Vivarail explores low-cost DMU conversion

A prototype trainset is now being built to demonstrate how former metro trains could be economically adapted to increase capacity on non-electrified routes.

Next month is due to see the roll-out of a prototype low-cost diesel-multiple unit, being developed by the Vivarail consortium in a bid to provide additional capacity for non-electrified routes to a rapid timescale.

Traffic on Britain’s regional and rural railways has been growing steadily, leading to a shortage of DMUs for non-electrified routes. The government has committed to an extensive programme of electrification (RG 5.14 p43), which is expected to release substantial numbers of DMUs over the next decade, but even so the industry-led Rolling Stock Strategy Study Group puts the requirement for new self-powered trainsets at between 350 and 500 vehicles.

The invitation to tender for the Northern franchise includes a requirement for 120 new DMU vehicles (RG 4.15 p8) as part of a government commitment to eliminate the unpopular four-wheeled Pacer diesel railbuses acquired by British Rail in the 1980s, amounting to something over 200 vehicles. However, the major rolling stock leasing companies have been reluctant to invest in new diesel vehicles because of the complexity and cost of developing a bespoke design for the UK’s restricted loading gauge which meets current European emissions regulations.

With all rolling stock required to meet the TSI PRM accessibility requirements by 2020, there is further pressure for any non-compliant vehicles to be modified or withdrawn by that date.

As an interim measure until electrification, Vivarail came up with the idea of converting former London Underground D78 metro trainsets, which are currently being replaced on the District Line by new Bombardier S-stock (RG 1.11 p38). These would not meet the TET requirements for ‘new’ vehicles, but they could provide additional capacity relatively quickly, according to former Chiltern Railways Managing Director Adrian Shooter, who is now Chairman of Vivarail with backing from Railroad Development Corp.

Enter the D-Train

The Vivarail D-Train would combine the bodyshells, bogies and traction motors from the D78s with underfloor low-emission diesel engines, and modern control electronics. This would give a high power-to-weight ratio and rapid acceleration, making the unit suitable for services with frequent stops, even though the maximum speed will be limited to 100 km/h.

According to Vivarail, the D78’s aluminium bodyshells are in good condition with no corrosion, while the bogies
Table I. Indicative configurations for Vivarail D-Train DMUs

<table>
<thead>
<tr>
<th>Type</th>
<th>Cars</th>
<th>Seating layout</th>
<th>Seats (fixed/folding)</th>
<th>Standing spaces</th>
<th>Toilet</th>
<th>Doors per car side</th>
</tr>
</thead>
<tbody>
<tr>
<td>City</td>
<td>2</td>
<td>Mostly longitudinal</td>
<td>88</td>
<td>106</td>
<td>No</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Mostly longitudinal</td>
<td>136</td>
<td>161</td>
<td>No</td>
<td>4</td>
</tr>
<tr>
<td>Commuter</td>
<td>2</td>
<td>Mixed longitudinal and 2+2</td>
<td>100 + 8</td>
<td>86</td>
<td>No</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Mixed longitudinal and 2+2</td>
<td>156 + 12</td>
<td>131</td>
<td>No</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Mixed longitudinal and 2+2</td>
<td>150 + 10</td>
<td>127</td>
<td>Yes</td>
<td>2</td>
</tr>
<tr>
<td>Country</td>
<td>3</td>
<td>Transverse 2+2</td>
<td>150 + 6</td>
<td>127</td>
<td>Yes</td>
<td>2</td>
</tr>
</tbody>
</table>

were replaced with a new flexible-frame design around a decade ago. With some 're-engineering' to give additional collision protection in a main line environment, the vehicles potentially have at least 20 years more life in front line service. Unlike LU's small-profile 'tube' trains, the sub-surface D78s are built to main line dimensions, and they already operate over Network Rail tracks in daily service.

The consortium has purchased 156 driving motor cars and 70 trailers from Transport for London for £1.9m, which it says would be sufficient to build 75 two or three-car DMUs. It has commissioned Revolve Technologies to produce the underfloor power packs, using five-cylinder Ford Duratorq automotive diesel engines of 200 hp coupled to an Evo alternator.

There would be two power packs on each driving car, giving 400 hp and a weight of around 31 tonnes against 285 hp and 37.5 tonnes for a comparable Class 150 DMU vehicle.

Strukton Rail is providing the IGBT traction controls, while Creative Design has been undertaking the industrial design and cab structure re-engineering as well as developing a range of modular interiors. Phenolics is supplying the universal access toilets and passenger communications system.

The first vehicles for conversion arrived at the Motorail UK engineering facility at Long Marston on January 19, and Vivarail expects to have a two-car DM-DM prototype ready for testing in June. The company anticipates that it will receive approval in September for the train to operate over the national network, and safety of interior configurations, which could be customised to meet the requirements of individual operators. Options include two or four doors per car side, traverse and/or longitudinal seats, tables, bicycle racks and PRM-compliant accessible toilets. Vivarail says the City configuration is intended for busy lines with frequent stations, whereas the Commuter and Country variants would provide more passenger amenities for routes with longer journey times (Table I). All trains would have inter-car gangways within the set, and be fitted with new lighting and onboard wi-fi.

Vivarail is proposing to offer the D-Train with either two or four doors per car side, depending on the type of duties envisaged.

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