Mechanics Transport Communications
Academic journal

ISSN 1312-3823
volume 10, issue 3/2, 2012
article № 0708
http://www.mtc-aj.com

PROBLEMS OF RAIL CONNECTIONS BETWEEN UKRAINE AND ITS NEIBOURING COUNTRIES

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Key words: *rail connections, Ukraine, movable wheelsets,* variable gauge system.

Abstract: *The paper presents the problems related to rail connections between Ukraine and its neighbouring EU member countries. The difference of track gauges is a barrier to achieve fast, comfortable and cost-effective transportation of passengers and goods especially with the traditional ways of transshipping and changing bogies. For that reason the new technical solutions are connected with changing the wheelsets in motion, which has already been applied by the Polish Railways at Medyka (PKP) - Mostiska-2 (UZ) border crossing. The advantages of this system make it an appropriate decision to solve the track gauge problems not only with Poland, but also with other countries.*

1. INTRODUCTION

The Ukrainian Railways or Ukrzaliznytsia (Укрзалізниця) is a public company managed by State Administration of Railroad Transportation in Ukraine, which controls vast majority of the rail transportation in the country. The railway network has a total length of over 23,000 km tracks that makes it the 14th largest in the world. It is also the world's 6th largest rail passenger transporter and the 7th largest freight transporter.

The railway construction on current territory of Ukraine began under the imperial rule of the Austria-Hungary. Przemyśl – Lviv was the first railway line built as part of the connection from Kraków (1861) with a length of 98 km. It was constructed by k.k. priv. Galizische Carl Ludwig-Bahn later nationalized by the Imperial Austrian State Railways.

The next lines set in operation were Lemberg (Lviv) - Czernowitz-Jassy Eisenbahn-Gesellschaft (1866), Lviv to Brody (1869) with a branch reaching Tarnopil and the connection with Russian Empire (1871): near Volochysk over the Zbruch river, ultimately connecting Odessa with Hamburg. Until 1884, the railways were managed by a local directory of state rail transportation, which effectively competed with the Carl Ludwig Railways. After the nationalization of railways in Austria-Hungary (1892) the railway directories in the Kingdom of Galicia and Lodomeria became three: Kraków, Lviv and Stanislawow.

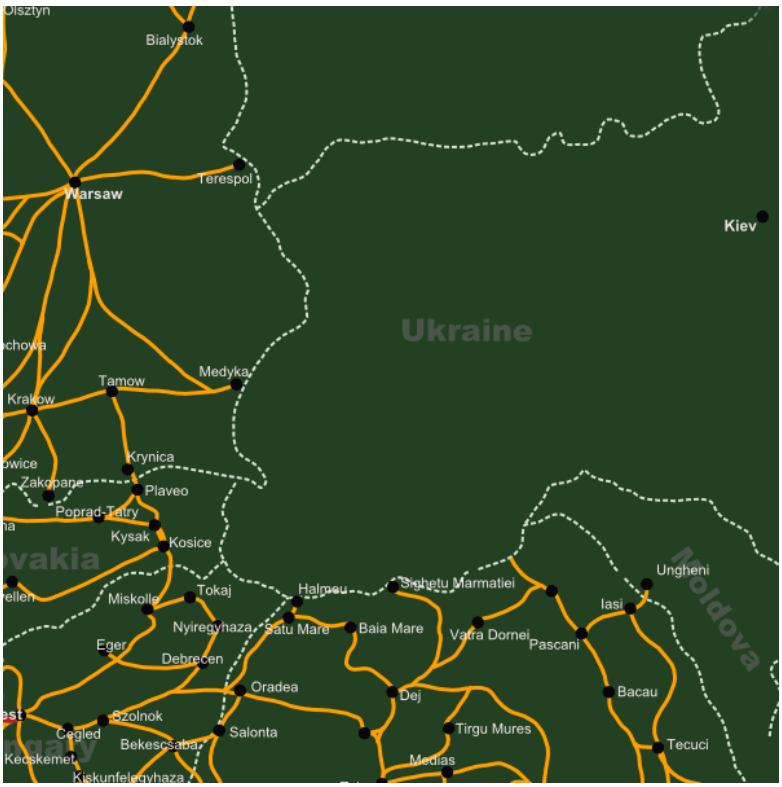
The railways in the eastern part of Ukraine were built within the Russian Empire and later within the Soviet Union when the network was largely expanded and all tracks were replaced with a gauge of 1,520 mm.

The Ukrzaliznytsia (Укрзалізниця), which is a public company managed by State Administration of Railroad Transportation in Ukraine and controls vast majority of the rail

transportation in the country, was separated from the Soviet Railways on 14 December 1991. It consists of six separate territorial railways with own directorates, located in the following cities: Donetsk Railway – Donetsk; Lviv Railway – Lviv; Odessa Railway – Odessa; Southern Railway – Kharkiv; Southwestern Railway – Kiev; Near-Dnipro Railway – Dnipropetrovsk.

The Ukrainian Railways have a total length of over 23,000 km being the 14th largest in the world. The number of employees is 375,900 and they operate 2,718 locomotives (of them the electric locomotives amount to 1,796); 74,939 freight cars; 8,429 passenger cars; 1443 electric multiple units and 186 diesel multiple units; 62 specially branded passenger trains. The Ukrainian Railways are also the world's 6th largest rail passenger transporter and the 7th largest freight transporter.

Concerning the existing rail connections between Ukraine and the neighbouring countries, they are of two types: with the same gauge (Belarus, Moldova and Russia) and with break-of gauge from 1,520 mm to 1,435 mm (Hungary, Poland (except for a standard gauge cross-border cargo line), Romania, Slovakia).



2. WAYS OF OVERCOMING OF THE BREAK-OF-GAUGE

There are different technologies of transferring from one gauge to another that are normally practised at present:

- The passengers have to change the trains or that the goods have to be loaded on other trains. Transhipping of freight is very labour- and time-intensive, and increases the risk of damage to goods. If the capacity of freight cars on each system does not match, additional difficulties can appear.
- "Bogie exchange" consists of removing the chassis containing the wheels and axles of the car, and installing a new chassis with differently spaced wheels. It is generally limited to wagons and carriages, though diesel engines can be exchanged if more time is available.

- Gauge changing systems, which provide an automatic transfer from one to another gauge. The gauge is altered by driving the train through a gauge changer or gauge changing facility. As the train passes through the gauge changer, the wheels are unlocked, moved closer together, or further apart, and are then re-locked. This technology requires special technical solutions both for the vehicle as well as at the permanent way at the intersection of the gauges: the so-called gauge change wheelset in the vehicle and a stationary gauge changing equipment between the gauges.
- The breaks-of-gauge can be avoided also by installing dual gauge track, either permanently or as part of a project to replace one gauge with another.

Among the automatic gauge changing systems, the most successful are the following implementations:

- Talgo (Spain) and CAF dual-gauge axles (variable gauge axles) which permit through running between broad gauge and standard gauge;
- Gauge Change Train in Japan built on Talgo patents running on standard and narrow (1067 mm) gauge;
- Movable wheel sets developed by the German Railway (DB AG) and the UIC study group of gauge change wheelsets followed by a contract with the factory Radsatzfabrik Ilsenburg GmbH (RAFIL) on the further development of the DRIV gauge change wheel set including the construction of prototypes for the gauges of 1435/1520 mm and 1435/1668 mm.

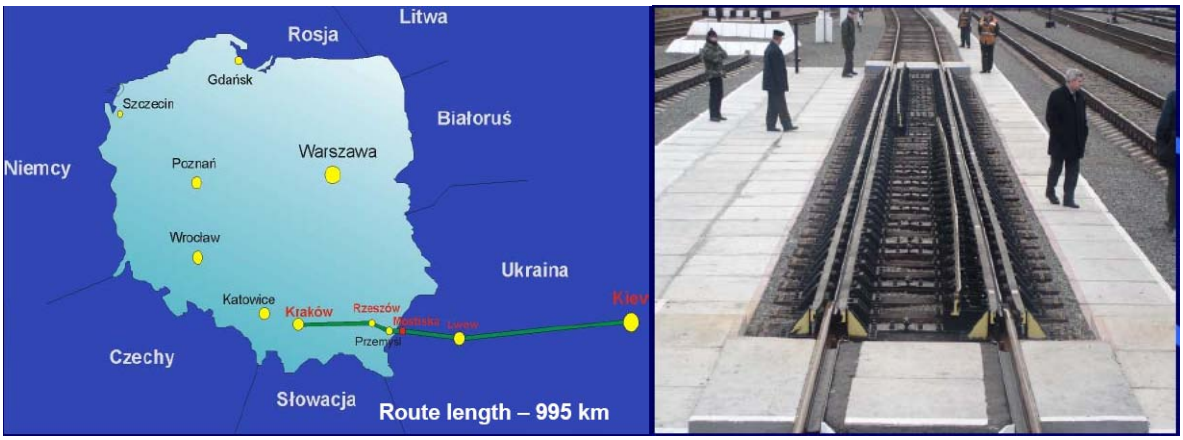
3. SUW 2000: THE POLISH ADJUSTABLE GAUGE WHEELSET

The SUW 2000 is a type of variable gauge system that allows a train to travel across a railway break-of-gauge. It was manufactured by Polish company ZNTK Poznań for Polish State Railways (PKP) and is used to enable through trains to Lithuania and Ukraine to proceed without lengthy bogie exchange.

The implementation of the system was preceded by research on test ring in CNTK – Warsaw. After being completed in August 2000, the technical documentation was submitted to the UIC to prove its conformity with the requirements contained in the UIC 510-4 leaflet.

SUW 2000 is operated on the three rail routes: Warsaw – Vilnius, Krakow – Kiev and Warsaw – Minsk – Moscow.

The international cooperation with Ukraine on applying SUW 2000 began with signing Bilateral Agreement between PKP (Polish Railways) and UZ (Ukrainian Railways). The use of the system with commercial operation of rolling stock trough the Medyka (PKP) - Mostiska-2 (UZ) border crossing started in December 2003.



To prepare the passenger train No. 35/36 Krakow - Kiev – Krakow in operation, it was necessary to do the following:

- modernization of four PKP and five UZ couches equipped with 25AN/S boogies with wheelsets of SUW 2000 system and upgrading of coach interiors to EuroNight standard;
- activation of the track gauge changing facility (TSP) in Mostiska-2 (UZ),
- introduction of common tariffs,
- common promotion,
- cooperation with travel offices.

4. RESULTS OF SUW 2000 IMPLEMENTATION

The effects of the SUW 2000 implementation have proved the advantages of the adjustable gauge wheelset systems. The direct connection between Krakow and Kiev has reduced the journey time by 2h 30min thus make it competitive with road transport. It has also resulted in reduction of the necessary infrastructure at the border crossing. It should be also underlined that the winter conditions with low temperatures (down to 35C below 0) as well as snow and ice accumulation on the bogies do not affect the system.

Using the main parameters of rail operation, the results can be summarized as follows:

- Journey time: 15h 13m (Krakow – Kiev) and 15h 14m (Kiev - Krakow);
- Average Commercial speed: 65,4 km/h (Krakow – Kiev) and 65,3 km/h (Kiev - Krakow);Maximum speed: 125 km/h for PKP and120 km/h for UZ;
- Distance covered by particular PKP Intercity coaches equipped with SUW 2000 system: from 204 200 km up to 223 000 km;
- Number of gauge changing on the TSP for particular coaches operated by PKP Intercity: from 186 up to 216;
- Total number of gauge changes for PKP Intercity operated coaches on the TSP at Mostiska-2 station (UZ): 632;
- Total number of wheelsets of SUW 2000 system subjected to gauge change changed on TSP at Mostiska-2 station (UZ): 5 056.

The plans related to further application of SUW 2000 include introduction of the second passenger train set connecting Lviv - Krakow - (Warsaw) and further reduction of journey time. Moreover, there will be provided an extinction of the route frpm Lviv to Krakow so that the trains can directly reach the final destination Prague (Vienna).

5. CONCLUSIONS

The application of SUW 2000 on the Medyka (PKP) - Mostiska-2 (UZ) cross-border rail connection has increased the interest of passengers to rail travelling between Ukraine and Poland. The advertisements are usually short but attractive enough for passengers: “The brand new luxury train that runs from Krakow, Poland to Kiev is the first to have "self adjusting" wheels … With your documents in order, border crossings are pretty easy”. The new technology has also been used foe freight transportation although not as regularly as with passenger trains.

Thanks to SUW 2000, which has already proved its advantages, it is expected that in future the variable gauge systems will be implemented at all border crossings of Ukraine with Poland and other neighbouring countries. Also, it is important that there are new ideas to further implement this technology. Among them is the project for an innovative product, a simulation model of bogie with a two-stage spring suspension with varying distance between

wheels and opportunity for connection with movable and standard wheelsets generally applicable to different track gauges in Europe, which will be developed by the Bulgarian company Techno Trance Ltd. in partnership with the University of Transport under the Operational Programme "Development of the Competitiveness of the Bulgarian Economy" co-financed by the European Regional Development Fund.

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