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AUTO TRANSPORT VEHICLES DURING OPERATION DETERMINATION OF THE COMPOSITION OF EXHAUST GASES

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ABSTRACT

Currently, vehicles are considered to have the highest index among the factors affecting environmental change, in this article, the composition of exhaust gases emitted by motor vehicles during operation, their harmful effects on the environment and ways to eliminate them are described. , ecological and environment-damaging factors, their legal prevention and solution, as well as conclusions and suggestions for the above problems.

Key words: automobile, toxic gases, carbon monoxide, nitrogen oxides, waste gases.

INTRODUCTION

The main source of exhaust gases (or used gases) is the internal combustion engine - these are substances with different chemical and physical properties in the form of inhomogeneous gases as a result of complete or incomplete combustion of fuel, air, aerosols and various micromixtures. and goes from the engine cylinder to the exhaust system. They contain more than 300 different substances, many of which are toxic. Carbon monoxide, nitrogen, and hydrocarbons are the main toxic components of exhaust gases from car engines. In addition, restricted and unrestricted hydrocarbons, aldehydes, carcinogenic substances, soot and other substances are released into the atmosphere together with waste gases. The approximate composition of gases coming out of nuclear reactors is presented in

Table 1. Composition of exhaust gases

Component of waste gases	Amount by volume, %		Comment
	Engines		
	gasoline	diesel	
Carbon onoxide	0.1 – 10,0	0,01 - 5,0	toxic
Non-toxic hydrocarbons	0.2 - 3.0	0.009 - 0.5	toxic
Aldehydes	0 - 0.2	0.001 - 0.009	toxic
Sulfur oxide	0 - 0.002	0-0.03	toxic
Body, g/m	0-0.04	0.01-1.1	toxic
Benzopyrene, mg/ m^3	0.01 - 0.02	Do 0.01	toxic

Engines running on ethylated gasoline contain more lead in exhaust gases, and soot in engines running on diesel fuel. Carbon monoxide (SO-is gas). Transparent, odorless, toxic, light compared to air, poorly soluble in water.

Carbon monoxide is a product of incomplete combustion of fuel, and it burns with a bluish flame when carbon dioxide is produced in the air. In the combustion chamber of the engine, SO is formed as a result of insufficient fuel injection, cold flame reaction, combustion of fuel with insufficient oxygen and dissociation of carbon dioxide at high temperatures. During post-ignition combustion (after the high end point, during the expansion stroke), carbon monoxide is burned by mixing with oxygen when dioxide is formed. In this case, SO combustion continues in the outlet pipeline. It should also be taken into account that when operating diesel engines, the amount of SO in exhaust gases is low (about 0.1-0.2 percent), so the amount of SO is determined only for gasoline engines. Nitrogen oxides (NO, NO2, N2O, N2O3, N2O5, later - NOx). Nitrous oxide is one of the most toxic components of car exhaust. Under normal atmospheric conditions, nitrogen is like an inert gas. At high pressure and high temperature, nitrogen actively reacts with oxygen. 90 percent of NOx in engine exhaust gases is nitrogen oxide NO, which is then oxidized to nitrogen dioxide NO2 in the atmosphere.

Nitric oxide NO affects the tear film of the eye, damages the human lungs, because when they move in the respiratory tract, they interact with moisture in the upper respiratory tract, forming nitric and nitrous acids. Usually, poisoning of human body with NO x does not occur suddenly, it happens gradually, there are no means to neutralize them. Nitrogen oxide (No.O-hemioxide, happy gas) is an aromatic gas that dissolves well in water. It has a narcotic effect. NO2 (dioxide)-leaking is involved in the formation of yellow liquid, smoky haze. When the concentration of nitrogen oxide in the air is 0.5-6.0 mg/m3, it has a direct toxic effect on trees. Nitric acid causes severe rusting of carbonaceous pods.Hydrocarbons (CnHm-ethane, methane, ethylene, benzene, propane, acetylene, etc.). Hydrocarbons are organic compounds whose molecules consist only of carbon and hydrogen atoms and are toxic substances. Exhaust gases contain more than 200 different hydrocarbons with aliphatic and aromatic rings. In the molecule of aromatic hydrocarbons, one or more rings consist of 6 carbon atoms and are interconnected by simple or double bonds. It has a fragrant smell. Due to the presence of SN content in the used gases of the engine, the mixture in the combustion chamber is not homogeneous, therefore, the flame extinguishing occurs on the walls of the cylinder where the fuel mixture is located, and this is explained by the interruption of the chain reaction (Fig. 1

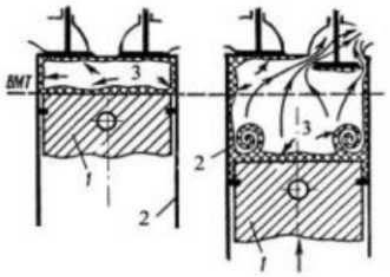

Figure 1. Form of appearance of SN m in waste gases: 1- piston; 2nd sleeve; 3- compound layer on the wall.

The composition of incompletely burned SN leaving with waste gases contains several hundreds of chemical compounds, some of which have an unpleasant smell and are the cause of many chronic diseases. Gasoline fumes are also toxic because they are also hydrocarbons. The average daily concentration of gasoline vapors is 1.5 mg/m3. SN in exhaust gases increases during throttling and forced idling. When the engine is operated in the above mentioned mode, the process of mixture formation is disturbed, the combustion speed decreases, the ignition worsens, as a result of which more waste comes out. Hydrocarbons appear in the regions of the cylinder where the rich mixture is formed, where there is not enough oxygen and on the relatively cold walls. They actively participate in the formation of biologically active substances, these biological substances irritate the eyes and nose, and cause them to get sick. In addition, hydrocarbons cause great harm to the flora and fauna. Hydrocarbon compounds have a narcotic effect on the central nervous system, can cause chronic diseases, some SNs have toxic properties. Hydrocarbons and nitrogen oxides create conditions for the formation of smoky fog (smog) in certain meteorological conditions. Smoky fog (smog). Smoky fog (smog-smoke, fog-fog) is a toxic fog that forms in the lower layer of the atmosphere, which is caused by toxic substances from production enterprises, gases from automobile transport, and emissions from other devices in unfavorable weather conditions. They consist of smoke, fog, dust, and partly liquid aerosol. It appears in industrial cities under certain meteorological conditions. The interaction of harmful gases entering the atmosphere creates new toxic gases. At this time, photosynthesis, oxidation, regeneration, polymerization, condensation, catalysis and other reactions take place in the atmosphere. Nitrogen oxides, hydrocarbons, aldehydes and other substances react with the sun's ultraviolet rays to form photooxidants as a result of complex photochemical processes. Nitrogen dioxide concentrations of NO2 can produce large amounts of atomic oxygen, which in turn forms ozone and reacts with pollutants in the atmosphere. The presence of formaldehydes, higher aldehydes and other hydrocarbon compounds in the atmosphere creates the ground for the formation of new peroxide compounds together with ozone.

Smog can lead to opening of aqueous layers of the eyes, headaches, runny legs, bleeding, and exacerbation of respiratory diseases. Visibility on roads deteriorates, which leads to an increase in traffic accidents.Smog is very dangerous for human life. For example, the smog in London in 1952 was considered a catastrophe, because four thousand people died in four days of smog. The presence of chlorine, nitrogen, and sulfur compounds in the atmosphere creates strong toxic

compounds and acid vapors, which dry up trees, damage and decay limestone ancient monuments.

Effects of waste gases on the environment and people

Exhaust gas is a work product developed in the engine. It is an incompletely burned hydrocarbon fuel and an oxidation product. The emission of waste gases causes an increase in the permissible concentration of toxic substances and carcinogens in the atmosphere of cities. The appearance of smog can be the cause of poisoning in a closed environment.

Figure 2. Smoke coming from the tailpipe of a truck

The amount of exhaust gases emitted from cars The amount of gases emitted from cars is determined by the amount of fuel consumption. Fuel consumption is normalized in relation to the distance traveled and is indicated by the car manufacturer. Estimated fuel consumption can be determined depending on the volume of exhaust gases coming out of the car's tailpipe. When one kg of gasoline burns, 16 kg of different gas mixtures are produced.

- k — carburetor engine
- i — injection engine
- D — diesel engine
- gasoline +20C density from 0.69 to 0.81 g/cm3
- the density of diesel fuel at +20C does not exceed 0.86 g/cm3 according to GOST 305-82

The composition of car exhaust gases		
	gasoline	diesel
N2, ob. %	74 - 77	76 - 78
O2, ob. %	0,3 - 8,0	2,0 - 18,0
H2O (steam)ob. %	3,0 - 5,5	0,5 - 4,0
CO2, ob. %	0,0 - 16,0	1,0 - 10,0
CO*, ob. %	0,1 - 5,0	0,01 - 0,5
Nitric oxide*, ob. %	0,0 - 0,8	0,0002 - 0,5
Hydrocarbons*, ob. %	0,2 - 3,0	0,09 - 0,5
Aldehydes*, ob. %	0,0 - 0,2	0,001 - 0,009
Saja**, g/m3	0,0 - 0,04	0.01 - 1,10
Benzpyrene-3,4**, g/m3	10 - 2010'6	10*10'6

Ways to reduce toxic waste

The incentive to reduce the volume of toxic waste is primarily to encourage the reduction of fuel consumption.The amount of waste (excluding fuel consumption and time) is greatly influenced by the organization of car traffic in cities (most of the waste comes from traffic jams and traffic lights). When the movement is well organized, it is possible to use low-power engines at lower speeds. - the use of passenger gases or natural gases as fuel can reduce the hydrocarbon content of exhaust gases by more than 2 times. The main disadvantage of natural gas is that it travels relatively less, which is not so important in urban conditions;

- in addition to the fuel composition, the condition and adjustment of the engine affects the toxicity of exhaust gases (mainly in diesel engines, the amount can increase up to 20 times, nitrogen oxide in the carburetor can increase up to 1.5-2 times);

- reduced exhaust gases (reduced fuel consumption) in engines of modern design with an injector supply system. In these engines, a constant stoichiometric mixture of unleaded gasoline is created, a catalyst is installed, gas engine units are driven and air cooled, and mixed transmissions are installed. But such structures make cars more expensive. -SAE tests show that one of the ways to reduce nitrogen oxide (up to 90%) in the exhaust gases and the total toxicity of the gases is to spray water into the combustion chamber.

Finding a technical solution to environmental problems is carried out in three directions in world practice: fuel, engine and system for reducing the toxicity of exhaust gases. Compulsory analysis of each of them is required, so we outline the task with several lines.

So, fuel. Meets fuel quality requirements. One of the ways to reduce the toxicity of used gas is to use compressed and liquefied gases as fuel. Almost 90 percent of gasoline engines in the Fergana Valley regions have been converted to gas cylinder cars, and more than 95 percent of gas cars are designed for methane gas.

The most promising is the use of hydrogen as a fuel. In this case, the engine's energetic and environmental performance will improve dramatically. The high heat of combustion of hydrogen is 120 MJ/kg and is much higher than the mass heat of other fuels: 45 MJ/kg of gasoline and 42.7 MJ/kg of diesel fuel. However, due to the low density of hydrogen, its simple energy characteristics are low compared to petroleum fuels. The heat release capacity of the hydrogen-air mixture is 15% lower than that of the gasoline-air mixture and 10% lower than that of the alcohol-air mixture.

Hydrogen is a type of fuel with great prospects for engines, because it has an inexhaustible base of raw materials, a very high heat of combustion (its heat of combustion is 118045 kJ/kg), as a result of combustion, toxic substances (except nitrogen) and does not deteriorate the properties of the oil The high diffusion coefficient of hydrogen makes it possible to create a homogeneous mixture even when the fuel is delivered to the cylinder in any way, to distribute it evenly to the cylinders in all engine operating modes. When burning hydrogen, no soot, soot and coke are formed, which is optimal from the point of view of corrosion of engine parts and service life. But due to the low density of hydrogen, its volumetric energy capacity is relatively low. Combustion of a hydrogen fuel mixture is 6 times faster than the combustion rate of a gasoline-air mixture. A working mixture of hydrogen and air in a ratio of 1:10 is relatively effective. Hydrogen is characterized by a small lower flammability limit of the hydrogen mixture (the ratio of hydrogen and air is 1:25) and a very low ignition energy (12-14 times less than gasoline). These properties

of hydrogen cause spark formation in the pipes of the introduction of the working mixture, ignition of the working mixture in the cylinders before the specified time, the intensity of the combustion process, and detonation. As a result of these conditions, the work process in the carburettor engine is disturbed. In addition, the issue of hydrogen storage and placement in the car is one of the problems that must be solved. For example, if the mass of the fuel tank is 13 - 15 kg in order to store enough fuel (gasoline or diesel fuel) to travel a certain reserve distance, then 19 The mass of the vessel system for storing compressed hydrogen intended for 1300-1400 kg For these reasons, hydrogen is considered as a replacement material for petroleum-derived liquid fuels in the long term. Currently, work is being carried out on the use of hydrogen as an additive to reduce the consumption of liquid fuel. Today, a promising and effective strategic environmental initiative is certainly to make changes in the design of engines. The widespread use of injection engines, electronic control systems and the improvement of the working process of the engine have raised economy and environmental indicators to a new level of quality. If we look at the concept of inventing an ecological engine, 30 years of research in world practice have only offered various forms, interesting projects and structures, but all of them have been turned into metal. An example of a rotor-piston engine can be given as an example, which differs from the classic IYOD in terms of the toxicity of exhaust gases. Currently, these engines are produced at the Volzhsk plant only for installation on special equipment.

Currently, hybrid power units are used, which are the most efficient in terms of economy and environmental parameters: they work with an internal combustion engine on highways, and in urban areas with an electric engine. Switching to one or another engine type is carried out automatically depending on traffic and road conditions.

The third way to reduce the toxicity of exhaust gases is to install additional devices in the exhaust pipes, i.e. afterburners, which are toxin neutralizers equipped with expensive catalysts. An additional device increases the price of the car, reduces its power and economy, we did not achieve economy and environmental friendliness with the above two methods, so we have to use different types of exhaust gas reducing devices. In addition, one of the ways to ensure eco-measurement is to increase the engine efficiency, reduce the tire vibration resistance, reduce the weight of the car using new materials, etc.

Summary:

Currently, in order to improve the resource saving and environmental performance of cars, the cylinder deactivation method is used in engine idle operation. The use of this method is especially good in cities, because in urban conditions there is a traffic light or a pedestrian crossing every 500-1000 meters, and the toxic gases released from it when cars stop have a toxic effect on the surrounding enterprises and institutions. shows. In this method, one or two cylinders are automatically turned off when the engine idles at pedestrian crossings, traffic lights, and parking lots, while the other two cylinders provide the engine with idle power. The disadvantage of this method is that the algorithm for turning off the cylinders is not developed, so there are some shortcomings in which cylinders are turned off and when.

Analysis of the problem of saving resources and ensuring environmental safety in the vehicle complex allows us to formulate a work goal, to achieve it, we will perform the following tasks:

- development of a method of improving the fuel-efficient and environmental performance of a modern car with an engine equipped with an electronic injection system;
- development of the methodology of differentiated fuel consumption of the car, taking into account the method of driving the engine in the mode of driving and operating conditions;
- development of a methodology for researching the effect of the proposed engine control method on the operational and standard fuel consumption of the car, the toxicity of the produced gases, and the vibration activity;
- development of a method of controlling the engine by turning off the cylinders of modern cars during operation;
- to study the influence of the rational algorithm of engine idle control on vibroacoustic, fuel-saving and environmental indicators in operating conditions.

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