

However, it should be assumed that vertical loading will not lose its relevance in the future, as it is a globally recognized technology that uses standard components.

Conclusions. The above shows that in order to improve the process of cargo transportation, it is advisable to combine the use of existing efficient transportation technologies and the implementation of cargo operations with the introduction of new, multimodal supply chains using promising horizontal transshipment technologies.

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THE DEVELOPMENT OF INTELLIGENT CONTAINERS AS A PROSPECT FOR THE DEVELOPMENT OF CONTAINER TRANSPORTATION TECHNOLOGY

*Cand. of techn. sciences E.V.Mykhailov, S.L.Zharavin
Volodymyr Dahl Eastukrainian National University (Kyiv)*

Container transportation constitutes a significant share of freight traffic during international trade. In the conditions of constant growth of container flows in the implementation of global supply chains, the task of introducing innovative technologies to optimize logistics and increase their efficiency is faced.

One of the most promising directions is the development and application of intelligent containers (smart containers) [1].

A smart container is a container equipped with various sensors, geolocation systems and other devices that allow monitoring its location and the condition of the cargo in real time. This is a key point for all participants in the global supply chain.

The main technologies and devices that turn an ordinary container into an intelligent one are:

- Sensors for temperature, humidity, acceleration, monitoring conditions inside the container.
- GPS to track the location of the container.
- 3G/4G communication systems for data transmission.
- Built-in battery for autonomous power supply of systems.
- Access devices and locks for remote access control.
- RFID tags for container identification and tracking.

All these technologies integrate the smart container into a single transportation information system and allow remote monitoring of its condition and movement.

The use of smart containers in supply chains can provide the following significant benefits:

1. Improvement of cargo security

Location tracking, access control, container opening monitoring and remote locking reduce theft risks. There are cases of unauthorized movement of containers.

Control of the temperature regime and other parameters prevents spoilage of perishable goods due to timely detection of critical temperature and humidity deviations.

2. Optimization of logistics and cargo transportation management

Tracking the location of containers in real time allows you to optimize transportation routes, minimize downtime, increase processing speed, and makes it possible to dynamically adjust delivery routes and schedules.

The time spent searching for containers at the terminal is reduced and downtime and delays in transportation are avoided.

3. Reduction of document flow

Sensor data automatically captures transportation conditions, reducing the volume of paper documents. This is facilitated by the use of cloud platforms for the accumulation and analysis of received data, blockchain technology for reliable data storage.

4. Environmental and economic benefits

Tracking conditions and optimizing routes reduces cargo spoilage and the amount of waste, which will allow you to save on fines and compensation for cargo spoilage, as well as reduce cargo insurance costs due to increased safety.

Rational transportation planning reduces CO₂ emissions into the environment.

5. Improvement of communication and interaction with clients

Using GPS technology for location determination, 3G/4G cellular networks for data transmission and satellite communication in remote areas, shippers and consignees can receive up-to-date information on the status of their containers.

Conclusions. Intelligent containers are the future of global logistics. Their widespread implementation will allow to optimize processes, reduce losses, increase the speed and reliability of cargo delivery. To gain maximum benefits, transport and logistics companies need to actively adopt new technologies, develop common standards and create integrated digital platforms for managing

container transportation.

Smart containers can completely transform freight logistics. However, despite the obvious advantages, the implementation of smart containers faces a number of problems:

- High cost of equipping containers with sensors and communication modules.
- The need to modernize the AI infrastructure of transport hubs for collecting and processing big data.
- Complexity of integration of disparate platforms of container carriers and transport hubs.
- Risks of cyber attacks and unauthorized access to cargo data.

Overcoming these difficulties requires joint efforts and investments by the state and business, as well as the development of uniform data security standards.

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**ПІДВИЩЕННЯ РІВНЯ БЕЗПЕКИ ЗАЛІЗНИЧНОГО
ВИРОБНИЦТВА ШЛЯХОМ ВПРОВАДЖЕННЯМ КОНТРОЛЮ
ФУНКЦІОНАЛЬНОЇ НАДІЙНОСТІ ЗАЛІЗНИЧНИХ ОПЕРАТОРІВ**

**INCREASING THE LEVEL OF SECURITY OF THE RAILWAY
PRODUCTION THROUGH THE IMPLEMENTATION OF CONTROL
OF THE FUNCTIONAL RELIABILITY OF RAILWAY OPERATORS**

В.Г. Брусенцов, Б.К. Гармаш

Український державний університет залізничного транспорту

V.G. Brusentsov, B.K. Harmash

Ukrainian state university of health transport

Рівень безпеки руху на залізничному транспорті сьогодні визначається «людським фактором», на частку якого припадає понад 80% порушень. При цьому мається на увазі рівень професійної надійності насамперед залізничних операторів. Йдеться про такі професійні групи як працівники локомотивних бригад та оперативного диспетчерського персоналу, які безпосередньо впливають на рівень безпеки. У зв'язку з цим актуальною є