TEMPERATURE FIELD OF EXHAUST CARS GASES AND CALCULATIONS OF THE STATISTICAL INFORMATION

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There are too many problems from the gases which constantly fly out from the exhaust pipes of cars and lorries, especially if this process takes place in the closed apartment (garage, laboratory, class, station of diagnostic or repair for transport systems with diesel or petrol engine). Practically all gases poison air, bring essentially injury to the health of people and for the all nature. Hitherto, many scientists affirm that gases create the negative hotbed effect in the atmosphere and influence to the appearance of the ozone holes. Some important experiments and investigations at the present day didn't make.

In this article there are several technical decisions not only how to decrease the negative influence of gases but the special calculations using personal computer and statistical information to describe the process by a chart.

Keywords: *exhaust gases; protection; temperature; pollution; calculation; statistical information.*

ТЕМПЕРАТУРНОЕ ПОЛЕ ВЫХЛОПНЫХ ГАЗОВ АВТОМОБИЛЕЙ И РАСЧЁТЫ СТАТИСТИЧЕСКИХ СВЕДЕНИЙ

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Существует много проблем с газами, которые вылетают постоянно из выхлопных труб легковых автомобилей и грузовиков, особенно если имеет место этот процесс в закрытых помещениях (гараж, лаборатория, класс, станция диагностики или ремонта транспорт-

ных систем с дизельным или бензиновым двигателем). Практически все газы отравляют воздух, приносят существенный вред здоровью людей и всей природе. Поэтому многие учёные утверждают, что газы создают негативный парниковый эффект в атмосфере и влияют на появление озоновых дыр. Некоторые важные эксперименты и исследования в настоящее время сделаны.

В этой статье есть несколько технических решений не только как уменьшить негативное влияние газов, но и специальные расчёты, используя персональный компьютер и статистическую информацию, чтобы описать процесс графически.

Ключевые слова: *выхлопные газы; защита; температура; загрязнение; расчёты; статистическая информация.*

Introduction

It is common knowledge, that any exhaust gases from the cars/lorries have the very bad and even dangerous influence to the man health. Namely, at the present day any type of cancer (as the illness) is the most dangerous for people. Unfortunately, these harmful gases take practically the first or maybe the second place as gases from the works, factories and boiler-houses which make the same negative effect. Moreover, hot gases constantly increase the temperature around the Earth. That's why any even a small achievement which can diminish this harmful influence from these gases on the surrounding environment it plays the very important significance. In this paper one new and effective technical decision to defend our atmosphere against these dangerous exhaust gases is presented.

Text 1. It has suggested how to quickly delete the harmful exhaust gases which are fling constantly into the air from the cars and lorries. It is needed to direct these gases into the water reservoir. In this case the most injurious chemical elements and their combinations will be on the bottom of the water pool or they'll float in it [1-3]. Of course, periodically the water reservoir must be cleaned. At the same time the hot temperature from these gases will be diminished essentially (practically to the normal level).

The first step of our control was linked with the test of temperature which is changing behind the end of the exhaust pipe depending on many factors, namely: type engine, it's term of operation, fuel, regime of combustion (start, normal or forced regime), temperature around the place of measurement, velocity of wind, the distance from the end of exhaust pipe till the point where the temperature was fixed by thermometer.

In a capacity of auxiliary instruments were taken the next: ruler (length about 500 mm) and thermometer which can show not less than 200 oC. All fixed results were written down on the leaflet. Moreover, the measurements were written down on the middle line with the hole of the exhaust pipe, then 50 and 100 mm above and below of the end of the pipe and on the length till 300 mm. Well, the same measurements of temperature were made from the both sides of the exhaust pipe. This information connected with these points of the temperature control during our investigation is given in Fig. 1.
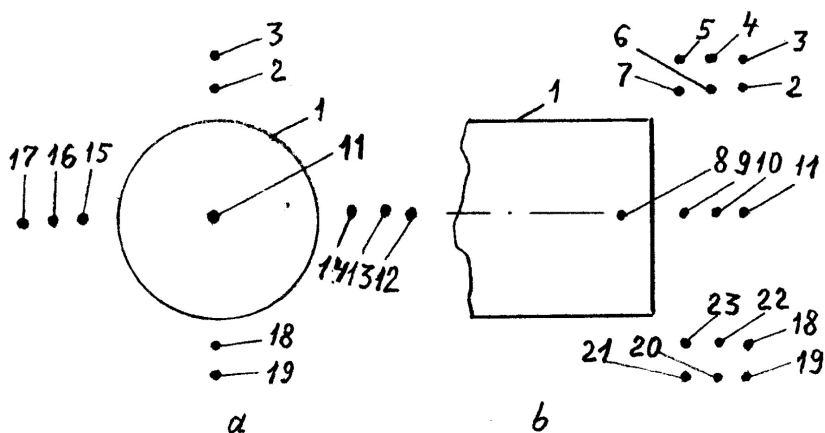

Fig. 1. Points where the end of thermometer was installed:
a – is the view from the face; *b* – from one side (lengthways)

In most cases the distances between places where the temperature is measured was 50 mm, for example: number 2-3; 18-19; 12-13; 13-14; 15-16; 16-17; 5-7; 4-6; 3-2; 23-21; 22-20; 18-19, but the lengthwise of

the pipe these distances were 100 mm between points 6-7; 2-6; 22-23; 22-18; 20-21 and 19-20. And the same distance in 100 mm was between the next points 8-9; 9-10 and 10-11.

Position number 1 is designated for the exhaust pipe. Position 8 is the point inside the pipe (the distance from the end of the pipe was about 15 mm).

The measured temperatures (oC, bold type) in these points were:

52, 43, 21, 2 (points 8, 9, 10, 11 for the line which is going through the centre of pipe); 14, 8, 3 (points 7, 6, 2); 5, 3, 1 (points 5, 4, 3); 3, 2, 1 (points 21, 20, 19);

6, 3, 1 (points 23, 22, 18); 22, 11, 1 (points 14, 13, 12); 11, 5, 1 (points 15, 16, 17).

The common field of temperatures is shown in Fig. 2. The investigation process was made 09.11.2019 quite near to the ITMO University (Saint-Petersburg) when the external air temperature was about + 1 oC only. The wind in the day of testing was not more than 1 metre per second. Using written computer programme MathCad let's get the equations which describe the distribution of temperature in all cases (Fig. 2 and Fig. 3) and at the same time to represent the appropriate curves [4, 5].

$$i := 1..4; \qquad h := 50; \qquad L_0 = \frac{L_1 + L_n}{2} = 75 \ ; \qquad L_n := 150; \qquad L_1 := 0;$$

$$H_1 := n \cdot \frac{n^2 - 1}{12} = 5 \qquad H_2 := n \cdot \left(n^2 - 1\right) \cdot \frac{n^2 - 4}{180} = 4 \qquad d_0 := \sum_i \frac{d_i}{n} = 29.5$$

$$a := \frac{1}{12 \cdot H_2} \cdot \left[3 \cdot \left[\sum_i \left[d_i \cdot (2 \cdot i - n - 1)^2 \right] \right] - \left(n^2 - 1\right) \cdot \left(\sum_i^n d_i \right) \right] = -2.5$$

$$b := \frac{1}{2 \cdot H_1} \cdot \left[\sum_i \left[d_i \cdot (2 \cdot i - n - 1) \right] \right] = -17.2 \qquad\qquad c := d_0 - \frac{H_1 \cdot a}{n} = 32.625$$

$$W_i := a \cdot \frac{\left(L_i - L_0\right)^2}{h^2} + b \cdot \frac{L_i - L_0}{h} + c$$

Table 1.

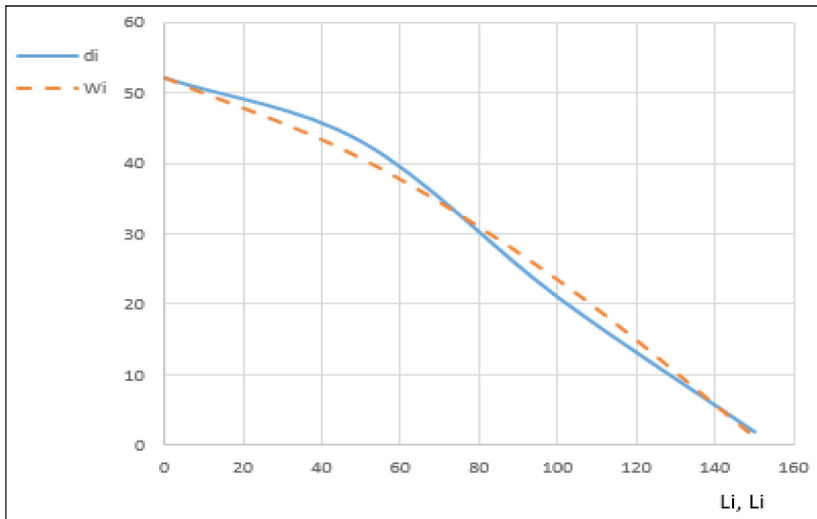| d_i	L_i	W_i
52	0	52
43	50	40.6
21	100	23.4
2	150	1.2

Fig. 2. Experimental and theoretical data connected with the temperature alteration along the center line of the pipe (from within to the outside)

The non-linear coincidence for this parabola approximation is very well.

Above we took into account the even points of observation (n = 4), but further there are information of temperature with n = 3 (odd amount of points for control). $t1_i$

Table 2.

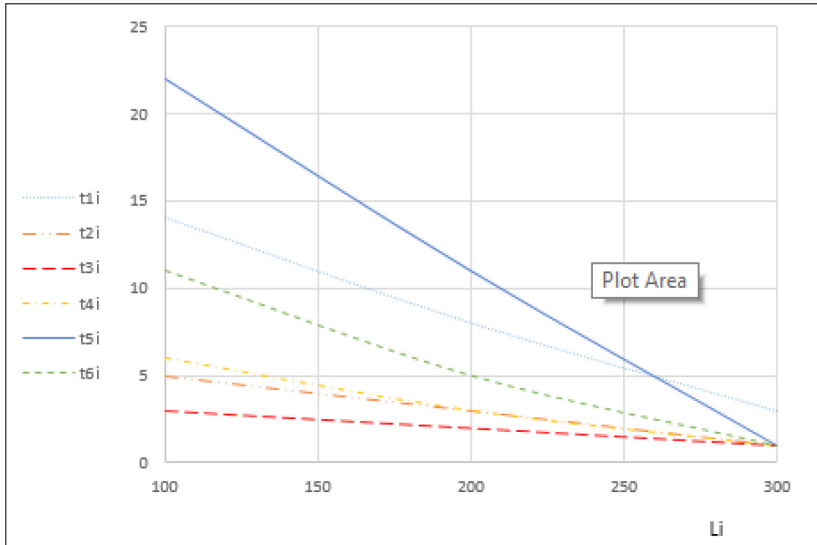| $t1_i$	$t2_i$	$t3_i$	$t4_i$	$t5_i$	$t6_i$	L_i
14	5	3	6	22	11	100
8	3	2	3	11	5	200
3	1	1	1	1	1	300

Fig. 3. Six lines which show how the temperature changes in different points
of measurements dimensions and in accordance with their positions

Therefore, the water in reservoir will not become hot extremely and as an addition result the evaporations will not be too strong from the water surface. This programme of calculation and common analysis were made many times.

Text 2. Experimental investigation consisted of taking away gases from different motor vehicles which are working using petrol or diesel fuel [6, 7]. For this aim special technical pears (like an enema), measuring-glasses, thermometer and distillation water were bought.

Moreover, special devices Tensor-37 FT-IR (firm BRUKER OPTIK GmbH with standard detector DLaTGS) and spectrum-scan Max-GV were applied as well.

They help to make the chemical analyses of the originally clean water with exhaust gases. For this purpose, the first measurement was obtained using this device (Fig. 4) and with computer programme, chart and calculations (Fig. 5).
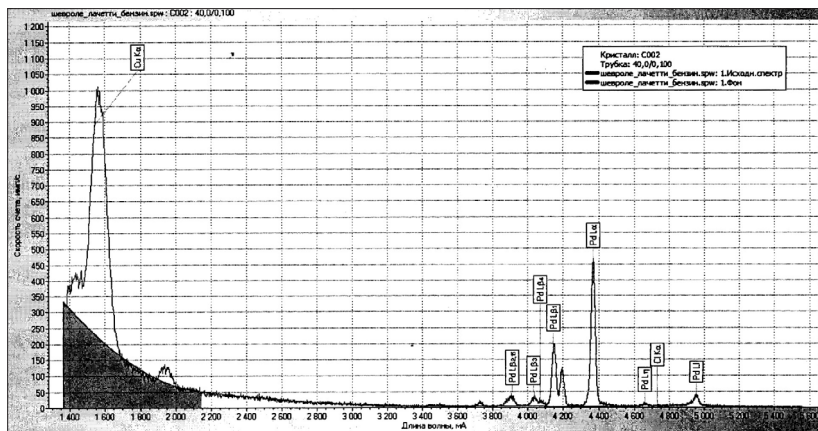
Fig. 4. The first information obtained from the motor vehicle (Chevrolet) /velocity of calculation as a function of the length for wave/

After the full gathering of statistical information about exhaust gases from different motor vehicles we plan to get important picture of influence gases and their harmful characteristics on our medium.

Approximate description of this figure 4 with the computer programme MathCad is given below. It's no difficult to get the mathematical equation too.

Table 3.

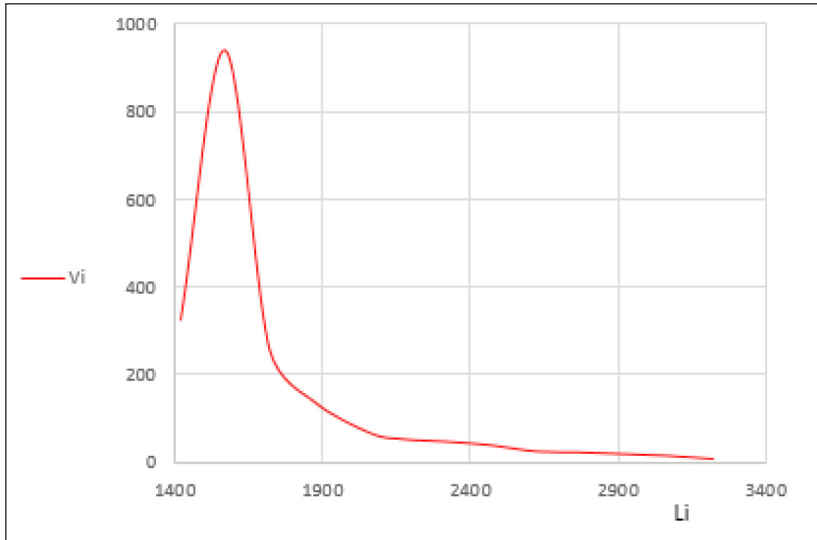| V_i	L_i
325	1420
940	1570
260	1720
140	1870
68	2060
54	2170
48	2320
40	2470
26	2622
24	2770
20	2920
16	3070
9	3220

Fig. 5. Chart to approximate the description for the initial part of statistical data

Results and Conclusion

Thus, the description how people can essentially decrease the harmful influence of the motor vehicles gases on the media is given here. The temperature changes were investigated for the first time around the exhaust pipes. These experiments show that the temperature in the water (where gases will go) aren't too hot and any essential evaporation will be absent. This very simple method to neutralize the high hot temperature from the exhaust gases helps to defend the environment (ozone holes and hotbed effect cannot appear at all) and water in reservoir annihilates many carcinogenic chemical components/elements which take always place in the exhaust gases.

Discussions

Expanded new way to diminish negative influence from the automobile exhaust gases which is represented in detail in here is the simplest and the cheapest at the present day among the many others well-known ways in this plan. Moreover, it can be realized very easy in practice.

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