The EU-funded SPECTRUM project has conducted research which suggests that a network of high-performance intermodal train services, using innovative wagons and horizontal transhipment technology could attract a significant proportion of the low-density high-value (LDHV) cargo which is currently transported by road in the European Union. ROSS JACKSON and TOM ZUNDER reveal all

The hope within the European Community is that the high technology, the right distances and the right market conditions, up to 1.9 billion tonnes a year of LDHV freight could be switched from road to rail in the future. The FP7 supported SPECTRUM (Solutions and Processes to Enhance the Rail Traffic Access to Unexploited Markets) project started in 2011, has 20 partners from a range of industries and is led by NewRail, the Newcastle Centre for Railway Research. The project has analysed the nature of the LDHV goods market and the technical and operational concepts which could facilitate a shift of time-sensitive traffic from road to rail.

Time-sensitive goods

In a competitive global market, shippers and consignees require a service that offers reliable, consistent and precise movement and storage of goods. These service requirements have become even more crucial for time-sensitive LDHV goods. Today, this traffic is generally transported by non-rail modes – either by road which is cost sensitive over shorter distances or by air which becomes effective when time-critical premium products justify the higher transport costs.

In the European context, road is typically favoured for the transport of LDHV goods between origin and destination in densely populated areas. However, the major road networks are increasingly congested and, in many regions this has made road transport unreliable. A shift to rail would help to relieve the congestion and offer significant benefits in terms of reduced energy consumption and greenhouse gas emissions.

The main European flows of LDHV goods were estimated using data from the ETSlipus project (Ref. 1) and validated using Eurostat 2012 statistics. Medium and long-term forecasts were prepared for 2020 and 2030 using the Integrated Scenario developed by the ITREN-2030 project (Ref. 2). For a qualitative assessment, the team also interviewed ten potential rail freight customers about their expectations. Around 49 per cent of all LDHV goods transported by road are moved over distances of 200km or more, and five national and international corridors were identified which have a substantial proportion of long-distance traffic, including routes in Greece, Spain and Sweden.

However, from a business perspective, rail freight could only be expected to attract a proportion of this volume. An estimate for the volume of ‘rail-accessible’ LDHV traffic moving over 200km is around 1.9 billion tonnes, which is around 12 per cent of the total tonnage currently being transported by road in the 27 EU member states and Switzerland.

To meet customer expectations, the rail freight service would need to offer short, fast, reliable and flexible trains, working in hub-and-spoke networks, on high-frequency corridors or serving multiple stops on longer routes. The network would have to accommodate temperature-controlled traffic, and link into urban feeder networks or serve strategically-located consolidation centres. Trains would predominantly run on mixed traffic routes, requiring integration between freight and passenger train services.

Given these conditions, the project team believes that a high-performance freight train running at passenger speeds would be able to capture a percentage of the LDHV goods currently being transported by road.

Capacity management

The integration of freight and passenger operations is key, as the LDHV freight trains would need to run between passenger services, using passenger-quality train paths. Feedback from infrastructure managers including Traktiewerk, TCDG and Network Rail helped the project team to understand the principles of timetabling, service patterns and operational procedures, alongside capacity management policy and practice.

A number of ‘service areas’ specific to the LDHV sector were identified. Infrastructure managers would have to schedule train paths that allow a freight operator to design a door-to-door supply chain that meets its customers’ needs. This would impact on the way in which they develop timetables, whilst still adhering to EU regulations about fair and non-discriminatory treatment of all operators. It is also important for terminals to be located close to pre- and end handling points, with suitable, affordable transhipment equipment for the swift transfer of goods from trains to delivery vehicles.

In the research the behaviour of a passenger-quality freight train was evaluated on four of the corridors identified as having significant demand for LDHV goods:

- Switzerland (Baillets – Chur)
- Sweden (Hallsberg – Malmo) – Denmark (Copenhagen)
- Italy (Turin) – France (Lyord)
- Bulgaria (Bulgarian Border (Haskalii) – Kapikule)

Using simulation techniques it was demonstrated to be possible to add a number of LDHV trains within the current freight and passenger timetables on each of the routes.

Conceptualisation

Using a combination of qualitative and quantitative research methods to identify the market requirements, the SPECTRUM team came up with seven concepts for further evaluation in order to produce an innovative freight vehicle to meet these requirements, and looked at opportunities to operate high-quality freight services on the most promising corridors.

Nineteen participants, including railway related academics, researchers, operators, manufacturers, suppliers and infrastructure managers, took part. Six characteristics were identified and used to define the logistics and vehicle design requirements: high performance, reliability, mixed running, flexibility, security and seamlessness. The types of goods and loading units to be transported, governed the concepts.

These concepts were reduced to three through a ranking methodology favouring Concept A, Concept C and Concept F. In a subsequent evaluation stage, Life Cycle Costing (LCC) and SWOT analyses were used with both methods identifying Concept C as the strongest.

The analysis was extended to look specifically at the application of the concepts to the four corridors, where trip distances varied from 535km to 1900km. On the basis of the LCC analysis, Concept C offered the cheapest cost per pallet-km.

Preferred option

The favoured concept is a multi-purpose flat wagon to carry containers and swap bodies, incorporating a horizontal transhipment technology. A key attribute is the ability to load and unload the loading units without the need for a costly dedicated terminal.

Having identified the market opportunities and a suitable vehicle technology, the SPECTRUM team will now undertake further research to match the vehicle development with the ‘service areas’ defining the potential LDHV mix. A full economic assessment of the concept is planned.

References
