STUDY ON IMPACT DEWATERING WORKS IN THE ROSIA JIU CAREER ON THE ENVIRONMENT

Popa Roxana Gabriela, *University ,,Constantin Brâncuși,, Târgu Jiu, ROMÂNIA*
Călinoiu Maria, *University ,,Constantin Brâncuși,, Târgu Jiu, ROMÂNIA*

ABSTRACT: Mining is located in Rosia Jiu Rovinari mining basin and its activity lignite exploitation by mining method combined with partial transport and internal transport tailings dump dump partial interior based extraction flow technology continuous large-capacity machines . Mining contributes to environmental pollution by large quantities of waste they produce and their diversity . It is necessary to loosen formations or aquifer dewatering , drainage and waste water that is inside masses of rock and coal for operations in normal conditions. For quantitative assessment of pollution levels produced in the quarry dewatering works Rosia Jiu, were sampled from environmental factors ael , surface water and air , the methods established by the regulations in force. Samples were analyzed according to STAS sites in force and as the results were given grades of creditworthiness for each medium . To assess the impact on the environment , we used the method of evaluation of the state of global environmental pollution by calculating IPG .

KEY WORDS: career, dewatering, impact, environment

1. INTRODUCTION

Rosia mining Jiu is located in the mining basin Rovinari municipalities, across Bâlteni Farcasesti and in the vicinity of Rovinari, at a distance of 30Km south of the county town of Targu Jiu and is engaged in operating lignite.

The rocks that make up the area are part of the soft rock, blunt, such as clays, sands and gravels. From the morphology, career area is part of the Piedmont Plateau, and the geographically, from the Jiu platform. Located in the interfluve between Jilţ and Jiu, career develops over 1/3 of the area in the Jiu valley and the remaining 2/3 in the hilly area. The perimeter includes two areas:

- meadow area (located between the regulated and the localities of Jiu Farcasesti, Farcasesti Mosneni, Rosia Jiu and Rovinari)
- hilly area (bounded by the North Valley Timişeni and by the south Valley Pârâului)

Lignite deposit area Rosia Jiu career includes 12 layers (I - XII) in the hilly and 10 layers (I - X) in the meadow, where erosion has removed layers of Jiu XI and XII. Due to the thickness of up to 2 meters and couch presence of sandy rocks and the roof thereof which mainly put strong aquifers, the layers I - IV are coal seams. Complex layers contain exploitable lignite V - X in the meadow and V - XII in the hilly area.

Rosia de Jiu career is applied mining method combined with partial transport and internal transport tailings dump dump partial inner extraction technology based on continuous flow of high-capacity machines.

Mining contributes to environmental pollution by large quantities of waste they produce and their diversity. It is necessary to loosen formations or aquifer dewatering, drainage and waste water that is inside masses of rock and coal for operations in normal conditions.

Removing water from the quarry is done using fixed or mobile pump stations located in small points as shares. Collecting water is through pipes and canals dug working steps. Evacuation is as far from the space career through metal pipes, so water does not seep

collected and return to their careers. Dewatering activity leads to reduced groundwater resources (Figure 1.).

Figure 1. Dewatering and drainage of career

Dewatering vary depending on the mode of extraction of water from the reservoir and the processes and equipment used for this purpose. Surface drainage can be performed through the purge:

- deep (represented by drilling systems, drainage or absorption)
- shallow (with trenches, channel filter installations, horizontal drilling)

Drainage by underground methods is achieved by underground wells , sumps , drainage gallery and special installations . Dewatering methods can be combined , using both types of work , and for dewatering of underground aquifers and artesian water loosen the couch deposits , apply several procedures and methods of drainage (by drilling , galleries, trenches), the frequently used asdewatering wells equipped with submersible pumps.

Annually, the quarry is discharged a volume of 30 million cubic meters of water. To remove one ton of coal layer V is necessary to evacuate a 51 cm water year is 20 million cubic meters evacuated water from the hearth career, including the drilling of artesian drainage, 4 million cubic meters of wate.

Water management is an important issue in careers in using minerals and rocks in areas where hydrographic regime, hydrogeology and rainfall is complex. Inadequate water management in quarries produce flooding works, rash caused by artesian waters, landslides and land slopes, damage machinery. A wet rocks and minerals than 25% by weight hourly productivity of the cutting machine is reduced to 25-30%, due to the capacity of bonding to the material of the cutting bodies of the excavators.

Water from the pits of percipitaţii and infiltraţtii is discharged via pump stations. Pump systems are used for drainage of steps and hearth career, distinguished:

- main pump stations (referred to in the opening of the quarry projects which discharge water from the general drainage and dewatering)
- secondary pump stations (designed to evacuate water ocazinală accumulated in different parts of career).

Main pump stations can be fixed and movable, and those can be fixed surface and groundwater. Fixed careers pump stations will be located in areas away from slopes landslides and faults which can affect their functioning. In Figure 2 has an RDP pump station with a capacity of 1200 m³ / h, located in the upper Rosia de Jiu career and a pump station with a capacity of 1400 m³ / h, located in layer V of the quarry.

Figure 2. Pump station located in upper layer V and career

Basins sumps are connected to the home water pump through suction. The main pump stations and underground quarry, water collection basins are concreted. Their position pump house can be vertical or inclined. At the mouth of each water collection basin shall be provided metal slats entering the sumps retaining pieces of rock and various materials.

In Figure 3 presents a sump located in the upper pit and a sump pit located on the site.

Figure 3. Sump located in the upper hearth career and career

2. MATERIALS AND METHODS

For quantitative assessment of pollution levels produced in the quarry dewatering works Rosia Jiu, were sampled from environmental factors aol , surface water and air, the methods established by the regulations in force. Their analysis was performed with standards and methodological standards.

Having regard to activity of lignite operation over a long period , there is the possibility of soil and water bodies. Because of diffuse sediment particles and particulate matter in ambient air in residential areas near the target site were conducted immission measurements. Was measured noise equivalent measurements being made in the receptor protected. Rainwater drain pits of fireplaces gravity through channels in the river Jiu, restitution is controlled in terms of total suspended material from settling systems.

Soil samples were taken from the on-site substation and the location of sampling points were taken into account electrical potential oil spills containing PCBs. Sampling was carried out at a depth of 0.3 m, with a soil probe. Layers have been described as plant and soil were determined PCBs by the method cromotografiei coupled with gas-mass spectrometry. The geographical coordinates of the sampling points of soil are presented in Table 1.

Table 1. Points of soil sampling

Code sample	The geographical coordinates of sampling points	
	N	E
R1	44,87225	23,20518
R2	44,87730	23,18846
R3	44,87603	23,21165
RD1	44,89079	23,17036
RD2	44,89058	23,16686
RD3	44,98170	23,16651

Surface water samples were taken from anthropogenic channel draining groundwater and rainwater inside the pit. Groundwater groundwater and rainwater is collected only to conventional clean surface water sample section downstream from the confluence with the river Jiu in order to quantify the effect of quarrying activity on surface need not be a sample of water from an upstream section. Were considered relevant hazardous substances and priority hazardous heavy metals spectometriaei method of inductive coupled plasma mass and hydrocarbons by solvent extraction and gas chromatography. The analysis results were compared with regulated limits on water quality classification.

The air samples were collected given that significant sources of air pollution are located in Rosia career coal deposit, located between the village Fărcăşeşti and the city Rovinari, consisting of two stacks of coal. In terms of sediment and particulate emissions of particulate matter , pollution sources are diffuse , linear (coal transport conveyor belts) and surface (coal train loading granites and training by air currents from the stack of coal). To quantify particle concentrations in ambient air measurements were performed at four points, two for depositing particulate measurement and two for particulate matter PM10. To measure the dust settled , the first sampling point was located in the village Farcasesti and the second at a distance of 150 m in the north- east of the coal deposit, the town Rovinari. Emission measurement of particulate matter sampling points were located in the area Farcasesti at a distance of 100 m in the south- west of the coal deposit . The first sampling point was located on the

west side of the stack in a local garden , and the second point was located in the eastern part of the stack in another local garden . Point air sampling are shown in Table 2.

The equipment used for the sampling of ambient air was:

-Sensor with digital display TESTO complex climatic GmbH Tipus: TESTO 400

-Multifunction Sensor Type: TESTO (0635.1540). Tube Prland

-Electronic digital manometer Greisinger GMH 3150

-Camera immission samples Controlflex Type: Aeromat 2000 A

Also, measurements were made of the noise in protected areas, with sound level meters with filter type A were performed three measurements, day and night, every measuring point is located in front sonometrele protected targets (homes in common Farcasesti). Distance from the front was protected targets 3m and 1.5 m distance from the ground is the average results calculated according to the relationship:

$$Laeq=10*\log\left(\sum^{t1}10^{*/10}\right) \quad \textbf{(1)}$$

In the CR 5 and CR 6 points were not carried out măasurători of noise during the night because of noise sources (conveyor) have not worked. Weather conditions that were used to determine the noise are shown in Table 3.

Table 3. Weather conditions that were used to determine the noise

Weather indicator	Day	Night	U.M.
Windspeed	0,2	0,4	m/s
Temperature	24,6	17,5	°C
Barometric pressure	994	1002	hPa
Relative humidity	60,4	37	%

To assess the impact was used comprehensive evaluation method of the state of environmental pollution. In this sense, environmental factors, has embarked on a scale of creditworthiness, by granting a note expressing Zooming ideal condition. Scale reliability include:

- creditworthiness grade 10 regarded as the ideal state of the environment.
- creditworthiness grade 9 granted for imissions falling within the maximum permissible

For immission measurement whose value is greater than the maximum allowed, given solvability note is the product of the number 9 and the ratio of the maximum allowable immission measured value. Scale for global pollution index:

I=1, the natural environment The activity unaffected by human

I=1-2, medium subjected to the effect of human activity within the allowable limits

I=2-3, medium subjected to the effect of human activities, causing discomfort life forms

I=3-4, environment affected by human activity causing disturbances life forms

I= 4-5, medium severely affected by human activity, dangerous life forms

I = over 6 degraded environment, life forms inpropriu

3. Results and discussion

Concentrations of PCBs determined in soil samples (mg / kg DM) compared to values governed by the laws in force, are shown in Table 4. Indicator analysis of soil samples collected PCB inside the site, have revealed the following results: in the section R1, the total concentration of PCB's in the threshold of intervention (5.04 mg / kg), but more than 5 times the threshold of intervention 1.0 mg / kg for less sensitive use of land.

Table 4. The concentrations of PCBs from soil samples analyzed and compared with PA and PI

Sampling point	Concentrations determined	Normal values	PA	PI
RD1	Nd	<0,01	1,0	5,0
RD2	0,035	<0,01	**1,0**	5,0
RD3	Nd	<0,01	1,0	5,0
R1	**5,04**	<0,01	**1,0**	**5,0**
R2	Nd	<0,01	1,0	5,0
R3	Nd	<0,01	1,0	5,0

Metals and hydrocarbons concentrations determined from prebele of water, compared to limits are shown in Table 5. It is found that

the concentrations of heavy metals and hydrocarbons do not exceed the maximum limits and determined values correspond to Get Quality category.

Table 5. The heavy metals and oil determined in water samples

Quality indicator	Measured concentration (µg/l)	C.M.A (µg/)
Cd	<0,01	1,0
Cr	<0,01	2,5
Ni	8,87	10
Pb	0,04	0,4
TPH-GC	21,2	200

The concentration of sediment particles and particulate matter in ambient air due to fugitive emissions from coal storage are presented in Table 6. Ambient air concentrations of fine sediment and PM 10 exceed the maximum limits.

Table 6. Quality indicators determined concentrations of air samples

Sample code	C.M.A	Concentration determined
RD1	**17** g/m²/month	32 g/m²/month
RD2		29 g/m²/month
RD3	**50** µg/m³	183,85 µg/m³
RD4		175,26 µg/m³

In Table 7 are given the noise levels determined day and night of the measuring points compared Career Rosia de Jiu permissible values. For the level of noise during the day, the high values exceeding the range of 12-14%, is recorded in all the sampling CR-1, CR-Cr-5 and 6, and the other section where measurements are made, overtaking noise levels are lower, being close to the bottom.

Creditworthiness notes that were given are shown in Table 8.

The ideal state is represented by a regular quadrilateral area S1 and the ideal state is represented by rectangles with area S2, enrolled in regular geometric shape ideal state. Global pollution index, PGI is S1/S2.

S1 = 200

S2 = 98.92

IGP = 2.0218 (subject to human activity and the environment is causing discomfort life forms.

Table 2. Point air sampling

Code sample	Location of sampling points		Indicators analyzed	Distance from the deposit (m)	Department to deposit	The averaging period
	N	E				
RD1	44,89135	23,16016	sediment particles	100	SV	30 zile
RD2	44,89170	23,16651	sediment particles	150	NE	30 zile
RD3	44,89135	23,16016	PM10	100	SV	24 ore
RD4	44,89156	23,16812	PM10	100	SV	24 ore

Table 7. Sound levels determined in day and night measuring points

Measuring point	Allowable amount day (Laeq dB)	Allowable amount night (Laeq dB)	Noise equivalent measured day (Laeq dB)	Noise equivalent measured night (Laeq dB)
CR-1	50	40	59,8	52,3
CR-2	50	40	50,2	48,3
CR-3	50	40	51,6	47,2
CR-4	50	40	53,2	48,1
CR-5	50	40	68,0	-
CR-6	50	40	61,1	-

Table 8. Notes creditworthiness awarded for environmental factors in career Rosia de Jiu

The environmental factor analysis		Note creditworthiness given	Observations
Soil		8,33	Overcoming the indicator PCB concentrations in section R1
Surface water		9	No exceedances of the CMA
Air	Immission	3,77	CMA are exceeded 1.79 times the dust settled and 3.59 times the particulate matter PM10
	Noise	7,35	There exceeded the permissible sound level of between 12-14%

3. CONCLUSION

Mining contributes to environmental pollution by large quantities of waste they produce and their diversity.

It is necessary to loosen formations or aquifer dewatering, drainage and waste water that is inside masses of rock and coal for operations in normal conditions.

For quantitative assessment of pollution levels produced in the quarry dewatering works Rosia Jiu, were sampled from environmental factors ael, surface water and air.

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