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ПОВЫШЕНИЕ ТЕХНОЛОГИЧНОСТИ ЖЕЛЕЗНОДОРОЖНЫХ ПЕРЕВОЗОК КАК ФАКТОР ПОВЫШЕНИЯ ИХ ЭФФЕКТИВНОСТИ

THE IMPROVING THE TECHNOLOGICAL EFFICIENCY OF RAILWAY TRANSPORTATION AS A FACTOR IN INCREASING ITS EFFICIENCY

О.А. Ходоскина, М.А. Володькин, И.Е. Дедковский

Аннотация. В статье рассмотрена актуальность повышения уровня технологичности обеспечения перевозочного процесса на железнодорожном транспорте с использованием беспилотных технологий на основе применения элементов искусственного интеллекта и ресурсосберегающих энергоэффективных технологий в транспортной системе.

Abstract. The article discusses the relevance of increasing the level of technological support for the transportation process on rail transport using unmanned technologies based on the use of elements of artificial intelligence and resource-saving energy-efficient technologies in the transport system.

Ключевые слова: беспилотные технологии, интеллектуальные технологии, железнодорожный транспорт, искусственный интеллект.

Keywords: unmanned technologies, intelligent technologies, rail transport, artificial intelligence.

Introduction

The railway transport of the Republic of Belarus is in the stage of active development, updating and improvement of the applied technologies in the field of organization of the transportation process. Moreover, this applies to both freight and passenger transportation. Against the background of the electrification of the main railway arteries of the country and the already completed renewal of the corresponding rolling stock in terms of passenger transportation and traction

rolling stock for freight traffic, the issue of further innovative development in various areas still remains relevant, in particular, the use of unmanned rolling stock, energy-efficient and resource-saving technologies, as well as elements of artificial intelligence.

Main part

Considering that railway transport includes not only main lines, but also urban railways and metro lines, the use of unmanned technologies, for example, has great potential. It is important to note that, subject to the availability of an appropriate amount of investment, it is possible to introduce unmanned rolling stock, for example, in relation to the Minsk metro. Current technologies (for example, those already used in Japan, Dubai and Hong Kong) can be successfully applied here. Moreover, at the current stage of development of transport systems, it is difficult to talk separately about each of the listed areas, since, for example, unmanned traction rolling stock in the control system includes elements of artificial intelligence and is much more environmentally friendly and economical, and therefore energy efficient compared to diesel traction. It should be noted that urban lines are not as long and are less susceptible to the occurrence of various kinds of emergency situations directly related to the organization of the transportation process than main lines. The emergence of such situations and their timely elimination can be achieved using the element-by-element use of innovative intelligent control systems with the simultaneous introduction of artificial intelligence elements in the general system of railway transportation management. In particular, it is possible to adaptively apply the existing developments of Russian Railways in the field of intelligent control systems for railway transportation in the event of emergency situations [6].

However, in the railway transportation system, the use of artificial intelligence is also possible in other areas. The element-by-element implementation of artificial intelligence on the railway allows optimizing many processes and improving the quality of customer service. Since 2024, artificial intelligence has been used in passenger transportation of Russian Railways.

The introduction of AI has a beneficial effect on such processes as:

- Optimization of fuel consumption;
- Train control;
- Preventive monitoring of the track environment;
- Video surveillance on rolling stock.

In all these aspects, artificial intelligence can play a key role in optimizing and increasing the economic efficiency of railway transportation. According to Markets and Markets Research, the global rail digital solutions market is expected to expand at a compound annual growth rate (CAGR) of 8.4% over the next decade. Straits Research, one of the world's leading market research and analysis organizations, expects global rail IT investment to grow at a CAGR of 9.8% through 2026. The range of possible applications here is wide – from monitoring environmental emissions to monitoring rail infrastructure using drones.

For example, intelligent video surveillance cameras at railway infrastructure facilities record everything that happens at a certain site and require virtually no outside intervention, making them easier to use.

Intelligent video surveillance at railway transport facilities helps to solve the following problems:

- ensure control over protected areas in real time;
- identify cases of unauthorized entry;
- monitor the work of security personnel and railway workers;
- detect items left by someone;
- monitor the situation inside the carriage.

With the correct use of artificial intelligence, it is possible to achieve better prevention of offenses and emergency situations in railway transport, which will increase safety and reduce the risk of tragic incidents.

Artificial intelligence can also be used to create contextual and targeted advertising for railway transport services - the machine helps to develop optimal advertising and focuses on the target. This has a positive effect on the overall efficiency of transportation, allowing you to optimize costs.

On the other hand, the use of unmanned technologies and intelligent control systems has significant prospects in freight traffic, in particular, in the field of formation and re-formation of trains, loading and unloading operations (especially with the use of containers). The combination of these technologies with the installation of special sensors on freight rolling stock and the modernization of railway infrastructure (including additional equipment with a track sensor system) using unmanned technologies and modern intelligent control systems in the context of various railway transport enterprises will soon recoup the investment required to implement these innovations, as well as improve the safety of the transportation process and the overall economic efficiency of transportation. However, against the background of obvious advantages, the process itself is associated with a number of difficulties. These include, first of all, the risks of software failure, incompleteness or insufficient reliability of input data, failure to take into account influencing factors. It is also important to take into account new electrical engineering developments for managing the transport process. In order to update the rail transportation system not only in the general transport system of the state, but also in the production system of the country as a whole, it is necessary to synchronize the processes of reorganization and modernization of rail transport with the introduction of modern technologies in all sectors of the national economy. It is necessary to introduce system elements into the systems that manage the transportation process, which convert and distribute energy from alternative environmentally friendly sources of electricity - solar panels, wind generators and other sources. This means including in the intellectual management system of organizing rail transportation at the level of the infrastructure component of work with electrical networks and the integration of renewable energy into the existing infrastructure (including the creation of specialized adapted systems for storing energy, such as batteries and supercapacitors, aimed at ensuring the stability and reliability of energy supplies from renewable sources).

Conclusion

It should be noted that one of the main tasks in the implementation of unmanned intelligent technologies in rail transport is the creation of a reliable control and monitoring system. To do this, it is necessary to develop a comprehensive train control automation system, including control and diagnostic tools, communication and data transmission systems, as well as decision-making software. Taking into account all of the above, we can conclude that improving the technological effectiveness of rail transportation, expressed by the use of unmanned technologies against the background of the use of resource-saving technologies in intelligent rail transportation control systems, has great prospects as a factor in increasing their efficiency.

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ПРИМЕНЕНИЕ РЕЛЬСО-СТРУННОГО ТРАНСПОРТА ДЛЯ РЕШЕНИЯ ТРАНСПОРТНЫХ ПРОБЛЕМ Г. ЯКУТСКА

USE OF RAIL-STRING TRANSPORT TO SOLVE TRANSPORTATION PROBLEMS IN YAKUTSK CITY

А.Э. Юницкий, Д.В. Филиппов, В.Н. Гаранин, Ю.С. Корзинникова

Аннотация. В статье рассмотрена возможность применения в пассажирских перевозках города Якутска (Республика Саха) альтернативного традиционным видам транспорта – рельсо-струнного транспорта Юницкого (uST). На примере рассмотренного типа транспорта спрогнозирован график его работы по наиболее загруженной городской трассе (Медцентр – 203-й микрорайон) с оценкой среднесуточного уровня пассажиропотока, а также необходимого количества транспортных средств.

Abstract. The article analyzes the feasibility of using Unitsky String Transport as alternative option to traditional types of transport, for passenger transportation in the city of Yakutsk (Sakha Republic). As exemplified by the considered type of transport, its operation schedule on the busiest city route (Medcenter – 203rd microdistrict) is estimated, with assessment of the average daily passenger flow level, as well as the required number of vehicles.

Ключевые слова: Струнный транспорт, пассажиропоток, Юнимобиль, затраты.

Keywords: String transport, passenger flow, unimobile, costs.