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Short Communication

CONTRIBUTION TO THE STUDY OF POLLUTING EMISSIONS ON THE ENVIRONMENT AND ANTI-POLLUTION STANDARDS IN DIESEL AND GASOLINE ENGINES

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ABSTRACT

The vehicle is an important part of air pollution. Some of these pollutants can be dangerous for our health but also for our planet, to limit the emissions of harmful gases released by vehicles, European regulations have been taken since the early 1970s. Called Euro standards, research on Euro standards have made it possible to develop technological progress on engines to reduce the average fuel consumption of vehicles, so pollutant emissions such as nitrogen oxides, CO, CO2, and particles have all been reduced by 75% between 1993 and 2019. Thus, thanks to stricter standards, the global quantities of pollutants emitted by the park have been considerably reduced.

INTRODUCTION

Vehicles produce emissions that affect human health and the environment. A vehicle that is powered by fuel, such as gasoline or diesel, evacuates a complex mixture of gases. Criteria Air Contaminants (CACs) include Carbon Monoxide (CO), Nitrogen Oxides (NO_X), Sulfur Oxides (SO_X), Volatile Organic Compounds (VOCs), Particulate Matter (PM), and Particulate Matter (PM), ammonia (NH_3). Today's vehicles produce less CACs than vehicles of the 1970s, thanks to technological advances in engines and emissions control, and tighter fuel quality standards.

Gasoline engines produce 2.3 kilograms (kg) of CO_2 per liter of gasoline consumed. Diesel engines produce 2.7 kg of CO_2 per liter of diesel consumed (Annual European Community, 2008). Nitrous Oxide (NOx) is a colorless, non-flammable gas with a mild odor. It is also a powerful with a global warming potential 300 times higher than that of CO_2.

To limit harmful gas emissions, European regulations have been adopted since the early 1970's Called Euro standards since 1990; they impose emission limit values for nitrogen oxides (NOx), carbon monoxide (CO), hydrocarbons (HC) and particles (Annual European Community, 2008).

For passenger cars, the effective dates are as follows:

These standards are ranked from 1 to 6 for light vehicles. The higher the standard, the more recent it will be (Euro 1 to Euro 6, 2017; Euro 1 to Euro 6, 2018).

- **Euro 1** - First entry into service: 1st January 1993
- **Euro 2** - First entry into service: 1st January 1996
- **Euro 3** - First entry into service: 1st January 2001
- **Euro 4** - First entry into service: 1st January 2006
- **Euro 5** - First registration: 1st January 2011
- **Euro 6b** - First registration: 1st September 2015
- **Euro 6c** - First registration: 1st September 2017

The aim of the Euro Standard is to reduce gaseous emissions from road vehicles by forcing car manufacturers to produce cleaner cars and trucks. For this, manufacturers must meet lower and lower particle emission rates. On the one hand, they differ depending on whether the model consumes gasoline or diesel (Doctissimo, 2000). Between Euro 1 and

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Euro 6, the values were then significantly lowered. Nitrogen oxides (NOx) are one example.

The Euro 1 and Euro 2 standards did not take this pollutant into account. Then, in 2001, the Euro 3 standard set the limit of 150 mg/km. Fourteen years later, the ceiling was reduced to 60 mg/km with the Euro 6 standard of 2015. With regard to fine particles (PM) emitted by diesel, the Euro 1 standard limited them to 140 mg/km whereas Euro 6 sets the maximum at 5 mg/km.

This limitation of fine particles which was absent for the Euro standards from 1 to 4 for gasoline vehicles appeared with the Euro 5 of 2009. The purpose of this work is therefore to correlate the harmful gases released by vehicles with European standards, in order to contribute a conclusion (WHO, 2017).

MATERIALS AND METHODS

Sampling

To carry out this work we randomly selected 30 vehicles (random) (15 petrol, 15 diesel) during the month of August 2017 in Mainz (German), the control of the exhaust gases of the engines was carried out at 60°C (temperature engine oils), the engine exhaust meter is called CO BOSCH works automatically.

Gasoline Engine Exhaust Control

- A motor vehicle equipped with a hot gas engine (60°C) rotates with a speed 3000/min.
- An exhaust gas analyzer for gasoline engines.
- Learn to control the exhaust of gasoline engines using the gas analyzer available in the workshop.
- Interpret the results of hiding.

Technical inspection of the lambda probe: The lambda probe is also called oxygen probe. The first lambda probes date back to the 1970s and were adopted in Europe in 1993 on petrol-specific vehicles, to meet the European Euro 1 emission standard for air pollutants (Barrier et al., 1989). The objective of the lambda probe is to reduce the emission of pollutants and reduce fuel consumption by allowing the vehicle to fine tune the amount of fuel. This sensor constantly measures the amount of oxygen present in the exhaust gas: The symbol of the lambda value is the Greek letter λ. It gives an air coefficient of lambda equal to 1 when the gasoline air ratio is optimum, namely a dosage of 14.7 grams of air per 1 gram of gasoline. On a vehicle, the lambda value (λ) must be between 0.97 and 1.03 (Barrier et al., 1989). This is the value we find on the report of the technical control. Beyond these values, the pollution rate is incorrect.

CO control: CO is a poisonous, colorless and odorless gas that comes from incomplete combustion. CO levels are higher when the mixture of air and fuel is too rich (i.e., the amount of oxygen is insufficient for fuel). CO reduces the ability of blood to carry oxygen from the lungs.

The determination of the percentage of CO volume in relation to the total volume of gaseous pollutants must be less than 0.20% (Fig. 1).

Diesel engine exhaust control

- A motor vehicle equipped with a hot diesel engine (60°C) in case of starting with maximum acceleration.
- Opacimetry for diesel engines.
- Learn how to control diesel engine exhaust using opacimetry available in the workshop.
- Interpret the results of hiding.

Diesel engine control: For the diesel engine, the opacity (Thouvenel, 2004) of the fumes emitted by the diesel engines is measured. The oldest mechanics, without particulate filter (FAP), mandatory only since 2011, will have trouble passing the test. For the most recent, it will be necessary that some of their components are not too dirty: the FAP, but also the exhaust gas recirculation valve (EGR), intended to lower the level of oxides of nitrogen (NOx), to which is added the admission circuit.

RESULTS AND DISCUSSION

The objective of this study is therefore to correlate the percentage of emission of pollutants with the age of cars (model), for the gasoline engine we have based on two parameters (%CO and lambda) but by the diesel engine we based on the control of the opacity of the fumes, the results found are grouped

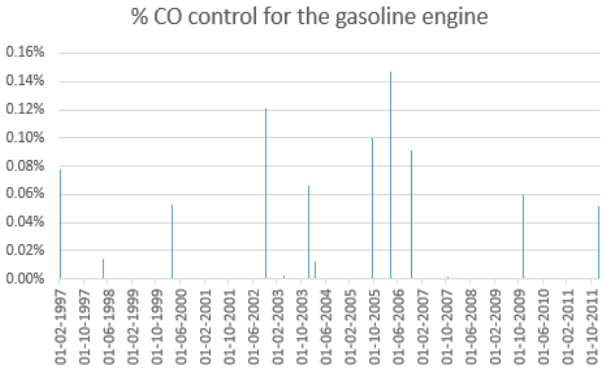

Fig 1. The percentage of CO control for the gasoline engine.

Table 1. Gasoline engine gas emissions.

Standards	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6
Nitrogen oxides (NOx) mg/Km	-	-	150	80	60	60
Carbon monoxide (CO) mg/Km	2720	2200	2200 (Acc max 3.5%)	1000 (Acc max 0.3%)	1000 (Acc max 0.3%)	1000 (Acc max 0.2%)
Hydrocarbons (HC) mg/Km	-	-	200	100	100	100
Particles (PM) mg/Km	-	-	-	-	5	5
Non-methane hydrocarbons (NMHC) mg/Km	-	-	-	-	68	68

Table 2. Diesel engine gas emissions.

Normal	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6
Nitrogen oxides (NO_X) mg/Km	-	-	500	250	180	80
Carbon monoxide (CO) mg/Km	2720	1000	640	500	500	500
hydrocarbons (HC) mg/Km	-	-	-	-	-	-
HC + NO_X mg/Km	970	900	560	300	230	170
Particles (PM) mg/Km	140	100	50	25	5	5

Table 3. Control results of % CO lambda and smoke opacity.

Number	Car mark	Fuel	Model	% CO	Lambda	The opacity of the fumes
1	Volkswagen-VW	Gasoline	07-02-1997	0.078%	1.029	-
2	BMW	Gasoline	27-04-1998	0.014%	1.023	-
3	Opel	Gasoline	28-03-2000	0.053%	0.997	-
4	Peugeot	Gasoline	25-10-2002	0.121%	1.006	-
5	Daimlerchrysler D	Gasoline	11-04-2003	0.003%	1.001	
6	Volkswagen-VW	Gasoline	01-12-2003	0.066%	0.999	-
7	Kia motors	Gasoline	27-02-2004	0.012%	1.004	-
8	Volkswagen-VW	Gasoline	23-09-2005	0.10%	0.994	-
9	Renault	Gasoline	08-03-2006	0.147%	0.993	-
10	Citroën	Gasoline	17-10-2006	0.091%	0.998	-
11	Daimlerchrysler D	Gasoline	30-10-2007	0.002%	1.015	-
12	Opel	Gasoline	14-07-2009	0%	0.970	-
13		Gasoline	12-11-2009	0.059%	0.996	-
14	KIA Motors	Gasoline	22-10-2010	0%	0.998	
15	Citroën	Gasoline	15-12-2011	0.052%	0.995	-
16	Audi	Diesel	07-05-2009	-	-	0.01
17	Daimlerchrysler D	Diesel	16-05-2000	-	-	0.56
18	Daimlerchrysler D	Diesel	15-05-2000	-	-	0.56

in Tables 1-3. For gasoline engines, we have found that the value of the lambda probe has decreased as car modeling increases, so it can be said that older gasoline engines emit noxious gases more than new engines. So this result shows that there is a correlation between the euro norms and the lambda probe (Fig. 2). The result of diesel engine opacity shows that the opacity of engine fumes has decreased as the modeling of cars increases, so from this result it can be said that older diesel engines emit more pollutant emissions than new engines (Fig. 3).

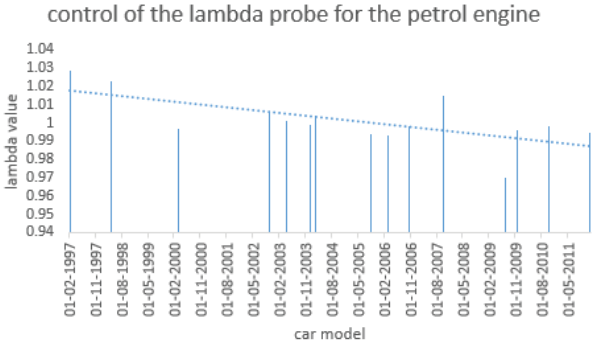

Fig 2. Control of the lambda probe for the petrol engine.

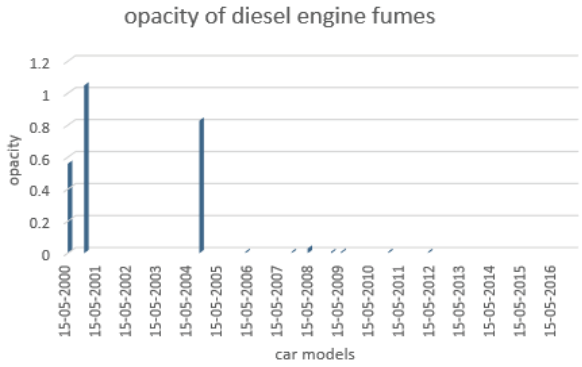

Fig 3. Opacity of diesel engine fumes.

CONCLUSION

Our result shows that today's vehicles produce less harmful gases than older vehicles, this reduction of gas due to technological progress made in terms of engines and emissions control and European standards.

REFERENCES

Annual European Community. LRTAP Convention Emission Inventory Report 1990-2006. Technical Report No 7 of the European Environment Agency, 28 July, 2008.

Barrier, C., Lambert, J., Georgiades, Y., Schreiber, H., Pasche, E. (1989). The French and German automobile industries face new anti-pollution standards. The scientific papers of the transport. p. 21.

Doctissimo. (2000). Diesel as harmful as asbestos American Journal of Epidemiology. 1(152): 32-40

Euro 1 to Euro 6: How clean is my car? | What car? Accessed November 17, 2017.

Euro 1 to Euro 6 – Find out your vehicle's emissions standard accessed 9, March 2018.

Thouvenel, N. (2004) Contribution to the study of polluting emissions and depollution means in a supercharged diesel engine transient operation. PhD thesis.

WHO adds pressure for strict Euro-5 standards Transport and Environment accessed July 10, 2017.