The organization of transportations by container trains

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Abstract. The article is devoted to the organization of transportation of container trains. The main elements of the transportation process and the main types of shipments are considered. Export railway deliveries from Russia to China began to develop relatively recently. China is actively purchasing Russian wood and wood materials, thereby raising the economic sector of the Russian Federation. The focus on the development of international rail transport is because with respect to other types of transport the railway is the most competitive. Transportation of large-sized various goods in large-capacity containers has a great prospect, both in the transport services sector and in foreign economic activity. Increasing such transportation means targeting the modernization of old rolling stock and the creation of new improved units to improve the efficiency and quality of cargo container traffic, as well as to reduce costs and shorten the delivery time for goods. To optimize both transit cargo and passenger, as well as import and export traffic, it is necessary to improve the border crossing procedure. Clearly, this issue requires discussion at the state and international levels, as well as the enormous costs of developing activities and the elimination of difficulties and time resources for the whole complex of procedures.

1. Introduction

The organization of traffic involves the management of a set of time-consuming activities, consisting of the selection of a rational and satisfying all the requirements of the vehicle, drawing up and determining the route of the route.

The main components of the transportation process are [2-4, 28]:
- collection from the seller of the cargo, its packaging and placement in a container and loading it onto a motor vehicle;
- movement of cargo from the warehouse of the seller to the temporary storage warehouse (TSW) at the terminal;
- preparation of documents, declaration, insurance and loosing goods and the formation of rolling stock;
- transshipment of containers from motor vehicles / from a temporary storage warehouse to a wagon;
− directly transport itself;
− customs inspections or inspections, if there is such a need;
− customs clearance of cargo and unloading operations at the consignee’s warehouse;
− throughout the entire journey of the container train, information support and regular notification of the operator and customers about the location of the cargo are being carried out [24,30].

The organization of container traffic involves the formation of a rolling stock with the required number of cars for further loading of containers on them.

2. Study methodology
The purpose of the publication is to analyze the scientific literature, regulatory framework and the results of scientific research on the development of container traffic. The following Russian scientists contributed to the study of this area: D.N. Arshintsev, P.V. Kurenkov, V.A. Persianov, T.A. Prokofieva. The study used the following methods: a systematic approach, comparative analysis, retrospective analysis, analysis of official statistics; document analysis method.

Much attention currently paid to the transport of goods by container trains. It is an advanced transportation technology that meets the modern requirements of the international transport market and allows to significantly improve the efficiency of work.

3. Assessment and results
At present, in the direction of Russia - China, the movement of accelerated container trains is being introduced. It is assumed that container trains will be able to travel 1,100 km per day. In January 2019, rates increased to 1155 km / day, which reduces the likelihood of downtime on the tracks.

At present, the ring accelerated route is being commissioned (Moscow - Irkutsk - PRC). February 27, 2019 the first container train, launched on a new route, sent from the Selyatino station (Kiev direction). The container train departed as part of 62 ktk and reached the city of Irkutsk in 7 days. This route is designed and introduced to increase the volume of export traffic [27]. From Russia - Siberia - the train will leave with containers loaded with forest raw materials, and return from China with imported electronics, textiles, etc., passing through Irkutsk, Krasnoyarsk, to Moscow [8,25].

Currently, the departure of container trains is easier than 50-60 years ago. Now to send any documents that are not enough, it is enough to take a photo of it and send it to the recipient. The equipment became more powerful, the traffic volumes increased, the containers became larger and more capacious. In the middle of the 20th century, the transportation of large cargoes was carried out by sea transport; however, despite the capacity of ships, the difficulty was in onboard loading. Delivery was long, but only because of the loading times of various goods [1, 11,29]. American Malcolm MacLean suggested that the movement of goods in container boxes would facilitate the process of loading and unloading. In addition to this idea, Macklin thought about the introduction of other types of transport in the organization of transportation, that is, about the multimodality of transportation. So the idea of creating container traffic [17, 19].

A small role in the export transportation of timber cargo belongs to Russia now; however, the sector, the cargo exported to it, is diverse.
The data shown in Figure 1 indicate that Russia can be called a source of raw materials, since in the structure of exported goods the main exported goods are gas and petroleum products, metals, and wood. These are all commodities.

Several container trains loaded with timber to China sent daily from different regions of Siberia. China is a priority consumer of the Russian forest. Then Russia imports Russian wood, but in an already processed form - in the form of furniture, building materials, various interior items, and so on.

Chinese buyers are trying to take out from Russia many containers with sawn timber and round timber, as there is a rule “wholesale cheaper”.

The cost of the railway tariff varies with the type of shipment (Figure 2), i.e. the amount of cargo on one invoice. Since one customer can often be the customer of a whole train, the cost for the railway fare will be lower with full departure of container trains.

Figure 1. Structure of goods exported by Russia, billion $. The data shown in Figure 1 indicate that Russia can be called a source of raw materials, since in the structure of exported goods the main exported goods are gas and petroleum products, metals, and wood. These are all commodities.

Figure 2. Types of cargo shipments on railway transport. To begin to clarify what meant by the term “sending”. Cargo transported from one departure station by one consignor, sent to one arrival station and intended for one consignee to whom one transportation document drawn up - these are the key conditions for defining this term.
Sending are route and group. Their difference is for cargo. The first type of shipment characterized by the fact that the cargo transported in the quantity required by the consignee (not less than the length of the block train). And for group sending it is typical to use from one car, but not more than X cars (route shipment) [5-7].

Small shipment refers to the shipment of goods on one consignment note, but for it, there is no need to use a separate container / car, since its weight does not exceed 10 tons.

In addition to the above listed there are a number of shipments.

Carriage by shipment implies the shipment of goods, passing on a single consignment note, on a separate carriage. The carriage team is the carriage of several goods that can be transport in one carriage.

The essence of container shipping is similar, only it requires a container. However, under this term, you can take and carrying empty container. A complete container shipment is the transportation of various goods through the Unified Tariff Statistical Nomenclature of Cargo (ETSNG) system in one car [10,12].

But before you send the train and calculate the tariffs, you need to prepare the containers in the required quantity. An important point in the organization of container traffic is tracking the state of the container: is there a need for repairs and the correctness of the container number.

After sending the train at the border crossing, they may find that the container is defective, because of which the container car must be unhooked from the train and sent either to the repair depot or to a temporary storage warehouse.

It is also important to know if something happened to the number of the container: it did not rip off the number on the container and the weather conditions did not affect the quality of the sticker. If the number on the container does not coincide with the number in any documents, there may be serious problems leading to criminal liability.

Often there are situations when the employees who prepared the documents made a mistake in one digit, and if it is detected at the customs, then you can find out which number is correct, without waiting for official confirmation from the operator’s company. When the choice of container made, and its condition checked for defects and the correctness of the number, the organization of transport moves to the stage of choosing the optimal route [9,22,26].

Currently, there are 5 main crossing points of the state border for the delivery of goods to China by rail. Key railway sections on the route of export trains are:

- Trans-Siberian trunkline of 9289 km in length, having three turns:
  - northern (using the Baikal-Amur Mainline);
  - Nizhny Novgorod
  - Kazan.

Crossing the state border, at the border crossing in Zabaikalsk, containers are rearrange to other cars, as in China the train will continue to follow the Trans-Manchurian mainline, whose track is equal to 1,435 mm. [13, 27]. If the transition takes place at Naushki - Sukhbaatar stations, then further, the train follows the Transmongol highway with a gauge width of 1,520 mm, but when arriving at the border of the PRC, wagons that are suitable for traveling on a 1435mm track change [15,20]. Also, it is possible to cross the border with China through the border crossing station (formerly Grodekovo) - Suifenhe, where the gauge is changed in the same way and containers are overloaded to Chinese cars.

The Central Eurasian Corridor is rarely use, since export shipments are mainly organized from Siberia. The gauge on the Kazakh railway is equal to the gauge width of the Russian Railways. Transition points Kazakhstan-China are: Art. Dostyk-st. Alashankou and p / p Altynkol - Khorgos, where there is a change of cars.
Comparative statistics of export shipments to the PRC through border crossings, TEU

![Diagram showing comparative statistics of export shipments to the PRC through border crossings, TEU.](image)

**Figure 3.** Comparative statistics of export shipments to the PRC through border crossings, TEU.

Promising routes of export container trains are the following routes: Transsiberian line + Transmanchurskaya with checkpoint Zabaikalsk and Transsib + Trans-Mongolian line with border crossing at Naushki station. From the dynamics of export train departures, it is clear that the Trans-Baikalsk passenger terminal has a higher capacity, but the growth rate of traffic through UBZD increased in 2017 by almost 300% compared to 2016 [16,18].

A less used border crossing point is the town of Pogranichny. However, at present, this crossing point has been taken under control, they are beginning to modernize the transport infrastructure and lay out additional freight routes to regulate speed and ensure throughput.

The use of the Kazakh railways when sending export container trains from Russia is stable and does not change. For 2016 and 2017, about 1% of total rail exports went through the Dostyk and Altynkol checkpoints. Such indicators are due to the fact that these checkpoints are most suitable for import from China to Russia and Europe, since there is nothing to export from the central part of the Russian Federation.

The main disadvantage of using railways is the difference in gauge in the Russian Federation and the PRC. Delivery times are increased due to idle time and container handling at the border. Also, overloading the CPC and renting Chinese cars leads to additional costs.

To reduce loading operations at checkpoints, it is necessary to solve problems with the difference in the gauge of countries that carry out economic activities among themselves. Perhaps there is a need to modernize the already existing means of communication, that is, duplication of the third rail, reducing the gauge to 1,435 mm, while maintaining the overall Russian width. On the other hand, make automatic carts on cars to reduce downtime. However, this issue must be raised to the state level.

Since the Russian Federation is one of the main exporters of forest products, it is important to consider the specifics of transporting such cargo by rail.

Transportation of forest raw materials and wood products is not much different from the transport of other bulk goods. The main difficulties in organizing the transportation of timber cargo, as well as during loading and unloading operations, are the scale, weight and dimensions of the cargo [13, 23].

In order for the transportation of cargo to be successfully organized, it is necessary to observe the following requirements. Cargo, depending on the classification and type, should be stored in the appropriate state standards. The technical conditions for loading operations, placement and securing of cargo in a container or on a wagon also depend on the classification of forest cargo Figure 4.
After cutting down the nearby forest belts, timber-processing plants have to send the vehicle over long distances, that is, the range of export of wood increases annually.

The peculiarity of timber cargo also affects the mode of transportation. Account taken of the type of container in which the cargo will be transported, the conditions of transportation, the spraying of the forest, the observance of the technological process of moving the cargo, and its fastening on the car or in the container.

For each type of forest product has its own characteristics of transportation, which require a certain container.

Saw-timbers and materials from wood waste can be transported in containers, where they are loaded in packages, putting a dry layer between them so that the cargo does not absorb excess moisture along the way. On the rolling stock, they are immerse, depending on the assortment and the length of the load, placing narrow materials between the wide ones. It is also permissible to transport lumber in battens and stacking with a protective film coating. Container shipments of wood allow to contain up to 26 tons of cargo in a container, as well as reliability and safety of goods will be higher than transportation on wagons. Also important advantage is that the container with the subsequent use of the car can be sent to any point, and the cost of loading and unloading works will decrease.

### 4. Conclusions

At present, the development and implementation of accelerated container trains, capable of reaching the consignee in 15 days, when goods are transport by ordinary KPs in 25 days, begins.

Modernization of transport infrastructure, rolling stock and the opening of new international transport corridors, for the possibility of establishing new trade and economic ties.

The main checkpoint for trains crossing the border between Russia and China is the Trans-Baikal-Manchuria railway station. Volumes of cargoes exported through this checkpoint accounted for almost three quarters of total exports to China. A big drawback in the use of this border crossing is
the historical fact that Manchuria was once part of the Russian Empire, then the laying of communication lines with a single gauge of 1,520 mm began [14,21].

The ability to realize the export of container trains depends on the assistance of states. Russia is investing money in modernizing existing lines of communication, as well as in developing new accelerated cargo delivery routes. On the Chinese side, support is expressed in the provision of subsidies for the export of timber cargo from Russia. Subsidies allow you to return some of the funds allocated for transportation. Russia began to learn from this experience and plans to allocate money in 2019 and pay off up to 80% of the costs of transport companies that won the tender to provide support to the Russian export center.

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