Technical Publication for Vehicle Users in Support of Environmental Pollution Reducing

Prof. As. Dr. Asllan Hajderi

"Aleksander Moisiu" University,
Professional Studies Faculty, Department of Mechanic and Transport,
Durres, Albania, E-mail: ashajderi@yahoo.com

Msc. Ing. Eli Vyshka

"Aleksander Moisiu" University,
Professional Studies Faculty, Department of Mechanic and Transport,
Durres, Albania E- mail: eli_vyshka@yahoo.it

Abstract*: In this study, it is addressed the problem of reducing pollution through the use of technical publications for vehicle users. They will inform the user in terms of vehicle choice with the lesser degree of pollution and recognition of ways for reducing of the pollution level for vehicles in use. Also provision of knowledge on damage that vehicle gases cause on human health will lead to increased interest in knowing the ways and new technologies in terms of reducing pollution from vehicles, which they use. Below it is shown the analysis of pollutant emissions that vehicles generate in the atmosphere, depending on years of production according to manufacturing factory, for the years 1992-2009. While it is shown the current situation of the structure of vehicles in Albania, from which results, that dominate vehicles manufactured before 1996 at over 70%. From the study it results, that if the vehicles in circulation will be only produced vehicles after 2000-2005, the pollution level reduction in urban centers will be reduced at least 3 times. At the bottom it is analyzing the impact of technical maintenance of vehicles, to their pollution level. Results show that a bad technical maintenance of the vehicle during use, could lead to the growth of polluting emissions by 3 times compared to standards. For this the methods used today to maintain engine performance and emission reduction of vehicles in use are shown. Subsequently it is shown that providing technical maintenance of vehicles in circulation will become through technical publications and environmental additional tax and therefore we will achieve a reduction of the pollution level in urban areas over 2 times.*

Keywords: *Vehicle emissions, environmental pollution, pollution reduction*

1. Introduction

In recent decades the number of automotive with internal combustion engine, circulating in urban areas has greatly increased, reaching over a billion cars. Personal automobile has become the largest polluter of the environment for the amount of emissions, they release into the atmosphere. In Albania the number of vehicles has increased by over 400,000[1]. The pollution caused by gases that cars emit into the atmosphere is made already, in the main problem of environmental pollution in urban areas. According to the Institute of Public Health in Albania, main pollution is pollution from fine particles, caused by transport vehicles, which exceeds the EU norms up to 200-300 % . The recent study made in 6 cities of the country, has shown that the Albanians are now more dangerous than ever to their health, not by ordinary dust, but from the soot of the cars. Most polluted city in our country is Tirana, which is in first place as for solid particles as well as for soot and benzene. Most polluted areas in Tirana, are the areas near the junctions, as the center of the capital, "21 Dhjetori", etc. Monitoring conducted by the Institute of Public Health in October 2011 in Tirana, regarding the content of solid particles in air, shows that the situation in Tirana comes to worse. Environmental pollution in Tirana goes up to 100 micrograms per cubic meter, when pollution norme for the EU are 30 micrograms per cubic meter.

The monitoring of air quality in the last years, shows that 80 - 90% of the population in major cities is exposed on polluted air by vehicle gases that are released into the air. This is the main cause, that in the Tirana-Durres area each year sick 1000-1500 persons and the life of Albanian people is reduced by 1.5 to 2 years. This happen, because particles and nitrogen dioxide released by burning of fuel (gasoline or diesel), are several times more dangerous, than those of dust, because they enter more easily in the body and cause serious disease cancer, especially at lung.

[1] Sourse:The archive's central of General Directorate of Road Transport Services www.dpshtrr.org.al

To have a good health, the human prefers clean air, clean water and healthy food. Chemicals dispersed into the air not only infect the air, but also water, its sources and food.

Driving is an action which directly contributes to pollute the air in the atmosphere, creating untold damage to yourself, family and society. It should therefore, that vehicle users become responsible for damage caused from the vehicle emissions on human health. This requires health publications for users of vehicles and television programs that show the damage caused from automobile gases.

On the other hand vehicle users should know, that which is the level of pollution produced by vehicle manufacturing factory, by year of production and corresponding tax rate for his vehicle. As for vehicles in use, they need to know about the impact of maintenance on the degree of pollution and methods that can be used to reduce it.

Vehicle users are with different professions and it is not possible, that all have knowledge on the construction of engines, the diagnosis, technical services and their maintenance. For this purpose the vehicle services are specialized for certain types of vehicles or special systems and aggregate of automobile in general.

The level of environmental pollution for vehicles in use depends on the technical condition of the vehicle. Vehicle users can give a major contribution, by increasing the care for the maintenance of the vehicle, that they use. Technical publications to users of vehicles in respect of damages that cause to human health and ways to reduce pollution from vehicle gases in use, have a positive impact in this regard

2. Technical publications for reduction of environmental pollution from vehicles

In Albania the vehicle services deal with problems of diagnosis, the repair of various defects and conducting of periodic technical services. Their completion depends on the user's vehicle, because they bring the vehicles into service. While assessment of pollutants, that vehicle causes to the atmosphere and the influence of constructive factors and technical services to the degree of pollution vehicle, not treated in our services. Worse, the pollution degree of the vehicle is not a stopper criterion for the circulation of the vehicle, even in technical control centers.

Technical publications required by users of vehicles to guide them on to the specialized service by type of vehicle or vehicle systems. In Albania there are few publications, like magazine "Auto Club"[2], which publishes advertisements for car sales business, the addresses of some services, etc.

While the problem of the vehicle performance providing and environmental pollution reduce, that they cause in the atmosphere, has shortcomings. In the market there are different types of additive[3], which added to the fuel tank to increase performance. While, recently it is used the additional equipment in the fuel system of engines, which carry an increased performance of vehicles, reduction of fuel and environmental pollution. These are used less in our services, because they haven't a economic interest. But even in the services of spare parts and additives, that used to increase performance and reduce pollution, lack the technical publications about ways of using these additives.

In many countries of the world there are in the market the various technical publications, that show for the efficiency of parts and equipment traded. Also it is indicated the additives and equipment, to be used by users of vehicles to reduce the pollution and increase the performance of the vehicle. There are also publications that discussed for the reduction of vehicle emissions[4].

Ministries that deal with licensing of technical services and transportation companies should promote the need for technical publications for vehicle users. But the association of transport mechanical engineers in conjunction with services, trading the spare parts of vehicle should seek to increase technical publications. They should serve to find spare parts in these services and the additives or devices manufactured recently, used to provide the vehicle performance and reduce of environmental pollution. In these publications should be given knowledge about the uses and advantages, that they provide in the vehicle for employees of services and users of vehicles. Technical publications for vehicle users have a special interest for the problems of the environmental pollution caused by automobile gases. For this must be given the level of vehicle pollution depending on their years of production.

The degree of vehicle pollution also depends on his technical condition in circulation, which directly affects the growth of fuel consumption. Therefore the information on the impact of technical services and maintenance through the use of vehicles for pollution reduction from his vehicle, is needed for vehicle users. So, the replacing of dirty air filters leads to

[2] Auto club Albania www.aca.al

[3] Disel-additive, Made in EU; www.wuerth.de ; info@chemical.check.de

[4] Quattroruote, Italy ; www.quattroruote.it

improved performance of the vehicle, increasing mileage by 10% and reducing environmental pollution. Technical publications can provide different messages for users of vehicles, as the impact of mouvement with enflated tires not good, low-speed movement, etc.. in increasing of the pollution level.

Technical publications have to show additional tax of environmental pollution, established by state bodies for vehicles that exceed pollution standards. This is because the cost of environmental damage and its recovery should be added to the cost of one, who uses the vehicle that damage. In this way, vehicles users become more responsible for the pollution degree of their vehicle. Even the establishement of used vehicles tax in circulation gives a contribution in this regard.

In global terms the task of determining ways to reduce environmental pollution and global warming is an ongoing task for the leading authorities of the respective states of the EU. For this purpose, CE has issued directives, where required by the vehicle manufacturing factory, to reduce pollution level from vehicles and strengthen technical controls in terms of regular vehicle maintenance. So in 2009/40/EU directive, is said: *This Directive aims to keep emissions of greenhouse gases at a low level throughout the useful life of a vehicle through regular emission tests and to ensure that polluting vehicles that are larger to draw from circulation until they are brought into the proper state through maintenance*

In the following we will address the impact that can give vehicle users, to reduce the level of environmental pollution through the choice of vehicle they will use and through care for a good technical maintenance of the vehicle during use. Initially it is shown for the vehicle pollutant gases and damage that they cause to human health.

3. Elements of automobile pollutant gases and damage to human health

Vehicles used in urban transport are mainly, with internal combustion engine, which use thermal energy released from burning fuel. For a clean fuel, typically burning in automobile engines can be expressed :

Fuel + Air => Hydrocarbons + Carbon monoxide +Carbon Dioxide + Nitrogen oxides + Water vapor

Hydrocarbons are parts (fragments) of fuel molecules, burn only partially. Hydrocarbons react in the presence of nitrogen oxides and sunlight to form ground-level ozone, a major component of smog. Ozone irritates the eyes, nose, throat and lungs hurting. A number of hydrocarbons are also toxic , some with potential to cause cancer.

Carbon monoxide (CO) is a product of incomplete combustion of fuel. Most it is produced when air entering in the engine is lower than the rate needed to fuel burning or hanging, where the air is rare and lacks the amount of oxygen. Two-thirds of carbon monoxide emissions come from transport vehicles. In urban areas, contribution of pollution of carbon monoxide from the passenger vehicle can exceed 90%. Carbon monoxide (CO) is a toxic gas is too risky, because it is colorless and odorless. [6]. Carbon monoxide blocks the transport of oxygen in heart, brain and other organs.

Carbon dioxide (CO_2) was seen initially by the Environmental Protection Agency (EPA) in the U.S. as a product of "perfect" the burning, but now viewed as a concern pollutants. Carbon dioxide is a greenhouse gas, that contribute to global warming land.

Nitrogen oxides (NOx) are formed by atoms of nitrogen and oxygen in conditions of high pressure and temperature in the engine. Nitrogen oxides, like hydrocarbons, are precursors to the formation of ozone and contribute to acid rain. Catalytic converters in car exhaust systems break down heavier molecules of nitrogen, forming nitrous Oxide (NO2) - 300 times more potent than carbon dioxide as a greenhouse gas. Nitrous Oxide makes up about 7.2 % of the gases that cause global warming. Vehicles with catalytic converters produce almost half of nitrogen oxide. These cause lung irritation and weaken the body's defense against infections such as pneumonia and influenza.

Particulate matter (known as PM) are tiny particles of solid matter and soot that stay suspended in air. These are created from the burning of fossil fuels in vehicles. Increased levels of these particles in the air, are associated with health risks such as heart disease, lung poorly functioning and causing lung cancer. Environmental Protection Agency in Albania estimates that contamination of air from gas emissions of cars causes half the cancers caused by air pollution.

At the level of environmental pollution from automobile gases emissions, affect several factors, but we will treat the constructive perfection by years of production, according to EU standarts and the technical condition of vehicles in circulation

4. Emissions of vehicle pollutant gases according to EU directives

Pollutant elements of gas emissions arising in the vehicle exhaust system in addition to carbon dioxide are treated in the EU directive no. 2003/27/EU and the rule no. 715/2007 of the European Parliament. Maximum values of the pollutants,

carbon monoxide (CO), nitrogen oxides and hydrocarbons (NOx+ HC) and particles PM, which allowed for vehicles in circulation, depending on the standards Euro 1, 2, 3, 4, 5, (belonging to the production years 1992, 1997, 2000, 2005, 2009), are given in the form of graphs for diesel engine vehicles, in figure 1 and for vehicles with gasoline engine, in figure 2 .

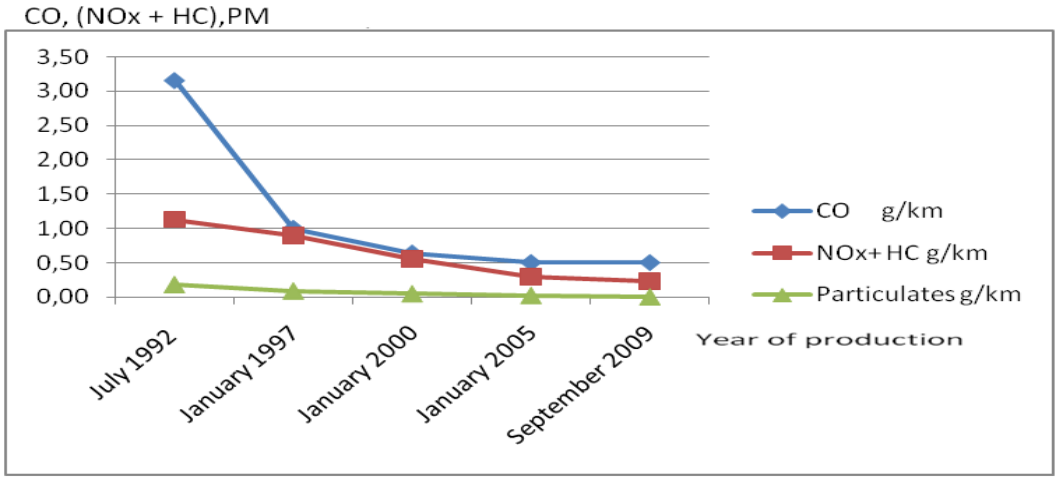

Figure 1. Amount of polluting emissions of diesel engines by years of production

Pollution level for vehicles with diesel engine manufactured after 2000, compared with those produced prior to 1996 (Fig. 1) results: for carbon monoxide (CO), 4.5 times decrease, for hydrocarbons and nitrogen oxides (NOx + HC), 2 times decrease and particles PM, 3 times decrease. In total, the reduction of pollution level for vehicles manufactured after 2000, compared with those produced before 1996, is about 3 times.

While, the level of pollution for vehicles manufactured after 2005, compared with those produced before the year 1996, results: for carbon monoxide (CO), 6 times reduction for nitrogen oxides and hydrocarbons (HC + NOx), 3 times reduction and particles PM, 6 times decrease. In total, the reduction of pollution level for vehicles manufactured after 2005, compared with those produced before 1996, is about 5 times.

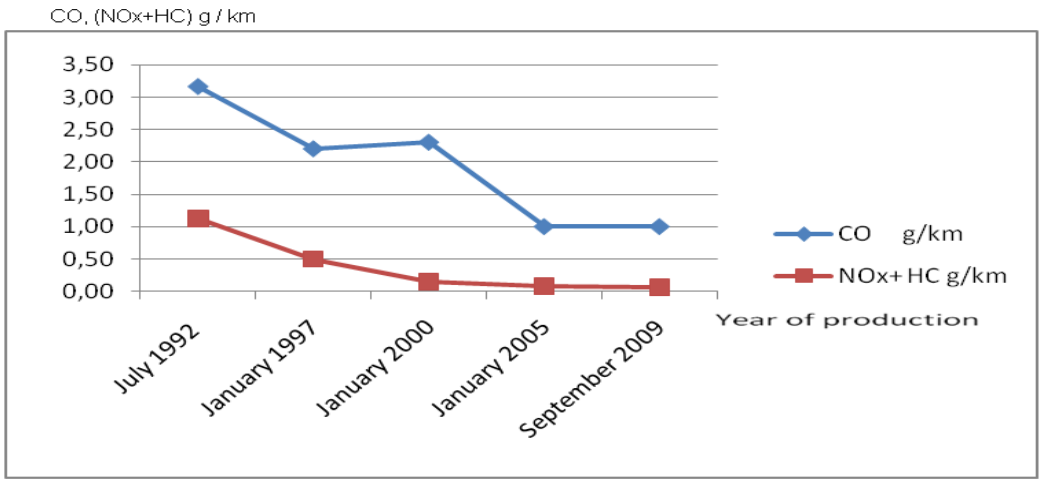

Figure 2. Amount of polluting emissions of gasoline engines by years of production

The pollution level for vehicles with gasoline engine, that produced after 2000, compared with those produced prior to 1996 (Fig. 2) results: for carbon monoxide (CO), 1.5 times reduction, for nitrogen oxides and hydrocarbons (NOx + HC), up to 6 times decrease. In total, the reduction of pollution level for vehicles manufactured after 2000, compared with those produced before 1996, is about 3.5 times.

While the pollution level of vehicles manufactured after 2005, compared with those produced before 1996 results: for carbon monoxide (CO), 3 times reduction and for nitrogen oxides and hydrocarbons (HC + NOx), 10 times reduction. In

total, the reduction of pollution level for vehicles manufactured after 2005, compared with those produced before 1996, is about 6 times.

5. Structure of vehicles in circulation in Albania

Vehicles in circulation in our country are different types and about 70% are over 17 years old[5]. Number of vehicles in circulation by years of production is shown in Fig. 3. As the number of vehicles brought by the import and registered in 2010, based on years of production is given in Fig. 4.

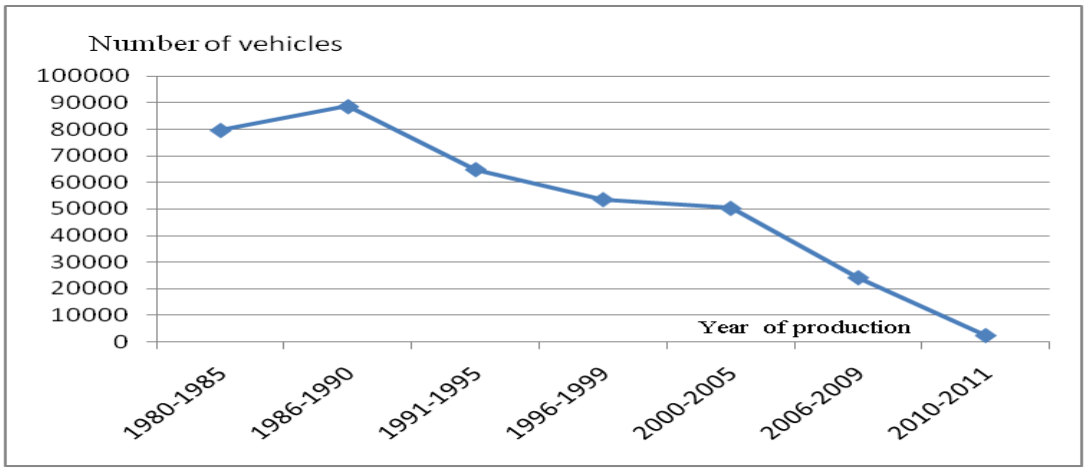

Figure 3. Number of vehicles in circulation in Albania, by years of production

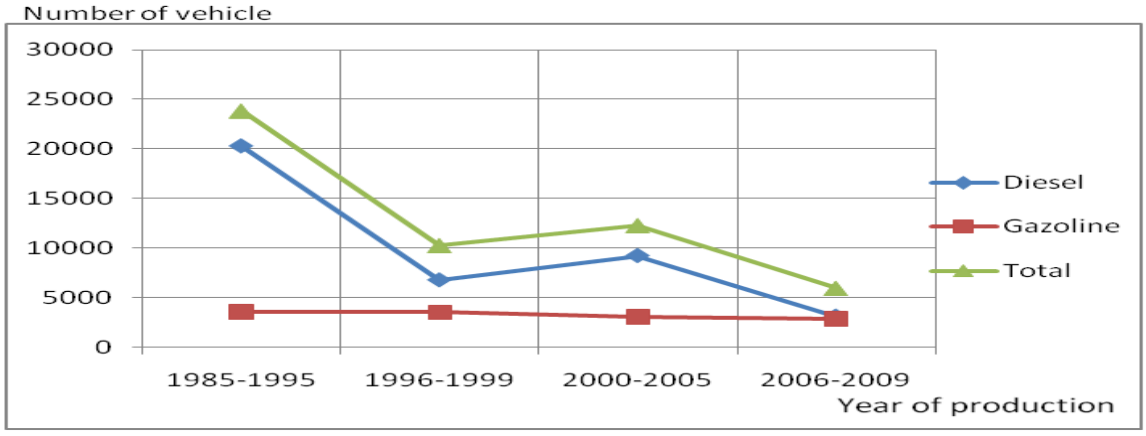

Figure 4. Number of registered vehicles in 2010, by years of production

It appears (Fig.3) that vehicles in circulation produced before 1995 are about 3 times more than those produced after 2000.

While, for registered vehicles in Albania in 2010 (Fig.4) it shows that dominate vehicles manufactured before 1995 to 3 times in comparison with vehicles manufactured in 1996-1999 and after 2000. During registration of this year, numbers of vehicles with diesel engine is about 85-90% of vehicles. While the number of vehicles with gasoline to any grouping of years of production is the same.

[5] Sourse:The archive's central of General Directorate of Road Transport Services www.dpshtrr.org.al

Technical publications and the establishment of additional tax, will affect at users of vehicles, to select for use, vehicles that are produced in years 2000-2005. This supposition is confirmed by higher demand for these vehicles during 2010 (Fig.4) and new registrations of vehicles made in 2012[6]. A valuable contribution would yield decisions that would restrict the importation of used vehicles over 5 years.

If we assume that in circulation will be only vehicles manufactured after 2000-2005, the level of pollution will be reduced at least 3 to 5 times.

6. Emissions of vehicle pollutant gases, in circulation

In fact, vehicles in circulation are to different production years, even before 1990. Their technical conditions, has many shortcomings in terms of pollution and this is due to non-regular technical maintenance by vehicle users. Technical control centers show, that 70% vehicles exceed the allowed limits of environmental pollution on 2 times[7]. For this purpose, we have made measurements on three types of vehicles with diesel engine in TCC Durres. For diesel engines, emission control consists in measuring of the opacity coefficient, which presents a complex indicator. Measurements of the opacity coefficient for 3 vehicles, Benz 170 CDI produced in 2000, Benz C250D produced in 1995, Ford Fiesta 1.8 D produced in 1997, in Durres TCC are shown in the Fig. 5. While the opacity coefficients derived from the German program (average values for 3 measurements) are respectively 9, 7.2, 6.1 m^{-1}.

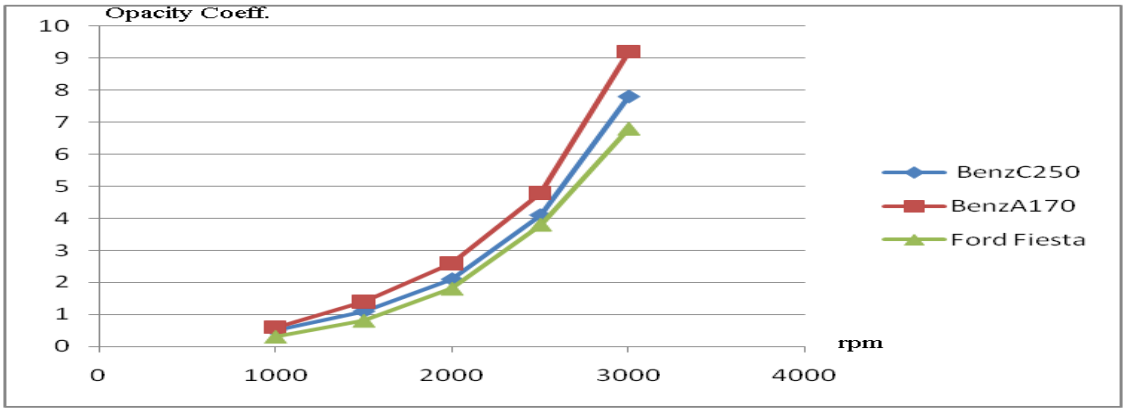

Figure 5. Dependence of the opacity coefficient from the engine rotations

MPWT[8] has issued guidelines for the technical control of the automobile, where are setting standards for the degree of pollution, which are given in table no. 1 (for vehicles with diesel engines). It appears from table no. 1, the coefficients of opacity for the above vehicles, result 2.5 - 3.6 times higher than the permissible value (2.5 m^{-1}).

Table. 1

Year of production vehicle	Diesel Engine Type	Opacity coefficient m^{-1}	Category of vehicle
Before 01.07.2008	Naturally aspirated	2.5	M, N
Before 01.07.2008	Turbocharged	3	M, N
After 01.07.2008	Naturally aspirated	1.5	M, N
After 01.07.2008	Turbocharged	1.5	M, N

[6] Sourse:The archive's central of General Directorate of Road Transport Services www.dpshtrr.org.al
[7] SGS Automotive Albania sh p k; www.sgs.com
[8] Ministry of Public Works and Transport; www.mppt.al

It appears that the vehicles in circulation, which have shortcomings in the technical maintenance, have increased pollution 2.5 to 3.6 times. Recognizing that they occupy about 70% of vehicles in circulation, the pollution level in urban areas results to increase about 2 times, only because of poor technical maintenance.

The improvement of engine performance and reduction of gases emission, can be achieved with the use of additives or additional device in fuel system. Technical publications will help vehicle users to use them, during the use of vehicles that they use. While, they are interested for maintaining of performance and fuel reduction of their vehicles, because this leads to a reduction of expenses.

Performed experiments in above vehicles have shown that from using of additives, can achieve a reduction of vehicle pollution in use 2.5-3.6 times.

Establishment of used cars tax, has a positive impact on the introduction of vehicles manufactured after 2005, but it does not stimulate users of vehicles to increase interest in technical maintenance of their vehicle. This tax represents a fine for all owners of vehicles, because it is regardless of technical state.

For pollution reduction from vehicle gases emissions in circulation, must strengthen technical controls in relation to assessing the pollution level and urgently to stop the circulation for vehicles that exceed pollution standards. Also need to strengthen traffic police control over the use of vehicles, that move with a high degree of pollution, being performed additional technical control only for the pollution. These measures will force drivers to maintain good the vehicles that use, or to remove them from circulation.

7. Conclusions

1. Air contamination from vehicle gases emissions causes to the human body acceleration of many diseases, to the performances of the half-cancerous diseases that come from environmental pollution in general
2. Pollutant emissions of gases that vehicles to draw in the atmosphere are at least 3-5 times smaller, for types produced in the years 2000-2005 than those produced before 1996.
3. Technical publications for vehicles users and environmental additional tax affect to select vehicles that use, with pollution degree 3 times smaller.
4. Vehicles circulating in urban areas are dominated by older types manufactured before 1996, to over 70% and worse still continue to enter more the old types with high pollution.
5. Technical publications for vehicles users and additional tax for pollution make accountable them, for the good technical maintenance of vehicles, contributing to reduce pollution in urban areas up to 2 times

References

Ndotja nga makinat 200-300 perqind tej normave te lejuara nga BE (2010 May 23); Retrieved from http://www.energjia.al/component/content/article/34-news/188-ndotja-nga-makinat-200-300-per-qind-tej-normave-te-lejuara-nga-be

Air Pollution (march 2012); Retrieved from http://www.nutramed.com/environment/airpollution.htm

Burn out catalog (2011), p.4; p. 165; Athens, Greece.

The draft Law " For some changes in law no. 9975, dated 28.07.2008 "On National taxes" to change; Tirana 13.07.2011 (In Albanian).

On roadworthiness tests for motor vehicles and their trailers (2009 May 6) Directive 2009/40/EC of the European Parliament and of the Council of 6 May 2009. P. 2,17. Retrieved from http://www.google.com/#q=DIRECTIVE%202009%2F40%2FEC%20&nfpr=1&ei=hvtMTsOhKc_oOcunvPgG&sqi=2&start=0&bav=on.2,or.r_gc.r_pë.&fp=ee045cc55d691584&biw=1024&bih=517

Car Exhaust, Air Pollution, Combustion Engines, (February 2010); Retrieved from http://www.nutra.med.com/environment/carsepa.htm

Hajderi A. (2010) "On the reduction of environmental pollution caused by automobile emissions"; Journal of studies on economics & society" Vol.2 2/2010 p. 115-124.

"Regulation (EC) No 715/2007 of the European Parliament and of the Council of 20 June 2007 on type approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information". Eur-lex.europa.eu. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32007R0715:EN:NOT

Instruction No. 12, dated 15.06.2010 of MPWT, "On some changes in instruction no. 6527, dated 24.12.2004 "On the permissible values of the elements of air pollutants in the environment from emissions and noise caused by road vehicles and methods of their control" (In Albanian) , art. 11.

Road Code of the Republic of Albania (1999). Tirana. Law No. 8378 dated 22.07.1998 " Road Code of the Republic of Albania" (In Albanian). Art.79; p. 86-87.