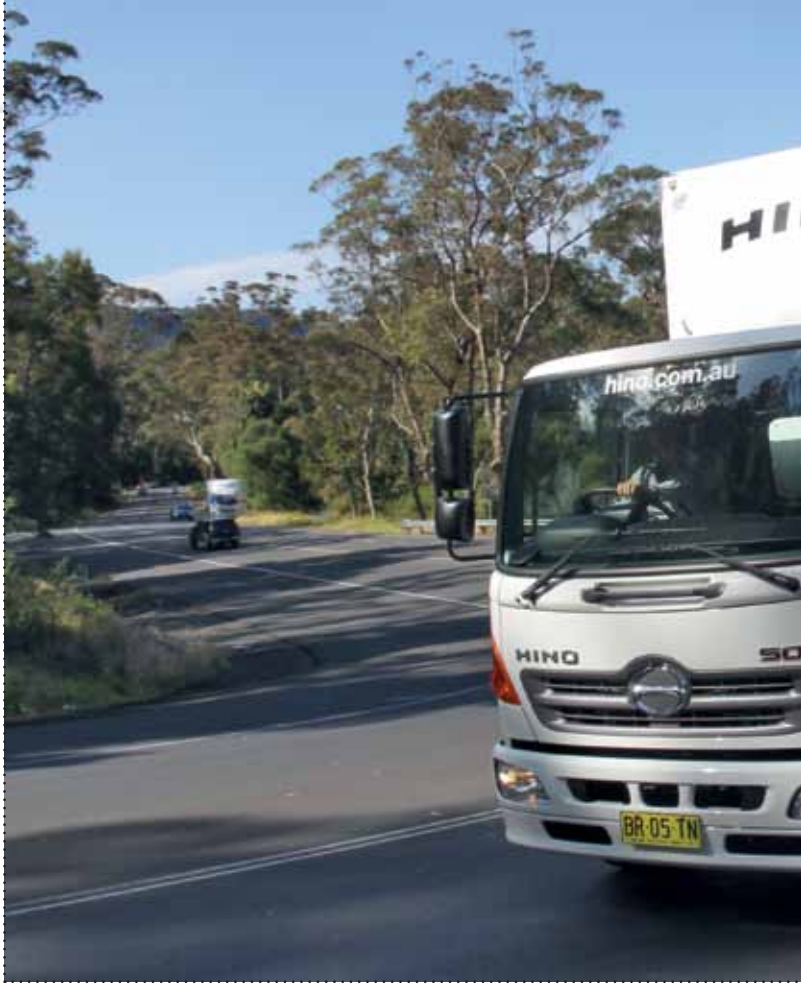
HINO 'shifts' up a notch



In its popular 500-series medium-duty range Hino now offers a 'transmission trifecta' with the choice of manual, automatic or the newly launched ProShift 6 automated manual transmission. **PAUL MATTHEI** reports after he and Steve Brooks put two trucks with ProShift through their paces over a mix of freeway and urban roads.

Never before has the Australian truck buying fraternity been so spoilt for choice as it is today, with truck manufacturers across the board using technological breakthroughs to deliver features that genuinely improve driving ease and reduce maintenance costs.

Such is the case with Hino and its recently released ProShift 6 automated six-speed transmission which ostensibly offers the best of both worlds by consolidating the positive aspects of both manual and automatic transmissions, in the process delivering an all-round transmission equally at ease pottering around city streets or barrelling along fast freeways.

This was certainly the first impression that came with testing the transmission over a variety of road conditions in Sydney and its southern extremities. But we'll delve into that a bit later in the report. First, some background: For his part, Alex Stewart, Hino Australia's product strategy manager, remarked that Hino has developed the ProShift transmission line in response to the emerging needs of medium-duty truck operators in Australia.

"Hino's Australian operation, in conjunction with Hino Motors Limited Japan, conducted extensive research, engineering development and durability evaluation prior to launching the ProShift 6 transmission locally," Stewart enthused. "By 2015 we are expecting models with an automated manual transmission or a torque-converter automatic transmission to account for more than 40 percent of all medium-duty trucks sold in Australia. Operators are trending towards these transmissions as metropolitan and outer-urban delivery route congestion grows."

Nifty shifter. The control lever is well placed and intuitive to use. Sequential manual shifting is achieved by moving the lever forward or backward in the right-hand gate.

Hino now offers AMT variants with all three categories of trucks in Australia. For instance, in addition to the ProShift 6 option in FC and FD 500-series variants, Hino's light-duty 300-series Hybrid models are fitted with the ProShift 5 AMT while at the heavy end, 700-series models can be optioned with a ProShift 16 transmission.

In the case of Hino's 500-series medium-duty trucks, Stewart says the automated versions will be priced around $5000 more than their manual counterparts.

But it's a price that comes in the wake of considerable product development work, he says. Hino engineers had made a number of significant upgrades to the ProShift 6 transmission – which has been developed and proven in the Japanese domestic market over the last decade – in readiness for Australian operation.

"Australian versions of the FC and FD are more likely to be operated over a variety of routes – from metropolitan to highway – compared with overseas markets where this class of truck is usually not operated on longer routes," he said. "Engineers have developed the Australian version for maximum durability and efficiency at all road speeds, utilising a unique final drive ratio and optimised computer shift control. In addition, Australian versions are fitted with a larger capacity oil sump to cater for the hot and heavy conditions typical of operations in this country."

Likewise, it was a typically upbeat Daniel Petrovski, manager of product planning at Hino Australia, who further expounded on the technical aspects of ProShift 6 by explaining that it has the potential to provide operators with significantly reduced fuel and maintenance costs when compared with conventional manual and torque converter automatic transmissions.

For a start, he said controlled testing by Hino in Japan has shown the ProShift 6 AMT to be around 10 percent more fuel-efficient than a comparable Hino truck fitted with a conventional torque converter automatic. He also said the ProShift stirrer's conventional dry plate clutch prevents driveline inefficiencies experienced by some AMTs in competitor models.

"The fluid coupling (torque converter) fitted to other AMTs relies upon the principle of 'oil shear' to provide drive to the transmission," he said. "As there is no direct mechanical link between the transmission and engine with a fluid coupling there is always the potential for driveline losses. The ProShift AMT negates these losses by using a conventional clutch plate."

IN TECHNICAL TERMS, PROSHIFT 6 IS A FULLY AUTOMATED VERSION OF HINO'S SIX-SPEED MANUAL TRANSMISSION WITH SYNCHROMESH ON SECOND TO SIXTH GEARS, AND DRIVING THROUGH A 350 MM DIAMETER SINGLE DRY-PLATE CLUTCH.

Furthermore, the fully automated operation of the ProShift 6 transmission means the clutch components are subjected to significantly less wear than a manual box, he emphasised.

"Hino's ProShift actuator ensures the transmission never misses a gear when changing, and actually can shift without completely disengaging the clutch," he said. "Each time a friction clutch engages and disengages it wears; by reducing the number of complete 'clutch cycles' Hino engineers have been able to significantly extend clutch life, in some cases by up to 20 percent."

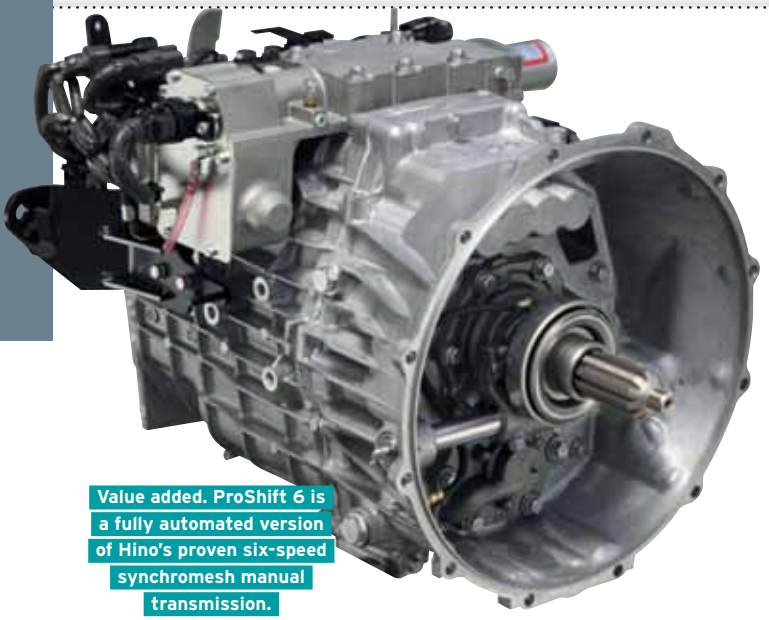
In fact, testing conducted by Hino Japan suggests the average lifespan of the ProShift 6 clutch will exceed 600,000 km when used primarily in urban stop-start conditions. Hino Australia expects local operators to achieve similar clutch life, especially those operating in outer-urban areas.

"Hino's advanced 'EasyStart' hill holder and two-pedal arrangement also contribute by completely removing any clutch slip, which accelerates clutch wear, as the vehicle moves off from a standstill," Petrovski said, adding an important point that "ProShift 6 is also serviced at the same intervals as a regular manual transmission, with no additional maintenance required."

In technical terms, ProShift 6 is a fully automated version of Hino's LX 06S six-speed manual transmission with synchromesh on second to sixth gears, and driving through a 350 mm diameter single dry-plate clutch. Ratios range from a 6.10:1 first through to a 0.74:1 overdrive sixth, and a reverse ratio of 5.67:1.

Clutch operation and gear shifting are managed by a computer-controlled air over hydraulic actuator, which means when the shift lever is in 'D' no input is required from the driver for these operations. In fact, vehicles equipped with ProShift 6 are not fitted with a clutch pedal and are driven in the same fashion as a normal torque-converter type automatic transmission. Also in common with automatics, the shift lever has a sequential shift position which allows the driver to manually select and hold gears, with upshifts and downshifts respectively initiated by pushing the lever forwards and backwards.

In addition, a slow mode can be instigated by means of a switch beside the shift lever which limits engine speed to approximately 550 rpm. This function is particularly useful for close manoeuvring such as when docking at a loading bay. Slow mode differs from the creeping



Value added. ProShift 6 is a fully automated version of Hino's proven six-speed synchromesh manual transmission.

effect of automatic vehicles because a ProShift truck will not move without throttle input from the driver.

All Hino FC and FD models are fitted with the 'EasyStart' hill hold function which keeps the truck's brakes on until the engine and transmission begin to drive the vehicle, thus preventing any roll-back while the driver's foot shifts from the brake pedal to the accelerator.

On the power front, the ProShift 6 'box is mated to Hino's five-cylinder common-rail turbo-diesel engine which has been tailored to provide near maximum torque delivery in an almost flat curve stretching between 1000 and 2400 rpm. Respective torque ratings for FC and FD variants are 647 Nm (477 lb ft) and 716 Nm (528 lb ft) at 1500 rpm while the two models achieve respective maximum power outputs of 162 kW (217 hp) and 176 kW (236 hp) at 2400 rpm.

Maximum rated engine speed is 2700 rpm and at 100 km/h in sixth gear the engine runs at approximately 2240 rpm which means at highway speeds the vehicle is still operating with the benefit of high torque output.

The final drive ratio of 4.625:1 provides a theoretical maximum road speed of 121 km/h.

To maximise reliability and durability in Australian conditions, a larger seven litre transmission oil sump and cooler are fitted to FC and FD variants.

ROAD RANGING

The test trucks supplied by Hino was a pair of FD 1124 ProShift 6 units fitted with curtain-sided bodies loaded to about one tonne shy of the model's gross weight rating of 11 tonnes. They weren't quite identical twins though as one had steel spring rear suspension while the other rode on Hendrickson's HAS airbag assembly. Surprisingly perhaps, after driving both versions back-to-back we found there was no perceptible difference in ride quality between the two models – both rode exceptionally well.

Leaving from Hino's bunker at Taren Point in Sydney's south, we headed down the Princes Highway to the foot of Mount Ousley before peeling off to follow the coastline north, rejoining the highway after ascending the steep and winding Bulli Pass.

Before leaving the yard, however, we took time to try out the aptly named 'slow mode' which is a feature not always found on medium-duty AMT trucks. It's a strange experience to flick the switch and feather the throttle only to find engine revs don't increase past idle speed, but for actions like backing up to a dock the benefit is obvious.

Out on the road, ProShift makes typically light work of suburban streets with their typical ebb and flow between traffic lights. Under light to medium throttle, the transmission generally up-shifted around 1800 rpm which brought engine speed back to 1200 in the next gear and since the green band on the tacho stretched from 1000 to 2000 rpm, this seemed the obvious way to maximise efficiency in both fuel and engine life.

Pushed harder, the upshift point rose to about 2200 rpm which is still within the peak torque band which peters out at 2400 rpm. This ensures the truck can accelerate rapidly when traffic conditions dictate a burst of speed. There is also a 'power mode' switch that causes upshifts at 2200 rpm regardless of throttle position but in practice this seemed a bit pointless when the engine's torque peak occurs at just 1500 rpm.

Similarly, when slowing down the transmission automatically gears down to help maximise retardation power of the exhaust brake. This in turn should ensure the right gear is selected when the accelerator is reapplied, however, on a couple of occasions when accelerating from a trailing throttle situation the transmission control unit seemed to be momentarily caught napping and the subsequent gear selection process occurred with a decided clunk.

Once up to freeway speed another minor aberration was noted with the transmission being too eager to change down from sixth to fifth at the slightest hint of a hill. This caused engine speed to flare out to 2500 rpm which actually impeded progress. While the immediate remedy was to select manual mode during high speed driving, it's an issue that Hino needs to sort out with an appropriate software tweak.

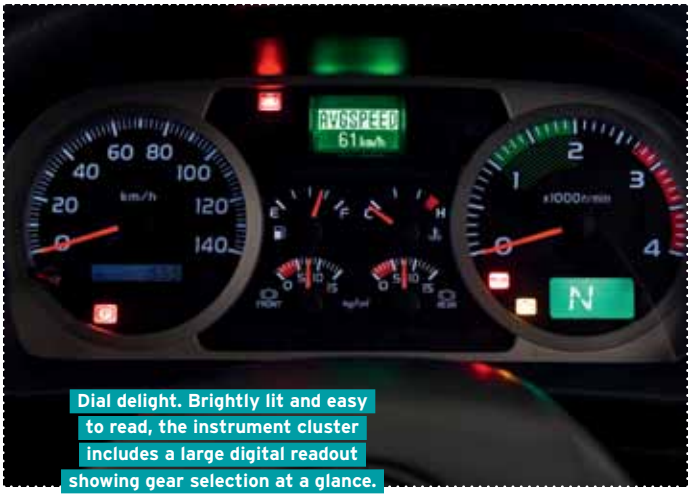
The run down Mount Ousley was made in fourth gear manual mode with the exhaust brake engaged, requiring only a couple of brief stabs on the brake pedal to keep the truck at the heavily enforced 40 km/h speed limit.

On the upside, the climb up the notoriously demanding Bulli Pass was handled with consummate ease although again it was necessary to select manual mode to stop the transmission 'hunting' between gears on the steepest sections. Given the reasonably wide gaps between gear ratios, we found the best method was to 'give it plenty' and allow revs to peak at around 2500 rpm before upshifts to ensure it wouldn't bog down in the next gear.

At the end of the journey, fuel economy measured by the onboard computer was 5.1 km/litre (14.4 mpg) which was a pleasing result given the realistic payload and widely varying topography of the trip.

To sum up, Hino's new ProShift 6 is a welcome and perhaps overdue addition to the 500-series line-up. Claims of improved average fuel economy and reduced maintenance costs over manual and automatic counterparts appear entirely justified.

But the best bit of course is the driving ease it delivers in city and suburban work where congestion is nowadays an increasingly ugly fact of life. IID



Dial delight. Brightly lit and easy to read, the instrument cluster includes a large digital readout showing gear selection at a glance.