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EVALUATION OF INSPECTED VEHICLES IN REPORTING PERIOD AT TECHNICAL INSPECTION AND EMISSION CONTROL STATION

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Technical inspection is a fast, relatively timely and inexpensive, and particularly comprehensive assessment of the technical condition of vehicles. The technical review process includes a wide range of control actions, which are slightly different depending on the category of vehicle. The evaluation of technical inspection is mainly dependent on the type of failures that occur on a vehicle, and it is a three-graded classification by the grades A, B or C. Based on data obtained from technical inspections, it is possible to determine the current condition of the fleet of road vehicles in the Slovak Republic.

Keywords: vehicles, technical inspection, results of technical inspections

At a time when the business and social environment develop dynamically, we can hardly imagine life around us without cars (Szabó et al., 2012).

To ensure a proper operating condition of vehicles and their operational reliability, especially ecology and safety, it is necessary to introduce a kind of a control mechanism that will ensure a comprehensive monitoring of the proper technical condition of vehicles in operation. This control mechanism must be particularly comprehensive, timely and inexpensive. All of these conditions of the control mechanism are met by 'technical inspection'. Technical inspection represents a set of checking actions to inform citizens about the technical condition of their inspected vehicles. This information is not only for that one particular citizen but is also very important for insuring vehicles, pricing, etc.

Part of technical inspection is also emission control. The main disadvantage of combustion engines is a combustion product – emission (Müllerová et al., 2012). Traffic is a problem, especially in cities with high levels of pollution from exhaust gases (CO, HC, NO_x, PM) and in places where most of the population lives (Štefina et al., 2012). The vehicles that passed the technical inspection meet the emission limits prescribed by the manufacturer or set forth by generally binding regulations, and are environmentally friendly, without increased exhalations. Results obtained in such an inspection can also be used to determine the quality and structure of the vehicle fleet, failure probability, or the precision of technical performance of vehicles of all categories that are subject to roadworthiness tests.

Material and methods

Diesel emission control is performed using the steps and procedures in the methodical guidelines for carrying out a regular emission control, emission control and administrative control published by the Ministry of Transport, Construction and Regional Development of the Slovak Republic (Králik et al., 2012).

The object of the analysis is to evaluate the roadworthiness of vehicles in the regular technical

inspection of vehicles of M₂, M₃ and N₂, N₃ categories. During the selected period, there was analysed the number of vehicles submitted to technical inspection, together with their final evaluation. The final evaluation of vehicles is described by percentages from the total number of vehicles. Partial data are then compared, and results obtained are presented in graphs. For the reporting period, it is necessary to select such a time in which vehicles undergo the roadworthiness test (depending on the category), at least two times one after another. If the vehicle analysis for the reporting period is used for concluding the current condition of the vehicle fleet, the last calendar year of the reporting period must not be older than two years from the calendar year in which the analysis is performed. For a better comparison, the reporting period can be divided into equal time periods that make up one calendar year.

According to the Decree No 578/2006, vehicles are subject to regular inspection at different intervals according to individual categories. According to each vehicle category selected by us, the intervals are as follows:

- a) M₁ and N₁ category: within four years after the first registration and thereafter periodically in two-year periods;
- b) M₂, N₂, M₃, N₃ category: within one year after the first registration and thereafter periodically in one-year periods;
- c) M₃ category: periodically in one-year periods after the first registration; periodically in half-year periods after eight years from the first registration;
- c) M and N category used for ambulances, mine rescue and emergency service of gas equipment, vehicles used for taxi and vehicles used in driving school as a training vehicle: within one year after the first registration and then periodically in one-year periods.

In technical inspection, evaluated vehicles are classified into the groups A, B and C, and each of the classification grades represents a different vehicle condition, depending on failures detected on the vehicle.

The classification grade A represents technical condition with no failures or with a minor failure that does not affect the safe operation of a vehicle on roads, and the vehicle is

evaluated as qualified for road traffic. In such an evaluation, the vehicle is assigned a certificate of technical inspection, and the validity period of technical inspection is 24 or 12 months.

The classification grade B means vehicle condition with a severe failure that affects the safe operation of the vehicle, but does not directly threaten the operated vehicle in road traffic. The vehicle is evaluated as qualified for temporary road traffic. The validity period of technical inspection is only 30 days. The document certifying the inspection performance is only the record on vehicle technical condition.

The classification grade C is technical condition with at least one dangerous failure that affects the safety of operated vehicle and directly threatens its operation in road traffic, the safety of persons and property, the environment, or damages communications. The vehicle is not qualified for road traffic, there is no validity period of technical inspection, and the vehicle's operator or driver is required to have such a vehicle towed at their own expense from the inspection station.

The proportion of vehicles in individual evaluations is calculated by Equation (1) (Hrubec, 2001) and rounded to two decimal places.

$$X = \frac{X_i}{N} \cdot 100 \quad (1)$$

where:

- X_i – value of the variable X of the i -th unit, pcs
 i – file unit name (i = qualified, unqualified ...), pcs
 N – file size, pcs (Hrubec, 2001)

Results and discussion

Tables 1 and 2 contain the data obtained from technical inspection stations for the M_2 , M_3 and N_2 , N_3 categories and for the selected reporting period.

Table 1 Evaluation of results according to vehicle categories in 2011

Category	Qualified in pcs	Temporarily qualified in pcs	Unqualified in pcs	Sum in pcs
M_2	695	18	30	743
M_3	12,195	609	2,031	14,835
N_2	25,387	402	1,627	27,416
N_3	47,868	562	2,335	50,765

Table 2 Evaluation of results according to vehicle categories in 2012

Category	Qualified in pcs	Temporarily qualified in pcs	Unqualified in pcs	Sum in pcs
M_2	699	15	34	748
M_3	11,842	490	1,296	13,628
N_2	23,773	493	1,251	25,517
N_3	48,465	706	1,973	51,144

Technical condition evaluation results for M_2 and N_2 categories

The data from Tables 1 and 2 determine the proportion of vehicles of M_2 and N_2 categories evaluated in regular technical inspection for 2011 and 2012 as qualified, unqualified and temporarily qualified. The data are recorded in Table 3. The proportion of vehicles in individual evaluations was calculated using Equation (1) (Hrubec, 2001) and rounded to two decimal places.

Subsequently, the results of roadworthiness tests for 2011 and 2012 were mutually compared. Based on the results, a conclusion was drawn on the current technical condition of road vehicles of those categories.

Table 3 Proportion of qualified, unqualified and temporarily qualified vehicles of M_2 and N_2 category subjected to regular technical inspection in 2011 and 2012

Year	Category	Qualification in %		
		qualified	temporarily qualified	unqualified
2011	M_2	93.54	2.42	4.04
	N_2	95.60	1.47	5.93
2012	M_2	93.45	2.00	4.55
	N_2	93.17	1.93	4.90

Figure 1 indicates the proportion of the total number of vehicles of M_2 category evaluated as qualified, temporarily qualified, or unqualified for use on roads in 2011 and 2012. As regards the M_2 category, 93.54 % were qualified in 2011 and 93.45 % in 2012 (the number of qualified vehicles decreased by 0.09 %), 2.42 % were temporarily qualified in 2011 and only 2.00 % in 2012 (in 2012 there was a decrease by 0.42 % as compared to 2011), 4.04 % were unqualified in 2011 and 4.55 % in 2012 (there was an increase by 0.51 % in 2012).

Figure 1 Proportion of qualified (A), temporarily qualified (B) and unqualified (C) vehicles of M_2 category submitted to regular technical inspection in 2011 and 2012

It is possible to state that in 2012 there was a slight decrease in vehicles qualified for road traffic as well as a decrease in vehicles temporarily qualified for road traffic. An increase was found in vehicles unqualified for roads. This condition could be caused due to wear and omissions of maintenance schedules of the said vehicle categories.

Figure 2 Proportion of qualified (A), temporarily qualified (B) and unqualified (C) vehicles of N₂ category submitted to regular technical inspection in 2011 and 2012

Figure 2 shows that in 2011 the vehicles of N₂ category were evaluated in regular technical inspection as follows: 95.60 % were qualified, 1.47 % was temporarily qualified, and 5.93 % were unqualified. In 2012, the evaluation of the same vehicle category was as follows: 93.17 % were qualified, 1.93 % was temporarily qualified, and 4.90 % were unqualified. Comparing various evaluations enabled the following conclusion: in the classification grade qualified, there was in 2012 a decrease by 2.43 %, the classification grade temporarily qualified showed an increase by 0.46 %, and the classification grade unqualified was characterised by a drop by 1.03 % compared with 2011.

It can be stated from the above-mentioned facts that increase was only in the classification grade temporarily qualified, which could be due to minor deficiencies on inspected vehicles. Minor deficiencies are considered deficiencies and failures occurred probably by ignoring the maintenance of this vehicle category.

Technical condition evaluation results for M₃ and N₃ categories

The data from Tables 1 and 2 were used to determine the proportion of vehicles of M₃ and N₃ category evaluated in the technical inspection of 2011 and 2012 as qualified, temporarily qualified and unqualified. The data are recorded in Table 4. The proportion of vehicles in individual evaluations was calculated using Equation (1) (Hrubec, 2001) and rounded to two decimal places.

Table 4 Proportion of qualified, unqualified and temporarily qualified vehicles of M₃ and N₃ category submitted to regular technical inspection in 2011 and 2012

Year	Category	Qualification in %		
		qualified	temporarily qualified	unqualified
2011	M ₃	82.20	4.11	13.69
	N ₃	94.29	1.11	4.60
2012	M ₃	86.89	3.60	9.51
	N ₃	94.76	1.38	3.86

Figure 3 Proportion of qualified (A), temporarily qualified (B) and unqualified (C) vehicles of M₃ category submitted to regular technical inspection in 2011 and 2012

Figure 3 clearly shows that in 2011 there were 82.20 % of M₃ category vehicles classified as qualified, 4.11 % temporarily qualified and 13.69 % unqualified. In 2012, the situation was somewhat different; the category qualified represented 86.89 %, temporarily qualified 3.60 % and unqualified 9.51 %. By comparing the individual evaluations during the reporting period, it was found that in 2012 there was an increase by 4.69 % in the classification grade qualified, a decrease by 0.51 % in the classification grade temporarily qualified, and a decrease by 4.18 % in the classification grade unqualified compared with 2011.

It is obvious that the technical qualification of vehicles in this category was significantly improved, which could be due to a variation of the vehicle fleet, e.g. by introducing a requirement that M₃ vehicles older than eight years are required to undergo the regular technical inspection in half-year periods, as well as by improving vehicle maintenance schedules, etc.

It can be determined from Figure 4 that based on the regular technical inspection of vehicles of N₃ category in 2011, 94.29 % of vehicles were evaluated as qualified, 1.11 % as temporarily qualified, and 4.60 % as unqualified for road traffic. In 2012, there was a slight change, and according to our findings, 94.76 % of vehicles were qualified, 1.38 % was temporarily qualified, and 3.86 % were unqualified. Comparing the results from 2012 with the results from 2011 enabled the following conclusion: there was an increase by 0.47 % in the classification grade qualified in 2012, an

Figure 4 Proportion of qualified (A), temporarily qualified (B) and unqualified (C) vehicles of N₃ category submitted to regular technical inspection in 2011 and 2012

increase by 0.27 % for temporarily qualified vehicles, and a decrease by 0.74 % for unqualified vehicles compared with 2011.

Comparing the results for the N_3 category, it is possible to state that in 2012 there was an increase in qualified and temporarily qualified vehicles, which can be caused by a variation of the vehicle fleet, e.g. due to the introduction of a toll system, in which the amount of payments depends on the emission class of vehicles.

Conclusion

This paper deals with the evaluation of vehicles of M_2 , M_3 and N_2 , N_3 category on the basis of results obtained at the technical inspection and emission control station between 2011 and 2012. Almost in all categories of vehicles, there was observed an increase in the evaluation of vehicles as qualified for road traffic during the reporting period, except for the M_2 and N_2 category, which revealed a drop in this evaluation. The highest increase for the reporting period was found in the M_3 category. The highest increase for temporarily qualified vehicles was recorded in the N_2 category and decline in all the other categories (the highest fall for the M_3 category). For unqualified vehicles, the highest increase was reported in the M_2 category, and other categories showed a decline in this evaluation during the reporting period. The greatest decrease for the reporting period occurred in the M_3 category.

All of the categories in the reporting period exceeded the evaluation limit above 90 %, except for vehicles of M_3 category. It is the case of vehicles for mass transport of passengers, while they have not a comparable technical qualification with other vehicle categories, and therefore they do not reach the qualification limit comparable with other vehicle categories. Based on the above-mentioned facts, it can be stated that the technical condition of vehicles is gradually improving, which is supported by observations from roadworthiness tests.

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