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METHODS OF REDUCING THE COSTS OF PROVIDING TRANSPORT SERVICES

In the face of rising operating costs and dynamic changes in the transport industry and road transport companies are looking for effective methods of optimizing expenses. The aim of this article is to identify and characterize the directions of activities and methods of reducing the costs of providing transport services. This study used an analysis of the literature on the subject, a case study, an analysis of company documentation and questionnaire interviews with the company owner and drivers. The results indicated key areas requiring optimization, including fuel consumption, vehicle depreciation and driver work organization. Specific cost-reducing actions were proposed, such as fleet modernization, implementation of telematics systems, driver training, use of fuel cards, regular vehicle servicing and proper outsourcing. The analysis of the implementation of these solutions showed their positive impact on the company's profitability.

Introduction

The transport industry plays a key role in the global economy, enabling the efficient distribution of goods and providing the necessary connections between producers and consumers. In the context of the modern market, effective cost management is becoming a key element of business strategy. Companies are looking for innovative solutions and strategies that will allow them not only to minimize costs but also to improve the quality of services and increase customer satisfaction. The topic of reducing the costs of providing transport services is particularly relevant in the face of a dynamically changing business environment. Companies in this industry face challenges related to rising fuel prices, regulatory changes and growing customer expectations in terms of speed and reliability

of deliveries. From the perspective of transport companies, cost reduction has become a key issue aimed not only at maintaining competitiveness, but also ensuring the profitability of the business. Currently, due to, among others, the war in Ukraine, the still affecting effects of the pandemic, inflation and changes in regulations, the situation of the TSL (Transport, Shipping, Logistics) industry has deteriorated significantly [1].

The main research problem of the article is to identify effective cost reduction methods in companies providing transport services in the TSL industry and to assess their impact on the company's operations. The research questions are as follows:

– What are the main cost components in transport companies?
– What cost reduction methods are used by transport companies?
– What are the benefits and challenges associated with implementing individual cost reduction methods?

Despite good development prospects and strategic importance, the TSL industry is currently facing a number of challenges caused, among others, by the introduction of new technologies, global crises or aspects related to sustainable development [2].The main problems include the rising costs of doing business, including in particular unstable fuel prices, the growing importance of ecological issues related to transport, global political uncertainty and the shortage of professional drivers on the labor market.

When choosing a partner for cooperation in the field of transport, companies are guided by three basic criteria: price, time and safety. The total cost of a transport service is very often the most important issue in decision-making [3]. The transport services market is characterized by a large number of entities, and consequently strong competition, where the price of the service is very often a factor where companies see their advantage over competitors. At the same time, each company strives to achieve the highest possible profits from its activities. In such a situation, the identification of the costs of providing services and their minimization is essential for the proper functioning of companies in the transport industry.

2. Literature review

Transportation costs are an important component of the expense structure of companies operating both in the logistics industry and in transportation companies themselves. Understanding and accurately identifying the components of transportation costs are key to effective management and streamlining transportation

operations. In an era of increasing competition and rising fuel and service prices, the ability to analyze and control costs becomes particularly important for staying in business and developing further strategies for business growth.

The total cost of conducting transport activities consists of various elements, the size of which largely depends on the specifics of the company and the services it provides. As in other branches of the economy, costs can be classified according to various division criteria. The basic criteria for their classification may include [4]:

– type of costs (depreciation, consumption of materials and energy, taxes, salaries, employee benefits, third-party services and other generic costs;

– dependence on the size of the business (fixed and variable costs);

– allocation of costs to services (direct and indirect);

– structure of costs (simple and complex);

– type of operating activities (primary, auxiliary and management);

– area of activity (purchasing, production and sales);

– place of cost generation (operating departments, separate teams and specific workstations).

In practice, a universal and frequently used cost division is based on the three basic cost groups including: depreciation, material consumption and remuneration [5]. Other sources additionally distinguish between remuneration charges, taxes, external services and other costs [6]. Depreciation consists on spreading the cost of purchasing a fixed asset over its useful lifetime. It means the progressive loss of value of a fixed asset that wears out over the years [7] and in a transport company this mainly concerns costs related to cars and trailers. Material and energy consumption includes fuels (petrol, diesel oil, gas, electricity and adblue liquid), spare parts and consumables (tires, oils, filters, brake system parts) and other resources used in offices and various types of facilities related to this activity.

Within the type system, further cost divisions can be made [8]. In transport companies, the division into fixed and variable costs can be particularly useful. Fixed costs are those that are not dependent on the volume of production, and in the case of a transport company, on the number of kilometres travelled or loads transported. This group includes depreciation, basic salaries, insurance and some taxes. It should be noted that these costs are fixed only for a specified period, because, for example, the amount of taxes may change as regulations change. Variable costs, on the other hand, increase with the increase in the amount and distance over which loads are transported. More kilometres travelled means higher fuel consumption, tyres usage or road tolls.

Another way to identify the components of costs in trucking companies is the costing system [9]. In this case, costs are divided into direct and indirect. The former are those that are directly related to the service produced and without them the performance of the service would not be possible, these include fuel costs, driver salaries or vehicle depreciation. Indirect costs, on the other hand, are for example expenses for training, management costs or costs of office supplies which are not strictly related to the service provided.

Total cost analysis allows transport companies to determine the unit cost of production which in cargo transportation can be expressed, for example, as the cost of driving one kilometer of route (hauler kilometer). This value makes it possible to estimate at what minimum freight rate a company should undertake a given order so that it is profitable and makes a satisfactory profit.

Understanding costs and the factors affecting them allow companies to better plan and improve operations. Effective management of transportation costs can lead to significant savings and improved competitiveness in the market. Regular monitoring and analysis of individual cost components is essential to maintain profitability and ensure the long-term success of the company.

The literature provides many examples of solutions that allow transport companies to reduce their costs. The first group of such solutions includes organizational methods such as outsourcing or benchmarking.

According to Matejun [10], outsourcing is a management method that involves limiting the scope of tasks performed directly by the main company and transferring their ongoing handling to external business entities. In the transportation industry, companies most frequently outsource accounting services, IT system administration, vehicle maintenance, and driver training.

Benchmarking, on the other hand, is a management method that involves comparing the company with other companies operating in the same area and adopting their best practices and models [11].

Actions related to transport process planning may prove to be extremely important for these purposes. The proper selection of means of transport suited to needs, maximum use of cargo space, and route planning that takes into consideration the elimination of empty runs are some of the methods of improving the transport process that can contribute to cost reduction.

An example of such a method is route optimization, one representation of which is the traveling salesman problem. This is a problem in which the goal is to find the shortest or fastest possible route that will allow the driver to visit each of the planned points on the route exactly once and return to the starting point. [12].

Directly related to route planning is the problem of empty runs. Access to transport exchanges allows to increase the number of available loads, which facilitates route planning so that the share of empty runs in transport is as small as possible. For example, Transmetrics boasts that using their platform has enabled logistics companies to reduce the number of empty runs and lower the associated costs by more than 20% [13].

Another method of reducing transport costs is cargo consolidation which is the process of combining smaller shipments from different senders or destined for different recipients into one larger transport. An example of such an activity and its effects were presented in a publication by Łukasik, Kuśmińska-Fijałkowska, Kozyra, and Olszańska [14], where transport costs were reduced by over €540 per week.

Therefore, IT tools such as Goodloading, EasyCargo and LOGGY, which assist in the proper distribution of goods in the cargo space, prove to be helpful for transport planners. Their basic functions include: calculating the use of cargo space, proper distribution of loads in a specific means of transport, the ability to coordinate activities by individual cells in the process and controlling the axle load of individual vehicles [15].

The biggest cost for transport companies is fuel, which is why authors of publications usually pay the most attention to it. Companies think about minimizing fuel consumption as early as the vehicle purchase stage. Therefore, when designing new vehicles, tractor unit manufacturers must take into account the needs of customers who expect their vehicles to generate the lowest possible operating costs. An example of this is the truck manufacturer Renault Trucks, which introduced, for instance, the Renault Optifuel Lab 2 program. It involved testing a technologically advanced truck prototype designed to reduce fuel consumption. The set, consisting of a tractor unit and a semi-trailer, implemented 20 solutions that addressed four main aspects that have a significant impact on fuel consumption, namely energy management, aerodynamics, rolling resistance and driver assistance systems [16].

In their publication, Zubrycka and Simiński [17] point to several areas that support fuel consumption management, including: the use of cruise control systems that can predict road topography, the use of speed limiters, reducing air resistance, achieving greater engine torque at lower revs, selecting the right vehicles for the job, training drivers to improve their driving style and monitoring the technical condition of vehicles. Researchers point out that there are a number of factors that affect fuel consumption and, consequently, its costs. For example, increasing the

weight of a vehicle by 1 ton results in up to a 2% increase in fuel consumption and driving on expressways at 90 km/h results in approximately 12% higher fuel consumption compared to driving at 80 km/h.

Due to their size, truck trailers generate significant air resistance. However, with the use of appropriate covers and spoilers, airflow can be improved, thereby reducing fuel consumption for the entire transport set. Representatives of ZF have prepared an article in which they describe the solutions offered by the company to improve the aerodynamics of semi-trailers and list the benefits of their use [18] The key elements that improve the aerodynamic properties of semi-trailers are:

– TrailerSkirt - side aerodynamic covers with a length of 3 to 4.5 meters;
– OptiFlow SideWings - aerodynamic side skirts mounted along the sides of the semi-trailer, ranging from 7 to 10 meters in length;
– Flow conductor, a vertical wing-shaped element that improves airflow under the chassis;
– Optiflow Tail, an aerodynamic rear spoiler that directs air behind the semi-trailer.

OptiFlow SideWings combined with OptiFlow Tail rear spoilers reduce fuel consumption by 2.2 l/100 km. With fuel prices at €1 per liter, the investment in these technologies pays for itself after 220,000 kilometers. On the other hand, the use of shorter TrailerSkirt covers with Flow Conductor and OptiFlow Tail 68 rear deflectors offer slightly lower savings of 1.5 l/100 km, but pay for themselves faster, after just 150,000 km.

Other factors also affect fuel consumption, one of which is tire pressure. Maintaining too low a pressure increases rolling resistance and, consequently, fuel consumption. In addition, this reduces the durability of the tires which in turn accelerates their wear and tear and reduces safety by impairing the vehicle's handling and increasing its braking distance. Sources indicate that a pressure drop of 0.5 bar increases fuel consumption by 2 to 5 percent, depending on the vehicle. In a truck, a pressure drop of 0.2 bar increases consumption by 1.5%. Studies also show that operating tires with a pressure 20% lower than the manufacturer's recommendations shortens their service life by as much as 30% [19].

Telematics systems can play a significant role in minimizing fuel costs by reducing fuel consumption. Individual modules of such systems allow for the control of numerous parameters, such as fuel consumption, vehicle speed, braking, idling, cruise control use, and acceleration. For example, the TeleMatics system

generates reports for individual vehicles and drivers which include data from the following modules [20]:
– fuel consumption module;
– speed profile module;
– rotational speed module;
– braking module;
– engine braking module;
– cruise control module;
– idling module;
– accelerator pedal position module.

The data from each of these modules provides a comprehensive picture of the driver's driving style and mistakes. Their analysis provides information on whether the driver performed their duties properly. The authors point out that in the company studied, the use of a telematics system made it possible to identify dishonest practices by drivers, such as deliberately lengthening routes or stealing fuel. The introduction of improvements also resulted in a reduction in fuel consumption by Renault Magnum tractors from approximately 36 to 29-31 liters of fuel per 100 kilometers, and by MAN tractors from approximately 34-36 to 28-30 liters of fuel per 100 kilometers.

Data from telematics installed in vehicles can also be used to identify the problem of a high percentage of idle time. This is the time when the vehicle's engine is running without performing any work. Monitoring data from 38 dump trucks for the mining industry revealed that an average of 48% of total operating time was spent idling. This amounted to over 20,000 hours which is a very large amount, as the average fuel consumption when idling is 2.57 liters per hour. After introducing solutions such as assigning individual ID cards to each driver connected to the system, making operators aware of the importance of the problem, introducing standards for engine idling time and a system of penalties and rewards for results, a significant improvement was observed. Analysis of data from the Scania Fleet Management system showed that after the implementation of corrective measures, an average of 39.5% of the total vehicle operating time was unjustified idling, compared to 48% previously. This is a reduction of more than 3,600 hours which translates into approximately 9,300 liters of fuel per month [21].

Currently, the development of artificial intelligence also allows it to be used to improve the transport process. One of the solutions using artificial intelligence is route planning. An example of a company that uses artificial intelligence is the

Lithuanian carrier Girteka. The use of AI Planner and AI Operator tools in road transport planning has a positive impact on fleet utilization, transport time and CO_2 emissions [22]. The implementation of AI-based solutions allows the company to streamline time-consuming tasks previously performed by humans, such as finding the fastest time to reach a destination or minimizing route length. These tools will allow the company to focus on individual customer needs or unforeseen situations which will have a positive impact on the quality of services provided and customer satisfaction.

Another example is UPS company which uses AI technology to plan routes for drivers in order to reduce the number of left turns in congested areas which is intended to shorten delivery times. FedEX also integrates data from navigation, vehicle computers and historical traffic patterns to create the best routes for its couriers. With the help of AI-based solutions, UPS claims to have increased mileage efficiency by over 100 minutes per year and FedEX claims to have reduced mileage by 6.6 million miles per year [23].

3. Methodology

The article uses a critical review of the literature on the subject, carried out in order, among other things, to identify the main concepts and directions of activities aimed at reducing the cost of providing transportation services which is the essence of achieving the purpose of this article.

The method of analyzing and critiquing the literature in this article was used to determine the current state of knowledge about the cost of operating transportation companies and provided a basis for further research into the identified problem.

The next stage of the research used the case study method which allows for a detailed examination of a specific case which here is a transportation company. Combined with other methods, the case study provided detailed empirical data that was analyzed and helped find a solution to the problem.

The document examination technique was based on the use of information and data contained in the relevant documents. Document analysis consisted of conducting quantitative as well as qualitative analysis of their contents. In turn, the questionnaire interviews conducted with the employees of the company under study were an important complement to the case study, as they made it possible to obtain detailed information not available from other data sources.

The case study carried out in this way, together with the complementary techniques of document research and questionnaire interviews, made it possible to identify the main areas of cost generation related to the provision of transportation services, including the unjustified ones. The study made it possible to identify cost reduction methods already in use at the transport company, as well as those whose implementation could prove reasonable and cost-effective for the company under study in order to ensure that it is profitable and generates a satisfactory return.

4. Discussion

The company selected for the study is a small family-owned transportation company specializing in domestic freight transportation. Its activities are classified under PKD code 49.41.Z which stands for road transport of goods. The company was founded in 2015 and has been gradually developed by the owner since then. Service recipients are mainly domestic freight forwarding companies and logistics operators operating in the TSL industry for which the described company is a subcontractor. In addition, the company also provides services directly to customers in the FMCG (Fast Moving Consumer Goods) industry, the construction industry providing transport services throughout the country.

Currently, the company has 11 employees and, due to its size, it does not have a complex organizational structure. The key group of employees is, of course, professional drivers. There are currently 9 drivers, ranging in age from 24 to 58, and each of them has a C+E category driver's license and a completed course for the carriage of goods, and thus a certificate of professional qualification, which allows them to perform their profession.

The company has a diversified transport fleet, consisting of truck tractors and semi-trailers. Currently, the company has 10 Scania truck tractors, with production years ranging from 2006 to 2018. The fleet consists of various models from this manufacturer, varying in terms of cab size, equipment, appearance and, especially importantly, technical parameters.

In order to find specific solutions to reduce the costs of the studied transport company, it is necessary to understand what costs are generated by this activity. Accordingly, the cost structure was analyzed first which made it possible to identify the areas generating the greatest expenses.
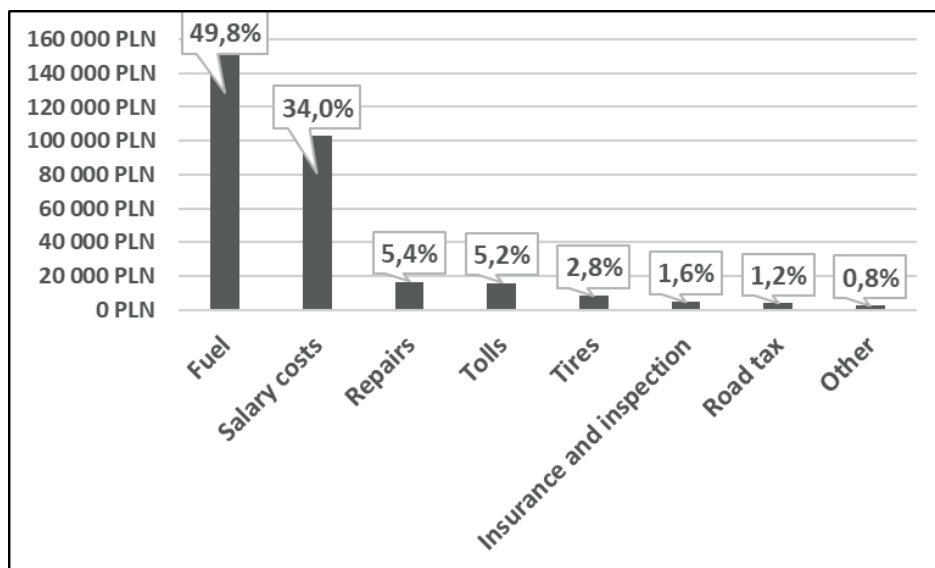
Figure 1. Average share of individual costs related to the operation of a transport set in 2023 in the surveyed enterprise

The data collected made it possible to note that each of the transport sets studied differs to some extent in the costs generated. These differences are due to the characteristics of the vehicles, the specifics of the work performed and a number of other factors. For this reason, an average for each cost group was calculated from the collected data. Based on figure 1, it can be concluded that fuel has by far the largest share in the cost structure, accounting for 49.8% of total costs and amounting to 150 764 PLN, indicating the dominant role of fuel in transportation activities. Salary costs are the second largest cost component, with a share of 34% and a value of 103 004 PLN.

The remaining costs already contribute much less to the total. The annual cost of insurance and inspections amounted to almost 5 000 PLN and road tax for the truck tractor and semi-trailer to 3751 PLN. In total, these two categories gave 4.4% of the total costs and there is very minimal potential for reduction here, since these are fixed costs and their values do not depend on the company. Repairs, tolls and tire replacement expenses account for 5.4%, 5.2% and 2.8%, respectively, of the total identified costs of operating the transport set. Although these values are significantly lower than fuel or wages, it is still necessary to look for possible improvements here.

According to the data collected from the company's surveyed records, in 2023 the average annual mileage of the 5 analyzed vehicles was about 103 000 kilometers. Thus, the highest costs incurred per kilometer were for fuel and drivers' salaries and amounted to 1.46 and 1 PLN/km, respectively. The next cost groups were repairs and tolls at 0.16 and 0.15 PLN/km. On the other hand, the costs of tires, insurance, inspections and road tax were already significantly lower, reaching 0.08, 0.05 and 0.04 PLN/km, respectively.

Another important aspect is the comparison of average vehicle operating costs depending on the year of production, as the company has both older and newer tractor units. The aim of the comparison is to understand how the age of the vehicle affects its operating costs over the years and to indicate possible savings related to the choice of newer vehicles.

The costs of tires remain unchanged, which wear out to the same extent regardless of the year of production of the vehicle and the amount of road tax, which is also not dependent on the vehicle's year of production.

Vehicles manufactured before 2006 are characterized by an average fuel cost of 1.52 PLN/km, while vehicles manufactured in the years 2007-2017 are 1.38 PLN/km. This means that newer vehicles are characterized by lower fuel consumption, thanks to the development of technology by manufacturers. The cost of repairs in older vehicles amounted to 0.21 PLN/km, and in newer ones 0.09 PLN/km. Newer vehicles are cheaper to maintain in terms of repairs, which is a direct result of their lower level of wear and tear and consequently lower failure rate. Taking into account fuel and operating costs, newer vehicles show savings of 0.25 PLN/km which is a significant difference.

The next stage is a cross-sectional analysis of data collected during interviews with drivers, including both closed and open-ended questions. The aim of this analysis is to find possible differences in the assessments of factors influencing fuel consumption depending on age, professional experience and length of service in the company. Drivers were divided into two groups depending on age, experience and length of service, as shown in table 1 which contains an assessment of the impact of each of the twelve factors on the fuel consumption of vehicles on a scale of 1 to 10.

Table 1. Cross-sectional analysis of interviews with company drivers

Factor evaluated:	Age		Experience in the profession		Seniority in the surveyed company	
	Up to 37* years	Over 37 years	Up to 10 years	Over 10 years	Up to 3 years	Over 3 years
Driving style	8,2	9	8,2	9	8,3	8,8
Driving speed	6,2	7	6,0	7,25	5,3	7,6
Driver experience	5,2	7,25	5,4	7	4,8	7,2
Model of truck tractor	7,8	8	7,6	8,25	7,8	8
Type of semi-trailer	4,2	5,5	3,8	6	3,8	5,6
Technical condition of the vehicle	7,6	8,5	7,2	9	7,3	8,6
Tire pressure	6,0	7	5,6	7,5	5,3	7,4
Weather conditions	6,4	6,75	6,0	7,25	6,3	6,8
Driving in city traffic	7,2	8,5	7,0	8,75	7,0	8,4
Time of day	3,8	5,25	3,8	5,25	3,5	5,2
Engine idling time	3,2	5	3,6	4,5	3,3	4,6
Load weight	7,8	9	7,6	9,25	7,8	8,8
Average	6,1	7,2	6,0	7,4	5,8	7,3

*- Median of the studied population.
Source: Authors' own work on the basis of research results.

Regardless of the groups, the vast majority of factors are rated similarly, suggesting that drivers' overall perceptions of the impact of individual elements on fuel consumption are similar. Each time, regardless of age or experience, the same five factors were considered the most important and these were: driving style, tractor-trailer model, vehicle condition, city driving and load weight. At the same time, a general trend can be observed among more experienced drivers with more years of experience, for whom each factor is of higher importance than in younger drivers. Drivers with up to 10 years of experience in the profession on average rated all factors at 6, while the group of more experienced drivers on average rated the importance of all factors higher by 23%, at 7.4. This may be due to the greater experience of older drivers and their greater awareness of the impact of various aspects on fuel consumption. The biggest differences between drivers with less than 10 years of experience and those with more experience can be seen in the type of trailer (3.8 to 6), tire pressure (5.6 to 7.5) and driving in city traffic (7 to 8.75).

In turn, in open questions, a clear influence of the driver's age, experience and seniority in the surveyed company on their answers was already observed. This is particularly visible in the question about the justification for introducing training in economic driving, where mainly younger and less experienced drivers were more likely to express interest in such a solution, while more experienced drivers suggested that their knowledge in this area was already sufficient. 100% of drivers with less than 10 years of professional experience believe that introducing training in economic driving is necessary and could bring benefits in lower fuel consumption, while in the group of more experienced drivers only 2 out of 5 drivers have the same opinion.

In addition, as actions that could reduce costs in the company, the younger part of the surveyed group indicated mainly solutions such as the implementation of telematics systems monitoring vehicle parameters and vehicle modernization, while the group of older drivers paid attention mainly to maintaining vehicles in good technical condition and better route planning taking into account the reduction of urban sections. In the age group up to 37 years, 4 out of 5 interviewed drivers working in the surveyed company mentioned vehicle modernization as actions aimed at reducing costs and 3 out of 5 the implementation of telematics systems, while in the second group only 1 driver paid attention to these two solutions. In turn, 3 drivers over 37 years of age paid attention to maintaining vehicles in good technical condition, and 2 to better route planning, also only in the group of older respondents. To sum up, older drivers indicate more traditional

methods of reducing costs and younger drivers to innovative methods using currently available technology.

Possible methods of reducing the costs of providing transport services can be divided into 3 groups:

– methods already used in the company
– methods which the company does not use, but their implementation is reasonable
– methods that are inappropriate for the company being examined.

Some cost reduction methods were considered inappropriate for the company being examined and these are: route optimization, reduction of empty runs, cargo consolidation, investment in AI solutions. For example, the problem of route planning is almost non-existent in the described case study. The traveling salesman problem most often concerns a situation in which the driver has to deliver cargo to a dozen or so to several dozen points and then the algorithms find such a route so that the total mileage of the car is as low as possible. Routes with such specificity are characteristic of local distribution and couriers. However, the analyzed transport company implements routes in which there is most often 1 loading point and 1-2 unloading points.

Methods such as outsourcing, regular vehicle servicing and the use of fuel cards are practices already used by the transport company in question, as the company's owner emphasized in an interview. The first of these is outsourcing, which is the delegation of specific tasks to external companies. In the case of the transport business, this offers the possibility, among other things, to reduce fixed costs resulting from the employment of specialists. In the case described, according to information obtained through a questionnaire interview with the owner of the company, the tasks outsourced are accounting and human resources, as well as vehicle maintenance and repair. The handling of taxes, Social Security settlements and salaries is carried out by an accounting office instead of hiring a full-time accountant. Instead of maintaining its own workshop, the company uses the services of specialized service centers, eliminating the need to have its own workshop and hire mechanics.

Currently, the company, in order to keep repair costs to a minimum, is trying to take care of the technical condition and regular maintenance of its fleet. In an interview, the company's owner stressed that the company pays special attention to the systematic replacement of oil along with filters in its fleet of vehicles and that some vehicle components such as the clutch or turbocharger are replaced

as a precautionary measure against possible failure. Replacing such vehicle components as the clutch or turbocharger every 400 000 – 600 000 kilometers or so, depending on the model of the vehicle, based on the owner's experience, contributes to reducing overall costs, since if such a failure were to occur en route the costs of repair and disruption to supply would be incomparably higher.

On the other hand, the fuel card system used by the company in is a quick and almost cost-free solution, since the fees are limited only to issuance fees of about 50 PLN for 1 piece. The use of fuel cards allows for fuel discounts. For example, a discount of 10 cents per liter when a vehicle burns 30 liters per 100 kilometers and has an annual mileage of 100 000 kilometers will result in a savings of 3000 PLN. In addition, there is the benefit of a system that will allow you to track and analyze fuel expenses for individual vehicles. It is crucial, to choose the right supplier with a large number of partner stations located throughout the country.

The implementation of new solutions aimed at reducing costs in the company under review requires careful identification of aspects such as implementation time, implementation costs, those responsible for the process, as well as the potential benefits and challenges of implementation. The first proposed solution is driver training, which is an investment that can lead to a 5 to 10 percent reduction in fuel consumption, depending on the driver's current skills. With an average fuel price in 2024 of 4.9 PLN per liter, fuel costs per vehicle could be reduced from 7000 to more than 14 000 PLN per year. With correct driving techniques, key vehicle components will be less stressed, prolonging the life of wear parts. Critical to successful implementation is the selection of the right training provider and convincing drivers of the validity of receiving training and applying the knowledge gained there in their daily work. The expected cost of such training for 1 driver is about 1000 PLN, to which should be added the lost revenue due to vehicle downtime amounting to an estimated 1000 PLN as well.

Implementing a low-burn bonus system is also a good way to motivate drivers to drive more economically and reduce fuel costs. The premise of the system is to finance bonuses for drivers from the savings achieved from their achieving lower fuel consumption standards. There is a lot of wage pressure in the industry due to the shortage of drivers in the labor market, and by reducing fuel consumption, the company could provide drivers with higher wages. What is needed is a transparent and fair bonus system, accurate monitoring of fuel consumption and communication with drivers about the goals and rules of the bonus system.

Modernizing a fleet is a strategic decision that requires significant financial and organizational investment. With modern vehicles, the company can achieve savings on fuel, tolls and servicing. In the long run, fleet modernization also contributes to the company's competitiveness in the transport market and meeting potential future green requirements. At the beginning of the fleet modernization process, a company can replace its oldest vehicles from 2006 and decide to purchase used vehicles from 2018, which it also has in its current fleet, in which case such a cost of 1 vehicle would be about 150 000 PLN. Due to the difference in fuel consumption between the company's 2006 and 2018 vehicles, at an average fuel price of 4.9 PLN per liter in 2024, fuel costs could drop by about 25 000 PLN per year. Thanks to higher emission standards, newer vehicles are subject to lower toll rates which would reduce their cost by about 5000 PLN a year. Newer vehicles tend to be in better technical condition, so the cost of servicing could also be reduced by about 5,000 PLN a year.

The cost of buying a brand new vehicle is about 500 000 PLN, which would require an external source of financing such as leasing. At the same time, however, it should be remembered that truck manufacturers are constantly improving their designs and the latest vehicles have even lower fuel consumption which in turn would allow even greater savings.

Another possible solution is the installation of aerodynamic side and rear covers for trailers. Which can reduce the fuel consumption of the entire transport set. In this case, however, you need to carefully analyze the rather high initial cost, which is about 14 000 PLN with installation, and keep in mind that this solution is best suited for long-distance transport on highway routes. The use of side and rear covers, according to the manufacturer, reduces combustion by an average of 1.5 liters per 100 km (Ramirez, Veldhuizen, Adolf, 2021). Annually, fuel costs could then fall by about 7000 PLN.

Implementing a telematics system brings numerous benefits in monitoring costs and increasing the competitiveness of the company. Although it requires incurring significant initial costs with no immediate effects, over time the potential savings on fuel, servicing and better utilization of the fleet can outweigh the outlay Purchase and installation of the equipment costs in the order of 4000 PLN and the annual subscription is another 2000 PLN per vehicle. Critical to the success of the implementation is the right choice of supplier and the use of data provided by the system to achieve the benefits. It is also important to install the devices in vehicles that the company will not plan to sell in the near term.

Almost all of the mentioned cost reduction methods can be evaluated in terms of potential return on investment. The exception here is the implementation of driver bonuses which by design is intended to increase the commitment of drivers to reduce fuel consumption and the savings from this will be covered by salary supplements. Installing telematics in vehicles does not in itself bring direct savings to the company. Telematics solutions are used to accurately monitor vehicles and drivers, and therefore support the implementation and monitoring of progress associated with other solutions. In contrast, the gains from the company's already practiced cost-cutting method of preventive vehicle servicing are impossible to estimate.

Table 2. Expected investment return periods for selected cost reduction methods

Cost reduction method	Implementation cost per vehicle	Expected annual savings per vehicle	Expected return on investment in kilometers
Fuel cards	50 PLN	2500-3000 PLN	170-200 km
Professional driver training in eco-driving	2 000 PLN	6000-15000 PLN	13 000-33 000 km
Modernization of the fleet (purchase of a used truck tractor)	150 000 PLN	34 500 PLN	435 000 km
Modernization of the fleet (purchase of a new truck tractor)	500 000 PLN	55 000 PLN	910 000 km
Aerodynamic covers for trailers	14 000 PLN	7 300 PLN	190 000 km

Source: Authors' own work on the basis of research results.

The data collected in table 2 estimates the return on investment of the presented solutions, for the calculations assumed annual vehicle mileage of 100 000 km and a price of 4.9 PLN per liter of fuel. By far the simplest, cheapest and at the same time returning almost immediately investment is the use of fuel cards, thanks to which the company can obtain more favorable prices at the stations. Also a relatively small expense is driver training to improve their driving technique. Depending on the driver's current skill level and the vehicle's fuel consumption, driver training can reduce annual fuel costs per vehicle by between 6 000 and 15

000 PLN. Another solution in terms of implementation costs is the installation of aerodynamic covers for trailers which by reducing fuel consumption can reduce annual costs by more than 7000 PLN. However, the payback period for such a solution, assuming an annual mileage of 100 000 kilometers, is almost 2 years.

The largest investment, but also the one that provides the highest annual savings, is fleet modernization. Assuming that the oldest vehicles in the company are replaced with models from the same manufacturer from 2018, which the company already has, it would be possible to reduce costs by almost 35 000 PLN per vehicle. This value consists of lower fuel demand, lower road tolls and minimizing repair expenses. Buying a used vehicle for 150 000 PLN would pay off after driving over 430 000 kilometers. The company owner may also consider buying a completely new tractor unit which would be characterized by even lower fuel consumption and minimal repair expenses.

In turn, under the Polish toll collection system, these would remain the same, due to the same Euro 6 exhaust emission standard. However, the cost of a new vehicle oscillates around the amount equal to 500 000 PLN, and the annual savings would increase by an estimated 20 000 PLN per year. Such figures indicate a return on investment after the vehicle has covered more than 900 000 km. However, it is important to bear in mind the much higher value of a newly purchased vehicle after its payback period, compared to a used tractor unit.

All of the solutions are aimed at reducing the provision of transportation services by road transport companies. Almost all of these solutions involve a certain amount of implementation time, initial costs and organizational requirements but they also offer tangible benefits in the form of savings, improved efficiency and increased competitiveness in the market. The least demanding yet effective solution seems to be the use of fuel cards. On the other hand, modernization of the transportation fleet, although it would by far reduce costs the most in the surveyed organization, involves very large initial outlays, which the company may not be ready for and would have to consider using external financing in the form of leasing or credit.

5. Conclusions

Based on the analysis of the literature and research, including the analysis of the cost structure in a selected transport company and interviews with its owner and employees, a number of recommendations and generalizations can be drawn about reducing the cost of providing transport services in road transport companies.

The indicated suggestions are of a practical nature and relate to the challenges identified in the analyzed enterprise but their universality makes them applicable in a broader context. The data and information collected in the paper can provide practical guidance for both owners of companies operating in the transportation industry and other entities operating in the industry.

As a result of the analysis, it was found that fuel costs are a key element in the expenditure structure of transport companies, despite the important role of this cost component, companies have limited influence on fuel prices themselves. Opportunities to reduce costs in this regard mainly boil down to the use of fuel cards offering discounts and negotiating contracts with fuel suppliers, but their effects are often marginal in relation to the scale of expenses. Much greater opportunities for savings lie in reducing fuel consumption which is greatly influenced by the drivers themselves.

In addition to training, companies can take advantage of modern telematics systems, the data from which can be used for ongoing analysis and to motivate drivers to drive more economically. This can be done for example by introducing fuel efficiency bonus systems.

Based on the research, it can be concluded that, in addition to drivers, the vehicles used by companies have a very large impact on fuel consumption, hence the importance of systematic modernization of the fleet emerges. Newer vehicles are characterized not only by lower fuel consumption but also greater reliability which translates into reduced service costs and downtime due to breakdowns. Modern trucks are equipped with more efficient engines that meet the latest emission standards, reducing not only fuel costs, but also tolls. Investing in a modern fleet also makes it possible to increase driver safety and comfort, which can help reduce employee turnover and improve the company's image.

Despite the valuable insights obtained, this study has several limitations. First, it should be remembered that in this article an individual case study was carried out, analyzing the structure of costs and methods of their reduction in a specific transport company.

However, it is worth noting that the cost of operations in the transport industry can vary significantly depending on the specifics of the company, the scope of its activities and the type of services provided. For example, companies engaged in refrigerated transport incur additional costs associated with the operation of refrigeration units which increase fuel consumption and require regular technical maintenance. Local distribution companies, on the other hand, mainly operate on short routes with multiple loading and unloading points, which means frequent

stops and the need for proper route planning. As a result, methods of cost reduction should be adjusted to the specifics of the company's operations. Second, the research covers a specific time period, and cost structures may evolve over time due to technological advancements and market fluctuations. Also, some indicators were obtained based on data provided by the company which may contain errors or not include all important values.

In this regard, further research should take into account a larger number of transportation companies that, among other things, differ in size or scope of their operations. With more cases of transportation companies analyzed, it would be possible to compare the effectiveness and cost-efficiency of various methods of reducing transportation costs, for example, for both domestic and international transportation companies, as well as companies of different sizes, from small to large.

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