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MAIN DIRECTIONS OF INCREASE OF ECOLOGICAL SAFETY OF MOTOR TRANSPORT

Y. Gorbik, student, E. Voronova, ass. prof., N. Vnukova, ass. prof., KhNAHU

Abstract. *The problems of pollution of the atmosphere by automobile exhausts are reviewed and the methods of reduction of exhausts and decrease of their toxicity are offered.*

Key words: *harmful matters, internal-combustion engines, exhaust gases, neutralization.*

Introduction

Motor transport is the main consumer of oil fuel and one of the sources of contamination of environment by harmful matters discharged with exhaust gases (EG) of internal-combustion engines [1].

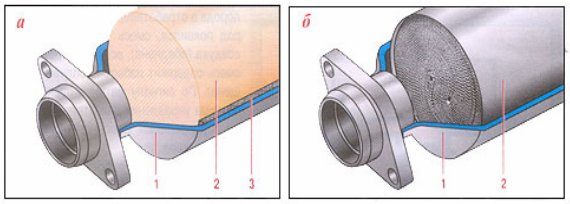
For a long time of existence of the problem of automobile exhausts and pollution of the environment it was developed a member of methods and ways in order to reduce the quantity of exhausts.

The methods of neutralization from exhausts of internal-combustion engines

These methods and ways of reduction of the quantity of exhausts include [2]:

1) Improvement of the quality of manufacturing and improvement of designs of the engines;
2) Looking for fuels using different dopes for it;
3) The development of devices reducing the contents of harmful components in exhaust gases:
– Liquid-phase neutralization of exhausts;
– Thermal oxidation;
– Catalytic neutralization;
4) Creation of installations for automobiles to exhaust less harmful matters.

Special attention is played to the methods of neutralization from exhausts of internal-combustion engines. Their essence is in elimination of toxicants in different ways. The constitution of neutralization is described in picture 1 [3].



Pic. 1. Device of automobile neutralization of exhaust gases: а – ceramic launcher; б – metallic launcher from the corrugated paper; 1 – punch frame from a stainless steel; 2 – catalytic launcher; 3 – elastic thermal construction

The methods are divided into catalytic, thermal and liquid. All of them are applied as accessories.
The features of the catalytic neutralization in diesel engines is the necessity of their regeneration as soot blocks the active surface of the catalyst and the excreting sulphuric anhydride interacting with aluminum oxide composes Al_2O_3 will derivate aluminum sulphate $Al_2(SO_4)_3$, which blocks pores and thereby reduces its efficiency. The method of catalytic neutralization is widely used.

The thermal neutralizer is a heat-insulated volume with specially organization of EG flow placed in the outlet system of the engine and executing thermal oxidation of toxiferous components at the expense of the heat of exhaust gases. The thermal neutralization does

not depend on any kind of fuel and usage of dopes.
The liquid neutralization has received a wide application as a simple physico-chemical way of effect on exhaust gases of diesel engines. The process includes the following stages: catching of finely divided fragments, adsorption, condensation and filtration. The exhaust gases skip through a layer of liquid and the gases are cooled up to 40 – 80°. Water soluble components of cleaned gases – aldehydes, sulfur oxides, nitrogen oxides are neutralized, soot and other dispersed fragments are trapped by the liquid and the intensity of exhausts smelt. Carbon oxides and nitrogen oxides are not decontaminated. To increase the efficiency of the solutions of Na_2SO_3, Na_2CO_3 and hydroquinone are used.

However the usage of the neutralizing agent in comparison with other methods demanding the utilization of slime, washing of the system and filling it with fresh liquid.

Catalytic neutralization has proven to be a reliable devices and successful in reducing noxious tailpipe emissions. However, they may have some adverse environmental impacts in use.

The requirement for a rich burn engine to run at the stoichiometric point means that it uses more fuel than a «lean burn» engine running at a mixture of 20:1 or less. This increases the amount of fossil fuel consumed and the carbon dioxide emissions of the vehicle. However NO_x control on lean burn engines is problematic and many lean burn engine manufacturers are considering rich burn variations. Another solution is to increase the amount of biofuels used - if 100% biofuel was used the engines would be CO_2 neutral, presuming no fossil fuels were consumed in production of the biofuels, which currently is far from the case (see energy balance of biofuels).

Catalytic neutralization is «estimated» to account for 50% of total nitrous oxide (dinitrogen oxide, 'laughing gas') emissions to atmosphere. While N_2O emissions in these concentrations are not harmful to human health, it is a potent greenhouse gas, accounting for around 7% of the overall greenhouse effect despite its small concentration in the atmosphere.
The manufacturing of catalytic neutralization requires palladium or platinum; a portion of the world supply of these precious metals is produced near the Russian city of Norilsk (about 15%), with significant negative environmental effects due to the lack of environmental protection legislation [4].

Conclusion

Today the primary goal from the point of view of ecological safety in the field of motor industry is the improvement of ecological and fuel energy parameters of automobile engines as the level of pollution of air in the majority of towns and large cities considerably exceeds the sanitary regulations and the deficit of refined oils increases. At burning of one ton of oil fuel in atmosphere an automobile exhausts more than 400 harmful substances, among them being a lot of carcinogenic substances.

The further investigation will be directed towards the development of testing methods of the system of neutralization in the condition of operating a car using racing drums developed at the department.

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Рецензент: Э.Б. Хоботова, профессор, д.х.н., ХНАДУ.

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