

## УПРАВЛІННЯ ПІДПРИЄМСТВОМ

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### MANAGEMENT ACCOUNTING OF THE TRANSPORTATION SERVICES' SELF-COST USING A GLOBAL POSITIONING SYSTEM

**Urgency of the research.** Informatization of social processes and global information and computing services introduction are necessary to improve the methodology and organization of automated management accounting.

**Target setting.** One of the most important data collection technologies that is actively used in the transport industry is the global positioning system. Most innovative business entities perform the organization of an automated system for managing traffic flows based on GPS navigation technology.

**Actual scientific researches and issues analysis.** Peculiarities of the use of GPS-navigation technology are researched by scientists from different areas of economic science: A. E. Goriev, D. A. Palant, Ye. T. Skoryk and V. M. Kondratiuk and others.

**Uninvestigated parts of general matters defining.** Accounting aspects of the introduction of GPS-navigation technology are left without scientists' attention, which actualizes research of the prospects of automated management accounting and control of traffic flows improving.

**The research objective.** To increase the efficiency of transportation, it is necessary to find out the possibilities of using GPS-navigation technology in automation of accounting and control.

**The statement of basic materials.** On the basis of data from the system of global positioning it is advisable to automate the calculation of the self-cost of provided transport services. It is necessary to apply a two-dimensional calculating unit – "ton-kilometer", which fully considers of the conditions of a vehicle management. Since all the credentials are received solely in electronic form, the need for the formation of printed copies of primary documents is reduced. Accelerating the receipt of necessary information for the adoption of operational management decisions.

**Conclusions.** The introduction of the global positioning system ensures the collection and processing of accounting information without the direct involvement of employees of the enterprise, documentation and document management exclusively in electronic mode, reliable and timely calculation of the cost of transport services.

**Keywords:** management accounting; control; global positioning system; automation of accounting; calculation; costs; transport services.

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### УПРАВЛІНСЬКИЙ ОБЛІК СОБІВАРТОСТІ ТРАНСПОРТНИХ ПОСЛУГ З ВИКОРИСТАННЯМ СИСТЕМИ ГЛОБАЛЬНОГО ПОЗИЦІОНУВАННЯ

**Актуальність теми дослідження.** Інформатизація суспільних процесів і впровадження глобальних інформаційно-обчислювальних сервісів потребує удосконалення методики та організації автоматизованого управлінського обліку.

**Постановка проблеми.** Однією з актуальних технологій збору даних, яка використовується у транспортній галузі, є система глобального позиціонування. Більшість інноваційних підприємств здійснюють організацію автоматизованої системи управління транспортними потоками на основі технології GPS-навігації.

**Аналіз останніх досліджень і публікацій.** Особливості використання технології GPS-навігації досліджують науковці з різних галузей економічної науки: А. Е. Горєв, Д. О. Палант, Є. Т. Скорик і В. М. Кондратюк та інші.

**Виділення недосліджених частин загальної проблеми.** Облікові аспекти впровадження технології GPS-навігації залишаються поза увагою науковців, що актуалізує дослідження перспектив удосконалення автоматизованого управлінського обліку та контролю транспортних потоків.

**Постановка завдання.** Для зростання ефективності транспортних перевезень необхідно з'ясувати можливості застосування технології GPS-навігації в автоматизації обліку та контролю.

**Викладення основного матеріалу.** На основі даних з системи глобального позиціонування доцільно автоматизувати калькулювання собівартості наданих транспортних послуг. Необхідно застосовувати двомірну калькуляційну одиницю – «тонна-кілометр», яка в повній мірі враховує умови функціонування авто-транспорту. Оскільки всі облікові дані надходять в електронній формі, зменшується необхідність в формуванні друкованих первинних документів, прискорюється надходження необхідної інформації для прийняття оперативних управлінських рішень.

**Висновки.** Впровадження системи глобального позиціонування забезпечує збір та обробку облікової інформації без прямої участі працівників підприємства, документування та документообіг виключно в електронному режимі, достовірне та своєчасне калькулювання собівартості транспортних послуг.

**Ключові слова:** управлінський облік; контроль; система глобального позиціонування; автоматизація обліку; калькулювання; витрати; транспортні послуги.

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**Urgency of the research.** Informatization of social processes facilitated the automation of management accounting and control at the enterprise. Automation as an object of research in the field of accounting and taxation has been known since the invention of electronic computing machines. However, with the transition to global information and computing services and communication technologies, there has been no evolution of the subject field of the scientific researches.

The use of modern computer and communications technology allows not only reducing the labor intensity of the management accounting and control works performance, but also moving exclusively to electronic document management, integrating accounting functions around unified databases, promptly transferring economic information over significant distances for effective cost control and the like. In the conditions of significant scientific achievements of a mankind in the fields of cybernetics, systemology, computerization, economics and mathematical methods of the research, the internal and external environment in which enterprises operate, have radically changed, and with it the accounting system also has to be changed.

**Target setting.** One of the current technologies for data collection, which is actively used in the transport industry, is the global positioning system (GPS-navigation). GPS, Global positioning system – is a set of radio-electronic means to determine the location and speed of an object on the surface of the Earth or in the atmosphere. The position of the object is calculated through the use of the GPS-navigator placed on it, which receives and processes satellite signals [1]. The sphere of the technology application is automated systems for dispatching control and transport management at vehicle enterprises and taxi stations, search systems, and specialized use of vehicles. Most innovative business entities organize automated systems for managing traffic flows based on the system of global positioning, which is conditioned by a significant economic effect from the introduction of technology. The advantages of using GPS-monitoring systems of transport are:

- reducing the mileage of vehicles – due to optimization of the routes, the redirection of the flow of traffic depending on the road situation, mileage is reduced by 5-15%;
- exclusion of the “human factor” – the vehicle control system helps to prevent misuse;
- improving the efficiency of transport use – properly automated dispatching with real-time control allows you reducing the downtime of the equipment, increase the loading rate of the transport, which ensures a 20-30% reduction in fuel consumption;
- increasing the quality of customer service – effective management, based on constant monitoring, allows increasing customer service speed [1].

**Actual scientific researches and issues analysis.** The information provided by the GPS-navigation system can have a broad functional purpose. Therefore, the peculiarities of the use of technology are investigated by scientists from various branches of economic science. In particular, A. E. Goriev [2], carrying out the classification of information technologies used by transport companies, disclosed the essence of electronic identification of vehicles based on satellite tracking of their movement. T. O. Palant [3] substantiated the economic advantages of using the global positioning system in transport logistics. Ye. T. Skoryk and V. M. Kondratiuk [4] formulated the principles of constructing vehicle dispatching systems using satellite monitoring technologies for control purposes.

As of today, two software products with functional support for satellite transport monitoring technologies are being used in national accounting practice: jParus “Vehicle management” [5], “1C: Vehicle management for Ukraine” [6]. Both computer programs provide for the possibility of accounting for traffic flows using cloud technologies and the formation of documents.

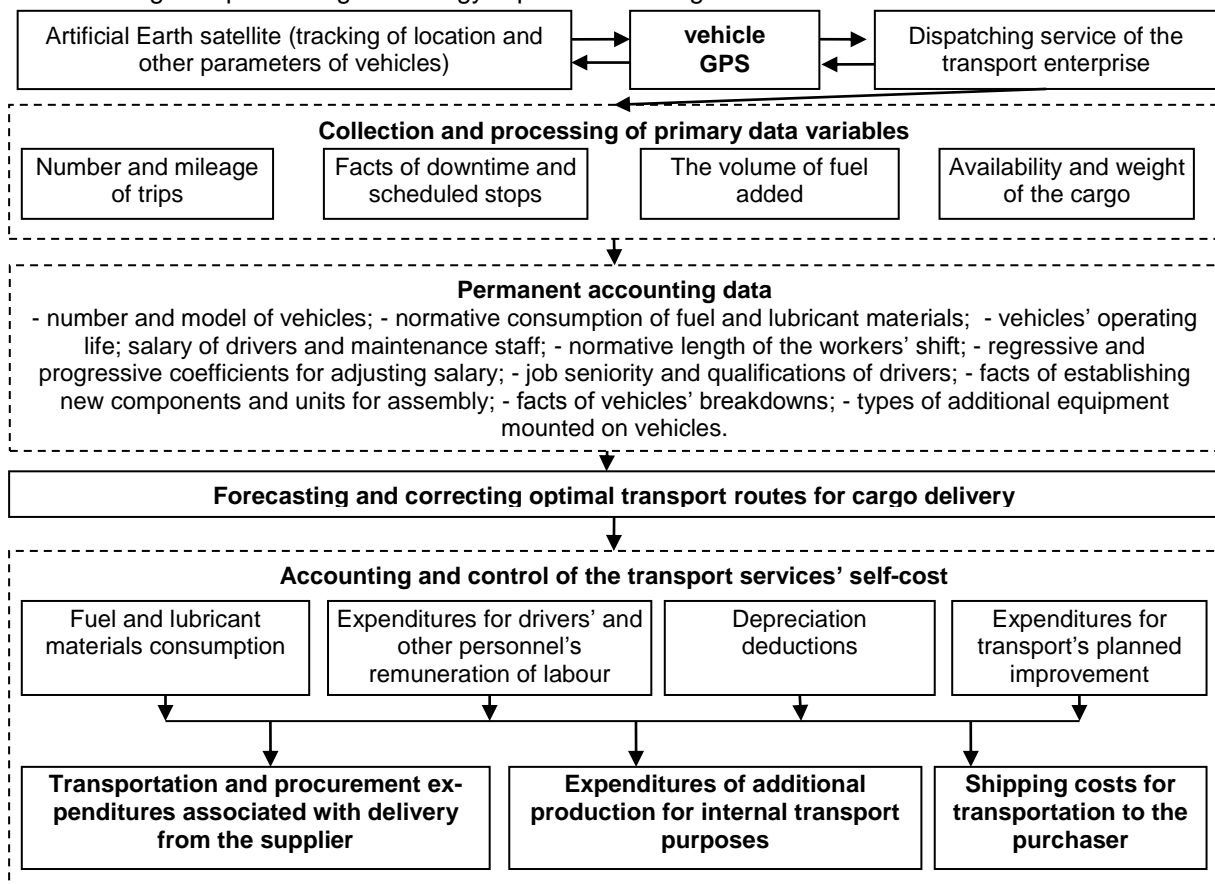
**Uninvestigated parts of general matters defining.** By accumulating developments and practical suggestions on the use of the global positioning system, it is necessary to pay attention to limiting the subject field of scientific research to the control capabilities of the technology. However, satellite systems of global positioning provide a complete management account of all the parameters of the vehicle’s operation: driving directions, mileage, speed, fuel consumption and refueling facts, engine speed, operating time and downtime, stops and parking, the number of trips, removal from the base and the addressees (distance), accounting for the work of additional equipment (crane, excavator, mixer, etc.), loading, unloading, etc. Accounting aspects of the introduction of GPS-navigation technology are left

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without scientists' attention, which actualizes the research of the prospects of improving the management accounting of traffic flows using information and communication technologies.

**The research objective.** To increase the efficiency of transportation, minimize the cost of maintaining vehicles, optimize the adoption of timely and effective management decisions, it is recommended to implement a global positioning system in the activities of enterprises providing freight services. The purpose of the article is to find out the advantages of using GPS-navigation technology in the organization of management accounting, researching possibilities of the automation of expenses accounting for fuel and combustible-lubricating materials, wages, depreciation of vehicle and its current repair.

**The statement of basic materials.** On the basis of the data from the global positioning system, it is advisable to automate the calculation of the self-cost of provided transport services for cargo transportation, forecasting and management of the enterprise. When automating the calculation, it is problematic to choose effective calculation units that would ensure the reliability of management accounting for the expenditures of the transport enterprise. Application of the measurement unit "one kilometer" in the account allows considering only the distance traveled by vehicles and significantly limits the implementation of information functions of the global positioning system. The weight of the cargo has the greatest influence on the cost of the transport services provided, along with the trip distance. Depending on the tonnage of freight transportation, fuel consumption may increase, tires and moving parts of the car may wear out, road charges, driver's wages and compulsory social security charges may increase. It is advisable to use a two-dimensional calculating unit – "ton-kilometer", which takes full account of most of the conditions for the vehicle's functioning. Method of automation of management accounting and control of traffic flows on the basis of global positioning technology is presented in Fig. 1.



**Fig. 1. Information scheme of automated management accounting and control of the self-cost of provided transport services**

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Information on the distance traveled by vehicles and the availability of cargo is advisable to use in automating the accounting of fuel and combustive-lubricating materials. Normative amount of fuel, which a vehicle consumes, is often taken from the automobile's technical passport. Such a calculation is quite subjective. It is advisable to focus only on the experimental conditions of the vehicles' activity. Based on the accumulated data on previous trips through comparison of consumed fuel and kilometers, the system is able to predict the quantitative parameters of the vehicles' operation.

The functional importance of an automobiles' trip ticket regarding fuel accounting in the context of automation of management accounting and control works is being significantly reduced. The traditional method of accounting for fuel and lubricant materials' consumption based on the reflection of balances at the beginning and end of the day in a trip ticket does not allow a complete effective control. Despite this, the automation of management accounting based on GPS navigation technology eliminates fraud, theft and inappropriate fuel consumption. Overtime fuel consumption under the same conditions of activity is compensated at the drivers' expense.

However, in the "Rules for Carriage of Goods by Road in Ukraine" [7], it remains a statement that the trip ticket is the primary document on the accounting of trucking that comprehensively characterizes the automobile's and driver's work from the moment of their departure and until returning to the vehicle enterprise (p. 1 of the Rules of transportation). And the courts, even after the trip ticket has disappeared from the Law on Vehicle, continue to consider it a necessary primary document for writing off fuel and recording transportation work, referring to the Rules of Carriage [8].

Therefore, the formation of the vehicle's trip ticket must be carried out automatically based on the data of the global positioning system exclusively in electronic form. The rest of the fuel at the end of the reporting period should be manually checked only periodically in the context of a control inventory of goods at the enterprise.

Similarly, automation is subject to depreciation of vehicles. Proportional to the number of ton-kilometers of vehicle operation by the production method, it is advisable to accrue depreciation of vehicle components and assemblies. Depreciation charges can be provided on the basis of actual data for the period of amortization charge and planned indicators of failure-free operation of component parts. Different components and assemblies wear out unevenly, depending on the number of kilometers traveled by a vehicle and the weight of the cargo carried. For instance, according to the planned volume of tire's ton-kilometers mileage, it is possible to keep an automated record of its wear and tear. Depreciation charges can be automatically accrued daily or after the provision of each transport service. Operational accounting of transport flows allows us to reliably determine the self-cost of transport services through the inclusion in its composition of depreciation charges before the end of the reporting period. Reflection in the financial accounts is based on the grouped data for the calendar month. After reaching the deadlines, the components and assemblies are automatically written off for recycling with the appropriate formation of primary documents and a reflection on the accounting accounts. In case inventory commission recognizes pre-written off spare parts as suitable for use, it is possible to restore them in the register at the enterprise.

The algorithm for calculating depreciation charges should be placed in the basis of the system of automated forecasting of the vehicle's breakdown and recording its current or major repair. When approaching the number of ton-kilometers of a vehicle activity to the indices of an uninterrupted (guarantee) period, it is advisable to initiate an automated check of the integrity of the components and assemblies. For enterprises that do not have a reserve vehicle fleet, automated forecasting of failure prevents the suspension of activities and non-fulfillment of contractual obligations. For enterprises that do not have a reserve fleet, an automated forecasting of breakdown prevents the suspension of activities and non-fulfillment of contractual obligations.

Also, as a part of the self-cost of the provided vehicles, expenditures for the maintenance of employees contain a significant part. The amount of accrued wages and deductions to social insurance funds should be tied to the mileage of the distance traveled during the reporting period. The possibility of setting a regressive form of payment is interesting. It is advisable to charge the automated system with the formation of optimal routes from the position of minimizing the time and expenditures for transporting the goods. The driver's non-compliance with a planned vehicle's route may influence the

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amount of salary. In conditions of a significant excess of the vehicle's planned performance indicator, stopping and parking for unreasonable reasons, it is possible to automatically reduce the amount of salary. Thus, the employees of the transport enterprise are motivated to maximize the efficiency of cargo transportation by road.

**Conclusions.** Among modern information and communication technologies, a system of global positioning in the activity of enterprises is actively applied. All modern commercial vehicles are equipped with GPS-navigators. The data provided by the global positioning system is the primary basis for the automated recording of fuel and lubricant consumption, expenditures for drivers' salary, depreciation of vehicles and current vehicles' repair. Automation of cost accounting must be carried out using a ton-kilometer unit. The two-dimensional calculation unit allows considering the growth of expenditures, acceleration of a vehicle wear and other operating conditions, not only in proportion to the distance traveled, but also in the volume of cargo carriage. Thus, reliability of accounting at transport enterprises is ensured. The efficiency of management accounting and control is realized through the possibility of calculating the self-cost of the transport services provided to determine the commercial price immediately after the trip ends.

The implementation of the global positioning system ensures the collection and processing of accounting information without the direct participation of employees of the enterprise; documentation and document circulation exclusively in electronic mode; reliable accounting of expenditures related to the vehicles' operation; timely calculation of the self-cost of services rendered; completeness of access of accounting specialists and managers to the data for the purpose of planning the activity of the enterprise for the effective management provision of freight services.

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