

CONTROL OF THE EXHAUST GASES EMISSION OF CARS

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ABSTRACT

Preventive maintenance includes regular and preventive technical inspections of the vehicles, which also includes the control of the exhaust gases emission of cars. Besides the reduction of the technical malfunction of cars this inspection can also contribute the reduction of the negative impact on the environment. In Bosnia and Herzegovina, and particularly in Federation B&H the activities have been started to properly equip the stations for technical inspection and since May 2009 the compulsory ECO test of vehicles has been introduced. This paper will present the brief chronology of testing in this field which resulted in its compulsory implementation at the state level.

Key words: ECO test, exhaust gases, station for technical inspection of vehicles, inspectors

1. INTRODUCTION

Due to ever increasing pollution in the cities and ever increasing number of the vehicles in those cities the total level of air pollution is increasing as well. The wish is to stop this trend and to start reducing the total level of pollution. As the impact of the traffic in air pollution of the cities is significantly high the need to reduce the consequences of such an impact is even greater. The reduction of air pollution can be achieved by reduction of the number of vehicles having bad combustion and greater investments in supply of modern vehicles having good quality of combustion and using fuels of better quality compared to the ones that have been used so far. As it is more realistic to expect that much better results can be achieved by reduction of the number of vehicles with bad combustion than by supply of the new vehicles, it is absolutely necessary to have greater engagement of the stations for technical inspection in more thorough inspection of the vehicles with respect to the quality of the exhaust gases.

2. CAR TESTING AIMED TO CONTROL THE EXHAUST GASES EMISSION

The equipment for inspection of the exhaust gases is the integral part of the equipment at all the stations for technical inspection and makes the obligatory part of it. Considering the increased interest in the quality of fuels being sold at our petrol stations, according to the instructions of the Federal Ministry for Transport and Communications, „IPI“ Zenica, being the institution having the authority transferred from the Federal Government to supervise the work of the stations for technical inspection and their staff, as well as to calibrate the equipment installed in the stations, carried out the testing of the fuels. The task was to carry out the tests with the registered vehicles with the most frequently installed engines. Therefore, after having analyzed the registered vehicles in FB&H, IPI made the decision about the models that were used in fuel testing. In supply of fuels for the tests, we used the new canisters (jerry cans), with the volume of 5 l, and the records about fuels were kept by using different designations to disable the inspectors as well as the owners of the vehicles to know which petrol station the used fuel was supplied from. At each test the fuel was filled into one of the cars being tested and it was tested on the equipment for control of exhaust gases at the stations, and these devices had been calibrated by the institution in charge. Before the test the engines of all the cars had

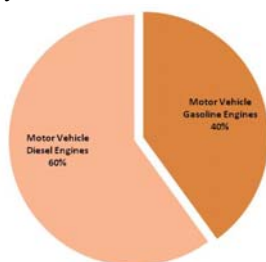
been heated to the proper temperature of 80°C, in order to meet the requirement prescribed by the regulations. Within the period from 04.11.2008. to 11.11.2008. the tests were carried out on 4 cars in order to control the exhaust gases emission.. The cars tested are presented in the Table 1.

We selected two diesel engines and two petrol engines because, to our knowledge, these two types of engines are most frequently present. The records kept for the vehicles as to the type of fuel for FB&H for the period from 1.4.2008.-18.11.2008. show that there are 149598 (40%) cars having petrol engine and 225429 with the diesel engine (60%), which is presented in Figure 1.

Table 1. The cars that underwent the exhaust gases emission test

Item	Model	Engine	Power	Fuel	TEST	Year	Catalytic converter
1	ŠKODA FELICIJA	1,9D SD	47 kW	Diesel	TEST 1	'01	
2	AUDI 80	1,6 TD	51 kW	Diesel	TEST 2	'85	
3	ŠKODA FELICIJA	1,3	43 kW	Petrol 98	TEST 3	'97	No catalytic converter
4	FORD ESCORT	1,4i	55 kW	Petrol 95	TEST 4	'89	With the catalytic converter

The fuels used for the tests were taken from 16 petrol stations in Zenica-Doboj Canton, Middle Bosnia Canton and there was one sample from Slovenia. All the tests were carried out by the equipment calibrated by the authorised laboratories. There was a continuous control of the performed testing in order to avoid the disallowed activities during the testing. All the tests from the first to the last one were performed by the same team of people at the above stated stations in order to achieve completely same performance of the tests. The tests were carried out in such a way that neither the inspectors at the stations for technical inspection nor the owners of the cars knew which fuel and from which petrol station underwent the testing. After testing all the fuels taken from the above mentioned petrol stations, we got the following results which are presented in the Tables 3,4,5 and 6. **Diagram for TEST 1 is presented in Figure 2.**



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Figure 1. Records on the motor vehicles as to the type of fuel in FB&H

Table 2.: The name of the station for technical inspection and the equipment for testing

Item	Name of the station for technical inspection	Equipment at the station for technical inspection
1.	AUTOCENTAR-BH ZENICA	MAHA
2.	REMIS II ZENICA	CARTEC
3	AGRAM ZENICA	MAHA

Table 3. TEST 1 ŠKODA FELICIJA 1,9D SD 47 kW Diesel

Blackening coef.	AUTO-CENTER k m ⁻¹	REMIS k m ⁻¹	AGRAM k m ⁻¹	Middle k m ⁻¹
1	0,31	0,23	0,28	0,27333
2	0,17	0,26	0,31	0,24667
3	0,17	0,24	0,47	0,29333
4	0,26	0,19	0,33	0,26
5	0,24	0,15	0,2	0,19667
6	0,2	0,21	0,23	0,21333
7	0,18	0,13	0,32	0,21
8	0,23	0,14	0,25	0,20667
9	0,22	0,2	0,26	0,22667
10	0,18	0,22	0,23	0,21
11	0,2	0,21	0,44	0,28333
12	0,23	0,23	0,37	0,27667
13	0,19	0,17	0,29	0,21667
14	0,22	0,23	0,32	0,25667
15	0,12	0,16	0,38	0,22
Average	0,208	0,198	0,312	0,239334

Allowed value for this engine is $k \leq 2,5 \text{ m}^{-1}$

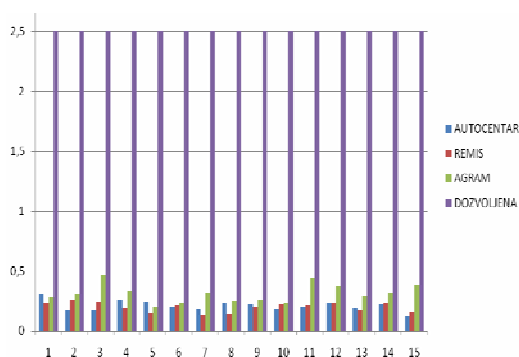


Figure 2. Diagram presenting the results for TEST 1

Diagram for TEST 2 is presented in figure 3.

Table 4. TEST 2; AUDI 80 1,6 TD 51 kW Diesel

	AUTO-CENTER	REMIS	AGRAM	Middle
Blackening coef.	k m ⁻¹	k m ⁻¹	k m ⁻¹	k m ⁻¹
1	2,89	0,24	3,87	2,33333
2	1,06	0,64	0,59	0,76333
3	0,42	0,37	0,65	0,48
4	0,44	0,79	0,85	0,69333
5	0,47	0,33	0,7	0,5
6	0,46	0,46	0,67	0,53
7	0,51	0,47	0,61	0,53
8	0,49	0,61	0,53	0,54333
9	0,82	0,24	0,26	0,44
10	0,55	0,19	0,57	0,43667
11	0,57	0,3	0,68	0,51667
12	0,87	0,22	3,39	1,49333
13	0,54	0,34	0,68	0,52
14	0,84	0,39	2,31	1,18
15	0,54	0,22	1,7	0,82
Average	0,764667	0,387333	1,204	0,785333

Allowed value for this engine is $k \leq 3,0 \text{ m}^{-1}$

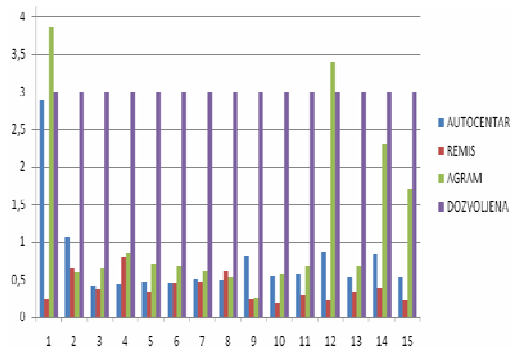


Figure 3. Diagram presenting the results for TEST 2

Diagram for TEST 3 is presented in figure 4.

Table 5. TEST 3; ŠKODA FELICIA1,3 43 Kw Petrol 98; without catalytic converter

	AUTO-CENTER	REMIS	AGRAM	Middle
Blackening coef.	% vol.	% vol.	% vol.	% vol.
1	9,99	13,06	9,99	11,01333
2	9,99	13,53	9,99	11,17
3	9,99	13,69	9,99	11,22333
4	9,99	13,28	9,99	11,08667
5	9,99	13,68	9,99	11,22
6	9,99	13,36	9,99	11,11333
7	9,99	13,3	9,99	11,09333
8	9,99	13,37	0,44	7,93333
9	0,23	13,32	0,44	4,66333
10	9,99	13,12	9,99	11,03333
11	9,99	13,42	9,99	11,13333
12	9,99	13,63	9,99	11,20333
13	9,99	13,29	9,99	11,09
14	9,99	13,48	9,99	11,15333
15	0,22	13,28	9,99	7,83
Average	8,688	13,38733	8,716667	10,264

Allowed value for this engine is $\leq 3,5 \%$ volume share for the vehicles first registered after 1.10.1986.

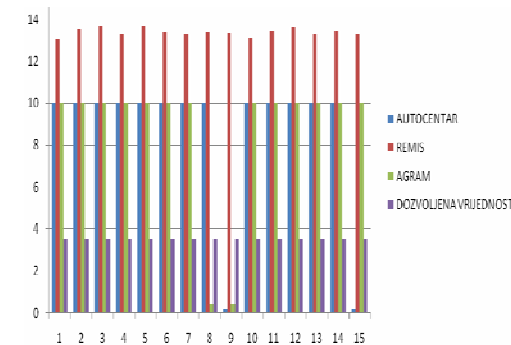


Figure 4. Diagram presenting the results for TEST 3

Diagram for 4 is presented in Figure 5.

Table 6. TEST 4; FORD ESCORT 1,4i 55 kW Petrol 95; with the catalytic converter

	AUTO-CENTER	REMIS	AGRAM	Middle
Blackening coef.	% vol.	% vol.	% vol.	% vol.
1	0,56	0,16	0,14	0,28667
2	0,77	0,26	0,58	0,53667
3	0,58	0,22	0,34	0,38
4	0,83	0,11	1,06	0,66667
5	0,23	0,2	0,38	0,27
6	0,17	0,07	0,5	0,24667
7	0,54	0,27	0,23	0,34667
8	0,26	0,3	0,32	0,29333
9	0,06	0,32	0,1	0,16
10	0,1	0,29	0,06	0,15
11	0,31	0,19	0,64	0,38
12	0,54	0,22	0,16	0,30667
13	0,28	0,31	0,18	0,25667
14	0,72	0,12	0,27	0,37
15	0,68	0,24	0,92	0,61333
Average	0,442	0,218667	0,392	0,35089

Allowed value for this engine is the carbon monoxide concentration (CO): $\text{CO} \leq 0,5 \%$ volume share at the number of rotations in idle run.

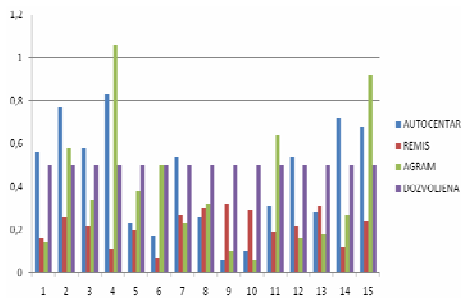


Figure 5. Diagram presenting the results for TEST 4

3. CONCLUSION:

1. Fuel from all petrol stations has satisfactory quality for the car from TEST 1. This is especially due to the fact that the engine 1,9D SD has such a construction that it can be satisfactory even in the case of some imperfections in the quality of fuel. The greatest number of consumers use this engine model so that the sellers at the petrol stations are making efforts to supply the best possible quality of this type of fuel.
2. Fuel from the petrol stations 1, 12, 14 and 15 has not a satisfactory quality for the cars from TEST 2. We may say that for this model of engine (Turbo diesel engines of older construction) which is most frequently present in older cars used in FB&H, the fuel has such properties that it meets the needs of this type of engine construction. Therefore these engines can still use diesel fuels being sold at our petrol stations.
3. Fuel from all petrol stations except 8 and 9 does not have satisfactory quality for the car from TEST 3. For this model of engine using petrol of 98 octane, we may say that they are practically dying out and there are few of them in usage so that the owners of the petrol stations do not make efforts to supply sufficiently good quality of this type of fuel.
4. Fuel from the petrol stations 1,2,3,4,11,14 and 15 is not of satisfactory quality for the car from TEST 4. The engines using fuel of 95 octane, and especially if they have permanent catalytic converters need the fuel of better quality, but unfortunately the sellers at the petrol stations are not aware of this. Namely, the stated number of the petrol stations supplying fuel of unsatisfactory quality shows this fact the best.

On the basis of the facts stated as regards to the tests performed we may presume that such and similar testing carried out in other cantons would present the similar results because the petrol stations purchase fuel from the same sources and the average age of the vehicles is rather uniform. However we do hope that, in near future, these conclusions will change owing to good quality of daily supervision of the work of stations for technical inspection in order to improve the standards of our citizens.

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