HOT AIR?

Diesel's continued demonisation and the prospect of tougher emissions restrictions spreading beyond London to other UK cities should prompt transport fleets to look at alternative means of propulsion. Steve Banner reports

A dedicated compressed natural gas (CNG) engine produces up to 99% less particulate matter and 70% fewer NOx emissions than a Euro 6 diesel, according to natural gas supplier Gasrec. Iveco, too, is eager to invoke the environmental credentials of CNG, having invested in the development of what it refers to as NP – Natural Power – versions of some of its key models.

CNG's CO_2 output is 10% below that of diesel, says Iveco's UK alternative fuels director Martin Flach. Refuel with biomethane – natural gas sourced from local landfills or food waste – and the CO_2 figure is closer to 80% or 90% lower, he adds (see ***https://is.gd/roheza*** about his recent gas-powered road trip).

LNG is slightly more expensive than CNG, but both fuels are approximately 25% cheaper than diesel on average. In addition, CNG/LNG attracts a duty of 24.7p/kg, compared with 57.95p on a litre of diesel. Those duty differentials are set until 2024, points out Gasrec chief executive Rob Wood, and seem unlikely to alter to gas's detriment given its air quality and carbon benefits.

On the other hand, engines that run on CNG/LNG are roughly 10% less efficient than their diesel counterparts.

Another significant drawback is the higher front-end cost of gas trucks compared with diesel models.

The ten biomethane-powered Scania tractor units that have recently gone into service with Waitrose were roughly half as much again as the equivalent diesel models. However, the annual fuel cost savings of £15,000 to £20,000 each that they can achieve means that the price premium can be recouped in two to three years, says CNG Fuels, which supplies the gas the Scanias run on. Thereafter, they are likely to remain in service for at least five more years, potentially generating lifetime savings of from £75,000 to £100,000 apiece.

Waitrose says that the truck fleet is the first in Europe to run entirely on biogas, and that the fuel it is buying is 35% to 40% cheaper than diesel.

The Scanias are fitted with twin 26-inch-diameter carbon fibre tanks developed jointly by the truck manufacturer and Agility Fuel Solutions of the USA. The first tanks of their type to be deployed on this side of the Atlantic, they carry gas at 250bar – thereby increasing its power density. That allows the trucks to achieve a range of up to 500 miles between refills. Gas tanks impose a weight penalty, and finding somewhere to put them on a truck chassis can be a challenge. The compression systems and tank materials used have reduced the size of the tanks and the number required (from eight to two), yielding a 500kg weight saving.

Meanwhile, in the PSV world, in May Nottingham City Transport (NCT) launched a £17 million fleet of 53 Scania/Alexander Dennis double-deck natural gas-powered buses deployed on six routes around the city, with part funding from OLEV (Office for Low Emission vehicles). The project also includes a gas refuelling station at its Lower Parliament Street garage.

NCT says that the buses (pictured, p28) run on biogas, but the reality is slightly more complicated. Supplier Roadgas produces biogas through anaerobic digestion and injects it into the national gas grid at the nearest point to production; NCT draws out

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an equivalent volume of gas from the nearest national gas grid point to the Parliament Street garage, where it is compressed and stored until the bus is fuelled up each night. The fuelling facility is designed for future expansion and can also be used by third parties.

Above: Bridgwater, Somerset gas refuelling station. Inset: Fife's dual-fuel refuse collection vehicle

DUAL-FUEL CONVERSIONS

While some truck manufacturers are heading down the dedicated fuel route, there is still a market for dual-fuel conversions, argues Tony Dent, sales manager at Mercury Fuel Systems. The Avonmouth, Bristol, company specialises in diesel/liquefied petroleum gas (LPG) dual-fuel technology.

Fitted to around 800 vehicles, this involves substituting LPG for approximately 30% to 35% of the diesel consumed. "LPG produces 45% less NOx than diesel does and 7% less CO_2, but that percentage will increase to 48% as bio-LPG starts to become available later this year," he says.

The conversion offers a healthy return on investment nevertheless, Dent argues.

"It costs £7,000 to £7,500, and if you do 120,000km a year in a 44-tonner you should see a payback in around 12 to 14 months," he contends. "Nor do you have any methane slip issues [loss of unburned methane] in the way you can with CNG or LNG."

Because it is an independent conversion, truck makers will not warrant the engine. "So we provide our own 12-month unlimited mileage warranty," says Dent.

Hydrogen represents another potential road to environmental virtue. It is usually associated with fuel cell technology; ten hydrogen fuel cell buses built by Van Hool are in service in Aberdeen. However, alternative fuel commercial vehicle conversion firm ULEMCo is trialling dual-fuel diesel/hydrogen vans and trucks.

Last year it delivered what it says are the world's first two diesel/hydrogen bin wagons to Fife Council as part of a £4 million Scottish government pilot.

"With trucks, hydrogen substitutes for around 40% to 50% of the diesel used, rising to up to 70% for vans," says Amanda Lyne, chief executive officer of ULEMCo, which has offered the technology for almost three years. The dual fuel vehicles are said to produce 70% less CO_2 than standard diesel models and hydrogen's environmental benefits include zero particulates.

The van conversion injects hydrogen into the engine via the air intake. The hydrogen is held at 350bar in two tanks; total supply system weight is 160kg.

Having the equipment fitted as a one-off is not a cheap option; it will double the price of the van. However, volume fleet orders should drive the price down significantly, ULEMCo promises.

Drawbacks include the CO_2 generated in hydrogen production, and a paucity of refuelling facilities; there are only about a dozen nationwide. That said, Shell has opened a new station on the M25 in Cobham, Surrey and plans two more this year, and Aberdeen now boasts its second hydrogen station.

Truck makers have not abandoned dual-fuel technology entirely.

Later this year Volvo could be introducing trucks in Europe fitted with Westport's HPDI (High Pressure Direct Injection) 2.0 technology that will allow a diesel engine to run primarily on CNG or LNG while preserving the efficient compressed ignition cycle. The engine runs on gas for more than 90% of the time and is around 15% more efficient than a dedicated spark-ignition gas engine, Westport contends.

Not surprisingly, Wood is convinced that the long-term trend is in favour of CNG/LNG. "Operators will no longer be saying that diesel is a safe bet," he observes. "Instead, they'll be looking at alternative fuels and saying that the safe bet is an alternatively-fuelled vehicle. And that will stimulate the demand." TE

FURTHER INFORMATION

Emissions Testing of Gas-Powered Commercial Vehicles, by the Low Carbon Vehicle Partnership (2017) – https://is.gd/jepija
Fortis (of Canada) natural gas fuel savings calculator – https://is.gd/qecure
Natural gas in transport: An assessment of different routes, by TNO/ECN/CE Delft (2013) https://is.gd/salati