IDENTIFICATION OF HARMFUL IMPACT ON THE WORKING ENVIRONMENT OF OPERATIONS IN " BUCHIM " MINE

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Abstract

The tailing is one of the riskiest facilities within the mining complex. The data show that the tailing there is a largest share of adverse impacts on the environment and possible disruption of the stability of the tailing dam and the consequence is the outpouring of waste rock out of mine.

In this paper will be present the harmful environmental impacts caused by the performance of work operations within the mine and that: adverse impacts on water, air and land and will be proposed measures for their reduction.

Introduction

The environment is a complex system whose components are interrelated and dependent on each other so that changes in one part can cause changes in other parts. That is why the issue of protecting the environment from harmful influences, can only be dealt with systematically integrated approach.

Tailing dump as object is certainly one of the riskiest facilities throughout ore complex.

Flotation Tailing dump which accumulate large amounts of very fine, mixed with chemically contaminated water, a technological need, but also a real danger to the environment.

In order to provide protection measures, it is good to know the negative impacts of flotation tailing flotaciskite jalovishta.

Within this paper will be referred to the harmful environmental impacts caused by the performance of work operations within the "Buchim" mine and will be proposed measures for their reduction.

THE IMPACT OF TALLING ON ENVIRONMENT

Influence of flotation tailing on the environment, in terms of design and controlled exploitation can be viewed through the following elements:

- Taking of land for their establishment;

- Pollution of surface water flows in the discharge of excess water or overall deposition lake and discharge of drainage waters;

- Pollution of underground water flows and filtration waters;

- Air pollution in fine particles from the parched slag, which are distributed under the effect of air currents;

- Pollution of land in the deposition of particles blown by the wind or a contamination by polluted waters;

- The potential risk of accidents during the destruction of levees that can result in major damage and possible casualties.

Adverse impacts on the environment and the immediate working environment of the working operations to be carried out within the process of surface mining of copper ore mine in the mine can be grouped into two main groups:

- degradation of the earth's surface and
- Pollution of the environment.

The pollution of the environment is manifested through pollution: soil, water and air.

SOIL POLLUTION

The pollution of soil in the vicinity of the mine "mine" is limited to the immediate area around the mine through aerosedimentacija or accumulation of dust emitted during mining operations, as well as the soil near the beds of rivers that flow through the mine waste water.

Actual analysis of samples of soil near the river Topolnica confirm that the level of contamination with salts of heavy metals in soil is above the allowed (Table 1). These assays are made within the study for assessing the environmental impact of the operation of the Buchim mine.
Test samples were taken at a distance of 25 m left and right along the River. Samples of soil taken from the layer which is located under the humus layer near the flotation tailing above village Topolnica.
Through chemical analysis performed on samples of soil along the river Topolnica identified increased concentrations of heavy metals in soil Fe, Cu, then Al, Ba, Ni, Zn, Cd, As and these concentrations are above the maximum allowable.

Special measures to protect soils from pollution by harmful substances are not provided because their pollution will be prevented through indirect measures to be taken for purification of waste water and measures to protect against air pollution.

Table 1.Results of the chemical analysis of soil samples

MDK	Metal	Buchim
		measured values (µgr/l)
		Tailing dump
(%)		(%)
0,26	Al	2,20
1,40	Fe	4,84
	Ca	1,65
	Mg	2,00
	Ma	0,131
	K	1,41
0,040	Mn	0,072
	Ti	0,182
	P	0,162
[mg/kg]		[mg/kg]
17,50	Cu	35,00
49,00	Sr	20,81
0,70	Ba	244,05
9,90	Ni	25,84
10,00	Cr	55,22
22,50	Zn	87,97
10,50	Pb	8,71
10,00	Co	19,68
0,20	Cd	6,64
50,00	V	79,00
1,10	As	3,08
< 0,5	Ag	0,53

Note: analysis was made in chemical laboratories of FNTS Stip

WATER POLLUTION

Although almost 95% of the wastewater system through technological processes of recirculation of the dam Topolnica again returned to production processes still a fraction of the contaminated water is discharged into nearby waterways performing their contamination with harmful substances.

According to the performed chemical analysis of samples of wastewater was determined that under the water klasification these waters belong to water class III, or contaminated water, which is especially pronounced concentrations of copper. Because it is polluted waters is proposed the following measures to protect water:

- measures to reduce the amount of water coming out of the zone of mine
- measures for purification and quality control efluentnite waters.

Also, as a result of long term discharge of contaminated water comes to the accumulation of harmful substances on the sides of the bed and around him, which leads to contamination and the surrounding land. So, water is a transporter of hazardous substances.

The waters of the drainage system from tailing dump of Buchim mine directly goes in the Topolnica river on which bed is built landfill for flotation slag, essentially is neutral to basic (pH 6-7) because flotation slag which is discharged into the landfill is extremely basic.

Table 2. Results of chemical analysis of water from r.Topolnic apropos draining water from tailing dump

Classification according regulation of division of water			metals	Water from r. Topolnica inflow Jasenov Dol	
I-II class	III-IV class	V class		measured values (μgr/l)	
MDK (μgr/l)				TP1	class
30	50	>50	As	169,27	V
2	20	>20	Ag	0,1047	I
100	100	>100	Ti	25,452	I
1500	1500	>1500	Al	150,14	I
1000	4000	>4000	Ba	56,405	I
50	100	>100	Ni	1,7152	I
50	1000	>1000	Mn	57,104	III-IV
300	1000	>1000	Fe	43,837	I
50	100	>100	Cr	-0,673	I
100	200	>200	V	1,6428	I
			P	47,352	I
100	200	>200	Zn	3,3533	I
10	50	>50	Cu	57,745	V
10	30	>30	Pb	11,497	III-IV
0.1	10	>10	Cd	0,106	III-IV
100	2000	>2000	Co	3,9109	I

Note: analysis was made in chemical laboratories of FNTS Stip)

All the above mentioned findings on the impact of tailing dumps on surface water flows related to the controlled conditions of their exploitation. In practice very often, due to various objective and subjective factors, uncontrollable situations arise, that lead to it in a short period of time the emission of the water hazards increase many times. The reason for their occurrence mostly minor or major cancellations in the transport systemflotation slag, and defects of other ancillary systems tailing landfill. It is especially dangerous if it came directly to the outpouring of slag flotation in the rivers.

AIR POLLUTION

Air pollution is generally expressed by:

- Air pollution with floating fractions of mineral dust (particulate matter) various gases (SOx, NOx, CO), volatile organic substances (VOC `s), methane and other harmful substances including radionucleides

-Change the microclimate and the creation of zones with a specific microclimate, the climate different from the surrounding area, etc.

- Noise as a separate factor of pollution of the atmosphere, both psychological (comfortable) and the physiological aspect.

Characteristic of surface exploitation of mineral resources is that in almost all stages of development of the technological process: escavation earth masses, their transport and again deposition, results with separating the floating mineral particles.

By separating the dust comes in other operations that are part of the evaluation of the mineral resource. These include operations comminution, purification, enrichment and primary processing of mineral raw materials.

Some minor amounts of dust emitted in the phase of geological research and the development of pit and stage in the development of trench in which to build access roads, the usecite otvoranje and various ancillary facilities, creates dust, but with less intensity, which usually differs from the intensity of the separation of dust in the same activities that are not part of the mining industry.

Machinery, vehicles and other mining equipment used in the process of getting the copper emissions NOx, SOx, CO and volatile organic compounds, which increase the amount of harmful substances present in the air.

Given the fact that the mine mine were not done measurements of emissions of harmful components, is made the same assessment. To this aim ,is used methodology which was recommendation by the USEPA and Australian NPI for Mining Industry.

The estimate is based on real (material) parameters for the intensity of individual activities (mentioned above) in the mine that are considered sources of emissions of harmful components in the air. These estimates of emissions aircontamination which assumes that goes out from the immediate area of mining activity and has national significance (such as greenhouse gases).

Depending on the degree of sigurnost factor of any given set of factors is an evaluation (rating) according to the following system:

A - Excellent reliability

B –above average security

C - average security

D – below average security

E - small security

U –unranging

Table 3. Assessment of fugitive emission from primary processing (preparation) of metallic mineral resources of the Buchim mine

Data on working hours					
Total working days					240 anual
Total hours					16daily
Working hours per year					3840 h/year
Capacity					4000000 t/year
	DEF (kg/t)		Фактор	Estimated emission (kg/god)	
	TSP	PM_{10}		TSP	PM_{10}
Activity					
Primary crushing	0,2	0,02	C	800000	80000
Secondary crushing	0,6	0,06	D	2400000	240000
Tertiary crushing	1,4	0,08	E	5600000	320000
Sowing, classification	0,08	0,06	C	320000	240000
Loading, unloading, transport and storage	0,06	0,03	C	240000	120000
Total plant for the preparation of mineral raw materials				**9360000**	**1000000**

Table 4. Total fugitive emissions and solid particles in the air from mining operations and facility for primary processing of mineral raw materials

Source of show	kg/anual					
	TSP	PM_{10}	CO	NO_x	SO_x	VOC_s
Blasting	5451,94					
Transportation	421950	104400				
Reciprocating internal combustion		14602	15505	40275	1918	3140
Primary plant preparation (comminution and classification)	9360000	1000000				
Flotation slag dump	97500	48750				
TOTAL	**9884902**	**1167752**	**15505**	**40275**	**1918**	**3140**

Because visibility light emission of gases and dust resulting in a series of negative changes, which significantly impair the overall environmental acceptability and image of mine, condition and possible problems before the inspection authorities are responsible for control of hygienic and technical conditions at work, because it is urgently necessary to overcome it.

To prevent the broadcasting of harmful particulate matter in air are proposed following categories of safeguards:

-control measures fugitivnata dust in production processes, and

-Measures to control dust that occurs as a result of erosion eol flotation tailing.

In the first category of measures include:

• measures to reduce the dust in the process of the ore usitnuvanje (mills, screens, open disposal sites, etc..)

• measures to suppress dust transport pathways in the mine.

In the category of measures to control dust that occurs as a result of eol erosion tailing flotation include:

• planting vegetation on the final part of the dam,

• technologies for surface stabilization of dust (spray with water and use binderi to create a surface layer).

CONCLUSION

Starting from the fact of interconnection and interaction of individual parts of the ecosystem, as well as technological processes taking place in the mine as the only way that can provide efficient and cost effective solution to the identified problems is integrated - systemic approach in their resolution. Namely, in order to ensure maximum efficiency of the proposed measures, and to ensure their successful implementation, it is their integration into a comprehensive *Plan for control and environmental management (EMP) in the zone of influence of mine*. This plan will be the basis for the possible establishment of a *System for Environmental Management (Environmental Menagement System-EMS)* in accordance with the recommendations of the ISO 14000 series standards.

Flotation postponement could be rehabilitated in the direction of creating new values in the first new plant and animal habitats, forest communities, aquatic habitats and the like.

Literature

Крстев, Б., 2004, „Флотациски хидројаловишта”.

Рударско-геолошки факултет Штип, 2006, Студија за процена на влијанието врз животната средина од работењето на рудникот „Бучим”.

Хаџи-Николова, М., 2008 „Загрозување на животната средина предизвикано од нарушување на стабилноста на земјени брани под дејство на сеизмички побуди“- Магистерски труд.

Case studies on tailings management, International Council on Metals and the Environment United Nations Environment Programme

Management of Tailings Facilities prepared by the Mining Association of Canada, 1998