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INFLUENCE OF INCREASED AVAILABILITY OF VARIOUS CATEGORIES OF SPARE PARTS IN THE MARKET ON THE COST OF SERVICING PASSENGER CARS IN POLAND

Summary. This article raises the issues related to the influence of increased availability of various categories of spare parts in the market on the cost of servicing passenger cars in Poland. The discussion is based on original simulations of the hypothetic cost of repairs involving several categories of spare parts. For the analysis, the authors selected models of vehicles that were demanded the most in Poland in recent years in the segment of brand new and second-hand cars. The purpose of this work is to show the differences in values arising in the case of using separate categories of spare parts in the class of repairs concerned. The presented research may be used to estimate the possible cost of use related to owning a specific model of a vehicle. Furthermore, the research results may be helpful in making purchase decisions by the individual as well as group clients.

Keywords: cost of repairs, spare parts, automotive market, EU regulations

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1. INTRODUCTION

Year after year, vehicle manufacturers release more models into the various market segments. However, this constantly and fast-rising number of vehicles requires continuous servicing to stay efficient and reliable [3].

In the literature, the dominating view is that servicing should involve only brand new genuine spare parts owing to their high technical parameters [5, 12]. However, many other authors state that no significant differences in cost arise when using other categories of spare parts in servicing, so these issues do not require any particular attention [13]. That could not be further from the truth, as thorough analyses and observations of the sector of repair services indicate explicitly so in the new reality, that is, an increased availability of various categories of spare parts in the market, components other than genuine spare parts are used more and more in this category of repairs and this is an economic factor which has not been known before [1].

Therefore, an attempt to present the economic nature of the influence of using different categories of spare parts other than genuine ones in servicing passenger cars in Poland has a material meaning in the aspect of academic as well as practical considerations. Noteworthy is the fact that there are no such analyses and works in available literature in the technical as well as economic sciences, in particular using an interdisciplinary approach, which increases the substantive value of the raised issues even more.

The presented approach forms the basis for adopting certain initial conditions and methods of proceeding directed at an attempt to measure the influence of increased availability of various categories of spare parts in the market on the cost of servicing passenger cars in Poland through:

- a description of the essence of servicing passenger cars using an economic and technical approach.
- an analysis of the cost of servicing involving selected vehicles from various market segments with the kilometrage of 90,000, using four categories of spare parts.

Furthermore, the purpose of the work is to demonstrate the differences of values arising in the case of using separate categories of spare parts in this type of repairs. The presented research may be used to estimate the possible cost of use related to owning a specific vehicle model. Moreover, the research results may be helpful in the process of making purchase decisions for the individual as well as group clients.

2. THE ESSENCE OF SERVICING PASSENGER CARS – ECONOMIC AND TECHNICAL APPROACH

As available reports and works show, an average consumer associates owning a vehicle only with two significant stages, that is, the purchase and use [14]. Nothing can be further from the truth, as between these stages other processes exist as well, ones which are unidentified at first but which involve, among other things, servicing related to specific economic factors.

Observations of the market reality conducted by the author demonstrate explicitly that many car users do not differentiate between a Ministry of Transport Test (MOT) and servicing. Professional literature explicitly indicates a fundamental difference between these notions. An MOT is an obligatory check of a vehicle conducted in a Regional Vehicle

Inspection Centre [13]. It is required to have a vehicle admitted to traffic on public roads. On the other hand, servicing involves a visit to a repairer (most frequently an authorised repairer) recommended by a manufacturer, aimed at replacing wearing parts and checking the technical condition of a vehicle. A vehicle user is not forced in any manner to have such a check conducted. However, maintaining a guarantee provided by a manufacturer requires regular servicing of this kind. It should be remembered that the guarantee period for certain vehicle elements or subassemblies may be up to 10 years [7, 14].

At this stage of the discussion, it should be emphasised that the frequency of servicing is specified individually by the manufacturer of a vehicle and depends, among other things, on the model, the engine version etc. The current technological progress visible in the digitalisation of vehicle drive systems means that it is a drive computer which more often decides, based on the conditions of use, when the owner should visit a repairer. The purpose of applications and the thematic tool referred to above is not to reduce periods between the service checks but to increase them if possible. For example, an analysis of the drive systems used in a vehicle concerned may lead to having the oil changed every 10,000 or 30,000 kilometres depending for example, on the driving style preferred by the user of the vehicle concerned.

A basic service includes a change of oil and replacement of an oil filter. Depending on the make, model, and kilometrage or age of the vehicle, other procedures may also be included, such as:

- replacement of the air filter,
- change of the coolant,
- change of the brake fluid,
- replacement of spark plugs (petrol engines),
- refill of the DPF fluid in vehicles with diesel particulate filter (diesel engines),
- replacement of engine timing,
- check of the suspension,
- check of the braking system,
- check of the steering system,
- check of the exhaust system,
- computer diagnostics,
- check of the correct tyre pressure.

Apart from its technical aspects, servicing also has an economic side to it. Prices for servicing depend on factors such as the following:

- the scope of the service provided (quantities of changed fluids and replaced parts),
- vehicle make and model,
- vehicle age,
- type and category of spare parts,
- type of service provider (authorised or unauthorised repairer).

Here, it should be emphasised, presently, users may choose from as many as four categories of spare parts, each of them with different price and quality parameters, which has a great influence on the economic calculation [4, 8, 11]. It should be remembered that the cost of spare parts is a key factor in the total costs of servicing a vehicle.

To sum up, maintaining the guarantee is not the only positive outcome of regular servicing. A correctly maintained car is less vulnerable to failures and it can also serve for a longer time. Here, it should be stated that failure to undergo due servicing may, in future,

expose a vehicle owner to a loss of the guarantee and to additional costs of repairing faults; it may also lead to obtaining a lower monetary equivalent during a possible attempt of selling a car [7, 10].

3. ECONOMIC ANALYSIS OF COST OF REPAIRING PASSENGER CARS USING SPECIFIC CATEGORIES OF SPARE PARTS

The complex nature of the technological processes involved in the service, the specification of materials used, and a diverse technology of repairing passenger cars require an alternative approach. Therefore, in order to demonstrate significant relationships, the authors used pre-determined models of behaviour in their simulations. As a result, further discussion will not focus on the qualification and analysis of unit costs involved in the total cost of servicing a vehicle; only the total costs of servicing chosen vehicles from thoroughly selected market segments will be presented, using four categories of spare parts in the process. Moreover, for the purpose of this research, the authors made a simplified assumption that the cost of servicing is the total cost of service and prices applied to the repair of spare parts.

In the beginning, to maintain the logical correctness and the methodological value of the research, it was assumed that:

- the research would include passenger cars from market segments A to D, Four models of vehicles with specific properties and purpose have been selected for the analysis, The selected vehicles were very popular among clients, as they reached the highest selling figures in 2017 in the Polish market,
- each selected vehicle is subject to service as provided for by the manufacturer after reaching the kilometrage of 90,000, This value has been selected due to the fact that according to available research and reports most users consider using spare parts other than genuine ones,
- to estimate the cost of repairs, a specialist expert application called D,A,T, was used in which the numerical experiment was supported with a cost estimation method, as it is the only method used in the practice of estimating the cost of servicing passenger cars in Poland,
- considering a large scope of servicing provided by repairers, it has been assumed that the cost analysis will concern servicing after reaching the kilometrage of 90,000 and will include the replacement of the air filter, fuel filter, and cabin filter, change of the coolant and brake fluid, and the replacement of spark plugs and engine timing, For the purpose of comparison, in each case prices of spare parts from November 2018 have been applied,
- in the case of simulating labour costs, the average rates of mechanic labour applied in the Zachodniopomorskie Voivodeship were adopted,
- to demonstrate the aforementioned relationships, the cost of servicing was analysed in four fundamental variants, that is, repairs using genuine parts, other genuine parts, non-genuine parts, and parts of comparable quality.

The presented assumptions forms the basis for adopting initial conditions and methods of procedure directed at measuring the importance of the cost parameter by analysing the selected categories of spare parts in servicing, using the example of specific passenger cars from selected market segments.

From the viewpoint of correct exploration and the possibility of capturing necessary data, the results of the numerical experiment are presented in Tables 1, 2, 3 and 4.

3.1 Segment A

Tab. 1

Comparison of costs of servicing segment A vehicles with the kilometrage of over 90,000 depending on the variant of parts used in the procedure (in PLN)

Type of parts/make of the vehicle	Skoda Citigo	Fiat 500	VV UP	Toyota Aygo
Genuine parts	1,620.26	1,963.76	1,778.24	2,597.72
Non-genuine spare parts – substitutes	1,109.99	1,240.99	1,109.99	2,065.76
Spare parts of comparable quality	1,123.59	1,150.20	1,123.59	2,225.64
Other genuine parts	1,234.06	1,549.12	1,331.72	2,597.72

Source: The authors' original study based on the D.A.T. system with prices of spare parts as of November 2018

The above overall simulation of the cost of repairs in class A indicates that the lowest cost of servicing has been observed in the case of using non-genuine parts, that is, substitutes. The analysis of data shows that using spare parts of comparable quality in repairs seems to be the most beneficial variant, for economic and technological reasons (the parts have quality parameters comparable to those of genuine parts), with regard to all analysed models of vehicles in that segment.

The analysis of data concerning separate spare parts shows that the highest cost of repairs has been observed for Toyota Aygo in all variants of spare parts. The lowest simulation cost of repairs, on the other hand, have been found for Skoda Citigo for all variants. Moreover, it is worth mentioning the fact that there are differences in costs of servicing in the case of Skoda and VW despite the fact that those vehicles use the same spare parts.

3.2 Segment B

Tab. 2

Comparison of costs of servicing segment B vehicles with the kilometrage of over 90,000 depending on the variant of parts used in the procedure (in PLN)

Type of parts/make of the vehicle	Škoda Fabia	VW Polo	Opel Corsa	Toyota Yaris
Genuine parts	2,121.28	2,708.40	2,478.65	2,922.51
Non-genuine spare parts – substitutes	1,224.92	2,156.64	1,540.17	2,406.93
Spare parts of comparable quality	1,537.56	2,242.78	1,970.03	2,648.54
Other genuine parts	2,021.43	2,664.40	2,120.61	2,922.51

Source: The authors' original study based on the D.A.T. system with prices of spare parts as of November 2018

The above overall simulation of segment B vehicles indicates again that the lowest cost of servicing has been observed in the case of non-genuine parts. The cost analysis has shown that using other genuine parts in the case of Skoda Fabia and VW Polo leads to the reduction

of servicing costs by a small extent. The highest costs, on the other hand, have been observed for Toyota Yaris, in all variants of spare parts. The lowest costs have been noted for Skoda Fabia. Moreover, it is worth mentioning that in the case of Toyota Yaris, cost of repairs using genuine parts and other genuine parts were the same.

3.3 Segment C

Tab. 3

Comparison of cost of servicing segment C vehicles with the kilometrage of over 90,000 depending on the variant of parts used in the procedure (in PLN).

Type of parts/make of the vehicle	Škoda Octavia	Opel Astra	Toyota Auris	Kia cee'd
Genuine parts	2,991.17	3,292.85	3,486.07	3,240.85
Non-genuine spare parts – substitutes	1,997.61	2,034.25	2,626.31	1,455.71
Spare parts of comparable quality	2,467.62	2,687.15	2,753.38	2,151.93
Other genuine parts	2,605.31	2,832.01	3,486.07	3,240.85

Source: The authors' original study based on the D.A.T. system with prices of spare parts as of November 2018

The above overall simulation of servicing costs in class C indicates that the lowest cost of service has been observed in the case of using non-genuine parts. The highest costs, on the other hand, have been noted in the case of genuine parts. The analysis of individual vehicle models shows the highest cost of servicing in the case of the Toyota Auris. The lowest cost of servicing, on the other hand, was observed for Skoda Octavia but not in all variants of parts. For non-genuine parts and parts of comparable quality, the lowest costs were noted for Kia ceed. It is worth mentioning that the costs are the same for Kia ceed and Toyota Auris in case of using genuine parts and other genuine parts.

3.4 Segment D

Tab. 4

Comparison of costs of servicing segment D vehicles with the kilometrage of over 90,000 depending on the variant of parts used in the procedure (in PLN).

Type of parts/make of the vehicle	Skoda Superb	Volkswagen Passat	Opel Insigina	Ford Mondeo
Genuine parts	3,831.11	4,529.75	4,335.13	4,467.24
Non-genuine spare parts – substitutes	2,951.02	2,632.15	3,667.77	3,650.82
Spare parts of comparable quality	3,114.12	2,956.41	3,918.31	4,935.11
Other genuine parts	3,407.16	3,135.13	4,006.01	4,167.21

Source: The authors' original study based on the D.A.T. system with prices of spare parts as of November 2018

The above overall simulation of cost of servicing in class D indicates that the estimate of costs for the variant of other genuine parts is higher than the cost of repairing a vehicle using non-genuine spare parts and parts of comparable quality for all analysed models. In this segment, the highest cost of service has been observed in the case of VW Passat, but only for genuine parts. In other variants of spare parts, the costs are the lowest. Moreover, it is worth mentioning that in the case of Opel and Ford the costs of service using non-genuine spare parts and parts of comparable quality were similar.

4. SUMMARY AND CONCLUSIONS

EU regulations concerning the automotive market which are currently applicable allow not only the use of services outside the dealers' network for a vehicle covered with a guarantee with no risk of losing the guarantee but also provide for a possibility of using spare parts other than genuine for this process as well. However, it is subject to the provision that in case of a fault and turning to the manufacturer with the problem, the owner who has used such services in the past will possibly have to prove that all service procedures were completed in line with the technology recommended by the manufacturer, which seems virtually impossible, as is well-known in the case of using spare parts other than genuine ones, marked with the manufacturer's logo. Therefore, many manufacturers try to extend the guarantee period to attach a client for the longest possible time to servicing at authorised repairers, using genuine spare parts. In many advertisements, it is emphasised that only the use of genuine spare parts ensures the correct performance of a vehicle. However, the advertisements do not say that as much as 80% of spare parts in the market come from independent spare part manufacturers and only 20% of them are supplied directly by car manufacturers themselves [2, 6].

In the present market reality, a car user may choose from as many as four categories of spare parts with various quality and price parameters. That being so, in the present market of repair services, the issue of estimating the cost of servicing passenger cars using other categories of spare parts has become particularly important. Prices of materials used in the process are related to each other, which means that low prices of spare parts often decide about the low cost of repairs, however, one should not forget about a factor which is equally important, that is, time needed to perform certain operations and the cost of a working hour with regards to individual manufacturers and selected vehicle makes.

Analysing the calculation of costs presented in the tables for vehicles from segments A, B, C and D, it was concluded that:

- the higher the analysed market segment is, the higher the hypothetic cost of servicing is,
- there are great differences in the cost of servicing after reaching the kilometrage of 90,000 depending on the adopted category of spare parts in analysed market segments,
- apart from other available categories of spare parts, the highest cost of servicing can still be observed in case of using genuine parts,
- in all analysed market segments, the choice of non-genuine parts is the cheapest solution in the economic aspect,
- in most cases, choosing other genuine parts is more expensive than using non-genuine parts and parts of comparable quality in the repair process,
- for several models of vehicles, it has been determined that choosing other genuine parts for repairs is not a cost alternative for genuine parts, as the cost of servicing is the same.

To sum up, the authors' attempt to raise the issue of the influence of an increased availability of various categories of spare parts in the market on the cost of servicing passenger cars in Poland does not exhaust the topic; it is only an attempt to show the complex nature of the examined issue concerning the influence of EU regulations on the automotive market in the economic aspect.

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