REPORTS OF SOCIETY MEETINGS

VIVARAIL – WHO, WHY, WHAT AND HOW

by Neil Bates and Dave King

A report of the LURS meeting at All Souls Club House on Tuesday 10 May 2016

The meeting welcomed Neil Bates and Dave King to talk about Vivarail – 'who, why, what and how'. Neil Bates began with an apology from his colleague and boss, Adrian Shooter, who had to travel to Australia. Both Neil and Dave presented sections in their areas of expertise throughout the meeting.

We were told that Vivarail was an interesting proposition, the concept being started a year and a half ago, when the company received its first train from London Underground in January 2015. Beginning with 'who', Vivarail comprises collectively five Directors with many years of experience in the railway industry. Neil is Design Director and Dave is Engineering Director of Vivarail, with Adrian Shooter bring their Chairman. Ian Whenman is Financial Director and Colin Flack Site Director, who has a test track and 10km siding space.

The meeting continued describing the 'why' concept. The Vivarail business is wholly private and its ambition is to look to seek a potential answer to a problem in the market place in that there are not enough diesel powered vehicles available for the immediate requirements of the railway. To that end Vivarail have developed a diesel electric multiple unit (DEMU). Moving on to 'what' behind what Vivarail is doing is driven by the huge amount of growth that the railways of Britain has seen for a considerable amount of time with capacity being a great problem – Vivarail could thus do something about it.

Vivarail's base is just south of Stratford-on-Avon at Long Marston, an old military base which has a 4½km test track which is used also by Network Rail for electrification training. Vivarail therefore saw a short-term opportunity to use the D Stock and employ 'smart engineering', developing a more friendly and sustainable business, which is referred to as the four 'c's – carbon, cost, capacity and customer satisfaction. There is no corrosion on the D Stock body shells and they were described as being in 'fabulous' condition with the bogies being relatively new. However, everything else is 'thrown away' apart from the Westcode brake controller. Vivarail are looking to develop a new vehicle with a 20-year life, possibly longer, with the challenge to fill the shortage of rolling stock until such time as the present national electrification programme is completed.

The concept for the project was then explained – how and why it had changed from the original concept to what it has now become. When the D Stock became available, it was planned to use it as a low-cost solution to the shortage of DMU problems as already outlined but accepting that the train has a maximum speed of 60 mph. It does, however, have a superior acceleration than most main line trains, which would make the D Stock ideal for use on branch lines. The concept was Adrian Shooter's brainchild.

The D Stock power can come from 3rd and/or 4th rail, or from generations fitted on them. As a result of calculations made, three 200 h.p. engines would be adequate for a three-car set. However, looking at the 'control' for the motors – being a traditional camshaft control – it became necessary to have four 200 h.p. generators which would sit comfortable under the solebar. The camshaft is out of gauge for most of the National Rail network as well as being 'maintenance heavy' – LU were familiar with their maintenance whereas Vivarail was not. It was thus decided instead to have DC chopper equipment which would be in gauge. This was the first big change from the original concept. The diesel generator sets could also incorporate a compressor, eliminating the need for a separate compressor. The result was therefore four generator sets per train, each comprising a Ford 3.2 litre 200 h.p. engine, 3-phase alternator and air compressor, all contained in an 800 kg box, which is easily accessible for maintenance and simple to change quickly. All that is needed to change them is a concrete pad so that a fork lift truck can gain access to the site.

For London Underground, the cab fronts had not been built for crash-worthiness especially for their future environment which includes unmanned level crossings. The front end has been rebuilt with new cab controls and the air con in the cab roof has been removed, as it was heavy and inefficient. It has been replaced with new air con equipment under the floor. All that is left of the original D Stock train are the bogies with traction motors and gearboxes, all of which, including the braking, is unchanged. We were told that the car body is in very good condition. Effectively, therefore, pretty much everything

else constitutes a ‘new train’. The original concept of just adding ‘generators’ has thus changed considerably.

Safety equipment as required on the National Rail network has been added, such as the Train Protection Warning System (TPWS) in lieu of tripcocks, head- and taillights have been changed to meet main line specifications, a GSM radio has been added in the cab and the train whistle replaced by warning horns. Passenger door release has been (re)fitted and the door engines changed. Wheel slide protection and auto sanding equipment has been added because of branch line running conditions. A rubber protection around the trailing end gangways and a treadplate has been added so that passengers can move more comfortably from one car to another.

The trains are fitted with ‘remote condition monitoring’, so that problems are flagged up immediately in a central control room and engineers can deal with a problem where it happens, without a time-consuming and costly depot visit being necessary. Speculation in the railway press that a Cummins engine would be placed in the saloon was considered unhelpful to the project, the result being that a small self-contained power pack was employed. The power pack actually produces less emission than a white van in the street and are therefore extremely efficient.

We were told that the D Train did not start out as a rolling stock development project but with Adrian Shooter’s involvement in Chiltern Railways it has – the company did not sit on its laurels and became a very successful operator, inspiration that went on to the D Train project. Vivarail suffered with internal company ‘damage’ with negative BBC reporting that described the D Train project as “London Underground’s cast-off trains”. It was less than helpful! It also didn’t do justice to London Underground either because the trains had been maintained in very good condition. It was just that the trains ‘were of a certain age’. The train had been withdrawn ‘early’ because a deal was done to bring LU’s new train fleet through quicker across all Sub-Surface lines, which gives equipment benefits for maintenance and depot working. The previous year has thus been regarded as a ‘challenge’. It was noted that the D Train has been developed at a fraction of the cost that Bombardier has spent on their ‘Aventra’ train, has been done with a fraction of resources and in a much shorter time. The philosophy of the D Train is that nothing is used unless it has been proven, is fit for purpose and meets all the necessary standards.

The certification process is interesting, in that because of parts of the District Line runs over National Rail metals, it is possible to enjoy some ‘grandfather rights’, which is very beneficial. The Office of the Rail Regulator (ORR) requires anything that is new is fully tested but with existing equipment, provided it fits within gauge and matches the infrastructure, then this avoids a lot of expensive and time-consuming testing and validation. Unchanged are the emergency braking system along with the bogies and dynamic performance within the 60 mph limit. However, with the reinforced front cab end in the process of certification, approval was anticipated in about four weeks’ time (of the meeting date) so that trials of the D Train could begin on the National Rail network. To begin with, testing is to take place in an engineering possession between Evesham and Moreton in Marsh.

The passenger information system has been replaced, making it Passenger with Reduced Mobility (PRM) compliant, a requirement necessary for all rolling stock by 2020, otherwise it will have to be withdrawn from service – a problem foreseen with the existing ‘Pacer’ class 142, 143 and 144 fleets.

We were told that the first unit arrived at Vivarail at Long Marston on 15 January 2015 and so far, (as of the date of the meeting) some 168 cars out of a total of 256 purchased (156 Driving Motor cars and 70 trailers) which will enable around 70 x 2-car or 3-car sets to be formed and provide a reserve of spare parts. The D Stock was built by Metro-Cammell in Birmingham and was later taken over by Alstom. Fortunately, all the relevant paperwork existed in a warehouse in Preston and the original strain gauge testing reports (from 1979) for the car body were located.

On arrival at Long Marston, the train was lifted and everything stripped away, including piping and wiring, and the seats removed. An asbestos survey was undertaken and a facility built to remove it. It was pointed out that the vehicles do not belong to Vivarail until it can be demonstrated that decontamination has taken place. From here, the conversion of a three-car prototype train was to be undertaken. The scratched car widows were replaced by a company called Percy Lane, the successor to ‘Beclawat’, who have all the original drawings. The six bogies were sent away for overhaul – the tyre profile used on LU is different from National Rail, so the tyres were reprofiled. The braking system was fully overhauled, traction motors overhauled, the wheel bearings checked, along with all the suspension elements. We were told that National Rail platforms should be of a standard height, but

very few conform. Because Vivarail wanted the train to go country-wide, the car body was raised by 45mm, which means the train can meet the stepping distance from platforms. Inside the driving cab the LU driving desk has been completely replaced. However, because of the redesigned and crash-worthy front end, the front cab door has been removed and the floor area re-plated.

We then saw photographs of the 'crash test' using unmodified motor car 7056, which took place on 15 May 2015. The weather had to be 'right' – i.e. not in bright sunlight and not in darkened conditions. The car was not a write-off, but won't be one of those converted for passenger service! The result was that the driving desk has been moved back by just 100mm so that in the event of a collision, the driver is able to 'walk away'. The master controller has been moved from the right to the left-hand side.

The trailer cars have no power packs underneath so there is plenty of room for toilet retention tanks and water tanks for the toilets. The optional toilet is positioned away from the doorways to avoid the door engines and the wheelchair space between the doors and the toilet. In this area there are a number of tip-up seats and spaces for wheelchairs. The grab rails extend over the top and strap hangers have been provided. The existing wheelchair space, although no longer compliant, is being retained to accommodate cycles. In the three-car prototype train there is a capacity for 296 passengers, both seated and standing, with space for a further 90 if conditions reach 'crush load' proportions.

Three versions of the D Train are proposed:

- The 'City' train – the layout largely unchanged from the LU layout. This version has no toilet.
- The 'Commuter' train – with either two or four doors per car side, with the centre section being provided with 2+2 seating as on a traditional main line train.
- The 'Country' train – longitudinal seats removed with transverse seating making it look like a main line train.

Views of the interior were then shown with back-to-back seats being able to accommodate a small folded cycle between them. The exterior as it looks now was then seen with the prototype motor cars as good as complete but with further work to be done on the trailer car.

We were told that the D Train is a 'kit of parts' – a toolbox – and Vivarail would offer the tools to each Train Operating Company to be configured in a way that they feel is appropriate to their business and the one that works best for their requirements.

Our presenters then showed film of the 'crash' tests, during which time there was a question-and-answer session during which the sentiment was expressed for a very successful venture.

The meeting then showed their appreciation to Neil and Dave for a most interesting and informative presentation.

Brian Hardy