Economic Indicators Evaluation of Transport Company in Terms of Individually Composite Indexes

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Abstract: *The article is focused on solution possibilities of international freight transport in selected company in terms of using economic analysis and analysis of fleet performance. During the analyse were used time indicators, power usage of vehicle combinations and using composite indexes, during mutual evaluation was determined the effects of annually performance variation of tracking vehicles combination from in terms of driving performance, transport performance, average transport distance and average load at which could be determined the effect of annually volume changes of performance and also unit load on total load of transporter in international freight transport.*

Keywords: *performance analysis, driving performance, transport capacity, individual composite indexes*

INTRODUCTION

The transport sector greatly effects on industry developing of countries and provides background to the positive functioning of the economy. Transport affects a large number of diverse factors such as infrastructure and integration of countries in international trade, urban planning, demographics, level of welfare of the people and others. All this contributes to creating supply and demand of services in the transport sector. Transport in each country is affected by a number of socio - economic factors, which can include demographics, urban planning, population level and, finally, the country's integration into international trade (Hujo et al., 2013).

Due to the continuous increase of supply over demand, when consumers benefit not only domestic but also foreign offer, the availability of goods and others, is also growing role of transport.

There is increasing competition, businesses are trying to maintain a competitive advantage when, the major route of maintaining the ability to adapt and engage in innovative changes. Innovation is associated with costs and road transport companies are hard to coping with the rapid introduction.

The energy fastidiousness of transport has long been an important topic of various economic and environmental debates, and in fact the starting point for determining the amount of emissions produced by transport, (Hegedus et al., 2012).

The aim of this article is on the basis of input data to appreciate the impact on performance indicators that characterize the production factors of transport company with a focus on international transportation.

MATERIALS AND METHODS

As reported by the use of economic categories, processes and relations in the management of road transport is a complex and difficult task, where does required detailed knowledge of the economic structure, the choice of an appropriate system of economic indicators, understand the links between operational and economic indicators.

It is also very important to understanding linkages of road transport in company and their economic context of its surroundings - suppliers, customers, national and financial institutions and others.

In the case that an economic analysis, supported by the values of specific indicators, it can be used as a diagnostic operation tool that talks about the economic health of the company (Konečný, et al., 2010).

Subject of economic examination is the transport company or its part, economic

situation, management and results of management. Comprehensive knowledge as a result of the economic analysis is to serve for professional decision-making and business management.

Selection of the appropriate combination is not only important for commercial reasons, i.e. due to efficiency, service quality and service efficiency, but also for safety reasons, i.e. due to the efficient maintenance and safe operation, also from personal reasons, i.e. suitable drivers and legal grounds, i.e. that were satisfy the orders of drivers with appropriate license and also because carrier license, which covers additions to the fleet carriers. (Gnap et al., 2002).

Traffic and transport process modelling using technical-economic indicators

Technical - economic indicators represent a set of indicators by which some road transport companies evaluate their performance. Information obtained by using them serve as a basis for planning, management and analysis of economic activity (Hujo, 2013).

In terms of traffic and transport process modeling in road transport, we followed the following indicators:

- turnover of lorry,
- port ride,
- lay-ride,
- waiting for vehicle,
- freight kilometer,
- empty kilometer,
- vehicle day,
- transport capacity.

Performance of vehicles usage can be assessed on the basis of absolute or relative performance indicators of fleet utilization (Poliak, et al., 2008).

Indicators of the power use of vehicles include:

- driving performance,
- loading performance,
- transport performance,
- average transport distance,
- average amount of traffic,
- average load.

Time capacity of vehicles and their use

Using suitable defined vehicle days can define individual coefficients as follows:

- vehicle days in operation, VD_{pr}
- vehicle days in repair, VD_o
- vehicle days in non-operating state, VD_n
- registered vehicle days, DVev

Vehicle fleet utilization coefficient α: a relative time indicator of utilization of vehicles

$$\alpha = \frac{VD_{pr}}{VD_{ev}} \quad (1)$$

Repair coefficient of vehicles state αo: a relative care indicator of technical state of the vehicle

$$\alpha_o = \frac{VD_o}{VD_{ev}} \quad (2)$$

Non-operating state coefficient αn: relative indicator to express non-operating state of vehicle days

$$\alpha_n = \frac{VD_n}{VD_{sv}} \quad (3)$$

The sum of the coefficients for the use of Vehicle fleet utilization, repair and non-technical state is valid:

$$\alpha+\alpha_o+\alpha_n = 1 \quad (4)$$

Performance indicators and performance use of vehicles

Driving performance: the number of kilometers covered by the vehicle per unit time (day, week, month, year) with the load (Surovec, Cisko, 1984).

Loading performance: relocation things with certain weight from the place of loading to the vehicle and oppositely, as well as transferred from one vehicle to another.

Transport performance (P): in freight transport is a multiple of the weight of things transported and the driven distance and those things.

$$P = \sum_{i=1}^{m} q_i . l_{zi} \text{ ,t.km} \quad (5)$$

where: P – the volume of transport performance, tkm
qi – i-th amount of traffic things, t
lzi – transport distance of the i-th quantity, km

Coefficient of utilization rides (β): the ratio of the number of driven kilometers with the load to the total number of driven kilometers (applied to vehicles with the same effective weight).

In one turnover:

$$\beta = \frac{l_z}{l} \quad (6)$$

For all turnover:

$$\beta = \frac{L_z}{L} \quad (7)$$

where: L – number of driven kilometers for a certain period of time, km
Lz – number of driven kilometers with the load for a certain period of time, km
l – number of driven kilometers in one turnover, km
lz - number of driven kilometers with the load in a single turnover, km

Average transport distance ($\bar{l}_z$): the distance at which the average is transport one ton.

$$\bar{l}_z = \frac{P}{Q} = \frac{\sum_{i=1}^{m} q_i . l_{zi}}{\sum_{i=1}^{m} q_i} \text{ , km} \quad (8)$$

The average traffic amount ($\bar{q}$): tons ratio of mass transporting things attributable to one driven kilometer with load vehicle.

$$\bar{q} = \frac{P}{l_z} = \frac{\sum_{i=1}^{m} q_i . l_{zi}}{\sum_{i=1}^{m} l_{zi}} \text{ , km} \quad (9)$$

Coefficient of effective utilization weight of vehicle (γ): the ratio of the achieved traffic volume to volume, which could be achieved if it were fully utilized effective weight (mu) for all driving whit a load.

$$\gamma = \frac{q}{K} \tag{10}$$

where: q – transport quantity, t

K – maximum transportable quantity (maximum effective weight, vehicle capacity), t.

Transmission coefficient of utilization capacity (γ): ratio achieved transmission work in tkm to transport work which could be achieved at maximizing of the effective weight for all vehicle rides.

$$\gamma = \frac{P_{sk}}{P_{max}} = \frac{P}{L_z.K} = \frac{P}{\sum_{j=1}^{m} L_{zj}.K_j}, \tag{11}$$

Coefficient on the basis of average load utilization (δ) shows the effect of the utilization level of rides and effective weight.

$$\delta = \frac{\overline{q_v}}{K} = \frac{P}{L.K} = \frac{P}{\sum_{j=1}^{m} L_j.K_j}, \tag{12}$$

where: K – maximum transportable amount, t

$$\delta = \beta.\gamma \tag{13}$$

RESULTS

In the present paper is focused on the evaluation a transport company in international traffic in terms of individual composite indexes, where we monitored the period of transport from 2012 to 2013.

Tab. 1 Individual composite indexes

OPERATION 1								
Month	Driving performances km		Unit costs EUR/km		$q_0.p_0$ EUR	$q_1.p_0$ EUR	$q_0.p_1$ EUR	$q_1.p_1$ EUR
	2012	2013	2012	2013				
	q_0	q_1	p_0	p_1				
January	12206	16553	2.90	4.80	35397.4	48003.7	58588.8	79454.4
February	17547	19233	3.30	2.05	57905.1	63468.9	35971.4	39427.7
March	20750	25317	2.31	3.02	47915	58460.9	62665	76457.3
April	20503	25178	3.27	3.66	67044.8	82332.1	75041	92151.5
May	20412	24302	3.15	3.10	64297.8	76551.3	63242.6	75295
June	18213	21987	2.18	2.18	39704.3	47931.7	39690.5	47915
July	20605	22812	0.89	2.92	18338.5	20302.7	60166.6	66611
August	19544	21231	1.88	2.42	36742.7	39914.3	47296.5	51379
September	23197	23336	2.95	3.23	68450	68860.2	74846.5	75295
October	22685	23644	1.81	1.45	41070	42806.2	32836.8	34225
November	21693	24405	2.30	2.24	49893.9	56131.5	48674.8	54760
December	14735	15013	11.02	10.52	162380	165443	155012	157937

During the reporting period, we focused on the calculation of individual composite indexes, which consists of the following calculations:

1. evaluation of annually changes of driving performance and unit costs of vehicle tracking costs,
2. driving performance comparison of vehicles of international transport, taking into account on the technical coefficient of vehicles duty,
3. transport performance.

Values necessary for the calculation of the above parameters of international transport are listed in table 1

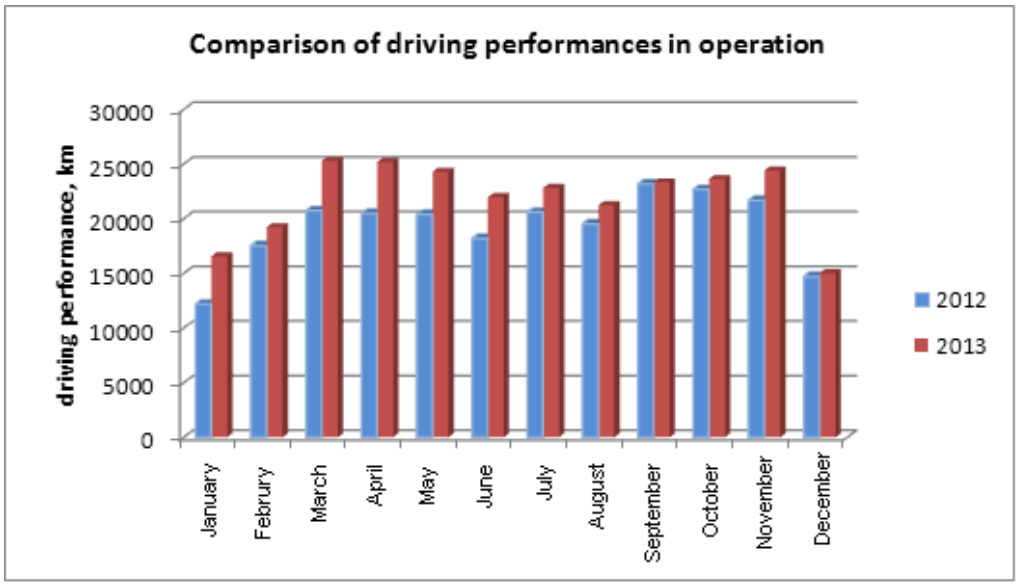

Fig. 1 Comparison of driving performances in years 2012 and 2013

Graphical comparison of driving performances is shown in Fig. 1, it speaks about increase driving performances throughout year 2013.

Performance use of vehicles in international transport

Between the monitored indicators of performance usage of vehicles were included:

- driving performance (fig. 2) – is defined by the number of kilometers that the vehicle has traveled us fixed unit of time, in our case we select a comparison of driving performance in each month throughout the calendar year 2012 and 2013,
- transport performance (obr. 3) – in freight transport is defined as a multiple of the transported weight of things and driven distance of things.

Transport performance we monitored throughout the calendar years in 2012 and 2013. On the basis of results of transport performance in international traffic during the monitored period we observed that transport performance in 2013 increased, and this trend is in economic terms attributable to the gradual vitalize of the economy, and thus the increase in transports of goods for industry. In the long term it can be stated that road transport plays in terms of transport performance the most important component in the Slovak Republic and by the global economic recession, has been recorded a decrease.

In the long term of European Union plans is preparing for carriers still new restrictions in terms of charge, and emission limits, which are reflected in the price of the transport operation and ultimately to the value of goods which pay the final consumer. Enforcement plans of more efficient use of rail transport for long journeys, encounters on technical and time constraints as well inflexibility of rail transport systems.

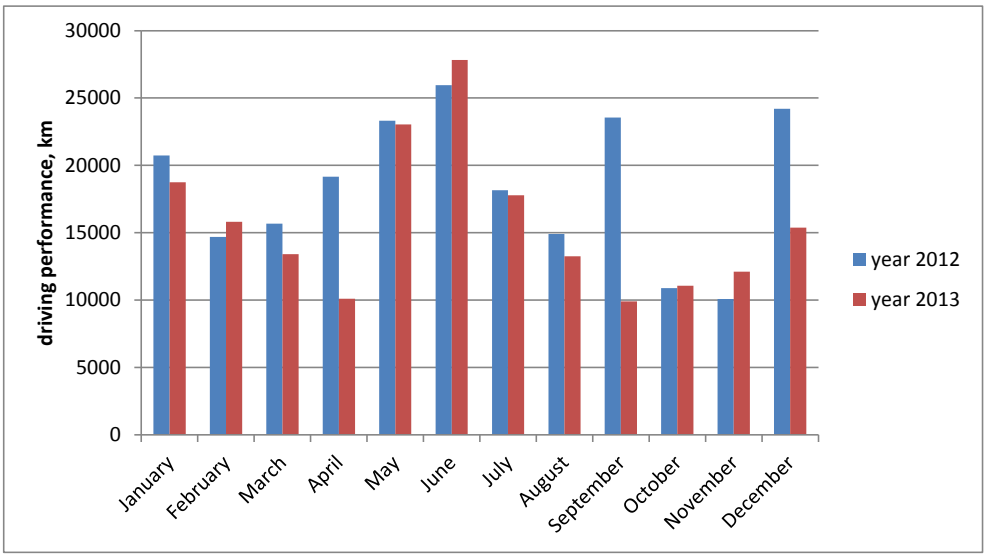

Fig. 2 Driving performances in years 2012 and 2013

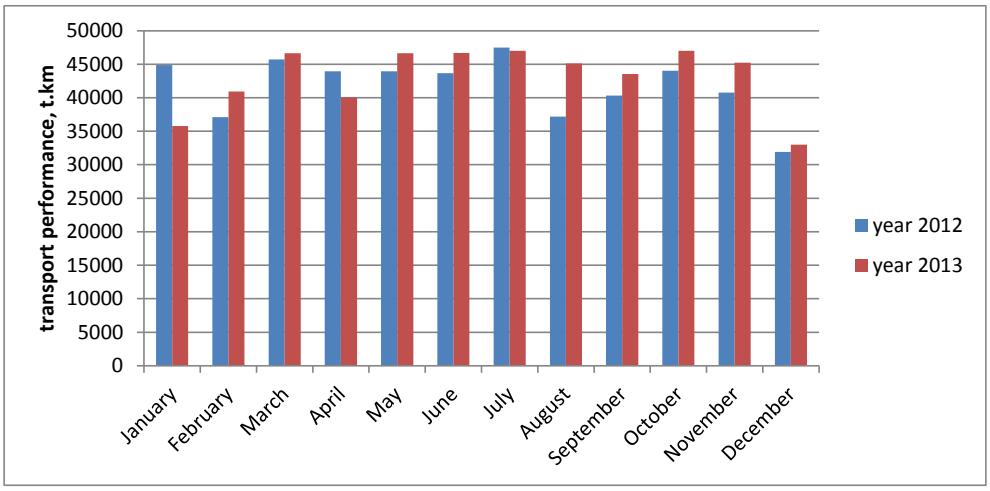

Fig. 3 Transported performance in years 2012 and 2013

Absolute indicators

In tab. 2 and 3 are recorded overall indicators of time usage of vehicles deployed on international transport driver. During the monitored period we monitored seven vehicle combinations consisting of a hauler and truck semitrailer. Full numbers of days in the vehicle evidence VDev in 2012 were recorded 365 days, except of vehicle combination no. 4 which was bought during year 2012 and the number of days in the vehicle evidence was 122 days.

In terms of deployment possibility of vehicle combinations are the most crucial the days of the technical readinessVDtp, while through vehicle days can be further to define individual coefficients:

- coefficient of vehicle fleet utilization,
- coefficient of non-technical state,
- coefficient of repair state.

In our evaluation period the highest number of days in the technical readiness VDtp in 2012 reached the vehicle combination no. 6,7 and in year 2013 the vehicle combination no. 5.

Tab. 2 Absolute indicators of time spent of vehicle fleet in year 2012

Vehicle	Licence Plate	VD_{ev}	VD_{pr}	VD_{n}	VD_{tp}	V_{Do}
Vehicle combination no. 1	NZ 945CM	365.00	24.75	4.92	356.00	0.75
Vehicle combination no. 2	NZ 581 DI	365.00	24.50	4.58	349.00	1.33
Vehicle combination no. 3	NZ 642 CG	365.00	24.25	5.17	353.00	1.00
Vehicle combination no. 4	NZ 850 EK	122.00	25.25	1.58	120.00	0.17
Vehicle combination no. 5	NZ 916 DV	365.00	25.92	4.00	359.00	0.50
Vehicle combination no. 6	NZ 994CF	365.00	25.08	4.75	358.00	0.58
Vehicle combination no. 7	NZ 330 EE	365.00	25.17	4.67	358.00	0.58

Tab. 3 Absolute indicators of time spent of vehicle fleet in year 2013

Vehicle	Licence Plate	VD_{ev}	VD_{pr}	VD_{n}	VD_{tp}	VD_{o}
Vehicle combination no. 1	NZ 945 CM	365.00	21.00	8.00	357.00	0.67
Vehicle combination no. 2	NZ 581 DI	365.00	25.00	5.00	347.00	1.50
Vehicle combination no. 3	NZ 642 CG	365.00	23.00	6.00	348.00	1.42
Vehicle combination no. 4	NZ 850 EK	365.00	23.00	5.00	346.00	1.58
Vehicle combination no. 5	NZ 916 DV	365.00	23.00	8.00	356.00	0.75
Vehicle combination no. 6	NZ 994 CF	365.00	20.00	8.00	348.00	1.42
Vehicle combination no. 7	NZ 330 EE	365.00	26.00	5.00	353.00	1.00

To achieve the highest performance usage of vehicles is from a technical point of view it is important to achieve the highest indicators of vehicle days in the technical readiness VDtp.

During evaluation of vehicle days in technical readiness, we found that in year 2012 we achieved gentle better indicators than in 2013, but transportation performances in 2013 were higher, which is related whit the reasons already described on the basis of increase transport performance. At vehicle combination no. 4 is again necessary to take into account the fact that that combination was bought during 2012, while the number of vehicle days in the vehicle evidence was 122 days.

CONCLUSION

Road transport is an essential means of passengers transport and goods in the European Union. European Union action is primarily aimed at regulating the multiple costs of road transport. Development of transport has to be in accordance with the safety requirements and environmental protection. The transport sector makes economic growth, significantly contributes to the functioning of the Slovak economy, individual regions and thus creates the conditions for optimal economic potential. Transport on the basis of the free movement of persons, goods, freedom to provide services and the free movement of capital makes the functioning of the united internal market of EU. The transport sector generates about 8.2% of

the gross domestic product of the Slovak Republic and about 4.2% of jobs.

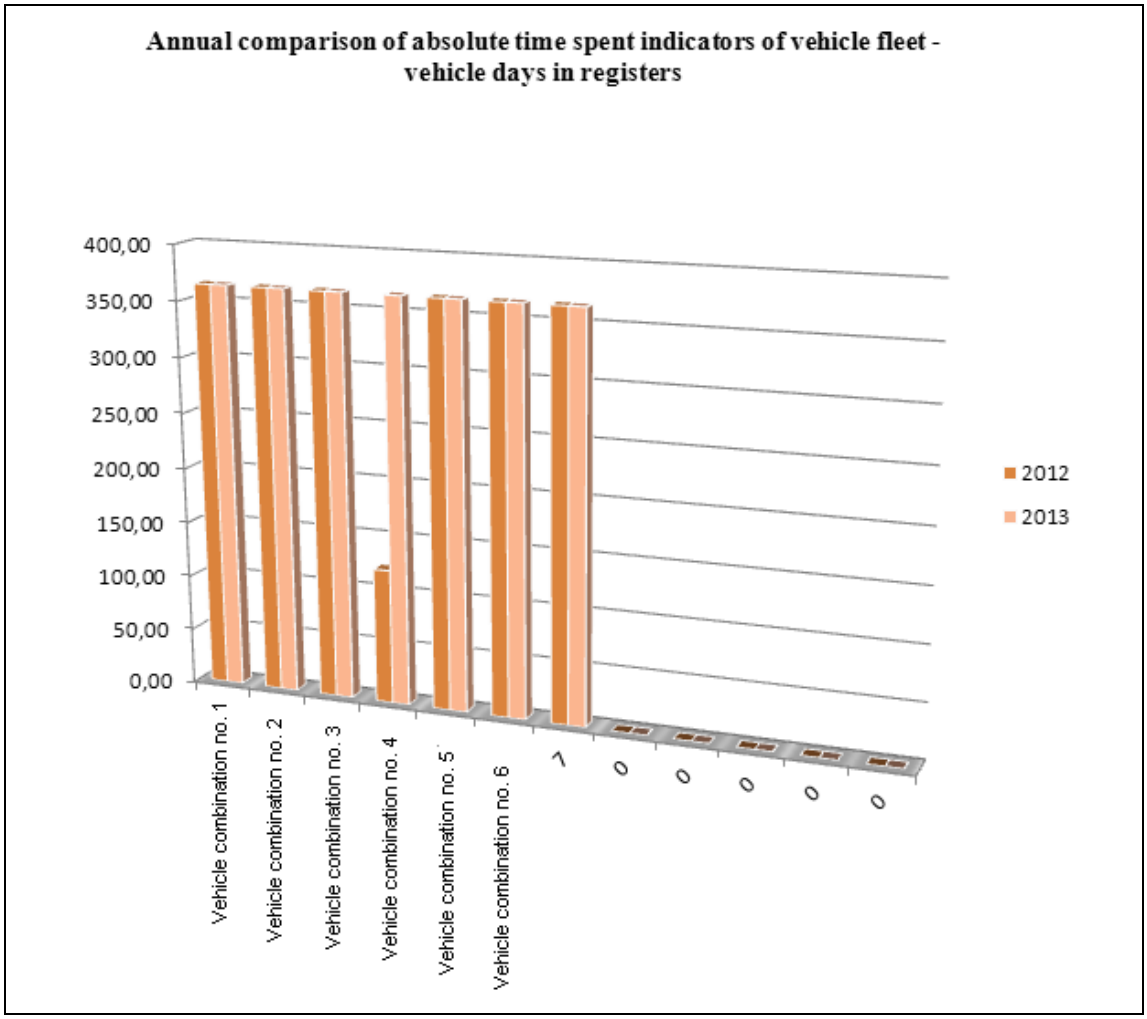

Fig. 4 Vehicle days in evidence for years 2012 a 2013

Whit the providing transport services create for carrier costs, which represented advisable expended consumption of economic resources expressed in monetary value. In road haulage are in cost items of vehicles, insurance, road tax, road charges and cost of mandatory vehicles inspection. In addition to those costs, are additional carrier costs the costs of fuel consumption, maintenance and repair costs, staff costs and travel expenses for drivers.

At annual comparison between year 2012 and year 2013 can be concluded that the influence of performance volume changes and unit costs were increased carrier costs in 2013 by the o 9.55%. This percentage value corresponds to the financial value of € 6,620.95 €. Graphical comparison of road performance is shown in Fig. 2, speaks about increasing volumes of driving performance throughout 2013 year. The total period of vehicle operation during calendar year speaks about how many days was the vehicle really in operation, that can be expressed by coefficient of vehicles duty and is an important indicator when are comparing driving performances for single periods.

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REFERENCES

[1] ESCHENBACH, R. Controlling. I.edition. Praga, 2000. ISBN 80-85963-86-8.
[2] FOLTÍNOVÁ, A., KALAFUTOVÁ, Ľ. Intradepartmental controlling. Bratislava : ELITA, 1988. ISBN 80-8044-045-9.
[3] GNAP, J. International road transport. Žilina : University of Zilina v EDIS – Publisher ŽU, 1999. s. 245. ISBN 80-7100-567-3.
[4] HEGEDÜŠ, Tomáš - JANOŠKO, Ivan - POLONEC, Tomáš. Assessment of monitoring Dynafleet system. ISBN 978-80-228-2342-5. Zvolen : Technical University in Zvolen, 2012, s. 93-98.
[5] HUJO, Ľ., JABLONICKÝ, J., TKÁČ, Z., ANGELOVIČ, M., REČKOVÁ, B. Assessment of a transport company in terms of performance utilisation of vehicles. In Acta technologica agriculturae. ISSN 1335-2555, 2013, vol. 16, no.
[6] CHAJDIAK, J. Statistic in Excel 2007. Bratislava : STATIS, 2009. ISBN 978-80-85659-49-8.
[7] KONEČNÝ, V., POLIAK, M. - POLIAKOVÁ, A. Economic analysis of a road traffic. I.edition. Žilina : University of Zilina / EDIS - Publisher ŽU, 2010. s. 279. ISBN 978-80-554-0253-6.
[8] Pencheva V., P. Gagova, H. Beloev, Management of Transport Company Buisness in Accordance with the Policies for Sustainable Transport Development /Управление на дейността на транспортната фирма в съответствие с политиките за устойчиво развитие на транспорта/. EKOLOGICA, godina XVIII, № 63, Beograd, Serbia, ISBN 978-86904721-8-5, 2011, p. 396-400.
[9] POLIAK, M. a KONEČNÝ, V. Ecomincs of Road and Urban Transport. Žilina : University of Zilina v EDIS, 2008. ISBN 978-80-8070-999-0.
[10] SZABÓ, M., - MAJDAN, R. Detection of fuel saving options in truck considering driving style. In Tudományos diákköri konferencia. 1 kiad. 189 s. ISBN 978-963-269-388-0. Tudományos diákköri konferencia. Gödöllő : Szent István University, 2013, s. 156.
[11] SZABÓ, M., - MAJDAN, R., - ANGELOVIČ, M., - ČÁPORA, R. The possibilities of fuel consumption reduction in truck transport. In SED 2013 - Science and higher education in function of sustainable development. ISBN 978-86-83573-39-4.: High business-technical school of Uzice, 2013.
[12] VAŠEK, M., JOBBÁGY, J., RATAJ, V. 2011. Evaluation of time structure of tractor deployment by monitoring system GPS. In: Mechanizace zemědělství. Praha, květen, 2011. s.159-166, ISSN 0373-6776
[13] UHRÍNOVÁ, D., - JABLONICKÝ, J., - HUJO, Ľ., - KOSIBA, J., - TKÁČ, Z., KRÁLIK, M., CHRASTINA, J. Research of limited and unlimited emission effect on the environment during the burning of alternative fuels in agricultural tractors. In Journal of Central European Agriculture online. ISSN 1332-9049, 2013, vol. 14, no. 4, p. 1402-1414,
[14] UHRÍNOVÁ, D., MACKELLAR, L., SCHIESS, I., - JABLONICKÝ, J., - PRÍSTAVKA, M. Operating parameters and emission evaluation of tractors running on diesel oil and biofuel. In Research in agricultural engineering. ISSN 1212-9151, 2011, vol. 57, special iss., s. S35-S42.

[15] ŽIKLA, Anton - KOSIBA, Ján. Brzdové systémy prípojných vozidiel a ich adaptabilnosť. In Moderná mechanizácia v poľnohospodárstve. ISSN 1335-6178, 2012, roč. 15. č. 12, s. 17-20.

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