Acta Technologica Agriculturae 3
Nitra, Slovaca Universitas Agriculturae Nitriae, 2014, pp. 83–85

ASSESSING THE TECHNICAL CONDITION OF INSPECTED VEHICLES IN REPORTING PERIOD

Michal ANGELOVIČ*, Mário SZABÓ, Radoslav MAJDAN, Tomáš POLONEC

Slovak University of Agriculture in Nitra, Slovak Republic

Vehicle emissions inspection represents a fast, relatively effective in terms of time and cost, and mainly comprehensive estimation of vehicle emissions. Procedurally, emissions inspection includes those inspection operations that focus not only on analysing exhaust gases but also on detecting the functionality and tightness of other engine components directly affecting the ecological friendliness of inspected vehicle's engine. Our study describes the results of vehicles inspected at an emissions inspection station for the reporting period. Based on the analysis of information obtained from the National Transport Authority of the Slovak Republic concerning the evaluation of vehicles according to individual categories, it can be alleged that the technical condition of vehicles of M_1 and N_1 categories is gradually improving.

Keywords: vehicle emissions inspection, motor vehicles, results of vehicle emissions inspection

The vehicle emissions inspection system in the Slovak Republic is regulated by the Act No 725/2004 on conditions of vehicle operation in road traffic and on amendments to some acts, with approved Decree of the Ministry of Transport, Posts and Telecommunications of the Slovak Republic No 578/2006 stipulating the details on certain provisions of the Act No 725/2004 on conditions of vehicle operation in road traffic and on amendments to certain acts, as amended.

The emissions inspection of motor vehicles means the inspection of the engine and its system that influence the production of pollution substances in exhaust gases, and meeting (determined by measurements) of the conditions and engine emission limits determined by the vehicle manufacturer; if engine emission limits are not specified by the manufacturer, then meeting the emission limits stipulated by generally binding legal regulations (Vitázek, 2006).

Emissions inspection is performed at a stationary emissions inspection station or in a mobile emissions inspection station (Müllerová, 2011).

The emissions inspection station is a workplace specializing on performing motor vehicle emissions inspections. According to the size of premises and category of vehicles, their emissions system and the type of fuel for engine drive, emissions inspection stations are divided into individual types of workplaces at which individual types of emissions inspections are performed (Lendák, 2013).

analysed during the identical reporting period. The final evaluation of vehicles was assessed in percentages of the total number of vehicles.

For the reporting period, we have chosen a time period when the emissions inspection of vehicles was performed at least twice one after another (depending on category). To enable using the analysis of obtained information for the reporting period for concluding about the actual condition of vehicle fleet in the Slovak Republic, then the last calendar year of the reporting period must not be older than two years from the calendar year when the emissions inspection of vehicles is performed. In order to improve the comparison of obtained information, it is necessary to divide the reporting period into identical time periods, i.e. one calendar year.

Considering the above-mentioned facts, we have selected years 2010, 2011 and 2012 as our reporting period.

Based on the information obtained from the National Transport Authority of the Slovak Republic and using Equation (1), we estimated the percentage of individual evaluations of vehicles subjected to emissions inspection for each calendar year of the reporting period and for the whole reporting period.

$$X = \frac{x_i}{N} \times 100 \quad (1)$$

where:

- X – percentage of capable/incapable vehicles, %
- x_i – value of variable X of the i -th unit, pcs
- N – sample size, pcs (Janoško, 1996)

Material and methods

The subject of analysis were vehicles in periodical emissions inspection. Vehicles from the M_1 to M_3 and from the N_1 to N_3 category were assessed without considering their type of fuel and their type of emissions system. On vehicles of selected categories, the number of vehicles subjected to emissions inspection as well as their final evaluation were

Results and discussion

Tables 1, 2 and 3 present the information obtained from the National Transport Authority concerning the evaluation of road motor vehicles in emissions inspections for the selected reporting period.

Table 1 Results of vehicles evaluation according to categories in 2010

Category	Capable in pcs	Incapable in pcs	Total in pcs
M ₁	666,354	7,856	674,210
M ₂	600	2	602
M ₃	7,329	69	7,398
N ₁	53,833	436	54,269
N ₂	22,178	138	22,316
N ₃	42,657	177	42,834

Table 2 Results of vehicles evaluation according to categories in 2011

Category	Capable in pcs	Incapable in pcs	Total in pcs
M ₁	655,538	5,479	661,017
M ₂	591	2	593
M ₃	7,351	45	7,396
N ₁	63,866	300	64,166
N ₂	21,739	121	21,860
N ₃	42,743	97	42,840

Table 3 Results of vehicles evaluation according to categories in 2012

Category	Capable in pcs	Incapable in pcs	Total in pcs
M ₁	716,871	5,956	722,827
M ₂	602	4	606
M ₃	7,191	42	7,233
N ₁	76,044	523	76,567
N ₂	20,773	69	20,842
N ₃	43,256	87	43,343

Results of evaluation of M₁ and N₁ category vehicles in emissions inspection

Only the M₁ and N₁ category vehicles have been selected from the results of emissions inspections presented in Table 1, 2 and 3. We calculated the percentage of vehicles evaluated as capable or incapable in periodical emissions inspection in 2010 and 2012. Using Equation (1), we estimated the percentage of vehicles from the total number of vehicles that belongs to individual evaluations.

The calculated data for the M₁ category is shown in Table 4 and for the N₁ category in Table 5.

Table 4 Percentage of capable and incapable vehicles of M₁ category subjected to periodical emissions inspection in 2010 and 2012

Year	Category	Capability in %	
		capable	incapable
2010	M1	98.83	1.16
2012	M1	99.18	0.82

Table 5 Percentage of capable and incapable vehicles of N₁ category subjected to periodical emissions inspection in 2010 and 2012

Year	Category	Capability in %	
		capable	incapable
2010	N1	99.19	0.80
2012	N1	99.31	0.68

Table 4 shows that the highest percentage of M₁ category vehicles was evaluated as capable in periodical emissions inspection. This represents 98.83 % in 2010 and 99.18 % in 2012 of the total number of vehicles subjected to emissions inspection. This vehicle evaluation shows an increase by 0.35 %. As regards incapable vehicles of this category, the percentage was 1.16 % in 2010 and 0.82 % in 2012. This evaluation indicates a decrease by 0.34 %.

According to evaluation in periodical emissions inspection, it can be alleged that there is an improvement in emissions of M₁ category vehicles.

Table 5 demonstrates that 99.19 % of N₁ category vehicles were capable in 2010 and 99.31 % in 2012, which represents an increase by 0.12 %. On the contrary, 0.80 % of vehicles were incapable in 2010 and 0.68 % in 2012, representing a decrease by 0.12 % as compared to 2010.

Based on the calculated data, it can be noted that the emissions condition of N₁ category vehicles is gradually improving, which is demonstrated by information from emissions inspections of vehicles of this category in 2010 and 2012.

Results of evaluation of M₂ and N₂ category vehicles in emissions inspection

As regards evaluating the results of M₂ and N₂ category vehicles presented in the following table, we have proceeded similarly.

Table 6 Percentage of capable and incapable vehicles of M₂ and N₂ category subjected to periodical emissions inspection in 2011 and 2012

Year	Category	Capability in %	
		capable	incapable
2011	M ₂	99.66	0.33
	N ₂	99.44	0.56
2012	M ₂	99.33	0.66
	N ₂	99.66	0.33

Table 6 demonstrates the percentage of the total number of M₂ category vehicles evaluated as capable or incapable for running on roads in 2011 and 2012, capable being 99.66 % of M₂ category vehicles in 2011 and 99.33 % in 2012. Based on the afore-mentioned facts, there is a decrease in capable vehicles by 0.33 %. On the contrary, 0.33 % of this category of vehicles were incapable for running on roads in 2011 and 0.66 % in 2012. There is a year-to-year increase by 0.33 % for this type of classification. This could be caused by the wear and insufficient maintenance of vehicles of this category.

Table 6 shows that vehicles of N_2 category were capable in 99.44 % and incapable in 0.56 % in 2011. In 2012, 99.66 % of vehicles of this category were capable and 0.33 % incapable. By comparing the individual evaluations, it can be concluded that there was an increase by 0.22 % for capable vehicles in 2012 and a decrease by 0.23 % for incapable vehicles. Differences between the decrease and increase of individual evaluations were caused by rounding of calculated values.

Based on calculated results, it can be noted that there was a year-to-year improvement in the vehicle fleet of M_2 and N_2 category. Such a condition could be caused by finding and subsequently removing small defects on inspected vehicles.

Results of evaluation of M_3 and N_3 category vehicles in emissions inspection

As regards evaluating the results of M_3 and N_3 category vehicles presented in the following table, we have proceeded similarly.

Table 7 clearly indicates that 99.39 % of M_3 category vehicles were capable and 0.60 % incapable in 2011. In 2012, 99.41 % of vehicles were evaluated as capable and 0.58 % as incapable. By comparing the individual evaluation classifications in the reporting period, there was shown an increase by 0.02 % for capable vehicles in 2012 and a decrease by 0.02 % for incapable vehicles when compared to 2011.

Table 7 Percentage of capable and incapable vehicles of M_3 and N_3 category subjected to periodical emissions inspection in 2011 and 2012

Year	Category	Capability in %	
		capable	incapable
2011	M_3	99.39	0.60
	N_3	99.77	0.22
2012	M_3	99.41	0.58
	N_3	99.79	0.20

The results demonstrate that the emissions capability of vehicles of this category did not improve significantly, which could be caused by using the same vehicle fleet in this category.

The results in Table 7 indicate that 99.77 % of N_3 category vehicles were capable and 0.22 % incapable for running on roads in 2011. In 2012, 99.79 % of vehicles were evaluated as capable and 0.20 % as incapable. Based on comparing the results of 2011 with the results of 2012, it can be stated that there were almost no changes in classification degrees in the reporting period.

Conclusion

The results of calculations demonstrate an improvement in emissions of road motor vehicles of M_1 and N_1 category, which could be caused by the fact that new vehicles are gradually more available for better prices. For the M_2 and N_2 category, there was a decrease in the evaluation of emissions of road vehicles within the reporting period. It could be due to the fact that vehicles of this category are not common and their occurrence is almost minimal. There were almost no changes in the evaluation of emissions of M_3 and N_3 category vehicles. This condition could be caused by the fact that the vehicle fleet of this category has remained almost unchanged.

Considering the above-mentioned circumstances, it could be noted that the technical condition of M_1 and N_1 category vehicles is gradually improving, being supported by results of emissions inspections, too. Emissions of vehicles have also improved by innovating the most numerous vehicle category (M_1) by means of a scrappage programme approved by the Government of the Slovak Republic in 2009.

References

- JANOŠKO, J. – DRABANT, Š. – CALEK, M. 1996. Meranie spotreby paliva naftových motorov objemovou metódou. In *Acta Technologica Agriculturae*, vol. 37, 1996, pp. 37–43.
- VITÁZEK, I. 2006. Tepelné procesy v plynnom prostredí. Nitra : SUA, 2006. 98 pp. ISBN 80-8069-716-7.
- LENĎÁK, P. – HUJO, Ľ. – JABLONICKÝ, J. – ANGELOVIČ, M. 2013. Implementation of a new methodology of emission inspection in motor vehicles with an advanced emission system. In *Acta Technologica Agriculturae*, vol. 16, 2013, no. 1, pp. 9–12.
- MÜLLEROVÁ, D. – JABLONICKÝ, J. – HUJO, Ľ. – KOSIBA, J. 2011. Detection of emission in combustion engines exhaust. In *Machines, Technologies, Materials*, vol. 5, 2011, no. 4, pp. 53–56.

Contact address:

Michal Angelovič, Slovak University of Agriculture in Nitra, Faculty of Engineering, Department of Transport and Handling, Tr. Andreja Hlinku 2, 949 76 Nitra, Slovak Republic, e-mail: michal.angelovic@gmail.com