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THE OPTIMAL ROUTES STRUCTURE OF THE CITY'S PASSENGER NETWORK

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Abstract
The issue of increasing the number of taxis in cities, raising the level of transport services of the population, saturation of the city's street-road network, increase of accident rate and deterioration of the ecological situation are considered. An algorithm for determining the optimal structure of rolling stock is proposed.

Keywords: urban passenger transport system, city street and road network, accident rate, environmentally friendly, rolling stock structure.

Introduction

A reliable system of urban passenger transport in Ukraine has always been one of the main factors in the socio-political stability of cities and the country as a whole. However, at the beginning of the 21th century, the system of urban passenger transport was almost destroyed. Responsibility for the operation of urban passenger transport, with the right to management motor transport enterprises, tram and trolleybus depots, was transferred from the state to the municipalities. But this transfer was not accompanied by investment support. Therefore, the municipalities were not able to ensure the timely replacement of an outdated park. This contributed to the deterioration in the level of services provided [1].

At the same time, the process of corporatization and privatization took place, which resulted in the virtual abolition of the monopoly of state-owned enterprises, and private carriers came to the market of motor transport services. Their services allowed to raise the level and quality of transport slightly, but interaction between different modes of transport was not achieved. In addition, an increase in the number of vehicles, inadequate capacity of the street and road network, and unsatisfactory state of rolling stock led to a decrease in the speed of communication [2].

Results of the research

At first glance, the growth of the number of taxis in cities has allowed to raise the level of transport services of the population, but this is not a panacea, because the saturation of the street-road network is happening and, as a result, the accidents increase and the environmental situation worsens. One way out of this situation may be the formation of a rational structure of transport for the servicing of urban passenger transportation [3].

The following algorithm can be proposed to predict the required types of rolling stock on the route to perform the specified transport volumes.

To implement the proposed algorithm it is necessary:

1. Set the initial data: the number of delays per kilometer of the path; loading of a vehicle; dispersion of slope of longitudinal profile; impedance of the route; traffic intensity; number of vehicles on the route.

2. Analyze the existing route network in the city's cartogram and determine the centers of population attraction. These may be sleeping areas, cultural centers, markets, etc.

3. Determine for each center of gravity the means of delivery of passengers, the number of transplants that they make, etc.

4. For each area and method of delivery, determine the quality indicators for the delivery of passengers using different types of transport (trolleybus, taxi, bus, etc.) for the following components: time costs; ease of travel; reliability of service; traffic safety; fare.

Naturally, the above factors need to be considered for different groups of the population, because for a pensioner and a working person, the ranking of these factors will be different. To evaluate the importance of

each of the factors for different groups of the population is possible only through the method of expert assessments.

5. For each category of passengers, determine the consumer value of transportation, or the competitiveness of each mode of transport. To do this, you need to use the weight parameters of the factors of advantage, the indicators that affect the efficiency of the transport process (time, price, convenience, reliability and safety), the social group of the respondent, the parameters of benefits for each type of transport.

The method of compiling the advantage table is as follows: the respondent is asked to snap the parameters for each of the modes of transport in order of importance in his opinion. Then, we summarize all the benefits by factors for each group of respondents for each type of transport. Finally, the relative weight parameters of each of the factors for each group of respondents for each type of transport are found. Then there is a coefficient that takes into account the level of transport services of the population.

6. Determine the speed of the connection on the route.

7. Knowing the type and mark of the rolling stock, as well as the speed of the connection, determine the fuel consumption by bus, mass emissions of harmful substances, maximum permissible emissions of harmful substances and maximum permissible emission of pollutants. Determine the environmental efficiency of transportation.

8. Calculate the degree of danger of this route, determine the safety factor of transportation.

9. Based on the data obtained in paragraphs 5-8 to calculate the required structure of transport.

10. Check the received structure according to the criteria of satisfaction of the population in the transport service, the ecological component and the criterion of the danger of crossings in this route.

11. Find the coefficient of optimization of the structure of transport.

12. Run the test for optimality.

13. Based on this information, design the structure of transport on the route.

Conclusions

The algorithm of optimizing the structure of urban public transport in the system "individual – operator of the transport services market – society", which contains a number of new provisions, is based on the proposed criterion, which takes into account the satisfaction of demand for transportation, road safety and environmentally friendly transport.

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