ON THE PROSPECTS OF DIAMETRIC COMMUTER RAIL ROUTES DEVELOPMENT IN MOSCOW AGGLOMERATION

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ABSTRACT

The article considers the prospects of implementation of diametric commuter rail routes in Moscow railway junction. It is shown that under existing infrastructure and technological limitations creation of Belarussky-Gorky diameter not only improves the quality of transport services, but also optimizes the volume of transport work of rolling stock, helps to reduce costs and layover time.

ENGLISH SUMMARY

Background.

Currently at Moscow railway junction (MRJ), commuter trains are in operation on three diametric routes: Belarussky-Kursky, Rizhsky-Kursky and Belarussky-Savelovsky. Despite the significant excess of standard of capacity's utilization at peak hours, these directions are not the busiest at the junction. The share of Smolensky direction amounts to 9.8%, Kursky – 8.9%, Rizhsky – 6%, Savelovsky – 6.5% of the total passenger traffic.

Transportation of this kind represents the similarity of so-called «commuter-city passenger rail service»; the project is successfully implemented in many major cities around the world. In Germany, such a system is called Stadtbahn, it exists in fourteen cities. French similar system of speed non-street transport RER serves Paris agglomeration. Implementation of Overground project has created a peripheral connection with a high carrying capacity within the boundaries of London metropolitan area (Table 1).

Objective.

The objective of the authors is to investigate the prospects of diametric commuter rail routes development.

Methods.

The authors use the methods of analysis and comparison.

Results.

Plans for development

Nevertheless, the general scheme of MRJ development (2008 year) was based on the idea of expanding the range of diametric routes by connecting Leningradsky and Gorky directions, as well as constructing deep inlets, uniting Paveletsky direction with Yaroslavsky and Kievsky with Gorky. [2] Since the mid-1970s there have been talks about potential prospects of «city commuter train», and nowadays these plans do not lose their topicality. Considering the length of the rail systems with a high carrying capacity, some specifications take certain form, which can be seen in Table 2.

Assessments of passenger traffic

The Soviet tradition of identifying promising transport passenger traffics implied study on separation of existing passenger traffic to stopping points on the basis of statistical data, field measurements, as well as taking into account the town- planning documents [3]. With help of modern technology sophisticated computer simulation using virtual transport models [4]; GPS and GSM technology, econometric modeling [6] are used now for such purposes. Development of sociological tools helps to determine the potential with help of questionnaires, using, for example, Internet resources.

On the other hand, it seems reasonable to assume that patterns of population mobility in the city represent an infinite number of ways to move, especially in light of the multi-modal transport proposals, which implies an increase in the coefficient of interchange, creating the possibility of a free change of transport mode, the complexity of the organizational structure of mobility as a category of analysis. Transport behavior in the broadest sense seems to be self-organizing everyday practice [8], subject to a number of objective impacts, in connection with which there is a need for a new approach to forecasting.

Historically established network of main rail transport systems can be called a frame, predefined direction of movement based on the service of maximum passenger traffic. Transport geography indicates the underdevelopment of the Moscow metro network due to the low degree of its cyclicality, which implies a small amount of interchanges [11] and limited connection of peripheral areas. Nevertheless, the character of passenger traffic on diametric commuter rail routes seems similar to the distribution of passenger traffic on the subway network when wagons are occupied in two stages: in the densely populated suburbs and in the center. That is, in case of project's implementation, and tariff and interchange integration with urban public transport prospects of diametric routes are undoubtful.

Technical adequacy of proposals

Today the main issue in the implementation of commuter-city movement is the allocation of specialized pairs of main routes, changes in the rules of safety.

Shorter interval between commuter-city trains is achieved by reducing the length of the block-sections, use of advanced tools for interval regulation, improved acceleration and braking performance of trains (provided acceleration is up to 1.2 m/s^2 against to 0.6–0.8 m / s^2 in current electric trains of domestic production), minimizing the duration of stop during embarkation-debarkation due to the increased number of doors. In MRJ interval between commuter trains on hauls is 4–5 minutes, but in reality, the interval may be even higher (6–7 min), taking into account not always optimal speed restrictions in leads of dead end stations.

Detailed study of motion graphics showed that even with the existing infrastructure constraints there is an opportunity to optimize the traffic on the Belarussky-Gorky direction with minimal financial investment. An additional argument in favor of the diameter is the complexity of communications' implementation in the direction east-west by alternative modes of transport, taking into account the presence of several inconvenient interchanges at both the rail and metro.

Traffic organization at Belarussky-Gorky direction of diametric trains will help to lessen the load on transfer hubs in the area of passenger platform «Sepr i Molot» and Kursky railway station, as well as reduce the underoccupied runs of commuter trains in non-preferential direction. At the end of morning rush hours some of them may not return to the depot, but go for layover to the park of station «Moscow-Smolenskay»

Table 1

Operational indicators of commuter rail systems

	Дистанция (км) Distance (km)	Станции (шт.) Stations (number)	Размеры движения (пар поездов в час пик) Volume of movement (train pairs per hour)
Швейцария/Switzerland			
RegioExpress	40–100	3–12	2
S bahn/ Regio	20–70	11–25	2
Германия/Germany			
S bahn	18–75	10–36	9
Regionalbahn	28–165	10–14	1
Regional-Express	90–250	26–28	1
Франция/France			
RER	52,3–185,6	21–84	до 30
Translink	31–256	10–46	2–6
Англия/England			
Overground/Regional Rail	1,7–101	2–45	8
РФ/Russia			
Пригородный железнодорожный транспорт Commuter rail transport	4,5–343 (169 на/at МЖУ/MRJ)	3–59	12

Table 2

Extension and number of stopping points of main rail transport systems within administrative boundaries of Moscow

	Длина путей (км). Факт./план Length of tracks (km) Real/planned	Количество остановочных пунктов (шт.). Факт./план Number of stopping points (number) Real/planned
Московский метрополитен/Moscow metro	318,1 /392.5	190/255
Железная дорога в административных границах города/Railway within administrative boundaries of the city	241/290	90/120

Table 3

Volume of movement in diametric directions of MRJ

	Длина путей (км). Факт./план Length of tracks (km) Real/planned	Количество остановочных пунктов (шт.). Факт./план Number of stopping points (number) Real/planned
Московский метрополитен/Moscow metro	318,1 /392.5	190/255
Железная дорога в административных границах города/Railway within administrative boundaries of the city	241/290	90/120

in anticipation of evening rush hours. However, at the dead-end tracks of station Moscow-passenger-Kurskay due to the movement of part of trains on the diametrical direction an opportunity will be given to perform their layover between rush hours.

Simultaneously, the number of diametric trains in Kursky- Rizhsky direction can be increased to 60 pairs, and in Belarussky-Savelovsky – to 35–40 (Table 3).

To improve the reliability of the Belarussky-Gorky diameter it is advisable to lay additional crossovers in the southern neck of station Moscow-passenger-Kurskaya (see Pic. 1): № 322–324 (past the bridge across Yauza where there is a straight section), № 326–328, and № 370–372. It helps to organize simultaneous movement of even-numbered and odd-numbered Gorky diametric trains, as well as simultaneous receipt of a train from Belarussky- Gorky diameter with departing trains of Gorky direction from dead end sidings.

Schedules of trains' round trips

Optimization of round trips' schedules in five directions (Gorky, Kursky, Savelovsky, Belorussky and Rizhsky) makes it possible to find the reserves to increase pairing motion. In Gorky direction it becomes possible due to the use of the third main track and transit tracks of station Moscow-passenger-Kurskaya, on which diametric electric trains will move. However, optimization of round trips' schedules of commuter trains (by reducing stop periods in the daytime) will free (despite the increase in the volume of movement) two trains and about 30 locomotive crews.

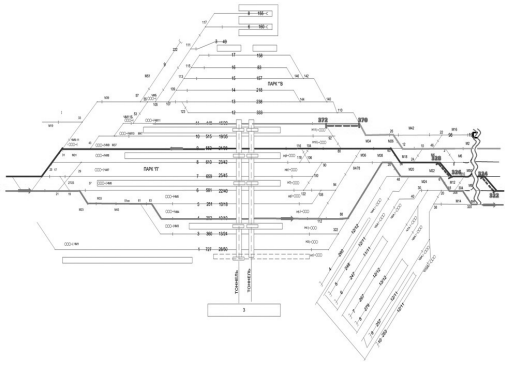
Tariff system

Specificity of zonal tariff determination serves as the most serious limitation to prospective innovations. One example: the price for the trip from station Odintsovo to station Reutovo reaches 115.5 rubles, while the minimum fare with two payable interchanges, including the underground is 77.5 rubles.

The existing zonal system obviously has flaws that can be remedied by reforming tariff system by the state body responsible for setting prices. The carrier is not authorized to regulate the price rate of price; the only tool is commutation tickets. In this case, the policy of tariff integration within the project of «Troika» cards, promoting public transport users, acts as an adequate price method of compensation of costs for public transport, including commuter rail transport.

Conclusion

The introduction of new diametric routes as well as intensification of existing routes is possible and at minimum cost. Such measures can be carried out under existing infrastructure and tariff restrictions, thereby contributing to the quality of transport services. Achievable benefits concern, moreover, labor optimization of locomotive crews, increase in transport work of rolling stock, reduction of costs and layover time. For reasons of economy of resources on the one hand, and on the other hand for reasons of doubts as to the exact predictions, it seems appropriate to implement a pilot project for the creation of Belarussky-Gorky diameter.



Pic. 1. Organization scheme of train handling of Belarussky-Gorky diameter at the station Moscow-passenger-Kurskaya, taking into account reconstruction of the lead (laying additional turnouts).

Keywords: railway transport, commuter rail traffic, route network, optimization of traffic schedule, diametric route.

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