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Environmental Protection against Harmful Emissions of Industrial Enterprises

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ABSTRACT: The article discusses atmospheric pollution by industrial production of harmful chemicals, its sources, monitoring of these emissions and its significance. Comparative analyzes of air pollution in 2017 and 2018 of industrial enterprises of the city of Navoi.

KEY WORDS: atmospheric air, emissions, local pollution, sources of pollution, measurement, reagents, maximum permissible concentrations, maximum permissible emissions, monitoring.

I.INTRODUCTION

Everyone knows that in all industrial zones, air pollution is much greater than in other zones. Metallurgical, chemical, cement manufacturing enterprises emit a huge amount of ash, sulfur dioxide and other harmful gases into the atmosphere [1,3].

Emissions of smoke, dust, vapors and sulfur oxides in this area are relatively small for such a developed industrial and municipal activities. This is mainly due to strict control over the implementation of the rules for combating air pollution established in this district. According to these rules, the emission of dust into the atmosphere from any production process should not exceed 18 kg per hour. To fulfill these requirements at all enterprises, the operation of which may be accompanied by the emission of fly ash, metal or mineral dust, chemical fumes and mists, highly efficient dust collection equipment must be installed. It is also forbidden to emit smoke, the density of which on the Ringelman scale is №2 and higher, as well as the emission of gases from pipes with a concentration of sulfur dioxide exceeding 0.2% by volume [2,4].

Large industrial air emissions are an accurate indicator of technology imperfections. The most radical means of eliminating emissions is to change the production technology, to create processes that either do not produce waste at all, or work in a so-called closed cycle, in which all generated waste is completely recycled or used at subsequent stages of production. We can completely agree with the opinion of Academician I.V.Petryanov-Sokolov that the root of the problem of environmental pollution, including atmospheric air, lies in technology, its imperfection. Based on the achievements of science and technology, it is considered possible to create in each industry such industries that can operate without waste and emissions [5,6].

Protection of the atmosphere from harmful emissions and emissions is reduced to ensuring concentrations of harmful substances in the air of the working area and the surface layer of the atmosphere equal to or less Maximum Permissible Concentration (MPC).

This is achieved by applying the following methods and tools:

- rational allocation of sources of harmful emissions in relation to populated areas and jobs;
- dispersion of harmful substances in the atmosphere to reduce concentrations in its surface layer, removing harmful emissions from the source of formation through local or general exhaust ventilation;
- the use of air purification from harmful substances;
- use of Personal Protective Equipment(PPE).

Rational location provides for the maximum possible removal of industrial facilities-air pollutants from populated areas, the creation of sanitary protection zones around them; taking into account the topography and the prevailing wind direction when placing pollution sources and residential areas in relation to each other. In particular, the industrial enterprise must be located in relation to the housing estate, taking into account the direction of the wind and the location of the enterprises in elevated, well-blown places. The main parameters of air (gas) treatment systems are efficiency and hydraulic resistance. Efficiency determines the concentration of harmful impurities at the outlet of the apparatus, and hydraulic resistance determines the energy consumption for passing purified gases through the apparatus. The higher the efficiency and the lower the hydraulic resistance, the better.

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The nomenclature of the existing gas-cleaning apparatus is significant, and their technical capabilities make it possible to provide high degrees of purification of exhaust gases for almost all substances.

To clean the exhaust gases from dust, there is a wide selection of devices that can be divided into two large groups: dry and wet (scrubbers), irrigated with water. Let us consider only a few of them that are most widely used in the dust collection technique. Dry dust collectors. Widespread cyclones of various types:

- single;
- group;
- battery.

There are many different types of cyclones, but the most common are cyclones of types TsN and SK - TsN (SK - soot conical), with which you can solve most dust collection tasks. A nomenclature of standard cyclones with a diameter of a cylindrical part from 200 to 3000 mm has been developed. All sizes required for the manufacture of a cyclone are presented in cyclones with a diameter of more than 1 m; It is better to use group cyclones in which several single cyclones (usually 4 or 6) are grouped into one unit, usually with a single dust bin and an output chamber. To clean large volumes of gas with high efficiency, battery cyclones are used, in which a large number of cyclone elements are located in a common housing. Cyclones can be used at inlet dust concentrations up to 400 g/m^3, and at gas temperatures up to 500°C. However, there are problems in capturing sticky and explosive dusts.

In the dust collection technique, filters are widely used that provide high efficiency for collecting large and small particles. The cleaning process consists in passing the gas to be purified through a porous septum or layer of porous material. The septum works like a sieve, without passing particles with a size larger than the pore diameter. Smaller particles penetrate into the septum and are delayed there due to inertial, electrical and diffusion capture mechanisms, some are simply wedged in curved and branched pore channels. According to the type of filter material, filters are divided into fabric, fibrous and granular. For fabric filters, the filter septum can be cotton, woolen, lavsan, nylon, glass, metal, etc. with a regular structure of weaving (twill, linen, etc.).

The main filtering mechanism of such filters is a sieve, in which it filters not only and not so much the filter cloth as the dust layer formed on its surface. Such filters can be regenerated by dropping a layer of dust from the surface of the fabric. The most common in the technology of cleaning industrial emissions found fabric bag filters. Gas is purified by passing through the fabric of each sleeve. During the filtering process, a layer of dust accumulates on the fabric, which is densified. The filter bags are regenerated by shaking and blowing back.

Fiber filters are a layer of thin and ultra-thin fibers with an irregular, chaotic structure (for example, felt). Dust particles pass inside the layer and linger there, i.e., the filtering mechanism is volumetric. Such filters are poorly regenerated.

Granular filters are free fillings of grains (granules), for example quartz sand, of various sizes or septa of grains connected (sintered) to each other through which the cleaned air is passed. Granular filters are less commonly used in exhaust gas cleaning techniques than fabric and fiber filters.

To clean large volumes of gas, electrostatic precipitators are used with high efficiency. They found the greatest application in metallurgy and the power system using coal fuel. The essence of the operation of the electrostatic precipitator is as follows. At high voltages, a corona discharge arises at the corona electrode and air ionization begins - negative and positive ions are formed. Purified gas is passed through the space between the electrodes, ions are adsorbed on the surface of dust particles, charging them. Negatively charged particles.

Chemisorption is used to capture gas impurities insoluble or poorly soluble in water. The method of chemisorption is that the gas to be cleaned is irrigated with solutions of reagents that enter into a chemical reaction with harmful impurities with the formation of non-toxic, low-volatile or insoluble chemical compounds.

Adsorption consists in trapping the surface of a microporous adsorbent (activated carbon, silica gel, zeolites) of molecules of harmful substances. The method has a very high efficiency, but stringent requirements for gas dust - not more than 2...5 mg $/m^3$. One of the best adsorbents is activated carbon, in which 1g contains up to 1600 m^2 of surfaces. Adsorption is widely used to trap solvent vapors, unpleasant smelling substances, organic compounds and many other gases. The adsorption capacity of the adsorbent is higher, the lower its temperature and significantly decreases with its increase. This is used in the operation of adsorbers and in their regeneration.

Thermal afterburning is the process of oxidizing harmful substances with atmospheric oxygen at high temperatures (900 ... 1200°C).

By means of thermal afterburning, toxic carbon monoxide CO is oxidized to non-toxic carbon dioxide CO_2, and hydrocarbons C_nH_m to carbon dioxide and water. The process of thermal oxidation at low temperature of the exhaust gases is energy-intensive, since it requires the use of additional fuel to heat the gases to high temperatures.

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Thermal afterburning is used to clean waste effluents from organic substances, for example, solvent vapors and paints in paint and varnish production, and to clean emissions from test stations of engines operating on organic fuels.

Catalytic neutralization is achieved by the use of catalysts - materials that enhance the reaction or make them possible at significantly lower temperatures (250...400°C). Thermocatalytic reactors are widely used for purification of exhaust gases from paint shops, drying chambers, etc. Catalytic converters are used for purification of exhaust gases.

With strong and multicomponent pollution of the exhaust gases, complex multistage purification systems are used, consisting of series-installed apparatuses of various types.

The main sources of atmospheric pollution are thermal power plants (29% of pollution) of ferrous and non-ferrous metallurgy enterprises (24 and 10.5%, respectively), petrochemical industry (15.5%), building materials (8.1%), and chemical nosti (1.3%), vehicles (13.3%). In large cities, the share of automobile pollutant emissions reaches 60–80% [7].

Carbon dioxide is a relatively low-toxic gas. Therefore, there are currently no special methods for cleaning carbon dioxide emissions. But in industry, a number of process gases (primarily ethylene) are purged of it, intended for further processing and where carbon dioxide is an undesirable impurity [5].

The third group includes industrial plants that have significant emissions of gases or aspiration air containing non-toxic or inert substances.

Thus, the emission of acidic components into the atmosphere is primarily due to the combustion processes that are characteristic of the oil refining and petrochemical industries. All high-temperature processes (thermal and catalytic cracking, pyrolysis) are associated with the combustion of gaseous or liquid fuels in tube furnaces.

Impurities in the atmosphere of anthropogenic origin include emissions from industrial enterprises, vehicles, agricultural enterprises, products of fuel combustion and waste incineration. These impurities are characterized by a large concentration in space, heterogeneity in composition, uneven distribution. Emissions are observed in densely populated areas, they contain many substances that adversely affect human health, materials, flora and fauna.

The second group, gaseous and vaporous impurities, is more numerous. This includes, for example, acids, halogens and halide derivatives, gaseous oxides, aldehydes, ketones, alcohols, hydrocarbons, amines, pyridines, mercaptans, metal vapors and many other components of gaseous industrial wastes. The need to eliminate gaseous industrial emissions or at least deep clean them is dictated not only by harmfulness to people, plants and wildlife. Industrial emissions into the atmosphere lead to significant economic losses, since large quantities of valuable products — organic solvents, metals, sulfur dioxide, etc. — are irretrievably lost. In addition, the presence of chemicals in the air causes premature corrosion of metals in industrial areas, 3-4 times rust faster than in rural areas. For example, the Navoi region is one of the industrially developed regions of the republic. In the region there are divisions of NMMC, as well as JSC Navoiazot, JSC Kyzylkumcement, Navoi TPP, etc. These data can be compared according to the values in the table and diagram.[8]

Nameenterprises	The amount of harmful emissions into the atmosphere, t/year		Compared to 2017, decrease (-), increase (+), in tons
	2017 year	2018 year	
NMMC	22553,760	17962,520	-4591,24
JSC Navoiazot	5963,590	6629,254	665,66
Navoi TPP	3064,319	3180,463	116,14
JSC Kyzylkumcement	9439,000	9544,700	105,70

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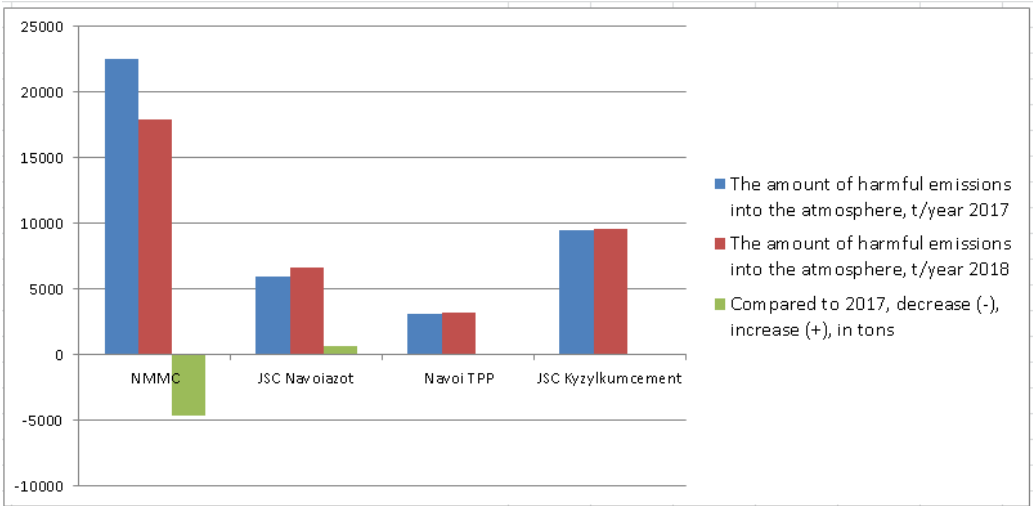

In 2018, NMMC enterprises located in the Navoi region emitted 4591.24 tons less than the year before due to the implementation of air protection measures.

In 2018, at Navoiazot JSC, the emission of harmful substances into the atmosphere amounted to 6629.254 tons, which is 665.66 tons more than in 2017, which is explained by an increase in the output of certain types of products, as well as due to malfunctions in the energy and gas supply system for external reasons and emergency shutdowns of production.

In 2018, at NTPP, the emission of harmful substances into the atmosphere amounted to 3180.463 tons, which is 116.14 tons more compared to the previous years, as a result of an increase in the generated electric energy and, accordingly, fuel consumption (natural gas) by 3.33%.

In 2018, at Kyzylkumcement JSC, the emission of harmful substances into the atmosphere amounted to 9544.7 tons. Compared to 2017, emissions increased by 105.7 tons, while increasing the hours of operation of technological equipment and, in general, increasing the number of manufactured products.[8]

Air emissions arising from the violation of technological regimes and the imperfection of the production of organic products consist of saturated and unsaturated hydrocarbons. Additional sources of pollution include defects in industrial equipment. The following briefly describes the production of the most important organic products [OP], as well as evaluates the effectiveness of environmental protection.

The main sources of atmospheric air pollution are emissions generated by the combustion of fuel at industrial and energy facilities (TPPs, etc.) and in automobile engines. The development of energy, industry and transport is accompanied by an increase in the emission of harmful substances into the atmosphere - sulfur dioxide, carbon oxides and nitrogen, hydrocarbons. It is estimated that for the period 1975-1980. the amount of gas emissions into the atmosphere increased by 30%, and accordingly the economic damage from air pollution increased annually, amounting to tens of billions of soums.

Precipitation is used in agriculture as fertilizer, soil remediation, as well as livestock feed in road construction, as aggregates and binders in the chemical industry for the production of technical fats, lubricants, household products and vitamins. If the disposal of precipitation is impossible or impractical, they are disposed of or burnt. As a result of combustion, mineral compounds are obtained, which are to be disposed of, and gases that need to be cleaned before being released into the atmosphere.

The use of sulfuric acid in industry is complicated by corrosion of equipment, high consumption of reagents and neutralizing substances, the formation of sulfoesters, as well as a large amount of wastewater and harmful emissions into the atmosphere, sophisticated technology, etc.

Modern technological processes of the chemical industry are accompanied by emissions of significant quantities of industrial waste polluting the air and water into the atmosphere and water bodies.

Increasing the reliability of equipment, searching for the best ways to prevent gas emissions, creating devices that signal these emissions, eliminating or reducing emissions into the atmosphere or ponds, developing devices and devices that facilitate heavy manual work, remote control of processes, designing fences, reducing noise - this is far from A complete list of areas in which innovators of the chemical industry should work tirelessly. It is not enough to make such proposals; it is necessary to seek their implementation and distribution to other sections of the enterprise. It is necessary that all workers actively participate in the discussion of nomenclature plans.

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Environmental authorities in many parts of the world have set such emission limits that it is no longer possible to operate plants below the standard level. Part of this problem arises due to the fact that chemical reactions in the process are only equilibrium and do not complete completely. A deviation in the proportions of air and hydrogen sulfide from the nominal values violates the balance between hydrogen sulfide and sulfur dioxide, which is why one of these gases in excess passes through the unit unchanged. In any case, this leads to an increase in emissions, since the exhaust gas is always burned to decompose

High rates of industrial development lead to a constant increase in harmful gas emissions into the atmosphere. The main sources of atmospheric pollution by toxic substances are thermal power plants, oil, chemical and metallurgical enterprises. The most common environmental pollutants include carbon monoxide, sulfur dioxide, nitrogen oxides, organosulfur and aromatic compounds, hydrocarbons, which pose a danger to the population, animals and vegetation of the surrounding areas.

The dustiness of the atmosphere in cities is 10 times higher than in rural areas. The content of harmful gaseous substances in urban air is 5–35 times, and for some substances — hundreds of times higher than in rural areas. The concentration of lead in the air of large cities reaches 30–35 mg / m of pyrene in places of heavy vehicle traffic and can exceed 10 mg / 100 m. The main harmful industrial emissions into the Earth's atmosphere are (million tons per year) carbon monoxide - up to 400, sulfur oxides —To 190-200, nitrogen oxides - up to 90, products of incomplete combustion of organic fuels - up to 120, solid particles - up to 120-130.

Environmental problems of protecting water and air basins of industrial regions from the negative impact of industrial emissions are currently a national task. In the oil refining industry, the main units with the highest emissions in the atmosphere, gas and effluents are vacuum-creating atmospheric vacuum tube systems (VTS) and vacuum tube (VT). The improvement of the vacuum blocks of the primary oil refining units is aimed at further deepening the vacuum during distillation of heavy residues and reducing both effluents and atmospheric emissions. The solution to this problem is facilitated by the development of new schemes for fractioning heavy residues, methods for creating vacuum, as well as improving and modernizing the equipment of existing vacuum blocks - vacuum furnaces (parts), transfer pipelines, vacuum columns and contact devices, preliminary and interstage condensers, and vacuum-creating systems themselves .

Gross emissions into the atmosphere are distributed by industry as follows: oil production - 2137, oil processing - 1389, gas - 1036, coal - 288 thousand tons / year. Such emissions are due to the low efficiency of gas and dust recovery plants or their absence.

The chemical industry is in fourth place among the industries that pollute the environment the most (after fuel energy, metallurgy and road transport). Pollution occurs due to the release into the atmosphere and water bodies of industrial waste containing harmful substances. The most dangerous substances entering the atmosphere with gas emissions are oxides of carbon, sulfur, nitrogen, hydrogen sulfide, hydrocarbons, etc. Water bodies are polluted by industrial wastewater.

The sanitary sector includes an explanatory note and a graphic part on heating and ventilation, water supply and sewage. The sector reflects the required amount of heat and electricity for heating, the ventilation system, air conditioning and hot water supply, the choice of the heating system (air, water, steam), heating devices and coolants, the principle of ventilation used in industrial premises and rational air exchange schemes indicating the sources of active gas emissions (quantity of harmful substances) and heat and methods for localizing harmful substances with cleaning before air emission into the atmosphere, the proportion of aeration, the choice of a erational devices taking into account the heat intensity of the premises and their remote control; explication of equipment and aeration devices; water supply sources; required water consumption; structures; water supply systems and schemes; education sources; amount, composition of pollution and discharge regime of industrial, household-fecal and storm sewage structures, systems and sewerage schemes, methods for purification and neutralization of wastewater, place of release into the reservoir explication of equipment.

When developing measures to prevent and reduce air pollution from industrial emissions, it is necessary to take into account the interaction of all types of emissions (technological and ventilation, high and low, organized and unorganized, etc.). It is necessary to take into account the pollution background created by neighboring enterprises, as well as the prospect of developing an enterprise or industrial unit and increasing their capacity. Therefore, it is necessary to consider and evaluate the relevant data on the absolute mass of industrial emissions into the atmosphere, on various sources of pollution and their concentrations, or to take emission samples directly at the enterprises for analysis.

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Thus, the availability of continuous information on the state of the environment in large cities makes it possible to quickly take the necessary measures to eliminate excessive pollution by reducing emissions from industrial enterprises.

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