



ENVIRONMENTAL IMPACT ASSESSMENT OF BUILDING MATERIALS MANUFACTURING MICROCALCITE, GYPSUM AND BUILDING POWDERS

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ANNOTATION

In the production of building materials such as micro calcite, gypsum, dry building mixtures, inorganic dust, gypsum dust, micro calcite dust, carbon monoxide, nitrogen oxides, sulfur dioxide and benzo (a) pyrene are generated and are released into the atmosphere. In order to reduce emissions of pollutants into the atmosphere, it is advisable to install modern equipment in the workshops, highly efficient industrial filters and other dusty gas cleaning plants. The concentration of inorganic dust in the air emitted into the atmosphere from the main workshop of the plant for the production of micro calcite, gypsum and dry mix, before entering the treatment plant, was 746.4-932.4 mg / m³. After collecting dust in the electrostatic precipitator installed in the shop, the proportion of dust in the air was 46.6-152.6 mg / m³, the efficiency of the dust-trapped installations was 92.2-94.0%. This showed that the concentration of dust after cleaning in the installations did not exceed the maximum permissible concentration and do not have a negative impact on people and other living organisms.

Key words: *emission, near-permissible concentration, dust, pollutants, stationary source, near-permissible emission, atmospheric layer, dust and gas treatment plants (PGOU).*

INTRODUCTION

Environmental Impact Assessment (EIA) - is carried out in order to determine the environmental and other consequences of options for management and economic decisions, develop recommendations for improving the environment, preventing the destruction, degradation, damage and depletion of natural ecological systems of natural resources. EIA is a mandatory and integral part of design and pre-design documentation. At the same time, it is important, in terms of maintaining the ecological situation in the area under consideration, to prevent the likely consequences after the implementation of the project. The environmental and technical measures proposed by the project are a confirmation of the environmental security of the project, associated with preventing the deterioration of the quality of the environment or its individual components, as well as preventing the occurrence of environmental risk. The methodology of the work performed was based on the generally accepted methods of carrying out the EIA procedure and took into account the features of the area under consideration. During the implementation of the EIS project, design, stock and factual materials were studied in detail. The information on emissions and discharges of pollutants into the environment has been analyzed. Based on the analysis of the collected data and the performed analytical determinations, a characteristic of the current state of the environment is given. Sources of impact have been identified, calculations of possible emissions and discharges of pollutants and the degree of their impact on the environment have been carried out [1-4].

In the production of building materials micro calcite, gypsum and building powders, inorganic dust, carbon monoxide, nitrogen oxides, sulfur dioxide and benz a pyrene are mainly formed and emitted into the atmosphere. The amount of inorganic dust emitted into the atmosphere at factories producing building materials, in many cases in the working area of a manufacturing enterprise, may exceed the maximum permissible concentration. In order to reduce emissions into the atmosphere during the production of building materials, it is advisable to install equipment for collecting dust, group cyclones of the TsN-11, TsN-15 brands or highly efficient industrial filters [5,6].

OBJECT OF STUDY

Workshop for the production of microcalcite, gypsum and building powders. For the production of microcalcite, siryo is brought from marble quarries.

Raw material chemical composition:

- CaCO_3 – 99,5%;
- MgO – 0,4%;
- FeO_3 – 0,03 %;
- SiO_2 – 0,01 %.

High quality crushed white marble (microcalcite) is obtained from calcium carbonate powder.

Microcalcite is used in many industrial and other industries:

- for adding other types of carbonates; in the preparation of dry building mixtures; plastic production; linoleum production; in view of the ingredient on the drives; in obtaining clean abrasive raw materials; in medicine; in the food industry; in the production of electrical engineering.

PLASTER PRODUCTION

The specific gravity of gypsum is 1.3 t / m³. Gypsum contains 16% dolomite, the rest is private white marble stone. In the production workshop, from the beginning, the raw material is crushed into large and small pieces, then passed through a sieve. After measurement, the crushed raw material is thrown through the elevator to the hopper, for the manufacture of gypsum from the hopper is transferred to the rotating drum with a temperature of 510-700 0C. The dimensions of the finished gypsum are 165 microns, gypsum grades G-7, G-5. The capacity of the production shop is 25 tons / hour, 600 tons / day, the shop is equipped with a cyclone with a capacity of 50 thousand m³ / hour, the height of the source is 25 meters, the diameter is 0.56 meters. Dry building powders production workshop. The workshop produces 7 types of dry building powders. For the preparation of building powders, an additional chemical Rotter is added. Finished products: satin, faience, comfort, Eco rotter and others. The workshop has two sections, each section has 4 containers with a volume of 60 tons and three mixer in each section. Building mixtures are prepared by order of construction customers. Carrying out detailed studies in order to determine the parameters of emissions, to identify the dynamics of their change at different stages of the technological cycle is often beyond the power of the developers of treatment systems, which is why they have to use data on more or less similar processes. In order to exclude the possibility of gross errors, it is necessary to first study the features of the production facility and the technological process as a source of

emissions. Among the large number of factors that should be taken into account, one can single out a number of common and necessary in the development of treatment devices [3.4].

METHOD OF RESEARCH

Simple dust collectors reduce the dust flow in the existing aspiration pipe and affect the dust particles on the pipes, reduce the dust content in the air, increase the dust holding efficiency by trapping dust particles. The research method is carried out by sampling the dust flow from the inlet and outlet of the source. The aim of the work is to reduce the amount of dust that forms in the production hall and is released into the atmosphere. At the same time, the share of atmospheric dust in the air at the site, within the boundaries and outside the enterprise, if the population is close, does not exceed the permissible air throughput. Adverse effects on the environment and human health are prevented [5-8]. The calculation was carried out at the source No. 11, which is equipped with electrostatic precipitators. The organized source is equipped with a cyclone electrostatic precipitators, source parameters: source height $H = 12$ m, source diameter $D = 0.56$ m. The source operating time is 2320 h / year, the outside air temperature during the measurement is 24°C . Before the cleaning process, the speed of the dust mixture was $V_1 = 14.4$ m / s, the dust concentration was $C_1 = 948.2$ mg / m³. The dust mixture consumption was determined by the following expression:

$$W_1 = \pi * D^2/4 * V_1 = 3,14 * 0,56^2/4 * 14,4 = 3,54 \text{ m}^3/\text{s}$$

$$\text{Emission per second: } M_{\text{sec. 1}} = W_1 * C_1 * 10^{-3} = 3.54 * 948.2 * 10^{-3} = 3.56 \text{ g / s}$$

The annual dust emission was:

$$M_{\text{year.1}} = M_{\text{sec. 1}} * T * 3600 * 10^{-6} = 3.56 * 2320 * 3600 * 10^{-6} = 28.06 \text{ t / year.}$$

Dust concentration graph before cleaning is shown in figure - 1.

After collecting dust at the outlet of the treatment plant, the flow rate was $V_2 = 13.9$ m / s, the dust concentration was $C_2 = 156.8$ mg / m³. We determine the consumption of the dust mixture according to the following expression:

$$W_2 = \pi * D_2 / 4 * V_2 = 3.14 * 0.562 / 4 * 13.9 = 3.42 \text{ m}^3 / \text{s}$$

$$\text{Emission per second: } M_{\text{sec. 2}} = W_2 * C_2 * 10^{-3} = 3.42 * 156.8 * 10^{-3} = 0.536 \text{ g / s}$$

$$M_{\text{year 2}} = M_{\text{sec 2}} * T * 3600 * 10^{-6} = 0.536 * 2320 * 3600 * 10^{-6} = 4.48 \text{ t / year.}$$

The efficiency of the dust trap is:

$$\eta = (M_{\text{year.1}} - M_{\text{year2}}) / M_{\text{year.1}} = (28.06 - 4.48) / 28.06 * 100 = 84.0\%.$$

Source number 17. The organized source is equipped with a cyclone, source parameters: source height $H = 25.0$ m, source diameter $D = 0.56$ m. The source operating time is 3480 hours / year, the outside air temperature during the measurement is 24°C .

The dust collector is designed to retain gypsum dust. Before cleaning, the velocity of the dust mixture was $V_1 = 14.2 \text{ m/s}$, dust concentration $C_1 = 764.2 \text{ mg/m}^3$. The dust mixture consumption was determined by the following expression:

$$W_1 = \pi * D^2 / 4 * V_1 = 3.14 * 0.562^2 / 4 * 14.2 = 3.50 \text{ m}^3 / \text{s}$$

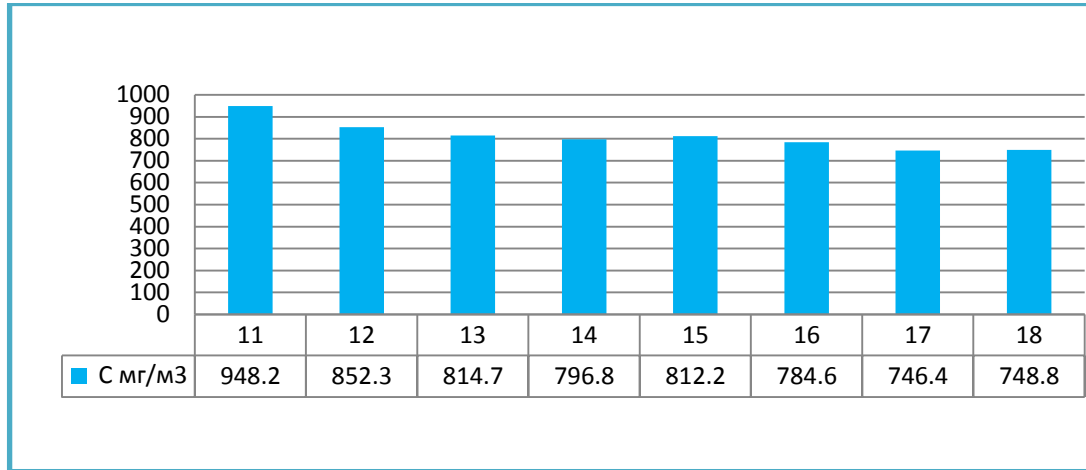


Figure - 1. Concentration of inorganic dust before cleaning in the production hall

Emission per second: $M_{\text{sec. 1}} = W_1 * C_1 * 10^{-3} = 3.50 * 764.2 * 10^{-3} = 2.67 \text{ g/s}$

The annual dust emission was:

$$M_{\text{year.1}} = M_{\text{sec. 1}} * T * 3600 * 10^{-6} = 2.67 * 3480 * 3600 * 10^{-6} = 33.45 \text{ t/year.}$$

Dust concentration graph after cleaning is shown in Figure - 2.

After catching, the speed was $V_2 = 12.8 \text{ m/s}$, the dust concentration was $C_2 = 52.8 \text{ mg/m}^3$. We determine the consumption of the dust mixture according to the following expression:

$$W_2 = \pi * D^2 / 4 * V_2 = 3.14 * 0.56^2 / 4 * 12.8 = 3.152 \text{ m}^3 / \text{s}$$

Emission per second: $M_{\text{sec. 2}} = W_2 * C_2 * 10^{-3} = 3.15 * 52.8 * 10^{-3} = 0.166 \text{ g/s}$

$$M_{\text{year.2}} = M_{\text{sec. 2}} * T * 3600 * 10^{-6} = 0.166 * 3480 * 3600 * 10^{-6} = 2.08 \text{ t/year.}$$

The efficiency of the dust trap is:

$$\eta = (M_{\text{year.1}} - M_{\text{year.2}}) / M_{\text{year.1}} = (33.45 - 2.08) / 33.45 * 100 = 93.8\%.$$

For the rest of the sources, the calculation is carried out similarly to sources No. 11 and No. 17. The efficiency of dust collecting installations is as follows. Source No. 11 -84.0%, source No. 12- 86.6%, source No. 17 - 93.8%, source No. 18 - 94.0%

CONCLUSION

The impact of manufacturing and industrial enterprises on the environment is not positive, even if the ecological state of manufacturing and industrial enterprises is considered satisfactory. Smoke and dust, nitrogen and carbon monoxide generated from them cannot be considered within or within the permissible limits even after passing through the treatment plant. Therefore, it is considered advisable to introduce a more efficient cleaning plant to improve the collection efficiency for dust removal. At construction industrial enterprises, dust is cleaned up to 85% and emitted into the atmosphere. With the use of equipment for cleaning gases using the recommended absorbent movable additional materials, a reduction in the content of pollutants in the atmosphere can be achieved by removing pollutants by 95-98%. If highly efficient dust collectors are installed to retain dust with dispersion of small particles in production workshops of enterprises, they reduce the flow of dust in the aspiration pipe, the amount of dust in the air, and increase the efficiency of dust removal by trapping small solid particles. Thereafter, the emission of dust and other pollutants does not exceed the maximum permissible concentration (MPC).

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