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# INCREASING THE EFFICIENCY OF USING BACKLINE AND PRIVATE RAILWAY INFRASTRUCTURE IN THE CONDITIONS OF THE TRANSPORTATION MARKET

**Purpose.** Improving the efficiency of interaction between enterprises that operate public and private railway infrastructure when performing cargo transportation and cargo operations.

**Methodology.** The studies were carried out using the methods of the theory of railway operation and economic and mathematical modeling.

**Findings.** The study found that the transition from a planned economy to a market economy along with increasing customer requirements for the composition and quality of transport services is an objective reason for an increase in carriage downtime at private sidings and junction stations, a shortage of track capacity and shunting locomotives. It is shown that the existing approaches to assessing the effectiveness of the interaction between train tracks of enterprises and mainline railways are aimed at improving the performance of the rolling stock and do not create incentives to solve the problem of the shortage of transfer and processing capacity of the railway infrastructure.

**Originality.** The paper proposes an improved method for assessing the effectiveness of the interaction of participants in the transportation process when performing transportation and cargo operations on the private sidings of industrial enterprises, based on the time the infrastructure is occupied. This approach, unlike the existing one, encourages railways and industrial enterprises to jointly search for the best technological solutions for the use of public and private railway infrastructure.

**Practical value.** The method proposed in the paper for assessing the interaction of participants in the transportation process makes it possible to separate station services in the tariff for the use of the railway infrastructure into separate services of service facilities and track access to them. This will create a competitive environment and encourage participants in the transportation process to use the existing railway infrastructure and develop a new one to obtain a synergistic effect more efficiently.

**Keywords:** *railway transport, railway station, private sidings, service facility operator, transportation tariff*

**Introduction.** Since the middle of the *19th* century, the "railway" has been one of the key types of passenger, freight and industrial transport. Transportation is carried out using rolling stock, locomotives and carriages. In addition, infrastructure is needed for rail transport. We are talking not only about railway lines [1] and contact networks, but also about all types of buildings, structures and technical equipment that are managed by various public and private railway companies and carriers.

The main direction of reforming the railway transport in the late *20th*–early *21st* century is associated with the liberalization of the rail transportation market and the introduction of competition in its various sectors. One of the types of railway infrastructure services that can be provided by both the infrastructure manager and independent operators of service facilities [2]. In particular, these services include the services of freight terminals and marshalling yards. Kazakhstan is the first of the post-Soviet states where market reforms of the railway industry were carried out. With the signing of the "Association Agreement" Ukraine has undertaken to implement the norms of the European Union directives on the organization of the rail transportation market into national legislation. Therefore, the problems of organizing the work of railway transport in market conditions are quite acute for the economies of both countries.

Kazakhstan and Ukraine have railway networks of considerable length. The length of public railway tracks in Kazakhstan is 16 thousand km, and the length of private sidings of its industrial enterprises is 15 thousand km. The length of railway lines of general use in Ukraine is 21 thousand km, and the length of private sidings of its industrial enterprises is 7 thousand km. In this regard, the study of the issues of interaction between the owners of the railway infrastructure in the new structure of the transportation market is relevant for both states.

**Literature review.** The railway transport of the beginning and middle of the *20th* century was characterized by such an

organization when the market for its services was in a state of monopoly [3]. Within individual states, the main transportation of goods and passengers, as well as the operation of the infrastructure of public railways, was carried out either by a vertically integrated company or a group of centrally controlled enterprises. This type of activity belonged to the public railway transport. At the same time, industrial enterprises, ports, and various organizations also owned the railway infrastructure and rolling stock [4], which provided their own needs for the movement of goods within enterprises and in interaction with the general railway transport use. This type of activity belonged to non-public railway transport.

In the last three decades of the *20th* century, reforms began in the USA and Canada, and later in Western Europe and China, aimed at demonopolizing the rail transportation markets. A critical analysis of the problems of restructuring the state-owned railways and the introduction of competition in the railway transport industry was made in the paper by Pittman [5]. The authors of [6] offer alternative scenarios for the restructuring of Chinese railways. A fairly detailed review of publications on the issues of reforming the rail transportation market in the countries of the European Union is made in [7]. The following should be noted as the main stages of reforming the rail transportation market of the European Union:

- Directive 91/440/EEC, which was the first serious measure of the European Commission aimed at separating the activities of the operation of the railway infrastructure and transportation;
- Directive 2001/14/EC, in which all railway infrastructure services were in turn divided into services of a minimum access package, services of service facilities and access ways to them, additional and ancillary infrastructure services;
- Directive 2012/34/EC which establishes the currently valid division of railway infrastructure services and defines which undertakings may operate the railway infrastructure.

In accordance with Directive 2012/34/EC, the following entities may operate the railway infrastructure:

- infrastructure managers who provide all types of railway infrastructure services;
- operators of service facilities (railway stations, freight terminals, locomotive and carriage depots, equipment points, etc.) that can provide various types of railway infrastructure services to third-party consumers, with the exception of the services of the minimum access package;
- a variety of enterprises and organizations that own the railway infrastructure and use it for their own needs, without providing important transport services to third-party consumers.

The current state of the European Union rail transportation market is presented in the paper by Ali & Eliasson [8]. Over the past 31 years since the adoption of Directive 91/440/EEC, a significant number of publications have appeared devoted to the analysis and generalization of the experience of competition in the market for the transportation of goods and passengers by rail, as well as the interaction between carriers, the infrastructure manager and regulators. Such studies are given, for example, in [7]. The material accumulated to date makes it possible to build mathematical models based on game theory that describe the relationship between participants in the rail transportation market, as, for example, in the paper by Lang, et al. [9]. At the same time, less attention is devoted to the problem of interaction between railway infrastructure facilities of different owners in a competitive market. Most papers are aimed at generalizing the existing experience of the industry, assessing the types and cost of services provided in this sector of the market. In particular, in the paper by Baron [10], an analysis was made of the regulations concerning the operation of terminals, as well as the systems for charging their services. It should be noted that in accordance with the studies carried out in [8], in many countries of the European Union, to date, the services of service facilities are still not separated from the services of the minimum access package. In some cases, in accordance with [11], this problem is even the subject of litigation.

The problem of interaction of railway infrastructures of different owners in countries that were previously part of the USSR has its own peculiarities. In the USSR, the railways, most of their clients (enterprises of consignors and consignees), as well as competitors (enterprises of other modes of transport) were in a single state property. The vast majority of transportation was carried out in domestic traffic. Under such conditions, the work of the railways and clients did not provide for either profit or competition for freight traffic. The development of railway infrastructure [12, 13], the acquisition of traction rolling stock for industrial enterprises [14] and connecting stations were carried out in accordance with industry plans and, often situationally, depending on the possibility of financing through one or another ministry. Under these conditions, at individual enterprises, primarily in the mining [15] and metallurgical industries [16, 17], as well as in seaports, a significant length of railway infrastructure was built. This rail network is still in operation today. In particular, the expanded length of the ArcelorMitall Kryvyi Rih private sidings is 800 km and includes about 40 separate points, incl. 2 sorting stations. There are about 190 locomotives in the inventory park of the enterprise. Kazakhmys Corporation LLP has an even greater length of private sidings, the length of which is more than 1200 km. The main goal of the interaction of enterprises of railway transport of general and non-public use in the USSR was the fulfilment of the established standards for quantitative and qualitative performance indicators, as well as the reduction of the cost of transportation. Ensuring the interaction of railways and large enterprises was based on the document "Unified technological process for the operation of the private sidings and the junction station". This document described the principles of operational management of the joint operation of private sidings and junction stations, the joint use of technical facilities, as well as the agreed work standards. In some cases, specialized enterprises of industrial railway transport were created to provide transport services to enterprises, to which the track infrastructure and locomotives were transferred. Market reforms in the economies of the post-Soviet countries have led to the fact that state-owned enterprises have received various owners, the main purpose of which is to make a profit, and not to meet the established in-kind indicators. Considering that the processes of reforming the railway industry in different countries are taking place at different speeds and in different directions, this provides material for analysis.

One of the main problems arising from the interaction of the main railway transport and sidings of industrial enterprises in the Republic of Kazakhstan is a significant increase in the idle time of carriages on the sidings. In particular, this problem was considered in the papers by Balgabekov, et al. [18] and Mogazhdarov, et al. [19]. The reason for the increase in carriage downtime is a change in the form of ownership of enterprises, a significant increase in the share of import-export traffic and an increase in carriage downtime under customs operations, and an expansion of the range of goods. Also, as the reasons in [18] and [19], the inconsistency of the existing technology and technical equipment of railway sidings with the working conditions, insufficient throughput and processing capacity of sidings due to a high degree of wear of technical means, etc. are indicated.

It should be noted that the legislative and regulatory framework governing the organization of rail transportation has some inertia. In this regard, the work of private sidings of large industrial enterprises and stations is still organized on the basis of uniform technological processes. Such an organization is presented, for example, by Borodina, et al. [20]. This paper points out the need to assess the efficiency of work distribution in the port junction separately for different participants in the transportation process, however, the optimization problem of choosing the mass of the train is formulated as a

single-criterion one and solved graphically from the condition of minimizing the total costs. The paper by Borodin & Panin [21] also considered the problem of distributing work between an industrial marshalling yard of a metallurgical enterprise and a main marshalling yard. The solution to this problem was obtained on the basis of a comparison of competing options. The assessment of competing options in [21] is based on the calculation of the operating costs of the railway and the enterprise. At the same time, the best solution obtained in [21] provided a reduction in the costs of both participants in the transportation process. This is not always fair. For example, in the paper by Kozachenko, et al. [22] the problem of routing empty carriage flows directly from the private sidings of the seaport is solved. At the same time, in this case, despite the significant overall economic effect, the port itself bears additional costs. Therefore, measures are needed to redistribute the profit arising from the improvement of the organization of transportation between participants in the logistics chain [23]. Mathematical modeling is used as the main tool for improving the organization of transportation and choosing rational routes in transport systems [24, 25].

**Results.** An important problem of organizing interaction between railways and industrial enterprises in countries that were previously part of the USSR remains the distribution of costs associated with the formation and disbandment of trains at stations that serve consignors and consignees. Large enterprises, such as, for example, ArsenalMitall Kryvyi Rih or Transinvestservice LLC, have at their disposal railway stations that provide reception of organized trains from the main network, as well as the formation and departure of organized trains to the main network. Others, enterprises operating in the same market sectors, use railway stations of the main network for these purposes. Given the lack of tariff differentiation in Ukraine depending on the type of shipment, the paper by Kozachenko, et al. [26] raises the question of ensuring equal competitive conditions for their activities.

It should be noted that the activities of enterprises, especially those operating in monopoly sectors of the market, are mainly focused on increasing income, and not on reducing costs. In this regard, Tanaino, et al. [27] point out that the formation of routes by consignors leads to a decrease in railway revenues and raises the question of the economic efficiency of transporting goods by route shipments.

**Purpose.** The purpose of the paper is to increase the efficiency of interaction between enterprises that operate public and private railway infrastructure in the performance of cargo transportation and cargo operations.

**Methods.** The research in this work was carried out using the methods of the theory of railway operation and economic and mathematical modelling.

**Presenting the main material.** Mainly the main railway infrastructure and the infrastructure of sidings of industrial enterprises were created during the Soviet era. Regulatory documents for the design and operation of railway transport were also created at the same time. They are largely focused on work in conditions of centralized control and planned economy. The organization of transportation in the USSR involved an industrial enterprise on the one hand and the railway as an infrastructure manager, wagon operator and carrier on the other. The main tasks that were solved at the same time were either maximizing the amount of work performed with given resources, or minimizing operating costs to perform a given amount of work. The quality of the work was assessed by the compliance of the length of time the railway carriages were on the sidings with the established standards.

As key changes in the conditions of operation of railway transport during the transition of the economies of the post-Soviet countries to the market, the following should be noted:

- change from planned production, and, accordingly, the probabilistic formation of cargo flows of consignors and consignees;
- an increase in the volume of work with carriages on sidings due to the division of the fleet by owners, an increase in the range of goods and the share of transportation in import-export directions.

Currently, the formation of cargo flows of consignors and consignees occurs on the basis of contracts signed by them, and not on the basis of state plans. This has led to an increase in uneven traffic. The Fig. 1 shows the histogram and the distribution function of the random value of the number of carriages arriving during the day on the access track of LLC "Transinvestservice".

At the same time, the mathematical expectation is 966 carriages per day, and the standard deviation is 267 carriages per day. The sustainable development of such volumes of traffic by the enterprise requires the creation of staff reserves and technical means to develop cargo flows that exceed the average daily by 1.83 times. Considering that, as a rule, the creation and maintenance of such reserves is not economically feasible, smoothing out the daily uneven operation of the private sidings of industrial enterprises is quite often achieved using the track capacity of the public railway infrastructure.

In the days of the USSR, transportation of goods by rail was carried out in its inventory carriages. These carriages were for the most part universal and technically sound. In this regard, the loading of goods was carried out in carriages, which were released after unloading. The following features of the work are typical for the present time:

- division of carriages according to the owners of the rolling stock;
- operation of a large number of carriages with malfunctions that do not threaten traffic safety, but limit the possibility of their use for the carriage of goods;
- increase in the share of specialized rolling stock.

How these changes affect the operation of private sidings is illustrated by the example of the work of metallurgical plants. The track development of most metallurgical plants is designed for such conditions when the shipment of finished products is carried out in gondola carriages, released after unloading raw materials (coal, ore, scrap metal, etc.). An enlarged order of operations with carriages, incorporated into their technological processes at the design stage of track development, is shown in Fig. 2.

The order shown in Fig. 2 assumes the most efficient use of carriages and railway infrastructure. However, this technology is focused on the transportation of goods by a single fleet of carriages in domestic traffic and does not take into account the modern requirements of railway transport customers.

Changes in the working conditions of enterprises have caused significant changes in the functioning of their private sidings. Currently, after unloading, it is necessary to select

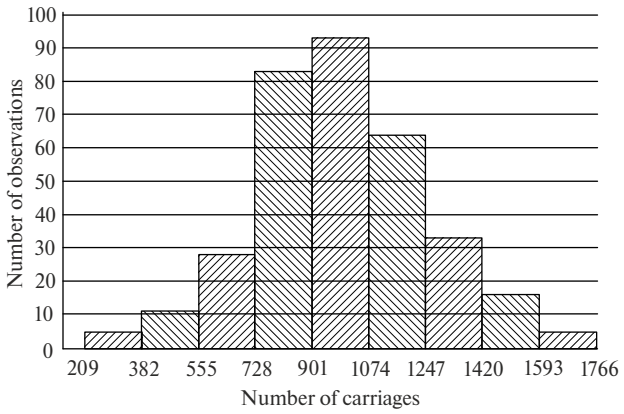


*Fig. 1. Histogram and distribution function of a random value of the number of carriages entering the siding of LLC Transinvestservice during the day*

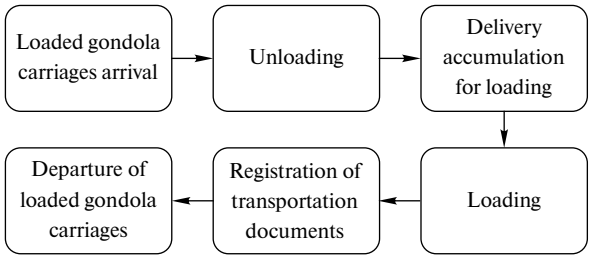


*Fig. 2. The procedure for performing operations carriages, incorporated in the technological processes of metallurgical enterprises during the design*

commercially sound empty carriages from those owners who allow them to be reloaded. In addition, about 40 % of the products of metallurgical enterprises are shipped on platforms and in empty containers. In this regard, additional shunting work arises related to the sorting and selection of cars into groups by type, owners and technical condition, as well as with the passage of oncoming empty car flows. In addition, the increase in the share of carriages for export has led to the need for carriages to stand in the loading shops during customs clearance. An enlarged order of operations that are performed with carriages on the sidings of metallurgical plants is shown in Fig. 3.

The performed analysis shows that as a result of the change in the structure of freight and carriages flows at the enterprises, there was a significant shortage of railway infrastructure and shunting locomotives. This deficit is of an objective nature and in many cases cannot be eliminated due to the lack of space for the development of the track infrastructure. Moreover, the Standard SNiP 2.05.07-91 "Industrial transport" is focused on the working conditions of private sidings of the USSR and does not reflect the current state of the problem. The emerging lack of infrastructure on the sidings is covered by the use of public infrastructure and leads to disruption in the work of both the enterprises that own the sidings and the railways that serve them. It should be noted that carriages delays on public infrastructure are recorded and a fine is charged for them. Quite often, these fines are systematic in nature and are the same source of income for the railways as the payment for transportation and additional services at the stations of departure and destination of goods.

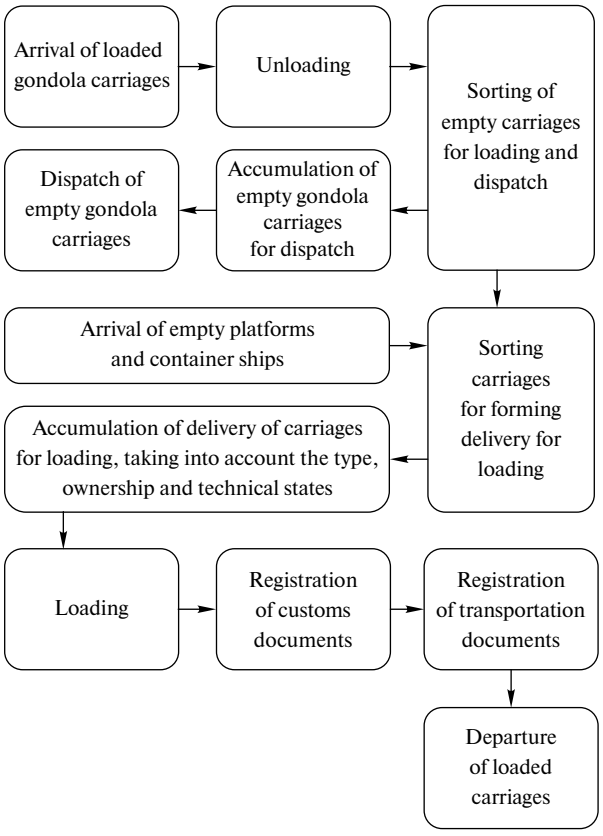


*Fig. 3. The actual procedure for performing operations with carriages at metallurgical enterprises*

The change in the form of ownership of industrial enterprises, which occurred as a result of market reforms, has led to the fact that many owners of private sidings have become competitors. As an example, we can consider the situation that arose during the performance of rail and sea transportation with the participation of the Yuzhny Commercial Sea Port. The scheme of the railway junction, which serves the Yuzhny Commercial Sea Port 2, is shown in Fig. 4.

Dozens of stevedoring companies that compete with each other for cargo flows directly carry out cargo operations in the port of Yuzhny. The carriages enter the railway junction through the Chornomorska marshalling yard. The seaport is serviced by the Berehova station, which belongs to Ukrzaliznytsia, as well as industrial stations of Chemical of Property of Transinvestservice LLC and Industrial of Property of Odesa Port Plant JSC.

In the case when transport services for cargo owners are performed by main railway stations, the cost of transporting cargo over a distance lp is determined as

$$E_{t1} = E_{SO} + E_S + E_{tr}(l_p) + E_e + E_{sd},$$

where $E_S$, $E_e$ are the costs for the initial and final components of the tariff, respectively, which include the cost of services of the departure and destination stations of the railway; $E_{tr}(l_p)$ is tariff for the transportation of goods over the distance $l_p$; $E_{SO}$, $E_{sd}$ are the expenses for the delivery of carriages to the cargo fronts and the removal of carriages from them at the departure and destination stations, respectively.

If the transportation is carried out to an industrial station, then the costs are determined as

$$E_{t2} = E_{SO} + E_S + E_{tr}(l_m) + E_e + E_{sh}(l_p - l_m) + E_{is} + E_{sd},$$

where $l_m$ is the distance of cargo transportation along the main railway; $E_{sh}(l_p - l_m)$ are expenses for maintenance of the track section between the public railway and the industrial station, as well as for the carriage of carriages between them; $E_{is}$ are the costs associated with the performance of operations at an industrial station.

As a result, if the carrier delivers goods to the industrial station, then with the same volume of services provided, additional costs arise in the amount of

$$\Delta = E_{tr}(l_m) + E_{sh}(l_p - l_m) - E_{tr}(l_p) + E_{is}.$$

In this regard, under the existing tariff system of railways, the construction of private railway infrastructure by industrial enterprises leads both to the need for capital expenditures and

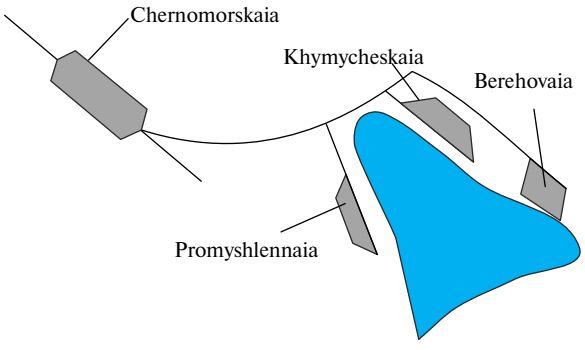


*Fig. 4. Scheme of the railway junction that serves the Yuzhny Commercial Seaport*

to an increase in operating costs for these enterprises. As a result, the competitive position of enterprises developing their own railway infrastructure is worse than that of enterprises using public infrastructure.

From the point of view of the railways, a change in traffic volumes only leads to a redistribution of freight flows between enterprises. As traffic volumes increase, railways receive additional revenue from fines, as well as revenue from longer distances. As a result, railways have no incentive to develop mainline rail infrastructure because it reduces their revenues during periods of growth and the need to maintain spare capacity during periods of decline in traffic volumes.

**Results.** The performed analysis shows that the observed shortage of throughput and carrying capacity of the infrastructure, the discrepancy between the processes taking place on the private sidings and the unified technological processes of the operation of the private sidings and junction stations are not the cause of the deterioration in the performance of railway transport, but an indicate that the existing design standards, technological processes and itself the system of indicators does not correspond to the market-oriented export-oriented models of the economy of Kazakhstan and Ukraine and the increased requirements of customers to the content and quality of transport services that have arisen. The modern system of relations between railways and industrial enterprises that own sidings does not create internal incentives for improving the technical equipment and technology of either mainline railway transport or sidings. In this regard, the increase in penalties for downtime of carriages will not solve the problem. To solve the problem, it is necessary to change the methods for assessing the effectiveness of interaction between railways and industrial enterprises, owners of private sidings.

The functioning of the main railway transport and sidings is proposed to be represented as a system, the elements of which are the owner of the siding, his contractors, infrastructure manager, carrier, carriage operator, as well as operators of such service facilities as station infrastructure and shunting traction. The elements of this system are interconnected by agreements regulating the use of carriages, railway infrastructure and locomotives. The modern system for evaluating the effectiveness of railway interaction is focused on improving the performance of rolling stock and is based on the rationing of the time it spends on sidings and junction stations.

Currently, both in Kazakhstan and Ukraine, the provision of carriages for transportation is carried out on competitive terms and is regulated by agreements between the participants in the transportation. Payment for services for the use of carriages may be provided depending on the time of use or the distance of transportation. Within the framework of the contracts, the cargo owner may assume the obligation to form groups of wagons of the specified length of a certain owner. Also, in accordance with the contracts, the cargo owner can ensure the stay of carriages on their tracks, etc. Therefore, the amount of idle time of carriages on the siding and its compliance with a certain norm cannot be used as an indicator of the effectiveness of the interaction between railways and sidings. Moreover, the primary solution to the problem of increasing the efficiency of the use of the rolling stock loses its meaning in the conditions of a surplus of rolling stock. Therefore, solving the problem of the rational use of carriages while they are on the private sidings and junction stations is currently a matter of improving the contractual relations between the participants in the transportation.

The main problem that needs to be solved at present is the use of the infrastructure of mainline railways and private sidings. In this regard, it is proposed to move to a method for determining the effectiveness of interaction between enterprises that operate the railway infrastructure, based on the time spent by the rolling stock on the tracks of various categories. The tracks of railway stations can be classified depending on their purpose and technical equipment. The proposed classification of tracks is given in Table. The owner of the infrastructure for each category of tracks, based on the analysis of the technological process, can set the norm for the time spent by trains or carriages. Payment for the services of the station infrastructure is carried out by the participant in the transportation process, who is responsible for the rolling stock in accordance with the transfer documents.

Given that the railway infrastructure of various owners can be used in the process of transportation, a competitive environment can be created in this market sector. Services for the use of railway infrastructure should be divided as it is, as provided for by Directive 2012/34/EC. To this end, station services should be separated into separate services of service facilities (including track access). Approximate distribution of costs for the transportation of goods by components, obtained on the basis of the analysis of the cost of transportation by Ukrzaliznytsia, is shown in Fig. 5.

Such a structure of rail transportation costs allows leaving about 35 % of costs in the monopoly sector of the market. The remaining 65 % of the costs will be in the potentially competitive and competitive sector of the transportation market. At the same time, cargo owners will be able to independently develop their railway infrastructure, which will ensure a significant reduction in their transportation costs. To serve groups of cargo owners in places of concentration of cargo work, operators of service facilities will be available, which will exist at the expense of payment for services to cargo owners and carriers. The infrastructure manager will have the opportunity to obtain the market value of the services of overloaded infrastructure in places of concentration of cargo flows, as well as to load the inactive infrastructure by creating buffer stations, stations for laying down carriages, etc.

***In general, the scientific novelty*** of the paper lies in the fact that it proposes an improved method for assessing the effectiveness of the interaction of participants in the transportation process when performing transportation and cargo operations on the private sidings of industrial enterprises, based on the time the infrastructure occupied. This approach, unlike the existing

*Table*

Classification of tracks of railway stations and tracks of industrial enterprises

| Tracks Specialization | Users | | |
|---|---|---|---|
| | Carriers | cargo owners | Carriages operators |
| Reception, departure, receiving | + | + | – |
| Exhibition | – | + | + |
| For delayed carriages | + | + | – |
| Sorting | – | + | + |
| For laying down carriages | – | – | + |

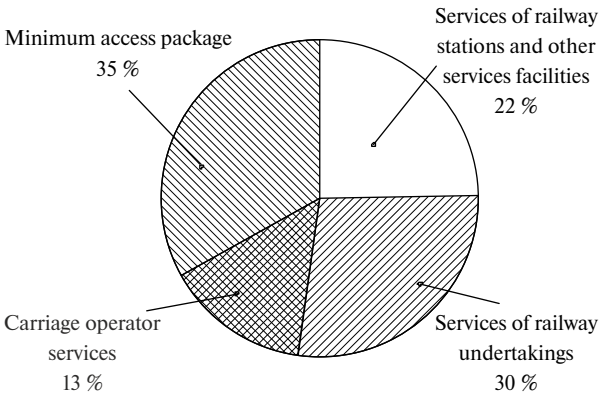


*Fig. 5. Distribution of transportation costs of cargo by rail*

one, encourages railways and industrial enterprises to jointly search for the best technological solutions for the use of public and private railway infrastructure. The method proposed in the paper for assessing the interaction of participants in the transportation process makes it possible to separate station services in the tariff for the use of the railway infrastructure into separate services of service facilities This will create a competitive environment and will encourage participants in the transportation process to more efficiently use the existing and develop new railway infrastructure to obtain a synergistic effect.

**Conclusions.** The performed studies allow us to draw the following conclusions:

1. Market reforms in the economies of Kazakhstan and Ukraine have led to a significant complication of the technology of private sidings. This complication is an objective reason for the formation of a deficit in the processing capacity of their infrastructure. This deficit leads to a disruption in the normal operation of both industrial enterprises and the stations of the main railways that serve them.

2. In modern conditions, neither individual enterprises nor railways have internal incentives for the development of railway infrastructure. At the same time, this state of affairs leads to a deterioration in the competitive positions of the export-oriented economies of Kazakhstan and Ukraine in the world markets.

3. To solve the problem with the shortage of railway infrastructure, it is advisable to separate the payment for station services from the tariff for railway transportation into a separate type of service for service facilities and access by ways to them. The share of these services in the current cost of transporting goods by rail is about 22 %. With such an organization, the infrastructure manager will be able to obtain the market value of the services of the overloaded infrastructure in places of concentration of cargo flows, as well as to load the inactive infrastructure. As a result, railways and enterprises have an incentive to jointly search for the best technological solutions and obtain a synergistic effect. Also, enterprises have the opportunity to develop their own railway infrastructure or create specialized service facility operators to provide station services. This way allows you to abandon the station services of the infrastructure manager and significantly reduce the cost of transporting goods by mainline rail transport.

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# Підвищення ефективності використання магістральної та приватної залізничної інфраструктури в умовах транспортного ринку

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**Мета.** Підвищення ефективності взаємодії між підприємствами, що експлуатують державну та приватну залізничну інфраструктуру при перевезеннях вантажів і виконанні вантажних операцій.

**Методика.** Дослідження проводяться за допомогою методів теорії експлуатації залізниць і економічного математичного моделювання.

**Результати.** У ході дослідження було встановлено, що перехід від планової до ринкової економіки й підвищення вимог клієнтів до змісту та якості транспортних послуг є об'єктивною причиною збільшення часу простою вагонів на під'їзних коліях і станціях примикання, виникнення дефіциту колійної ємності й маневрових локомотивів. Показано, що існуючі підходи до оцінки ефективності взаємодії між операторами транспортного ринку, що експлуатують рейкові шляхи підприємств і магістральних залізниць, спрямовані на покращення показників використання рухомого складу та не створюють стимулів для вирішення проблеми дефіциту перепускної й переробної спроможності залізничної інфраструктури.

**Наукова новизна.** У роботі запропоновано удосконалений метод оцінки ефективності взаємодії учасників перевізного процесу при виконанні перевезень і вантажних операцій на під'їзних коліях промислових підприємств, що базується на часі заняття інфраструктури. Такий підхід, на відміну від існуючого, стимулює залізниці та промислові підприємства до спільного пошуку найкращих технологічних рішень щодо використання магістральної та приватної залізничної інфраструктури.

**Практична значимість.** Запропонований у роботі метод оцінки взаємодії учасників перевізного процесу дозволяє виділити в тарифі за використання залізничної інфраструктури станційні послуги як окремі послуги об'єктів обслуговування й доступу до них. Це дозволить створити конкурентне середовище та стимулюватиме учасників перевізного процесу до більш ефективного використання існуючої й розвитку нової залізничної інфраструктури для отримання синергетичного ефекту.

**Ключові слова:** *залізничний транспорт, залізнична станція, оператор об'єкта обслуговування, тариф на перевезення*

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