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ЕКОНОМІКА ТА УПРАВЛІННЯ

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METHODICAL APPROACH TO DEFINING INFRASTRUCTURE COMPONENT OF THE COSTS FOR THE PARTICULAR PASSENGER TRAIN TRAFFIC

Purpose. In the scientific paper a methodical approach concerning determining the infrastructure component of the costs for traffic of the particular passenger train should be developed. It takes into account the individual characteristics of the particular train traffic. **Methodology.** To achieve the research purposes was used a method which is based on apportionment of expenses for the traffic of a particular passenger train taking into account the factors affecting the magnitude of costs. This methodology allows allocating properly infrastructure costs for a particular train and, consequently, to determine the accurate profitability of each train. **Findings**. All expenditures relating to passenger traffic of a long distance were allocated from first cost of passenger and freight traffic. These costs are divided into four components. Three groups of expenses were allocated in infrastructure component, which are calculated according to the certain principle taking into account the individual characteristics of the particular train traffic. **Originality**. The allocation method of all passenger transportation costs of all Ukrzaliznytsia departments for a particular passenger train was improved. It is based on principles of general indicators formation of each department costs, which correspond to the main influential factors of operating trains. The methodical approach to determining the cost of infrastructure component is improved, which takes into account the effect of the speed and weight of a passenger train on the wear of the railway track superstructure and contact network. All this allows allocating to reasonably the costs of particular passenger train traffic and to determine its profitability. **Practical value**. Implementing these methods allows calculating the real, economically justified costs of a particular train that will correctly determine the profitability of a particular passenger train and on this basis it allows to make management decisions on amendments to the existing schedule. Also, the cost of using the infrastructure for a particular train and its profitability can be determined with the help of PC due to this method.

Keywords: infrastructure; costs; speed; weight of the train; the profitability of a passenger train

Introduction

Today in Ukraine there is no a single method of determining the efficiency of a particular passenger train, but there is only a certain procedure for calculating the profitability of trains. To determine the profitability of trains, income are taken from the program certificate G-100 for a specified period of time (the amount of income from tariffs in Ukraine and seat reservation), and the costs are calculated on the base of consolidated and

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individual expense rates, identified by passenger traffic costing on the Ukrzaliznytsia [4]. The calculation reflects the direct costs of all households are attributable to passenger tarnsportation and indirect costs, which are distributed on passenger transportation proportionally to corresponding figures. Based on the operating costs and the volumes of passenger traffic expendable rates are calculated .

The problem is that expendable rates do not include individual characteristics of a particular passenger train traffic, such as speed, comfort, class of a train, seasonality and running term. All this leads to distorted information about the costs of a particular train running, the profitability calculation of a particular passenger train and as a result the non-objective management decisions making relative to amendments in to the existing train schedule and efficiency upgrading of passenger transportation.

The comprehensive theoretical and methodical approach to the determination of the profitability of a particular passenger train has not yet been suggested. Also there is no methodical approach for calculating the costs of infrastructure component for a specific train, which would take into account all the individual characteristics of a passenger train movement.

Previous studies analysis

The problem of determining the profitability of an individual passenger train, and in particular the definition of infrastructure component costs of a specific train in Ukraine, such scientists Yu. S. Barash [1, 6, 7, 14] T. Yu. Charkina [15] V. V. Chornyy [16, 18], T. M. Blyznyuk [2, 17], N. O. Bozhok [3], N. M. Kolesnykova [5], V. V. Skalozub [14] etc. researched recently.

I. P. Korzhynevych, Yu. S. Barash, M. B. Kurhan devoted their research to determining the dependence of track infrastructure deterioration from increasing train speeds. In a study [6] researchers found that the calculation the impact of trains on infrastructure through the given turnover is not accurate because it does not take into account a number of technical and operational factors. Analytical dependence, obtained by the authors in the course of their research, determine the relationship between the quality state of infrastructure and quantitative indicators of influence, they characterize exactly the influence of the latter (speed, type of rolling stock, infrastructure state) on deterioration of a railway track and catenary system.

Purpose

To distribute the costs of all households on Ukrzaliznytsia upon transportation of passengers in long-distance and international traffic to a specific passenger train. To develop the methodical approach to defining the infrastructure component of the costs for the particular passenger train raffic, that takes into account the individual characteristics of this train movement.

Methodology

The methods of theoretical generalization, logical and systematic analysis, synthesis, formalization, statistical processing, and analysis of information and method of expert evaluations were used.

Findings

In order to find the costs for movement of a particular passenger train one should allocate all costs of passenger transportation in the domestic and international traffic from freight and passenger transportation costing. Then divide them into separate components:

1. Passenger component;
2. An infrastructure component;
3. Locomotive component;
4. Motor car component.

Certain groups of costs are formed in each component. For their calculation is used a specific principle taking into account the individual characteristics of the train.

All costs of operation, maintenance and repair of the infrastructure can be divided into the following:

1. Costs of passenger services;
2. Costs of suburban passenger service;
3. Costs of transportation facilities;
4. Costs of a locomotive facilities;
5. Costs of car facilities;
6. Costs of a track facilities;
7. Costs of installation and construction works, civil structures;
8. Costs of automation, telemechanics and communications facilities;

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9. Costs electricity supply system;
10. Costs of material and technical facilities;
11. Costs of railway administration;
12. Costs of raiway traffic management and railways subdivisions under their authority.

Based on an analysis of all costs included in the infrastructure component, were formed three groups of expenses that are calculated according to different principles (Fig. 1).

In her scientific work Charkina T. Yu. [15] proves in order to increse the competitiveness of passenger trains on the transport market one should implement primarily their new classification, which takes into account the organization of movement depending on the running period during the day, distance and speed, term and comfort travel, type of rolling stock and source of financing their activities. This will further determine the optimal distances and timing of a trip by various rolling stock for commuter, regional, interregional and high-speed passenger trains and significantly reduce their loss ratio.

In this paper we consider only long-distance passenger trains that are designed to carry passengers for a distance of over 500 km within Ukraine and beyond (Fig. 2).

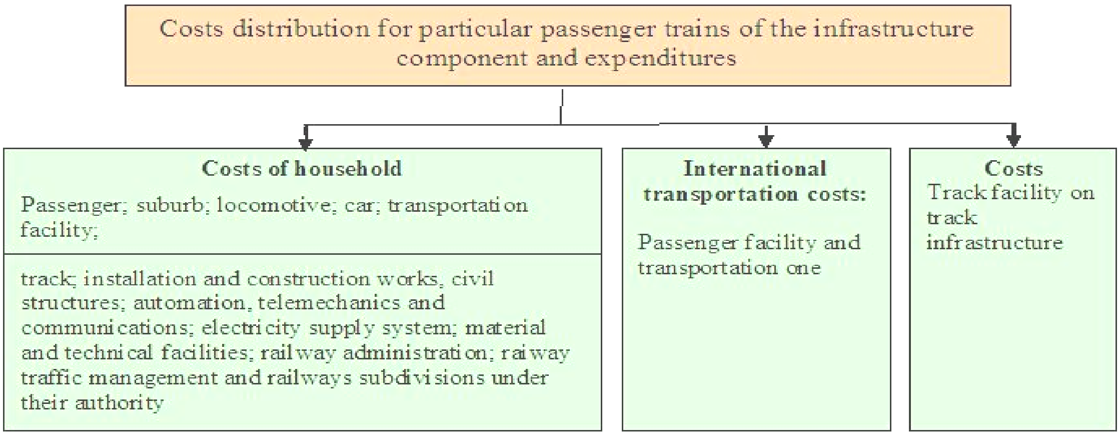

Fig. 1. The principles of costs distribution on a particular passenger train upon with infrastructure cost component upon articles to determine its effectiveness

The name of the train accordinly service area	Long-distance trains						
The final name of the train	Day intercity express	Night intercity	Night intercity express	Intercity	Intercity express	International	International express
The maximum distance, km	till 90	500-800	900-1300	Within Ukraine	Within Ukraine	Outside Ukraine	Outside Ukraine
The average route speed km / h	110-140	70-90	110-140	70-90	110-140	70-90	110-140
Way time	till 7	8-10	8-10	till 24	till 16	Depending on the distance	Depending on th distance
Funding source	Regional authorities and private investments	City authorities and private investments	City authorities and private investments	City authorities and private investments	City authorities and private investments	JSC "Ukrzaliznytsia" and private investments	JSC "Ukrzaliznytsia" and private investments
Type of rolling stock	MCRS express and cars of locomotive traction	Cars of locomotive traction of old generation	MCRS express and car of locomotive traction	Cars of locomotive traction of old generation	MCRS express and cars of locomotive traction	Cars of locomotive traction of old generation	MCRS express and cars of locomotive traction

Fig. 2. Classification of passenger trains in Ukraine for the running period, service area, speed of movement, a source of funding in today's market and the introduction of high-speed traffic [15]

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To determine the cost of a particular train one need to be able to calculate the costs relating to a specific group of trains, the number of these trains, taking into account movement period, the number of cars in the train and speed.

As discussied earlier, speed and weight of a train impact on energy consumption, traction of trains and deterioration of a track infrastructure.

In view of the above, the cost of movement of passenger trains and their impact on the wear track infrastructure necessary to individually calculate and attributed to a specific passenger train.

Fig. 3 shows the costs structure of the passenger train depending on the speed, running time, the number of cars in the train and annual car-mileage.

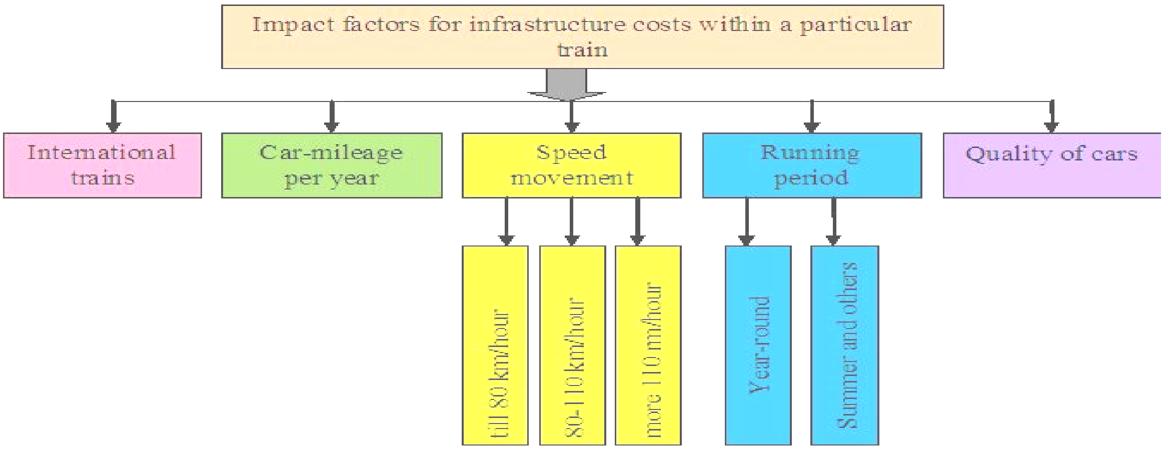

Fig. 3. Impact factors on the cost value of a particular train for the infrastructure maintenance

The first group of expences can be divided into two subgroups. The first subgroup includes the costs of infrastructure facilities directly involved in the transportation of passenger (excluding international transportation), commuter, locomotive, car facility and transport sector (excluding international transportation). Under the Nomenclature Costs of the main economic activities of railway transport [9], this subgroup expenses include items such as: 4 001, 4 003, 4 005, 4 007, 4 030, 4 033, 4 034, 4 037, 4 040, 4 041, 4 042, 4 060, 4 061, 4 153 etc. That is the cost of current and capital repair of fixed assets related to passenger transportation and transport facility, building servicing, constructions, equipment and inventory connected with passenger transportation and belonging to transport facility; maintenance in the program M–1 of passenger cars on the route, arrival and departure of trains at the passenger and other stations, overall repair, roundhouse servicing of maintenance vehicles, overall repair of vehicles, machinery, equipment, etc. In the calculation of the second subgroup there are follow costs:

− installation and construction works, civil structures upon items such as: 4 185, 4 187, 4 189, 4 195, 4 197, 4 199,4 201, 4 204, 4 206, 4 208, 4 210-4212, 4 240-4 247 etc.;

− automation, telemechanics and communications facility, numbers 4 301-4 304, 4 400-4 409, 4 412-4 415 etc.;

− electricity supply system, numbers 4 500-4 507 etc.;

− material and technical facilities, numbers 4 050-4 054 etc.;

− railway administration upon items such as 4 600, 4 606, 4607 etc.;

− raiway traffic management and railways subdivisions under their authority 4 420, 4 421, 4 601-4 604, 4 609 etc.

Also this group includes the costs of track facility that are not related to costs for deterioration of a track and contact system. According to the Nomenclature they are as following: 4 101, 4 102, 4 104, 4 105, 4 107, 4 108, 4 111, 4 113-4 116, 4 120, 4 122, 4 125, 4 127, 4 128, 4 130, 4 131, 4 134, 4 137, 4 140, 4 142, 4 144, 4 147, 4 149, 4 150, 4 152-4 154, 4 156, 4 158, 4 160, 4 162,

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4 164-4 166, 4 168-4 171, 4 181-4 183, 4 062, 4 063. This is the cost for current work of maintenance vehicles, other works of track machinery of heavy type, current maintenance of yards, single replacement of rail sleepers and replenishment and replacement of ballast on yards, single replacement of rails, replacement and replenishment of fastenings, rail anchors and other elements of permanent way at yards, maintenance control of tracks, crossings and artificial structures, maintenance of protective afforestation, works against snow and water, track facilities operation, overall repair, complex and curative, medium and enhanced medium repair of yards and roadbed with them, overall repair of artificial structures on the main tracks and yards, replacement of turnouts, rails at the yards, replacement of wooden crossing sleepers, overall repair of crossings, mechanisms machinery of equipment and platforms; medium repair of switchgears at yards; reconstruction of curves; amortization of a permanent way and roadbed at yards; amortization of vehicles and mechanisms, engaged in all kinds of repair, afforestation, artificial structures on the tracks; welding, grinding and other rails processing; current work, overall repair of permanent assets in rail welding trains and their amortization. In general, those cost items that do not depend on the speed of trains running.

All above expenses for all types of passenger trains, without exception, in proportion to the number of cars in the train, running period per year and annual mileage. And it is calculated by the formula 1.

$$C^i_{fac} = \frac{(C^d_{fac} \cdot n^i_{train} \cdot T^i_r / N) \cdot l^i \cdot F_{ac}}{\sum nS} \qquad (1)$$

where C^i_{fac} – costs under the items of passenger, commuter, locomotive, car facilities and traffic one for a specific passenger train (electric train, diesel-train), UAH; C^d_{fac} – direct costs under the items of passenger, commuter, locomotive, car facilities and traffic one for all trains during the reporting period, UAH; n^i_{train} – number of cars in the i-th train, which costs are calculated, cars; l^i – mileage in the i-th the passenger train in the reporting period, km; T^i_r – running period of i-th train, twenty-four hours; N – number of days in the reporting period, twenty-four hours; $\sum nS$ – total mileage of passenger cars during the reporting period, cars, km.; F_{ac} – coefficient taking into account accrual of production overhead costs, administrative costs and sales expences.

Thus one can calculate the costs of a particular passenger train both upon each item individually, and upon all the items of the given group as a whole.

The second group of expenses, which is calculated by the formula 2, include the costs of the passenger sector and the transportation facility for international trains. This includes items such as: 4 031 – receiving and sending international passenger trains at border passenger stations, 4 035 – shunting operations at border stations and other.

The amount of expences for a particular passenger train according to items affect only a number of cars in the specific train and the total number of cars in all international trains for the reporting year.

$$C^i_{border} = \frac{(C^d_{border} \cdot n^i_{border} \cdot T^i_r / N) \cdot F_{ac}}{n_{rp.border}} \qquad (2)$$

де C^i_{border} – direct costs of the passenger sector and the transportation facility on a specific international passenger train upon pointed items, UAH; C^d_{border} – costs of a passenger sector and the transportation facility for all international trains crossing the border during the reporting period; n^i_{border} – number of cars in the i-th international train, where costs are calculated in UAH; $n_{rp.border}$ – total number of passenger cars in international trains during the reporting period, cars; N – number of days during reporting period, twenty four hours; F_{ac} – coefficient taking into account accrual of manufacturing expences, administrative costs and sales expences.

It should be noted that the second group of costs concerns only international trains, and will not be used in the calculation the costs for passenger train of domestic route.

The third group of expences – is the costs of tarck facilities to the track infrastructure (its detereoration, repair, and so on.). To calculate the amount of these costs on a particular passenger train one need to consider not only trains running

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during the reporting period, but also weight train (namely the number of cars in train) and running speed of this train. According to the nomenclature of costs for items that are distributed in proportion to deterioration, that depends on speed of a passenger train and its weight, belong following items 4 110, 4 121, 4 124, 4 133, 4 136, 4 139, 4 143, 4 146, 4 155, 4 159, 4 163 etc. This is the costs of relaying the tracks, fastenings, rail anchors and other elements of permanent way on the main line; capital, comprehensive repair and medium repair of the main tracks; replacement of turnouts, rail on the main tracks, medium and enhanced repair of turnouts; amortization of permanent way, etc.

To calculate correctly the costs of specific passenger train that moves at a certain speed one need to know how it affects the deterioration of track infrastructure. The impact of increasing the speed ratio is calculated approximately on the basis of scientific work [1]. In their work the authors have developed a program ZnoInfra, that when calculating the cost of maintaining the infrastructure on trains categories, taking into account all the peculiarities of their movement: weight, length of run, average speed and the amount of travel during the billing period. Following factors, taking into account changing of track repair costs from trains with certain speed were adopted:

- for passenger trains with an average speed of 80 km/h, the ratio can be set 1;
- for speeds of 80-110 km/h the ratio is 1.67;
- for speeds over 110 km/h the ratio equal to 2.79.

Hence, the formula for calculating the costs of a particular passenger train depend on the velocity, weight and distance will look like the following (3):

$$C^{i}_{track.fac} = \frac{(C^{d}_{track.fac} \cdot n^{i}_{train} \cdot F^{j}_{s} \cdot T^{i}_{r} / N) \cdot l^{i} \cdot F_{ac}}{n^{pas}_{rp} \cdot F^{j}_{pas} \cdot l_{pas} + (n^{sp}_{rp} \cdot F^{j}_{sp}) \cdot l_{sp} + (n^{\exp}_{rp} \cdot F^{j}_{\exp}) \cdot l_{\exp} + \sum_{i=1}^{r} (n^{i}_{s} \cdot F^{j}_{s} \cdot T^{i}_{r} / N \cdot l^{i}_{s})} \quad (3)$$

where $C^{i}_{track.fac}$ – costs of track facility for a specific passenger train at certain speed, UAH; $C^{d}_{track.fac}$ – direct general costs under items, which are assigned to all passenger trains during the reporting period; n^{i}_{train} – number of cars in the i-th train, which costs are calculated, cars; F^{j}_{s} – factor that takes into account the costs chages for the track repairs from J-th trains of a certain speed. For passenger trains with an average speed (without stopping period) up to 80 km/h. F^{j}_{s} = 1, for speed 80-110 km/h F^{j}_{s} = 1,67, for speed more than 110 km/h F^{j}_{s} =2,79; n^{pas}_{rp} – total number of cars in trains, runningduring the whole year with speed up to 80 km/h, cars; n^{sp}_{rp} – number of cars in the express passenger cars, running during the reporting period with speed 80-110 km/h, cars; $n^{\exp}_{rp}$ – number of cars in the express passenger cars, running during the reporting period with speed more than 110 km/h, cars; n^{i}_{s} – number of cars in i-th passenger trains at different speeds, running during the summer season, holidays, during the increase of passenger traffic, etc., cars; l^{i} – mileage of i-th passenger train to be tested for the reporting period km; l_{pas} – mileage of all trains that ply at mid-speed up to 80 km/h, during the reporting period, km; N – quantity of days during the reporting period, twenty four hours; l_{sp} – milage of all trains that ply with mid-speed of 80-110 km/h. During reporting period, km; $l_{\exp}$ – mileage of all trains,mid-speed more than 110 km/h during the reporting period, km; l^{i}_{s} – mileage of i-x passenger trains, running with various speeds during summer season, holidays, increase of traffic flow etc., km (separately for each train) during thereporting period; F^{j}_{pas} – factor takes into account increase in expences for repairs of tracks from trains running with mid- speed of 80 km/h, equals – 1; F^{j}_{sp} – factor takes into account increase in expences for repairs of tracks from trains running with mid-speed of 80-110 km/h, equals – 2; $F^{j}_{\exp}$ – factor takes into account increase in expences for repairs of tracks from trains running with mid-speed more than 110 km/h., equals – 4; T^{i}_{r} – running period of

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i-th train, twenty four hours; F_{ac} – factor takes into account accruals of production overhead costs, administrative costs and sales expences.

After studies the reporting of UZ during 2010 year was determined annual mileage ratio, executed by trains with mid-speed up to 80 km/h, 80-110 km/h and more than 110 km/h. They are – 0.432; 0.487; 0.081 respectively (an indicative coefficients of determination). Then the formula (3) for manual calculation after simplification takes the form (4). This error in the calculations would be insignificant.

$$C^{i}_{track.fac} = \frac{(C^{d}_{track.fac} \cdot n^{i}_{train} \cdot F^{j}_{s} \cdot T^{i}_{r} / 365) \cdot l^{i} \cdot F_{ac}}{\sum nS(0,432 \cdot F^{j}_{pas} + 0,487 \cdot F^{j}_{sp} + 0,081 \cdot F^{j}_{\exp})}, \quad (4)$$

where the values of all indicators are above.

On the base of the foregoing approach a rather complex and voluminous procedure of calculating the actual costs on infrastructure of each train were obtained, and as a consequence, profitability, reflects adequately the real effectiveness of the particular passenger trains running.

Since to count manually the costs of every particular train is very complex and cumbersome procedure, it was necessary to automate this process. The software to determine the effectiveness of a particular passenger train running was developed by scientists of DNURT (with authors) in research and development work [11].

The list of all the necessary data for the calculation was formed in order to automate the process of calculating the costs of the infrastructure component. The total direct and overhead costs for each sector are taken from the output cost pricing of passenger traffic [4]. Except the amount of the total costs on items, calculating the cost of a particular train requires some quantitative indicators:

− average number of passenger cars in i-th passenger train for the period of calculation, cars;

− term and running of a passenger train for the calculation period, twenty four hours;

− total mileage of a passenger train during the period of calculation, km;

− total mileage of all passenger trains during the period of calculation, cars,-km;

− average number of passenger cars in i-th passenger train of international traffic during the period of calculation, cars;

− total number of cars of international trains during the period of calculation, cars;

− the total number of cars in passenger trains that run during the period of calculation, at a speed up to 80 km/h, cars.

− the total number of cars in passenger trains that run during the period of calculation, at a speed from 80 to 110 km/h, cars.

− the total number of cars in passenger trains that run during the period of calculation, at a speed more than 110 km/h, cars.

− total mileage of passenger trains that run during the period of calculation at a speed up to 80 km/h;

− total mileage of passenger trains that run during the period of calculation at a speed from 80 to 110 km/h;

− total mileage of passenger trains that run during the period of calculation at a speed more than 110 km/h;

− percentage of passenger trains that run with mid-speed up to 80 km/h in total quantity of passenger trains;

− percentage of passenger trains that run with mid-speed from 80 to 110 km/h in total quantity of passenger trains;

− persentage of passenger trains, which run at mid-speed above 110 km/h in the total number of passenger trains

− number of days in the reporting period, twenty four hours

In all formulas of methodical approach was used coefficient of costs accrual, taking into account accrual of production overhead costs, administrative ones and sales expences. This ratio is calculated by the formula:

$$\mathrm{F}_{\mathrm{ac}} = 1 + \frac{C_{adm} + C_{gen.\exp.} + C_{sale}}{C_{d} + C_{dist}}, \quad (5)$$

where C_{adm} – administrative expenses of household, $C_{gen.\exp.}$ – production overhead costs of household, C_{sale} – costs for household's sale, C_{d} – direct cocts of household, C_{dist} – allocated costs of household.

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− The user of software has the possibility to see the results of costs calculations of a passenger train by components and objects of expenditure. The results are presented in absolute amounts (UAH.) And relative ones (%)

− persentage of each component in the total amount of train costs;

− percentage of each item in calculation in the component of costs;

− percentage of each article in calculation in total sum of the train costs;

To perform automatic calculations when determining the infrastructure component of the costs for the particular passenger train, railway services (divisions) have to submit in standard procedure information about passenger transportation, listed in the table 1.

Table 1

Information about passenger transportation to determine the infrastructure component costs of a particular passenger train

No.	The structural division of Ukrzaliznytsia	Required data
1	Ukrzaliznytsia, the main passenger management	1 Total quantity of passenger cars that equipped in Ukrzaliznytsia, cars;
		2. Total quantity of cars in all passenger international trains that ply during the reporting period, cars;
		3. Total quantity of cars in all passenger trains that ply during the reporting period with mid-speed up to 80 km/h;
		4. Total quantity of cars in all express passenger trains that ply during the reporting period with mid-speed from 80 to 110 km/h;
		5. Total quantity of cars in all express passenger trains that ply during the reporting period with mid-speed from 110 km/h;
		6. Total year mileage of all passenger trains that ply during the reporting period with mid-speed up to 80 km/h, km;
		7. Total year mileage of all passenger trains that ply during the reporting period with mid-speed from 80 km/h to 110 km/h, km;
		8. Total year mileage of all passenger trains that ply during the reporting period with mid-speed from 110 km/h, km;
2	Passenger car car-repair shed to which a specific train is attached	1. Average number of cars (***pass. and luggage)*** in a specific passenger train during reporting period, cars
3	Main Transportation Department	1. Running period of a passenger specific train, twenty four hours
		2. Mileage of a passenger train during the reporting period, km
		3. Average speed of a specific passenger train during the reporting period, km/h

Originality and practical value

The method of costs disribution of all households of the Ukrzaliznytsia for passenger transportation in long-distance traffic and international one for a particular passenger train was improved. It is based on the principles of formation of selected general indicators of costs for each sector, corresponding to the main influential factors of train operation.

Methodical approach to determining the costs of the infrastructure component, which includes the movement speed impact and weight of a passenger train on deterioration of permanent way and contact system was improved.

This allows allocating correctly the costs for passenger train traffic.

Methods of cost allocation taking into account all the individual characteristics of a passenger train running allows calculating costs for the particular passenger train, depending on its structure,

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comfort of the running period and movement speed.

The introduction of this methods for determining the infrastructure component of costs for particular passenger train running will let calculate the exact, economically justified expences of this component to a specific train.

This all makes it possible to determine correctly the profitability of a particular passenger train and on its basis to make management decisions to introduce amendments in to the existing schedule. Later, through the proposed approach and using a PC, one can promptly identify the costs for the infrastructure use by a specific train.

Conclusions

On the basis of conducted studies the following conclusions were made:

1. The methodical approach of costs allocation for passenger transportation by the particular passenger train under general indicators, taking into account the peculiarities of each train running was developed.
2. In determining the costs of a particular passenger train a new classification of passenger trains was applied.
3. The dependence of permanent way deterioration and contact system on the movement speed and weight of a passenger train was found out.
4. The method of costs allocation on infrastructure between passenger trains, taking into account the running speed and weight of the concrete passenger trains was developed.
5. Organizational support relating to automation system of calculating the expences allocation of infrastructure component for the movement of a particular passenger train was formed.

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МЕТОДИЧНИЙ ПІДХІД ЩОДО ВИЗНАЧЕННЯ ІНФРАСТРУКТУРНОЇ СКЛАДОВОЇ ВИТРАТ НА КУРСУВАННЯ ОКРЕМОГО ПАСАЖИРСЬКОГО ПОЇЗДА

Мета. В науковій роботі необхідно розробити методичний підхід щодо визначення інфраструктурної складової витрат руху окремого пасажирського поїзда, який враховує індивідуальні особливості руху конкретного поїзда **Методика.** Для вирішення задач такого класу в роботі запропоновано нову методику, яка розроблена на основі постатейного розподілу витрат конкретного пасажирського поїзда з врахуванням факторів впливу на їх величину. Ця методика дозволяє коректно розподіляти витрати на користування інфраструктурою окремим поїздом і, як наслідок, визначати точну рентабельність кожного поїзда. **Результати**. З калькуляції собівартості пасажирських та вантажних перевезень по Україні виділено всі статті витрат, які стосуються пасажирських перевезень у дальньому сполученні. Всі ці витрати розділено на чотири складові. В інфраструктурній складовій виділено три групи витрат, які розраховуються за певним принципом із врахуванням індивідуальних особливостей курсування конкретного поїзда. **Наукова новизна**. Удосконалено метод розподілу витрат усіх господарств Укрзалізниці на перевезення пасажирів у дальньому та міжнародному сполученні для окремого пасажирського поїзда. Цей метод базується на принципах формування окремих узагальнюючих показників витрат по кожному господарству, які відповідають

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основним впливовим факторам експлуатації поїзда. Удосконалено методичний підхід щодо визначення витрат на інфраструктурну складову, яка враховує вплив швидкості руху та маси пасажирського поїзда на знос верхньої будови колії та контактної мережі. Все це дозволяє обгрунтовано розподілити витрати на рух конкретного пасажирського поїзда та визначити його рентабельність. **Практична значимість.** Впровадження вказаної методики дозволить розрахувати реальні, економічно обгрунтованни витрати на конкретний поїзд. Це сприяє правильному визначенню рентабельності окремого пасажирського поїзда і, на основі цього, прийняттю управлінських рішень щодо внесення змін в існуючий розклад руху. Також, на основі даної методики можна буде за допомогою ПЕОМ визначати вартість користування інфраструктурою конкретним поїздом та його рентабельність.

Ключеві слова: інфраструктура; витрати; швидкість руху; маса поїзда; рентабельність пасажирського поїзду

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МЕТОДИЧЕСКИЙ ПОДХОД К ОПРЕДЕЛЕНИЮ ИНФРАСТРУКТУРНОЙ СОСТАВЛЯЮЩЕЙ РАСХОДОВ НА КУРСИРОВАНИЕ ОТДЕЛЬНОГО ПАССАЖИРСКОГО ПОЕЗДА

Цель. В научной работе необходимо разработать методический подход к определению инфраструктурной составляющей расходов на движение отдельного пассажирского поезда, который учитывал бы индивидуальные особенности движения конкретного поезда **Методика**. Для решения задач такого класса в работе предложена новая методика, разработанная на основе постатейного распределения затрат на курсирование конкретного пассажирского поезда с учетом факторов влияния на их величину. Эта методика позволяет корректно распределять затраты за пользование инфраструктурой отдельным поездом и, как следствие, определять точную рентабельность каждого поезда. **Результаты**. Из калькуляции себестоимости пассажирских и грузовых перевозок по Украине выделены все статьи расходов, касающиеся пассажирских перевозок в дальнем сообщении. Все эти расходы разделены на четыре составляющие. В инфраструктурной составляющей выделены три группы расходов, которые рассчитываются по определенному принципу с учетом индивидуальных особенностей курсирования конкретного поезда. **Научная новизна**. Усовершенствован метод распределения расходов всех хозяйств Укрзализныци на перевозки пассажиров в дальнем и международном сообщении для отдельного пассажирского поезда. Этот метод базируется на принципах формирования отдельных обобщающих показателей затрат по каждому хозяйству, которые соответствуют основным влиятельным факторам эксплуатации поезда. Усовершенствован методический подход к определению затрат на инфраструктурную составляющую, учитывающую влияние скорости движения и массы пассажирского поезда на износ верхнего строения пути и контактной сети. Все это позволяет обоснованно распределить затраты на движение конкретного пассажирского поезда и определить его рентабельность. **Практическая значимость**. Внедрение указанной методики позволит рассчитать реальные, экономически обоснованные расходы на конкретный поезд. Это будет содействовать правильному определению рентабельности отдельного пассажирского поезда и, на основе этого, принятию управленческих решений по внесению изменений в действующее расписание движения. Также, на основе данной методики можно будет с помощью ПЭВМ определять стоимость пользования инфраструктурой конкретным поездом и его рентабельность.

Ключевые слова: инфраструктура; затраты; скорость движения; масса поезда; рентабельность пассажирского поезда

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