



# Emissions statement

There's more to Euro 6 diesel and alternative fuel emissions than meets the eye.

Brian Tinham unpicks LowCVP's 'Emission Testing of Gas-Powered Commercial Vehicles' trials

When it comes to truck emissions – both greenhouse gases (GHG) and air pollutants – all may not be quite as we imagined. That's certainly the take-away from the year-long government-funded HGV emissions testing study, conducted by LowCVP (Low Carbon Vehicle Partnership) in 2016 and published earlier this year.

Tests were conducted on: four Euro 6 natural gas vehicles – two 40-tonne artics, one 18-tonne rigid and a 7-tonner; one Low Carbon Truck Trial dual-fuel diesel/natural gas retrofit to a Euro 5 44-tonne artic; one similar conversion on a Euro 6 44-tonner; and one diesel/LPG (liquefied

petroleum gas) dual-fuel retrofit, again to a Euro 6 44-tonner.

As for the test programme itself, that used track-based test procedures and three drive cycles developed by LowCVP for its low-carbon HGV technology accreditation scheme. The goal was to simulate long-haul, regional and urban delivery operations, with emissions measurement via PEMS (portable emissions monitoring system). LowCVP's report indicates that a fourth, city-centre delivery cycle was also developed.

Clearly, we're looking at entirely representative truck types and trials, so we might expect good emissions performance, at the very least from Euro 6 diesel vehicles. But, not so. Although

NOx and PM (particulate matter) were within range, tailpipe nitrous oxide – N<sub>2</sub>O, which is unregulated under Euro 6, but a far more damaging GHG than currently worrying methane – turns out to be significant. And, unfortunately, that's particularly the case for vehicles equipped with SCR (selective catalytic reduction). Which is all Euro 6 diesel trucks – meaning they are more environmentally unfriendly than their CO<sub>2</sub> performance alone suggests.

Turning next to overall GHG emissions from dedicated natural gas vehicles, LowCVP found overall improvements of 4–8%, compared with higher powered diesel equivalents. However, on like-for-like tests, CO<sub>2</sub> savings were, "at best,

5% and, at worst, 15% higher than” the diesel comparator. LowCVP puts that down to engine efficiency losses incurred by moving from compression ignition to gas spark ignition on the then current generation gas trucks.

The good news: methane emissions were confirmed as negligible. Even the worst performing 44-tonners on the long-haul cycle only notched up a methane hike equivalent to 1% CO<sub>2</sub>. Also, NO<sub>x</sub> (and specifically also NO<sub>2</sub>) emission rates were well down against the diesels, at nearly half and better than a third respectively. Only CO and unburnt hydrocarbons emissions were somewhat raised.

Moving on to dual-fuel retrofit diesel-natural gas trucks, LowCVP confirmed the now known “substantial” methane slip issue – and, what’s more, under all test duty cycles. So, although both the Euro 5 and 6 dual-fuel trucks demonstrated CO<sub>2</sub> savings of 4–11%, the total GHG penalty turns out to be circa 37% for the Euro 5 conversion and 26% for Euro 6. That’s hardly likely to impress government or green-aware



operators. Add in slightly higher NO<sub>x</sub> emissions (although lower CO) and it’s plain that, unless and until methane slip is sorted, dual-fuel diesel-L/CNG is going nowhere.

But dual-fuel diesel-LPG Euro 6 retrofit conversions are a very different kettle of fish. Although LowCVP says hydrocarbon emissions levels were “quite high”, these are not a problem from a GHG perspective. Indeed, the report finds “modest” overall GHG savings of 2%. Furthermore, NO<sub>x</sub> emissions are reduced against the diesel comparators, although CO output is higher. Overall, the report suggests that diesel-LPG conversions necessarily involve some compromises around current exhaust after-treatment systems’ capacity to mitigate regulated emissions.

The bottom line: current generation

dedicated gas vehicles take most of the green points, but only if they can be fuelled by high biomethane blends, which naturally boost carbon savings. Given the higher performance promises – in terms of everything from GHG emissions, vehicle range, and power and torque outputs – of emerging next-generation gas trucks, this can only get better (see panel for Scania and page 12 for Iveco).

Dual-fuel diesel-LPG conversions come second and, with the arrival of bulk bioLPG and a solid biofuel infrastructure this year and next, are pipped to do considerably better. However, until dual-fuel diesel-natural gas technologies overcome their methane slip issues, government, manufacturers and industry are unlikely to see them as viable transport alternatives. **TE**

## Waitrose commissions Europe’s first 500-mile biomethane trucks

A fleet of 10 new Scania CNG (compressed natural gas) trucks, delivering what the company describes as a “game-changing” 500-mile range, started operations with Waitrose late in January. The supermarket giant says its latest fleet is also Europe’s first to run entirely on biomethane.

Twin 26-inch diameter carbon-fibre gas tanks – developed jointly by Scania and US-based CNG fuel systems specialist Agility Fuel Solutions – are the enabling technology here. They store gas at 250bar, so increasing the fuel’s power density and enabling the circa 70% range improvement compared to traditional steel gas tank storage.

Justin Laney, general manager for transport at John Lewis, says the technology means his new trucks can always run on biomethane,

noting that the fuel is 35–40% cheaper than diesel and emits 70% less CO<sub>2</sub>. Although Waitrose’s new CNG trucks cost 50% more than equivalent diesels, each will repay the extra in two to three years, he adds, with fuel savings anticipated at £15,000–£20,000 a year.

Additionally, its vehicles are likely to operate for at least five more years, so generating lifetime savings of £75,000–£100,000, while cutting CO<sub>2</sub> to the tune of 100 tonnes per year.

The new tanks were adapted and certified for the European market by Agility. Beyond the range upgrade, they offer significant advantages over the European set-up of eight steel tanks. Each vehicle is half a tonne lighter, and is also quicker to refuel and easier to maintain.

“With Europe’s most advanced CNG trucks, we will be able to make deliveries to our stores without having to refuel away from base,” states Laney. “Using biomethane will deliver environmental and operational benefits to our business. It’s much cleaner and quieter than diesel, and we can run five gas trucks for the same emissions as one diesel.”

“High pressure carbon-fibre fuel tanks demolish the range anxiety concerns that have made many hauliers reluctant to move away from diesel to CNG,” comments Philip Fjeld, CEO of CNG Fuels, which is supplying the biomethane. “Biomethane is far cheaper and cleaner than diesel, and, with a range of up to 500 miles, it is a game-changer.”