The driving launch of the Mercedes-Benz SLT heavy haulage chassis shows how the load can be lightened, reports Ian Norwell

Turbo retarder



Many heavy haulage (HH) operators still rely on manual gearboxes. The fuel penalty of a torque converter fluid coupling is just too much to bear. But now they have a new device to consider: the turbo retarder clutch, or TRC, an early version of which made a stealthy debut as an option on the predecessor to Mercedes-Benz's new SLT range, the Titan.

It's an interesting story. The conundrum for Daimler's engineers was how the TRC's high design and build costs could be justified on the super-heavy niche market. The answer was a joint project with a transmissions specialist – in this case, Voith. But if Voith was able to sell the resulting devices elsewhere, Mercedes would be funding its competitors' R&D. Equally, however, Voith couldn't afford to sell them to just one truck maker. Even Daimler Trucks' worldwide sales on HH would be insufficient to make business sense. Their solution was to let Mercedes have exclusive rights to the TRC for a limited period.

The prize is a wear-free clutch that can also provide massive retardation and, wedded to the functionality of an AMT

(automated manual transmission), preserve fuel performance, too. The TRC also has very high potential braking power: in fact, its output is limited to protect the drivetrain. Why? Add the high-performance engine brake of Mercedes' OM473 – 475kW or 646bhp – to the integrated engine speed retarder of the TRC (350kW or 476bhp) and there could be problems.

Klaus Fischinger, head of Daimler's Molsheim plant where the SLT is built, says: "In heavy haulage applications the next most vulnerable component would be the tyres slipping on their rims. For this reason, we have limited the two non-friction braking systems to a combined effort of 720kW [979bhp]."

The TRC has been 10 years in the making, and Mercedes-Benz engineers are cagey about the development cost, saying only that it has been millions. Georg Staskiewicz, international key account manager for Mercedes' HH sector, says: "There were not only a wide range of mechanical challenges, but very significant electronic and software obstacles to be overcome in developing the TRC. It's been a long process"

So although the exclusivity arrangement with Voith is already



over, other truck makers wanting to get in on the act will find the development of such a device expensive and time consuming. They will have to study potential sales carefully and decide if the investment is worth the trouble, particularly as Mercedes will have built its reputation long before they come to market.

The fact is Mercedes' SLT trucks are about more than just this component, but it is the TRC that sets it apart. The hydrodynamic clutch is not new, but coupling it to a dry clutch under full AMT control is. It reduces the dry clutch to an almost wear-free role, with a simple open and close function at set speeds. That makes a huge difference: the wear generated on a conventional dry clutch at 250 tonnes gcw is high, particularly in the wrong hands.

Test track experience

Mercedes chose to use the facilities of an ex-military track at Munsingen, one hour outside Stuttgart, to demonstrate its SLT's performance. Panzerringstrasse is a long, high-quality concrete track complex that sweeps through open countryside and gives a perfect mix of gradients and bends. The German giant launched the regular haulage versions of its new Actros there, and now it

was back with this super-heavyweight.

As an introduction to the TRC, I started with an Arocs 8x4 tipper grossing at 41 tonnes, for which the new device is optional. An off-road course with 25% gradients and the usual axle-torturing sinusoidal surfaces, is something I've tackled before, but only with an AMT. Holding this kind of weight on a steep incline on a regular clutch for more than a moment or two would be a friction plate destroyer.

Enter the TRC. Of course, torque converter automatics have been around a long time and they have the same wear-free characteristics. But they do not hand over the reins to a dry clutch when sufficient forward movement has been established. And they don't cut it on tipper work, due to their size and weight. But primarily it's the poor fuel economy that rules them out.

Holding a laden tipper on a steep incline for over a minute, and controlling it with just the throttle, even allowing it to slip back, was counter-intuitive. Only the confident smile of the Mercedes co-driver, and a dash display giving the temperature of the fluid in the TRC told me that all was well. Overheating is not an issue as the cooling circuit is shared with the engine and a massive cooling

tower behind the cab has plenty of capacity.

As the dry clutch engaged with increasing speed, the green light that had signalled the deployment of the hydrodynamic clutch went out. Deliberately dropping the speed to an untenable level simply disengaged the dry clutch and redeployed the TRC. That may sound like abuse of equipment, but positioning a very heavy load millimetre-perfect is something HH drivers often have to do.

The main course

After the starter comes the main course: an Actros SLT 4163LS 8x4 tractor, hauling a 10-axle Scheuerle swan-neck trailer loaded with Liebherr crane ballast weights, and grossing at 170 tonnes. The concept of 'standard spec' is not really applicable to the SLT, as it is really a bespoke chassis from the Mercedes CTT (custom tailored trucks) operation at Molsheim. However, at 170 tonnes, a TRC is regarded as essential equipment on the SLT.

Although I have experience of long and wide loads, this was the first time I'd driven above 50 tonnes gross. The powerful retarder and engine brake held the combination back on an 8% gradient, but I knew that the approaching hills would be a challenge. To some extent you can use momentum, but taking a run at a hill with 170 tonnes is not the way to do it. As the long 8% gradient bit in, it did feel like the entire combination was going to grind to an ignominious halt, but she settled in fifth gear

at 1,700rpm and 12kph.

Then my co-driver wanted me to stop on the hill and re-start. A demonstration the previous week had put experienced HH drivers behind the wheel, and they were understandably far from keen to do this. But their natural resistance made the drama-free re-start all the more impressive. Not only was the re-start easy at this very heavy weight, but I was able to pull the same slipping-back, moving-forward trick you use on a tipper. The impression left by strong retardation, wear-free starts and an AMT working in concert, was one of complete control.

Nevertheless, how far the TRC might reach beyond the rarified world of HH is a difficult one. To some extent, Mercedes and Voith have taken a leap of faith. Very heavy duty tippers working in remote mining locations at top design weights, never troubled by weighbridges, may go for it. But it's unlikely to attract even muckaway in the UK. The costs need close examination, as a TRC will replace a retarder – but £7,000 seems a baseline.

It will be an interesting alternative for those heavy haulage specialists who often still go for a manual gearbox in favour of an AMT. This device could allow them to jump two hurdles at once by taking on an AMT and the TRC. They'd find it a formidable combination. That said, AMTs are already extending clutch life, so the TRC will need to go some to prove its worth. But in its natural habitat of special types operation it seems to have raised the bar to a height for others simply to admire. **TE**

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