

# Benefits of AMTs in heavy duty trucks



Over the last 10 years we have seen an unrelenting tide of change from manual transmissions to automated manual transmissions (AMTs) – whether they be non-synchronised, like the Eaton Roadranger, or the synchronised versions found in most European makes. AMTs are based on manual transmissions except they do not require shifting by the driver and, depending on the make of the system, may or may not offer automated clutch controls. Automatic shifting is controlled electronically (shift-by-wire) and performed by a hydraulic system or electric motor. AMTs combine the best features of manual and automatic transmissions (AT). The installed weight of a manual transmission is generally lighter than conventional automatic transmissions of

the same rating or capacity and suffers fewer energy losses. Driving an AT in a truck is very similar to driving a car fitted with an AT. There is little or no reduction in drive from the engine to the rear wheels, which provides smooth and linear vehicle acceleration. However this type of shifting is not free – due to the increased energy losses, fuel consumption is generally increased. ATs are ideally suited to high intensity start/stop operations like door to door rubbish pick-up for example.

Heavy Duty AMTs available in Australia typically come from three main countries or regions. North America is represented by Eaton with the AutoShift, the new UltraShift Plus products and Mack with the new M-Drive; Japan has the Isuzu Smoother-G; and Europe has the Volvo I-Shift, the ZF AS Tronic/ Eurotronic and Scania Opticruise, to name a few. Generally AMT transmissions are available in two and three pedal configurations. Two pedal means there is only a brake and throttle pedal in the cab (clutch is automatically actuated).

The three pedal system retains the clutch pedal so the driver has full control over the clutch for starting and stopping the vehicle. Once the vehicle is moving all other shifts are automated so the driver does not have to use the clutch for gear changes. The Eaton AutoShift is a three pedal configuration. The Scania Opticruise is available in both two and three pedal configurations. All the remaining transmission systems indicated above are two pedal designs.

There are many beneficial features of an AMT. The most common are improved

fuel economy for the fleet, increased safety and the ability for the fleet to use a wider pool of drivers – a key point in our current labour market.

One major benefit that is often forgotten, however, is extended component life in the whole driveline, from the clutch to the tyres.

## Clutch

Modern AMT systems have grade sensing and can accurately calculate the vehicle weight to select the most appropriate start gear for any given situation. This reduces clutch slip, heat generated and clutch wear. The AMT system works with the engine to carefully control engine torque during vehicle launch. This ensures a smooth launch and also protects the clutch. Anti clutch abuse features also actively intervene if the driver is potentially damaging the clutch. For example, using the throttle to hold a vehicle still on a grade by slipping the clutch. Manufacturers have different fall back modes designed to protect the clutch.

## Transmission and Lube

From my experience, and that of our expert technical team, the life of transmission bearings, gears and shafts are significantly increased when compared to manual transmissions. With a manual transmission, if the gearshifts aren't right, a missed shift or pulling the transmission into neutral while there is residual torque in the transmission contribute to gear, sliding clutch and selector wear. As a result, the microscopic metal 'shavings' from

this wear get circulated around the transmission in the lube. Over time, even though there is a lube filter in most cases, bearing and gear life is shortened. There have been many cases where we have thought of rebuilding an Eaton AutoShift transmission that had done well in excess of one million kilometres only to find very minimal wear inside the transmission. In addition, due to reduced lube contamination, drain intervals can be extended based on periodic oil analysis results.

#### Drive shafts and axles

As with the clutch, due to the precise control of engine torque during vehicle launches, torque spikes transmitted into the driveline are minimised. To enable smooth gear changes, the transmission controls the engine torque 'ramp down' prior to the shift and torque 'ramp up' after the shift. This control also eliminates shocks to the driveline therefore extending yoke, universal joint, slip joint, inter-axle differential, wheels and pinions, therefore increasing component life.

Although the features outlined above are not immediately apparent to the fleet owner or driver, they are no less important when the overall life cycle cost of the AMT is taken into account. These benefits go straight to the bottom line of the fleet through reduced downtime and maintenance costs.

Graeme Weston  
Engineering Manager for Eaton Vehicle  
Group, Australia/NZ/SEA  
& ARTSA Executive Member



Eaton UltraShift Plus

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