

Assessment of the impact of industrial enterprises on the environment and the introduction of new types of equipment for dust and gas cleaning

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Abstract

This article provides time standards and calculation methods for the purpose of studying air pollution from industrial facilities. Calculations of technological equipment and the efficiency of the dust and gas treatment plant. The results of inventory, regulation of emissions of pollutants entering the atmosphere are considered. Questions on the study of equipment for cleaning dust - gas, methods for improving and improving the efficiency of the equipment are highlighted. The methods for determining the composition and quantity of pollutants in the off - gas flows are given: theoretical (balance), computational and analytical (experimental), and reporting and static. The procedure for conducting an inventory of sources of emissions on the territory of the enterprise, the number and composition of emissions of pollutants.

Analyses of harmful substances entering the atmosphere from the production of asphalt concrete, measures to improve the efficiency of dust and gas treatment plants were performed. The process of asphalt mixing and production capacity of the enterprise are studied Samarkand asphalt concrete production.

Keywords: cement, plant, harmful substances, assessment, efficiency, dust and gas cleaning, installation, implementation, environment, inventory.

Introduction

In the leading research centers of the world, special attention is paid to the assessment of harmful substances produced by industrial enterprises in accordance with the projects of maximum permissible standards, rationing, improving the efficiency of dust and gas cleaning equipment. Particular attention is paid to reducing the impact of enterprises on the environment, analyzing the development of assessment levels based on approved regulatory documents, reducing the impact of enterprises on atmospheric air, human health, flora, creating

a two-stage purification system on dust and gas cleaning equipment of enterprises, achieving long-term operation of technologies, increasing efficiency through changes in the process of filters and dust extraction technologies.

Along with the modernization of cleaning equipment in the field of production of building materials, comprehensive measures are being taken in the republic to prevent excess air pollution, to prevent harmful substances from exceeding the maximum permissible standards. The Strategy of Actions for Further Development of the Republic of Uzbekistan

defines the tasks of "... timely implementation of measures aimed at environmental protection, prevention of negative impact on the gene pool and public health." Proceeding from these goals, the issues of introduction of new types of dust and gas cleaning equipment at industrial enterprises, thereby increasing their efficiency, reducing and assessing the impact of enterprises on atmospheric air, human health and flora are of great scientific and practical importance.

According to the 5 priority areas of the Development Action Strategy of the Republic of Uzbekistan for 2017-2021, approved by Decree of the President of the Republic of Uzbekistan No. PF-4947 dated February 7, 2017 No. PF-58, this dissertation will serve to a certain extent to implement these tasks set out in the Resolution "On approval of the concept of environmental protection" and in other relevant legal documents. documents related to this activity.

Modern methods of determining air parameters and aerodynamics of industrial buildings, analysis and quantitative determination of dust and gaseous substances, monitoring of enterprises, as well as methods of experimental and statistical analysis were used in scientific research. In the republic, S.M. Babaev, K.I. Buriev, R. Aymetov, N.K. Zhamankulov, V. Ganiev, O. Kudratov. were engaged in the design of dust and gas cleaning equipment at enterprises, air conditioning of industrial enterprises, and the design of ventilation systems. In this study, the impact of industrial enterprises on the environment, the efficiency of dust and gas cleaning equipment at enterprises were not improved, and the impact of pollutants on the atmosphere, flora and human health was not evaluated by modern methods. The study evaluates the regulation of emissions of pollutants into the atmosphere, the efficiency of dust and gas cleaning equipment, as well as the impact of enterprises on the environment. The dissertation research work is based on the assessment of the environmental impact of enterprises producing construction materials in the Samarkand region.

□ The following methods were used to determine the composition and

amount of pollutants in exhaust gas streams:

- - theoretical (balance);
- - calculation and analytical (experimental); and
- - reporting and static methods.
- The theoretical method allows us to establish the composition

and quantity of pollutants based on the determination of thermal and material balances of technological processes, considering the chemical composition and properties of raw materials, fuel, structural and geometric features of units, technological parameters, processes maximizing the performance of units and data on specific emissions of pollutants of the operated equipment.

□ The Samarkand State Unitary Enterprise for Current Road Use is

located in the village of Farhad in Samarkand. The main activity of this enterprise is the production of asphalt-concrete mixtures and reinforced concrete products. The production capacity of the enterprise reaches 200 thousand tons per year of asphalt-concrete mixture, and the plant produces 10 thousand m³/year of reinforced concrete structures. [2]

Analyses.

Determination of the retention capacity of dust and gas cleaning equipment TSN-11.

The throughput of the dust mixture before the cleaning process is $S=862.4 \text{ mg/m}^3$, velocity $V=12.8 \text{ m/s}$, source height $N=12.4 \text{ m}$, diameter $D=0.5 \text{ m}$. At the same time, the volume of emission of the dust mixture into the atmosphere was:

$$Q= 2.51 \text{ m}^3/\text{s}.$$

The amount of inorganic dust per unit of time before the cleaning process is 2.16 g/s . The annual amount of dust is 39.19 tons/year .

Retention capacity of harvesting equipment:

$$T = 39,1-5,81/39,1*100 = 85,1\% (2)$$

The efficiency of the cleaning equipment was 85,1%.

The result was achieved through the use of a new type of dust-gas cleaning equipment.

The results of the analysis during the operation of the equipment

Tab. 1

Indicators of cyclone TSN-11.		
Analysis time	harmful substances	Selected sample, mg/m ³
During 3 hours of equipment operation	CO	48,7
	NO	82,6
	SiO ₂	140,6
	hydrocarbons	42,5
For 6 hours of equipment operation	CO	48,8
	NO	83,4
	SiO ₂	141,2
	hydrocarbons	42,9
For 9 hours of equipment operation	CO	48,3
	NO	82,4
	SiO ₂	139,4
	hydrocarbons	42,4
Indicators for the use of new equipment		
During 3 hours of equipment operation	CO	2,46
	NO	3,28
	SiO ₂	4,30
	hydrocarbons	2,80
For 6 hours of equipment operation	CO	2,48
	NO	3,36
	SiO ₂	4,40
	hydrocarbons	2,82
For 9 hours of equipment operation	CO	2,26
	NO	3,26
	SiO ₂	3,90
	hydrocarbons	2,78

The throughput of the dust-gas mixture before the purification process is $S=132.8$ mg/m³,

velocity $V=12.6$ m/s, source height $N=11.4$ m, diameter $D=0.45$ m. In this case, the volume of the dust mixture released into the atmosphere is $Q=1.81$ m³/s. The amount of inorganic dust per unit of time before the cleaning process is 0.240 g/s. The annual amount of dust is 4.35 tons/year.

The amount of dust per unit of time at the outlet of the cleaning equipment is 0.0065 g/s.

The annual amount of dust is 0.118 tons/year. Retention capacity of cleaning equipment: $T = 4,35 - 0,118 / 4,35 * 100 = 97,3\%$

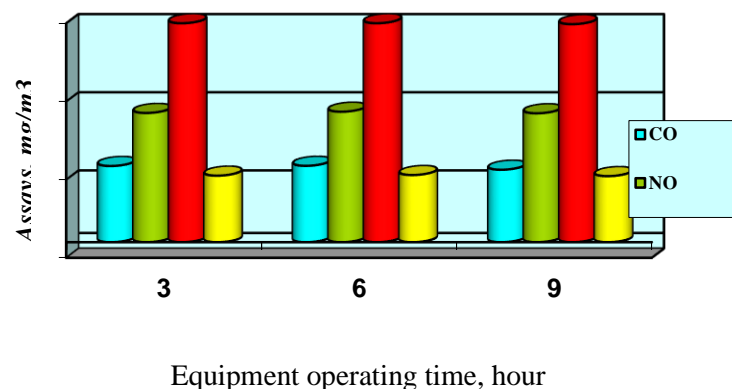


Fig.1. The results of the analysis of cyclone ЦН-11.

The results of the analysis showed that due to the operation of the dust and gas cleaning equipment at full capacity, the emission of harmful substances into the atmosphere will be higher. In addition, due to the widespread use of inert products in the asphalt workshop, the amount of inorganic dust is released more than other harmful substances. Thanks to the installation of the second stage of dust cleaning, it was possible to ensure that emissions of harmful substances into the atmosphere did not exceed the MPC.

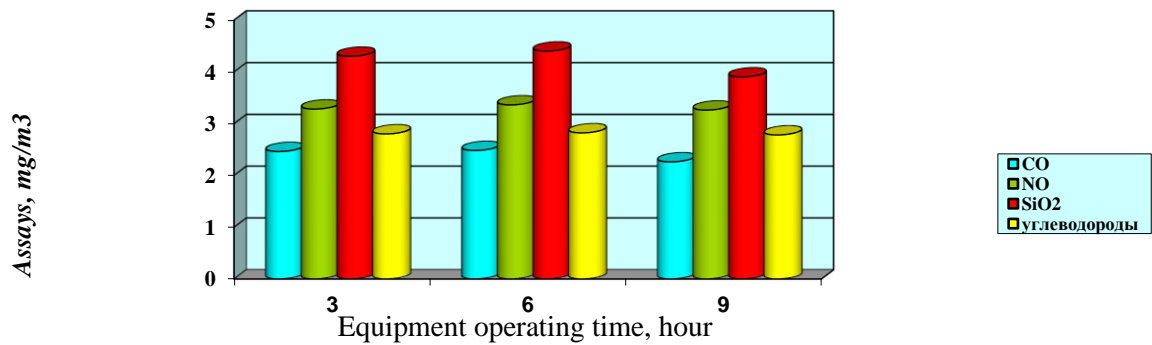


Fig. 2. Results of the analysis of the use of a new type of equipment

The dust is inorganic. (cyclone-TSN 11). The dust is inorganic. ((New equipment)).

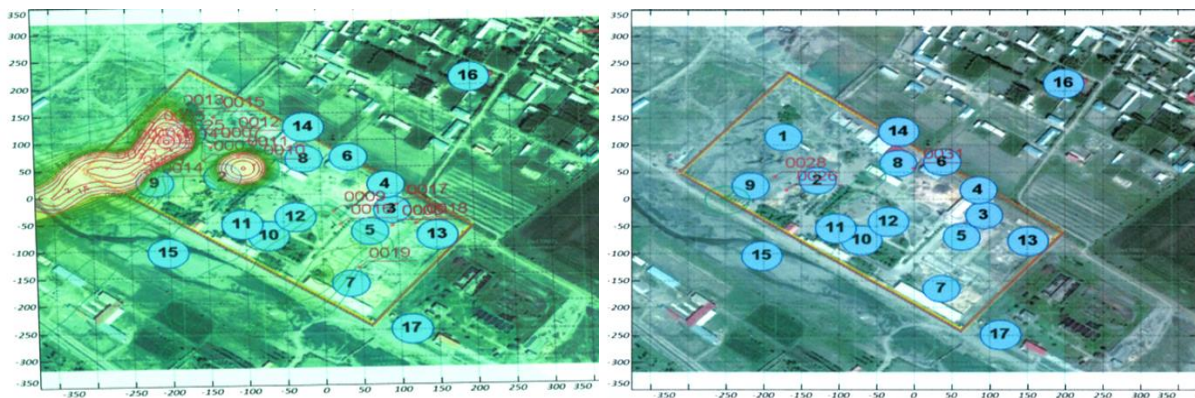


Fig.3. Scheme of dispersion of inorganic dust emission from asphalt concrete plant (distance 50-130 m. Eco-center program).

1-stone processing workshop, 2-asphalt concrete workshop, 3- concrete workshop, 4- cement warehouse, 5-reinforced concrete preparation workshop, 6-boiler room, 7-reinforcement workshop, 8-mechanical workshop, 9-fuel storage rooms, 10- dining room, 11-administration and service building, 12-laboratory, 13-finished goods warehouse, 14-bitumen pool, 15-Akdarya, 16-Halvoyi mahala, 17- highway.

Figure 3 shows the distribution of inorganic dust emitted by an asphalt concrete plant in the Samarkand region with existing equipment and after the installation of dust and gases of a new type. The Eco-Center program has developed maps of the distribution of harmful substances in the atmosphere, such as inorganic dust, nitrogen oxides, carbon monoxide and hydrocarbons, released by the unitary enterprise for the regular use of Samarkand roads selected for scientific research. The inorganic dust emitted by the enterprise was analyzed taking into account the quota of emissions of harmful substances into

the atmosphere from enterprises of the Republic of Uzbekistan and the wind direction.

Results and Discussion

The amount of inorganic dust (0.33mg/m³) calculated at an acceptable quota of 3 depending on the hazard class was 0.42 mg/m³ with a distribution width of 50 m from the organized source and 0.34 mg/m³ at a distance of 130 m. The danger of nitric oxide. class-3 (0.25 mg/m³), 0.27 mg/m³ at a distance of 50 m, 0.23 mg/m³ at a distance of 130 m. The danger of carbon monoxide. class-2 (0.50 mg/m³), 0.43 mg/m³ at a distance of 50 m, 0.38 mg/m³ at a distance of 130 m. Hydrocarbons are dangerous. class-2 (0.50 mg/m³), 0.51 mg/m³ at a distance of 50 m, 0.42 mg / m³ at a distance of 130 m. The analysis of slate and brick production enterprises is given in Table 1.

Table 1. Analysis of the breadth of distribution of harmful substances emitted into the atmosphere during the production of building materials

Industrial enterprise	Harmful substances	Analysis of the Eco-cent program, mg/m ³ , distance 50 m	Analysis of the Eco-cent program, mg/m ³ , distance 130 m	Installation of a new type of equipment distance 50 m	Installation of a new type of equipment distance 130 m
Productions slate	The dust is inorganic.	0,59	0,45	0,32	0,26
	Carbon monoxide	0,38	0,29	0,24	0,18
	Nitric oxide	0,64	0,52	0,38	0,29
Proc. asphalt-concrete	The dust is inorganic.	0,55	0,46	0,33	0,27
	Carbon monoxide	0,36	0,27	0,21	0,15
	Nitric oxide	0,58	0,37	0,29	0,17
	Hydrocarbons	0,36	0,27	0,19	0,12
Proc. bricks	The dust is inorganic.	0,89	0,68	0,54	0,32
	Carbon monoxide	0,46	0,34	0,29	0,21
	Nitric oxide	0,67	0,54	0,39	0,28
	Sulfur dioxide	0,61	0,49	0,37	0,26

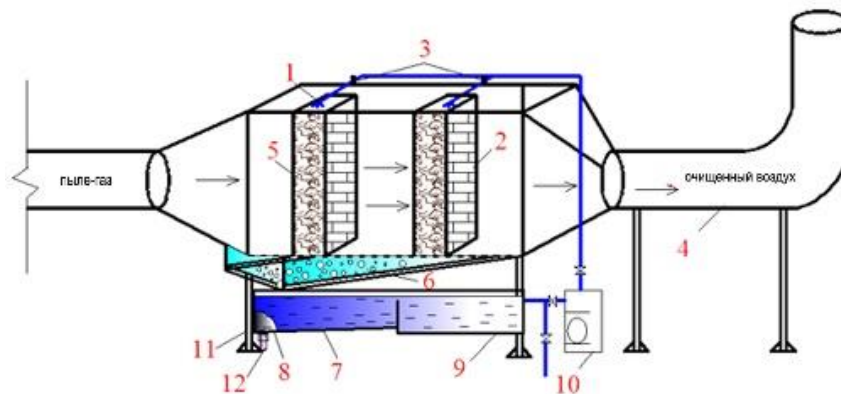


Fig. 4. Dust and gas cleaning plant with filling materials

Tab. 2.

	Using a single cassette		Application of the second cassette	
	Cassette thickness (sm)		Cassette thickness (sm)	
Эффективность	15	20	35	40
	92,9	93,4	95,2	97,8

1. 1)The thickness of the cassette on 15 sm:
 $\eta = (0,09 - 0,0066) / (0,09) * 100 = 92,9$
 (93 %)
 (1)
2. 1)The thickness of the cassette on 20 sm:
 $\eta = (0,09 - 0,0059) / (0,09) * 100 = 93,4$
 (93,5 %)

3. 1)The thickness of the cassette on 35 sm:
 $\eta = (0,09 - 0,0044) / (0,09) * 100 = 95,2$
 (95 %)
4. 1)The thickness of the cassette on 40 sm:
 $\eta = (0,09 - 0,002) / (0,09) * 100 = 97,8$
 (98 %)



Fig.4. The efficiency of the installation depending on the thickness of the layers.

The efficiency of the dust and gas cleaning equipment is 98%. The principle of operation of the equipment. Samples were taken by laboratory analysis. Samarkand Regional Unitary Enterprise for the operation of highways. Analysis of harmful substances released by enterprises-manufacturers of building materials, depending on the working hours of the existing PSOs at enterprises.

Conclusion

The results of the analysis showed that due to the operation of the GHG at full capacity, the emission of harmful substances into the atmosphere will be higher. In addition, due to the widespread use of inert products in the asphalt workshop, the amount of inorganic dust is released more than other harmful substances. Thanks to the installation of the second stage of dust cleaning, it was possible to ensure that emissions of harmful substances into the atmosphere did not exceed the MPC. Thanks to the installation of new gas cleaning equipment, it was possible to ensure that emissions of harmful substances into the atmosphere did not exceed the maximum permissible concentration.

The impact on atmospheric air during the operation of the enterprise will be determined by the introduction of pollutants, such as: clinker dust, cement dust, limestone dust, gypsum dust,

clay dust, iron dust, nitrogen dioxide, sulfur dioxide, carbon monoxide, nitrogen oxide, iron oxide, manganese dioxide, metal dust, diesel fuel hydrocarbons, oil mineral.

The sources of environmental impact during the operation of the enterprise will be:

- processes of reference, storage, drying and grinding of raw materials;
- processes of firing, storage and grinding of clinker;
- processes of storage, grinding and upsetting of cement;
- cooking processes;
- processes of operation of the RMC equipment;
- processes of receiving, storing and distributing diesel fuel and oil.

The impact on the environment during the production activity of the enterprise will occur for 355 days a year.

The results of the level of atmospheric pollution and the list of pollutants released from the production area are presented in the table environmental characteristics of pollutants selected from hygienic standards.

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