One of the Scenarios for Reduction the Emission of Pollutants from Motor Vehicle in the Territory of the Republic of Kosovo

Bashkim Baxhaku, Hajredin Tytyri and Shpetim Lajqi
Department of Construction and Design, Faculty of Mechanical Engineering, University of Prishtina, Prishtina 10 000, Republic of Kosovo

Received: April 02, 2012 / Accepted: April 24, 2012 / Published: May 25, 2012.

Abstract: Together with development of the industry, there is present a continuous increase number of motor vehicles that contributes to the growth of the emission of pollutants. This is the main reason that during eighties of the last century, a special attention has started to be paid on pollution emissions from vehicles. It is important to note that most of the current emissions are formed directly and are present in urban areas. The aim of this research was to determine the emission of pollutants in the territory of the Republic of Kosovo, when circulates more than 380,000 motor vehicles. Taking into consideration the daily traffic jam, and the fact that gasoline engines are responsible for most emissions of CO, while diesel engines for NOx emission, the conclusion arises that there is necessary a special dedication to the emission of pollutants and to the definition of the measures to reduce or control them. Based on the performed tests and realistic assessment of the overall situation in the Republic of Kosovo, the current situation on the amount of pollution was compared with development countries in the region as a matter in the research. The results obtained, suggest to the most important causes that increase pollutant emission from motor vehicles and offer actions to keep the same level or to reduce them.

Key words: Pollution, emissions, ecology, urban environment, motor vehicles.

1. Introduction

The first link between motor vehicles and pollution of human environment in urban areas is set at 50’s of last century when researchers come to the conclusion that transport was the main culprit for the sky filled with clouds of smoke over Los Angeles, California, USA. This conclusion was supported by the fact that industrial development after World War II has increased the total number of characteristic motor vehicles. The second factor and probably most important in establishing the connection of motor vehicles and human environmental pollution is the source of energy for driven motor vehicles, respectively fuel. With continued growth in the number of motor vehicles, amounts of fuel consummation and number of passed kilometers emitted significant pollutants which are most important: carbon monoxide (CO), non burned hydrocarbons (C,H), not-methane volatile organic compounds (NMVOC), nitrogen oxides (NOx), particle and carbon dioxide (CO2).

In the Republic of Kosovo, the situation has changed after the last war in Kosovo. Besides power plants, in Kosovo there are no industries that will participate in environmental pollution. Therefore, as the potential pollutants can be defined: the motor vehicles, the city’s heating system and power plants in Kosovo.

In this paper, the results of ecological review in the Republic of Kosovo in 2009 and the possibility for reducing pollution based in scenario for modification the
old motor vehicles to the drive with gas are presented.

The paper is organized as follows: Section 2 discusses the analysis of the emission of pollutants as per the source and the categories of the motor vehicles; section 3 introduces indicators to estimate emission of pollution materials in the future; section 4 denotes situation in the Republic of Kosovo; section 5 introduces calculation of emission of pollution materials from external gases in Republic of Kosovo; section 6 discuses comparing analysis of emission of pollution materials and CO2; section 7 gives conclusions.

2. Analysis of the Emission of Pollutants as per the Source and the Categories of the Motor Vehicles

As per the creation of the pollutants in the atmosphere, the division can be as in the transport sector, industry, fuel use for power generation, commercial use, etc.

As Fig. 1 represents the analysis of the pollutants’ component like CO, NOx, CxHy and CO2 according to the source of creation, it is evident that transport sector is the main pollution source in the world with 89%—CO, 44%—CxHy, 52%—NOx and 29%—CO2 from the total emission of all the sources.

Further breakdown of the transport sector according to the types of motor vehicles [1] shows that the use of the passengers’ motor vehicles. Firstly, in urban environment and short relations contributes, the greatest deal of the emission of the pollutants’ components are 91%—CO, 77%—C,H,y, 42%—NOx and 53%—CO2, whereas motor vehicles for transport take the biggest part in emission of 57%—NOx, 5.5%—CO2, 9%—C,H,y and 34%—CO2. Remaining emission falls with motorcycles (3.5%—CO, 14%—C,H,y, 1%—NOx and 3%—CO2) as a category of the motor vehicles that is being used a lot recently and a category that is paid less attention so far.

3. Indicators to Estimate Emission of Pollution Materials in the Future

Motor vehicle represents the most used machine for individual transport, goods for general consumption, special deliveries, etc. due to its flexibility. Ref. [1] shows how much the motor vehicles are famous based on the increase of the number of registered motor vehicles in Europe from 1990 to 2010 and projections until 2030. Whereas in 1990 there were 182.67 million registered motor vehicles, and at the end of the 2000, the number reached 226.869 million. Fast increase of the registered motor vehicles is expected due to overall fast industrialization of the economically under-developed.

With the urbanization and geographical extension of the residing spaces in Europe, improvement of the infrastructure and development of the economy, motor vehicles with its flexibility take first place in the total transport sector among means for transporting of passengers and goods (with 70% of the total performed transport).

In the past, it was noticed the highest rate of the increase of motor vehicles in countries is with highest economic growth (North America and Western Europe). It is expected that in the future, a huge increase of motor vehicles in the countries that are not OECD (Organization for Economic Co-operation and Development) members, forecasting that almost 50% of the total number of the motor vehicles will be registered in those countries. Total average increase of motor vehicles is foreseen to be 3% [1].

This increase of motor vehicles in every aspect will contribute to the evident increase in emission of the pollutant components. Researches done by OECD by MOVE (Motor Vehicle Emissions) project verify the possibility of reaching positive aspects from emission aspect of pollutant components from the external gases of motor vehicles with the help of two scenarios of which one foresees application of harsher measures and more extensive control of emission of pollutants and measures that will fall until the decrease of consumption of fuel from fossils. Second scenario is based in the control and before all in reducing of increase of transport by 3% in real value that can be realized by 2% [1].
4. Situation in the Republic of Kosovo

The Republic of Kosovo, as a new country still does not have the entire institutions organized which can uniquely monitor all the issues regarding the transport that is being developed by road transport, in principle it is thought in emission of pollutants’ components in the country level. According to the data maintained until 2009, the number of registered vehicles in Republic of Kosovo was 380.552.

Fig. 2b shows the percentage of participation of vehicles in Republic of Kosovo to the total number of vehicles in 2009, while Figs. 2c-2d show the age and average age of vehicles according to the vehicles’ categories.

Fig. 2a shows that out of total number of the registered vehicles in Kosovo in 2009, 31.18% of them were registered in Pristina region. This region has the biggest number of vehicles registered with newer that 5 years old and older than 15 years old that makes the Pristina region more representative for more detailed analysis than other regions.

According to the data in Ref. [4], vehicles newer than 5 years old make 4.0% of the total number of the registered vehicles, whereas 84.31% of the registered vehicles are older than 10 years, 74.79% of the vehicles are older than 15 years old from the total number of the registered vehicles.

From the total number of the registered vehicles, 80% are passengers’ vehicles, 15% are transporting vehicles and the rest are buses, motorcycles, tractors and other vehicles in this region.

The age of the vehicles by type is: the busses with 21.98 years; transporters with 19.15 years; passengers vehicles with 18.13 years while the youngest category of vehicles are motorbikes with 10.41 years.

5. Calculation of Emission of Pollution Materials from External Gases in Republic of Kosovo

According to the analysis of the situation of the vehicles park for Republic of Kosovo as well as verification of value of the calculated results (with aim
patterns), pollution materials using the calculating program COPRET IV will be analyzed below.

To perform calculation with COPERT IV, data for kilometers spent, type of road used, average speed as well as the total amount of the spent fuel are needed. Due to the lack for some of these data, the estimated ones or the data from the countries of the region were considered.

If the imported amount of the fuel is compared to that calculated, the difference with the program is 3.6% that represents an acceptable value according to Ref. [6].

The cause for this difference can be non-existence of data for parallel registration of vehicles from Serbia in Kosovo as well as the border problems in north Kosovo.

Calculation is made for scenario, where only the situation of the car park would be modified, while other parameters remain the same in the calculating program.

The modified scenario foresees 50% of passenger vehicles on gasoline up to EURO 1 turn to the drive by gas after system modification, as per category:

- 210,039 passenger vehicles on gasoline with volume under 1400 cm³,
- 44,612 passenger vehicles on gasoline with volume between 1400 and 2000 cm³,
- 4,609 passenger vehicles on gasoline with volume over 2000 cm³ turns to the gas drive system with the same respective volume (shown in Fig. 3 as Kosovo 1).

6. Comparing Analysis of Emission of Pollution Materials and CO₂

Definition of emission of special pollution materials from external gases of cars on road transport being released in the environment people live would have been possible if the emission could be compared with the region countries and the countries where traditionally there is a high ecological awareness.
One of the Scenarios for Reduction the Emission of Pollutants from
Motor Vehicle in the Territory of the Republic of Kosovo

Fig. 3  Compare coefficients of emission of special pollution materials from external gases.

Because of this, in this paper, the comparison of coefficient of pollution materials from motor vehicles CO, CxHy, NOx, and CO2 as gases that influence sera effect is made with appropriate results from countries of the region as well as Europe OECD countries (Fig. 3). Comparison data are taken from Refs. [1, 4, 7-8].

In order to compare coefficients of emission of special pollution materials from external gases of cars of road transport, there were compared results for Republic of Kosovo (initial situation and scenario), OECD countries—EU, Federation of Bosnia and Herzegovina for 2005 and Serbia for 2009 (Fig. 3). The comparison is made in the emitted amount of a car per one kilometer of road.

Emission of carbon dioxide (CO2) as the gas of the sera effect, even after the application of renewal of the car park remains above the values of OECD—EU. The reason is the very old structure of the car park and the suspicious quality of the fuel.

The situation of the carbon monoxide (CO) with the application of renewal car park is becoming closer to the values of OECD—EU.

Emission of nitrogen sub oxide (NOx) even after the application of the renewal of the car park remains above the values of OECD—EU. Emission of hydrocarbons (CxHy) after application of renewal of car park is reduced under the values of OECD—EU.

7. Conclusions

The problem of urban pollution from motor vehicles represents one of most important problems with whom taken the contemporary world. Given the geographical position of Prishtina situated near the Kosovo power plants, park vehicles on the average ages of 16 years, the pollution problem should be given significant attention. Analysis of pollution from motor vehicles in the Republic of Kosovo in 2009 has shown that the current level of pollution is the pollution level of the average of OECD countries—Europe before seven
One of the Scenarios for Reduction the Emission of Pollutants from Motor Vehicle in the Territory of the Republic of Kosovo

years. Recognizing the above facts are analyzed “modification” of the vehicles’ park is shown in this paper. Besides “modification” of the vehicle park the measures for reduction the emission of pollutants should be directed to: Increasing efficiency with alternative fuels consumption; use of alternative fuels for vehicles which use in public transport and for passenger cars, by providing appropriate infrastructure, permanent monitoring of the emission of pollutants in characteristic urban environments of countries with the goal of defining regulatory measures.

It is certain that only continued activities in all mentioned directions can be achieved desired results in controlling and reducing the emission of pollutants in urban environments.

References