

Cooking



CNG/LNG-diesel dual-fuel technology may be more applicable to more trucks than most of us realised. Brian Tinham talks to Catherine Crouch of Howard Tenens about sustainable logistics

So you think that dual-fuel truck engine conversions are only viable on long distance, double-shifted haulage? Think again. Trials by Gloucestershire-based distribution firm Howard Tenens – which, since 2008, has been focusing on initiatives to achieve environmentally sustainable logistics – appear to demonstrate that worthwhile returns may well be available, even on less obvious drive cycles. That's if you can handle the initial investment or find grant assistance.

Catherine Crouch (left), director of Tenens Environmental, is the driving force behind the transport company's move, so far, to CNG (compressed natural gas – methane) and diesel dual-fuel conversions – on a mix of Mercedes-Benz Axors and Actros tractive units, mostly the latter.

“We ran a six-month trial on two of our older Actros vehicles first [both OM501LA 440bhp], to



on gas

check that the technology was as effective and robust as the engine conversion companies say it is," she says. "We used Hardstaff and its OIGI technology, because the conversion is then warranted by Mercedes. Those were commissioned in August 2009 and, earlier this year, we placed an order for an additional 12 vehicles [including two Actros at 460hp and two Axor, OM457LA 430bhp] to be converted, because it was so successful."

Trial tractors

The trial she refers to examined all aspects of Howard Tenens' distribution drive cycles, including shunting, trunking and multi-drop work. "Both tractors were used to pull fully loaded trailers of between 10 and 26 tonnes, with products ranging from plastic cups for vending machines right up to heavy paper reels. We also looked at the effects of day versus night running, because one of the factors you need to consider is idling times, and starting and stopping frequency – and, at night, with much less traffic, those are greatly reduced."

Crouch makes the point that, like other transport companies, it regularly schedules vehicles for certain routes during the day and others at night. Data from the trials, she states, could have been useful in determining the vehicles, loads and routes worth investment in the technology, and those where the returns wouldn't merit conversion. But, she says: "The cost benefits from gas were at their highest on



motorway journeys at night and lowest on daytime multi-drop. However, they were still good on our multi-drop; they were just even better on trunking."

Hence Howard Tenens' investment in a near wholesale fleet conversion, which Crouch explains is an ongoing programme, currently being rolled out from depot-to-depot. "We have had 14 units converted so far. They're doing about 120,000 to 130,000 miles a year, so you don't have to double-shift to make it work. We have a 64-strong fleet of HGVs and we'll convert the rest of the appropriate vehicles over the next two years," she says.

Appropriate? Crouch explains that part of the viability calculation clearly has to do with how much life is left in the tractor unit – and that depends on your approach to fleet renewal. "Payback obviously ties in with your leasing arrangements from the dealers or manufacturers. The oldest units we converted were three years old, but they were for the trial. The rest have been anything between two years old and brand new, straight from the factory. Our figures show that you need to have at least three years' life left on a vehicle to make it pay – but then the returns are considerable and you're significantly improving your carbon footprint."

But, before you phone Hardstaff, Clean Air Power (the two biggest names in natural gas) or your truck supplier, you need to know the up-front costs. And they're not trivial: retrofit CNG or LNG (liquefied natural gas) dual-fuel truck conversions

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cost around £20,000–25,000, whichever supplier you engage. That’s for the gas handling system (rail, injectors, delivery tubes, etc. to fit the engine space and manifold configuration) and software, interface with the host engine, gas tanks, exhaust safety catalyst, auxiliary re-siting and commissioning.

Howard Tenens went to the extra expense of installing gas tanks not only on the tractors, but also its trailers. “The reason is the lack of a gas refuelling infrastructure in the UK at the moment,” explains Crouch. “As more natural gas stations appear, we’ll no longer do that, but, until then, we had to ensure that our trucks could get back.”

This is not about trucks grinding to a halt: all dual-fuel conversions revert to diesel when the gas runs out. No, it’s about maximising gas burning to save money on diesel. Crouch concedes that, if your operation involves round trips of, say, 250 miles or less, then tractor unit CNG tanks are probably enough. She also agrees that it might be worth looking at LNG, although there may be cost, fuel ‘shelf life’ and well-to-wheel energy considerations around gas liquefaction and storage. “Also, if Keyfuel indicates gas fuelling stations on your route, then again, you won’t need additional gas containment,” she adds.

Gas stations

But the outgoings don’t stop there. Howard Tenens also decided it needed its own gas fuelling stations, first at one of its depots and more recently two more – at a cost of several hundred thousand pounds. Sounds nasty, but Crouch makes the point that no operator needs to write down that investment over a vehicle lifecycle.

“That additional expenditure stretches your payback time, but you can spread it over, say, 25 years, so it won’t kill your project. Also, we received support from the government’s alternative fuels infrastructure grant programme, through CENEX [the UK’s Centre of Excellence for low carbon and fuel cell technologies].” And she agrees that, if demand for dual-fuel grows, other operators could use Howard Tenens’ gas fuelling stations – providing another win-win revenue stream.

Either way, for this transport operator, the

Sustainable logistics at Howard Tenens

Howard Tenens is a mid-size, family-owned warehousing, logistics and haulage firm that’s been around for some 50 years. Peter Morris, and his two sons Dan and Ben, run the business. Back in 2008, they set up Tenens Environmental to work on initiatives capable of improving transport efficiency, cutting carbon emissions and eventually sustainable logistics.

Catherine Crouch joined the company from the waste industry, where she had put her environmental science training to use “looking at problem waste streams, and trying to find ways to treat and dispose of them in an environmentally friendly manner”. In her previous post, she helped specify the equipment necessary to set up an aerosol recycling plant. “We extracted the gases and liquids from spent aerosols and turned that into LPG-based fuels for heating, replacing diesel fuel for cement kilns, for example,” she explains.

With that company sold, however, Crouch was looking for another environmental improvement challenge, she says, when she came across the Morris family. “I’m passionate about what we’re doing here,” she says. “We’ve positioned ourselves as an environmentally sustainable logistics company and part of that is making a commitment to all our customers to help them reduce their carbon footprint, too.”




investment is part of what Crouch explains is a practical two-phase approach to sustainable green improvement, using methane gas. "To get the job done, we decided to get the vehicle infrastructure in place first, which meant doing the conversion for CNG, because it's available. We were also very comfortable with natural gas prices [currently 75p to 80p per kg]. For us, the second phase will come when the infrastructure, availability and cost of biomethane (CBG) improves.

"At the moment, LNG is delivered to us and then vaporised to the gaseous state, and compressed to 250bar in our tanks. You can go for a gas grid-connected fuel station instead, but then it's critical the gas is analysed. It will probably need drying to stay within specification and prevent the problems the industry witnessed 10 to 15 years ago."

Could dual-fuel gas and diesel conversion work for you? Crouch is reluctant to release guideline figures, because of the sheer variety of trucks, routes and operations in haulage. "If an operator runs his trucks even at very low mileage, but keeps them for, say, more than five years, it's probably worthwhile. But, if it's a high mileage operation and the trucks are replaced every three or four years, then it's definitely worth doing."

Her view: "I think operators should get all the information from Hardstaff and Clean Air Power before deciding if dual-fuel is for them. They'll provide all the information you need, with detailed cost analyses, payback periods, carbon savings and diesel savings, tailored to your particular operation and its routes, loads and mileages.

"Whatever you do, don't be put off by the capex. The low carbon benefits from running HGVs on gas are very big. You get an initial carbon saving of up to 20% and, once biomethane is readily available, that will rise to nearly 100%. This has to be a good option for HGVs, because it's the only renewable fuel option that's truly sustainable." 



Dual-fuel payback, from the experts

For rough idea of financial viability for dual-fuel, go to Clean Air Power's online calculator: (http://www.cleanairpower.com/genesis_calculator.php). Selecting £1 per litre diesel, 10mpg and 110,000 miles per annum, for example, renders a predicted annual fuel saving of £10,438 on CNG and £11,290 on LNG per truck.

According to CAP operations director Jon Berry, that assumes approximately 60% for the all-important gas-diesel substitution rate, in line with its latest version of the retrofit Genesis systems (for Euro 5 Volvo FH/FM13s and Euro 3 Mercedes Axor vehicles). The firm's alternative Interfaced technology (available for Caterpillar in Australia, and now under development with Volvo and Navistar) returns up to 85%, substantially improving the figures.

However, Berry suggests that operators seriously interested in pursuing fuel and emissions reductions through dual-fuel technology should come and talk. "The point is that so much depends on the duty cycle: the weights, distances, routes, etc, all have a significant effect, so we prefer to talk. In Australia, we can also download an operator's route profile and put that into an engine simulator to predict the substitution rate and hence the savings. But that's not normally necessary in the UK."

Darryl Hylands, head of R&D for Hardstaff, agrees, adding that his organisation's experience over nine years with its own fleet of 90 (of 140) converted vehicles, as well as those sold into industry (from concrete mixers to tipplers and haulage tractors), provides a useful benchmark for estimating different vehicles' and duty cycles' gas substitution rates.

"For example, on haulage, we know that substitution varies through the cycle, from standing start, where gas injection is low, depending on engine load, through to cruising speed when it's 80-90%," explains Hylands. "Then, as the truck climbs a hill, load goes up and substitution is backed off in a controlled manner to protect the engine against knock. So average figures can range from 60 to 70%. But we've also worked on RCVs [refuse collection vehicles] and the gas substitution rates there are much poorer, because the vehicles are always in stop-start mode or idling, where gas is zero."

What about CNG versus LNG? Hylands suggests that, although most transport engineers instinctively think CNG, if for no other reason than avoiding the cost of LNG containment, it's not that simple. "For CNG, we use Type 3 cylinders in aluminium and carbon fibre for light weight and strength, whereas LNG tanks are double skinned stainless steel, vacuum insulated – so the costs are not that different. But, if you're trunking long distance on a 6x2, you soon run out of space for gas tanks and then the best option may be LNG, because of its much greater energy density – as long as you don't keep it on board for more than four days – or extra gas tanks on the trailer, connected via our patented umbilical hose technology."

Hence, again, the importance of consultation. For the record, Hardstaff conversions are currently available on Mercedes-Benz Axor, Actros and Econic trucks, and the company is also currently working with Volvo on its D7 litre engine vehicles.

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