INFLUENCE OF MINING WORKS FROM BERBESTI PERIMETER ON AIR QUALITY

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Abstract: *The environmental impact of coal exploitation has significant, inevitable and irreversible effects on aquatic systems, air, natural mineral resources, ecosystems, climate, geomorphology and landscape, land use and human collectivity*

Key words: pollutants, parameters, mathematical modeling, monitoring the level of dust

1. Introduction

Berbesti career with Panga I career and Oltetul career are recently detached from the Oltenia S.A. Power Plant Company, Branch Mining Division Tg-Jiu, carrying out its activity from the beginning of 2015 in the Mining Division - CET Govora, Valcea County. From the territorial-administrative point of view, the Berbesti quarry is located in the western part of Valcea County, within the Amaradia-Taraia mining perimeter and spreads over the Berbesti, Sinesti, Alunu communes, near the border with Gorj County. The nearest urban settings are: Horezu at 33 km, Ramnicu-Valcea at 75 km, Tg. Carbunesti at approx. 45 km and Tg. Jiu at approx. 70 km, which together with the neighboring communes provide the necessary labor force.

2. Description of activity in Berbesti mining perimeter

The elements that particularly individualize the area are on the one hand the existence of energy resources, and on the other hand, the very special nature of the activities in the natural environment. To this is added the sometimes unbalanced punctual effects of the environmental factors produced by the exploitation activities.

The future development of activity until 2031 took into account the demand for lignite on the domestic market. Career Berbesti began its activity in 1980 with the purpose of exploiting the lignite by up to date mining works at a projected production capacity of 1300 thousand t/year, to be achieved in 1985. The opening of the mining perimeter started with the works : inclined conveyor belt, rotor excavator access road, preliminary excavations with classical means, at + 420m elevation, opening of stairs between 275-420m. The production capacity of 1300 thousand t/year has been reached and exceeded; during the quarry production has been achieved over capacity projected in the years 1988-1989.

3. Air quality

As is well known, the air is the carrier of many pollutants, which easily spreads it on the surface of the land.

Area specific activities are: agriculture, exploitation of lignite, woodworking, animal husbandry.

Taking into account the specific activities of the area, the main sources of air pollution that can be considered are: exploitation of lignite, combustion of fuels for the heating of living quarters and the production of food (sources of carbon dioxide, carbon monoxide, nitrogen

oxides and sulfur oxides), mobile sources (cars, means of transport) generating carbon oxides, sulfur oxides, nitrogen oxides, lead, benzene.

4. Pollution and protection of air quality

The effects of the air quality change caused by the Berbesti quarry will materialize by the possible increase in the mining perimeter of the concentration of dust, gas and smoke resulting from the development of the technology in the quarry.

The most important points of manifestation are:

• in the excavation area;
• in the tailings deposition area;
• at the points of discharge of the front strip on the connecting strips;
• at distribution nodes;
• depositing the coal in the warehouse and its expedition;
• on access roads.

Another potential source of air quality alteration is the self-ignition of coal from storage or from the quarry. Due to incomplete combustion, carbon dioxide is released in the air and small amounts of sulfur dioxide, light hydrocarbons - toxic substances whose concentrations do not usually exceed the limits allowed. By oxidation of the deposited coal, the calorific power loss in relation to the fuel mass (Qsmc) is produced. Taking into account the technological process carried out in the perimeter, the sources of pollution of the atmosphere can be considered:

- related fixed machinery
- mobile machinery related to the process of: discontinuous flow extraction with classic machines and auto transport, supply of material and spare parts at the point of work on the technological flow with auto means, landscaping and superstructure bands, landscaping and superstructure access, rehabilitation / installation of technological equipment, soil modeling and biological recultivation works.

Fixed equipment related to the technological process

The activity carried out in the quarry, the exploitation of the lignite on the surface, is the main source of pollution of the atmosphere with powders. Excavated rocks are mostly friable, with low mechanical strength, to which a reduced humidity is added, especially in the warm season, leading to the formation of sedimentary dusts.

Air Purification Areas with Powders:

a. Working area of the rotor excavator in the working front

In the case of the method of excavation block transverse to the advance direction during the cutting operation, the discharge of the trays on the band # 1 of the excavator and further relay strip to discharge the tape main flow, it releases a large amount of dust. Other sources of dust in the working front form the fall of the rock on the step, to the base of the slope during rotor operation, the fall of the material stored in the cups on the band no. And in the crushing of bullets in the crushing plant on the excavator.

b. On the conveyor belt route

On the transport route, dust is formed during the spill of the mining mass from one strip to another. The main factors influencing the high concentration in the case of belt conveyance are:

• Reduced humidity of the mining mass;
• reduced atmospheric rainfall;
• high transport speed;

• The drop height on the pickup belt.

c. Return to production points (concentration of production)

In addition to the factors listed above, the concentration of the production of all the technological lines in the flow in the distribution node occurs, which increases the concentration of dust. These areas are relatively isolated from human settlements.

d. In the coal deposit

d.1 On storage of lignite

From the distribution point, the coal is taken up on strips and deposited with the stacker.

In addition to the above-mentioned factors that lead to dust formation, the addition of coal from the deposition belt is added and the discharge from about 5-10 m high, the attendant aiming at the lowering or lifting of the boom corresponding to the increase of the deposition cone so that the distance between the tip of the cone and the spillway of the strip or as low as possible.

d.2. Excavation of coal in the warehouse

Excavating machine is used to excavate the coal from the warehouse. The main source of dust formation is the loading of the cups, their rotation and the discharge of coal from the transport lane that discharges the production into the expedition.

e. Shipping - loading in wagons

Coal from storage is routed through conveyor belts to the dispatch station, where it is loaded into wagons. The fall from the height of approx. 1-2 m, favors the formation of a high concentration of dust.

f. At waste disposal

Hailing of tailings resulting from the discovery of lignite layers in the quarry is done in the inner pit of the quarry and the Jigai outburst. Dust is formed when depositing tailings in the dump. Quantification of emissions resulting from excavation, transport and waste dumps and caravans.

Monitoring points:

• access road T703
• access road T704
• access road charcoal

At the time of sampling and measuring in situ excavators in quarries worked in sterile and complex, cutting with high-capacity excavators with a rotor and conveyor belt conveyor mounted in the relay on the technological flow.

Powder level monitoring - PM 10

Determinations were made with "air sampler, GILIAN".

TABLE Nr. 1

Monitoring point (averige)	**Measured value (averige)**
Access road T703	12µm3
Access road T704	11µm3
Access road charcoal	13µm3

Mobile machinery

The main specific pollutants are represented by:

• suspended powders, sedimentable powders;
• burning gases.

In the case of the supply of material and spare parts to the point of work on the technological flow with means of auto, on the access roads in the quarry, dust forms, which if not splashing with water represents a danger to the health of the personnel that unfold themselves activity in the area. We appreciate that air pollution in the fueling, maintenance and repair of the means of transport is low and can be neglected. Mobile equipment involved in the perimeter activity will generate emissions in the form of dust and combustion gases (NOx, SO2, CO, CO2, CH4, NMVOCs).

TABLE No.2

Machine type	**SNAP code**	**Specific consumption**
Bulldozer	080810	13-16 l/h
Excavator	080805	28 l/h
Front loader	080823	15 l/h

TABLE No.3 Emission factors for the main components of the combustion gases

No.	Pollutant	UM	Emission factor
1	NOx	g/kg fuel (diesel)	48,8
2	NM-VOC		7,08
3	CH4		0,17
4	CO		15,8
5	NH3		0,007
6	N2O		1,3
7	PM		5,73
8	Cadmium	µg/Kg fuel (diesel)	0,01
9	Copper		1,7
10	Chromium		0,05
11	Nickel		0,07
12	Selenium		0,01
13	Zinc		1
14	Benzo-a-anthracene		80
15	Benzo(b)-fluoranthene		50
16	Dibenzo(a,h)anthracene		10
17	Benzo(a)pyrene		30
18	Chrysene		200
19	Fluoranthene		450
20	Phenanthene		2500

For transport activity carried out with transport equipment of more than 3.5 tons and using diesel fuel, the emission factors are presented in the tables below.

TABLE NO. 4 Emission factors for heavy metals contained in combustion gases

Nr. crt	Poluant	UM	Factor de emisie
1	Cadmium (Cd)		0,01
2	Copper (Cu)		1,7
3	Chromium (Cr)		0,05
4	Nickel (Ni)		0,07
5	Selenium (Se)		0,01
6	Zinc (Zn)		1

The amount of pollutants emitted into the machinery atmosphere depends mainly on the following factors:

- engine technology level;
- engine power;
- fuel consumption per unit of power;
- Machine capacity;
- Engine / machine age.

Emissions of pollutants decrease the performance of the engine, the trend in the world being the manufacture of engines with lower consumption on the power unit and with the most restrictive control of emissions. In fact, these two elements are reflected by the dynamics of both EU legislation and US legislation in the field. For the means of transport, the above assessments of the correlations between pollutant emissions and engine technology, fuel consumption per unit of power or 100 km, vehicle age, etc. are also valid. The main area of emission of pollutants resulted from the road transport activity of the tailings, as well as of the supply of material and spare parts at the point of work on the technological flow is considered the amplitude of the extended activity zone laterally, on one side of the axle road with about 25 m, which leads to an impact area of approx. 50 m wide. The equipment (excavator, bulldozer, front loader) instead moves at reduced distances in the work area; a uniform distribution across the emission work areas is considered. Maximum concentrations of pollutants occur within this area. Dispersed studies completed with measurements show that concentrations of pollutants in the air are substantially reduced outside this area. Thus, at 20 m outside this strip, the concentrations are reduced by 50% and over 50 m the reduction is 75%. Throughout the transport route, the distribution of pollutants is considered uniform.

5.Conclusion

The impact on air produced by coal mining activities in the Berbesti mining field is local, temporary and refers to:

- suspended and sedimentable particulate emissions in the phases of excavation, transport, sterile dumping, charging and dumping, with local effects around the points of activity and limited in time over the actual activity periods;
- emissions of sedimentary gases and dusts in the air due to the operation of mining perimeter of own or leased internal combustion

machinery and means of transport;

• Acoustic emissions of different origins, fixed or mobile, produced by technological equipment or means of transport, with local effects, limited to hundreds of meters from the origin of the source and limited in time for their operation.

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