Agronomy Research **14**(2), 533–539, 2016

Quantitative research SME and STK in the Czech Republic

H. Marušková* and K. Pluhař

Czech University of Life Sciences Prague, Faculty of Engineering, Department of Vehicles and Ground Transport, Kamýcká 129, CZ 165 21 Prague 6, Czech Republic
*Correspondence: maruskova@tf.czu.cz

Abstract. The article deals with the emission control stations (SME) and technical inspection stations (STK) in the Czech Republic. The increasing number of vehicles and their operational age has significant impact on these stations. The nowadays situation in the both stations does not react adequately to the changing conditions. The use of quantitative research, which was conducted through an Internet poll in September 2015, obtained responses from SME and STK staff, as well as from the public. The questionnaire didn't show substantial dissatisfaction with the current controls on SME and STK and there is no urgent need for immediate and major changes, but rather the need for continuous improvement and better control on SMEs, at least as at STK, i.e. the introduction of a central information database (preferably shared by STK and SME) and a camera system for better control. The cardinal question is not whether the existing emission checks on vehicles in no-load mode of the engines are able to detect all faults.

Key words: emission control, vehicle, inspection station.

INTRODUCTION

Transportation is a very important part of the global economy as well as people´s everyday life. These days there are lots of people who are interested in reducing pollution and protecting the environment and it is crucial to be strict during the inspection and maintenance of vehicles, because in the Czech Republic the age of the vehicles is increasing (Automotive Industry Association, 2015). The average age of vehicles increases also in European Union - the average vehicle age was 9.65 years in 2014, but it is still lower than in the Czech Republic (European Automobile Manufacturers Association, 2015).

In the Czech Republic to 30th September 2015 a total of 7,069,206 motor vehicles exist, and from this number is over 5 million passenger vehicles. The number of vehicles increases every year, as the average age of the fleet of the Czech Republic. Average age of vehicles increased to 17.45 years, while the average age of passenger cars is 14.73 of the year, but is still increasing, so that vehicles older than 10 years account for approximately 66% of the fleet of the Czech Republic (Fig. 1). For these vehicles, there is a high probability of partial loss of efficiency, eg. Catalysts.

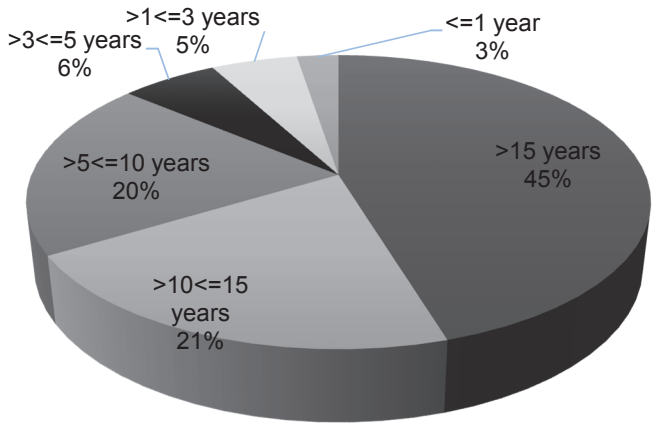

Figure 1. The total number of motor vehicles in accordance with the operating time from first registration (as of September 30, 2015, (Automotive Industry Association, 2015).

According to the OECD economic survey of the Czech Republic (2011) it is necessary to 'tighten its obligations regarding the inspection and maintenance of vehicles to better control of emissions from old vehicles and to support fleet renewal cars, trucks and buses'.

The production of harmful emissions (such as NOx, carbon monoxide, particulate matter), decreases in all Member States for the period from 1990 to 2010 because of the stricter homologation regulation according to European Environment Agency (2012).

Many studies follow up the pollution from vehicles in the world. Shancita et al. (2014) consider the most efficient technologies because of reducing fuel consumption and exhaust emissions from vehicles. Keall & Newstedad (2013) evaluate the costs and benefits of the frequency of periodic vehicle inspections. There are annual vehicle periodic inspection in New Zealand and they consider the 6–monthly inspections but the result is not cost-effective.

Selim et al. (2011) made a survey of vehicle inspection and emission standards in the United Arab Emirates, which results in insufficient integrity standards, tests carried out and the quality of testing. Questionnaires were completed by employees of vehicle inspection centres, importing ports, experts and car owners across the United Arab Emirates.

The Czech Republic put emphasis mainly on the technical inspection station and it is not so much interested in the emissions of vehicles. However, in other countries they have different rules. For example in the United States they measure only the emissions and they do not have to go to the technical inspection stations.

There are various tests in different countries and also the frequency of the inspections is not the same. In some countries the emission inspection is part of the technical inspection. These tests are used in Europe (Hromádko et al., 2011): Unloaded test, Transient Loaded Tests, Remote Sensing, Fuel Evaporative Tests, On Board Diagnostic, etc.

The United States is the leader when it comes to emissions inspection. Some states have the most stringent tests in the world. They measures not only the exhaust gases but also the noise. The emission tests in the United States are unloaded test, Remote Sensing,

Fuel Evaporative Tests, Transient Loaded, On Board Diagnostic and also Steady State Loaded, etc. (Hromádko et al., 2011).

Vehicles have to pass an emission inspection every two years in the Czech Republic (the first is after four years for a new car). The new law no. 239/2013 Coll. for measuring emissions is valid from 1st January 2015 and it is still improving. If the vehicle passes the emissions inspection, it will be able to go to the technical inspection. There are only two results during the emission inspection – satisfactory or unsatisfactory.

According to the Decree of the Ministry of Transport (2013) the emission measuring in the Czech Republic is split by fuel type (engine type):

- spark-ignition engines with uncontrolled emission system and uncontrolled emission system with catalytic converter;
- spark-ignition engines with controlled emission system with catalytic converter
- diesel engines uncontrolled system
- diesel engines with a controlled system
- the motors for driving the fuel gas (e.g. LPG, CNG, H2, ...)
- more fuel drive.

Detailed scope and method of measuring emissions is described in Decree of the Ministry of Transport 342/2014 Coll. And in Transport Bulletin 12/2015 Appendix 1 – Methodology emission vehicles in measuring emissions stations (Table 1).

Table 1. Framework emission measurement procedures for different categories of vehicles (Bulletin of Transport, 2015)

	Vehicle identification	Visual control	Diagnostics of engine management system	Depending on the outcome of the diagnostic engine management system/ optional additional procedures	Concentrations measuring (spark-ignition engines)smoke (diesel engines)
Spark-ignition engines					
– uncontrolled system	x	x			x
– a controlled system without OBD	x	x	x		x
– a controlled system with OBD	x	x	x	x	x
Diesel engines					
– uncontrolled system	x	x			x
– a controlled system without OBD	x	x	x		x
– a controlled system with OBD	x	x	x	x	x

OBD = on-board diagnostics

Each emission measurement station is authorized to measure emissions of certain vehicles. Emission measuring stations must use the measuring device that is approved by the Ministry of Transport.

MATERIALS AND METHODS

Quantitative research titled Cars and emission measuring stations (Table 2) took place in the Czech Republic for a week in September 2015, namely from 16th September to 23th September 2015. The research method was used CASI (Computer Assisted Self Interviewing) or technique, where the respondent itself fills in the questionnaire on your computer without having to interfere with the interviewer. The questionnaire was created on the website www.vyplnto.cz and contained 15 questions (Table 3).

Table 2. Quantitative research – CASI

Name	Vehicles and Emission Control Station
Method	CASI
Target group	STK and SME staff, general public
Sample size	N = 119
Location	The Czech Republic
Research tools	15 questions in the questionnaire
Questioning term	16th September – 23th September 2015
Rate of return	67.3%*
Average time filling	4:48 min

* Rate of return is determined by the ratio of completed questionnaires and displayed - data is approximate (www.vyplnto.cz).

Table 3. List of the questions

Number	Question
Q1	Do you have a vehicle (own, use, take care of...)?
Q2	Do you go to the emission control with your vehicle regularly?
Q3	How many vehicles do you have (in the household, have the use of it)?
Q4	What is the age of your vehicle?
Q5	What is the age of your second car?
Q6	What fuel do you prefer (what do you choose in case of purchase new car)?
Q7	How often would be the emission control (what frequency)?
Q8	Do you consider the frequency satisfactory (enough)?
Q9	What changes do you suggest during the measuring at the emission control stations?
Q10	Are you a worker (employee, owner...) of the emission control station?
Q11	Gender
Q12	Age
Q13	Region
Q14	Education
Q15	If you have any comment to the emission control station, you can write it here

If we counted the return polled people it would be lower, about 17%. Email with questionnaire was sent to about 330 e-mail addresses of technical inspection stations (and others about 15 e-mails were not delivered). 55 questionnaires were filled by staff of technical inspection stations or emissions inspections stations.

RESULTS AND DISCUSSION

Out of 119 respondents, only 5% owned or used automobile. People who responded that they have or used car, were automatically redirected to question no. 6 – What type of fuel do you prefer.

Nine out of ten respondents personally run on emission measuring stations. Only 10% of people do not go to regular checks and sends the vehicle to someone else. Based on the results of question 11 – Sex can be assumed that half of those who do not go to SMEs are women.

For questions 3 can be seen that almost half of respondents have two vehicles, which may be associated with an increasing number of cars. The largest group of vehicles aged 10–15. Fortunately, nearly 30% of the cars are aged 5–10 years and only 13% of cars are older than 15 years. Nearly 1/3 of respondents have no second car. The order of frequency of answers to the age of the other vehicle remains very similar to the previous issues.

Almost half of the respondents would choose diesel fuel if acquiring a new car. Less than 40% by opting for gasoline, only about 10% gas and 1% electric car. This order can depend on low awareness of alternative fuels, a small number of service stations and even an emission control station or unwillingness to choose something relatively new and unextended.

53% of respondents are satisfied with the current status, (i.e. the first inspection after 4 years, and then every two years), and the rules should not change (Fig. 2). 15% of people is very similar variation with the difference that the first inspection would be after two years. And almost equally large group would regulate the timing of the second check, which would be after three years. These results suggest that only about 15% of those surveyed would shorten the intervals of emission controls.

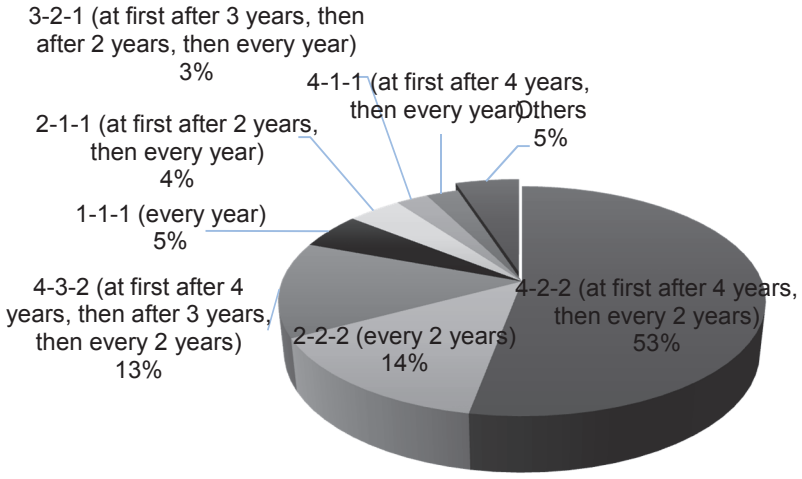

Figure 2. How frequent should inspections be at the stations of measuring emissions (SME)?

More than half of the responses to the question whether the controls are adequate emission stations, is positive. Approximately 25% of people admit that checks on the technical emission not always take place according to the rules and 15% of people are aware of the imperfection of current measurement methods.

Approximately 1/4 of the respondents would not change inspections at emission stations during measurements done. Popular innovation would be the introduction of a central information system, emission measuring stations. This change was expressed by 36% of respondents. Almost 30% of respondents would welcome a change in the final assessment, which would be more opportunities in an unsatisfactory condition of the vehicle. Now it is a very small percentage of inspections with unsatisfactory results (about 1%), so it can be assumed that if the vehicle fails to meet the conditions for supervision and control instead of towing it 'does not count' and the car is towed away, but 'leave' home. 27% of respondents would be for cameras introduction.

Over 50% of respondents work on emission measurement station or in the station of technical inspections. Due to this result, it is possible to consider the response from this questioning for a really beneficial because they are made by people in the field who 'knows what they are talking about'.

Men were interviewed mostly, only 15% were women. This result is quite expected considering the subject questionnaire. The age representation was fairly even, where only about 5% of the respondents were over 60 and less than 2% younger than 18, which is related to the ownership and driving a motor vehicle.

Even the distribution of responses by region is relatively uniform, the highest number of responses were from Prague and Central Bohemia, which is logical considering the number of inhabitants and the capital of the Central Region, which surrounds Prague. The least respondents were from the Hradec Kralove Region and Zlín Region. More than half of the respondents have secondary education and 30% of respondents received a college degree.

Question number 15 was open while the optional question (unlike the previous questions). Therefore, the answer was a small amount, but on the other hand, the responses were much more valuable (in terms of their content). For this question, therefore, it is more of a qualitative research.

The response was that there are more SMEs than is needed; it would be appropriate to establish a central information system as the STK, as well as the proposal to introduce emission plaques in larger cities, such as in Germany, and especially the need for a new measurement methodology.

CONCLUSIONS

The answers are considered sufficient expertise to this questionnaire because more than half of the respondents worked at stations for technical inspection stations and emission measurement. The questionnaire does not imply a fundamental dissatisfaction and the urgent need for immediate and major changes, but rather the need for continuous improvement. The result of the questionnaire is different from the OECD economic survey of the Czech Republic.

The most important is considered the introduction of a central information system, as is already the case for technical inspection stations. Given the relatively high number

of respondents from the field (STK and SME staff), the emphasis is on accuracy, which can bring a new methodology for measuring emissions.

Probably the people who work in SME or STK calls for the introduction of CCTV and an extension of the inspection results. Increasing number of vehicles means the station for emission controls more regular inspections and also theoretical inspections, which are not compulsory and will depend on the decision of the owner of the vehicle.

Ever increasing average age of vehicles could lead to a renewal of the fleet and thus again increased the number of inspections at stations measuring emissions. The high average age of cars is not good for both security and even the environment, so there is much room for innovation, whether measuring device or measurement methodology that would lead to a tightening of the rules and disposal of vehicles that are most harmful to human health.

The new methodology of emissions measuring should be fundamentally different from existing ones. Measurements of emissions should be carried out also in stress mode engines.

REFERENCES

European Automobile Manufacturers Association (ACEA): Average vehicle age 2015 [online]. [cit. 2016-18-03]. Available at: *http://www.acea.be/statistics/article/average-vehicle-age*

European environmental agency. The contribution of transport to air quality. TERM 2012: Indicators tracking transport and environment in the European Union. EEA Report No. 10/2012 [online]. [cit. 2015-01-05]. Available at: *http://www.eea.europa.eu/publications/transport-and-air-quality-term-2012*

Hromádko, J., Hromádko, J., Hönig, V. & Miler, P. 2011. Spalovací motory. Praha: Grada Publishing. ISBN 978-80-247-3475-0.

Keal, M. & Newstead, S. 2013. An evaluation of costs and benefits of vehicle periodic inspection scheme with six-monthly inspections compared to annual inspections. *Accident Analysis and Prevention* **58**, 81–87.

The Department of International Relations: Conclusions and recommendations of the Economic survey of the Czech Republic. 2011. [online]. [cit. 2011-11-05]. Available at: *http://www.mfcr.cz/cps/rde/xbcr/mfcr/CZE_2011_PB_CZ.pdf*

Selim, M., Maraqa, M.A., Hawas, Y.E. & Mohamed, A.M.O. 2011. Assessment of vehicle inspection and emission standards in the United Arab Emirates. *Transportation Research Part D* **16**, 332–334.

Shancita, I., Masjuki, H., Kalam, M, Raizwanul, I., Rashed, M. & Rashedul, H. 2014. A review on idling reduction strategies to improve fuel economy and reduce exhaust emission of transport vehicles. *Energy conversion and management* **88**, 794–807.

Automotive Industry Association: The composition of motor vehicle fleet in the Czech Republic. 2015. [online]. [cit. 2016-07-01]. Available at: *http://www.autosap.cz/zakladni-prehledy-a-udaje/slozeni-vozoveho-parku-v-cr/*

Transport Bulletin 12/2015. Ministry of Transport. 2015. [online]. [cit. 2016-18-03]. Available at: *http://www.mdcr.cz/cs/Vestniky/Vestnik_dopravy.htm*

Decree of the Ministry of Transport 342/2014 Coll. The technical inspection and emission measuring controls of vehicles. 2014. [online]. [cit. 2015-10-05]. Available at: *http://www.sagit.cz/pages/sbirkatxt.asp?zdroj=sb14342&cd=76&typ=r*

Vyplnto.cz. The cars and emission stations. 2015. [online]. [cit. 2015-23-09]. Available at: *https://www.vyplnto.cz/moje-pruzkumy/?did=49825*