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Integrated railway-tramway transport in Poland

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Abstract

The paper presents the basic problems connected with the introducing of the integrated railway-tramway transport system in Poland. Traffic density on the PKP railway network, especially in large cities and suburban areas, has been described. As an example, the results of the feasibility study of the use of railway infrastructure for dual mode transport in Krakow are reported. Basic technical and economical problems have been outlined. Certain railway-tramway connection in Wroclaw region has been also presented. In summary the possibilities of the development of railway-tramway transport system in Poland have been pointed out.

1 Introduction

Integrated railway-tramway transport system was introduced in the Karlsruhe region in 1992 (see [3]). Now, in more than 30 European cities, so-called Karlsruhe model, is being intensively studied or is already in service (see Fig. 1, based on the data described in [5]). The problem of non-conventional use of the existing railway infrastructure in Poland has been studied since 1990. The example of the analysis of this problem is presented in paper [1]. On the basis of the proposed class specification of the railway lines, two basic possibilities have been analysed: use of Karlsruhe model in the regions of large cities and use of railway microbuses for regional links. If the region of a large city is considered, then two ways of the use of railway lines for urban transport are possible:

a) conventional - city railway (S-bahn) as a separate network in relation to the tramway, metro, etc.;
b) non-conventional - Karlsruhe model.

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If the development of the transport system in urban and suburban area is considered, especially the building of a new, separate rapid tramway, then the analysis of use of Karlsruhe model is necessary. The paper presents the basic problems connected with the introducing of the integrated railway-tramway transport (Karlsruhe model) in Polish conditions. Only general results of the feasibility study for the Krakow region will be described - more detailed analysis is presented in paper [2].

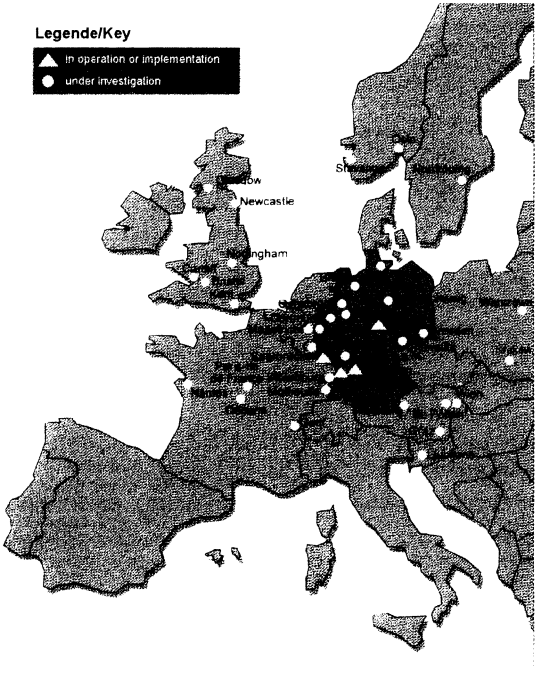

Figure 1: Karlsruhe model in Europe - in operation, in implementation and under investigation (based on the [5])

2 General description of the polish railway and tramway network (infrastructure and traffic)

Polish State Railways (PKP) network consist of more than 20000 km of lines with standard gauge (third position in the Europe, larger network is in Germany and France). In 1998 the total length of the railway lines in operation was equal to 21491 km, including 5047 km of the lines with the international agreement (AGC and AGTC). The basic characteristics of the Polish railway network is the relatively high density (in Poland -7,5 km of the lines per 100 sq. km of the area, average value in EU - 6,2 km/100 km2) and the degree of electrification (in Poland -49,2%, average value in EU - 37,8%, see [4]).

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Total length of the tramway lines in Poland is more than 950 km. Tramway networks are in 14 cities and groups of cities (Katowice and Lodz regions). In 9 regions standard track gauge (1435 mm) is used. Among the regions of large cities (8 localisations, more than 500 000 inhabitants) the narrow gauge (1000 mm) is only in Lodz.

Total length of the railway network in large cities is approximately the same as the tramway network; e.g. in the Krakow area, the railway lines are about 90 km, and the tramway lines are about 80 km, in Poznan - railway lines: about 70 km, tramway lines: about 60 km. These numbers describe only railway lines in the city area, without suburban regions. It means that the integrated railway-tramway network in basic Polish regions should significantly increase in relation to the existing tramway networks.

Passenger and freight traffic on the PKP railway lines since 1990 has had a general tendency to reduce. The number of passenger-kilometres (pkm) decreased about 50 % (from 50300 millions pkm in 1990 to 25000 millions pkm in 1998) and number of tonne-kilometres (tkm) has declined by more than 30% (from 83500 millions tkm in 1990 to 61500 millions tkm in 1998). During 1998-2000 traffic has also been decreasing. PKP planes to close about 6000 km of the lines in 2000 and reduce the basic service to the 6000 - 7000 km; the state of the other lines is under consideration.

At the same time, tramway traffic has declined, but not significally - e.g. in Krakow between 1990 and 1997 decreased and since 1997 it has increased.

In 1997 PKP in Poland transported 414 millions of passengers; in Kraków and suburban regions only 9,8 millions of passengers, on more than 100 km network. Municipal Transport Corporation (MPK) - at the same time - transported 316 millions of passengers on the 80 km tramway network..

It follows that a detailed analysis of the possibility to introduce Karlsruhe in Polish conditions is necessary.

3 Concept of the integrated railway-tramway transport system in Krakow

3.1 Railway - tramway junctions

In the basic project 9 tramway - railway junctions have been considered. Total length of the junction tracks (including turnouts, partly railway and partly tramway as well as constructing of the second tracks) is equal to about 6,5 km of single track. The general layout of the railway-tramway system with the junctions is presented in Fig. 2.

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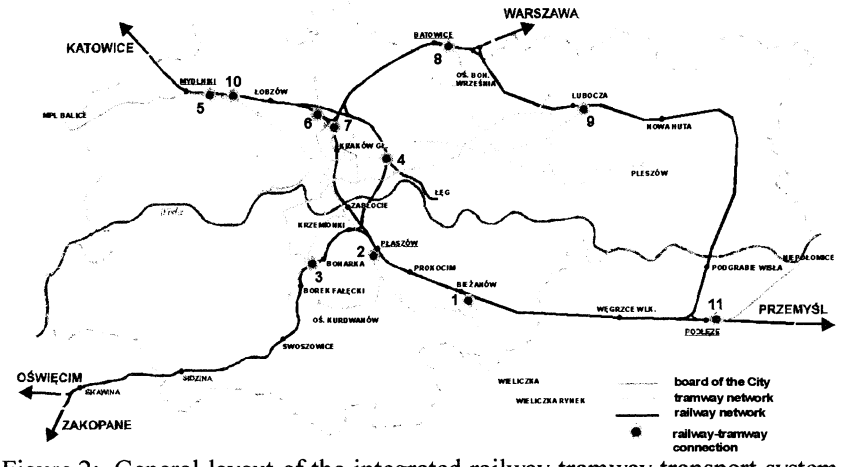

Figure 2: General layout of the integrated railway-tramway transport system in Krakow and suburban regions.

3.2 Traffic organisation and control system

This problem should be described as follows:

a) introducing the cyclic time-schedule for the heavy trains and time separation of the tramway and railway traffic;
b) limitation of the maximum heavy trains speed for the several zones of the tramway traffic density:
   - central zone of the city - maximum trains speed 60 km/h;
   - next zones - 80,100 km/h and full admissible speed
c) improvement of existing railway control system on the all railway lines in the considered area;
d) introducing of the vehicle positioning and communication/information system (GPS, GSM-R or/and other systems);
e) introducing of the electronic collision - elimination system for the tramway on the roads.

3.3 Stops and interchanges (modal split)

More than 70 % of the existing stations and stops have the platforms with the height less than or equal to 0,38 m. Therefore for the new stops the platform of the 0,3 m height will be designed. In the existing service points certain modernisation work should be also taken into account. A typical new stop for the double track lines will be designed including the following equipment:

a) platforms: length - 50 m, wide - 4,5 m; height - 0,3 m;
b) stairs and lifts - if difference of altitude of non-collision crossing between track and road is equal to about 6 - 6,5 m;
c) parking lots for cars and/or bus stops;

d) other equipment for passenger service (information, rain and wind protection, etc.).

Comfortable passages for passengers will be also built in the interchanges points (so called „door to door" interchanges)

3.4 Vehicles

Comfortable dual-mode tramways (3000 VDC and 600 VDC), with the 40-70 % low floor will be used for the integrated tramway-railway service. The capacity should be at a level of 200 passengers. Typical mechanical/electrical parameters will be implemented.

3.5 Investment and service costs

Investment costs (infrastructure only) are estimated at a level of 170 millions PLN (82 millions DM). Service costs on the railway network have been estimated at the same level as on the tramway network. The opening of the first line is planed in 2002 and the next ones within 4-5 years.

4 Example of integrated railway-tramway transport system in Wroclaw region

The general layout of the railway-tramway connection between Trzebnica and central zone of the Wroclaw is presented in Fig. 3.

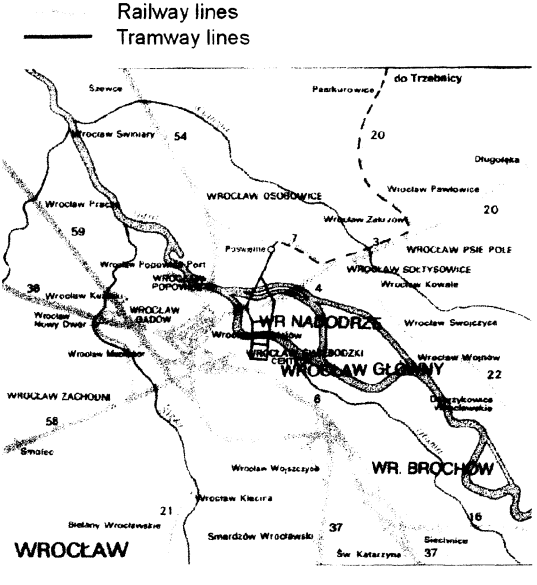

Figure 3: General layout of the railway network and example of integrated railway-tramway connection in Wroclaw region

The existing railway line from Trzebnica to Wroclaw Psie Pole is not electrified. Therefore the use of the dual mode, diesel-electric tramway is proposed. A basic transportation analysis shows that this solution will be effective.

5 Summary

In the paper certain problems connected with the introducing of the integrated railway-tramway transport system in Poland have been described. From the presented data it follows that the development of the Karlsruhe model in Poland will be probably very effective.

References

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