



JUST THE TICKET?

Powered by the outgoing Green Bus Fund, no sector comes close to the sheer diversity of drivetrains put into service on modern buses. Steve Banner examines the pros and cons

Electric buses may yet rise to prominence in UK public transport as early range limitations are overcome, charging facilities proliferate and pressure is brought to bear on operators by city authorities to switch to zero-emission technology. So reasons Glenn Saint, deputy chief executive officer at bus manufacturer Optare.

"As things stand, we can offer up to 90 miles between recharges, if we rely solely on the Li-Ion batteries fitted in the space otherwise occupied by the engine," he says. "However, if we mount additional batteries – on the roof, for example – we can extend that to 150–180 miles."

For some, this is already happening: £5bn-turnover Chinese manufacturer BYD claims that its single-decker 12-metre ebus offers a similar range, and two are now in service with Go-Ahead in central London to prove the point. Further, when exhausted, the batteries take four or five hours to recharge at night, using off-peak electricity. "We're finding that after 160–170 miles, they still have 25% charge left," says BYD's UK representative Bono Ge. That is encouraging, given that BYD is a major manufacturer of rechargeable batteries that has moved into electric bus production, with a range that runs from 8-metre single-deckers to 18-metre artics, with a 10.2-metre double-decker under development.

Naysayers, of course, point out that batteries add weight, a point conceded by Saint, who says Optare's electric buses are half a tonne heavier than their diesel equivalents. However, he argues that the duty means this is not the drawback it might be in haulage. "An electric Versa single-decker can carry more than 50 passengers," he points out.

Of greater significance is the financial case for going electric. "Electric buses cost £120,000 more

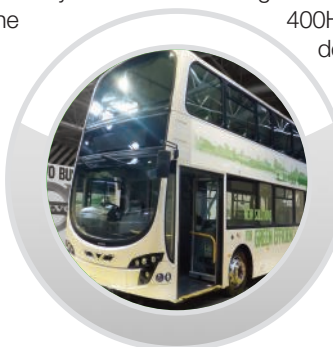
than diesel vehicles, but, because electricity is one-tenth the cost of diesel, an electric bus will start paying back within five years," contends Saint. BYD, meanwhile, reckons operators running its e buses will reach break even after just four years.

That's because the power required to run 60 miles costs a mere £7.80. And Ge insists that battery life is also not the problem of popular perception. "After 4,000 cycles – which is equivalent to about 10 years of operation – our batteries will still have 75% of their capacity," he says.

Virtual electric

But not everyone agrees: speaking at last October's Coach & Bus Live, at the NEC, ADL chief executive Colin Robertson said: "The crux of the electric vehicle debate is that battery technology is simply not up to the demands." That's why ADL is developing what he described as "a virtual electric bus", combining existing hybrid engineering with periodic recharging of batteries by wireless induction while vehicles are in service. Such an arrangement helps to overcome another of the objections to pure electric buses: the huge amount of power required, if a fleet is involved and all recharging has to be done at shift end from a single location.

In recent years, ADL has become a major producer of 'conventional' diesel-electric hybrids, with Stagecoach among the latest to order its Enviro 400Hs – in its case, taking 40 of the double-deckers. Volvo and Wrightbus are also in there, delivering 32 B5LH hybrid double-deckers to the same fleet. And Wrightbus has additionally seen its own hybrid success, building the controversial NBfL (New Bus for London). Such diesel-electric hybrids can achieve a 25–30% improvement in fuel economy over mainstream diesels,



Small is beautiful

A change in the bus market may turn out to be just as significant as any moves towards alternative forms of propulsion. The swing away from traditional, heavy-duty 18-tonners to lighter, more fuel-efficient buses, grossing at 12–13 tonnes is bound to make a difference, and Optare and Wrightbus are among manufacturers leading the change.

“Whereas an 18-tonner will typically return 5–6mpg, a 12-tonner gets you into double figures,” comments Optare’s Glenn Saint, deputy chief executive officer. And Wrightbus managing director John McLaughlin adds: “Fuel efficiency improves by 8% for every tonne saved.”

The drawback is that, while both sizes of vehicle typically offer 40 seats, the heavier units are also capable of carrying 60 standees as opposed to just 30 – although that is rarely an issue in the UK, according to Saint.

Optare has been able to reduce the weight of its products by rejecting body-on-chassis construction in favour of an integral design. There is no evidence that it is any less durable than traditional methods, Saint contends, so Optare’s long-awaited double-decker, set to debut in May, will be another recipient.



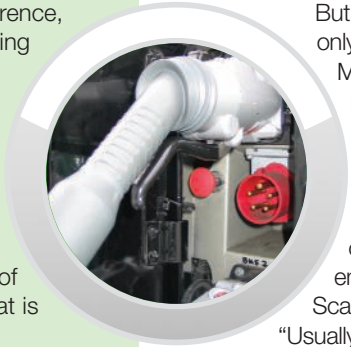
but, as Saint points out, like pure electrics, the technology involved still adds £120,000 to the purchase price.

Other, lower cost types of hybrid are available, however, with one already offered by Wrightbus. Its StreetLite Micro Hybrid single-decker is equipped with an inexpensive regenerative braking package that enables lost energy to be clawed back and used to power the vehicle’s compressed air system and electrics. This is said to cut diesel usage by 10% on city centre routes – a claim backed by Wrightbus and First, both of which have worked to develop and trial the vehicle. First has now ordered 274 such vehicles.

The premium for a StreetLite Micro Hybrid can be recouped in less than a year, says Wrightbus. When making that calculation, however, it includes the fuel subsidy of 6p per km (14p per km in Scotland) that operators can claim, because the vehicle qualifies for Low Carbon Emission Bus Certification.

Yet another option is the much vaunted, super-

efficient Flybrid, originally developed for F1, says recently-appointed Wrightbus managing director John McLaughlin. “It’s a flywheel running in parallel with the engine, which stores braking energy that is then released,” he explains. “It offers a 15% fuel saving and we’ll have it on test vehicles this year.”



But bus engine developments are not only about electrics and hybrids: both MAN and Scania are continuing to promote buses that run on CNG (compressed natural gas) or biogas. “What we’re talking about here is affordable, proven technology that delivers major savings when it comes to NOx and particulate emissions,” explains Alan Martin, Scania’s UK special projects manager.

“Usually, we fit eight 250-litre gas tanks that collectively weigh no more than a hybrid’s battery pack. Also, while the engines are spark-ignition, each entire chassis has only 40 part numbers that differ from a standard diesel.”

And no feature on bus engineering would be complete without mention of fuel-cell buses. Some, built by Wrightbus, have been in service in London for a while. However, suffice to say, the technology remains too expensive to be economically viable. That may well become true for many of the foregoing electric and hybrid technologies, too (with the clear exception of micro hybrids and Flybrids), with the demise of the Green Bus Fund, following the recent placements for the fourth round of funding.

Fortunately, improvements to conventional drivetrains are helping to make conventional buses more fuel efficient, too, albeit not to the same extent. Voith, for example, says its DIWA.6 automatic transmission delivers a 5% fuel saving, compared to its predecessor, thanks primarily to a reduction in operating pressure.

ZF also reports that its EcoLife auto box, now being fitted to Euro 6 buses, is contributing to a fuel economy improvement of 3–4.5%, compared to figures achieved on Euro 5 buses.

“We’ve matched it more closely to the engine’s own mapping and Automatic Idle Shift is having an impact, too,” explains UK bus market sales engineer Neil Gladstone. “It decouples the drag effect an automatic transmission can have by disengaging first gear as the vehicle comes to a stop, while ensuring that it doesn’t roll backwards. So the 200Nm of drag that would otherwise be there at idle falls to 20Nm. That probably accounts for 80% of the fuel saving we’re seeing.”

Introduced in 2008, initially exclusively on Volvo buses at Euro 5, EcoLife was already 5% more fuel efficient than the Ecomat box it succeeded. Provided as standard, its TopoDyn Life continuous shift software programme also contributes to minimising fuel use. 