Two 12-metre BYD ebuses are in service in central London with Go-Ahead

TRANSPORT *of* DELIGHT

Buses and coaches are seeing greater uptake of advanced engine and transmission technologies, thanks largely to the incentives available. Steve Banner looks at some of the latest systems

A quiet revolution is slowly unfolding in Britain's city centres as electric buses start helping to reduce urban air pollution and background noise. Already a supporter of battery power as a means of making mass transit cleaner and more efficient, Nottingham City Council, for example, has ordered 13 single-decker electric 12-metre ebuses, constructed by Chinese manufacturer BYD. They will join 45 electric buses already operating there. Two 12m BYD ebuses are also in service in central London, with Go-Ahead.

Nottingham's ebuses have a claimed range of just over 155 miles, so seem unlikely to run out of juice between stops. However, costing one-third more than their diesel equivalents, ebuses do not come cheap. In Nottingham's case, their purchase was part-funded by a £1.4m grant from the DfT's (Department for Transport) Green Bus Fund. The £2.1m balance comes from the city's workplace parking levy.

RAPID CHARGING

Recharge times? Go-Ahead's ebuses have to be plugged in for five hours, but can then tackle a 17-hour shift, says BYD. Technology is continuing to develop, it adds, with two hours now a realistic figure. Also, BYD unveiled a 47-seater electric coach with a claimed range of 190 miles earlier this year, although there are no plans to market it in the UK.

But BYD is by no means the only electric bus manufacturer. Rivals include Optare and Wrightbus. Last year saw eight electric Wrightbus StreetLite 9.6m single-deckers go into service with Arriva on a 15-mile route through the centre of Milton Keynes. In this case, an induction charging point was installed in the road at both ends of the route, and now a 10-minute layover replaces two-thirds of the energy consumed during each run.

One issue: traction batteries eventually have to be disposed of, which raises environmental concerns. However, BYD contends that the iron-phosphate batteries it installs still hold 75% of their charge after 10 years, so can thereafter be switched to static applications.

Also equipped with batteries, diesel-electric hybrid buses can make use of an induction charging system. Last autumn's Euro Bus Expo, held at Birmingham's NEC, saw Volvo and Lothian Buses extolling the virtues of a system that employs roof-mounted rails rather than a plate in the road. This allows Lothian's Volvo 7900H 12m hybrid single-deckers to run for almost five miles on battery power.

Meanwhile, battery disposal is not an issue with some other packages becoming available. Last November, ADL committed to acquiring 250 Gyrodrive electric flywheel systems from

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Top gear

Fuel economy on gas and diesel engines is heavily influenced by gearbox programming and, specifically, the timing of gear changes. In Allison's case, its new FuelSense package – which is suitable for use on its automatic bus transmissions – is said to be capable of improving economy by up to 20% compared with the its earlier generation transmissions.

It does so by taking into account factors such as how steep an incline is and how heavily the vehicle is laden and optimises the shift pattern accordingly. It draws the data it needs from sensors attached to the engine and transmission, and from a built-in inclinometer.

GKN Hybrid Power. Designed to last the life of the vehicle, Gyrodrive employs a high-speed carbon fibre flywheel to store energy generated by the bus as it slows. That energy is then used to power a GKN EVO electric motor, which helps accelerate the vehicle.

One Euro 6 Enviro400 double-decker fitted with Gyrodrive has already achieved Low Carbon Emission Bus Certification, says ADL. This signifies a 30% cut in CO_2, which gives an indication of the fuel saving and entitles operators to enhanced fuel rebates.

Heading down a similar path is Wrightbus with the Flybrid KERS (kinetic energy recovery system) developed in a collaborative project with Torotrak, Voith Turbo, Productiv and Arriva (see page 12). This, too, uses a flywheel but in this case linked to the rear diff by its own prop shaft, transferring energy directly.

However, this should not be confused with the Micro Hybrid package offered on both StreetLite and the new StreetDeck double-decker. This also recovers braking energy, but then uses it to power the bus's pneumatic, hydraulic and electrical systems.

COOKING ON GAS

What about gas? Most believe it has a significant role to play. Biomethane produced by a local sewage treatment works, for example, is being used to fuel one bus operated by Bath Bus Company on a shuttle service between Bristol Airport and Bath city centre. The new vehicle produces up to 30% less CO_2 than equivalent diesel buses.

Then, at the other end of the UK, Aberdeen saw the opening of a hydrogen production and bus refuelling station this year that will be used to fuel 10 fuel cell buses built by Van Hool. Six will be operated by Stagecoach while four are set to join FirstGroup.

Lothian Buses uses an induction charging system, in roof-mounted rails

Braking systems

Safety is of paramount importance, particularly on passenger vehicles. AEBS (advanced emergency braking system) has been mandatory for all new type approvals on coaches since 1 November 2013. Stage 1 AEBS will be compulsory on all new coaches from 1 November this year, while Stage II, which imposes more demanding deceleration, will be introduced on 1 November 2018.

Both stages mandate equipment that can detect moving, decelerating and stationary vehicles ahead, and alert the driver. If there is no response, emergency brakes are applied automatically.

Government funding for the purchase of low-emission buses – and the infrastructure to support them – has been given a fresh boost with the launch of a £30m package by OLEV (the Office for Low Emission Vehicles). It will be available from April 2016 to March 2019.

All that said, one of the best ways of reducing fuel usage – and hence emissions – is to cut the vehicle's weight. ADL has slimmed both its Enviro400 and the single-decker Enviro200, and the latest Euro 6 versions are lighter than their predecessors to the tune of 400kg and 200kg respectively.

Meanwhile, Optare's MetroDecker double-decker (unveiled in 2014) boasts an unladen weight of under 10 tonnes, thanks to its integral construction and composite panels. Powered by a 5.1-litre twin-turbo Mercedes-Benz diesel, this vehicle highlights another trend – the drift to smaller, lighter engines at Euro 6. And an all-electric model is set to break cover later this year.

So which way is the wind blowing? "Electric buses represent the future," suggests Optare chief executive officer Enrico Vassallo. "I do not see hybrid technology as a long-term solution." TE