STAYING ENGAGED

Claiming a world first in heavy-duty truck drivelines, Volvo has launched its I-Shift dual clutch on selected FH models. Ian Norwell reports from the hills south of Granada

Dual clutch (DC) transmissions have been in cars for over 15 years, with the VW DSG (Direkt-Schalt-Getriebe) probably the best known, but Volvo has had more to contend with in bringing its I-Shift Dual Clutch (I-SDC) technology to heavy trucks. As Jonas Odermalm, Volvo's heavy transport segment manager, put it at the launch in Andalucia: "It's not been so easy for heavy truck development. Making a DC gearbox sufficiently robust and reliable has been difficult, with the software development especially tough."

That rings true. Back in November 2012, during the FH launch in Sweden, Volvo product manager for powertrain Astrid Drewsen said its then struggling I-Torque development was waiting for DC to be perfected. Now that it is here, Volvo is portraying the DC as the next stage in the evolution of its I-Shift AMT (automated manual transmission), itself the successor to Volvo GearTronic.

I-Shift is about to become a teenager, having first arrived in 2002. As with other AMTs, it's been a case of continuous improvement from a hesitant start. Today it probably vies for benchmark AMT status with Mercedes-Benz' PowerShift3, in turn a derivative of Mercedes' earlier AutoTrans. The march of these AMTs has been unstoppable, with Odermalm now claiming that 95% of heavy trucks it sells in Europe are fitted with them.

Improving shift comfort has been the trend, and the DC development certainly carries on that tradition. But to justify the extra expense, there should be a financial return for fleets, if this is not to end up the preserve of owner-operators, or SME fleets understandably wanting to reward top drivers.

A simple technical review shows there are two separate input shafts connected to the engine via two clutches. It's a transmission working in parallel, each clutch handling six ratios of what amounts to a 12-speed layout. Clutch one looks after odd numbered gears, and clutch two is in charge of the even numbers. So as, say, sixth gear passes the drive to the next gear, seventh (or fifth), it has already been pre-selected and engaged by the parallel drive path, making the transfer instant.

This means that there are seamless shifts, with no break in

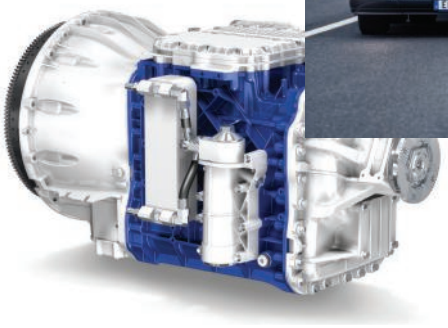
FH-16 750 at Euro 6

Volvo also put a pair of its new 16-litre, 750bhp Euro 6 tractors on the demo fleet, but without the dual clutch, which will initially only be available on the top three power ratings of its 13-litre engines – so at 460, 500 and 540bhp. Series production began in June, and Volvo claims parity on fuel economy with the Euro 5 version.

The D16K Euro 6 unit has the range-topping 750bhp (3,550Nm) version, with 650bhp (3,150Nm), and 550bhp (2,900Nm). An additional 550bhp version, with slightly reduced torque of 2,800Nm, will also be available and the engine range has been given the familiar quality of delivering maximum torque over a wider rev range – in this case, from 950 rpm to 1,400 rpm.

These heights rarely need scaling, with the optimum economy range between 1,000 and 1,200 rpm. And with this much power available, a careful choice of rear axle ratio should be rewarded. The unit is quieter, with a new common rail injection design and adjustments to the cooling fan, often the noisiest item under the cab. The Volvo engine brake on the DK16 now delivers 640bhp (470kW) of retardation.

Test driving across six differently specified models also served as a useful reminder of how good the dynamic steering is, and gave another opportunity to watch the predictive cruise control ('I-See') at play. They both function well.



torque, and it is this quality that is I-SDC's ace. But don't run away with the idea that all shifts in an I-SDC box will be similarly executed. The 'no torque break' effect is only achieved with sequential shifts between gears, not during block shifting. Since the same clutch handles, for example, second and fourth, it cannot provide a seamless shift between these ratios.

And since many gear changes are not between neighbouring gears, especially at lower speeds, much of the action is bound to be conventional, and carried out at normal shifting speeds. However, for a mile-munching motorway machine, the vast majority of shifting is then between the top three or four gears, and here is where the DC will be most noticeable. A long steady hill will mean no break in power delivery when it really matters, saving fractions of seconds for every shift.

Smooth and instant

Of course, any hill-climbing trucks will benefit, but few as much as those used in timber extraction, which often rely on 6x2 rigid and drawbar combinations running on poor surfaces where traction can easily be lost. At top weights on forest tracks, a gearshift is often avoided to steer away from the risk of grinding to a halt when the break in torque kills the momentum.

In these marginal conditions, traction can also be lost altogether simply from the drivetrain percussion of a conventional gearshift re-applying torque. A DC gearbox would present a real benefit here. Drivetrains put to work on heavy haulage operations could also gain from the smooth and instant power transfer between gears, and it could reduce the risk of product surge for tankers, too.

Volvo claims that fuel economy will be on a par with single clutch systems, and the OEM sees the benefits as primarily driveability and journey times. It's all part of the 'incremental gains' story. The days have gone of components spinning away all the time an engine is running. Smart electronics and sensors have put compressors and alternators, for example, on part-time working, saving an energy drain from the engine – and, hence, helping fuel economy.

Even if it's difficult to measure, engineering logic tells us this must help. The interior of I-SDC has two 'parallel workflows' active, with one providing traction, while the other waits in the wings. Although the second gear path is not actively propelling the vehicle, it is turning a few kilos of metal that would otherwise be stationary in a single clutch layout. So that same engineering logic tells us that this must mean an incremental loss. However, it must be outweighed by the gains elsewhere, and it is also more fuel efficient to have engine revs make simple transitions from one geared speed to another, rather than dropping away and resuming between shifts.

From the driver's seat, because not all shifts are DC managed, pulling away may well seem quite normal with the usual short gaps, but when the first shifts are made between sequential gears, there's no mistaking it. There is the feel of a torque converter style of operation. In urban settings, with a lot of block-shifting, it is not especially apparent, but on highway working, moving up and down between the higher ratios, I-SDC takes centre stage. Of course, performance in operation will be the acid test, but fleet managers may well need to scratch their heads a little before committing to an extra outlay of a cool £4,000. TE