Transport and Communications, 2013; Vol. I.
ISSN: 1336-7676

Optimization of Fuel Costs Using the Information System

Dušan Halaj[1]

[1] University of Žilina, Faculty of Operation and Economics of Transport and Communications, Department of Road and Urban Transport, Žilina, 010 01, Slovakia

Abstract The paper deals with optimizing fuel consumption through the use of information system in road freight transport. The aim is to calculate and compare the costs for an operation with the information system as well as without it.

Keywords Information System, Semi-Trailer, Fuel Costs

JEL L91 - Transportation: General

1. Introduction

The road freight transport market can be characterized as a market with a high degree of competition. On this type of market, only the carriers that efficiently manage available resources have a chance to succeed. This means that they are able to effectively operate their fleet (vehicle fleet) and optimize their costs. Carriers try to minimize their operating costs to the lowest level while keeping a quality of services provided. Various cost items can be optimized in a transport company but attention should be paid mainly to the fuel costs which are the highest cost item in road freight transport. Fuel costs account for about 40% of the total costs. Therefore, it is necessary to monitor and optimize this cost item. Fuel costs can be optimized in different ways:

- fuel consumption reduction through better driving techniques,
- refuelling outside of highways,
- refuelling at petrol stations and in countries where the fuel prices are lower,
- using vehicles with lower fuel consumption on longer distances.

2. Functions and price of information system which is necessary for controlling and monitoring fuel consumption

The factors such as a poor technical condition of the vehicle and a bad driving technique can have an impact on increasing fuel consumption. In most cases, a poor driving technique is the most common negative factor. The carriers can monitor the fuel consumption of individual vehicles as well as a driver's activity during transportation using functions of appropriate information systems. Introducing the information system, the carriers are able to identify which of drivers and vehicles demonstrates over-consumption due to a bad driving technique. The price for such functions of the information system is approximately 25 €/month and the carriers do not need to install any additional hardware in vehicles. Purchasing the information system, the carriers obtain functions as follows:

- tracking and tracing – it is used to determine the vehicle position in real time,
- processing the working time of a driver,
- data processing of driving, fuel consumption and driver's identity,
- integrating all the data to a centre.

3. Data processing of driving, fuel consumption and driver's identity

Data processing of driving, fuel consumption and a driver's identity is a service offering information about fuel consumption for a given vehicle during particular carriage, average consumption for the entire journey or its individual sections and overall average fuel consumption of the vehicle. Furthermore, the service is used for transmission of important information about riding, a driver, and vehicle. The output may be a graph with a percentage representation of consumption.

The output can also be a report about a vehicle performance for a certain time period. The dispatcher can monitor:

- **report about fuel consumption** where the fuel consumption for the total time of the vehicle operation is recorded; there is also shown how much fuel was consumed during the vehicle running at idle,
- **performance** indicating the average fuel consumption in liters per 100 km, average fuel consumption for a journey, average speed, total distance travel, average axle load, and average number of stops per 100 km (the more stops, the higher fuel consumption),
- **driver's behaviour** where the driver's impact on vehicle fuel consumption is evaluated. The output is the per-

centage of the total time, when the driver went faster, which consumption is above average; how much time the driver travelled at high engine speed; how many times the driver had to brake sharply; how many hours from the total driving time the driver went at idle, how many kilometres the driver travelled using cruise control; and how many hours the driver was driving economically.

Based on above mentioned, the carriers have information about individual drivers with bad driving techniques and thus they can alert a particular driver to the areas where he makes mistakes. The mentioned information may also help drivers whose fuel consumption is at the required standardized level to improve their driving technique and skills. In this way, the fuel consumption can be reduced by 5 %.

4. Cost comparison before and after an introduction of the information system

The costs invested by carriers into the information system should not be higher than savings achieved by the carriers when using the information system. In addition to reducing the consumption, the carriers can also obtain further functions by purchasing the information system. Based on average costs shown in Table 1, it is possible to calculate cost savings when using the information system in €/km and /year; the method used is the calculation with classification of costs on fixed and variable costs.

Table 1 – Average costs €/year a data for the articulated vehicle

Fuel costs – 42 500
Oil costs – 800
Tires costs – 2 500
Maintenance, repair and treatment (M, R and T) – 5 950
Wages with levies – 14 000
Travel compensation (TC) – 7 000
Heating vehicle costs (HV) – 495
Coefficient of drives utilization – 0,80
Other direct costs (ODC) – 5 200
Depreciation of vehicle – 13 500
Overhead – 7 000
Toll – 12 000
Driving performance - 110 000 km
Time of operation – 3 000 h/year
Technical speed – 55 km/h

The following tables (Tab.2, Tab. 3, and Tab.4) contain the calculated costs in €/km and €/h of the operational downtime (idle time) in situations before and after the introduction of the information system. Using the information system, it was possible to reduce fuel costs by 5 % or 0.5 %; however, there is a need for an increase in costs due to the monthly fee for the information system.

Table 2, 3, 4 – Comparison of charges during the utilization of individual information systems

	Costs	*Without IS*	
Item	**€/year**	**C_{km}(€/km)**	**C_h(€/h)**
Fuel	**42500**	**0.3864**	-
Oil	800	0.0073	-
Tires	2450	0.0223	-
M,R and T	5950	0.0541	-
Toll	12000	0.1091	-
Wages	14000	0.0848	4.67
TC	7000	0.0424	2.33
Levies	13500	0.0818	4.5
ODC	5200	0.0315	1.73
HV	495	0.003	0.17
Overhead	7000	0.0424	2.33
Fee		-	-
Total		***1.0814***	***15.73***

	Costs	*IS and consumption -5%*	
Item	**€/year**	**C_{km}(€/km)**	**C_h(€/h)**
Fuel	**40375**	**0.367**	-
Oil	800	0.0073	-
Tires	2450	0.0223	-
M,R and T	5950	0.0541	-
Toll	12000	0.1091	-
Wages	14000	0.0848	4.67
TC	7000	0.0424	2.33
Levies	13500	0.0818	4.5
ODC	5200	0.0315	1.73
HV	495	0.003	0.17
Overhead	7000	0.0424	2.33
Fee	**300**	**0.0018**	**0.1**
Total		***1.0595***	***15.83***
Cost savings by reducing consumption by 5%			***2406 €/year***

DOI: 10.26552/tac.C.2013.1.1

	Costs	*Consumption -0.5%*	
Item	**€/year**	**C_{km}(€/km)**	**C_h(€/h)**
Fuel	**42287.5**	**0.3844**	-
Oil	800	0.0073	-
Tires	2450	0.0223	-
M,R and T	5950	0.0541	-
Toll	12000	0.1091	-
Wages	14000	0.0848	4.67
TC	7000	0.0424	2.33
Levies	13500	0.0818	4.5
ODC	5200	0.0315	1.73
HV	495	0.003	0.17
Overhead	7000	0.0424	2.33
Fee	**300**	**0.0018**	**0.1**
Total		***1.0813***	***15.83***

5. Conclusions

Based on the calculated costs it can be stated that if carriers reduce fuel consumption on average by 5 % per each vehicle, the savings achieved will be significantly higher than the costs associated with the use of the information system. The carriers would achieve costs of 1.0814€/km without the information system and fuel cost reduction. On the other hand, the carriers can reduced their costs by 1.0595 €/km when using the information system. This represents savings of 2 406 €/year. The following data shows that if carriers save 0.5 % of fuel costs, the costs on the information system will be approximately compensated by savings achieved from the fuel consumption reduction. Moreover, by purchasing the information system, the carriers can obtain other functions that might help in business. If the carriers have different inputs, the values will vary.

The following Figure 1 shows the cost savings in €/km when using the information system and reducing fuel consumption by 5 % and 0.5 % per each vehicle.

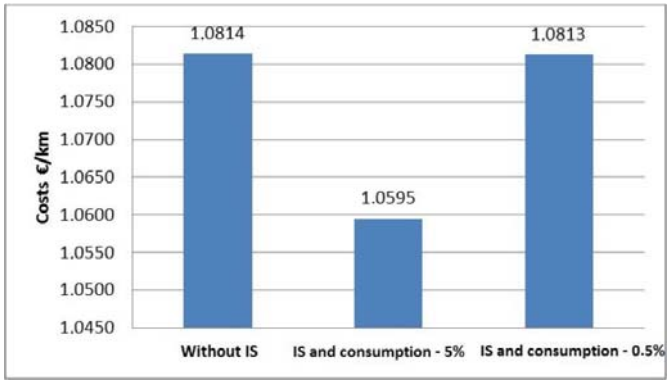

Figure 1. – Comparison of costs in €/km within the fuel consumption reduction

The following Figure 2 shows the cost savings in €/year when using the information system and reducing fuel consumption by 5 % per each vehicle.

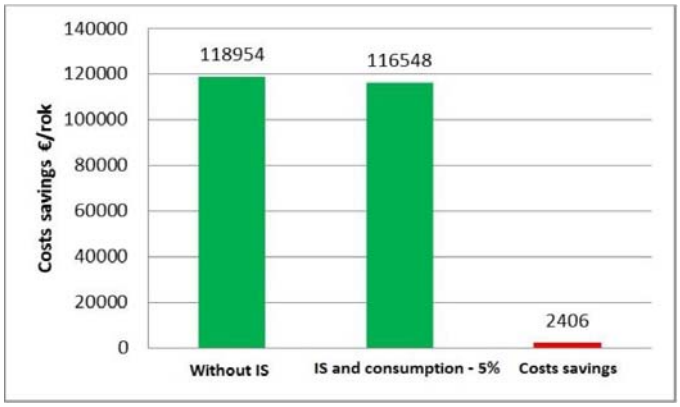

Figure 2. – Comparison of costs in €/year within the fuel consumption reduction

ACKNOWLEDGEMENTS

This paper was developed under the support of project: MŠ SR VEGA č. 1/0144/11 POLIAK, M.: Vplyv zmeny kvality poskytovaných služieb verejnej hromadnej osobnej dopravy na zvyšovanie jej konkurencieschopnosti vo vzťahu k individuálnemu motorizmu

REFERENCES

[1] GNAP, J. - KONEČNÝ, V. - POLIAK, M.: Aplikácia informačných systémov v cestnej doprave; Žilinská univerzita v Žiline/EDIS - vydavateľstvo ŽU; 2007

[2] GNAP, J.: Kalkulácia vlastných nákladov a tvorba ceny v cestnej doprave 3. vydanie; Žilinská univerzita v Žiline/EDIS - vydavateľstvo ŽU; Žilina; 2006

[3] internal resources IVECO Žilina