Заключение. При установке на асфальтобетонном заводе предлагаемого барботажного абсорбера эффективность пылегазоочистной установки повышается от 95 – 99 %.

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MODERN AIR QUALITY MONITORING SYSTEMS FOR ENVIRONMENTAL EVALUATION OF POLLUTION LEVELS IN THE AREA OF ROAD INTERSECTIONS

Bondarenko S., Vishnyakov N.
Belarusian National Technical University

Monitoring of pollutions is such a system which allows to give an assessment and the pollution contents change. Direct measurement of incomplete combustion toxic products concentration of automobile fuel is the most importance for ecological assessment of atmospheric air pollution level in zone adjacent to the highway. The control for toxic components emissions into the atmosphere is particularly effective in the case of using gas sensors. This modern remote-sensing instruments of atmospheric pollution from mobile sources on the road allow to carry out monitoring of pollution in atmospheric air by toxic blowouts of automobile engines in close proximity to roadbed in real time regime.

Safety of road-transport motion: real-time devices for monitoring of ecological component

This observation procedure allows to identify and to eliminate the negative consequences of natural and technogenic influences.

The expert forecast for motor transports toxic emissions indexes provides an opportunity to give an estimate and organizational decisions on safety transport traffic flows regulation and management.

Holding these actions provides decrease in level of pollution ingredients concentration in air and improves quality of an ecological situation in a traffic zone.

In this case the initial (basic) indicator for such ecological assessment and adoption of the relevant decisions are mass emission concentration of pollutants by the motor transport.

The assessment of the state of atmospheric air on highways and near adjacent residential buildings can be carried out on the basis of the determination of exhaust gas components and their concentration in the air (carbon monoxide, hydrocarbons, nitrogen oxides, formaldehyde, acrylic aldehyde, lead compounds).

Statistics show that the main source of pollution of the air over Minsk is motor transport, the contribution of which one of the main criteria to the total volume of emissions in the city is about 85% for atmospheric air environmental safety evaluation are the average daily and maximum single threshold limit values (maximum permissible concentrations (MPC) for air pollutants in roadside zone, subject to influence of the motor transport.

Direct measurement of incomplete combustion toxic products concentration of automobile fuel is crucial essention for ecological assessment of atmospheric air pollution level in zone adjacent to the highway.

The control for toxic components emissions into the atmosphere is particularly effective in the case of using gas sensors. This type of sensors represents a modern semiconductor device for monitoring the content of carbon monoxide (CO), hydrocarbons and also their derivatives - products of incomplete combustion (such as C, C_xH_y, $C_xN_yO_z$) as well as nitrogen dioxide (NO_2).

This modern remote-sensing instruments of atmospheric pollution from mobile sources on the road allow to carry out monitoring of pollution in atmospheric air by toxic blowouts of automobile engines in close proximity to roadbed in real time regime.

There is a wide variety of modern sensors for sensing atmospheric air pollution, which are based on various principles. These sensors are especially expedient to use for control of air pollutions in places of road interchanges and traverses of highways. Trace amounts of the constant presence of gases (such as carbon oxide and dioxide, nitric oxide (I) and water vapor) can be detected in air by means of an ultrasonic detector, an electrochemical detector in which a CO

oxidation reaction is used on a platinum electrode, an argon ionization detector, as well as by means of a mass spectrometer having high sensitivity to carbon oxides and nitrogen oxides. Traditionally, sensors are used for analysis of carbon monoxide micro-mixtures, the principle of operation of which is based on recording the difference in thermal conductivity of components of the analyzed mixture of exhaust gases containing products of incomplete combustion of organic fuel. A pyroelectric catarometer, the sensitive element of which is a lithium tantalate crystal, is very promising for the analysis of micro-mixtures of some exhaust gases, especially carbon oxide. This detector has sensitivity about 500 times higher than that of a conventional catarometer and is able to detect 5 x 10 – 5 % (bulk) carbon monoxide in the air at a relative error of determination of just ± 5%. The principle of operation of optical-acoustic gas analyzer CO is based on measurement of infrared radiation absorption degree by carbon oxide (II). A gas analyzer of this type is a continuous analysis device that is designed to determine the carbon monoxide (II) content in atmospheric air. The device on the principle of laser excitation of infra-red fluorescence is operated to determine the content of carbon monoxide in the air in the range of concentrations of 0 - 2 -10 – 3 %. Measurement accuracy is ± 1 %. Highly sensitive gas analyzers operating on the principle of chemiluminescence are used to detect the content of oxides in the air, including carbon monoxide and nitrogen oxides.

Abroad, chemiluminescent gas analyzers are produced by “Horiba” (Model APHA-0500, Japan), “Tociba – Bekman” (Model 104, Japan), “KEM” (Models 642 and 652, USA), “Termo-Electron” (Model 14 D8A, USA), etc. In the United States, Japan and a number of other countries, a series of portable gas analyzers has been established, operating on the voltamperometriya principle to determine nitrogen and carbon oxides (including CO) in the atmosphere and in roadside zone air. The determination of gases and specifically carbon monoxide may be carried out automatically.

A combination of sample enrichment techniques and subsequent conversion can be effectively used to analyze CO. To enrich the air with carbon monoxide, the analyzed air is passed through a molecular sieve column, and then the carbon monoxide-rich air can be passed over a nickel catalyst in which CO is converted to methane in the presence of hydrogen. The methane conversion method is also used to analyze a mixture of carbon oxides.

When determining gross concentration of the most toxic automobile blowouts on small ring traverse and on entrance to this traverse

on elementary platforms with the long of 0.01-0.02 m is expedient to install sensors on carbon oxide (CO), on hydrocarbons and products of their incomplete combustion (C, CH, CHO) and also on nitrogen dioxide (NO_2), registering pollution of atmospheric air components of exhaust gases: (see fig. 1).

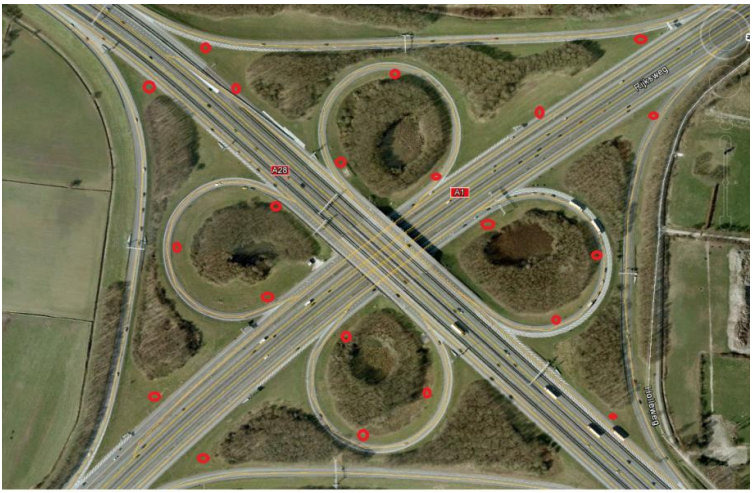

Fig. 1 – Exhaust gas sensor layout from mobile emission sources (sensors marked with dots)

After signal registration by the sensor from the mentioned polluting components further calculation (and processing of the steering information) is made according to the special computer program.

Only threshold (at the level of maximum permissible) concentrations of emission components from point sources are taken into account in the work of these special programmer. These threshold concentrations will be registered only at the most adverse combinations of engines operating modes of cars during certain period. These threshold concentrations will be registered only at the most adverse combinations of car engines operating modes during certain period.

Recently, owing to intensification of car traffic in the air over areas of Minsk even more often than usually have begun to be found considerable concentration of CO, which is more than maximum permissible.

Carbon oxide, was the first gas which content in air of places of traverse and outcomes began to be measured by automatic devices and for which registration automatic signaling devices have been developed. At long stay even in the open air in close proximity to the working gasoline engines there is always danger of poisoning with carbon oxide. In this regard carbon oxide constitutes special danger in places of outcomes and traverses of highways

In fig. 1 the scheme of monitoring of concentration of some types of pollution by blowouts from mobile sources in places of outcomes and traverse of highways with use of sensors of concentration of exhaust gases is submitted. After registration by sensor the signal from the mentioned soiling components further calculation is made according to the pre-developed computer program.

The presented scheme allows to control the degree of air pollution at the controlled-movement intersection and at self-controlled movement on small circular intersection with depending on the average delays of the movement and to determine the threshold levels of air pollution by toxic components of processed gases - carbon oxide (CO), hydrocarbons (C_xH_y) and nitrogen oxide (in the nitrogen dioxide NO_2) in the real time regime.

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