

The Assessment of Fixed Asset Use Efficiency of Motor Transport: A Methodological Approach

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Abstract – This paper continues studying the method of assessment of efficient use of buildings, structures and non-residential premises of motor transport companies of Belarus. The paper is aimed at identification and accounting of branch specifics of activities by means of accounting of diseconomies of scale, having sufficient force in the sphere of rendering services by freight motor transport.

Keywords – administrative premises, method, production area, efficiency.

I. INTRODUCTION

At the present time, almost all state-owned or having a share of state ownership motor transport companies (hereinafter MTC), are experiencing a paradoxical from the economic point of view situation: from the beginning of the 90-ies of the past century the number of rolling stock, and accordingly the volume of road transport services provided by them were reduced manifold, but the area used for rendering these services, despite attempts of diversification of production, was decreased insignificantly. Therefore, a natural question arises whether MTC use buildings, structures and non-residential premises (B&S) under their jurisdiction efficiently.

Organs of public administration and, first of all, owners of the asset complex need the crisis management tools to assess the efficiency of use of long-term used means of labour [1] under their jurisdiction. But as the assessment of the efficiency of every given object requires knowledge of production specifics and technique, consequently, it is a function of management of the administration of the given economic entity, then the differential assessment of the efficiency of use of every object of every company is expensive and economically inefficient. Therefore, this kind of assessment should be carried out by the owner of property in an aggregative way and should give an answer to the question on the total number of objects used inefficiently.

Thus, the purpose of the study is to develop a method for determining the total size of the area, inefficiently used by some MTC. Besides, for the subsequent making of more reasoned managerial decisions by the management of the concrete depot on the improvement of efficiency of area use, production area and non-production area should be considered differentially..

At the first phase of the study, a conclusion has been made that in the economic sense B&S are attributed to part of the fixed capital of a company and, in a more general case, to its

capital [2]. The value of capital, in its turn, is considered by most economists with the help of the marginal theory of value, and the concept of imputed costs closely related to it [3].

II. MAIN PART

The main function of the fixed assets of the company is providing good working conditions for its personnel and technical equipment of the production process in accordance with the achievements of Scientific and Technological Progress. The main purpose of company activities is maximization of profit in the long run through the provision of road services to their customers. On this basis, the hypothesis of the study suggests that the efficiency of use of fixed capital depends on the effective operation of equipment and vehicles, as well as of the personnel of the company. In this case, if the result of use of the active part of fixed assets of the company depends on the quality of the labour of production workers (drivers and maintenance workers), the efficiency of use of the administrative area can be assessed, in general, by the efficiency of labour of the personnel working at it.

Taking into account the specifics of the national production, all the labour in the aggregate production process can be divided into labour of workers (production) and managerial work. In this case, since the efficiency of these two categories of labour is assessed differently, then the efficiency of use of the area by the personnel will be assessed by the alternative indicators [2].

The method of calculating indicators of efficiency of B&S use is developed based on the following principles, reflecting the specifics of the studied sphere:

- a) scientific character – implies the use of the only universally accepted categories and concepts, as well as deducing the derived concepts from them by the laws of logic;
- b) uniqueness and unambiguity of the assessment criterion – for each category of MTC area used it shall give an unambiguous answer about the efficiency or inefficiency of use of each category of area. In the case of inefficient use, it shall be possible to determine its size;
- c) practical applicability – implementation of this principle shall ensure achievement of the goal of implementation of the developed method;
- d) cost efficiency – achievement of the goal of assessing the efficiency of use of the studied part of fixed assets (B&S) with the least labour inputs.

Existing methods of assessing the efficiency of use of B&S proceed from the fact that “the efficient use of area of

buildings, structures and non-residential premises depends on the efficiency of operation of the technological equipment accommodated thereon, as well as on the number of professionals working in this area" [5]. It is suggested that the assessment of the efficiency of use should be performed differentially for the production facilities, the efficiency of use of which is commensurate with the indicators of the production capacity, and for the administrative entities, defined by the coefficient of use of usable floor space of these entities (in this study – the non-production ones).

It is suggested that the efficiency of use of the production B&S is determined by the coefficient of use of the production capacity (K_w) of the technological equipment accommodated in this area, which is defined by a formula (1):

$$K_w = \frac{Q}{W}, \quad (1)$$

where Q – the gross output for the period in the natural, conditional-natural or value terms;

W – the average production capacity for the reporting period.

The production facility is operated efficiently, if the actual coefficient of use of production capacity (K_w^f) is not less than the normative one (K_w^n), in an equation (2):

$$K_w^f \geq K_w^n. \quad (2)$$

(K_w^n) is calculated by the formula (1) based on the threshold volume of sales of goods and services (Q_{thr}), ensuring only minimal profitability necessary for the expanded reproduction, which can be found based on the theory of a break-even point [1, 3]. If we write down (2) in detail, we will obtain:

$$\frac{Q_f}{W} \geq \frac{Q_{thr}}{W} \Leftrightarrow Q_f \geq Q_{thr} \text{ at } W = const, \quad (3)$$

where Q_f – the actual volume of production and sales of goods and services;

W – the production capacity of the company.

As it is evident, despite the differences in indicators, the essence of methodology for assessing the effective use of B&S coincides with the one suggested by the author of the paper [2].

If (2) is not satisfied, it is suggested to determine the size of the inefficiently used production B&S by a formula (4):

$$S_{prod}^{\wedge} = (K_w^n - K_w^f) \times S_{prod}, \quad (4)$$

where S_{prod} – the usable area of the production facility, corresponding to the production capacity (W).

Having transformed (4) componentwise, we will obtain:

$$S_{pr}^{\wedge} = (K_w^n - K_w^f) \times S_{pr} = \left(\frac{Q_{thr}}{W} - \frac{Q_f}{W} \right) \times S_{prod} = \frac{\Delta Q}{W} \times S_{prod}, \quad (5)$$

where ΔQ – the decrease in actual volume of production and sales relatively to the threshold value.

As we can see from (5), the developers of methodological guidelines assume direct proportionality between the decrease in production volume and usable area of the production B&S, i.e., the decrease in production volume by a number of times leads to the release of production area by the same number of times. In such a way, the developers of methodological guidelines ignore the effect of economies of scale – positive or negative. However, the effect of diseconomies of scale is strong enough in the sphere of production of motor transport services, which is clearly proven in the study [6]. The study of the effect of economy of scale on MTC while producing motor transport services were performed in the study [6] with the help of production functions. The production function is understood as a quantitative relation between the spending of economic resources and the volume of output of goods (or rendering services) in connection with the spending. Having examined activities of 22 MTC from the different regions of Belarus, D. Karzhytski has built the production function of MTC while rendering the motor transport services:

$$Q = 44,045 \times A_{run}^{0,85} \times N^{0,05}, \quad (6)$$

where Q – the total mileage of the fleet of rolling stock of the motor transport company, thousand kilometres;

A_{run} – the running number of motor vehicles, vehicl.;

N – the number of personnel at the motor transport company, pers.

The total mileage of the fleet of rolling stock (Q) in (6) characterizes the volume of production of services by the MTC, the running number of motor vehicles (A_{run}) – the volume of its capital, and the number of personnel (N) – the volume of labour used. Using (6), it is possible to study the effect of economy of scale while producing the motor transport services by the state companies. For this purpose, having increased the volumes of used capital and labour by (λ) times, we will obtain:

$$Q_1 = 44,045 \times (\lambda \times A_{run})^{0,85} \times (\lambda \times N)^{0,05} = \lambda^{0,9} \times 44,045 \times A_{run}^{0,85} \times N^{0,05} = \lambda^{0,9} \times Q, \quad (7)$$

where Q_1 – the volume of production of motor transport services when increasing capital and labour by (λ) times, thous. km..

As we can see, the volume of production of motor transport services will increase only by ($\lambda^{0,9}$) times. Thus, one can state that diseconomies of scale are acting at MTC of Belarus while producing freight motor transport services: the increase in the

number of used resources by a certain number of times leads to a disproportionately smaller increase in the volume of rendering services. This is due to difficulties in managing a large fleet of rolling stock of MTC.

Based on the above said, one can state that (5) does not take into account the specifics of production of motor transport services. The concept of production capacity of MTC and its indicators also require a more precise definition.

As regards a formula (8) developed by the author of the article to determine the size of the inefficiently used area of the production B&S:

$$S_{prod}^{\wedge} = \frac{(Q_{thr} - Q_f)}{W} \times S_{prod} \times K_{scale}, \quad (8)$$

where K_{scale} – the coefficient, taking into account the effect of economies of scale,

then based on the above said we can concretize it taking into account the effect of diseconomies of scale.

Let (S_{prod}^f) be the area of production B&S, corresponding to the actual volume of the services rendered (Q_f), and (S_{prod}^{thr}) be the area corresponding to a threshold volume of the services rendered (Q_{thr}) [2]. Since the production B&S are the capital, the volume of which is characterized by the amount of area, then the relation between (S_{prod}^f) and (Q_f), as well as between (S_{prod}^{thr}) and (Q_{thr}) will be the same as the relation between the capital of MTC and the produced with its help volume of motor transport services. Therefore, if the capital in motor transport production increases by (λ) times (with a corresponding increase in labour), and the volume of motor transport services rendered with its help increases only by

($\lambda^{0,9}$) times, the relation between $\left(\frac{S_{prod}^f}{S_{prod}}\right)$ and $\left(\frac{Q_f}{W}\right)$ will be

the same:

$$\frac{Q_f}{W} = \left(\frac{S_{prod}^f}{S_{prod}}\right)^{0,9}, \quad (9)$$

or:

$$\left(\frac{Q_f}{W}\right)^{\frac{1}{0,9}} = \frac{S_{prod}^f}{S_{prod}}. \quad (10)$$

Similarly we have for (Q_{thr}) and (S_{prod}^{thr}):

$$\left(\frac{Q_{thr}}{W}\right)^{\frac{1}{0,9}} = \frac{S_{prod}^{thr}}{S_{prod}}. \quad (11)$$

Finding the difference between (11) and (10), we have:

$$\left(\frac{Q_{thr}}{W}\right)^{\frac{1}{0,9}} - \left(\frac{Q_f}{W}\right)^{\frac{1}{0,9}} = \frac{S_{prod}^{thr} - S_{prod}^f}{S_{prod}}. \quad (12)$$

(Since the size of the inefficiently used area is ($S_{prod}^{\wedge} = S_{prod}^{thr} - S_{prod}^f$), then we will have from (12):

$$S_{prod}^{\wedge} = \left[\left(\frac{Q_{thr}}{W}\right)^{\frac{1}{0,9}} - \left(\frac{Q_f}{W}\right)^{\frac{1}{0,9}} \right] \times S_{prod}. \quad (13)$$

Applying the concept of coefficient of use of the production capacity (K_w), the formula (13) is re-arranged into the following form:

$$S_{prod}^{\wedge} = \left[\left(K_w^n\right)^{\frac{1}{0,9}} - \left(K_w^f\right)^{\frac{1}{0,9}} \right] \times S_{prod}. \quad (14)$$

Thus, (14) is the formula for calculation of the inefficiently used area of the production B&S.

As regards the non-production B&S, the Methodological guidelines [5] suggest determining the efficiency of their use by the coefficient of use of their usable area (K_{nprod}), which can be calculated using a formula (15):

$$K_{nprod}^f = \frac{S_{nprod}^n}{S_{nprod}^f}, \quad (15)$$

where S_{nprod}^n – the usable area of premises by standards, required for accommodation of managerial personnel;

S_{nprod}^f – the actually vested area of premises for accommodation of managerial personnel.

If the actual coefficient of use of usable area of an administrative premise (K_{nprod}^f) is greater than or equal to the normative (K_{nprod}^n),

$$K_{nprod}^f \geq K_{nprod}^n, \quad (16)$$

then the non-production area of this MTC is used efficiently, otherwise – inefficiently. It is suggested that the normative coefficient of use of usable area (K_{nprod}^n) of an administrative entity is defined based on the volume of production and sales of products, ensuring profitability, necessary for expanded reproduction, Formula (17):

$$K_{npr/nprod}^n = \frac{S_{nprod}^{thr}}{S_{nprod}^f}, \quad (17)$$

where S_{nprod}^{thr} – the usable area of an administrative entity by standards, required for accommodation of the personnel, ensuring the threshold volume of product output (Q_{thr}) [2].

If the administrative B&S are used inefficiently, then it is suggested to calculate the size of such an area ($S_{nprod}^{\wedge}$) by a formula (18):

$$S_{nprod}^{\wedge} = (K_{npr/nprod}^n - K_{npr/nprod}^f) \times S_{nprod}^f. \quad (18)$$

To evaluate the proposed methodology for determining the efficiency of use of non-production B&S area for compliance with the developed principles and prerequisites [6], the author of the paper formalizes the condition (16), in which the administrative area is used effectively, using (15) and (17):

$$\frac{S_{nprod}^n}{S_{nprod}^f} \geq \frac{S_{nprod}^{thr}}{S_{nprod}^f}. \quad (19)$$

Or, after multiplying (19) by (S_{nprod}^f) :

$$S_{nprod}^n \geq S_{nprod}^{thr} \quad (20)$$

In the relationship (20) $[S_{nprod}^n]$ depends on the current number of personnel at the company (sometimes far from the optimum number for the volume of motor transport services being rendered), and (S_{nprod}^{thr}) depends on the estimated number of personnel required to provide a threshold volume of the motor transport services.

Therefore, even for a smaller volume of the services being rendered, than its threshold level, the area of the non-production premises by standards, necessary to accommodate the existing staff, may be larger, than the area by standards, required for accommodation of the personnel, providing the threshold volume of services (Q_{thr}). Therefore, the formula (20), not presupposing any assessment of the efficiency of the activities of the personnel occupying the area, cannot assess the efficiency of use of the non-productive B&S. Consequently, the formula (18) is universal, as it reflects the particular case, when the threshold number of employees of the company coincides with the normative (calculatable) number for a given volume of services rendered.

As we can see, the principles of assessing the efficiency of the use of B&S in the methodological guidelines are correct, though the final formulas for the calculation require serious revision, which will be the subject of further studies.

III. CONCLUSIONS

Continuing to study the problem of assessing the effectiveness of usage of the passive part of the main means of freight road transport (buildings, structures and non-residential buildings), based on a reasonable need for separate consideration of their production and non-production (administrative) part, alternative assessment criteria for each of these named parts are proposed: the utilisation ratio of production capacity and utilisation of useful area, respectively.

Implementing the principle of uniqueness and unambiguity of evaluation criterion, it is proposed to define the inefficiently used production area based on reduction of the actual production volume of the relative threshold, with a mandatory quantitative calculation of the negative economies of scale taking place in the road freight transport in our country. It is suggested that the effectiveness of use of non-productive areas and the value of ineffective part thereof are evaluated based not only on the current number of administrative staff and their provision with office premises per sanitary norms, but

also based on the efficiency of managerial work, the development of methodology for its assessment is the subject of further research.

REFERENCES

- [1]. Антикризисное управление: 17-модульная программа для менеджеров «Управление развитием организации». Модуль 11. / В.И. Кошкин, Л.П. Белых, С.Г. Беляев и др.; под ред. В.И. Кошкина. – М.: Инфра-М, 2000. – 512с.
- [2]. Shchemeleva, A. Anticrisis Management: Estimation Concept of Fixed Assets Usage Efficiency / A. Shchemeleva // Весн. Ин-та соврем. знаний. – 2009. – №1. – Р. 72-76.
- [3]. Экономикс: принципы проблемы и политика: В 2 т. / К.Р. Макконел, С.Л. Брю. – Таллин, 1993. Т. 1-2.
- [4]. Fixed Assets // CPA Practice Advisor. – 2011. – Vol.21, Iss.8. – Р.32-35.
- [5]. Об утверждении Методических рекомендации по определению критериев отнесения зданий, сооружений и нежилых помещений, находящихся в республиканской собственности, к категории неэффективно используемых: постановлением Министерства экономики Респ. Беларусь, 30 июля 2004 г №189 // Нац. реестр правовых актов Респ. Беларусь. – 2007г. – № 43. – № 8/84532.
- [6]. Karzhytski, D.L. Обоснование перспективной потребности грузовых автотранспортных предприятий в персонале: Ph.D.: Академия управления при Президенте Республики Беларусь, 2007, p. 168.
- [7]. Liapis, J.K. Accounting GAAPs and Accounting Treatments for Management of Property Case Studies from Greek Real Estate Market / J K. Liapis, Chr. L Galanos // European Research Studies [Electronic resource]. – 2010. – Vol.13, Iss.3. – Mode of access: <http://proquest.umi.com/pqdweb?index=254&did=2296749231&SrchMode=1&sid=1&Fmt=3&Vinst=PROD&Vtype=PQD&ROT=309&Vname=PQD&TS=1303565848&clientId=53220>. – Date of access: 11.04.2011
- [8]. Karanovic, G. Financial Analysis Fundament for Assessment the Value of the Company / G. Karanovic, S. Bogolan, S. Baresa // UTMS Journal of Economic [Electronic resource]. – 2010. – Vol.1, Iss. 1. – Mode of access: <http://proquest.umi.com/pqdweb?index=30&did=2143919511&SrchMode=1&sid=1&Fmt=3&Vinst=PROD&Vtype=PQD&RQT=309&VName=PQD&TS=1303564584&clientId=53220>. – Date of access: 23.04.2011
- [9]. Верещагин, С.А. Основные средства: новый порядок учета. / С.А. Верещагин. – М.: Эксмо, 2009. – 254 с.
- [10]. Эффективность использования основных фондов промышленных предприятий: учеб.-метод. пособие / Южно-Рос. гос. ун-т экономики и сервиса; сост.: Н.П. Ушакова, Н.Г. Жарова. – Шахты, 2009. – 43с.
- [11]. Разинькова, О.П. Комплексный анализ эффективности формирования и использования

- основных производственных фондов промышленных предприятий: учеб. пособ. / О.П. Разинькова – Тверь: ТГТУ, 2010. – 223с.
- [12].Kornev, A.K. Possibilities of Rapid Renewal of Active Part of Fixed Assets of Branches of Industry / A.K. Kornev // Studies on Russian Economic Development [Electronic resource]. – 2009. – Vol.20, Iss. 5. – Mode of access: <http://www.springerlink.com/content/bt2162281724mqh0/>. – Date of access: 16.03.2011
- [13].Павлов, К.В. Эффективность использования основных фондов с учетом региональных различий трудоспособности / К.В. Павлов // Региональная экономика: теория и практика. – 2010. – № 14 (149). – С. 8–12.
- [14].Mykolaitiene, V. Peculiarities of Tangible Fixed Assets Accounting / V.Mykolaitiene, G. Vecerskiene, K. Jankauskiene, L. Valanciene // Engineering Economics. – 2010. – Vol.21, Iss.2. – P.142-150.



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Jeļena Šchemeleva. Automobiļu transporta pamatlīdzekļu efektīvas izmantošanas novērtējums: metodiska pieeja

Pētījuma objekts ir Baltkrievijas Republikas kravas automobiļu transporta uzņēmumi. Pētījuma metodoloģiskā bāze ir vispārzinātniskas izziņas metodes: indukcija un dedukcija, analīze un sintēze.

Pašlaik spēkā esošie valdības normatīvie dokumenti, kas attiecas uz valsts īpašumā esošo ēku, iekārtu un nedzīvojamo telpu efektīvas izmantošanas novērtējumu, paredz vienotu šo objektu atestācijas mehānismu, neņemot vērā nozares uzņēmumu specifiku.

Saglabājot esošās metodikas paredzētos diferencētos rādītājus, lai novērtētu ražošanas un neražošanas (administratīvo) telpu izmantošanas efektivitāti, tiek piedāvāts ražošanas telpu novērtēšanā ņemt vērā transporta nozares specifiku. Valsts kravas automobiļu transporta uzņēmumu transporta process pašlaik ir pakļauts mēroga negatīvā efekta iedarbībai, kad izmantojamo resursu daudzuma palielināšanās rada sniegto pakalpojumu apjoma mazākas izmaiņas, jo ir objektīvas grūtības pārvaldīt lielu ritošā sastāva parku, tomēr ignorēt šo apstākli nav ieteicams. Turpretim neražošanas telpu izmantošanas efektivitāti tiek piedāvāts saistīt ne tikai ar pārvaldes personāla skaitu (normatīvo, kritisko), bet arī ņemt vērā administratīvā pārvaldes personāla darba efektivitāti, kas būs turpmāko pētījumu priekšmets.

Елена Щемелева. Оценка эффективности использования основных средств автомобильного транспорта: методический подход

Объектом исследования являются грузовые автотранспортные предприятия Республики Беларусь. Методологической основой исследования являются общенаучные методы познания: индукция и дедукция, анализ и синтез.

Действующими в настоящее время государственными нормативными документами по оценке эффективности использования зданий, сооружений и нежилых помещений, находящихся в республиканской собственности, предусмотрен единый механизм их аттестации, не учитывающий отраслевую специфику предприятий.

Сохраняя предусмотренную действующей методикой, дифференцированность показателей для оценки эффективности использования производственных и непроизводственных (административных) помещений, предлагается, оценивая производственные помещения, учитывать специфику транспортной отрасли. Транспортный процесс отечественных предприятий грузового автомобильного транспорта в настоящее время подвергается воздействию отрицательного эффекта масштаба, когда увеличение количество используемых ресурсов, вызывает меньшее изменение объема оказываемых услуг, ввиду объективных трудностей в управлении большим парком подвижного состава, пренебрегать этим обстоятельством не следует. Эффективность же использования непроизводственных помещений предлагается основывать не только на численности управленческого персонала (нормативной, пороговой), но и принимать во внимание эффективность труда работников административно-управленческого персонала, что является предметом проведения дальнейших исследований.