

# Advancing



Fuel saving remains a key driver for truck OEMs, and engine, gearbox and running gear specialists. Dan Gilkes looks at current and future technologies and finds out what matters for transport engineers

**R**educing heavy truck fuel consumption has, for some time, been an exercise in the law of diminishing returns, with manufacturers and customers chasing ever smaller percentage improvements as fuel prices continue to rise. But, with most admitting that things are not likely to improve any time soon, following the introduction of Euro 6 emissions regulations next year, any savings that can be made now are well worth investigating.

While the engine, transmission and aerodynamic packages have been obvious places to start, companies are now delving deeper into the rest of the workings of the truck – for example, looking to reduce friction and drag, and trying to better optimise vehicle specifications to match individual operational requirements.

This has led, in particular, to low rolling resistance tyres and to faster rear axle ratios, which permit trucks to run at 56mph while in the most efficient rev band of the engine. And, as engines have become more powerful, as well as, more importantly, boasting increased torque output with virtually flat torque curves, so it has been possible to raise axle ratios further and hence reduce the revs. It's not just the engines that have made this viable, though: greater use of automated gearboxes has also been assisting drivers in getting the best from their engine and transmission combinations.

"Higher torque engines, with flatter torque curves all the way down to 1,000rpm, still have a lot left at 900rpm," observes DAF's marketing director Tony Pain. This means that, whereas historically engineers would have set gearboxes to change at around 1,350rpm, using 2.93:1 or perhaps a 3.3:1 rear axle ratio, now they can lug much lower. Look at continental Europe, for example, where 2.8:1 or

even 2.69:1 axles, in combination with 315/70 tyres and 40 tonne gross weights, are common.

"You can set up the gearbox logic to allow the vehicle to really lug down now," agrees Iveco UK's product director Martin Flach. As an example, his company dropped the rear axle ratio from 2.85:1 to just 2.63:1 for its EcoStralis model, which has proven very effective as a high-speed truck, though Flach admits that fuel savings are less impressive when operators have a more mixed range of routes. "EcoStralis works very well on the motorway, but it really depends what you are doing on smaller roads. On delivery work and distribution, it can be too long legged," he says.

"Operators have to look at their fleets more closely and not buy one vehicle to do everything. We need to be smarter as an industry at looking at what the customer really needs," states Flach.



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At the 2010 Hannover show, Meritor announced the LogixDrive system, which it claims can cut fuel consumption by up to 2%. LogixDrive is said to be an intelligent axle system. By using electronic controls, the drive unit constantly monitors temperatures, speed, braking and torque conditions within the axle, allowing it to optimise the amount of lubricating oil used. This reduces oil churn within the axle, so cutting parasitic losses.

## Logical move

LogixDrive was initially announced for Meritor's 17X drive axle, but the company has confirmed that the system will also be available on the recently introduced heavy-duty 18X. The 18X has been developed in cooperation with Volvo, where it

**Meritor's Logix Drive was one of the first intelligent CV suspensions**





# axles

maintained at all times, so cutting rolling resistance.

The concept also incorporated an underbody aerodynamic kit, a powered sliding fifth wheel,

low energy lighting, exhaust heat recovery and a KERS kinetic energy recovery system for the braking and retarder system.

## Oily days

DAF, too, has been taking a more holistic approach to fuel saving. Under the Advanced Transport Efficiency (ATe) banner, the firm recently introduced a limited edition XF105 Super Space Cab, though it can also be applied to CF models. ATe incorporates engine idle shutdown, turning the engine off when it has been idling for five minutes, and enabling the speed limiter to be factory set for 85km/h, rather than the usual 89km/h limit, which is also said to reduce fuel consumption.

DAF also looked at reducing thermal losses from the turbo and exhaust system and even changed the speed of the oil pump to cut energy consumption. "We're also looking at having less oil in the axles," says Pain. DAF's campaign includes synthetic fill-for-life type oils that also cause less friction and drag within the axle bowl, particularly in low temperature conditions.

It is perhaps natural that much of this development work is aimed at the large motorway truck fleets. However, the technologies and techniques are filtering down to other sectors, too. DAF, for instance, is offering single reduction axles that allow high power outputs on eight-wheelers and other double-drive trucks. "We did have hub reduction on some 8x4s, but now we are going up in size with single reduction," states Pain.

Early this year, DAF intends to introduce a single reduction tandem drive axle, the SR1360T, that can handle up to 70 tonnes gross weight. This will be ideal for 6x4 tractors, such as those used by landfill contractors, which have traditionally used hub reduction for improved ground clearance, but have then suffered poor fuel consumption on the road.

It will also provide a suitable axle for 8x4 drawbar rigs running at 44 tonnes, riding initially on an eight-bag air suspension system. "Other than emissions regulations, such as Euro 6, everything is to do with fuel consumption," comments Pain, who maintains that, at DAF, evolution never really stops.

comes as an RSS1360 – a single reduction solo axle, designed for use on high powered trucks up to 60 tonnes.

"The trend in Europe shows an increasing shift toward more powerful trucks and larger rigs," explains Alex Mortali, vice president for Meritor's truck business in Europe. "Also, in long-haul operations, our customers' vehicles may cover 100,000km annually. Together with our partners at Volvo Powertrain, Meritor's innovation efforts are highly focused on improving fuel efficiency [for these situations]."

"The introduction of the new rear axle is one of many measures from Volvo designed to show that fast and efficient transportation can also be very economical," adds Volvo's Hayder Wokil, product manager for the long-haul segment.

Meritor is not alone in looking for low-drag and reduced friction solutions through subtle technology improvements. Iveco's Glider concept, first seen in 2010 at the IAA Show, looked at every component of the truck, using existing technologies geared specifically to reducing fuel consumption. This included removing all of the belt drives for auxiliaries from the engine and powering them with electric motors instead. An automatic tyre inflation system also ensured that optimum tyre pressures were



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Volvo has been working with Meritor on next-generation rear axles

“The supermarket people already know all about this; it’s the smaller guys now that we need to look after. It’s about how you can tweak out the last bit of fuel economy.”

### Conquer every mounting

But there are other ways, too. Continued focus on every aspect of the vehicle has led Mercedes-Benz to redesign the mounting point for its rear axle on two-axle versions of the latest Actros. The traditional wishbone, with a single mounting point to the axle, has been replaced with two separate longitudinal arms. The result is improved lateral stability and steering characteristics, thanks to more precise axle control.

With wider spread mounting points, a stiffer chassis and the two independent arms (whose centre lines meet behind the axle), the Actros offers improved axle control over rough surfaces and in heavy load operations. The result of a more controlled drive axle is that trailers tend to track the towing unit more closely, so improving stability and reducing the need for constant steering inputs, which can cause additional drag.

Of course, for an articulated rig, the tractor is only half of the combination. Trailer manufacturers are also working hard to find stability solutions, while continuing the search for reductions in weight. Schmitz Cargobull, for example, has been very successful with its ROTOS running gear for trailers. However, the company has recently


updated the system with the introduction of ROTOS+, which is said to be considerably lighter for improved payload.

Schmitz Cargobull has essentially found a better way to produce the axle tubes, without warping due to thermal effects. The company can now shrink the axle guides onto the axle tubes, to form a maintenance-free unit. Friction welding is carried out on the axle stubs to keep manufacturing temperatures low, while small guide bearings and a torsion-resistant axle tube complete the package.

This results in a lighter overall axle, but again with improved tracking, causing less rolling resistance and improving the durability of the axle suspension. Its ROTOS+ axle can also be combined with the firm’s light wheel end (LWE) or a 19.5in disc brake option. The LWE uses a steel wheel, but the 12 wheel bolts are used to mount the disc brake and the wheel, through a shared pitch circle on the wheel bearing housing. This does away with the conventional wheel flange and the 10-bolt wheel circle.

As mentioned, these days it is all about incremental improvement, creating 1–2% of fuel saving on the axle, a further 1–2% through the driveline and adding these small amounts together to create more significant savings.

There are other technologies available that will eventually make a larger contribution. KERS is one, along with solar panels, heat exchanging energy recovery and various hybrid solutions. However, at present the price of many of these technologies is simply too high for any potential benefit.

Most manufacturers agree, though, that the easiest and most productive way for operators to achieve fuel savings today is to take a closer look at their individual truck requirements and, where possible, to specify vehicles specifically to carry out those tasks. Whether it’s engine output, axle ratio or even cab width, there are small savings to be made at every step – and they all add up. 



**Hayder Wokil:**

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