

Volvo joins dash for gas



Diesel engines have led progress in efficiency and environmental protection for 40 years, but Volvo is now bringing alternative fuels and drivelines into the mainstream. Richard Simpson reports from Slovakia

At the Volvo Future Trends and Innovation event in September in Slovakia, Volvo Trucks' engine product manager Mats Franzen announced the company's plans to diversify into alternative technologies, including gas engines and hybrid drivelines for long-haul heavy trucks.

Franzen hints that the UK might be one of the first markets to see Volvo's LNG-powered heavy-duty gas truck, as it has a comparatively well-developed gas distribution network. Short-range trucks using CNG are already in operation in the refuse collection and distribution sectors, but the far greater energy density of liquefied methane (double, according to engine developer Ricardo) gives the opportunity to use gas in long-haul applications.

Otto-cycle (spark ignition) engines as used by Scania and Iveco were rejected by Franzen: "Otto is 15-25% less efficient than compression ignition," he points out.

But gas alone will not work in compression-ignition engines, so

Volvo is returning to a technology that many consider to be discredited: dual-fuel, where diesel is injected and compressed to ignite the methane. Aftermarket conversions on dual-fuel engines have disappointed: diesel has formed up to 40% of the fuel used, and the emission of unburned methane through the engine has been problematic, according to the company.

"Methane slip has been eliminated in our engine; it comes through from valve overlap," Franzen said, hinting that the Volvo solution would involve injecting gas only once the exhaust valve was shut. "The diesel injected will act as a fluid spark plug: 90% of the burn will be methane. Natural gas is very clean for a fossil fuel, it's also a gateway fuel for carbon-neutral biogas, which is chemically identical but from renewable sources."

Payback time depends upon relative fuel prices, but "the greater the distance travelled, the quicker it will be," Franzen pointed out. Launch is expected before year-end.

In contrast to the well-publicised plans of Volvo's car division to go electric from 2019, the company is not giving up on heavy-duty diesels for trucks.

Franzen started by reviewing progress so far: in terms of pollution, one 1980s-vintage diesel truck produced about the same pollution as 100 heavy-duty diesel trucks did now. Passing the emissions test for Euro I had involved laboratory tests on just one new engine: now compliance has to be proved over seven years/700,000km.

POWER BOOST

In terms of power, 30 years ago Volvo had launched the F16 truck, and the received wisdom then was that its 463bhp engine output was excessive: 485bhp is now the average output for new maximum-weight trucks sold in the EU. "Our FM11 now has the same torque output as that original F16," he pointed out. In terms of fuel saving, truck fuel economy has improved at a rate of 1% per year for the past 40 years.

But in 2007, concerns about the future acceptability of diesel led Volvo Trucks



GAS ENGINE DETAILS

The gas engines will be available under FM and FH cabs, in 4x2, 6x2 and 6x4 configurations for both tractors and rigid. Two in-line six-cylinder 13-litre common rail G13C Euro VI variants are offered, rated at 414bhp (producing maximum torque of 2,100Nm) and 453bhp (maximum torque 2,300Nm). Fuel consumption is said to be on par with Volvo diesels, but 15-25% lower than for conventional gas engines.

LNG is stored pressurised at 4-10 bar and a temperature of -140 to -125°C. Before combustion, the fuel is warmed up, pressurised and converted to a gas. Three LNG tank sizes are available: 115kg (275-litre); 155kg (375-litre) and 205kg (495-litre). The latter is said to have an operating range of 1,000km.

to produce seven outwardly identical trucks, each using an alternative fuel or driveline technology, including DME (dimethyl ether), HVO (hydrotreated vegetable oil) and methane (CNG and LNG), plus hybrid drivelines. Despite their promise, not all have flourished, according to the product manager. DME failed because of difficulty in sourcing it from renewable feedstock, even though it could be made from forestry waste and produced very low emissions. HVO was promising as a direct and renewable replacement for diesel for all Volvo engines from Euro III onwards, but methane was showing the most potential.

As for electricity, Volvo had offered a production hybrid truck from 2007, but production ended with the introduction of Euro VI emissions limits. The FE Hybrid's performance had not been thought good enough to make an update worthwhile. "We expected the battery industry to develop smaller, lighter and less expensive batteries, but that didn't happen," Franzen said.

Instead, electric mobility has

developed at sister company Volvo Bus, which is now offering hybrids, plug-ins and full-electrics; it is said to be prepared to take that step with trucks when the time comes. Also, Volvo believes that the future of long-haul is in embedding an electricity source in the road; it has installed such a system in a test track.

Volvo's hybrid heavy tractor grew out of the government-backed SuperTruck project in the USA, where manufacturers had been challenged to improve transport efficiency. Careful engineering had removed 1.9 tonnes from the tare weight of the tri-axle trailer, although the floor was still strong enough to drive a forklift on, and the fitment of low-resistance Continental tyres and the addition of lift-axles front and rear had reduced frictional losses. Attention also turned to aerodynamics where, perhaps counter-intuitively, most savings come from trailer rather than tractor design: most crucially the fitting of a boat-tail to the rear. Other measures include fairing: in the trailer underside,

sculpting the roof and matching its nose to the rear of the tractor's cab. The 6x2 tractor itself has benefited from the addition of a curved front profile, the replacement of standard mirrors with cameras in streamlined housings, and a drastic repackaging of the chassis, with enclosures covering the wheels of the second and drive axles.

A diesel-powered tractor unit incorporating these modifications was on display in Slovakia in the form of a fuel-saving concept truck, but there were further savings planned from a parallel hybrid driveline. This would use regenerative braking to replenish its batteries on downhill inclines of over 1%, and allow up to 30% of driving to be done on electric power alone. The enhancement of Volvo's existing I-See GPS-enabled predictive gearchange management system would enable the truck to adopt the most effective charging and driving strategy for the electric motor, allowing up to 30% of driving to be done without the diesel engine – and making a 30% fuel saving possible. [TE](#)