So, the solutions to the environmental problems associated with the fossil fuels usage can be provided by the replacement of current technologies with the eco-friendly alternative ones, in particular by fuel modification with additives of different nature, including bio-additives. Many technological solutions in this scientific sphere have been developed on the basis of the Design Engineering Bureau "Shtorm" of the Igor Sikorsky Kyiv Polytechnic Institute. In particular, we have proposed to use the method of the physical and chemical modification of the fuel characteristics and, on the basis of the studied regularities and features of the radical-chain processes of the fuel oxidation, we have developed the unique additive of complex action to diesel fuel. This additive contains synthesized antioxidant complex, a friction modifier, complex of surfactants and a solvent.

It has been experimentally determined that such fossil fuel modification makes it possible to reduce the emissions of smoke, CO₂, CO, NOₓ, С₃Н₆ etc. of diesel vehicles and also to reduce the fuel consumption. The positive environmental effect from the modification of the diesel fuel by the developed additive was also proved by the calculation of the values of the integral index of atmospheric pollution "IZA;". During the investigation, the spatial mathematical models based on the solution of the turbulent diffusion equation [1, 2] were created on the bases of the study of road conditions of transport corridors in Kyiv. Taking the modeling results into account, the method of forecasting of pollution of roadside urban territories was improved by implementation of the discrete-interpolation approach which allows, in particular, to take into account the geometrical features of roads [3]. This method can be used for the monitoring purposes.

**BIBLIOGRAPHY**


**MODERNIZATION OF GAS CLEANING SYSTEMS OF JSC "GOMEL PLANT OF CASTING AND NORMALS" FOUNDRY**

N. Kononchuk, V. Misiuchenko, T. Belyaeva

Belarusian State University, ISEI BSU,
Minsk, Republic of Belarus

kononchuk2012@bk.ru

The paper analyses the project design of modernization of the foundry gas cleaning systems of JSC "Gomel plant of casting and normals".

*Keywords*: pollutant emission, modernization, gas cleaning equipment.

JSC “Gomel plant of casting and normals” (hereinafter referred to as "GZLiN") functions as an independent plant within Production Association "Gomselmash". The industrial site of JSC "GZLiN" is located in the north-western part of the city of Gomel.

The company undertakes the following principal activities: the production of agricultural machinery and its spare parts; engineering fasteners; foundry, non-standard and stamping equipment; cold heading tools, punches; as well as consumer goods. The foundry produces cast iron, steel and non-ferrous alloys castings for the needs of the plant and third-party customers.

The modernization of the foundry gas cleaning systems includes the replacement of worked out equipment with more efficient one by installing aspiration systems with filter ventilation units (hereinafter referred to as "FVU") such as Herding DELTA FLEX (analogue) instead of existing wet dust collectors, and replacing existing air ducts.
The need for modernization is determined by the fact that the main existing systems of dust cleaning, and, in particular, wet dust collectors, have completely worked out their resources. The efficiency of existing equipment is 92%.

The modernization of the existing gas cleaning equipment is aimed at the reducing technological equipment emissions the on the following indices: particulate matter (dust/aerosol of undifferentiated composition), inorganic dust with \( \text{SiO}_2 < 70\% \) and wood dust at various manufacturing stages of the foundry.

Technological equipment supplying molding materials with the help of HWS line conveyors and a "Multomatic" automatic line for the subsequent production of molds is installed in the ductile cast iron shop at the molding stage. In this sector the source of inorganic dust emissions, with \( \text{SiO}_2 < 70\% \), is a conveyor spillage. In the non-ferrous casting shop, the sources of dust and particulate matter emissions are the following: belt conveyors, electric furnaces, jaw crushers, grinding machines and foundry runners. The sources of inorganic dusts with \( \text{SiO}_2 < 70\% \) in the heat-treating and fettling department are as follows: a grinding machine, an overhead rail conveyor shot blasting machine, and a tumbling barrel.

The principles of operation of newly installed aspiration systems with FVU in these production sectors are the following: dusty air enters the filter inlet, where the distribution and alignment of the air flow occurs. Then the air passes through the filter elements inward. Thus, the dust remains on the surface of the filter cassettes, and the cleaned air enters the clean gas chamber through the fan at the outlet of the unit. The purification efficiency of filter ventilation units of the "HWS" and "Multomatic" lines in the heat-treating and fettling department and in the stripping unit will become 99.9%.

The main sources of wood dust in the wooden models sector of the foundry are machines of various configurations. “Giprodrevprom Ts-1500 cyclone” dust cleaning system with a purification efficiency of 90% will be replaced with more efficient aspiration systems with a recirculating dust collection system and a filter regeneration system. This gas cleaning equipment operation principle is as follows: dust falls into the dust collector and then is transported for processing under the contract. The purification efficiency of such systems is 99.92%.

The calculation of pollutant emissions is presented in Table 1.

<table>
<thead>
<tr>
<th>Substance Description</th>
<th>Substance emission before modernization of gas cleaning equipment t/year</th>
<th>Substance emission after modernization of gas cleaning equipment t/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particulate matter (dust/aerosol of undifferentiated composition)</td>
<td>0.241000</td>
<td>0.162190</td>
</tr>
<tr>
<td>Inorganic dust with ( \text{SiO}_2 &lt; 70% )</td>
<td>13.311</td>
<td>0.595655</td>
</tr>
<tr>
<td>Wood dust</td>
<td>0.258</td>
<td>0.0085182</td>
</tr>
<tr>
<td>Total:</td>
<td>14.068</td>
<td>0.766363</td>
</tr>
</tbody>
</table>

Table 1 shows that the amount of particulate matter entering the atmosphere, the amount of inorganic dust with \( \text{SiO}_2 < 70\% \), and wood dust will decrease by 67.29%, 4.47%, and 3.30% respectively. When new gas cleaning equipment is installed, the total amount of pollutants emitted by technological equipment of the "GZLiN" foundry will decrease by 5.44%.

The suggested figures are substantiated by the calculations that show that after the modernization of the dust cleaning systems the ecological situation in the vicinity of the enterprise will meet the regulatory requirements for the ambient air quality for populated areas. At the same time, the amount of dust entering the ambient air will decrease by 13,302 tones per year, and the air quality of the working area will improve.

**FUNCTIONAL STRUCTURE OF INFORMATION RETRIEVAL SYSTEM “Pollen of woody and shrub plants growing in territory of the Republic of Belarus”**

O. Konopelko, B. Tonkonogov
Belarusian State University, ISEI BSU,
Minsk, Republic of Belarus
olga95_kon@mail.ru, boristonkonogov@iseu.by

Some characteristics and features of functional structure of information retrieval system “Pollen of woody and shrub plants growing in territory of the Republic of Belarus” are considered, that is being created by order of State Institution “Scientific and Practical Center of the State Forensic Examination Committee of the Republic of