Delivering solutions

Gary Mason is NCT's upbeat Engineering Director, a man who relishes the many challenges and opportunities he faces in what he sees as exciting times for the industry, as he explained to **Andy Izatt**

The NCT fleet is now dominated by the 120 ADL Enviro400 CBG City-bodied Scania N280UD gas buses that are now in service. *NCT*

"2019 was a really busy year with 77 new buses joining the fleet," explained NCT Engineering Director, Gary Mason. "67 of the new intake were Scania ADL (Alexander Dennis Ltd) gas double-deckers taking our total to 120 in a fleet of 310.

"The last of the 67, the one that Scania has been using as a demonstrator, arrived before Christmas from Plymouth. It went to ADL for a couple of weeks so some minor changes to the specification could be made to bring it into line with what we require and went into service with us from 2 January. In terms of when it was built, it was the 100th gas double-decker. In terms of when it would have come to us had it not gone on demonstration, it would have been our 100th so we reserved fleet number 500 for it as they're numbered from 401.

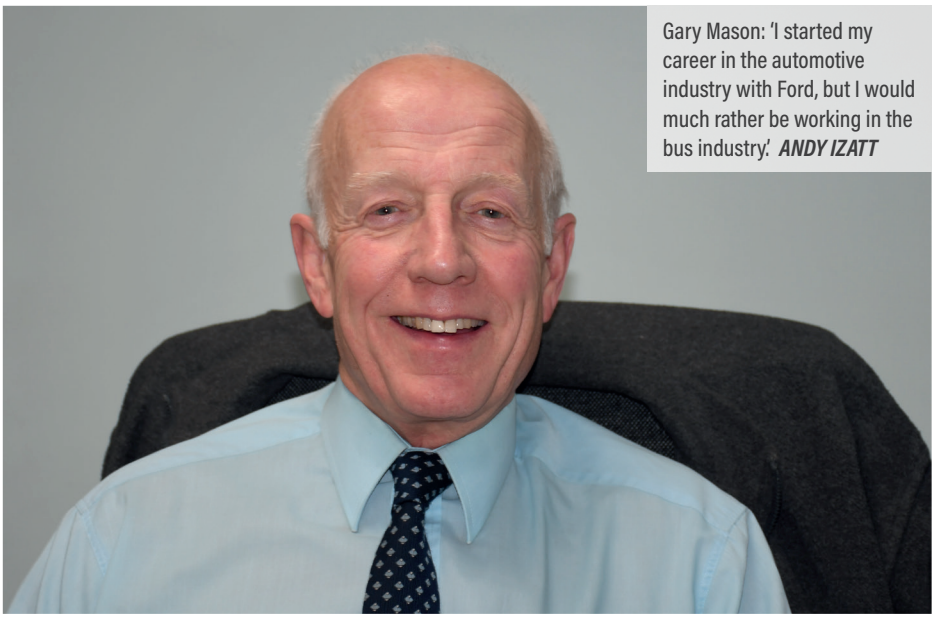
"There's a lot that is very different about the gas buses, which we first started buying two years ago. Inevitably there were going to be some teething problems, not least because the technology was new to both us and Keltruck, Scania's agent in Nottingham. A lot of it was learning as we went along, but now there's not much we've not seen before and we're refining how we operate them all the time.

"Our gas fleet is still being well received by drivers and customers. Although the buses were more expensive to buy, operating costs are a bit lower compared to diesels. Fuel efficiency is what we were expecting and they have proved to be cost effective. We're very pleased.

"We effectively pulled this year's fleet replacement forward into 2019 in order to meet Nottingham City Council's clean air plans for the city centre. That means that in 2020 we're expecting no new vehicles, but what that does give us is the opportunity to revisit our vehicle specification from scratch. What is it we really like and want to improve on? Then build all of that into our fleet replacement requirement for ordering from 2021.

"The NCT fleet has been rationalised in recent years and we're now either a double-deck or a midi-bus operator. There are no 12m single-decks. The routes they ran on have predominately gone double-deck which is good because it gives us the opportunity to grow our customer base. That means the midi-bus fleet has stayed pretty much the same size. We have 78 including 33 ADL Enviro200s and 35 Optare Solo SRs with most based at Trent Bridge depot. Gotham garage has a small number although it's now just an out-station of Trent Bridge where all servicing and maintenance is carried out.

"We introduced 10 new Enviro200 MMCs towards the end of last year and they're performing well. However, while they've



Gary Mason: 'I started my career in the automotive industry with Ford, but I would much rather be working in the bus industry.' ***ANDY IZATT***

NCT's Lower Parliament Street gas station now has five compressors and 18 tonnes of gas storage. ***ANDY IZATT***

NCT maintains a small works adjacent to Trent Bridge depot. ***NCT***

The 120th gas bus to enter service with NCT was the vehicle used by the manufacturers as a demonstrator. Here, it's in Plymouth. ***ANDY IZATT***

achieved low carbon bus certification, we know they're not zero emission. Our gas double-deckers aren't zero emission either, but in terms of carbon footprint they're as close to being carbon neutral as possible. One of the objectives of the city council is for Nottingham to be carbon neutral by 2028 and we'll not be able to do that if we carry on buying diesel buses. We've got to look at alternatives.

"Whatever the type of bus, we can't afford to waste energy any more and I think that's where, as an industry, there's still room for improvement. Energy recovery works on electric drive buses and the same is true for fuel cell vehicles. We have not quite yet got the ideal system that can be incorporated with an internal combustion engine to optimise the energy we get out of a fuel. If we're going to go from Euro VI to Euro VII, and that's going to be more about CO_2 than tailpipe emissions, this is the area that has to be addressed."

Single-deck future

"In terms of midi-bus, there isn't a gas product available to us at the moment. In any event, our Trent Bridge depot is not well served with a suitable gas main so that's not really an option. I think it's almost inevitable that we will start seriously looking at electric particularly as battery technology improves along with range, and hopefully price reduces. Having said that, we are a wholly commercial operator and it's difficult to justify buying an electric bus when we can buy two diesels for the same price, particularly when they're very clean Euro VI vehicles.

"Therefore funding is an issue that still has to be addressed whether it's via incentives to reduce the operating costs to give us an acceptable payback or whether it's capital support through something like a ULEB (Ultra Low Emission Bus) grant that bridges the gap between diesel and electric. That's why I'm thankful we have got this coming year when I'm hoping the mist will clear a little and we will know going forward what the opportunities are going to be. Then we can do the arithmetic and hopefully be able to justify ordering electric midi-buses for delivery in 2022. If there was a 'ULEB 2' in the interim we would be crazy not to try and take advantage of that and bring fleet replacement forward.

> **"If we do look at electric, we'll have to make sure there's sufficient substation capacity at our Trent Bridge depot to make that happen**

"We had a BYD ADL demonstrator last year and were very impressed. I would expect that during the second half of this year we will be looking to take in more demonstrators just to get a feel for them, not least to understand which suppliers we should be talking to.

"The problem with demonstrators is it's difficult to run them in service because of all the ticketing and real-time equipment that needs to be installed. It generally takes about two weeks to kit a bus out so it can be used in service, then another week at the end to decommission it. Unless we can have a vehicle for at least two months, we can't really run it in service. All we can do is shadow a service bus, which is not the same.

"If we do look at electric, we'll have to make sure there's sufficient substation capacity at our Trent Bridge depot to make that happen. There is a very old substation on site already that serves the area and we have been in preliminary discussions with Western Power Distribution which knows it needs to replace it. We would like something bigger to future proof what we might do, but it's reluctant to install that unless there is a firm commitment which is difficult for us to give at this time. It's something to resolve during the year and then the infrastructure will certainly be in place in time for electric bus deliveries, if we go that way. I want to make sure we're working well

ahead of what might be required.

"We already have plans to improve the vehicle flow through Trent Bridge depot which will make it easier to introduce electric vehicles. Overnight charging is what we would install and I estimate we could charge at least two thirds of the midi-bus fleet, possibly all of it, if we took out all the diesel fuelling infrastructure and made some other changes. One of the benefits of going electric is the depot is in the middle of a residential area so it would make it a much more friendly operation, not just in terms of emissions, but noise as well.

"Our route network is like the spokes on a wheel, serving the city centre. We're not allowed to linger in the city centre where different corridors have their own stops anyway so, if we utilised any opportunity charging, it would need to be at outer termini and would have to be replicated around the whole circumference of the city which is not practical.

"I think the range of electric midi-buses is getting close to what we would be looking for anyway although we do still have some running boards that are in excess of 200 miles a day. As every month goes by technology is improving and the range is gradually increasing so if we start off by converting our shorter routes, the situation will hopefully have improved enough to deliver a range where we can buy vehicles later that will be able to do the remainder.

"Other than Euro VI diesel and electric, I don't see any other options for the single-deck fleet at the moment, but new developments are coming along all the time. I can see no reason why hydrogen should not be feasible for both single and double-deck, for example, although it doesn't seem to be any closer to being commercially viable."

NCT's gas bus fleet was bolstered by 67 new additions during 2019. ***ANDY IZATT***

The 12m Scania N230UD Optare OmniDekkas can seat an impressive 86 passengers. ***ANDY IZATT***

Double-deck alternatives

"We will be looking to buy more new double-decks at the same time as we'll be investing in the single-deck fleet and gas remains an option," said Gary. "While we now operate 120 gas double-deckers from Lower Parliament Street, that still leaves us with 112 diesels that are also mostly based there although there are 16 at Gotham.

"Over the coming months we'll be monitoring the gas infrastructure we've installed at Lower Parliament Street very closely. Because of the additional vehicles we introduced last year, gas storage capacity has been trebled, up from six to 18 tonnes, and two additional Gardner Denver compressors have been installed. The original three compressors were supplied by Wärtsilä. Together, it means we have slightly more than doubled compression capacity and we had all five running simultaneously for the first time at the beginning of the year. There is a quite involved control system and what we need to do now is tweak how the compressors are sequenced because we don't want them starting and stopping unnecessarily or the valves on the storage cylinders constantly opening and closing. I expect it could take a couple of months before we settle on the optimum setup.

"Roadgas is our infrastructure partner, Air Liquide our biogas supplier while Cadent is the local grid operator and it's confident that there is plenty of gas in the main we're drawing from to increase our gas fleet further still. We know we can fuel 120 buses, but what we don't know is how many we can go up to. It will be interesting to see how we get on when we're taking gas more quickly from the grid because we have all the compressors running.

"We still have two routes with running boards that are too great even for our gas double-deckers. That's Lower Parliament Street's Pathfinder 26/26A route (Southwell-Nottingham) and Gotham's service 1/1A/1B between Loughborough and Nottingham. Vehicles on both can cover 300 miles a day. We could swap buses over during the day, but we don't really want to do that.

"At the moment I don't see other viable options to diesel at that sort of range, but in terms of replacing the bulk of the remaining double-decker fleet, we're monitoring how electrics are performing in London and we'll be very interested to see how the hydrogen fuel cell double-decks get on there once they're introduced.

"I was at a low carbon workshop prior to Christmas where a very good presentation was given by Ian Foster (ComfortDelGro UK Group Engineering Director) and it's clear from what he was saying, there is still some

way to go on the electric double-deck product, certainly before the range gets anywhere near what we need. However, by 2022/2023 battery technology may have improved such that it's a viable option. At this time I'm not ruling anything out. We just need a clever person to invent something, make a breakthrough, and someone will. It's just a question of when."

Retrofit success

"Our exhaust retrofit programme to bring our remaining 180 diesel buses up to Euro VI is nearing completion. We had hoped it would be the end of last year, but there was a little delay predominately through material supply issues encountered by Baumot, which was undertaking the conversions. We also encountered teething problems with every vehicle type. There were probably some vehicle related issues that Baumot didn't understand and aspects of its system that we didn't understand, but there wasn't anything that we weren't able to overcome.

"My biggest concern was with our 112 Euro V Scania double-deckers. We were putting SCR systems on to vehicles that had never had SCR, but they've performed really well although it's difficult to evaluate exactly what has happened to fuel consumption. Most of the buses are now operating on different routes to what they were running on previously. However, overall we don't seem to be suffering and in terms of reliability there have been very few problems. So far so good.

"Working with Baumot has gone well. We gave it designated areas initially at Trent Bridge and then at Lower Parliament Street where it could carry out the work and where it could store all its equipment and materials. It started by converting one bus at a time and then that was increased to two.

"Five of the 2011 Scania double-decks are being used to upgrade the driver trainer fleet. They're exactly a type of bus the new drivers will be using in service so are ideal, but look different now because we've taken the staircase out. The instructor sits on the nearside, but there's a big window where the staircase used to be so he or she has the same visibility as the driver. We've also moved the fuel tank and it's now under the panelled aperture that yielded the window at the rear of the saloon. That's where there's now a training area where there's a table and whiteboard. It's almost like a mobile classroom and the buses are dual-control like the vehicles they're replacing. The design and conversion work was all done in-house at Trent Bridge. It meant the guys could use all their skills and they loved doing it."

More innovation

"Another major project we're undertaking is introducing contactless payment on all our buses," continued Gary. "We use INIT ticketing and it involved putting new hardware on just about every vehicle in the fleet. On some of the older ones, the work, which we did ourselves, was quite extensive.

"We were expecting contactless to go live last autumn and in terms of hardware, we were ready to go, but contractual issues around bringing the card companies onboard have delayed it. Another reason, is, we're not the only operator involved as we're also working with the City Council and Nottingham Express Transit which operates the tram. We're hoping to have contactless introduced by March.

"Full credit to the guys in my team who carried out the hardware work. We did something similar when we changed from Almex to INIT ticketing several years ago, seconding people for part of their day-to-day

NCT takes full advantage of the branding and advertising potential of its vehicles. ***ANDY IZATT***

to form a dedicated team to do all the swap overs. It was probably more involved when we changed ticket machine supplier, but nevertheless, it has been a big project.

"The major initiative I want to take forward in 2020 is upgrading our maintenance management system and our driver defect reporting system, something I've been looking at since 2014. When I joined NCT I wasn't very happy with our driver defect reporting system. I felt there was room for improvement, but at the time we were undertaking the changeover from Almex to INIT and it would have been asking too much to do both at the same time. I'm glad we waited because in the interim DVSA said it would be prepared to accept paperless driver defect reporting. It's going paperless itself and understands that operators want to do the same.

"To go paperless and integrate driver defect reporting with a maintenance management system, to me, is the way forward, but what I've struggled with is finding something suitable. We ended up looked at systems from many providers before we found what we were looking for.

"In terms of a maintenance planning system, we like what Freeway can provide and we really like Tranzaura's driver defect reporting system. The good thing about those two companies is they're prepared to work together to provide a combined solution. Initially we signed a development agreement, but at the NCT board meeting on 31 January I was given final approval for all the hardware we will require as well.

"We'll be looking to introduce the

Unbranded vehicles like this Scania N230UD Optare OmniDekka carry a silver-based livery. ***ANDY IZATT***

maintenance planning system first, get that up and running and then integrate the driver defect reporting system in the middle of the year. We don't want to be introducing the two at the same time because I think that would be difficult and what's planned fits nicely with our Driver CPC training because we do that in yearly blocks. That will be running until the middle of the year and when it comes to an end, we'll have a bit more resource available from our driver training team that can be devoted to training the drivers on the new system.

"On the current CPC course we've given drivers an insight into what's coming by providing some details of the Tranzaura system. They now have the device with the app installed in a mock-up of what it would look like once it's mounted in a bus so they can see what it's all about.

"While we're introducing all the maintenance planning, we'll be completing the hardware installations in all the vehicles. We'll be doing that in the second quarter with a view to progressively going live, depot by depot in the middle of the year. By September we should have both systems integrated and operational.

"What we're introducing will involve every engineer, all the drivers and most of the support team. There aren't many people who work for NCT who won't be involved in some way. In terms of a company-wide project, it's huge, but one that I've been desperate to do for a long time and Liam O'Brien, my Chief Engineer has been instrumental in moving it forward.

"It should make a big difference to the service we in engineering provide to drivers in terms of addressing repeat defects. We should be able to deal with them more quickly and thoroughly. Within engineering, we will be more efficient because we have better data provision. I would probably expect to incorporate out stores system within a year.

"All the time I've been looking at this, I've been saying to the various systems providers, whoever cracks this first in terms of having an easy to use driver defect reporting app that integrates with a very comprehensive and easy to use maintenance management system that includes all vehicle inspections, will reap the rewards. The whole industry is crying out for it. There are so many operators that would love to have this as an integrated package. I'm really excited by it all. We've been waiting for it for a long time."

Changing thinking

Said Gary: "What happened last year with regard to climate change and the focus there now is on CO_2 reduction is very interesting. However, I don't think people understand that if you're talking about being net carbon neutral by 2050, lifestyles have got to change out of all recognition.

"Replacing a petrol car with an electric one is not going to be enough. A car must become a mode of transport that is only used when it's absolutely necessary so there has to be a change in how people get from A to B – a change in the way they shop – as well. Does the move from the High Street to online need to be reversed because all that's done is increase the demand for distribution and the number of vans on the road?

"I hope people will need to return to the High Street and they'll get there by public transport – a lifestyle change that will affect us all. The way to making that happen is good quality, frequent, low carbon public transport and this is the message the industry must get across not least to government. The bus is at the heart of it all. It's key to how the country can reduce its carbon emissions and that's why this is such a good industry to be in.

"In addition to renewable energy and biofuels, I also think we'll see carbon capture become much more of an issue in the future. Surely it will be in the interest of the fossil fuel industry to invest billions in direct air capture? That industry can extend its life if, somehow, having caused the problem, it can help resolve it by getting the carbon out of the atmosphere. There is no single solution to the challenges of climate change. We must seize upon every opportunity to reduce greenhouse gases because electrifying everything is not the 'silver bullet.' A mix of technologies is needed.

"I started my career in the automotive industry with Ford, but I would much rather be working in the bus industry that is a solution to carbon emissions than the car industry, which is a cause. There are exciting times ahead." //

A batch of 10 ADL Enviro200 MMCs were added to the fleet towards the end of 2019. *NCT*