ANALYSIS OF THE INLAND GOODS TRANSPORTATION AT THE TRANSPORT COMPANY IN SLOVAKIA

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Abstract: *The paper presents an analysis of the transport company undertaking related of used of transport vehicles. Analysis in the inland goods transport in Slovakia and coefficients of time and performance utilization of transport vehicles was performed. Attention is focused on assessment of transportation enterprise according to performance coefficients of transportation enterprises utilization within monitored period of 2010 – 2011.*

Keywords: ROAD-TRAFFIC, VEHICLES, TRANSPORTATION PERFORMANCE

1. Introduction

Transportation in each country is effected by various socio-economical factors, such as demography, land use planning, population level and especially an integration of the country in international trade. All mentioned factors have significant effect on demand and supply of transportation services. Actual condition of major road-traffic infrastructure is characterized with inefficient coverage of the area and inefficient access to highway, respectively expressway network. The time for highway, respectively expressway access is longer than 45 minutes from the third of Slovakian area (Hujo et al., 2013).

Total energy intensity of transportation is an important issue of several economical and ecological discussions for years and is essentially a start point for determination of the amount of produced emission in transportation (HEGEDÜŠ et al., 2012).

According to KONEČNÝ et al., 2010, the utilization of economical categories, proceedings and relations within the management of road transportation enterprises is complicated and challenging task, conditioned with detailed knowledge of enterprise economical structure, with suitable selection of economical coefficient system and with knowledge of relations between operating and economical coefficients. In addition, it is important to understand the links between road transportation enterprise and its economical dependence on external factors – suppliers, consumers, government and financial institutions etc.

The subject of economical research is a transportation enterprise or its section, economical condition, management and economical results. A complex knowledge, the result of realized analyse, will be used for professional decision-making and management of the enterprise. In case, when the economical analyse is based on values of specific coefficients, it could be used as an instrument for diagnostic activity, which exposes an economical health of the enterprise (KONEČNÝ, et al., 2010). Implementing of new elements into the transportation enterprises management could result to a better efficiency of the management system, where controlling can be considered as one of those new elements. The function of controlling is to create a complex system of information about costs and production; economical coefficients, which should evaluate a progress of the enterprise as a unit, even to monitor the functioning of all sectors of the enterprise, which are critical related to management (FÍBEROVÁ, 2001, Szabó et al., 2012, a, b, Štefina et al., 2012).

2. Materials and methods

The effect of time and performance utilization coefficients on performances of road transportation enterprise, achieved annually, will be expressed as an effect of the driving utilization coefficient, wagon stock utilization coefficient, payload utilization coefficient; and the time standard of the loading and unloading.

To express individual coefficients, it is necessary to monitor realized performances within fixed period of time. It is important to start from turnaround time, which is defined by following relation:

$$t_o = t_j + t_{nv} + t_c$$

where:

t_o – turnaround time [h],
t_j – driving time from place of loading to place of unloading [h],
t_{nv} – loading and unloading time [h],
tc – downtimes [h],

Driving time t_j is defined as:

$$t_j = \frac{1}{v_t} = \frac{l_z}{\beta \cdot v_t} \quad [\text{h}] \qquad \beta = \frac{l_z}{1}$$

where:
l – number of travelled kilometres [km],
v_t – technical speed [km.h^{-1}],
β – driving utilization coefficient.

Loading and unloading time is defined based on performance coefficient of wagon stock utilization and coefficient of useful capacity utilization:

$$t_{nv} = q \cdot n_{cv} = K \cdot \gamma \cdot n_{cv} \quad [\text{h}]$$

where:
q – transported quantity [t],
n_{cv} – time standard of the loading and unloading [h.t^{-1}],
K – payload of vehicle [t],
γ – coefficient of vehicle payload utilization.

To determine the performance of the vehicle, respectively wagon stock performance, it is important to determine the number of turnarounds realized within one working day:

$$p_0 = \frac{T_d}{t_0}$$

where:
T_d – daytime of the vehicle operation [h],

The number of turnarounds within monitored period (month or year) is defined based on the relation:

$$p_{oso} = p_0 \cdot VD_{pr} \qquad \alpha = \frac{VD_{pr}}{VD_{cv}}$$

where:
VD_{pr} – operation days of vehicle,
VD_{ev} – evidence days of vehicle,
α – coefficient of wagon stock utilization.

Driving performance travelled within fixed monitored period is calculated by multiplication of number of turnarounds and average distance travelled at one turnaround according to relation:

$$L_{so} = p_{oso} \cdot l \quad \text{[km]},$$

Driving performance travelled by loaded vehicle within monitored period is calculated by multiplication of number of turnarounds and average distance travelled by loaded vehicle at one turnaround according to relation:

$$L_{zo} = p_{oso} \cdot l_z \quad \text{[km]},$$

Loading performance within monitored period is calculated by multiplication of number of turnarounds and average weight of transported vehicle load at one turnaround according to relation:

$$Q_{so} = p_{oso} \cdot K \cdot \gamma \quad \text{[t]},$$

Table 1: *Input data for transportation enterprise assessment based on performance coefficients for year 2010*

Vehicle	Technical speed v_t, km/h	Load weight per year, t	Coefficient of vehicle payload utilization	Time standard of the loading and unloading n_{cv}, h/t	Payload of vehicle K, t	Daytime of the vehicle operation T_d, h	Downtimes t_c, h	Loading and unloading time per year, h
Daf FT XF	85	121.09	0.67	0.30	15.03	10.00	0.50	36.33
Mercedes	90	117.51	0.60	0.35	16.28	10.00	0.50	41.13
MAN	90	116.64	0.93	0.15	10.40	8.00	0.50	17.50
Renault	90	124.12	0.78	0.20	13.30	10.00	0.50	24.82
Volvo	90	114.53	0.73	0.20	13.15	10.00	0.50	22.91

Table 2: *Input data for transportation enterprise assessment based on performance coefficients for year 2011*

Vehicle	Technical speed v_t, km/h	Load weight per year, t	Coefficient of vehicle payload utilization	Time standard of the loading and unloading n_{cv}, h/t	Payload of vehicle K, t	Daytime of the vehicle operation T_d, h	Downtimes t_c, h	Loading and unloading time per year, h
Daf FT XF	85	127.56	0.71	0.30	15.03	9.00	0.50	38.27
Mercedes	90	144.92	0.74	0.35	16.28	8.00	0.50	50.72
MAN	90	121.88	0.98	0.15	10.40	8.00	0.50	18.28
Renault	90	125.75	0.79	0.20	13.30	9.00	0.50	25.15
Volvo	90	114.41	0.73	0.20	13.15	8.00	0.50	22.88

Transportation performance within monitored period, expressed in tkm, is calculated by multiplication of number of turnarounds within monitored period; average weight of transported vehicle load at one turnaround and average distance travelled by loaded vehicle according to relation:

$$P_{so} = p_{oso} \cdot K \cdot \gamma \cdot l_z \quad \text{[tkm]},$$

3. Results and discussion

In our study we focused on assessment of transportation enterprise according to performance coefficients of transportation enterprises utilization within monitored period of 2010–2011. This assessment enables operative monitoring of driving performances within individual months of specific year of 2011, compared to coefficients shown in 2010. MS OFFICE includes a program for calculation of transportation enterprise performances analyse, which consist of following parts:

1. time utilization,
2. performance utilization,
3. absolute coefficients,
4. relative coefficients.

Selected values important for calculation of mentioned coefficients are presented in Table 1 and Table 2.

Based on relations mentioned in a foregoing chapter, the time and performance utilization of vehicles are defined from input data. At transportation enterprise assessment based on time vehicles utilization, it is possible to monitor driving utilization coefficient,

performance of vehicles, driving time from place of loading to place of unloading, number of turnarounds and coefficient of technical service of vehicle. At transportation enterprise assessment based on performance utilization, it is possible to compare driving performances, transportation performances and loading performances of individual vehicles. All mentioned time or performance coefficients are compared monthly or annually. Calculated values are used to assess the correct weight of transported load of individual vehicles, number of operation days of vehicles and number of days of vehicle maintenance.

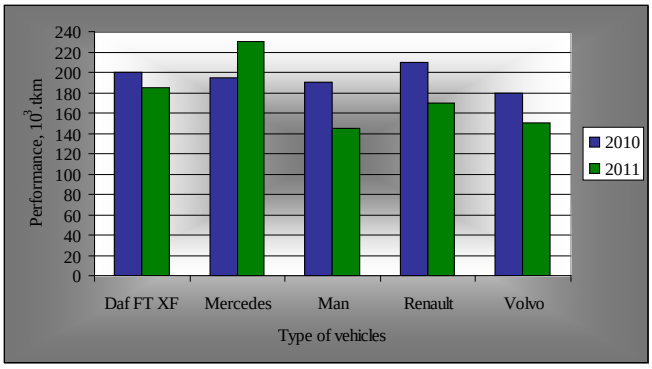

Fig. 1 *Interannual comparison of absolute coefficients of performance utilization of wagon stock based on performance*

Interannual comparison of wagon stock utilization based on performance is presented in graphical form in Figure 1. This coefficient is directly connected to transportation performance, which is defined by multiplication of number of turnarounds; payload of vehicle; driving utilization coefficient and distance travelled by loaded vehicle. As it is shown in graphical form for year 2011, a decrease in performance utilization of vehicles was recorded compared to year 2010. The highest interannual decrease of performance was recorded at Volvo vehicle, 22.6% expressed in percentage. The exception within this coefficient is Mercedes vehicle, which performance increased by 15.3%, caused by increase in travelled distance of transported goods and better utilization of vehicle payload.

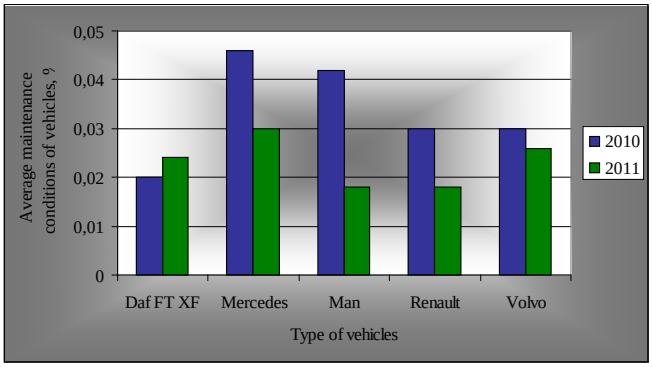

Fig. 2 *Interannual comparison of average maintenance conditions of vehicles*

Technical condition of monitored vehicles effects a total performance of transportation enterprise. Figure 2 graphically presents an interannual comparison of average maintenance condition of vehicles, which showed significant deviations within monitored period. Based on that, it is possible to allege, that the costs for maintenance and service increased within monitored period. The highest increase of economical costs for maintenance was recorded at Mercedes vehicle.

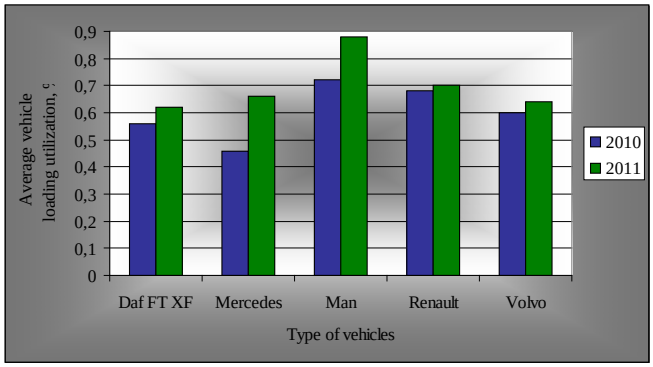

Fig. 3 *Interannual comparison of coefficient of average vehicle loading utilization*

Figure 3 presents interannual deviations in average vehicle loading utilization in monitored period, where average vehicle loading increased in year 2011, resulting in increase of efficiency and performance of transportation enterprise.

4. Conclusion

As in other sectors of national economy, even in transportation is necessary to secure most effective utilization of human and material sources. Based on realized analyse of transportation enterprise related to his performance, it was possible to assess an interannual comparisons of selected coefficients. Based on data processed by statistical methods, it is possible to draw necessary measures to increase the performances of transportation enterprise. It is possible to allege, that following coefficients have the most significant effect on an increase of monitored transportation enterprise performance: number of travelled kilometres with loaded vehicle, optimal utilization of vehicle payload and the time of vehicle maintenance.

5. Acknowledgement

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