AMERICAN JOURNALS
Open Access, Peer Reviewed Journals

American Journal of Technology and Applied Sciences
ISSN (E): 2832-1766 Volume 29, October - 2024

PROBLEMS OF INDUSTRIAL EMISSIONS OF HARMFUL GASES

Turgunov Abdulxashim Axmadaliyevich
Tashkent State Technical University
named after Islam Karimov. Doctoral Student (DSc), Ph.D.
E-mail: turgunov66@inbox.ru

Rakhmatullaev Fayzulla Nigmatullaevich
Tashkent State Technical University
named after Islam Karimov, PhD, Associate Professor
E-mail: f.rakhmatullaev7@mail.ru

ABSTRACT

In this research work, the state of atmospheric air was studied, it was noted that air pollution by industrial enterprises is one of the significant problems in the field of environmental protection today.

It has been studied and noted that reducing the emission of pollutants into the atmosphere from sources of industrial enterprises is possible using the latest technical solutions in the field of non-waste technologies; this in turn is associated with high costs and complete re-equipment of certain industries. An alternative solution to the problem of atmospheric air pollution by industrial emissions of harmful gases is the effective and scientifically based use of dust and gas purification devices (DGCD).

It is noted that the qualitative characteristics of emissions of pollutants into the atmospheric air are divided into two groups. The main types of pollutants formed by greenhouse gases are given. Classifications of sources of emissions from industrial enterprises are given.

It has been revealed that waste gases from stationary sources of industrial enterprises make a huge contribution to environmental pollution, in particular air pollution, contribute to the formation of unfavorable living conditions for living organisms in the zone of formation and dispersion, have a negative effect on the human body, and play a huge role in the formation of the greenhouse effect, which leads to global warming.

In this regard, reducing, and in some cases preventing the formation and dispersion of pollutants in the atmospheric air is an urgent and in demand task today.

KEYWORDS

Emissions, emissions, emission sources, pollutants, greenhouse gases, climate change, waste gases.

Introduction

In modern conditions of development, when the natural environment of the whole world is under the influence of man-made activities of society, environmental factors are of great importance, without which any design solutions for reconstruction or construction of new industrial complexes may turn out to be untenable and lead to certain costs, both in demographic, social and environmental aspects.

Based on the fifth direction of the strategy of action for the further development of the Republic of Uzbekistan to stimulate "the prevention of environmental problems that damage the environment, health and gene pool of the population" [1], it is planned to implement a number of promising projects for the consistent implementation of reforms in the field of atmospheric air protection, including the reduction of emissions of pollutants from stationary sources, with the adoption of comprehensive measures to reduce greenhouse gases, as well as the introduction of modern innovative systems.

An existing problem. Along with this, air pollution by industrial enterprises is currently one of the significant problems in the field of environmental protection. This phenomenon contributes to the formation of greenhouse gases, climate change, disruption of environmental stability, irreversible destruction of ecosystems formed over centuries, a huge negative impact on the animal and plant worlds and, finally, deterioration of the health of entire generations of humanity.

Research results. In gaseous industrial emissions, harmful impurities can be divided into two groups:
a) suspended particles (aerosols) of solid substances - dust, smoke; liquids - mist
b) gaseous and vaporous substances.
Aerosols include suspended solid particles of inorganic and organic origin, as well as suspended particles of liquid (mist).
Dust is a dispersed low-stable system containing more large particles than fumes and fogs. Inorganic dust in industrial gas emissions is generated during mining, processing of ores, metals, mineral salts and fertilizers, building materials, carbides and other inorganic substances. Coal, wood, peat, shale, soot, etc. industrial dust of organic origin.
Fumes include aerodisperse systems with a low rate of deposition under the influence of gravity. Particle sizes in fumes are much smaller than in dust and mists, ranging from 5 μm to submicron sizes, i.eMists consist of droplets of liquid formed during the condensation of vapors or the atomization of liquid. In industrial exhausts, fogs are formed mainly from acids: sulfuric, phosphoric, etc.
The gaseous and vaporous substances contained in industrial gas exhausts are much more numerous. It includes acids, halogens and halogen derivatives, gaseous oxides, aldehydes, ketones, alcohols, hydrocarbons, amines, nitro compounds, metal vapors, pyridines, mercaptans and many other components of gaseous industrial wastes To date, researchers in the field of environmental protection have to a certain extent identified pollutants that form the greenhouse effect, which are called greenhouse gases [2]. These gases are formed both in the natural environment and from human activities - in industry. Anthropogenic impact on the environment in As a result, pollutants are formed and emitted into the atmosphere Greenhouse gases are of great interest among scientists working in the field of ecology and environmental protection. The main components of greenhouse gases are identified, which are shown in Table 2.

Table 2 Greenhouse gases

Code	Substance name	Formula	Potential global warming coefficient
0380	Carbon dioxide	CO_2	1.0
0381	Nitrous oxide	N_2O	320
0369	Sulfur hexafluoride	SF_6	23900
0410	Methane		24.5
0013	Hydrofluorocarbons (HFCs)		
0966	HFC-23 Trifluoromethane (Freon -23)	CHF_3	11700
0957	HFC-32 Difluoromethane (Freon) -32)	CH_2F_2	650
0971	HFC-41	CH_3F	150
0972	HFC-43-10mee	$C_5H_2FH_{10}$	1300
0967	HFC- Pentafluoroethane (Freon -125)	C_2HF_5	2800
0974	HFC-134	$C_2H_2F_4(CHF_2CHF_2)$	1000
0938	HFC-134a 1.1.1,2- Tetrafluoroethane (Freon 134-a)	$C_2H_2F_4(CH_2FCF_3)$	1300
0850	HFC-152a 1,1 Difluoroethane (Freon-152)	$C_2H_4F_2(CH_3CHF_2)$	140
0977	HFC-143	$C_2H_3F_3$ (CHF_2CH_2F)	300
0978	HFC-143a	$C_2H_3F_3(CF_3CH_3)$	3800
0989	HFC-227ea 1,1,1,2,3,3,3-Heptafluoropropane (freon 227ea)	C_3HF_7	2900
0980	HFC-236fa	$C_3H_2F_6$	6300
0981	HFC-245ca	$C_3H_3F_5$	560
0014	Perfluorocarbons (PFCs)		
0965	Perfluoromethane Tetrafluoromethane (freon-14)	CF_4	6500
0963	Perfluoroethane Hexafluoroethane (freon-116)	C_2F_6	9200
0964	Perfluoropropane Octafluoropropane (Freon -218)	C_3F_8	7000
0991	Perfluorobutane Decafluorobutane (Perfluorobutane; freon31-10)	C_4F_{10}	7000
0986	Perfluorocyclobutane	$c\text{-}C_4F_8$	8700
0987	Perfluoropentane	C_5F_{12}	7500
0988	Perfluorohexane	C_6F_{14}	7400

Global warming potential (GWP) (potential global warming factor) is a measurement of the ability of a gas in the atmosphere to trap heat emitted from the earth's surface compared to the reference gas, which is usually considered carbon dioxide. The lifetime of gases in the atmosphere is characterized by large differences, so the results obtained are integrated over different time intervals. Usually a time horizon of 100 years is chosen [2].

Flue gases emitted by industrial enterprises contain products of incomplete combustion of fuel, and ash particles are also in the flue gases. Process emissions contain dust, solvent vapors, alkalis, vinegar, hydrogen, as well as excess heat

Many technological installations of industrial enterprises are sources of unpleasant odors that irritate people, even if the concentration of the corresponding substance in the air does not exceed the

maximum permissible concentrations (MPC). Sources of air pollution can be classified according to the following characteristics

1. By purpose: technological and ventilation. Depending on the height (H) of the mouth of the sources of emission of harmful substances above the ground level. The specified sources belong to one of four classes:

1) high (H ≥ 50 m);
2) medium height (H=10-50 m);
3) low (H = 2-10 m);
4) ground (H < 2 m).

Emissions from high sources enter the area of undeformed flow and are dispersed by the wind. Emissions from low sources enter the aerodynamic shadow zone, the position of which is determined by the proximity of the ground and the influence of buildings on the air flow. The spread of harmful substances in this zone occurs under the influence of turbulent circulation. Air exchange in this area with the area of undeformed flow is limited.

2. By geometric parameters: point (pipes, shafts, etc.) and linear (aeration lanterns, closely located shafts, transport, etc.).

3. By mode of action: continuous action and salvo. Depending on the temperature difference between emissions and the environment, sources are divided into heated and cold.

4. By the nature of the organization of emissions: organized and unorganized [3].

Ways to solve problems

Scientific research in the field of atmospheric air protection is aimed at the development and implementation of modern methods of purification of industrial emissions, as well as technological processes, the implementation of which excludes or sharply reduces harmful emissions into the atmosphere.

Reducing the emission of pollutants into the atmosphere from the sources of industrial enterprises is possible with the use of the latest technical solutions in the field of waste-free technologies, this, in turn, is associated with high costs and complete re-equipment of certain industries. An alternative solution to the problem of atmospheric air pollution by industrial emission of harmful gases is the effective and scientifically based use of dust and gas cleaning devices (DGCD)

At stationary sources of industrial enterprises, various types of DGCD are used for the treatment of waste gases, both in terms of treatment method and design [4].

According to the method of purification, DGCD are classified as follows:

1. Group C - devices for dry mechanical purification of gas from dust, solid particles, the principle of operation of which is based on the deposition of particles due to gravity, centrifugal force, change in the gas flow velocity;
2. Group M - devices for wet cleaning of gas from solid particles, as well as liquid and gaseous pollutants;
3. Group F - devices and devices of the filtering type;
4. Group E - electric filters;
5. Group X - devices for sorption (chemical, biological) gas purification from gaseous pollutants;

6. Group T - devices for thermal, thermocatalytic and catalytic methods of neutralization of gaseous pollutants;
7. Group D - devices for other methods of gas purification.

In industry, various configurations of these DGCDs are used. Along with single devices, battery and combined devices are also operated.

Dry and wet methods of exhaust gas cleaning are used to capture dust and neutralize fogs. In addition, the equipment for the treatment of harmful emissions differs from each other, both in design and in the principle of deposition of suspended particles.

В основе работы оборудования сухого осаждения взвешенных частиц, лежат The operation of dry sedimentation equipment is based on gravity, inertial and centrifugal sedimentation mechanisms or filtration mechanisms.

In wet dust collectors, dust gases come into contact with liquid. In this case, deposition occurs on droplets, on the surface of gas bubbles or on a liquid film.

At present, a large number of different methods for cleaning gases from technical pollutants have been developed and tested in industry: NO_x, SO_2, H_2S, NH_3, carbon monoxide, various organic and inorganic suspended solids.

The main disadvantages of many units are low productivity, difficulties in manufacturing, excessive metal capacity, high hydraulic resistance, etc.

The operation of DGCD, in particular scrubbers, is associated with certain requirements for the quality of pollutant capture and productivity.

In connection with the above, in order to solve environmental problems on the rational use of water resources, it is proposed to use a horizontal rotary scrubber, which is being developed at the Department of Ecology and Environmental Protection of the Tashkent State Technical University.

The proposed horizontal rotary scrubber is distinguished by the fact that it is equipped with spatula strips, which are installed perpendicular to the axis and rotated at an angle of 45°C relative to the plane of rotation. This arrangement of the spatula bar allows for efficient and targeted spraying of the liquid inside the scrubber, which in turn creates favorable conditions for more contact with contaminant particles. The greatest contact between liquid and contaminant particles contributes to an increase in wettability, adhesion, thereby increasing the size and weight of pollutant particles. The increase in size and weight contributes to the fastest deposition of contaminant particles and their transport to the storage hopper.

- main features of a rotary scrubber:
- • low pressure drops with high separation efficiency
- • gas separation and dust absorption in one step
- • no clogging;
- • recirculating detergent with a high solids content;
- • low consumption of fresh water;
- • compact design;
- • high efficiency.

The use of the most advanced and optimal scrubbers for certain technological processes contributes to the most rational use of natural resources, the improvement of the environmental situation in the area where the emission source is located, the preservation of biodiversity, the improvement of

environmental well-being and the creation of favorable conditions for human life.

Conclusions

Based on the above, it follows that waste gases at stationary sources of industrial enterprises make a huge contribution to environmental pollution, in particular, atmospheric air pollution, contribute to the formation of unfavorable living conditions for living organisms in the zone of formation and dispersion, have a negative impact on the human body, play a huge role in the formation of the greenhouse effect, which leads to global warming.

In this regard, the reduction, and in some cases the prevention of the formation and dispersion of pollutants in the atmospheric air is an urgent and demanded task today

References

1. Указ Президента Республики Узбекистан № УП 4947 от 7 февраля 2017 года «О стратегии действий по приоритетным направлениям развития Республики Узбекистан».
2. Бюллетень МАГАТЭ, том 42, № 2, 2000 г, Вена, Австрия.
3. Кальверта С., Инглунда Г.М. Защита атмосферы от промышленных загрязнений. ч. 2, М., Металлургия, 2005. 712 с.
4. Постановление Министерства природных ресурсов и охраны окружающей среды Республики Беларусь от 14.05.2007 N 60 "Об утверждении Правил эксплуатации газоочистных установок».