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URBAN PUBLIC TRANSPORT, LOGISTIC APPROACH TO THE TRANSPORT MANAGEMENT

ANTON LOBACH, POLINA SULIMENKA, IRINA KRASNOVA
Belarusian National Technical University, Belarus

In modern condition further development and improvement of economy are based on progressive transport maintenance.

Urban public transport has a special place at social life. It's a part of social infrastructure sector such as spheres connected with the reproduction of labor force and livelihoods of citizens along with health, education, housing and communal services and other spheres of social life in the city.

Urban public transport has a great impact on economic and social development of *territorial administrative units*. Urban transport is also a means of acceleration and deceleration of the city development, it provides or, conversely, prevents from getting some vital services by population [1].

Logistic approach to creating technical infrastructure of urban public transport is to provide the shortest links between main passenger forming items, to equip these items with all necessary facilities, to take into account the volume of passenger traffic and requirements of comfortable travel when logistics operators carry out the calculation and selection of the correct transport equipment.

The structure of logistic system of passenger transportation is the combination of three components, which match certain levels of transport service. These components are pre-transport, transport, post-transport services. [2]

Pre-transport service includes trip planning, comfortable access to transport stops.

Transport service is passenger deliver by certain transport from the point of departure to destination with high comfort level.

Post-transport service includes timely transfer to other transport or a convenient way out from transport stops.

The next categories of citizens travelling are more perspective for introduction of logistics management techniques:

– labor trips from the place of mass living building to large enterprises;
– trips, connected with mass culture pursuits and entertainments;
– trips on religious holidays (to church or cemetery);
– travel from station to residential areas and on the contrary;

The systems of urban transport's management may be divided into two groups based on operational principles: traditional and logistic systems.

The main goal of using logistics at systems of urban public transport is to ensure passengers that their travel will be short and thro as possible.

Traditional system provides trips between city destinations which were evenly or accidentally distributed.

Logistic system provides mass travel of citizens, who has the same goal of trip. Such system has common with such logistic system as Just in Time: between fixed city destinations at fixed moment of time. In accordance with this principle logistic approach fits when the point of departure to destination is known.

Our team has analyzed the passenger turnover of Molodechno in the work on the project. And, as a result, we have known that city's carriages of passengers are provided by «Minoblavtotrans» and its affiliate «Bus Fleet № 4» [3].

We have used Pareto rule in our estimate [4].

The population of Molodechno is about ninety-four thousand people. Twenty-six thousand and sixty-seven cars are owned by physical entities. Given this, sixty-eight thousand citizens need urban public transport. But thirty-eight percent of citizens are pensioners and one thousand one hundred citizens are unemployed, it means that these citizens don't need daily use of public transport.

$$P_н = 68 – 68 \cdot 0{,}38 – 1{,}1 = 41 \text{ thousand people.}$$

By Pareto rule, eighty percent of that number of people uses the urban public transport daily on working days. It means:

$$P_{w.d} = 41 \cdot 0{,}8 = 32{,}2 \text{ thousand people.}$$

The main population movements go from place of living (point A) to place of work or study and to railway station (point B).

Accept that it was eighty percent of general flow, other citizens move randomly.

Pa b = 32,2 · 0,8 = 25,8 thousand people.

Next picture presents the scheme of bus city's route of Molodechno.

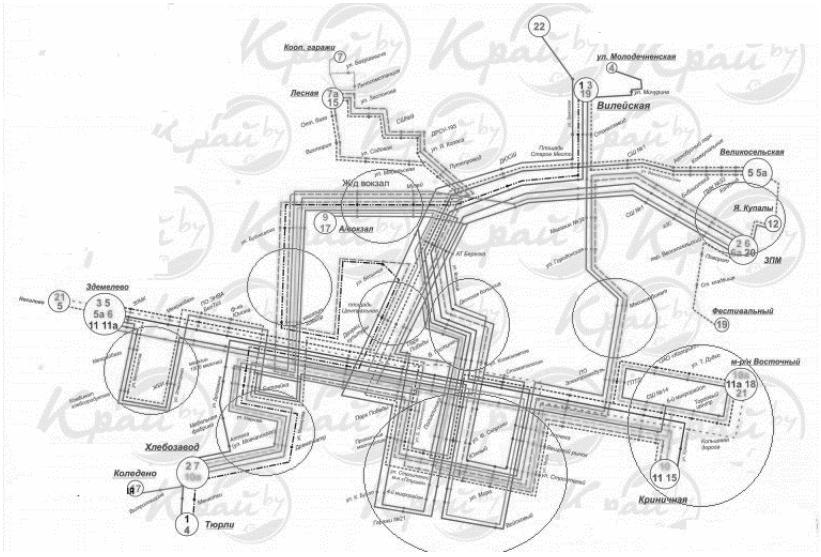

Fig.1. The scheme of bus city's route of Molodechno

Also there are routes in this picture, that serve the main passenger flows.

Most flows are going in rush hour: 7–9, 14–15, 17–19 o'clock. To the place of work from 7 to 9 o'clock and to the place of living at the period from 14 to 15 and 17 to 19 o'clock.

For example:

$I_{7–9}$ = 25,8 · 0,8 = 20,6 thousand people;

$I_{13–15} = I_{17–19}$ = 10,3 thousand people.

The equipment must meet the requirements for the capacity as much as possible based on the rate of flow and the character of passenger flows.

The power of passenger's flow is set in the survey. It depends on rush hours, because during these periods passengers' flows can vary to a high degree. So it is necessary to use the public transport of different capacity.

An appropriate interval of movement on a route is an important selection criterion for rational transport's capacity. The interval value is given by various restrictions. For example, the movement's interval couldn't be too large because passengers are waiting for the transport too long. Such perspective makes the passengers choose another way to get to the place. They call a taxi, choose an indirect route with few transport's changes.

One of the most important and main requirements for organization of passenger carriage is to use comfortable and safe buses on a route.

The transport equipment of large capacity doesn't appropriate to use on the route with low passenger's flows, because the level of use of the transport is low and it can lead to cost increase. And, on the other hand, the transport equipment of small capacity is not appropriated to be used on the route with high passenger's flows. In this case, transport should go more often to carry all passengers on the route and then the interval of movement will decrease, so we need to use a larger number of transport equipment on this route. But even though the carrier has the necessary number of vehicles, it will lead to cost increases (oil and lubricant, salary for drivers etc.).

The buses with large capacity such as MAZ-105 with nominal capacity as one hundred and sixty people are used on the previously identified routes.

The calculation of required frequency of bus traffic is shown below:

Tmv7-9 = 180 / (20600 / 9 / 160) = 12,6 = 13 min;

Tmv13–15 = Tmv17–19 = 26 min.

It is appropriate to perform the change of transport equipment to avoid a break-even activity and to satisfy needs of customers during the intermediate periods. For example, we can modernize and change existing

transport to buses such as MAZ-205 with nominal capacity as one hundred and seventy-five people, this action will reduce the total number of buses.

The calculation of this activity's effectiveness is shown below:

Tmv7–9 = 180 / (20600 / 9 / 175) = 13,7 = 14 min;

Tmv13–15 = Tmv17–19 = 28 min.

So then the intervals of movement will correspond to the norms and the necessary number of buses on each route will drop by one. In this way, it is possible to decrease bus depot by 24.4 percent.

The lack of logistical approach to urban public transport management creates the next problems with its effective use:

– passenger's carriage planning, in the first place, based on reporting and time permitting without proper economic justification;

– little explored factors, that determine the volume and structure of passenger's carriage;

– significant omissions are allowed in planning of the transport work, cost price of carriage and operating personnel, engaged in this process of passenger carriage;

– tariff system contains a special item, which deforms a real pricing.

– opportunities of public transport are used not fully, especially this is about increasing the operational speed, productivity, profitability, culture of transport services; decreasing carriage cost. [5]

New developments in the sphere of auto industry are used in the world practice to solve the problem of logistic approach at passenger's carriage. They are as follows:

– the use of electric buses;

– the use of ground subway;

– BelFort – it is a software and hardware system, which works on the basis of satellite technology such as GLONASS and GPS. This complex is designed to control the movement of various type of transport, equipment, workers;

– satellite-based monitoring system «Resource control»;

– CityPoint – it is a multifunctional system to control inter-city or international passenger's carriage;

In this way, during our scientific work the transport network and passengers' flows of Molodechno have been reviewed and the analysis technique based on principle of Pareto has been proposed. Also we have touched upon the subject of logistic approach and modern systems, which help this approach work.

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