

Abstract

Analysis of security mechanisms for the functioning of the Trans-Siberian corridor to EU countries

The purpose of this dissertation research was to research the safety mechanisms of the functioning of the Trans-Siberian corridor to the EU countries on the example of container transportation "China - EU" (People's Republic of China - the European Union) along the Trans-Siberian Railway and formulating proposals for their improvement. Doctoral dissertation consists of eight numbered chapters.

The main thesis of the dissertation was as follows: there is the possibility of increasing the security of the functioning of the Trans-Siberian corridor to the EU countries through the introduction of technical mechanisms and an integrated technical, economic and legal approach.

All the goals and objectives described in the introduction to the dissertation were performed by the author, i.e.:

- An analytical review of scientific research related to the features of ensuring the trains safety movement during container transportation is made;
- A mechanism to ensure the cybersecurity of container transportation on the Russian railways has been developed;
- The analysis of technologies for ensuring the safety of containerized cargo was carried out and the possibility of preparing proposals for improving the one of the existing systems operations was considered;
- Two versions of tracking systems for the quality of containerized cargo transportation based on a client-server model were developed to improve the operation of existing systems for tracking the movement of container wagons;
- A mechanism has been developed for the functioning of container transportation at individual landfills of the Trans-Siberian Railway using cluster analysis mechanisms;

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- The needs for the development of means and mechanisms that enhance the security of container traffic along the Trans-Siberian Railway are identified;
- The author's original comprehensive technical, economic and legal approach has been developed to increase the security of the functioning of the Trans-Siberian corridor to the EU countries.

In the dissertation, an analysis of scientific research related to the specifics of ensuring the safety of railway traffic during container transportation “China (People's Republic of China) - EU (European Union)” along the Trans-Siberian Railway was carried out.

In the framework of this analysis, four main safety issues were identified:

- The problem of placing containers without fastening;
- The problem is how to properly place the cargo in order to minimize the risks during its transportation;
- The problem of increasing the efficiency of container transportation, i.e. their economic security;
- The problem of ensuring the safety of the movement of container trains.

In addition, the work carried out an analysis of the mechanisms for ensuring cyber security of container traffic on Russian railways.

The problem of cybersecurity was considered in the administrative aspect for which it was carried out:

- Analysis of regulatory documents in the field of cybersecurity in the Russian Federation as a whole;
- Analysis of regulatory documents in the field of cybersecurity, published specifically at Russian Railways.

Since cybersecurity is a sphere that is poorly quantifiable (it is impossible to say exactly how much one cyber-protected system is more than another), then basically all the assessments are qualitative (i.e., whether the whole system is

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assessed or not), author also presents two most common mechanisms in the Russian Federation for such a qualitative assessment, namely:

- Cybersecurity threat protection model (using microprocessor-based container train control systems as an example);
- The classification of traffic control systems by security classes based on the administrative and legal mechanism of such an assessment existing in the Russian Federation.

The work also conducted an analysis of the technologies for ensuring the safety of containerized cargo. To improve the operation of existing systems for tracking the movement of container wagons, the author of the dissertation research proposed and developed two versions of tracking systems for the quality of transportation of containerized goods based on a client-server model. The first system operates on the basis of radio communication protocols (on a frequency of 868 MHz open for free use on an unlicensed basis in Europe). The second system uses the widespread WIFI and Ethernet protocols for data transfer. The author expresses the hope that these systems may interest customers from among the railway companies of the Republic of Poland.

Also, in the dissertation, an analysis of the container transportation functioning mechanisms at individual polygons of the Trans-Siberian Railway using cluster analysis mechanisms was made. In order to verify the correct operation of the program and the validity of its conclusions, the results obtained by software were compared with manually calculated values.

This system allows the automatic analysis of the parameters of the Trans-Siberian Railway landfills, to identify the closest polygons in terms of parameters (for example, landfills with an approaching reconstruction period) and can be used in decision support systems of the governing bodies of railway companies to simplify the receipt of data by senior and middle management about subordinate structures and infrastructure.

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In conclusion, we can say that as part of the implementation of the tasks set, the author was able to prove that the security of container transportation is a combination of technical, administrative, legal and economic mechanisms. Together, they allow us to talk about an integrated approach to the functioning of transport corridors. According to the author, the author's development of security systems indicated in the dissertation can find practical implementation on the railway.

Based on the foregoing research and development, it can be concluded that there really is a relatively inexpensive opportunity to improve the security of the Trans-Siberian Corridor to the EU countries through the introduction of the technical mechanisms proposed by the author in the dissertation and a comprehensive technical, economic and legal approach.

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