special display or control panel, after which the platform autonomously lowers the car back to the platform.

In conclusion, the smart parking system will reduce the time spent searching for parking spaces and make the parking space more practical, convenient and efficient.

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FORMATION OF A RATIONAL TECHNOLOGY FOR DELIVERY OF GRAIN LOADS IN CONTAINERS IN THE DIRECTION OF EUROPE

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In the modern conditions, in the market of transportation of grain cargoes in the containers, there is a perspective of their development because every year the number of such orders is increasing to the address of transport and freight forwarding companies. The authors [1] focus on the development of multimodal transportation involving railway transport, road and marine type of transport in the scientific works in the sphere of cargo shipping in the containers, thus it is determined that railroad transport carries out the transportation of the grain cargoes in the conditions of critical depreciation of the main means and increasing competition from the side of other types of transport. The analysis of the practical experience in ~~of~~ the organization of grain cargoes delivery in the containers in international traffic has shown that many companies offer services on this type of activity, using different technical means to simplify the process of loading and unloading and transportation of grain cargoes. The analysis of the current state of the matter of shipment grain cargoes from Ukraine has shown that our country has a powerful export port capacity. In addition, two leaders in storage and transshipment of grain cargoes have been specified, Odessa and

«Chernomorsk» sea trade port. It has been found out that delivery of grain cargoes to the seaport is used by bulk grain lorries, carriages, containers. The held analysis has revealed the problem of delivery organization of grain cargoes in the international traffic - the choice of rational technology of delivery.

The aim of this development is the definition of rational technology of delivery of grain cargoes in the containers in the international traffic. The object of the research is the process of delivery of grain cargoes in the containers in the international traffic.

The development of supply chains between Ukraine and the European Union is due to increasing trade relations. Goods export has begun increasing to European countries in recent years (2018-2021) based on cost indicators. Although under the influence of the coronavirus pandemic, there was a slowdown in trade development, this trend was around the world. Export amounts to five European countries increased from $11,343 million to $15,447 million Dollars USA, according to statistics from 2018 to 2021, which corresponded to 1.36 times increase.

It is necessary to organize new logistics systems and improve existing ones for any developing country. This is especially important for a country with high potential as a manufacturer and exporter of grain loads to Europe. Thus, export volumes from Ukraine to Europe of these products in 2021 for the leading positions on average increased by 16,1% compared to 2020. Moreover, the main problems faced when organizing such transportation are the next: searching for responsible counterparties, structural coordination at all stages of operations, and designing adaptive interaction systems at all decision-making levels.

Planning the efficiency of container use has become more complicated due to the rapid development of the container transportation market in the world. It is particularly evident with an increase in the number of mega-container carriers operated by major container operators. The authors of the article developed a model of a container transportation network that covers both the main route and a segment of coaster shipping, considering the sea container port as a hub. Ports have a crucial role in the container transportation system, especially in the main hubs of the continents - Asia

(ports of China), North America (ports of the USA), Europe (ports of the Netherlands and Germany)

To design rational logistics for grain loads to Europe from Ukraine, it is necessary to use world experience based on technologies of Industry 4.0, implementation of SMART solutions, and providing an integrated approach in management. It is also important to consider efficient resource use and cost reduction for each participant in supply chains. Relevant solutions in logistics market fields are essential for creating a rational supply of goods in international directions, considering each operation time and possibilities of forming consolidated shipments. Therefore, there is a need to develop new scientifically based approaches to determining rational logistics options for grain loads delivery from Ukraine to Europe.

Modern international conditions which Ukraine strives for demand more attention in the sphere of logistics cargo transportation, rapid growth and development. The efficiency and the quality of cargo transportation significantly depends on the optimization of the process of work coordination of different types of transport, rational distribution between traffic volumes, timely formation of the necessary management decisions. First, it is necessary to pay special attention to the important indicator of transport process - the cost of transportation.

Three alternative technological schemes of delivery of grain cargoes in the containers in the international traffic have been proposed.

The first scheme is with the use railroad transport (grain cars) to deliver the grain to the port of departure «loading of the rail car at the elevator - delivery to the port or the external terminal - reloading into the container – delivery of the container by the sea lines - delivery to the end user».

Scheme 1. This scheme has some significant moments that influence the process, according to the statistics at this scheme technical losses make up from 5% to 7% of the total turnover of the product; the impossibility of forecasting the timing of a process; additional costs on certification and customs clearance.

The second scheme is with the use of road transport (bulk grain lorries) for the grain delivery to the port of departure «loading of the bulk grin lorry on the elevator -

delivery to the port or the external terminal - reloading of the container – delivery of the container by the sea lines - delivery to the end user».

Scheme 2. This option has several significant factors affecting the process: the lack of delivery schedule and respectively planning of the shipments; non-conformity of the quality of goods which are transported; lack of laboratories at cargo complexes; technical losses of 3% to 5%.

The third scheme is with the use the containers and railcars for grain deliver to the port of departure «supply of empty containers for loading on the elevator by railroad - loading on the elevator - the return of the loaded containers to the port – delivery of the container by the sea line - delivery to the end user»

Scheme 3. The main advantages of the third option: the grain goes through qualitative selection; no overload, except loading on the elevator; low-cost price of export certification and customs clearance; minimal loss of cargo - 0.5%.

The most perspective to describe the process of cargo transportation on transport and technological schemes is the use of mathematical modelling. When designing and developing new models a number of difficulties appear, the main cause of which is not only in a large number of items which are included in the projected system but in the complication of causation ties in the complex of interacting components.

Since transport processes are complex systems of interacting elements, so it is appropriate for their modelling techniques to apply the systems analysis which essence is to identify the connection between the components of the object of research and the impact of each of them on the efficiency of the system as a whole.

Using the apparatus of the set theory the technological process is considered on the basis of the model M_{TP} as the combination of the following components:

$$M_{TP} = \{\{X\},\{Y\},\{Z\},\{E\},\{LS\}\}, \quad (1)$$

where *{X}* – the input impacts that can be changed in the process of taking decision as for the management of transport process;

{Y} – criteria of effectiveness of the transport process;

{Z} – environmental effects that cannot be changed during making management decision but should be taken into account herewith;

{E} – components of the transport process;

{LS} – connections between the elements of the transport process.

This model describes: all the elements of the system (warehouse); all communications of the systems: internal (structure), external (inputs, outputs); boundaries of the system; parameters of the environment; parameters of the internal environment.

It is determined that in the current market conditions in the market of grain cargoes transportation in the containers, there is a perspective of their development, because every year the number of such orders in the address of transport companies is increasing. The scientific works have been analysed in the sphere of organization of cargo delivery in the containers in which the authors focus on the development of multimodal transportation involving the rail, automobile and marine types of transport. Yet, it is specified that rail transport performs transportation in the conditions of critical depreciation of the main means and increasing competition from other types of transport (including automobile).

Three alternative technological schemes of delivery of grain cargoes in the international traffic have been proposed: the first scheme is with the use of the rail transport (grain cars) to deliver grain to the port of departure, the second scheme is with the use of road transport (bulk grain lorries) to deliver grain to the port of departure, the third scheme is with the use of the containers and wagons to deliver the grain to the port of departure, moreover the third scheme has advantages such as minimal loss of cargo – up to 0.5%.

The method of determination of the rational scheme of delivery of grain cargoes is proposed which allows after calculating the total cost to choose one of the three proposed schemes. The suppositions that have been proposed, take into account all the requirements of the customers, specifications of performing the operations by rail and road transport, as well as an organizational component of the use of the containers on transporting the grain cargoes.

References

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TRANSPORT LOGISTICS OF FREIGHT TRANSPORTATION

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Transportation of goods across Ukraine or the whole world is the main task of transport logistics. Such services are the basis for the transportation of goods, and therefore for the entire world economy. In order to do this effectively and safely, you need to plan and calculate everything in advance, so you should contact experienced professionals for the Services.

What is transport logistics and what are its features?

Transport logistics is a science that shows how to correctly perform organizational and management processes and provides various systems with goods and material resources. There are several types of logistics, and one of them is transport.

Transport logistics is a complex of logistics services, which includes not only transportation, but also related services:

- cargo movement;
- loading and unloading;
- processing of documentation;
- planning and development of the transportation route;
- selection of the best mode of transport;
- Services of porters and drivers;
- analysis and cost calculation;
- consultations and support during delivery.