

EVALUATION OF LIQUID FUELS DISTRIBUTION QUALITY ON THE EXAMPLE OF A SELECTED PETROL STATION

Piotr Bojar, Bogdan Landowski

*University of Technology and Life Sciences
Department of Machine Maintenance
Prof. S. Kaliskiego Street 7, 85-789 Bydgoszcz, Poland
tel.: +48 604 195 937, +48 52 340-84-24
e-mail: p-bojar@utp.edu.pl, bogdan.landowski@utp.edu.pl*

Abstract

Due to a growing demand for liquid fuels in Poland, there is a need to organize their transport and distribution. Companies involved in extraction, processing and distribution and wholesale of crude oil and its products, have been operating on the fuel market for almost one century. In Poland, 700-900 thousand tons of crude oil is extracted every year, whereas the demand of Polish oil refineries for this resource is 20 mln tons, yearly. This paper describes the liquid fuel distribution system and the quality of services available at the filling station known international oil company. Characterized demand for liquid fuels in terms of their kind on the Polish market, using the results of the Polish Organization of Oil Industry and Trade in 2012. As the description of the test stations and characterized the sale of liquid fuels (type and quantity of fuel sold). It provides guidance on the company's distribution and service quality. Using the available literature shows you how to evaluate the effectiveness and quality of the distribution system. In times of global crisis, it is advisable to seek to improve the sales of liquid fuels, better organize the transport of fuel to the station to meet the demand for liquid fuels using economic methods. The company, to which the station has developed a distribution system according to your requirements, set the quality level of customer service. These activities are aimed at by increasing the efficiency of distribution and quality of services to increase sales and increase cooperation with regular customers.

Keywords: *transport, road transport, fuel, oils and lubrication*

1. Demand for liquid fuels in Poland

High demand for crude oil as compared to the amount that is extracted involves a necessity to import it from abroad in order to meet the demand. Crude oil imported to Poland from Russia, by means of 'Przyjaźń' pipeline accounts for 92.9% of the total import of liquid fuels. It is delivered to two refineries 'Lotos' in Gdańsk and 'PKN Orlen in Płock. Oil products from the refineries go to customers through a developed logistic network. Polish Organization of Oil Industry and Trade (POPiHN) carried out research on the use of liquid fuels in Poland. It has been found that the biggest demand is for gasoline and diesel fuel, whereas the sale of diesel fuel in the years 2010-2011 increased by 7.5%. In that time, the sale of diesel fuel increased from 14632 thousand tons to 15809 thousand tons, and the sale of gasoline decreased by 4%.

Sales of fuel differ from region to region. Probably, the differences are connected with the standards of living and the level of development of a particular province. According to POPiHN data from 2012, presented in Fig. 1, the biggest amount of fuel is sold in Mazowieckie province being 15%, whereas the smallest amount is reported in Podlaskie province, that is 2% of the total fuel sale in Poland. The research object analyzed in this work is located in Kujawsko-Pomorskie province where the sale accounts for 5% of the total fuel sale. The average sale of fuels in Poland is 6.25% of the total fuel sale, for standard deflection equal to 3.8%.

According to the data shown in Fig. 2, there are three kinds of fuel sale dynamics during a year. An increase in fuel demand is reported from March to October. It is thought to be caused by a warm weather which provides good conditions for construction works and tourist activities

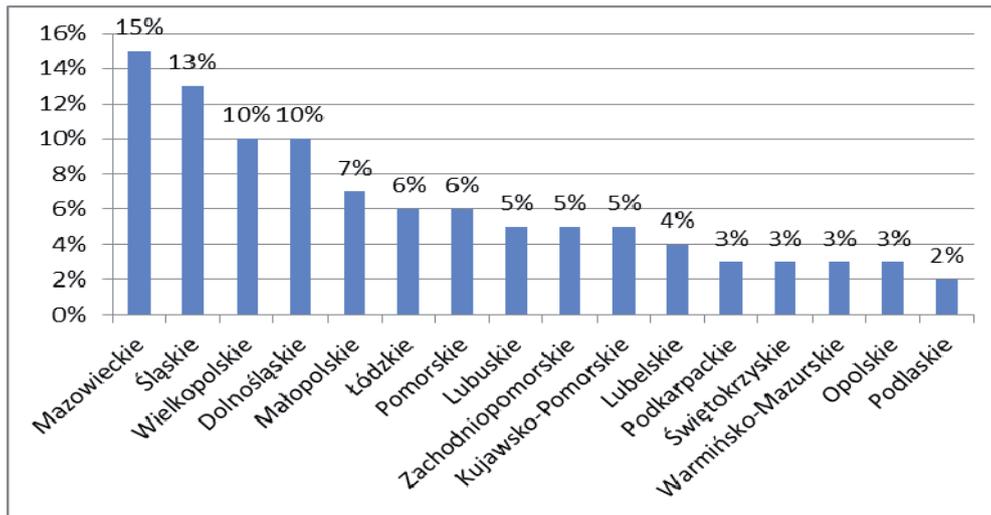


Fig. 1. Retail sale of engine fuels of POPiHN firms in Poland [8]

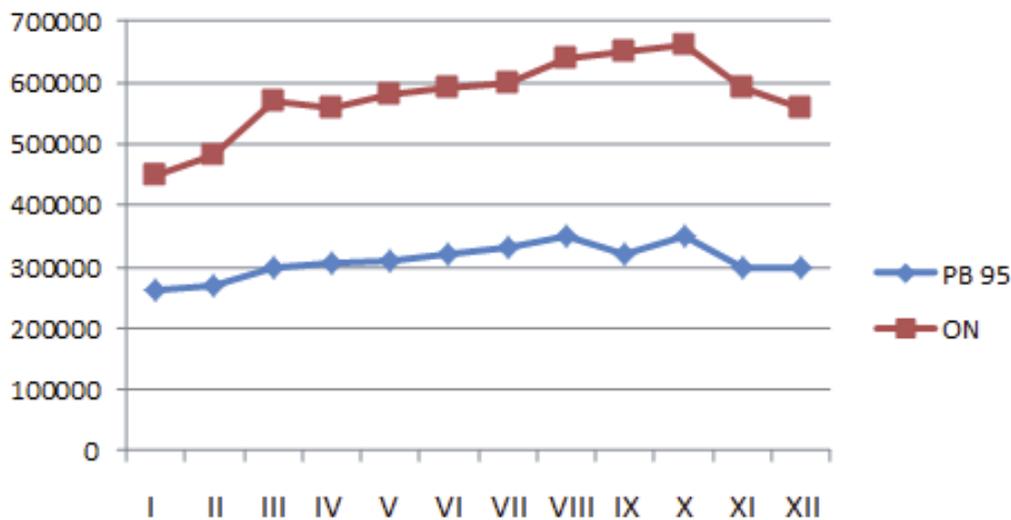


Fig. 2. Sale of engine fuels in POPiHN firms [m3] in 2012 [8]

from June to September. Changes in the fuel sales figures can be the effect of changing market trends or fuel price fluctuations. In 2012, Polish towns, roads and stadiums were being built and modernized for the needs of European football championships, Euro 2012. Many different enterprises representing different industries were involved in that project. The scale of investment, engagement of people and equipment had an influence on fuel sales in POPiHN stations. Football fans both from our country and abroad bought fuel in gas stations. Ensuring the safety transport of hazardous materials is a priority, the problem is described in the work [7, 8].

2. Gas stations in Poland

The Polish Organization of Oil Industry and Trade was established in 1995. The organization members include the following companies: BP, Fuchs Oil, GroupLotos, LukoilPolska, NestePolska, OLPP (LogisticOperator of Liquid Fuels), Spółka PERN „Przyjaźń”, PKN Orlen, Tanquid. In 2009, a drop in the number of gas stations was noted from 6 854 to 6 715 which means a reduction of the number of gas stations by 139 objects, that is by 1.9%, as compared to 2008. Such a dramatic decrease in the number of stations was probably caused by a financial crisis affecting many sectors of economy, all over the world.

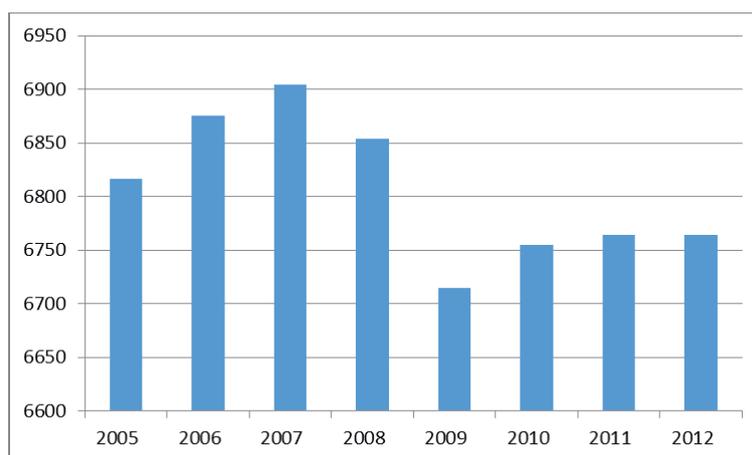


Fig. 3. Total number of stations in Poland [8]

The data presented in Fig. 3 shows that since 2010 the number of gas stations operating on the Polish market has been stabilized. According to the yearly report published by the Polish Organization of Oil Industry and Trade (POPiHN) from 2012, the highest market share belongs to independent providers -2000 stations, which can be seen in Fig. 4.

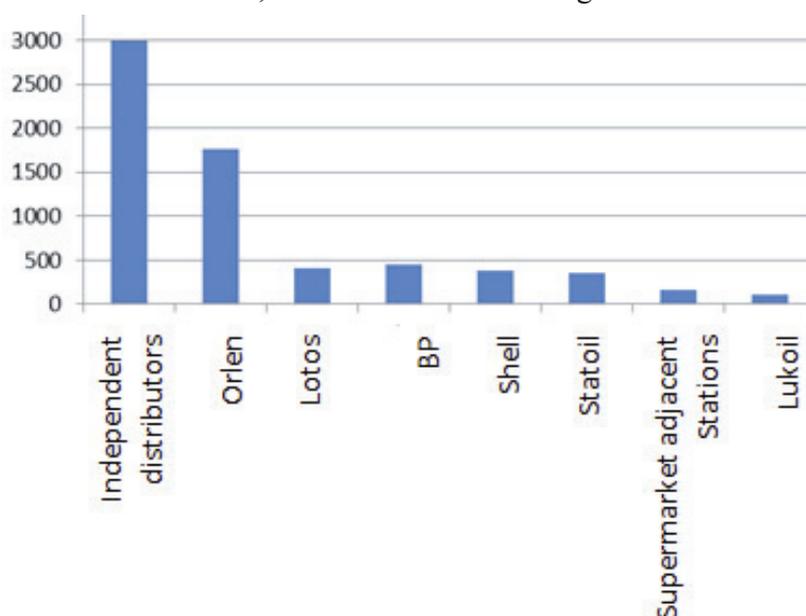


Fig. 4. Presentation of the number of gas stations of different distributors in 2012 in Poland [6]

3. The research object and subject

Shell occupies the third position in the gas station ranking [5]. In 2002 Shell was the first to introduce noble fuels Shell V-Power, as well as to provide new fuels Fuel Save for replacement of basic fuels which are supposed to reduce fuel consumption by engines. In order to help drivers to reduce costs, Shell has developed solutions thanks to which the chemical energy contained in liquid fuels can be used more efficiently. Since noble fuels were introduced, Shell stations have been reporting an increase in fuel sales, both gasoline and diesel oil. The concern is aware of the potential involved in establishing more gas stations as a response to the growing demand for fuels of a statistical Pole. Development of roads which provides good conditions for moving from place to place is another possible cause of the fuel consumption increase.

The studied gas station is situated at a crossroads of Jana PAWŁA II (being a national route 55 performing the function of transit route) and Łyskowskiego street (district road no. 3126), in

Grudziądz (Fig. 5). The transit road in which the research object is located connects the northern part of Grudziądz with its southern part and leads to a motorway node ‘Grudziądz’ of A1 motorway. This route connects road 55 from Torun with road 16 to Olsztyn. It is a good location due to high traffic intensity of the transit road bypassing the town. While going on this road vehicles use services of this station [1].

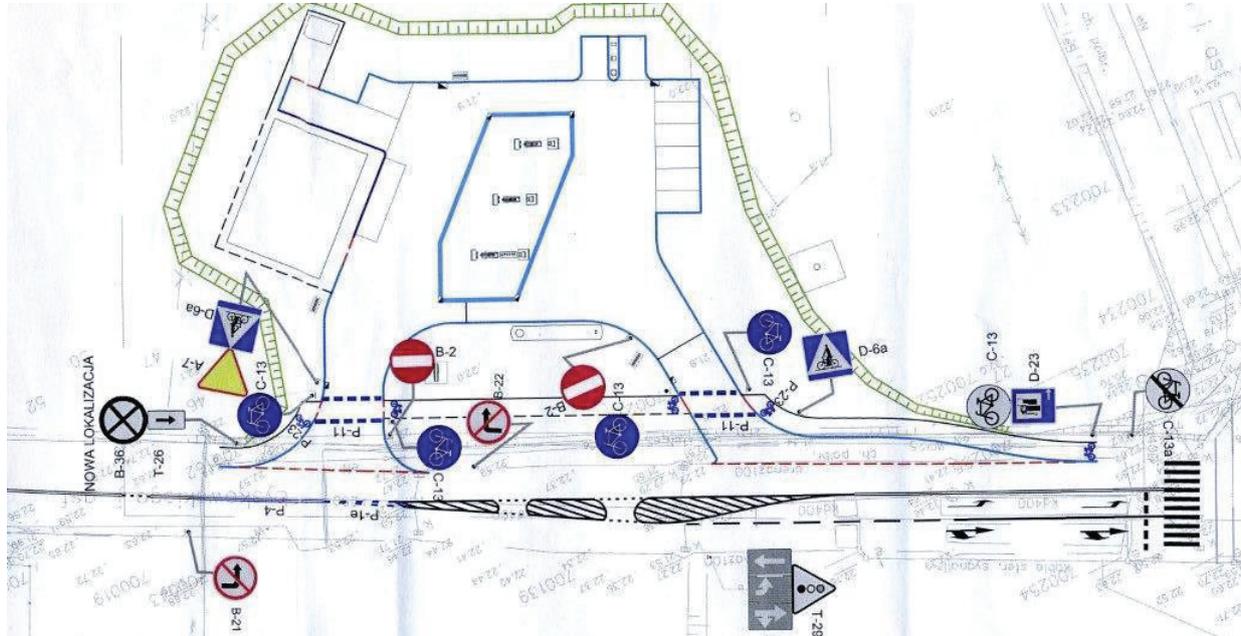


Fig. 5 Land survey map of the station [7]

The analyzed gas station was opened in January 2011. It is the only station on the Circumferential Route. This object is located within the distance of two kilometres from the town centre. The station operates day and night with a thirty minute break scheduled for financial settlements (23:30-24:00). At 22:00-6:00 sale is performed through a night sale window.

4. Organization of liquid fuel transport in the selected gas station

The station is delivered with fuel according to the demand that is about 1 to 2 times a week. The sale of fuel is of constant character with no breaks caused by shortages in the assortment. Breaks in selling lead to: loss of income, subsequently loss of customer' trust and serious costs. Therefore, availability of all kinds of fuels means customers safety and credibility of the gas station staff (including the fuel supplier). In the analyzed station 1/3 of the customers use a loyalty card for payment so losing these customers would involve significant losses.

The station manager controls the quantity of fuel in a container by means of devices communicating with the use of telemetry (the device for reading the fuel level in containers in installed inside the station building). This device provides readings of the fuel level in containers by means of built-in probes. Next, information is sent to the logistic office where decisions as to the next fuel supply are made. To prevent from running out of fuel the logistic office is provided with reports on the current fuel level in containers every day.

Figure 6 shows the fuel monitoring process and the process of fuel delivery in the analysed object. A division of duties is into particular teams of the distribution system.

An important aspect connected with fuel delivery is its seasonal character. For example the summer time (holidays) provides good conditions for travels, hence the demand for fuel increases. In the summer, thanks to good weather, more heavy machines need to be fuelled as there are more construction works.

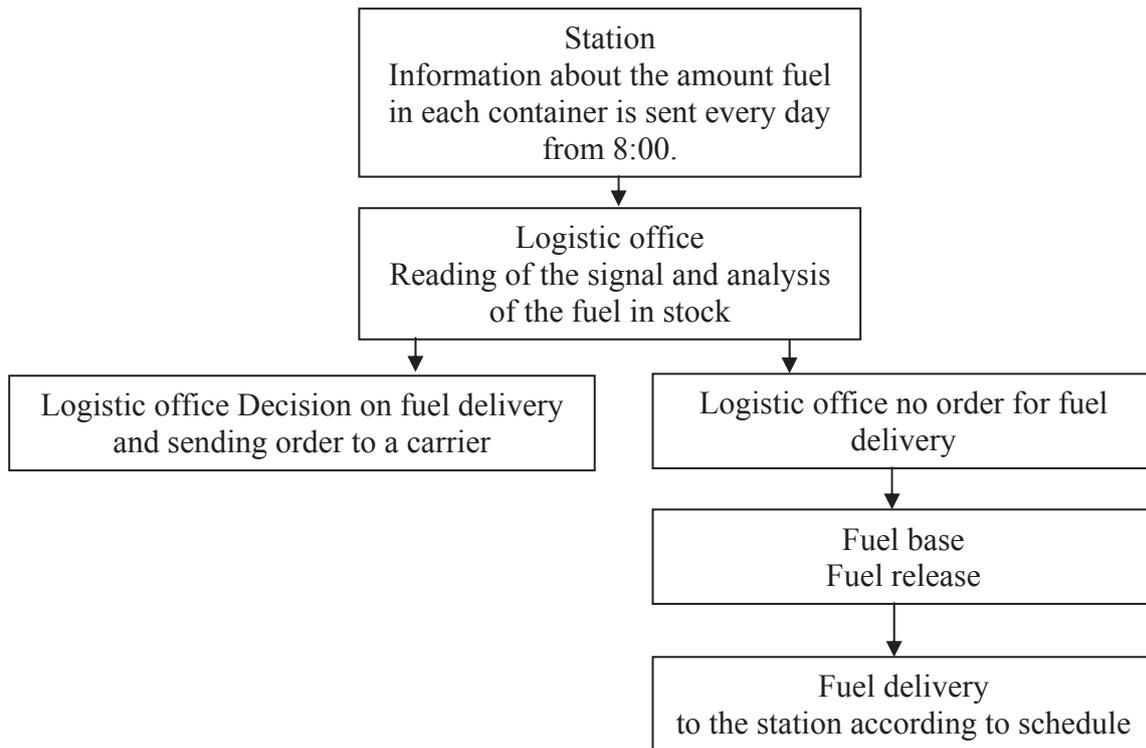


Fig. 6. Scheme of fuel monitoring in the station [5]

It is interesting that the summer time witnesses an increase in the demand for fuels with improvers. It is possible that drivers want to try these fuels when going on longer trips. Also in the summer season, noble fuels are more frequently chosen by customers. Such a choice is probably connected with anew technology, used in fuels with improvers, for cleaning of the engine subassemblies (fuel injection, carburettors) which both improves the engine performance and the vehicle dynamics. A unique double-action formula, developed in Shell laboratories, means that V-power fuels are characterized by the ability to clean and protect injection systems so that they can operate at their full capacity. V-power formula does not only improve removal of residue in injection systems which are the effect of using other fuels but also protects

It makes the engine work easier, and the energy provided by fuel can be effectively transmitted to the power transmission system [2] Thanks to these properties customers often choose noble fuels.

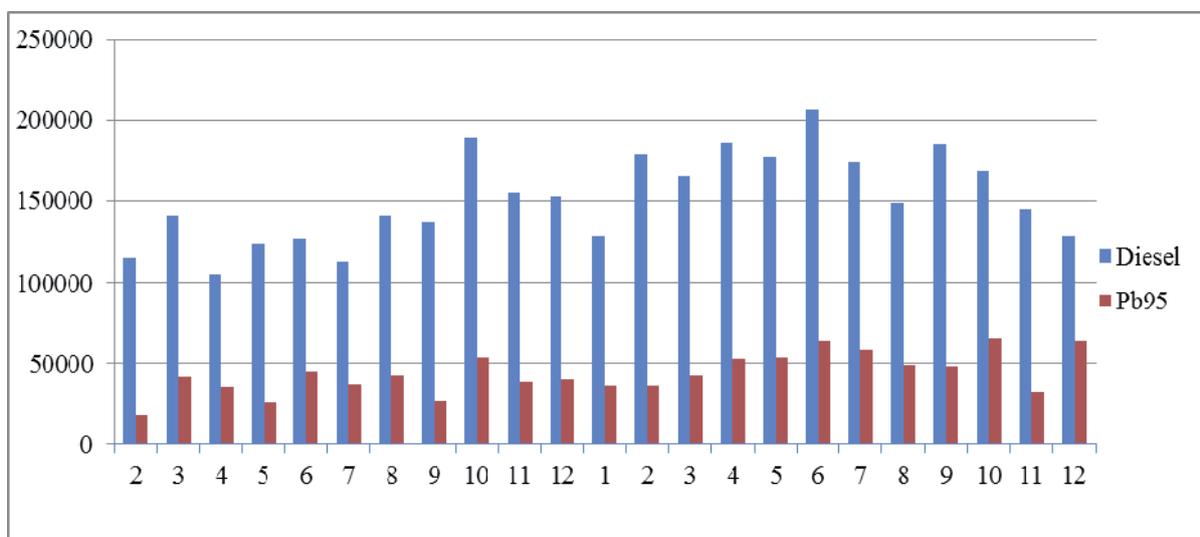


Fig. 7. Presentation of the number of monthly fuel deliveries in the period of two years 2011-2012 [8]

5. Analysis of the quality of provided services and fuel distribution in the studied gas station.

In the carried out research of the type ‘test shopper’, a multi-attribute ranking method WMP was used. This method puts emphasis on customer satisfaction and their impressions while using the station services. This is a rating assessment and it consists of a few components. The below figure shows the ‘test shopper’s evaluation, in terms of the object functioning.

According to the ‘test shopper’s’ evaluation shown in Fig. 8, the offered assortment and the service staff meet the company requirements set for the quality of gas stations functioning (100%). An employee of an external company, working on order of the, noticed some inconsistencies concerning the station interior such as: messy toilet, its poor lighting, and insufficient order of the sales room (97%).

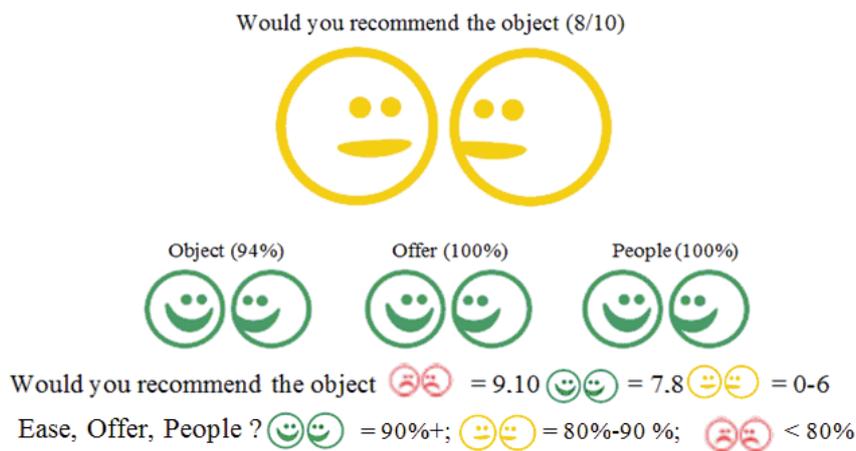


Fig. 8. Results of multi-attribute measurement WMP

In order to evaluate the quality of provided services, an external company, acting by order of the concern, investigated the gas station using the technique Importance-Performance. Using this method, importance and perception of the factors affecting the quality of services, were investigated from the point of view of a customer. Results of these investigations are presented in Fig. 9, 10 and Tab. 1.

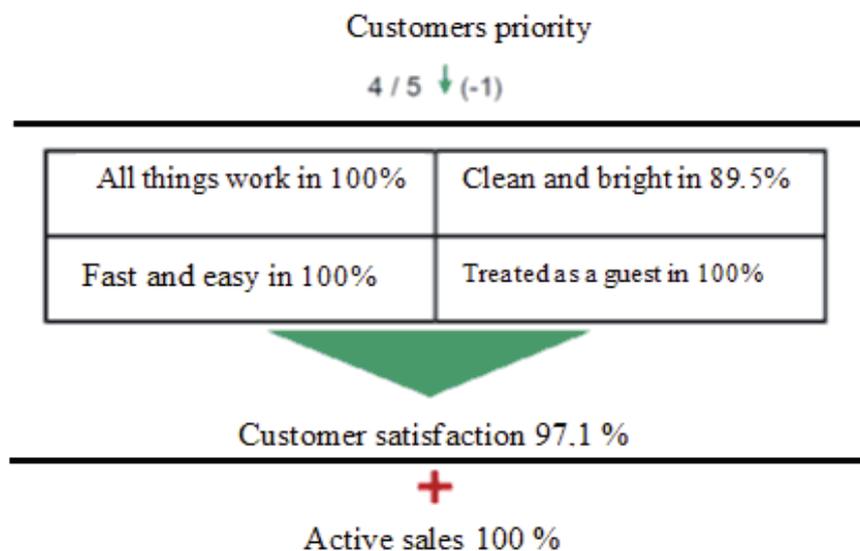


Fig. 9. Results of research by means of Importance-Performance method used for evaluation of the provided services, performed by a ‘test shopper’

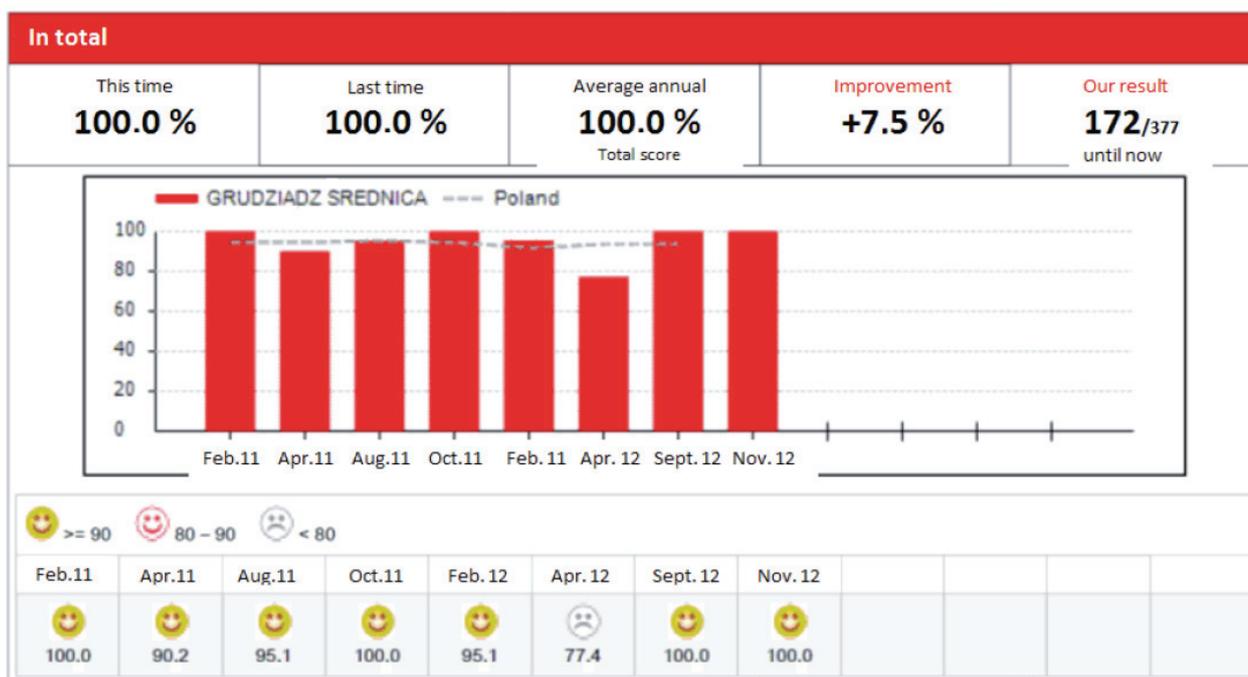


Fig.10. Presentation of the 'test shopper's' research results from February 2011 to November 2012

The evaluation depends on cooperation of the whole team, it is an overall evaluation consisting of partial grades, which has been presented in Tab. 20. The station was rated for 100% for the period of two years (eight quarters) as many as four times. According to a decreasing value, the research results were equal to 95.1% in August 2011 and in February 2012, 90.2% in April 2011. The worst result 77.4% was reported for June 2012. It was caused by failing to use polite expressions by the station staff and a messy toilet.

Tab.1 Partial grades of the 'test shopper' including the mean value from the obtained grades

Result of SEKCJA – This time				
	To be improved	This time%	Current result/possible result	Yearly average (5%)
Total MMP points		100.0%	79/79	94.5
Active sales		100.0%	20/20	94.1
Country Customer Priority	3	100.0%	5/5	94.7
Drive		100.0%	4/4	100.0
Fuelling		100.0%	35/35	96.5
Shop	1	100.0%	36/36	94.4
Toilet	2	100.0%	4/4	75.0

Conclusions

The discussed results of the provided services quality assessment show that the distribution system of the analyzed gas station functions properly. The station personnel participate in job trainings and their performance is regularly evaluated. The average grade for 2011 was 96.3% and for 2012 it was 93.1%. Having met 90-100% of the company requirements the result is considered to be a very good.

The carried out research on the quality of provided services makes it possible to indicate the areas which need to be improved. While analyzing the gas station operation, the following factors should be accounted for: Cleanliness and lighting of toilets – closer monitoring of the station for cleanliness and lighting efficiency is recommended as well as personal responsibility of shift

workers for the condition of toilets. Proper operation and cleanliness of fuel dispensers – more frequent control of fuel dispensers' cleanliness to be provided by employees serving customers at the dispensers and their quick actions in case of their damage or failure is recommended. The actions should involve providing immediate information to the dispensers' service staff in order to maximally reduce time of the dispenser malfunctioning.

The company attaches big importance to the way of communicating with customers and providing its employees with systematical trainings. Polite expressions and cultural manners while offering products prepared by the concern are required and have an influence on the customer satisfaction and thereby on the sale. Frequent job trainings and repetitions of acquired knowledge aims at making the employees aware of the importance of such values as personal culture and appreciation of customers.

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