ISSN: 2836-3655
DOI: 10.33552/AHM.2024.02.000527
Advances in Hydrology & Meteorology
Iris Publishers

Research Article

Evaluation of the Environmental Impact of the Ultramarine Pigment Production Facility in the Industrial Area of Jizzakh City, Uzbekistan

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Received Date: July 18, 2024

Published Date: August 06, 2024

Abstract

Examining the process of environmental effect and the degree of pollution in the environment is one of the most crucial directions. The creation of the "Environmental Impact Statement" project has been extensively used in the analysis and assessment of the project's environmental effect. The creation of such records is crucial for both avoiding and assessing the level of pollution in the area. The working principles of the construction industry enterprises, ecological condition and its impact on the environment are extensively analyzed in this article. Furthermore examined in the evaluation of the project's atmospheric effects were the project's role in creating the local pollution background, the nature of the impact, and the significance of anticipating changes in the environmental components due to the project's location and pollution level.

Keywords: Efficiency; Production enterprises; Impact statement; Discharge; Source; Atmospheric air

Introduction

The goal of normalizing pollutant emissions is to ensure compliance with the ambient air quality criteria for public health and the primary ecological system constituents, which regulate the permissible limited amount of pollutants in them, as well as the conditions for ensuring the permissible limited (highest) load of the load on the ecological system outside the organization's boundaries or its sanitary protection zone.

Examining the process of environmental effect and the degree of pollution in the environment is one of the most crucial directions. The creation of the "Environmental Impact Statement" project has been extensively used in the analysis and assessment of the project's environmental effect. The creation of such records is crucial for both avoiding and assessing the level of pollution in the area.

Common traits of the socio-ecological issues facing the industrial sector include the topics and duties of industrial ecology and alternative energy, the different ways that industrial systems affect the environment, and the effects that industry has on atmospheric air. Permittable emission limits for gases released by automobiles

and the effect of stationary sources on the environment are calculated. electrofilter parameter computation. Gases can be neutralized by thermocatalysis; moving sources can affect atmospheric air; industry can affect water supplies; Industrial wastewater classification and treatment techniques. parameter calculation for sewage treatment equipment that uses biochemical and electrochemical processes, contamination of water supplies by both permanent and mobile sources, effects of industry on available land.

The quantity of trash produced by motor transport companies, the effects of the industrial complex on the wildlife, and the processes involved in the chemical and physical effects of the business on the environment are all calculated. Among the most crucial things to determine is the noise level in the vicinity of the roadways.

The wet method of cleaning industrial emissions from dust and harmful substances is based on the effect of wetting solid dust particles with liquid (water in the first approximation) and depriving them of their volatility. This happens in a special device-a scrubber. Dust becomes an integral part of a dirty solution or sludge that does not pollute the air and can be disposed of or buried.

Methods and materials

To assess the impact of the enterprise on the environment, the following tasks had to be solved:

- assess the current state of the environment in the area where the enterprise is located;
- conduct an environmental analysis of the design solution;
- assess the level of atmospheric air pollution by emissions from the main production;
- assess the amount of production and consumption waste generated after the implementation of design solutions and consider their placement and disposal;
- evaluate emergency risks after the implementation of the design solution.

The wet method of cleaning industrial emissions from dust and harmful substances is based on the effect of wetting solid dust particles with liquid (water in the first approximation) and depriving them of their volatility. This happens in a special device-a scrubber. Dust becomes an integral part of a dirty solution or sludge that does not pollute the air and can be disposed of or buried.

A high degree of air purification from dust using wet technology, especially on small fractions, allows you to design and create powerful final installations for almost complete dust removal or bringing its emissions to the maximum permissible concentration.

The technological scheme of dust extraction requires the fastest and most complete mixing of dusty gas and liquid. The developed area of contact between solid and liquid particles is of great importance in cleaning the air from dust with water. A number of installations are widely used in industry:

Hollow(nozzle) scrubbers. They have the simplest and most inexpensive design. In a special chamber or pipe, a sprayed liquid is supplied towards the gas flow with dust.

Attachment devices. Fine dust with gas rises along the body of the scrubber, overcoming the counter flow of liquid droplets supplied to the scrubber through nozzles located in belts. The scrubber body is filled with nozzles in order to increase the contact of water and dust.

Centrifugal devices differ from nozzle units by the method of supplying dusty gas. The swirling gas stream interacts with the water film sprayed through the nozzles. The sludge flows down.

Bubbling and foam machines. They work on the principle of passing gas through a volume of liquid, from bottom to top. The gratings serve to increase the contact area, which accelerates the process of dust collection by liquid.

High-speed vehicles (SPU Venturi). The gas with dust enters the scrubber through a Venturi pipe, into which liquid is also injected. A suspension of small droplets forms in the neck and their interaction with dust. The sludge is discharged through the lower opening, the purified gas enters the gas outlet.

Shock-inertial devices (roto clones). The purified gas is supplied to a vertical container with liquid, under pressure from the upper part. Upon impact with the liquid, rapid boiling and capture of dust particles are formed. The purified gas is discharged through the flue.

Wet gas purification methods have been well studied, they have shown high efficiency in cleaning air from dust in production. Therefore, wet de-dusting installations are always in demand and successfully compete with other devices.

Results and Discussion

The total number of employees operating in the enterprise is 180 people. The administrative building of the working staff is heated and cooled in the winter summer season with an electric current (winter-summer capacitor).

The level of pollution of the atmospheric air of the district under consideration is formed from Foni production cexes and discharges from auxiliary structures.

The level of pollution of the atmospheric air of the Rayon under consideration is formed from products and dust that are formed in gas, coal, firewood combustion in residential areas, which operate and are under construction in the Jizzakh City Industrial Area, and dumping (fumes from engine combustion) from motor vehicles.

The main components of pollution of the Rayon atmosphere are: inorganic dust, elemental sulfur, sodium carbonate, sodium sulfate, glass dust, skin sawdust (flour) dust, grain dust, flour dust, carbon monoxide, nitrogen (IV v.)- oxide, hydrocarbon, gasoline vapor, aromatic hydrocarbon, alkali vapor, Benz(a)pyrene, metal dust, Iron (III) v-oxide, manganese (IV v.)- oxide.

Object: Limited Liability Company Sofitel in the Free Economic Zone of the city of Jizzakh. Its main activity is the production of Ultramarine pigment.

"Sofitel" project "notification on environmental consequences (EOB)" project "notification on environmental consequences (EOB)" project "notification on environmental impact (AMOTBL) "project" notification on environmental consequences (EOB) "project 03-01/11-08-676-1 of April 20, 2023, and the previously developed" report on environmental consequences (EOB) project " Project 03-01/July 17, 2023 11-08-1106 - state environmental examination conclusions and enterprise data were used.

The final eTap of the object's environmental impact notification project is the "environmental impact notification (EOB)" project.

The project capacity of the joint venture Sofitel LLC for the production of Ultramarine pigment is 11 t/sut., 330 t/month, 4000 t/year. The product produced is export and konkurentbop in the domestic and foreign market. The product is exported through China to the countries of Egypt, Turkey.

The research work carried out developed sources producing pollutants, production and consumption emissions into the atmosphere, their quantity, norms, toxicity class, subsequent proposals for disposal and placement, an assessment of the impact of installed equipment on surface and grunt water.

A limited amount of dumping into the atmosphere, a limit on the placement of waste, was determined.

The total land area of the ultramin pigment production plant, located in the industrial zone of the city of Jizzakh, Jizzakh region, is 4.4 hectares. The enterprise is limited as follows;

- "Toshtepa Textile" LLC from the north side;
- An open field area on the west side;
- "Irrigation Invest" LLC from the east side;
- Bordered by "ROISON" LLC from the south.

800 meters to the south and south-west is the closest settlement to the business.

The company's primary operation is the manufacture of ultramarine pigment.

The business is open for business 290 days a year, 24 hours a day. There are 180 workers in the company. Ultramarine Pigment Production Joint Venture is a limited liability business that comprises the following divisions and branches::

1. Grinding and semi-finished products department;
2. Product warehouse;
3. Grinding department;
4. Cooking department;
5. Boiler room;
6. Jug shop;
7. Motor transport department;
8. Administrative building;

Because it is located in Jizzakh City's Free Economic Zone and can utilize the enterprise's communication and engineering networks, the joint venture that produces ultramarine pigments offers the following advantages:

- The water network of the Jizzakh City Free Economic Zone provides the water supplies;

- The delivery of natural gas is accomplished via the Jizzakh City Free Economic Zone's natural gas network;

- The kitchen and medical service department is in charge of providing medical care and overseeing employee kitchen usage. Nothing open water exists in the area.

1. 40° 8'42.82"C 67°53'49.45"B
2. 40° 8'49.24"C 67°53'53.38"B
3. 40° 8'52.13"C 67°53'44.58"B
4. 67°53'42.06"B 67°53'42.06"B
5. 40° 8'46.46"C 67°53'44.40"B
6. 40° 8'45.06"C 67°53'43.44"B

Figure 1: Topographic map of the production enterprise.

Baking section

There are thirty baking rooms with WNS-3-1,25-0 cooking hobs in the cooking section. Its contents, which include gas mixes and dust from 15 cooking rooms, are released into the environment via a 36-meter-long pipe with a 1600 mm or 1.60-meter diameter.

There is natural gas in the kitchen area. Ten to fifteen cooking rooms operate sequentially. 2610 hours are worked by the resource annually. 2064 thousand m^3 of natural gas are used annually by this source. Carbon monoxide, nitrogen oxide, sulfur oxide, and benz(a) pyrene are all emitted into the atmosphere during the combustion of natural gas.

The Republic of Uzbekistan's Ministry of Justice registered Appendix 1 of "Instructions for Accounting for Sources of Pollution in the Territory of Enterprises in the Territory of the Republic of Uzbekistan and Regulating Pollutants" on January 3, 2006, under No. 1533 1.13. The following formula was used to determine how much carbon dioxide and nitrogen oxide were emitted into the atmosphere:

Natural gas is really used at a rate of 2064 thousand m^3/year, or 0.0824 g/sec. Natural gas has a density of 0.62 kg/m^3.

Volumetric weight is equal to: 204,29 g/sec.

Carbon monoxide emitted into the atmosphere was determined by the following formula:

$$П_{CO} = 0,001*C_{CO} *B*(1-q_4/100), \text{ here}$$

C_{CO} - emission of carbon monoxide during fuel combustion (kg/t, kg/thousand m^3, g/s), determined by the following expression:

$$C_{CO} = q_3 * R * Q_{ir}$$

here q_3 – heat loss due to chemical incomplete combustion of fuel, %;

R-depending on the type of fuel, the coefficient that takes into account the heat loss due to the chemical incomplete combustion of carbon dioxide formed during fuel combustion is equal to R = 1 for solid fuel, R = 0.5 for gas, and R = 0.65 for fuel oil;

Table 1

Boiler and stove model	Fuel type	α	q3	q4
A shaft furnace with a horizontal grate	Firewood, shredded waste, sawdust	1,4	2	2
Fast-burning furnaces	Firewood, sawdust	1,3	1	4/2
Chamber stove for solid fuel	Coal, brown coal	1,2	0,5	5/3
		1,2	0,5	3/1,5
		1,2	0,5	3/1,5
A furnace with a chamber	Fuel oil	1,1	0,5	0,5
	Gas (natural)	1,1	0,5	0,5
	Stove gas	1,1	0,5	0,5

Carbon monoxide can also be determined by the following expression:

$$П_{CO} = 0,001*C_{CO} *B*K_{CO} (1-q_4/100), \text{ here}$$

KCO - coefficient that takes into account the amount of carbon monoxide released during fuel combustion per unit of fuel, (kg/GDj)

The maximum amount of pollutants released into the atmosphere per unit of time is as follows:

Nitrogen oxide released into the atmosphere was calculated using the following formula:

$$П_{NO2} = 0,001* B * Q_{ir} * K_{NO2} (1 - β), \text{ here}$$

B – natural fuel consumption (t/year, thousand m^3/year, g/s, l/s);

Q_{ir} – the lowest heat required for natural fuel combustion (MDj/kg, MDj/m^3);

K_{NO2} – 1 GDj is a coefficient that takes into account the amount of nitrogen oxide used to obtain heat, kg/GDj.

β – the coefficient that takes into account the reduction of nitrogen oxide emissions based on the adopted technical decision.

The amount of sulfur oxide released into the atmosphere is as follows:

The quantity within the unit of time is equal to the following

Waste placement limit is the maximum amount of waste allowed to be placed for a certain period of time.

During the operation of the Sofitel LLC joint venture ultramarine pigment production facility, the following wastes are generated:

Inorganic dust;

Fracture of the pitcher;

Black metal waste;

Special clothing waste;

Lead plate;

Battery case;

Electrolyte;

Used tire;

Motor oil;

Oily rags;

Food waste;

Strict household;

Suprindi;

Maclatura, paper.

The waste disposal limit calculation was carried out based on the requirement of the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 14 of January 21, 2014 "On the approval of the Regulations on the procedure for the development and agreement of draft environmental regulations".

The limit size is calculated for each type of waste according to the following formula:

$$L = P_п * hФ * t_1 /t + K_1 * q_y$$

here: $P_П$ – Planned amount of developed product, tn/year.

$h_Ф$ – the comparative amount of waste generation is determined by carrying out the enterprise waste inventory, tn/tn kg/tn and so on.

t_1 – The time limit is assumed to be 180 days and nights.

t – The temporary disposal period is 365 days and nights.

K_1 – The coefficient of growth of the final amount of waste placement, with their disposal, was taken as equal to 0.25.

q_y – Amount of disposed waste, tn/year.

Enterprise areas that do not exceed the necessary limits are used for waste disposal. These limits are determined by the total size of the enterprise area, the scale of disposal of private waste, their level of toxicity, etc. The total area of temporary disposal of waste in enterprises (S1) is calculated according to the following formula:

If a large amount of waste is generated in a small area of the enterprise, the size of the limit is limited by the following formula:

$$L < S_1 * h * V$$

here: S_1 – waste disposal area;

h – waste placement height;

V – volume mass of waste is assumed to be 1 tn/m^3.

The total area of temporary disposal of waste in enterprises (S_1) is calculated according to the following formula:

$$S_1 = K_S * S_2 (1 + 0,5 * q_y : P_n * h_Ф)$$

here: K_S – The ratio of the total area of temporary disposal of waste to the total area of the enterprise territory (Table 1), determined according to the results of the "Waste Inventory at Enterprises" works;

S_2 – total area of the territory of the enterprise, ha, m^2.

0,5 – coefficient of expansion of the boundary areas of temporary placement in waste disposal.

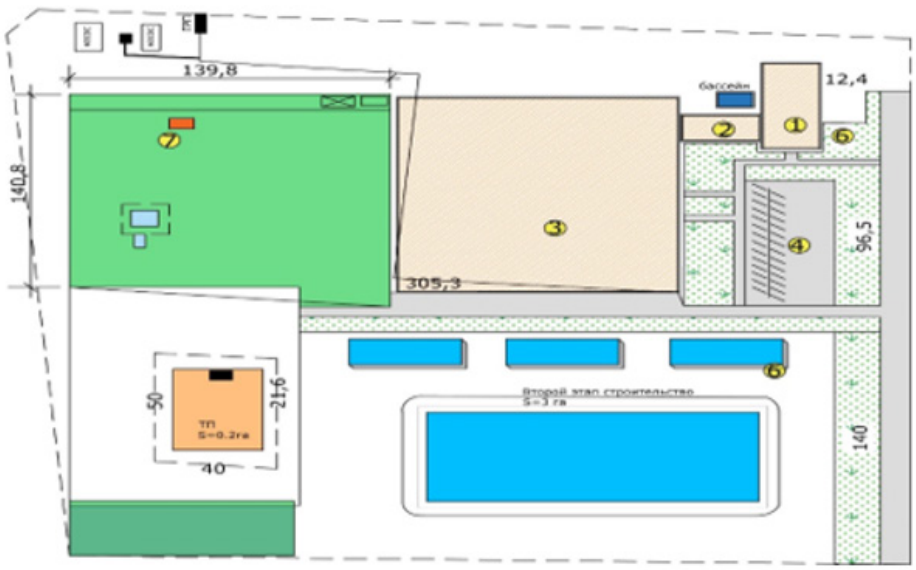

Figure 2: Topographic map of the production enterprise.

Conclusion

This is the "statement of environmental impact assessment of the object"'s last phase. Wastes from production and consumption as well as airborne contaminants were examined.

When the company is operating, pollutants are released into the environment from 11 stationary sources. Of the sources, four are disorganized and seven are ordered.

These sources contribute 46.934615t of pollutants per year to the atmosphere. According to observations, the amount of pollutants emitted into the atmosphere did not surpass the allowable threshold (PS).

The special industrial zone of Jizzakh City provides the firm with water for production and drinking requirements, which is drawn from the water network.

Production wastewater is recycled into new technical processes inside the company. The city sewage system receives the waste water produced by commercial and residential activity.

Therefore, it is not anticipated that effluent would contaminate the soil or subsurface water. Sewer networks are used to release snow and rainwater into the surrounding terrain.

A draft of the trash placement limit is given during the course of work, which includes an inventory of the sources of waste creation. There were 14 distinct forms of garbage in the project; the total amount of waste recorded was 63,105 t/year, and it was found that these wastes did not surpass the average.

I – class waste does not exist;

II - class - 0.2224 t/year;

III - class - 0.1356 t/year;

IV - class - 29,014 t/year;

Class V - 33,733 t/year.

The waste passport, waste hazard class, temporary placement conditions, and disposal method are specified for each type of trash.

In light of the quality and quantity indicators of waste water as well as the monitoring of sources of atmospheric air pollution, a plan-graph for the control of specified criteria is suggested. There are now specified permissible environmental standards for discharges, standards for waste water and water supply, and comparison metrics for waste created.

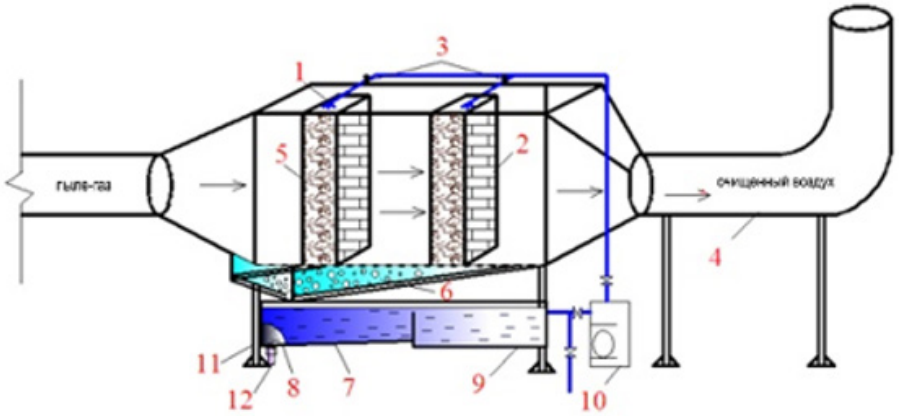

Figure 3: Dust and gas cleaning plant with filling materials.

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.

The amount of inorganic dust (0.33mg/m^3) calculated at an acceptable quota of 3 depending on the hazard class was 0.42 mg/m^3 with a distribution width of 50 m from the organized source and 0.34 mg/m^3 at a distance of 130 m. The danger of nitric oxide. class-3 (0.25 mg/m^3), 0.27 mg/m^3 at a distance of 50 m, 0.23 mg/m^3 at a distance of 130 m. The danger of carbon monoxide. class-2 (0.50 mg/m^3), 0.43 mg/m^3 at a distance of 50 m, 0.38 mg/m^3 at a distance of 130 m. Hydrocarbons are dangerous. class-2 (0.50 mg/m^3), 0.51 mg/m^3 at a distance of 50 m, 0.42 mg / m^3 at a distance of 130 m. The analysis of slate and brick production enterprises is given in Table 1 [1-12].

Table 2: 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/m3, distance 50 m	Analysis of the Eco-cent program, mg/m3, 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. Carbon monoxide Nitric oxide	0,59 0,38 0,64	0,45 0,29 0,52	0,32 0,24 0,38	0,26 0,18 0,29
Proc. asphalt-concrete	The dust is inorganic. Carbon monoxide Nitric oxide Hydrocarbons	0,55 0,36 0,58 0,36	0,46 0,27 0,37 0,27	0,33 0,21 0,29 0,19	0,27 0,15 0,17 0,12
Proc. bricks	The dust is inorganic. Carbon monoxide Nitric oxide Sulfur Dioxide	0,89 0,46 0,67 0,61	0,68 0,34 0,54 0,49	0,54 0,29 0,39 0,37	0,32 0,21 0,28 0,26

Acknowledgement

None.

Conflict of interests

None.

References

1. GF Keldiyarova (2021) Environmental impact assessment of industrial enterprises (on the example of objects of category I,II of environmental impact in the Samarkand region). E3S Web of Conferences 265: pp04025, APEEM 2021.
2. Keldiyarova G, Boboeva G, Khusanova M, Dadayev M, Rakhmanova N (2024) Issues of increasing the economic efficiency of manufacturing enterprises on the impact on the environment. E3S Web of Conferences 486: pp01003.
3. GF Keldiyarova (2021) Calculation of ground-level concentrations and mapping of pollutant dispersion fields. E3S Web of Conferences 265: pp02012, APEEM 2021.
4. Maere S, Bodt SD, Raes J, Kasnev T, Montague MV, et al. (2005) Modeling of gene and genome duplication in eukaryotes. Studies Natl Academy of Sciences USA 102: 5454-5459.
5. Azamat Fozilov, Shodi Kholikulov (2023) The dynamics of the Akhangaran basin's groundwater level in relation to physical-geographical and anthropogenic factors. E3S Web of Conferences 431: pp04016, XI International Scientific and Practical Conference Innovative Technologies in Environmental Science and Education (ITSE-2023).
6. Azamat Fozilov, Ziyodullo Ganiyev, Rasuljon Mamajanov, Dilbar Jurakulova, Oytula Abdurayimova (2024) The effect of the Almalyk-Akhangaran industrial zone on changes in the groundwater level of the Ahangaran river basin. E3S Web of Conferences 494: pp01014, International Conference on Ensuring Sustainable Development: Ecology, Energy, Earth Science and Agriculture (AEES2023).
7. GF Keldiyarova(2020) Evaluation of the efficiency of dust and gas treatment plants in asphalt plants. International Journal of Scientific and Technology Research 9(1):3210–3212.
8. Murat F, Van de Poer Y, Sals J (2012) Decoding the plasticity of the genome of plants and animals based on differential paleoevolutionary patterns and processes. The Biol genome Evol 4: 917-928.
9. Zhang J(2003) Evolution by gene duplication: an update. Trends in Ecology & Evolution 18: 292-298.
10. Jiao Yu, Wickett New Jersey, Ayyampalayam S, Chanderbali AS, Landherr L, et al. (2011) Ancestral polyploidy in seed plants and angiosperms. Nature 473: 97-100.
11. Doyle JJ, Lakou MA (2003) The rest of the iceberg. The diversity and evolution of legumes in a phylogenetic context. The physiol of plants 131: 900-910.
12. Baltrocchi APD, Maggi L, Dal Lago B, Torretta V, Szabó M, et al. (2024) Mechanisms of Diffusion of Radon in Buildings and Mitigation Techniques. Sustainability 16: 324.