

## Determination of the effect of emissions from stationary sources of OGPD "Zhaiykneft" on atmospheric air pollution degree of the industrial region

**Aidosov A. A.<sup>1</sup>, Aidosov G. A.<sup>4</sup>, Azhiev G. I.<sup>2</sup>, Zaurbekov N. S.<sup>1</sup>,  
Uazhanova R.U.<sup>1</sup>, Zaurbekova N. D.<sup>3</sup>, Zaurbekova G. N.<sup>4</sup>**

<sup>1</sup> *Almaty Technological University, Almaty,*

<sup>2</sup> *Kazakh Leading Academy Of Architecture And Civil Engineering, Kazakhstan,*

<sup>3</sup> *Kazakh National Technical University after K.I. Satpayev, Kazakhstan*

<sup>4</sup> *Al-Farabi Kazakh National University, Kazakhstan,*

*E-Mail: agu\_nurgali@mail.ru, allayarbek@mail.ru*

### Abstract

The effects of emissions from stationary sources from a particular deposit on the degrees of atmospheric air pollution in the region were determined. Substantiation of the data on pollutant emissions into the atmosphere from emitting sources was carried out with taking into account the existing methods and passports of existing equipment, consumption of raw materials.

Keywords: ATMOSPHERIC AIR, ATMOSPHERIC AIR POLLUTION, POLLUTION SOURCES, FLARE

The sources of impact of the existing enterprise OGPD "Zhaiykneft" on atmospheric air are the technological equipment, installations, systems and buildings of the main and auxiliary production facilities needed for production, picking, processing and transportation of products and hydrocarbons.

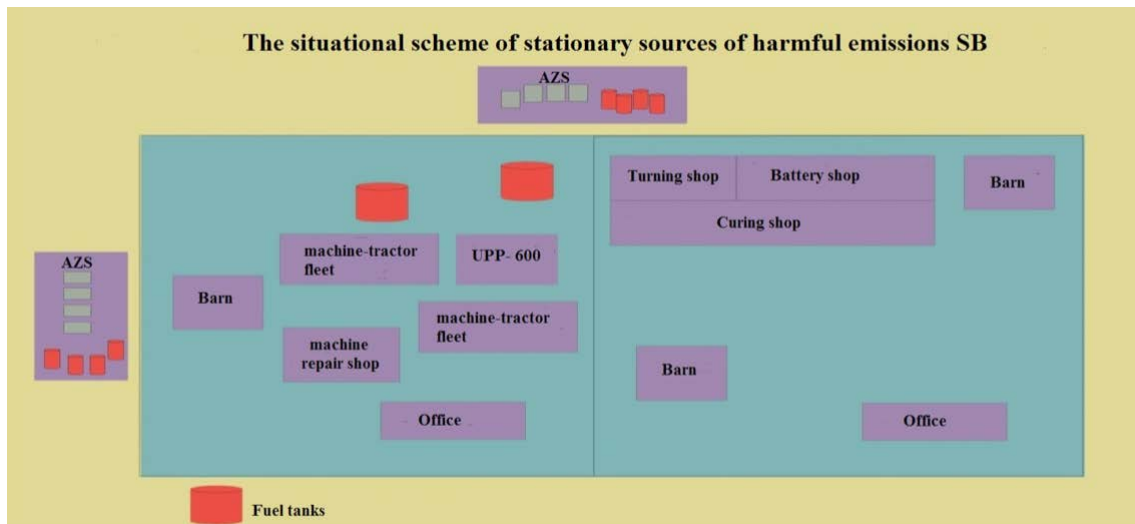
Oil and gas enterprises along with the specific pollution emit oxides of nitrogen and sulfur in large quantities. In this regard observations were carried out, mainly over the content of hydrogen sulphide, sulphurous anhydride, nitrogen dioxide in atmospheric air, oil products in the soil and water of the region of oil and gas deposit of OGPD "Zhaiykneft". According to the materials of inventory when performing the production program for the preparation of 920 210 tons of commercial oil placed on the 22 industrial sites (S.Balgimbaeva, V. Kamyshitovy, Yu. Z. Kamyshitovy, Yu. V. Novobogat, Zaburunye,

Zhanatalap, Gran, Rovnoye, Karashagan,) we defined 840 stationary sources of polluting emissions, where 710 were fugitive emission sources. Classification of emission sources is shown in Fig. 2.

**Stationary emission sources** are plant and furnaces chimney stacks, flare systems of group measuring units, ventilation pipes of industrial premises.

**Fugitive emission sources** include the sources which emissions pollutants happen through the leakiness of packages, flange connections, control and shutoff and control valves, valve leakiness, leaks in equipment and units, open surfaces of solid, liquid and gaseous media. Fugitive emission sources of CFP (centrifuge feed pump) are low and have a height of 2-12 m. Stationary sources of the enterprises have a height of 2.5 - 10 m, 11 - 15 m.

Emission sources and situational scheme of the harmful emissions sources of OGPD "Zhaiykneft" are presented in Figures 1-4.



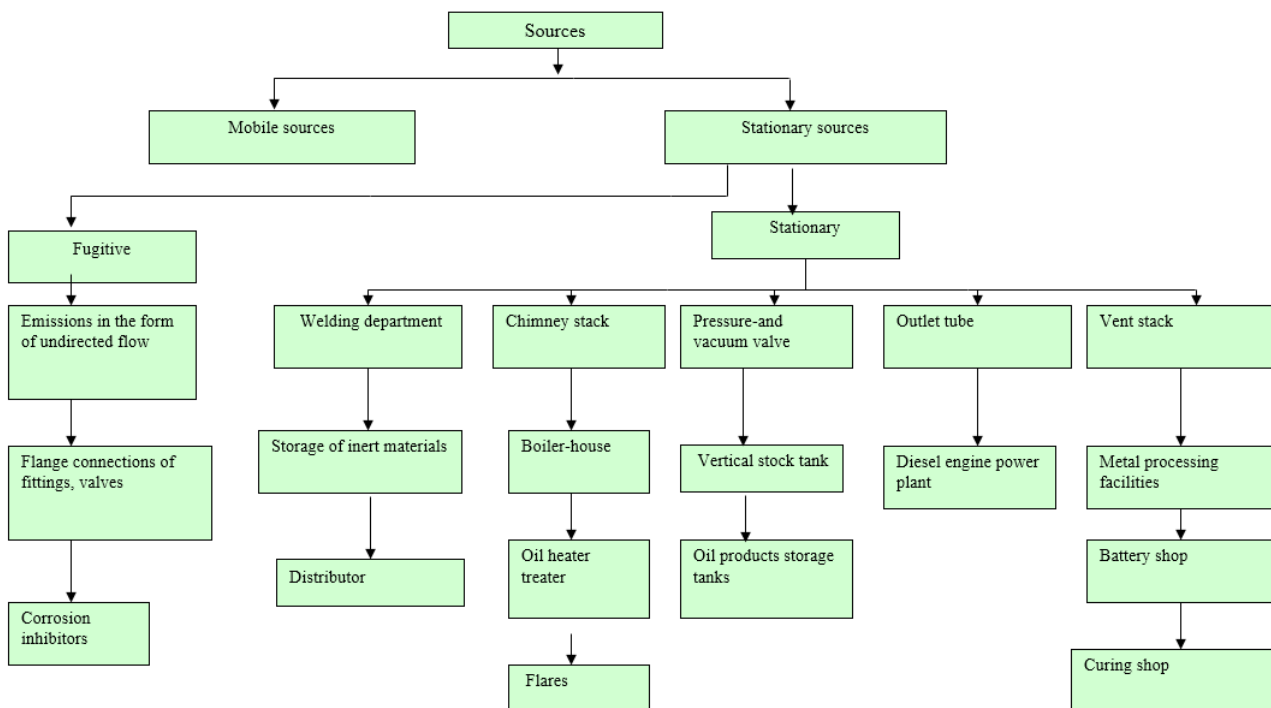
**Figure 1.** The situational scheme of stationary sources of harmful emissions SB

The main atmospheric air pollution is carried out by the products of fossil fuels combustion, carbon oxides, soot and substances contained in the original fuel or burning process. From the stationary sources of emissions 15 items of substances are emitted into the atmosphere having only one group of the summation (nitrogen oxides + sulphurous anhydride), which is present in all industrial sites, except for the industrial site of Karashagan deposit. The main pollutants are: nitrogen oxides, carbon oxides, hydrocarbons, soot their share is 78% of gross emissions.

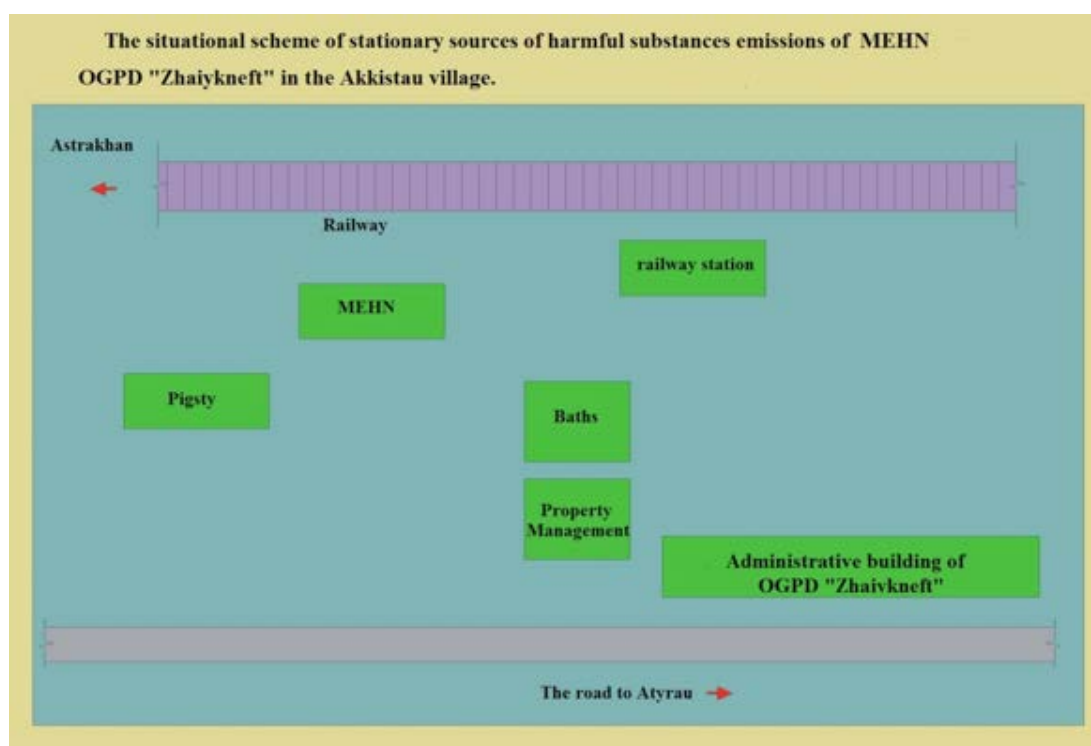
Emissions of nitrogen oxides during burning of

oil gases are connected with the oxidation of air nitrogen in a high temperature gas flare. The amount of emitted nitrogen oxides depends on the organization of the burning process and can be adjusted by the technological methods in a certain range. The composition of oxides consists of monoxide NO (up to 95%), nitrogen dioxide NO<sub>2</sub> (5%) and other oxides. When dispersing the flue gases in the atmosphere as a result of photochemical reactions of interaction with the atmospheric ozone full oxidation of NO and NO<sub>2</sub> takes place.

### Emission sources of OGPD "Zhaiykneft"



**Figure 2.** Classification of emission sources



**Figure 3.** The situational scheme of stationary sources of harmful substances emissions of MEHN (management of enterprise of heating networks) OGPD "Zhaivkneft" in the Akkistau village

**Table 1.** List of polluting substances emitted into the atmosphere by OGPD "Zhaivkneft" facilities

No	Names of polluting substances	Hazard Class	MAC maximum single mg/m <sup>3</sup>	Average MAC mg/m <sup>3</sup>	Pollution emissions per year / ton
1	2	3	4	5	6
<b>SB after S. Balgimbayev</b>					
1	Nitrogen oxides	2	0.085	0.04	8.355
2	Carbon monoxide	4	5.0	3.0	23.958
3	Sulphurous anhydride	3	0.5	0.05	2.062
4	Hydrocarbons	4	1.0	-	0.386
5	Soot	3	0.15	0.05	7.54
6	Aldehydes	3	0.015	0.015	0.01
7	Welding aerosol	2	0.01	0.001	0.0696
8	Manganese oxides	2	0.01	0.001	0.002
<b>Total:</b>				<b>42.38</b>	
1	2	3	4	5	6
<b>Column 2 heavy equipment and TT</b>					
17	Nitrogen oxides	4	0.085	0.04	0.396
2	Carbon monoxide	3	5.0	3.0	2.783
3	Sulphurous anhydride	4	0.5	0.05	0.4
4	Hydrocarbons	3	1.0	-	16.56
5	Soot	2	0.15	0.05	0.0247
6	Welding aerosol	2	0.01	0.001	0.053
7	Manganese oxides	2	0.01	0.001	0.0004
8	Sulfuric acid	3	0.3	0.1	0.007
9	Oil aerosols	2	0.5	0.15	0.0142
10	Emulsol	3	0.05	0.05	0.0001
11	Metallic dust		0.5	0.15	0.16
<b>Total:</b>				<b>20.398</b>	
<b>IDW shop</b>					
1	Nitrogen oxides	2	0.085	0.04	0.026

## Ecology

2	Carbon monoxide	4	5.0	3.0	0.033
3	Welding aerosol	2	0.01	0.001	0.5
4	Manganese oxides	2	0.01	0.001	0.0001
5	Oil aerosols	3	0.5	0.15	0.0004
6	Emulsol	2	0.05	0.05	0.00001
<b>Total</b>				<b>0.113</b>	
IRS department					
1	Nitrogen oxides	2	0.085	0.04	0.573
2	Carbon monoxide	4	5.0	3.0	0.233
3	Sulphurous anhydride	3	0.5	0.05	0.07
4	Hydrocarbons	4	1.0	-	0.064
5	Soot	3	0.15	0.05	0.058
6	Aldehydes	3	0.015	0.015	0.0063
7	Welding aerosol	2	0.01	0.001	0.05
8	Manganese oxides	2	0.01	0.001	0.0004
9	Oil aerosols	3	0.5	0.15	0.01
10	Emulsol	-	0.05	0.5	0.00012
11	Metallic dust	3	0.5	0.15	0.048
<b>Total:</b>				<b>1.11</b>	
1	2	3	4	5	6
PPN site on C. Balgimbayev deposit					
1	Nitrogen oxides	2	0.085	0.04	55.79
2	Carbon monoxide	4	5.0	3.0	175.9
3	Sulphurous anhydride	3	0.5	0.05	1.22
4	Hydrocarbons	4	1.0	-	90.32
5	Soot	3	0.15	0.05	2.55
6	Welding aerosol	2	0.01	0.001	0.001
7	Manganese oxides	2	0.01	0.001	0.0002
<b>Total:</b>				<b>325.78</b>	
TsDN and G No1 of C. Balgimbaev deposit					
1	Nitrogen oxides	2	0.085	0.04	0.566
2	Carbon monoxide	4	5.0	3.0	0.193
3	Sulphurous anhydride	3	0.5	0.05	0.006
4	Hydrocarbons	4	1.0	-	16.35
5	Soot	3	0.15	0.05	0.003
6	Welding aerosol	2	0.01	0.001	0.058
7	Manganese oxides	2	0.01	0.001	0.0007
8	Aldehydes	3	0.015	0.015	0.006
<b>Total:</b>				<b>16.87</b>	
Rovnoye deposit					
1	Nitrogen oxides	2	0.085	0.04	0.11
2	Carbon monoxide	4	5.0	3.0	1400
3	Sulphurous anhydride	3	0.5	0.05	0.536
4	Hydrocarbons	4	1.0	-	174.596
5	Soot	3	0.15	0.05	167.2
<b>Total:</b>				<b>1742.44</b>	
Karashagan site					
1	Hydrocarbons	4	1.0	-	1,283
<b>Total:</b>				<b>1,283</b>	
Yu. Z. Kamyshitovy deposit					
1	Nitrogen oxides	2	0.085	0.04	33.336
2	Carbon monoxide	4	5.0	3.0	553.813
3	Sulphurous anhydride	3	0.5	0.05	1.136
4	Hydrocarbons	4	1.0	-	96.219

1	2	3	4	5	6
5	Soot	3	0.15	0.05	57.758
6	Aldehydes	3	0.015	0.015	0.0123
7	Hydrocarbons	4	1.0	-	1.17
<b>Total for OGPD "Zhaiykneft"</b>					
1	Nitrogen oxides	2	0.085	0.04	183.9
2	Carbon monoxide	4	5.0	3.0	3245.9
3	Sulphurous anhydride	3	0.5	0.05	29.2
4	Hydrocarbons	4	1.0	-	662.42
5	Soot	3	0.15	0.05	395.8
6	Welding aerosol	2	0.01	0.001	0.447
7	Manganese oxides	2	0.01	0.001	0.006
8	Sulfuric acid	2	0.3	0.1	0.007
9	Oil aerosols	3	0.5	0.15	0.028
10	Emulsol	-	0.05	0.05	0.0002
11	Metallic dust	3	0.5	0.15	0.2
12	Aldehydes	3	0.015	0.015	0.053
13	Inorganic dust	3	0.5	0.15	2.297
14	Vapors of hydrochloric acid	2	0.3	0.1	0.009
15	Neonol				0.01
<b>Total:</b>			<b>4520.28</b>		

As the degree of the transformation for the energy companies 0.8 is accepted, i. e. from the total weight of nitrogen oxides coming from the flue gases to the ground layer of air, 80% are accounted for NO: as a result emissions toxicity increases.

Formation of carbon monoxide, hydrocarbons, soot is connected with the organization of the burning process.

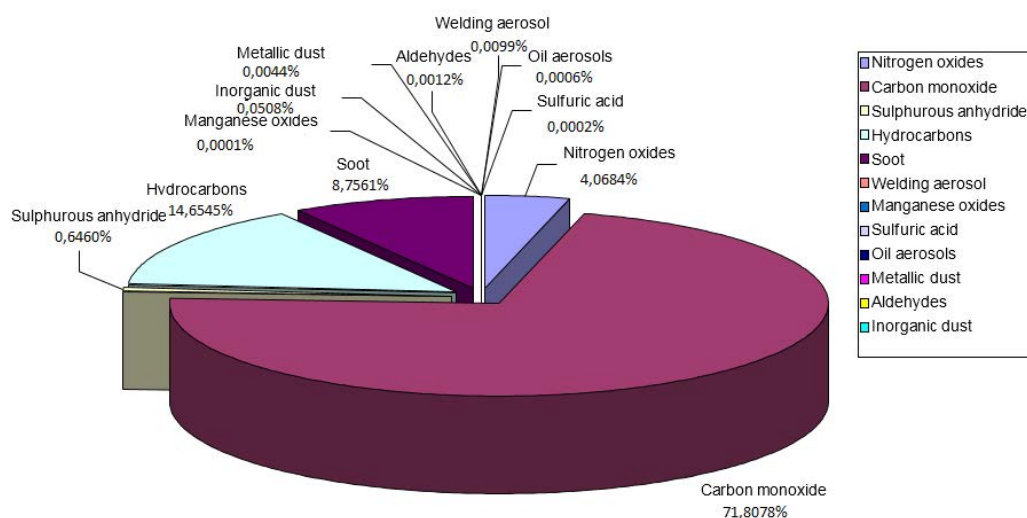
The greatest amount of emitted pollutants into the atmosphere accounted for the hot springs - flares and chimney stacks of boiler rooms.

Emissions from flares are up 3,422.5 tons or 75%; boiler rooms chimneys stacks emission are defined in amount of 112.675 tones or 3% of the pollutants.

Substantiation of the data on pollutant emissions

into the atmosphere from the emitting sources was carried out with taking into account the existing methods and passports of existing equipment, consumption of raw materials.

According to the degree of impact on the human body emitted substances are classified in accordance with the sanitary standards by 4 class of hazard. From OGPD "Zhaiykneft" facilities emissions of the substances of 1 hazard class are absent; from the sub-substance of 2 hazard class 0.447 tons of welding fumes are emitted into the atmosphere, 0.006 tons of manganese oxides, 0.007 tons of sulfuric acid. And 0.46 tons of total 2 hazard class substances are emitted and from the substances of 3 hazard class the nitrogen oxides in an amount of 183.9 tons are emitted.



**Figure 4.** The share of pollutants emitted into the atmosphere by OGPD "Zhaiykneft"

A complete list of pollutants emitted into the atmosphere by OGPD "Zhaiykneft" facilities is given in Table 1. The table shows the maximum allowable concentration (MPC), the amount of emitted substances (M) and the substances hazard categories (SHC).

On the basis of the table data analysis the diagrams of emissions and the share of polluting substances on the main sources emitted by OGPD "Zhaiykneft" facilities are built (Fig. 1-4)

Such emissions of substances as carbon oxides, hydrocarbons, nitrogen oxides and sulphurous anhydride are predominant on the deposits of Yu. Z. Kamyshtovy, Rovnoye, S. Balgimbaev. Fig. 4 shows that in all deposits by the share of emissions predominate are following pollutants: carbon monoxide, hydrocarbons, soot, nitrogen oxides, sulphurous anhydride.

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