

## EVALUATION OF THE EXHAUST PRODUCTS, AFFECTING POLLUTION THE ENVIRONMENT FROM TAXIS IN RUSE

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**Abstract:** The vehicles in the main waste products that have the most negative impact on the environment are carbon dioxide CO<sub>2</sub> and oxide CO, nitrogen oxides NO<sub>x</sub>, hydrocarbons CH and solid fragments obtained after burning of working substance (fuel) and separated into the atmosphere. Over the last decade, hardly have been taken to reduce vehicle exhaust emissions by introducing standards (Euro 3, Euro 4, Euro 5) and Directive (1999/96 / EC) for environmental protection in Europe, focused into producers to create improved engine designs, new fuels, catalysts etc. At the same time to evaluate the pollution vehicles introduced methods for regulation of emissions for petrol and diesel cars and trucks. On the basis of studies, to reduce the release of products that affect pollution from public transport from Ruse, recommended use of cars with alternative engines. When introduced into service it is necessary to make comparisons with the existing transport park in terms of pollution and their effectiveness.

**Keywords:** Public transport, environment, ecology, taxis, alternative engines, effectiveness, electric cars

### 1. INTRODUCTION

In recent years, the public is becoming more sensitive to the issues of environmental pollution, both from industry and transport. With the law since 2005 in the Republic Bulgaria, the Kyoto Protocol [5] draws attention precisely to global warming and pollution on the planet. Along with the other signatories to the Protocol, Bulgaria is committed to optimize the industrial produce and the transport so as to reduce the products that affect to pollution, and to strive to lead the continuous policy in this direction.

In the transport mechanical energy transmitted to the leading wheels of the vehicle (Figure 1) that receives from engines that use different energy sources.

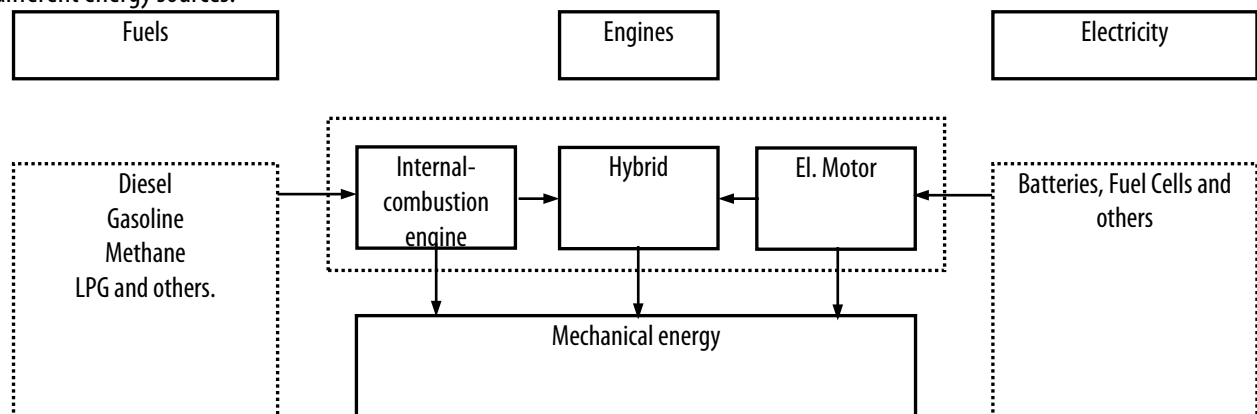


Figure 1. General scheme for the preparation of the mechanical energy

Operation exploitation of conventional vehicles with internally combustion engines creates many social problems of the environment and for the effective use of liquid fuels.

The vehicles in the main waste products that have the most negative impact on the environment are carbon dioxide CO<sub>2</sub> and oxide CO, nitrogen oxides NO<sub>x</sub>, hydrocarbons CH and solid fragments obtained after burning of working substance (fuel) and separated into the atmosphere [1]. Over the last decade, hardly have been taken to reduce vehicle exhaust emissions by introducing standards (Euro 3, Euro 4, Euro 5) and Directive (1999/96 / EC) for environmental protection in Europe, focused into producers to create improved engine designs, new fuels, catalysts, etc. [2]. At the same time to evaluate the pollution vehicles introduced methods for regulation of emissions for petrol and diesel cars and trucks.

These rules are set out in Bulgaria with a published ordinance in the Official newspaper [3].

The world looks for new solutions that can overcome these problems. The use of electric or hybrid cars are some of the possible solutions. By introducing the solutions into service it is necessary to make comparisons with the existed transport park in the attitude of pollution and their effectiveness.

The control of emissions, discharged from the vehicles with the engine idling, and comparing them with the accepted standards implemented in the operating cycle of the European Union for cars with two stages – urban and rural in g/km and thirteen duty cycles for trucks in g/kWh [4]. In these tests it is possible to verify in the lab if the vehicles meet the requirements, but they do not allow comparing what the emissions between vehicles due to different methods (in g/km and g/kWh). Proponents of reducing emissions, discharged into the atmosphere from cars, advocate the idea that by 2030 CO<sub>2</sub> emissions should be reduced to 17 gCO<sub>2</sub>/km [5].

## 2. EXPOSITION

According to the Bulgarian National Statistical Institute harmful emissions into the environment in Bulgaria in the industry are grouped into several categories (Table 1). The total amount of emissions obtained 56,578 million tonnes for 2012. From them the amount of carbon dioxide is 94.5%, of which 1/3 are produced from road transport, agriculture and households.

**Table 1.** Emissions of harmful substances into the atmosphere for 1000 tons in Bulgaria for 2012.

Pollutant	Type of pollutant							
	Sulphur oxides	Nitrogen oxides	Methane	Non-methane volatile organic compounds	Carbon monoxide	Carbon dioxide	Nitrous oxide	Ammonia
Industrial combustion processes	293	57	34	13	215	35866	7	0
Manufacturing processes	36	27	17	442	25	3698	0	3
Other processes *	1	43	238	320	206	14955	39	43
Total	329	127	290	775	446	54519	47	46

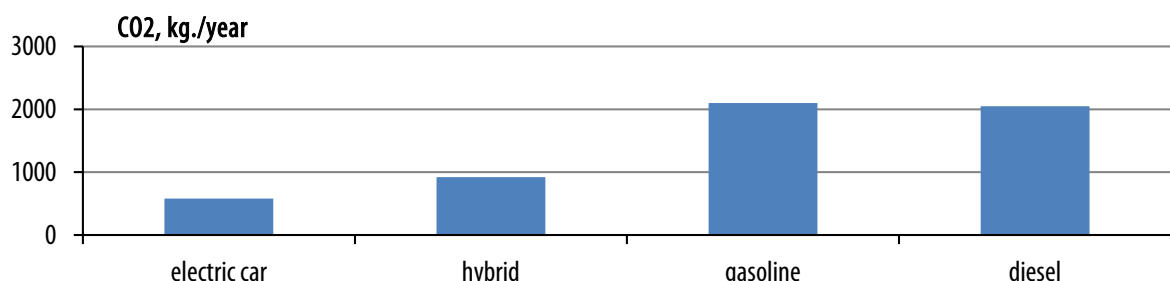
\* includes emissions from road transport, agriculture and households

Taxis are a part of urban public transport. They play a major role by service the passenger in urban areas. Therefore, they take a serious part in environmental pollution in modern cities.

To determine the level of emissions on randomly we selected six taxi car used in the company "Tochnite taxita" Ruse. The total mileage for the year of this six taxis was 82 056 km (Table 2) the released amount of CO<sub>2</sub> is 17 150 kg.

**Table 2.** Total mileage per year from selected cars

№ car	Mileage for the day	Number of working days per week	Brand car	Motor vehicle	Mileage per year	Amount of CO <sub>2</sub> per year
	km				km	kg
1	62	5	Dacia	gasoline	16120	3369.08
2	69	4	Shevrolet	diesel	14352	2999.586
3	72	5	BA3 21011	gasoline	18720	3912.48
4	54	1	Skoda	gasoline	2808	586.872
5	41	2	Daewoo	gasoline	4264	891.176
6	52	1	Renault	diesel	2704	565.136
7	76	3	Opel	gasoline	11856	2477.904
8	54	4	Dacia	diesel	11232	2347.488
Total		25			82056	17149.7



**Figure 2.** Comparing the amount of CO<sub>2</sub> for mileage 10,240 km

For all taxis in the city of Ruse, the data obtained that the total thrown out CO<sub>2</sub> in Ruse is over 1.6 million kg. In Figure 2 is shown separately CO<sub>2</sub> in the environment from electric, hybrid, petrol and diesel cars. The least amount of CO<sub>2</sub> released from electric cars - mileage 10,240 km only – 600 kg per year of a electric car. By plan Green Post, implemented by the research team of the Department of Transport at the University of Rousse "Angel Kunchev" for electric car "Free Duck" has studied the specific energy expense. To mileage from electric car of 4 947 km (Figure 3) has spent 528 kWh of electricity (Figure 4). For such expenditure aggregate of energy consumption for the average specific energy consumption is obtained 0,11 kWh / km, (Figure 5).

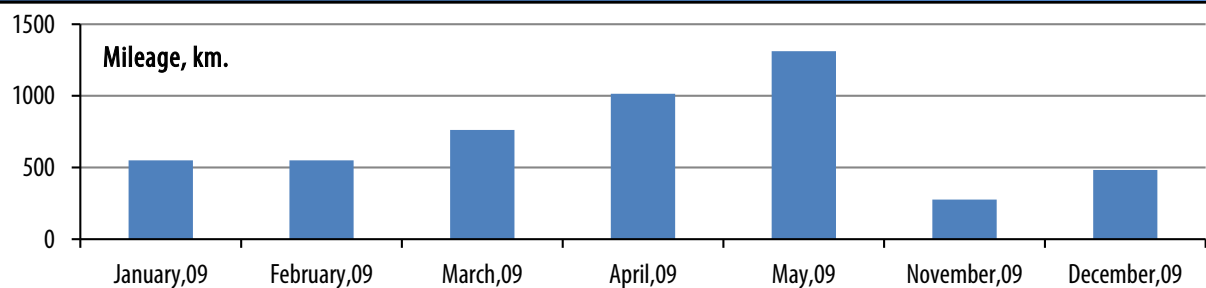


Figure 3. Data of the mileage per month

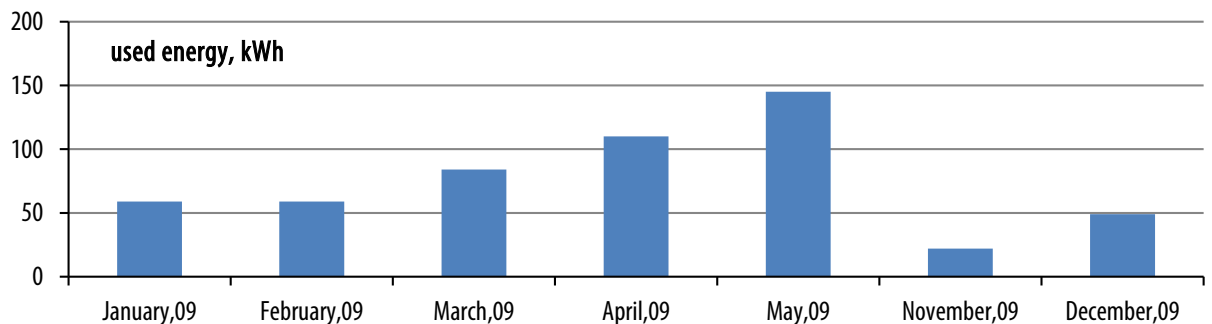


Figure 4. Data on energy consumption per months

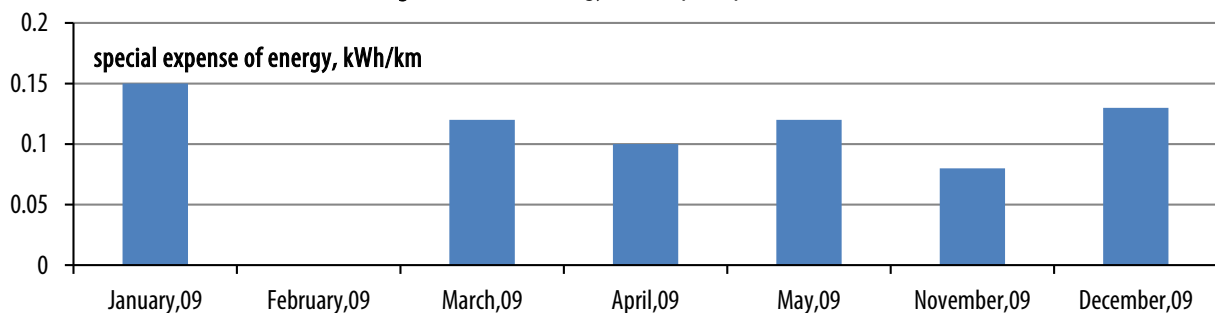


Figure 5. Specific energy consumption in kWh / km per months

For reporting of energy consumption used mobile system for measure wattage for a second, developed specifically for this purpose with a precision of one watt, it indicated in the last part. Environmental effect obtained by emitted into the atmosphere exhaust gases. For example, CO<sub>2</sub> electric vehicle charging from the mains is 50 g / km. While in vehicles with an internal combustion engine is 150 to 200 g / km. This indicates that in this manner can be obtained a reduction of CO<sub>2</sub> emissions by 3 to 4 times.

### 3. CONCLUSIONS

- » Vehicles with alternative ICE preferred for transportation of passengers due to reduced emitted of products that affect the environment.
- » Necessary is the regulation of car brands that are registered as taxis, depending on the amount of harmful products emitted into the atmosphere.
- » Necessary is to look for reserves for raising the level to ecology to the taxi park.
- » Taxis are not enough studied and analysed to processes is based on environmental performance can enhance the effectiveness of this type of service.

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