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PECULIARITIES OF PASSENGER TRANSPORTATION TRAFFIC IN KYIV CITY

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Abstract. The Kyiv city transport network is analyzed in this article. Main operational characteristics of each city transport type are shown. Positive and negative tendencies in further development of passenger transport traffic are defined.

Keywords: city passenger transport, operational characteristics, passenger transport traffic.

1. Introduction

The city passenger transport system is important component for all the megalopolis's life activities and solving the wide spectrum of questions concerning its formation and rational functioning. It's obvious that development of any city and its transport network are two interrelated processes. Division of city into regions, their population number, and arrangement of labor application places determine in general the quantities, directions and density of passenger traffic. While transport development, in its turn, improves conditions of settling citizens in new residential areas and makes new labor application places and public amenities more available and convenient for people (Gudkov and Miritin 1997).

High quality and effectiveness of city passenger transport operation in Kyiv is very important attribute for normal functioning of all branches of city economy, insuring transportation requirements of city population, improvement of its ecological state, etc. At the same time, transportation system of such megalopolis should be safe, easily accessible, high speed and comfortable under high level of service quality available.

2. Analysis of last researches and publications

The operation effectiveness of different kinds of city passenger transport in Kyiv was researched in publications of many national scientists. Among all publications it should be noted works of such scientists as O. M. Kryvopishin, I. M. Tretyakov, M. Dyomin, I. O. Lysik, I. M. Shpylyovyi, Y. S. Grysyuk, G. Y. Filvarov, A. M. Pleshkanovska and others.

3. Purpose of the work

The purpose of this research is the analysis of city passenger transport networks in Kyiv and main operational characteristics of each its type of transport. Plus determination of positive and negative trends in further development of passenger transportation traffic in the megalopolis.

4. Main part

Kyiv is the grates city of the Ukraine and 7-th in the Europe by population number. By the data represented by Main Statistical department of the Ukraine its population number accounts for more than 2.9 million in October 1 of 2012, while, taking into account the so called "daily population" (i.e., persons staying in hospitals and hotels as well as transit visitors and guest-workers) its population number accounts for 3,5 millions (Statistical annual of Kyiv for 2011).

The complicated and multibranch network of city passenger transport is functioning in Kyiv. Such network includes: subway, city railway (partially, suburban railroad), trolleybus, tram, bus, and minibus (route taxi) of different form of ownership. Organization of passenger transportation in Kyiv is performed by municipal companies "Kyiv subway", "Kyivpastrans" and private carriers operating in a route taxi mode.

The ground-surface passenger transport network includes 22 tram routes, 39 trolleybus routes, 294 bus routes (73 bus routes and 221 minibus routes operating in taxi mode).

The tram network consists of two separate networks: left-bank and right-bank ones. At the end of 2011 the total length of passenger tram routes accounts for 139,9 km (including 10 km for high speed trams) with 350 stops. The total length of passenger trolleybus routes accounts for 500 km (Vlasenko 2012).

The most widespread types of ground-surface passenger transport network in Kyiv represent busses and of different form of ownership. The route network is formed in such manner to insure possibility for any passenger to travel from one region of city to another one without any change of transport vehicles. Routes of minibuses are either long (travel though a few city regions) or short (travel between two neighboring subway stations or between suburban railway (or subway) station and nearest residential area.

Moreover, communal busses serve 49 suburban, 91 taxi, 14 intercity and 3 international routes.

Table 1. Rolling stock by the type of city transport in Kyiv

Rolling stock	Years						
	2005	2006	2007	2008	2009	2010	2011
subway	627	654	664	664	669	753	762
Trams	509	501	497	482	465	446	415
Trolleybuses	514	554	592	608	565	494	453
Busses	9000	9700	10 400	11 300	11 200	10 500	17 200
Including private busses	3800	4900	5700	6000	5900	5300	6600

Table 1 shows that during analyzing period the number of trolleybuses and trams decreases substantially. Particularly, the number of trolleybus coaches decreased on 25.5 % and number of tram-cars on 18.5 %. At the same time, number of passenger busses of both form of ownership increased almost in two times – on 91 %. But part of private minibuses in this case decreased from 42.2 % to 38.4 % (Vlasenko 2012).

The total amount of passenger traffic by all types of city transport in Kyiv during 2011 year in comparison with 2005 decreased on 23,4 % (fig. 1). The passenger traffic decrease tendency is observed on all type of passenger transport in all counties of the world. Such tendency is explained by the world financial crisis started in 2008 year.

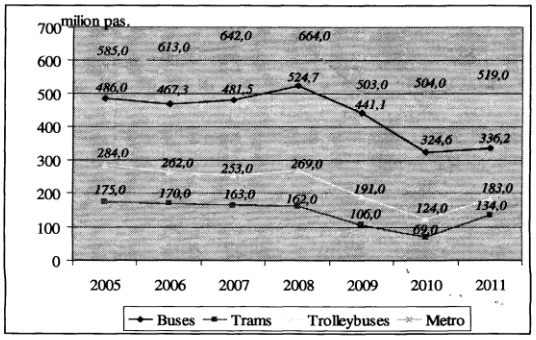

Fig. 1. Dynamics of passenger traffic performed by city passenger transport in Kyiv during 2005–2011 years

During the analyzed period the positive tendency of high level of passenger traffic by bus transport is retained. In 2011 the proportion of passenger traffic by bus transport accounts for 28.7 % of total amount of passenger traffic by whole city transport.

Unfortunately, at this period the amount of passenger traffic by such ecological types of ground transport as trolleybus and trams decreased substantially. In 2011 the their proportion accounts for 15.6 % and 11.4 % of the whole passenger traffic respectively (Vlasenko 2012). Such fact is caused from one side by old rolling stock and from another side by closing the considerable number of tram routes and changing them by route taxis. In general the route taxis are the serious problem of megalopolis: displacement of trams, trolleybuses and busses; great level of environment pollution; vehicles overcrowded permanently which decreases the safety level and quality of passenger service.

Further development of ground passenger transport network should be considered through growing influence of private cars. It's obvious, that public transport can be perspective only in a case when it will meet competition with private cars concerning such factors as speed and comfort of trip. But growing quantity of private motor cars (during the last 7 years their total number in Kyiv city increased on 25.8 % and accounted for 652 900 cars in the end of 2011 (Vlasenko 2012). decreases their positive factors mentioned above due to absence of parking places near places of arrival and departure and lowering their speed of travelling caused by traffic jams. So, in such situation the main advantage of private motor car transportation "from door to door" becomes difficult to realize in full manner. It follows from all that growing number of private motor car cannot be serious alternative to traditional public transport (Vyeklich and Zbarskyi 1980).

Moreover, it's necessary to take into account that Kyiv is situated on both banks of Dnieper River and disbalance between residential area and location of work places exists, (that is, about 55 % of city population lives on the right bank while more than 80 % of work places are located on the right bank as well). Such disbalance becomes apparent at peak hours when actual traffic intensity on all operational motor road bridges exceeds the design one (12–13 thousands of vehicles per hour along 1 1traffic lanes) on almost 25 % (Dyomin *et al.* 2005). That is why, Kyiv requires additional motor road bridges and out-of-street high speed transport means. Out-of-street high speed passenger transport network includes 3 subway lines of 65.2 km long (Fig. 2) and circle line of city railway 50.8 km long (Fig. 3) (city electric trains moves along two routes: clockwise and counter-clockwise ones). Subway is the main type of city transport in megalopolis. During 2005–2011 years, the total number of subway vehicles increased on 17.7 % from 627 to 762 units respectively while the corresponding number of passengers decreased on 11.3 % and accounts for 519 million persons to the end of 2011 year. But proportion of subway passenger traffic accounting for 44.3 % is the greatest one in comparison with other city transport types. Today Kyiv subway network includes 51 stations and 3 interchange stations located in the central part of city. Kyiv railway transport network was put into operation only in 2009. Its first line route included only two stations between two banks of Dnieper River within city border. The second queue of railway transport network was opened at the beginning of 2011 October, using existed railway transport circle of Kyiv. Nowadays 10 electric trains consisting of 6 wagons travel along the circle with 15–17 minute interval between trains. The total number of stations is 15. Some stations of city electric train railway are the transport-interchange stations of different public transport type: 5 stations of changing on another ground transport types; 4 stations of changing on subway lines; 2 stations are transport-interchange stations of combined type (Lutsyk 2012).

Out-of-street high-speed transport allocation in different administrative regions of Kyiv is represented in table 2.

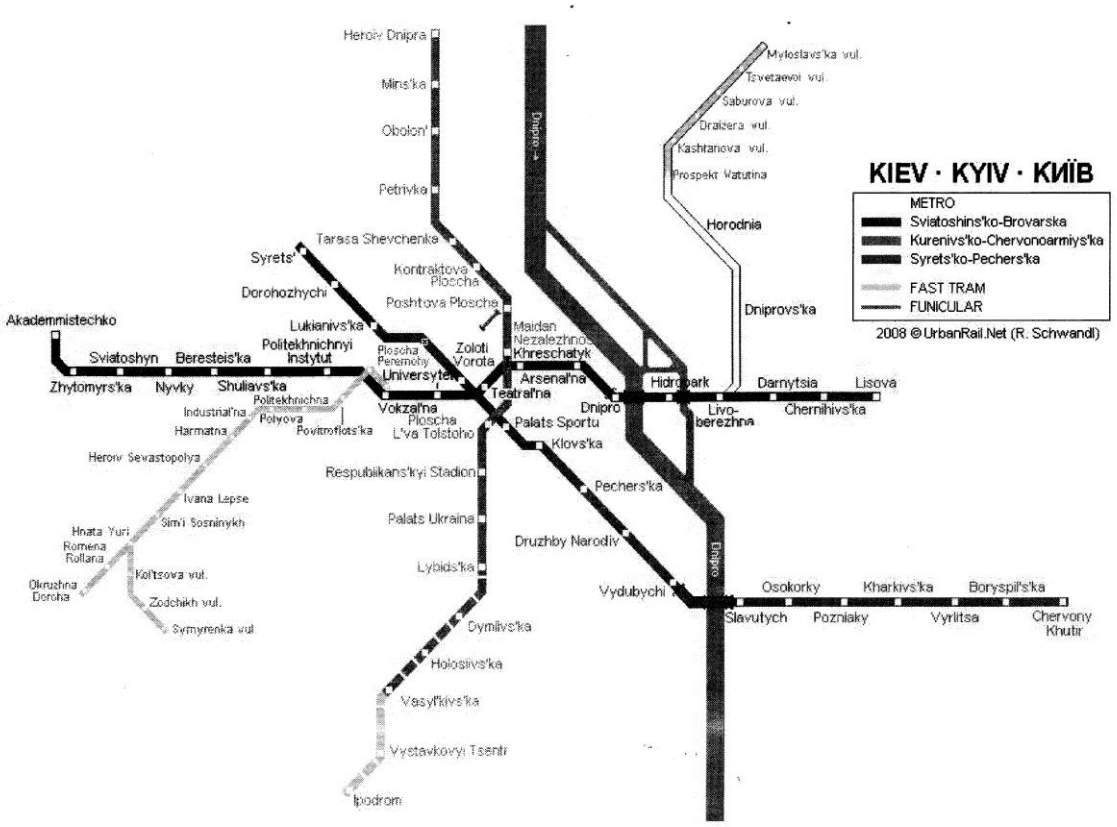

Fig. 2. Scheme of Kyiv subway network

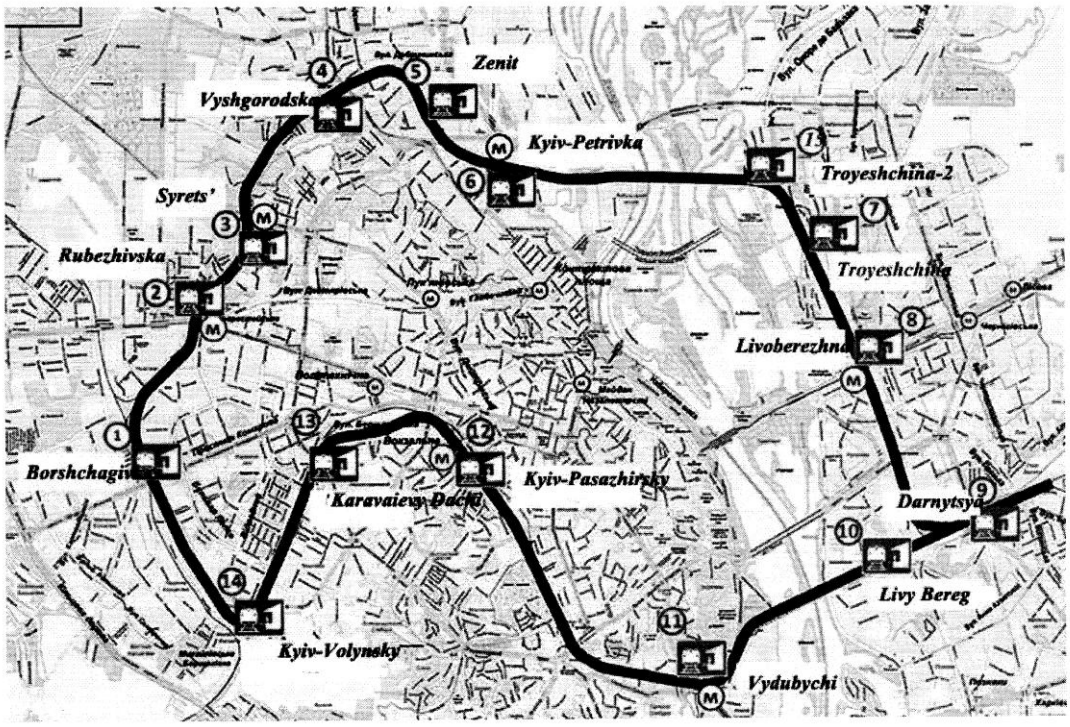

Fig. 3. Scheme of Kyiv railway network

Table 2. Allocation of subway and city railway stations amidst of administrative regions of Kyiv

Administrative region	Population number, thousand persons	Area, km^2	Number of subway stations	Number of city railway stations
Chevchenkivsky	229,251	26,6	15	3
Pechersky	142,769	19,6	15	1
Podilsky	192,718	34,0	5	1
Obolonsky	316,616	110,2	4	3
Svyatoshynsky	336,872	103,3	5	2
Solomyansky	343,890	40,5	4	4
Golosiivsky	233,764	156,4	10	1
Desnyansky	360,479	148,4	2	-
Dniprovsky	347,639	66,7	4	4
Darnytsky	318,122	133,6	7	2

This allocation takes into account the station influence zone of 500 m radius corresponding to maximal distance required for pedestrian to reach to the public transport stop on foot (Lutsyk 2012).

Nowadays traffic capacity of Kyiv subway doesn't correspond to real requirements of city population causing lowering of its transportation service level due to such factors as: excessive filling of trains; formation of permanent queues on platforms, near escalators, ticket offices and entrance doors. Trip in overcrowded train causes an increased fatigue, discomfort and safety level lowering as well.

Moreover, there are a lot of residential areas in Kyiv (Vygurivschina–Troyeschina, Voskresensky, Raidugnyi, Vynogradar, Borschagivka, etc.) where subway lines are absent at all; taking into account that building of new subway lines and stations requires significant capital investments and time.

In such situation, further development of city railway transportation network enable to solve series of transportation problems: lowering intensity and increasing speed of street transport movement due to using city railway by part of passengers; partial unloading of subway stations and the whole transport system at all; insuring a direct connection between the right bank and left bank parts of city; rational development of city and suburb passenger transport as united network; creation of transport connections between peripheral regions without moving though the city center; providing residential areas where subway is absent with out-of-street high-speed transport (Old and New Darnytsya, Bereznyaky, Rusanivka, Sotsmistechko, Raidugnyi, Rusanivsky and Voskresensky garden-cottage areas, Mykilska Borschagivka, Vidradny, Pivdenna Borschagivka and Solomyanka); shortening of time and change of transport types for passengers moving from outskirts or peripheral parts of city to its center; lowering of negative influence on environment.

Unfortunately, city railway has some shortcomings as well: some stations of circle type routes are located relatively far from interchange transport junctions (a few hundred meters) and convenient pedestrian interconnections with stops of another types of transport are absent; operation of city railway trains is realized only at peak hours and doesn't coincide with schedule of suburban electric trains; some stations aren't equipped with automated control system to monitor a passenger fare; Desnyansky administrative region hasn't any station and therefore transport problem for "Troyeschina" residential area isn't solved by city electric train yet; city trains and usual passenger and freight trains use the same railway tracks, therefore city train operation rate doesn't exceed 10–12 trains per hour that corresponds to 24 000 passengers per hour (Stepanchuk and Lutsyk 2012).

5. Conclusion

The experience of European countries, Asia, USA and Latin America proves that different variants of integrating electric city railways into united transport network of megalopolis enables to solve the transport and environment problems in general. The city railway transport in such united network represents one of the main types of city passenger transport. Its transportation capacity corresponds to transportation capacity of subway and sometimes exceeds it while the cost and duration of city railway building is much less then for subway construction.

It follows from mentioned above that potential of railway transport in Kyiv as a city transport is used only partially. The further development and improvement of city railway transport system will enable to increase the effectiveness of its operation in united city transport network and enhance the state of passenger traffic in the megalopolis at all.

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