

BUS PRESS

Lightweight body construction techniques aim to squeeze as much performance as possible from alternative power sources, explains Steve Banner

The lighter a bus is, the more passengers it will be able to carry and the less fuel it will consume. But how do you achieve these two desirable goals without sacrificing durability or including exotic and expensive materials in its construction, making it fiendishly difficult to repair?

For Optare, the answer is to construct vehicles using a semi-stainless-steel tubular space frame that does away with a conventional chassis, says engineering director Alastair Munro. "It gives us a high level of strength and structural rigidity while allowing us to remain price-competitive with our rivals," he says.

"It is an approach that enables us to reduce the weight of a single-decker by between 600kg and 800kg, although a lot depends on the bus's exact specification," he adds.

The frame can be clad with non-structural alloy and GRP panels that are easy to replace if they are damaged. Nor is the space frame especially challenging to straighten out if it gets bashed, states Munro.

Higher-grade steels are used elsewhere in the construction of the bus (pictured p34), especially when it



comes to supporting key components. "That's the sort of steel we use for the suspension beam mounting points, for example," he points out.

He is happy to entertain the use of composites, if it is limited. He observes: "The cost can be high though and the number of people who can repair them is restricted. As a consequence you have to be very careful if you are thinking about using them externally."

He adds: "Something we're certainly looking at is using ABS plastic corner cappings." ABS is well-known for its ability to resist impact damage.

Optare's space-frame can accommodate all likely methods of propulsion, Munro says. "Any changes that need to be made are quite subtle," he comments. As the structure is power-agnostic, it would be possible to swap battery power for a conventional diesel powertrain, once the bus was in the hands of its second or third owner, if it were cost-effective to do so without making major modifications.

ON THE UNDER SIDE

Chassis manufacturers have a lot less scope than bodybuilders when it comes to saving weight, says Volvo Bus product

engineering manager Norman Thomas. One way in which the former can help the latter, however, is to ensure there is no duplication of effort, he contends.

"What you don't want to end up with is two cross-members sitting next to one another, each doing the same job," he observes.

Switching to a smaller engine can certainly cut weight, assuming that this is possible. Moving from, say, a 9-litre to a 5-litre can reduce the flab by 50kg to 60kg and will not necessarily lead to a diminution in performance.

And do city buses really need to run around with 250-litre fuel tanks given that they return to the same garage each night? "Fit a 200-litre tank instead and you can save another 50kg," Thomas says.

Lighter vehicles gain maximum benefit from any alternative power source.

POWER PLANTS

At present it is battery power that is making the running, with, for example, 13 BYD 12m single-deckers going into service with Nottingham City Council last year. The buses employ iron-phosphate batteries and their

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John Randerson

powertrain components are warranted for five years.

Chinese manufacturer BYD – the initials stand for Build Your Dreams – has been working closely with Alexander Dennis Ltd (ADL) to supply buses to the capital’s operators, with BYD providing the drivetrain and batteries and ADL the bodies.

ADL’s 85-passenger 12m Enviro200 EV is the result, with 51 of them deployed by Go-Ahead for central London’s 507 and 521 routes since last September. Fitted with two 90kW capacity hub motors, they offer a range of 160 to 180 miles between recharges, says ADL, with a full recharge of the 324kWh battery pack said to take no more than four hours. More recently, Go-Ahead ordered 14 10.8m Enviro200 EVs for use on TfL’s 360 route, also in central London.

BYD and ADL are by no means having things their own way. Last November’s Euro Bus Expo show at the NEC saw Optare launch its 96-passenger 10.5m Metrodecker EV electric double-decker. It has a forecast range of between 105 and 145 miles on a single charge, which takes six hours to complete. Optare has been working to extend the range to over 150 miles. Developed by Magtec, the driveline features lithium-ion magnesium phosphate batteries.

Elsewhere, Wrightbus launched a new line-up of electric buses under the StreetAir banner in 2016 and has come up with a hydrogen fuel cell driveline with lightweight hydrogen tanks and an electric drive axle.

Battery power is finding its way into minibuses, with Mellor Coachcraft using this year’s CV Show to give the 16-seater Orion E its global debut. Its electric front-wheel-drive system removes the need for a prop shaft and rear diff so that the floor is completely flat as well as low for easy access by passengers.

The lithium-ion batteries deliver a 100-mile range and can be recharged

in as little as 100 minutes, says the manufacturer. “The current concern over particulate and NOx pollution in city centres is likely to drive the adoption of electric vehicles,” comments Mellor managing director, John Randerson.

HYBRIDS STILL GOING STRONG

Wrightbus has come up with a parallel hybrid package called HEV – Hybrid Electric Vehicle – that can be installed in both the StreetLite single-decker and the StreetDeck double-decker. It uses a pair of motor generators plus a lithium-titanate (lithium titanium oxide) battery to store the energy recouped under braking.

All-electric Wrightbus StreetLite EVs have been trialled with Arriva in Milton Keynes using power supplied wirelessly from in-ground charging coils.

So where does all this leave gas? Alive and well, according to Reading Buses.

It recently became the first operator in the UK to run double-deckers on compressed natural gas (CNG) when it put five Scania-powered ADL Enviro400CBGs (pictured, p33) into service. They joined 37 CNG single-

deckers already in operation. (For more about gas-based HGVs, see pp 25-26.)

CO₂ emissions from CNG can be 20% lower than those generated by Euro 6 diesel engines, according to ADL. Iveco technical and alternative fuels director Martin Flach makes the point that CNG produces 95% fewer particulates than diesel, while NOx output is down by 35%. He adds: “A 3dB reduction in noise levels compared with diesel means that engines that run on it are quieter, too,” a point worth noting by bus companies operating night services in urban areas.

The Reading buses can be run on biogas which enhances their environmental credentials. Using fuel generated by a local landfill site has to be as environmentally-friendly as one can get – and the source is one that constantly renews itself. [TE](#)

FURTHER INFORMATION

Improving air quality in towns and cities, by Greener Journeys – <https://is.gd/azujem>

ZeEUS e-bus project report: an overview of electric buses in Europe – <https://is.gd/ralaku>

‘Small is beautiful’ – <https://is.gd/asidad>

