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**THE MODERN APPROACHES TO CALCULATION
OF COSTS IN
THE ROAD PLANNING OF TRANSPORT
ENTERPRISE**

**NOWOCZESNE METODY KALKULACJI KOSZTÓW ORAZ KOSZT
W PLANOWANIU ROZWOJU PRZEDSIĘBIORSTWA TRANSPORTU
DROGOWEGO**

**СОВРЕМЕННЫЕ ПОДХОДЫ К РАСЧЁТУ ЗАТРАТ И
СЕБЕСТОИМОСТИ ПРИ ПЛАНИРОВАНИИ НА
АВТОТРАНСПОРТНОМ ПРЕДПРИЯТИИ**

Abstracts

The article deals with the theoretical basis of motor transport enterprise (MTE) planning. The methods of produces process financial planning of MTE have been considered. Considerable attention is paid to lighting methods of plan economic activities, cost calculation and cost planning activities MTE, developing the company's financial plan. The approaches to substantiation measures aimed at ensuring the stability of financial activity have been ordered.

Keywords: *planning, cost, motor transport company.*

Streszczenie

W artykule opisano teoretyczne podstawy planowania rozwoju przedsiębiorstwa transportu samochodowego (ATP), oraz omówione zostały metody planowania finansowego procesu produkcji przedsiębiorstw ATP. Poza tym szczególną uwagę przywiązano do wyjaśnienia metod badawczych planowania finansowego działalności gospodarczej przedsiębiorstw transportu drogowego, w tym kalkulacji kosztów i kosztów oraz

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opracowania planu finansowego spółki. Poza tym w artykule przedstawiono metody i rodzaje działań, które powinny zapewnić stabilność działalności finansowej, uzyskiwanie stabilnych wyników finansowych w przedsiębiorstwie transportu drogowego.

Słowa kluczowe: *planowanie, koszt, przedsiębiorstwo transportu drogowego.*

Аннотация

В статье раскрыты теоретические основы планирования деятельности автотранспортного предприятия (АТП), рассмотрены методы планирования финансового обеспечения производственного процесса АТП. Значительное внимание уделено освещению методов обоснования планов экономической деятельности автотранспортных предприятий, расчёта затрат и себестоимости при планировании деятельности АТП, разработке финансового плана предприятия, обоснованию мероприятий, направленных на обеспечение стабильной финансовой деятельности АТП.

Ключевые слова: *планирование, затраты, себестоимость, автотранспортное предприятие.*

Introduction. The economic reforms that take place in Ukraine allow for a transition from the command economy to the principles of independent activity and self-management of enterprises, based on the formation of new economic relations and market development.

The main economic conversion is the implementation in practice of the principles of self-planning, self-sufficiency and self-management. At the same time, the principles of self-financing for the final results of the economic activities of enterprises can be implemented to a certain extent provided that the labour collectives are given independence.

The fulfilment of this condition can be achieved through the harmonious integration of all areas of the enterprise into a single balanced mechanism. Such a mechanism can be created on the basis of a central management function - planning, since planning is an important part of commercial, economic and social activities. With the help of planning, enterprise managers establish the lines of activity, the fulfilment of which ensures the unity of

purpose and goals for all its production units and employees. An enterprise that does not know how to plan and does not consider that it is necessary to plan its activities becomes itself the object of planning; a means for achieving better results by other enterprises and other participants in market relations. Therefore, enterprise management is a process of planning, organization, motivation and control, which are necessary to formulate the purpose of the enterprise's activities and ways to achieve them.

The development of theoretical, methodological and practical foundations for the formation of the enterprise development strategy, including consideration of the planning process as an important element in the formation of the strategic plan, is carried out in Ukraine by V.G. Gerasimchuk, V.L. Dikan, A.S. Ivanilov, N.V. Kudenko, A.P. Nalivayko, G.V. Osovskaya, V. Pastukhova, Y.V. Sobolev. Some foreign authors, such as G. Ackoff, I. Ansoff, A.S. Vikhansky, A.P. Gradov, N.I. Kruglov, G. Mintzberg, A. Thompson,

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A. Chandler and others, focused their researches on this problem.

Body. It is known that in general terms the cost of production is a combination of costs in monetary form for the production and sale of products, for trading, transfer, agency operation, financial services and other types of non-productive activities.

Production costs, per unit of output, characterize the product cost of an industrial enterprise. The indicator of a product cost is one of the most important qualitative indicators of the enterprise's production and economic activities. The level of the cost price of production is determined, mainly, by internal factors, material-and-technical and organizational-and-economic support of production [1].

Transport costs of production include the cost of transportation of goods and passengers, cargo-handling operations and freight forwarding costs. Transportation costs are an integral part of the cost of production of industrial, agricultural enterprises, building organizations, that is, they affect the economic efficiency of all sectors of the economy.

Transport costs reduction is an important factor in reducing of production costs and increasing the effectiveness of the production. The cost of transportation is affected by a number of factors: lot size, type of rolling stock; technique of works; features of rolling stock loading in the opposite direction; movement control organization. Therefore, the cost of transportation may not be the same for motor transport enterprises that perform the same transportation services [1].

The major cost associated with the implementation of road transportation mainly depends on the mileage of cars, not on the work performed, which is measured in tons or passenger-kilometres. It follows that the individual performance indicators have different effects on the performance

of cars and the cost of transportation. Thus, the capacity of cars varies in proportion to the change in the output ratio and the duration to stay on duty (all other factors remaining constant). The impact of these indicators on cost is much less, since productivity in this case increases as a result of increasing the mileage of the car and, accordingly, the total amount of variable costs.

The other factors influencing the decrease in the cost of transportation are the coefficients of the use of the mileage and the load-carrying capacity of the car. The increase of these factors leads to the increase in the car's performance even with a reduced mileage.

In trucking activities it can be distinguished the cost price depending on the type of carriage and activity. Furthermore, it is possible to identify the individual and industry prime costs.

The individual cost is formed at the trucking enterprise and reflects the specific costs for bearing transportation burden or trucking.

Sector cost is the average cost of production in the industry and is determined by dividing the costs of all motor transport enterprises (MTE) of the industry by the total volume of traffic [2].

When determining the cost of transportation, the costs associated with the transportation of goods and passengers are taken into account, but not all costs of the transport process are included in the cost of road transport. They include:

- costs of cargo-handling operations;
- costs of repair and maintenance of highways;
- costs of organizing and ensuring traffic safety.

All costs are included in the cost of road transport can be divided into the following separate articles:

- material costs;

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- labour costs;
- safety net contributions;
- depreciation;
- other costs.

It is included the cost of various types of fuel, energy resources and materials used in the production process, spare parts for repairs, technical maintenance of rolling stock, tires, equipment, tools, instruments and other means of labour in the material expenses planning, as well as costs of production services, carried out by outside organizations [3].

1. The fuel costs include the costs of fuels (gasoline, diesel fuel, fuel oil, petroleum, gas) for the operational needs of the vehicle assets, and also for heating of buildings and rooms and other process objectives.

2. The cost of energy includes the cost of purchased electricity, heat, cold for technological, energy, lighting and other economic needs for a vehicle fleet.

3. The cost of materials includes the cost of all materials for the maintenance and repair of rolling stock (lubricants, paintwork materials, insulating materials, wipe), spare parts for car repairs, car tires and other equipment.

4. Other material costs include costs that do not relate to core activities, including:

- contributions to insurance funds and other mandatory contributions established by the current legislation;
- payments for production services performed by third-party enterprises or auxiliary units that are not related to the main activity of the vehicle fleet.

5. Production services include:

- cargo hauling services provided by third-party organizations through the territory of the motor transport enterprise (MTE) (handling of material, parts, blanks, maintenance and repair parts from

the central warehouse to structural units or shops). The costs associated with transportation of material resources as well as the personnel of the enterprise are included in the corresponding items of production costs (labor costs, material costs, depreciation of fixed funds, other costs);

- services of third-party enterprises for maintenance and repair of motor transport enterprise rolling stock;

- storage services for vehicles, stocks of material assets;

- costs of purchasing office supplies, technical documentation forms, uniforms and etc.;

- payment for natural resources, attributed to the costs of transportation (payment for water, land, heat, etc.).

The cost of material resources is formed based on the prices of their purchase, retail margin, additional charge for suppliers of these materials, the cost of customs services, transportation fees, warehousing of resources by third parties.

The main task of labour remuneration planning is to meet the final production factors, to establish the dependence of labour payment on the volume of production and profit.

The mechanism of organization and planning of labour remuneration should be directed to the solution of the following main tasks:

- to guarantee an employee compensation based on his/her performance;
- to create incentives to improve the quality of work;

- to ensure productivity growth compared with the rate of average wage growth [4];

- to provide a proportion of pay for activities, skill level and other indicators.

1. The article "Labour Costs" reflects the costs of the production line, namely:

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- staff payroll costs, including bonuses for employees, managers, specialists for strong performance, compensation due to the increase in prices, the indexation of income within the norms stipulated by the current legislation;

- compensations and payments to women on maternity/parental leave until the child reaches the age established by the legislation;

- labour costs for employees who are not included in a company's staff, but are engaged in basic production [4].

2. In addition, the labour costs include the following social costs:

- the payment of wages and hours of work, based on the piece wage-rates, base wage rates, position salaries, in accordance with the forms and systems of labour payment adopted at the enterprise;

- supplements to wages and salaries and fringe benefits for work on weekends, holidays, night work, work in heavy, harmful conditions;

- additional payments for working in more than one position, extended service area, including foremanship, freight forwarding, etc.;

- long service bonus;

- bonus system for overfulfillment of production quotas;

- additional payments in case of disability before actual earnings;

- payment of annual and additional holidays;

- leave compensation

- cash bonuses for the core results of business activity, including bonuses to drivers for cutting time of down time during cargo handling operations, saving of fuel, over mileage of automobile tyres.

3. Expenses related to training and re-training of personnel:

- payments of wages to employees of the enterprise at their main place of work for the period of their training outside of

the workplace in a career and personnel development system;

- wages of skilled workers not exempted from their normal work, for the education of students and training of workers;

- the costs of key enterprises to pay for directing the production practices of students in general education schools, vocational schools and students of higher educational institutions;

- other costs associated with the payment of vacation allowance with full pay to persons who study in a secondary, higher postgraduate education, schools, etc. [4].

The costs allocated for the implementation of social measures include:

1. Social insurance contributions (mandatory), including contributions for compulsory health insurance - 1.4% of the wage bill.

2. Deductions to the State Pension Fund for compulsory state pension insurance, as well as deductions for supplemental pension insurance - 33.2% of the wage bill.

3. Deductions to the employment promotion fund - 1.6% of the wage bill.

Planning of the social maintenance costs for compulsory social insurance, compulsory pension insurance and employment promotion fund is carried out according to the legislated norms depending on the amount of labour costs.

The term "depreciation of fixed funds" should be understood as a gradual allocation of costs for their purchasing, manufacture or improvement as they wear out for manufactured products and use these costs to reproduce worn-out fixed funds. The term "fixed funds" refers to the means of labour and material assets that are used by enterprise in its production activities for a period that exceeds 365 calendar days from the date of putting them into operation. The need for depreciation arises from

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the fact that fixed funds function in the production process for many years and are subject to physical and moral depreciation. In this case, the process of transferring the value of fixed funds to the new product and a corresponding reduction in their value occurs. The amortization fund is formed at the expense of depreciation deductions. It is used to replace worn-out fixed funds [5].

The subjects to amortization costs:

- purchasing of fixed funds for their own use in production;
- independent production of fixed funds for own production needs, including costs of wages for the employees who were engaged in the production of such fixed funds;
- carrying out all types of repair, reconstruction, modernization and other types of improvement of fixed funds.

They are not subject to amortization and are fully included in the gross expenditure of the planned period:

- purchase of fixed funds for the purpose of their further sale to other enterprises or their use as components of other fixed funds intended for further sale;
- the maintenance of the fixed funds that have been closed temporarily.

The fixed funds are distributed in the following groups:

- group 1 includes buildings, structures, their structural components and transfer devices;

- group 2 includes over-the-road truck transport and its units (spare parts); furniture; household electrical, optical, electromechanical devices and tools, other office equipment and equipment needed for them;

- group 3 includes electronic computers, other machines for automatic information processing, their software, other information systems, telephones, micro-

phones and radio terminals, the value of which exceeds the value of inferior goods (items);

- group 4 includes any other fixed funds that are not included in groups 1, 2, 3.

In road transport, the depreciation rates are set on the full recapture of basic production assets. When developing depreciation rates it should be taken into account the specified service life, cost, operating conditions of hauling stock.

There are three methods for calculating depreciation rates: regressive, cumulative, proportional.

In the cumulative method of calculating for each year over the useful life of car the depreciation rate is 25, 21.3, 17.8, 14.3, 10.7, 7.2 and 3.6% respectively, i.e. 100% of the original value of the vehicle will be fully compensated in 7 years.

With this method, the depreciation rate is determined from the formula:

$$H_a = \frac{2(T_n - t + 1)}{T_n(T_n + 1)}, \quad (1)$$

where T_n – standard service life, measured in years;

t – attained the age of the car, measured in years.

In the regressive method of determining the rate of depreciation deductions are not taken from the original, but from the residual value of the car. This method allows you to write down up to 70% of the cost of the car in the first years of operation for a more intensive renovation of the car park. Thus, the depreciation rate is determined from the formula:

$$H_a = 1 - \sqrt[T_n]{a}, \quad (2)$$

where T_n – standard service life of a car;
 a – ratio of liquid price of a vehicle to the initial value (balance).

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The proportional method of calculating the rate of depreciation allows you to make straight-line depreciation, while the depreciation rate is calculated as a percentage of the car's book value per 1000 km of mileage, taking into account the mileage requirement to capital repair [5]. $H_a = \frac{(C_{\bar{o}} - C_{\bar{n}}) \cdot 1000}{C_{\bar{o}} \cdot L_n} \cdot 100\%$, (3)

where L_n – normative depreciation of rolling stock, measured in kilometers;
 $C_{\bar{o}}$ – car book value in UAH;
 $C_{\bar{n}}$ – liquid car price in UAH.

The amount of depreciation for the full restoration of rolling stock is determined by the dependence

$$A_a = \frac{H_{a_i}}{100} \cdot C_{\bar{o}_i} \cdot \frac{L_{o\bar{o}u_i}}{1000}, \text{ грн}, \quad (4)$$

where H_{a_i} – the rate of depreciation for the i car brand;
 $C_{\bar{o}_i}$ – balans value of a car in th. of UAH;
 $L_{o\bar{o}u_i}$ – the total mileage of the car, km.

The amount of depreciation for the planning period is determined for each type of rolling stock by multiplying their average annual value of the relevant depreciation rates until the full restoration (renovation). The calculation is carried out in a tabular form.

Table 1. Calculation of depreciation charges for rolling stock of motor transport enterprise (MTE) for 20 year

Indicators	Method and results of calculations			
	Car model			Industrywide in MTE
	1	2	3	
Balance cost of rolling stock, UAH	$C_{\bar{o}_i}$			
Total annual mileage of cars, km	$L_{o\bar{o}u_i}$			
Norms of depreciation for the full restoration of rolling stock, H_a , %	H_{a_i}			
Amount of depreciation for the full restoration of rolling stock, A_a , UAH	$A_{a_i} = \frac{H_{a_i}}{100} \cdot C_{\bar{o}_i} \cdot \frac{L_{o\bar{o}u_i}}{1000}$			$A_a^{ATPI} = \sum_{i=1}^n A_{a_i}$
The total amount of depreciation, $A_{o\bar{o}u}$, UAH	$A_{o\bar{o}u_i} = A_{a_i}$			$A_{o\bar{o}u}^{ATPI} = \sum_{i=1}^n A_{o\bar{o}u_i}$

The item "Miscellaneous expenditure" includes three elements:

- repair fund;
- tolls and fees;
- other costs.

1. MTE creates a repair fund to ensure the implementation of particularly com-

plex types of repair of fixed production assets.

2. Road charges on payments carried out in accordance with the current legislation of Ukraine.

3. The item "Miscellaneous expenditure" includes all costs that cannot be attributed to one of the above cost items, namely:

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- taxes, fees, payments;
- deductions established by law;
- payments for harmful substances discharged into the environment;
- remuneration for inventions and rationalization proposals;
- costs associated with the transportation of workers to and from work places in areas not served by public passenger transport;
- costs associated with life and health insurance of certain categories of workers of the motor transport enterprise;
- costs associated with the prevention of fires, natural disasters, unforeseen situations, as well as deductions to the fund for the implementation of measures to eliminate the consequences of the Chernobyl disaster.

The item "Miscellaneous expenditure" also include:

- transport tax;
- environment pollution payment;
- land tax;
- license fees.

1. The transport tax is expressed in percentages of the minimum wage and depends on the modification of the hauling stock and the power of the automobile engines.

2. The environment pollution payment is

$$H_u = Q_m \cdot \sigma_m \cdot H_3 \cdot K_1 \cdot K_2 \cdot 10^{-6}, \quad \text{UAH}, \quad (5)$$

where Q_m – a general demand in fuel for MTE, l;

σ_m – fuel density, kg/m³;

H_3 – deduction rate, UAH;

K_1 – environmental situation coefficient;

K_2 – inflation factor.

2. The land tax is determined from the formula:

$$H_{3M} = H \cdot F_{ATPI}, \quad \text{UAH}, \quad (6)$$

where H – the rate of payment for the land, UAH / m²;

– the land area of MTE is determined from the formula:

$$F_{ATPI} = H_i \cdot N_{cn}, \quad \text{m}^2, \quad (7)$$

where H_i – the norm of the area for an average vehicle, m²/ car.

Costs calculation of cargo carriage or hauling operations is the determination of the amount of planned or actual costs per volume of cargo or the performance of hauling operations. Costing is carried out for all types of cargo transportation, taking into account the features of their implementation and the terms and procedures of payment.

It is used the following initial data for planning the cost of transportation:

- cargo transportation plan;
- production program for rolling stock operation;
- manpower program
- material management plan;
- financial plan for the basic period.

A calculation unit is established depending on the type of transportation and form of payment for labour accepted at the trucking company. So, with a piece-rate form of payment for labour for a revenue unit of service is taken 10 ton-kilometre, tkm, 1 t, 1 haul cycle, at an hourly rate - 10 auto-hours, and when transporting passengers - 10 passenger-kilometres, pkm.

The main objectives of the transportation cost calculation are as follows:

- full and timely recording of actual costs for the carriage of goods;
- control over the rational use of labour, material, financial resources;
- use of a standard method of accounting and estimating of operating costs for calculating the cost of carriage.

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The cost calculation of road transportation of cargo consists of the following cost items:

- driver wage;
- charges on payroll for drivers in social funds;
- road transportation fuel;
- oil;
- maintenance and technical repairs of the hauling stock;
- renovation of automobile tyres;
- equipment depreciation;
- general administrative expenses.

1. In the article "Driver wage" it is taken into account all types of wages of drivers for work in service, based on piece and tariff rates in accordance with the forms of payment accepted at the enterprise and the organization of labour, all types of extra-fees and allowances for work in weekends and on public holidays, for the achievement of output standards, bonuses for saving fuel, cutting time of down time during cargo handling operations, etc.

$$\Phi_{3\Pi_6}^{obuy} = \Phi_{3\Pi_6}^{obuy} + \Delta B_{3\Pi_6}^{\delta} + \Delta B_{3\Pi_6}^{\mu} + \Pi_p, \quad \text{UAH}, \quad (8)$$

where $\Phi_{3\Pi_6}^{obuy}$ – the total planned payroll of all drivers of motor transport enterprise, thousands UAH;

$\Delta B_{3\Pi_6}^{\delta}$ – additional payment to drivers for foremanship, UAH;

$\Delta B_{3\Pi_6}^{\mu}$ – additional payment to drivers for work at night, UAH;

Π_p – percentage of premiums to wages, UAH.

2. Charges on payroll of drivers in social protection funds are determined from the formula:

$$C_{3\Pi_6} = \Pi_p \cdot \Phi_{3\Pi_6}^{nl}, \quad \text{UAH}, \quad (9)$$

where $C_{3\Pi_6}$ – charges on payroll of drivers, which can be determined as a percentage of the total payroll of drivers passed by the current legislation of Ukraine;

Π_p – percentage of allocations to budget funds;

$\Phi_{3\Pi_6}^{nl}$ – planned fund of piece-rate wage of drivers, ths. UAH.

3. In the article "Road transportation fuel" it is taken into account all the costs of purchasing fuel for the company's cars to implement the production program for the operation of MTE's rolling stock

This article includes the cost of fuel transportation from the tank farm facility to the capacity of the MTE.

The cost of 1 km of the car mileage is defined as follows:

drop-side trucks:

$$B_n^a = \frac{(H_{\kappa\mu} + H_{m\kappa\mu} \cdot q \cdot \beta) \cdot 1.05 \cdot U_{\mu}}{100}, \quad \text{UAH}; \quad (10)$$

road tractors:

$$B_n^m = \frac{(H_{\kappa\mu} + H_{m\kappa\mu} \cdot q_n \cdot \beta) \cdot 1.05 \cdot U_{\mu}}{100}, \quad \text{UAH}; \quad (11)$$

dump trucks:

$$B_n^c = \frac{(H_{\kappa\mu} + H_c \cdot n_c) \cdot 1.05 \cdot U_{\mu}}{100}, \quad \text{UAH}, \quad (12)$$

where $H_{\kappa\mu}$ – standard rate of fuel usage, l/100 km;

$H_{m\kappa\mu}$ – fuel allowance to perform the transportation and additional weight of the trailer, l/100 tkm;

H_c – fuel allowance of the dump truck or tipper truck, l/100 km;

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$U_{л}$ – sale price of one litre of fuel, UAH.

4. The costs of the enterprise for the purchase of lubricants are determined from the formula

$$B_{M_i} = U_{M_i} \cdot Q_{M_i}, \text{ UAH}, \quad (13)$$

где U_{M_i} – cost of one litre of lubricants, UAH;

Q_{M_i} – annual requirement of the auto enterprise in this type of lubricants, l.

5. In the article "Maintenance and technical repairs of the hauling stock" it was taken into account all types of costs for maintenance and repair of MTE's cars, including:

- wages of repair and support workers engaged in maintenance and PR with all types of premiums and allowances;
- social costs;
- the cost of spare parts and materials for maintenance and repair of motor vehicles;
- depreciation cost;
- rent for equipment, premises and etc.

The costs of a road transport company for maintenance and repair of vehicles are determined by the function, UAH (14)

where H_{TO} і H_{IP} – norms for the consumption of materials, spare parts, equipment for 1000 km of the total mileage of the car, l; $L_{o\delta u_i}$ – the total mileage of the car, km.

6. Renovation of automobile tyres.

The article takes into account the following costs:

- salaries and bonuses for employees engaged in tires repair using company's own resources;
- demounting and mounting of tyres;
- social costs

The repair costs and renovation of tyres are

$$B_{u_i} = \frac{H_{u_i}}{100} \cdot U_{u_i} \cdot \frac{L_{o\delta u_i}}{1000} \cdot n_{u_i}, \quad \text{UAH}, \quad (15)$$

where H_{u_i} – a standard cost of tire re-moulding and repair as a percentage of the value set for 1000 km of the total mileage of the car;

– a price for a set of tires, UAH;

$L_{i\delta u_i}$ – the total mileage of the car, km;

n_{u_i} – the number of tires in one set,

pc.

7. Depreciation deductions for rolling stock.

The depreciation deductions on the rolling stock of cars are determined by depreciation rates for two indicators: total mileage and life the vehicle. The amount of depreciation for full renovation is determined from the formula

$$A_a = \frac{H_{e_i}}{100} \cdot C_{\delta_i} \cdot \frac{L_{o\delta u_i}}{1000}, \text{ UAH}, \quad (16)$$

where A_a – the amount of depreciation deductions in percentage of the cost of cars per 1000 km of mileage;

C_{δ_i} – balance cost of a rolling stock unit, UAH;

$L_{o\delta u_i}$ – total annual vehicle mileage, km;

H_{e_i} – depreciation charge for the full restoration of the rolling stock, %..

8. General production costs include:

- salary expenses for janitorial staff
- expenses for current repair of machine tools;

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- expenses for the maintenance of vehicles for economic and technological purposes;
- interest charges for short-term loans;
- expenses for fire protection;
- advertising costs, etc..

The amount of general economic costs of ATP is determined from the formula:

$$B_{zi} = H_{ci} \cdot N_{cni} + H_{ni}, \text{ UAH}, (17)$$

Все проведенные выше расчёты сводятся в табл. 2.

When planning the cost of transportation of goods, it is taken into account the types of transportation and cargo, the type of rolling stock, the ways of cargo operations, the features of loading cars, the organization of transportation management, etc.

The total cost of transport in hryvnias per unit of transport work is determined from the formula:

$$S_{нол} = \frac{B_{ек} + B_{\delta} + B_{np}}{W_{мкм}}, \text{ UAH/tkm}, (18)$$

where H_{ci} – indirect costs

N_{cni} – the average number of cars, units;

H_{ni} – the amount of taxes and charges related to the cost price, UAH..

where $S_{нол}$ – the total cost of the cargo carriage, UAH/tkm;

$B_{\text{эк}}$ – the amount of the operational rolling stock costs, UAH;

B_{δ} – the amount of costs for maintenance and repair of roads, UAH;

B_{np} – the amount of costs for cargo-handling operations, UAH;

$W_{мкм}$ – the scope of hauling operations

Table 2. Calculation of the cost of the cargo hauling by rolling stock for 20 year

Input item	Method of calculation		
	1	2	3
Car model			
1. Driver wage, UAH	$\Phi_{3n_6}^{общ} = \Phi_{3n_6}^{nl} + \Delta B_{3n_6}^{\delta} + \Delta B_{3n_6}^h + \Pi_p$		
2. Charge on payroll, UAH	$B_{3n_6} = \Pi_p \cdot \Phi_{3n_6}^{nl}$		
3. Road transportation fuel	Per 1 km: $B_n^a = \frac{(H_{км} + H_{мкм} \cdot q \cdot \beta) \cdot 1.05 \cdot U_{л}}{100}$ Road tractors: $B_n^m = \frac{(H_{км} + H_{мкм} \cdot q_n \cdot \beta) \cdot 1.05 \cdot U_{л}}{100}$ Dump trucks: $B_n^c = \frac{(H_{км} + H_c \cdot n_c) \cdot 1.05 \cdot U_{л}}{100}$		
4. Lubricants	$B_{M} = U_{M_i} \cdot Q_{M_i}$		

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5. Maintenance and technical repairs of the hauling stock	$B_{TOiIP} = \frac{(H_{TO} + H_{IP}) \cdot L_{o\delta u}}{1000}$
6. Expenses for repair and renovation of automobile tyres	$B_{u_i} = \frac{H_{u_i}}{100} \cdot U_{u_i} \cdot \frac{L_{o\delta u_i}}{1000} \cdot n_{u_i}$
7. Equipment depreciation	$A_{a_i} = \frac{H_{a_i}}{100} \cdot C_{\delta_i} \cdot \frac{L_{o\delta u}}{1000}$
8. General administrative expenses	$B_z = H_{c_i} \cdot N_{cn_i} + H_{n_i}$
Total for MTE	

The operating costs include fixed and variable costs and wages of drivers.

The variable costs are calculated for 1 km of run and include: fuel costs; lubricants and other operational materials costs; spare parts costs; tire repair; carrying out maintenance and technical support; depreciation of the rolling stock.

The fixed costs are determined in UAH for 1 car-hour of work and include: the cost of depreciation of the rolling stock in the part that is used to restore the rolling stock [6].

The cost price of motor trucking is determined by dividing the sum of costs for the maintenance of a rolling stock park for a certain period of time for the overall transport activity for the same period

$$S_i = \sum_{i=1}^n B_i^{ATM} / W_{MKM}, \text{ UAH, (19)}$$

where $\sum_{i=1}^n B_i^{ATM}$ – the total costs for MTE

in the planning period for the maintenance of rolling stock, UAH;

W_{MKM} – the scope of hauling operations in the planning period for the i brand of the cars, tkm.

Taking 1 hour as an estimated period of time, it is determined the total amount of costs for the performance of hauling operations from the formula:

$$\sum_{i=1}^n B_i = B_{nep} + B_{noc}, \text{ UAH; (20)}$$

$$B_{nep} = B_{nep}^{1KM} \cdot V_e, \text{ UAH, (21)}$$

where B_{nep}^{1KM} – the sum of the variable costs per 1 km of car run, UAH;

B_{nep} i B_{noc} – the amount of fixed and variable costs of 1 work hour of rolling stock, UAH.

Then the value of costs for the transport operation will be equal

$$\text{to } \sum_{i=1}^n B_i = B_{nep}^{1KM} \cdot V_e + B_{noc}, \text{ UAH. (22)}$$

The total cost of motor trucking of MTE is determined from the formula:

$$S_i = \frac{C_{nep}^{1n} \cdot V_e + C_{noc}}{\sum_{i=1}^n W_{MKM}}, \text{ UAH. (23)}$$

The total mileage of the car for 1 hour is the operating speed

$$\sum_{i=1}^n L = V_e,$$

when

$$B_{u_i} = \frac{B_{nep}^{1n} \cdot V_e + B_{noc}}{V_e \cdot \beta_n}, \text{ or}$$

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$$B_{\beta_i} = \frac{1}{\beta_n} \cdot (B_{nep}^{1_{KM}} + B_{noc} / V_e), \quad (24)$$

where β_n – loaded mileage proportion of a car.

When a truck is operated with payment for 1 hour of work or 1 km of run, the cost of transportation in UAH is 1 auto-hour or 1 km of run:

$$S_{a-u} = B_{nep}^{1_{KM}} \cdot V_e + B_{noc}, \text{ UAH};$$

$$S_{KM} = \frac{B_{nep}^{1_{KM}} \cdot V_e + B_{noc}}{V_e} = B_{nep}^{1_{KM}} + \frac{B_{noc}}{V_e},$$

UAH, (25)

where S_{a-u} and S_{KM} – the cost of cargo transportation for 1 car-hour and 1 km of run, UAH.

The following dependencies are used to calculate the cost price in practical tasks.

The cost price of cargo transportation per km is equal

$$S_{KM} = \frac{N_{CII} \cdot S_i \cdot T_3}{L_{\text{общ}}}, \text{ UAH/km, (26)}$$

where T_3 – car service life, hour;

S_i – car maintenance costs, UAH;

N_{CII} – average number of cars of the brand, units;

$L_{\text{общ}}$ – total vehicle mileage, km.

Handling cost of one ton of cargo is

$$S_T = \frac{N_{CII} \cdot S_i \cdot T_e}{Q_T}, \text{ UAH/t, (27)}$$

where Q_T – volume of carriage by a given car brand.

The cost of transportation of one ton-kilometer of cargo is

$$S_T = \frac{N_{CII} \cdot S_i \cdot T_3}{Q_T}, \text{ UAH/tkm, (28)}$$

where P_{MKM} – freight turnover, tkm.

The main method during development of a business operations plan of MTE is a direct counting method for each type of transportation and in terms of expense items. At the same time, it is necessary to take into account the possibility of reducing costs of cargo carriage during the planning period under the influence of performance indicators and operational characteristics [6].

The target prime cost of cargo transportation is calculated on the basis of technical and economic factors for each subsequent year, proceeding from the planned level of costs of the base year.

For this purpose, the transportation costs of the base year are multiplied by the growth rates of cargo transportation.

The sum of savings is subtracted from the target prime cost due to the influence of technical and economic factors. Then the cost of transportation is calculated at the prices of the base year.

The level of cost per unit of hauling operations is:

$$B_i = B_{\text{общ}_i} / W_i, \text{ UAH/tkm, (29)}$$

where $B_{\text{общ}_i}$ – general costs of MTE for the production of the i type of hauling operations, UAH;

W_i – volume of the i -type hauling operations, tkm.

The savings from the reduction of cargo transportation in the planned year are determined by the following performance indicators:

- increase of technical level;
- improvement the labour management and the vehicle operation;
- improvement of fixed assets use;

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- relative reduction of fixed costs;
- other factors.

1. Savings from increase of the technical level (the introduction of new technology, innovation technology, automation solutions for transport) is determined from the formula:

$$\mathcal{E}_m = (B_1 - B_2) \cdot W_H, \text{ UAH}, \quad (30)$$

where B_1 i B_2 – current costs per unit of the hauling operations before and after the introduction of the relevant event, UAH;

W_H – the volume of transport work from the beginning of the introduction of the event to the end of the planning period, tkm.

2. The factor "Improvement the labour management and the vehicle operation" reflects the saving in wages by improving the organization of transport work and saving from reducing fuel, energy and other materials consumption rates. Savings from reduced fuel consumption rates are determined by the function:

$$\mathcal{E}_n = (H_1 - H_2) \cdot W_2 \cdot U_1, \text{ UAH}, \quad (31)$$

where H_1 i H_2 – norms for fuel equivalent consumption per unit of the hauling operations in the base and planned years, l;

W_2 – the volume of hauling operations in the planning period, tkm;

U_1 – the unit price of the fuel equivalent in the base year, UAH.

3. Improving the use of fixed assets reflects savings due to lower depreciation charges in the planning period

$$\mathcal{E}_a = A_{a_1} \cdot \Delta W_2 / 100 - A_{a_2}, \text{ UAH}, \quad (32)$$

where A_{a_1} and A_{a_2} – the amount of depreciation deductions, respectively, in the basic and planning periods, UAH;

ΔW_2 – the growth rates of volumes of transport work in the planned period in comparison with the basic one, %.

4. The savings from the reduction of the conditional-constant costs (without depreciation) are computed using the following formula:

$$\mathcal{E}_e = B_{noc_1} \cdot \Delta W_2 / 100, \text{ UAH}, \quad (33)$$

where C_{noc_1} – the amount of the conditional-constant costs in the base year, UAH.

The total savings in reduction of expenses for the cargo transportation due to changes in technical and economic factors are

$$\mathcal{E} = \sum_{i=1}^n \mathcal{E}_i = \mathcal{E}_m + \mathcal{E}_n + \mathcal{E}_a + \mathcal{E}_e, \text{ UAH}. \quad (34)$$

The growth in labour productivity due to the saving of cargo transportation costs with a change in technical and economic factors is determined from the formula:

$$\Delta \Pi \Pi = \frac{\mathcal{E}}{q_{ucx} - \mathcal{E}_i}, \quad (35)$$

where q_{ucx} – the initial number of employees.

The cost of the cargo transportation is affected by a number of operational characteristics of the MTE, which can be divided into three groups:

1. The capacity indicators of a motor vehicle park:

- list of a rolling stock;
- load-carrying capacity.

2. The capability utilization index of the motor vehicle park, the change of which does not affect the performance of

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the rolling stock, calculated for 1 km of the total mileage of the car:

- vehicle utilization;
- operation of the car on line;
- running speed;
- standing time of a car during cargo handling operations;
- load distance.

3. The capability utilization index of a motor vehicle park. Their change doesn't affect the rolling stock capability, calculated for 1 km of total mileage.

- rolling stock's capacity utilization rate;
- a loaded mileage proportion.

Depending on the degree of influence on the cargo transportation cost of all the technical and operational parameters they are divided into two groups.

The first group: load-carrying capacity, rolling stock's capacity utilization rate and loaded mileage proportion.

The second group: residence time of the car on duty, vehicle utilization rate, running speed, down time during cargo handling operations.

The prime cost of 1 tkm of the cargo transportation consists of variable and fixed costs and driver's wages for 1 ton of cargo transported.

The variable costs include the costs that change directly in proportion to the change in the total mileage of the car: the fuel costs, lubricants and other operational materials; repair and renovation of automobile tyres; motor maintenance and TR of rolling stock; depreciation deductions for rolling stock for which depreciation rates are set at 1000 km.

The fixed costs are the costs that do not depend on the general mileage of the car - general business expenses, depreciation costs for the restoration of rolling stock vehicles, for which depreciation rates are set without taking into account the total mileage.

The cost of 1 tkm in terms of variable costs is determined by the dependence

$$S_{km} = \frac{C_{km} \cdot L_{o\sigma u}}{P} = \frac{C_{km} \cdot T_n \cdot V_m \cdot l_{zpyz}}{T_n \cdot V_m \cdot l_{o\sigma u} \cdot q \cdot \gamma \cdot \beta} = \frac{C_{km}}{q \cdot \gamma \cdot \beta},$$

UAH, (36)

where C_{km} – costs for 1 km of car run,

UAH;

$L_{o\sigma u}$ – total vehicle mileage, km;

P – supply turnover, tkm;

l_{zpyz} – the average length of haul with cargo, km.

Thus, the cost of 1 tkm due to variable costs is affected by the operational characteristics of the first group: load-carrying capacity, rolling stock's capacity utilization rate and loaded mileage proportion.

They reduce the cost of cargo transportation for all items of expenditure.

The constant costs vary in proportion to auto-hours of work, that is

$$C_{noc} = \frac{C_u \cdot T_n}{P} = \frac{C_u \cdot (l_{zpyz} + V_m \cdot \beta \cdot t_{np})}{V_m \cdot \beta \cdot q \cdot \gamma \cdot l_{zpyz}},$$

UAH, (37)

where C_u – costs for one hour of the car work, UAH.

As can be seen from formulas (32) and (33), the operational characteristics have the greatest influence on the cost of 1 ton of freight traffic: average load-carrying capacity, rolling stock's capacity utilization rate and mileage coefficients. With the growth of these indicators, there is a decrease in the cost of cargo transportation both at the expense of variables and fixed costs per 1 tonne of cargo transported.

The effect of these indicators on cost reduction increases with the increase in the distance of transportation, as the specific weight of variable costs in the total cost price sharply increases.

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As the indicators of the second group (T_H, α_6, t_{np}) increase, the variable costs increase in proportion to the output, so they do not affect the cost price, and the amount of fixed costs remains unchanged in absolute magnitude. Therefore, the cost reduction is only due to fixed costs.

The wages of drivers depend on the indicators of the first and second group. The wages of drivers for one haul is

$$3\Pi_6 = CT_M \left[t_{np} \cdot Q_{zpyz} + t_{da} \cdot P_{zpyz} / (q \cdot \beta \cdot V_m) \right] \cdot \frac{n_{zpyz}}{P_{zpyz}}, \text{ UAH, (38)}$$

where CT_M – minute rate for the payment of the driver's work, UAH;

t_{np} – rate of down time during cargo handling operations;

Q_{zpyz} – the amount of cargo carried in one haul, t,;

t_{da} – the travel time of a car

P_{zpyz} – cargo turnover a single haul, tkm;

q – cargo capacity, t;

β – standard mileage utilization factor;

n_{zpyz} – number of trips;

V_m – running speed, km/h.

The cost of 1 tkm in terms of driver's salary is determined from the dependence:

$$S_{zn} = CT_M \left[(t_{np} \cdot Q_{zpyz} + t_{pyz} \cdot P_{zpyz}) / (q \cdot \beta \cdot V_m) \right] \cdot \frac{n_{zpyz}}{P_{zpyz}}, \text{ UAH, (39)}$$

where P – cargo turnover, performed for the total number of hauls, tkm.

Conclusions. Thus, the planning takes the main place in the management of the economic activity of the enterprise. It is associated with the organizational beginning of the whole process of implementing the justified directions for the further development of the enterprise.

Therefore, the planning is a process of forming the aim of enterprise's activity, determining of priorities, means and methods for achieving it based on identifying a set of tasks, as well as implementing effective methods, means and resources that are necessary to perform specific tasks within a specified time. The planning of MTE activities is a managerial process that is focused on transportation of cargo and passengers, rendering other transportation services to meet the needs of consumers and the national economy in order to generate profits with full provision of material, labour and financial resources.

Bibliography

1. Gorev A.E. Freight road transportations: Textbook for students of higher educational institutions / A.E. Gorev. - Moscow: Publishing Center "Academy", 2004. - 288 p.
2. Kramarenko G.V. Maintenance and reliability of cars / G.V. Kramarenko. - Moscow: Transport, 2002. - 400 p.
3. Bychkov V.P. Entrepreneurial activity in road transport / V.P. Bychkov. - St. Petersburg: Peter, 2004. - 448 p.

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PhD Mykola Turcheniuk

Opublikowany: 2017-06-30

DOI: 10.5604/01.3001.0010.4257

4. Levkovets L., Marupic V., Ignatenko O. and others. International transportation and transport law / L. Levkovets, V. Marupych, O. Ignatenko. - K. : Publishing House, 2001. - 300 p.

5. About the Transport of Dangerous Goods: Law of Ukraine No. 1644-III dated 06.04.2000 // Bulletin of the Verkhovna Rada of Ukraine. - 2000. - No. 28. - P. 222.

6. Turchenyuk M.O. Planning of the activity of the motor transport enterprise / M.O. Turchenyuk, M.D. Shvets, M.E. Kristopchuk: Textbook. - Rivne: National University of Water Management and Nature Resources Use, 2013. - 299 p.

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