

Right: Mercedes' Powershift gearbox and Volvo's I-Shift technology

The evolution of dual clutch technology, coupled with increasing popularity of automated manual transmissions, is leading to more choice for operators. John Challen looks at current gearbox innovations

# Double shift

**N**ot to be outdone by their power plant engineering colleagues, those in the R&D departments of the major transmission manufacturers are determined to develop solutions that will boost efficiency, driveability, fuel economy and reliability in commercial vehicles through that other key part of the drivetrain – the gearbox.

The days of manual domination in HGVs are long gone (in Europe at least), and operators have been finding them replaced with AMTs (automated manual transmissions) that provide better comfort, but also improved efficiency and reduced maintenance. More than a decade has passed since Volvo unveiled its I-Shift – at the time a serious departure from other AMTs that had been adapted from manual transmissions. By 2002, 14% of Volvo trucks were specified with I-Shift and today that figure stands at close to 70% in Europe.

Now into its third generation, I-Shift works with most types of transport, including applications demanding engines with high torque. This means, where once it was unheard of, the auto box can also function in vehicles designed for really heavy-duty, gruelling haulage assignments, such as in forests and gravel pits.

The basic transmission has been refined and a

new front splitter gear has been added, together with a new clutch system. The rear range transmission has also been redesigned and shortened. As a result, the entire transmission is also lighter and more compact. I-Shift therefore now functions together with all axle configurations, with the exception of all-wheel drives.

So far, so good, but what of the future? Hayder Wokil, product manager, long-haul segment at Volvo Trucks, confirms that the company is working hard on further improvements. "We still want to be in the lead position when it comes to the shift quality through the gearbox itself," he maintains. "This is one of the key areas we are looking into, and the aim is to make it more comfortable and faster, because this is what operators demand.

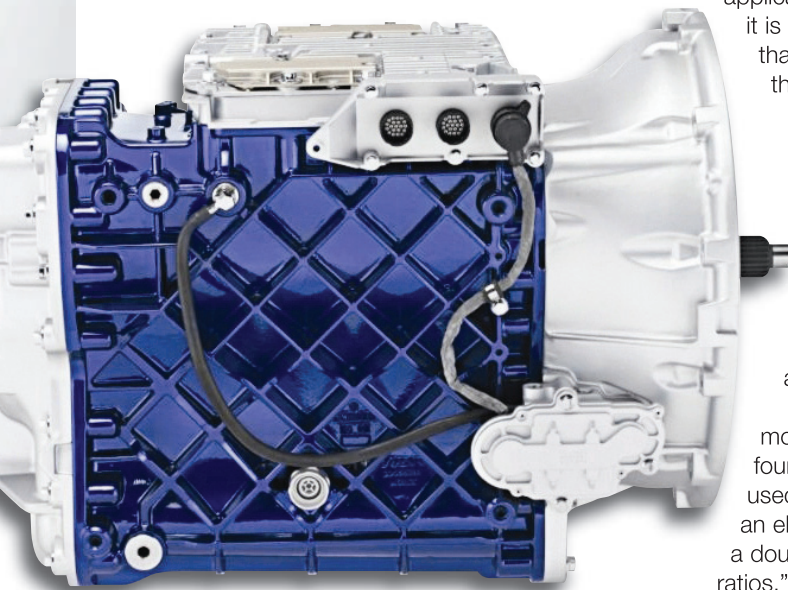
"We run some clinics where we ask customers about new features, so the improvements that make it onto the final transmission come from a mix of pure product development and requests from end users," he explains.

Wokil makes the point that, as well as smoother shifts and more comfort, there are other considerations concerning transmissions. "For example, we expect there will be more legal demands on noise levels, especially quieter operation of vehicles in urban areas. So it is

paramount that we make the trucks quieter in operation," he states, adding that attention to gearing can help make a very big difference.

### Gear change

Mercedes-Benz, like Volvo Trucks, relies on its own transmission technology. The German manufacturer has recently upgraded its Powershift and the version in the new Actros – Powershift 3 – is a big leap forward, says Nick Blake, sales engineering manager at Mercedes-Benz. "Combined with new engine technology, Powershift 3 gives quicker shift speeds," he asserts. "That kind of development will



continue until there is no substitute for an AMT – which is the way we are going, as we are offering fewer vehicles with manual transmissions."

Blake believes that attention to detail on the individual components and the use of advanced lubricants are behind enabling gearboxes to become lighter, as well as service intervals to be extended. "The possibility of fit for life gearboxes – as seen in cars – is now quite possible in trucks and that will obviously reduce maintenance costs even further," he states.

Elsewhere in the Mercedes-Benz stable, Fuso last year was the first manufacturer to feature a double-clutch gearbox, when the Duonic was shown in a Canter truck. The six-speed box features a non-wearing wet clutch, which lowers maintenance costs by eliminating the need to replace worn clutch discs. As with passenger car versions, there are two clutches and the next step is engaged before the clutch is released, a near continuous process, providing smooth changes.

"Whether Duonic comes up the range to higher horsepowers [and larger engined vehicles] will be very interesting to see, because that would give us


a quicker and smoother change," comments Blake. However, he adds that a new gearbox would be needed to accommodate such a system.

Transmission giant ZF is currently applying its AS Tronic to work with Euro 6 power plants. Despite the sophistication of the existing and very popular transmission, there is clearly an opportunity to improve efficiency further.

"In terms of mechanical efficiencies, we are very close to 100%," says Werner Engl, director, sales and application for ZF's truck transmissions. "We have internal losses within the transmission of less than one. However, for AMTs it is about the application and finding the right setup. For Euro 6, it is up to us to work on the transmission, so that it works well with the new engine, within the complete driveline."

A little further in the future – Engl won't be drawn on an exact date – will come the production version of a concept transmission shown at the IAA in Hannover in 2010. Touted as a unit that will "lead to more fuel savings and comfort in heavy [up to 60-tonne] trucks, heavy-duty or construction site vehicles", the transmission's flexible design will start a new trend in box design, he says.

"The biggest feature is the gearboxes' modularity and the possibility of developing four different versions," he says. "It can be used with a normal clutch, a torque converter, an electrical engine for hybrid versions and with a double-clutch module for very long wheel axle ratios," he explains.

Like Fuso and many others, ZF clearly believes that two clutches can be better than one. "We are preparing a double clutch module that can shift more seamlessly for extra comfort in the highest gears," he continues. "You use an extra long rear axle ratio of 2.5 or lower and this has a positive effect on the fuel consumption." 

**ZF debuted a modular system in a transmission concept show at the IAA in 2010**

