EVALUATION OF THE IMPACT PRODUCED ON THE ENVIRONMENT BY THE ACTIVITY OF ROSIA JIU QUARRY AND THE POSSIBILITIES TO PREVENT NEGATIVE EFFECTS

Daniela Cirtina, Camelia Capatina

„Constantin Brancusi" University of Targu-Jiu, Faculty of Engineering, 3 Geneva St., Targu-Jiu, Romania; e-mail: daniela@utgjiu.ro

Abstract

The actual mining activity has a varied and complex influence on the environment, materialised by temporary or definitive occupation of a field surface, by affecting, in some cases, the hydrology and the relief surrounding the exploitations, the partial or total degradation of soils and the landscape, changing hydrographical conditions, as well as ulterior change of the environment and the degradation of existence conditions of the inhabitant from the industrial areas. The protection of the environment is accomplished by the reasonable use of the natural resources, by preventing and combating the pollution and the damaging effects of the natural phenomena by means of certain law means. In the present paper it was realised an evaluation of the impact produced on the environment by the activity realised in the Rosia Jiu quarry, being also proposed the necessary measures for the intercession and minimization of the negative effects realised on environment factors.

INTRODUCTION

The mining industry exerts special influences on the environment, and these influences manifest in all the phases of the technological processes of production. The influence on the environmental factors starts at the same time with the activity of prospecting and exploring the deposits and continues to be intensified at the same time with the development of the productive activities. In some cases, the negative influence manifests for a long time, even after the total case of the productive activity in the area. The impact produced on the water occurs due to the perturbation of the underground water resources, but also due to the evacuated used waters inside the quarry. The impact on the waters may be a quantitative impact strictly related to the evacuation of the drying out waters, of the technological waters and of the precipitations one, and also of the used waters in the administrative field that have a high content of substances in suspensions and organic substances [1,3]. The effects of the water pollution by the mining industry consist of: changing the hydro-geographic system by extending the exploitable perimeters and the drying out drillings, changing the pressure, the level and the debits of the aquifer horizons as a consequence of the drying out works accomplished at the surface and underground and changing the quality of the surface waters by discharging the mining, meteoric and waste waters in the emissary. The metal pollution is the most significant impact of the pollution caused by the mining waters, due to its persistence and to its relative easiness that helps it not to be detected. The danger represented by different heavy metals released in the aquatic environment depends on: their persistence in different compartments of the environment (water, substances in suspension and sediments by the erosion of

the fine particles of dislocated soil by excavating works in quarries, by depositing and dumping the excavated material and by depositing the wastes); their toxicity for the aquatic organisms; the bioaccumulation by these organisms [2,4]. The air quality is affected by the technological process in the quarry, dump and coal deposit, by the increase of the powder concentration in certain points of the mining perimeter and by the self-ignition of the coal in deposits or in the layers of the soil surface. Due to the incomplete combustions, CO and, in smaller quantities, sulphur oxides, easy hydrocarbons and other toxic substances are released in the air. The coal self-ignition is unleashed especially during the summer time, due to the high temperatures at the soil level. The motor vehicles circulation determines different emission of polluting substances in the atmosphere, resulted from burning the fuels in the motors of the vehicles as NOx, CO, SOx and particles in suspension [5].

EXPERIMENTAL PART

Rosia - Jiu exploiting perimeter is part of Rovinari mining basin in Gorj county, being placed in the neighbourhood of Rovinari town, 30 km away from Tg-Jiu town. Rosia Jiu quarry is placed in the inter-river between Jilt river and Jiu river, regularized and developed on 1/3 of the surface of Jiu meadow, and the rest in the hilly area, being the biggest quarry in Romania and in the South-Eastern Europe. The activity developed in Rosia - Jiu perimeter of mining exploitment has negative effects on the environmental factors and it needs to quantify these effects and to efficiently administrate them by implementing some actions of preventing the pollution and the protection of the environment. The impact evaluation was accomplished by the systematic analysis of the pollution degree of every environmental factor affected by Rosia – Jiu quarry as it is presented furthermore.

The impact on the quality of the surface waters. The nature and the pollution degree of the surface waters as a consequence of the activities in Rosia-Jiu quarry was established based on the results of the analysis accomplished on the samples of the anthrop channel that drains the underground and pluvial waters inside the quarry. In order to quantify the effect of the activity developed in the quarry on the surface water, there were taken surface water samples from the downstream, at the confluence with Jiu river, the underground and pluvial waters being conventionally clean. Sampling, transporting, conserving and depositing the water samples, all of these were accomplished by respecting the valid standards; the water samples were transported to the laboratory in a cooler bag, keeping thus a temperature where the components of the water sample are not chemically, respectively physically damaged. In the process of evaluating the quality of the waters in Rosia Jiu quarry, we monitored a series of qualitative physical-chemical indicators determined for the samples of used water in the quarry that are discharged by Jiu river (table 1). From the results obtained after the analyses, there are not crossings of the maximum admissible concentrations, according to NTPA 001/2005.

The impact on the air quality. The significant sources of pollution of the environmental air in Rosia-Jiu quarry are placed in the coal deposit composed of two rows of coal piles. From the perspective of the sedimentary powder

emission, the pollution sources are diffuse and they are represented by the coal transport by the transporting bands (linear source), the charging of the train sets with coal and the training by the air streams in the coal pile (surface sources).

Table 1. Physical-chemical indicators of wastewater from Rosia-Jiu quarry.

Quality indicators	Measurement unit	Concentration determined	Maximum admissible concentrations
Material in suspension	mg/l	5,8	35
pH	pH units	7,5	6,5-8,5
Chlorides	mg/l	14,6	500
Nitrates	mg/l	0,8	25
Sulphates	mg/l	14,2	20
BOD_5	mgO_2/l	2,4	25
COD-Cr	mgO_2/l	5,6	125

For quantifying the powder concentrations in the environment, we accomplished measuring in four points, two for measuring the sedimentary powders and two for measuring the powders in suspension PM10. The results of the accomplished analyses in relation to the values regulated by order no. 592/2002 and STAS-12574/87 are presented in table 2, respectively fig.1 and fig.2.

Table 2. The results of the analyses in relation to the admissible values.

Sample cod	Maximum admissible concentrations	Measured value	Standard/Order
RD_11	17 g/m^2/month	34 g/m^2/luna	STAS 12574-87
RD_12	17 g/m^2/ month	30 g/m^2/luna	STAS 12574-87
RD_13	50 $\mu g/m^3$	193,75 $\mu g/m^3$	Order no. 592 /2002
RD_14	50 $\mu g/m^3$	186,18 $\mu g/m^3$	Order no. 592/2002

According to the graphical representations in fig. 1 and 2, we notice that the accomplished measuring crosses the maximum admissible concentration both for the sedimentary powders and for the ones in suspension.

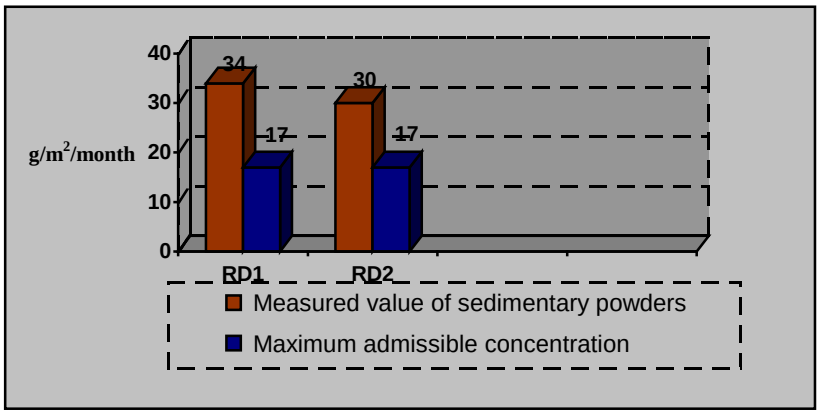

Fig.1. *Graphical representation of sedimentary powders concentration*.

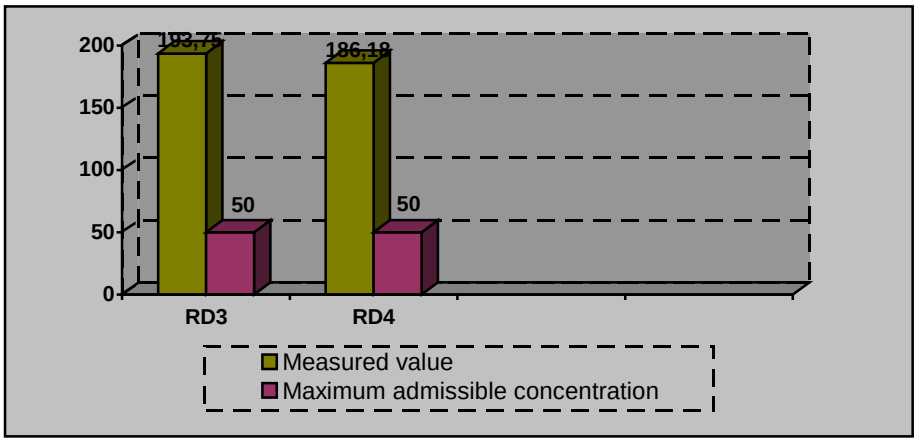

Fig.2. *Graphical representation of powders in suspension PM10.*

Evaluating the phonic pollution level in Rosia-Jiu quarry. In the production sectors of Rosia-Jiu quarries, the noise and vibration sources are represented by excavators, transporting bands and other installations, dumping machines, the workshop for supporting the installations and the circulation of the motor vehicles. The sound effects and the vibrations determined by these sources are received in the working fields (sections, workshops), and also in the dwellings of the citizens in the quarry neighbourhood. In order to determine the noise level, we accomplished measuring in different lapses of time, in six measuring points of Rosia-Jiu quarry (fig.3). According to fig. 3, none of the accomplished measuring crosses the maximum value of the noise level admitted (65 dB) on the field limit.

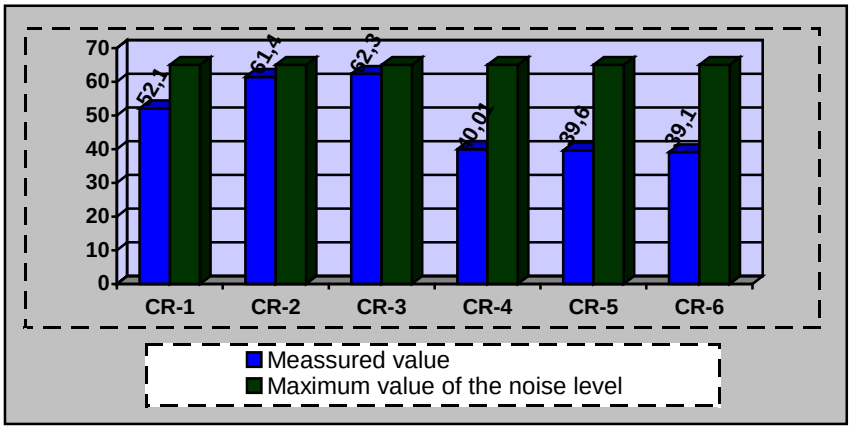

Fig.3. *Graphical representation of noise level on the field limit.*

RESULTS AND DISCUSSION

The mining industry has produced big and diverse quantities of waste, either solid, or liquid, or gaseous, and this is why we will need supported efforts to protect the environment. The prevention of the damaging influence of the solid wastes is based on the application as reasonable as possible of the principles of clean and efficient mining exploitation, following:

- to diminish the waste quantities resulted in the exploiting process and to improve the technical proceedings of concentration and of complex capitalization of the ores in the quarry;

- to occupy field surfaces as small as possible and as less productive as possible, by building waste deposits (dumps or rivers) with the maximum possible height, in the conditions of the chosen field (usually, a valley or a hollow having a reduced economical value), only after removing the vegetal soil and depositing it in order to give it back to the agricultural-forest circuit and to use the solid mining wastes in different fields.

In order to prevent or to reduce at minimum the influence of the waste waters resulted from the technological processes that occur in different sectors of the mining industry, we impose reducing the industrial water consumption and, implicitly, reducing the quantity of waste waters that are not purified and reducing the pollution degree by purifying the not purified waters before evacuating them in the emissaries. The purification methods most frequently used in the mining industry are the physical ones, such as: sedimentation, filtration and electro-flotation, but also the chemical methods, such as the treatment with ion changers, the inverse osmosis, the electro-dialysis, the distillation and the lime neutralization that have to demineralise the waters that are not purified.

Starting from the quantification of the mining activity effects on the air quality that consist mainly of increasing, in certain points, the mining perimeter, the powder, gas and smoke concentration resulted from the motor vehicles in the quarry, the measures that we have to take for protecting the air are the following ones:

- instituting a monitoring network composed of gathering points of the sedimentary powders and of the ones in suspension and adopting organizational and technological measures that should lead to the diminution of the toxic emissions in the atmosphere;

- in summer, when the dust concentration increases in the atmosphere due to the draught, we have mobile sources that could douse the access and handling areas and the roads for the motor tips circulation will be arranged on some emplacements that will avoid the inhabited areas;

- in the coal deposits of the quarries, we accomplish douses, periodical aeration of the coal and a movement of the stocks in order to prevent the coal self-ignition in the hot lapses of time;

- it is necessary the chassis and the remove of the dust on the installations that produce dust in the coal deposits and in order to stop the coal self-ignition, the layers that outcrop will not be completely discovered, and in the roof we will keep a waste layer of about 10-15 cm. After stopping the activity, the coal layers in the embankments will be covered by an impermeable layer (argyle), thick of at least 15 cm, in order to prevent the self-ignition [6].

CONCLUSIONS

The exploiting activity of the coals has a special complexity and a direct action with the negative effects on all the environmental factors: water, air, soil and subsoil, but also on the local communities. The negative influences of the

mining activities consist of impure feature of the surface running waters and of the phreatic ones, the hydro-dynamical imbalance of the underground waters, negative influences on the atmosphere, the flora and the fauna in the area, the relief changes manifested by damaging the landscapes and movements of the households and of the industrial objectives in the exploiting areas. The chemical pollution of the soil may affect for many years its fertile properties, and the noises, the vibrations and the radiations spread in the environment by the quarry activity have a strong unfavourable action.

The mining industry, either directly by the proper exploitation, or indirectly by the installations of stocking-preparing and processing of the useful mineral substances, produces polluting elements for the air. The excavated coal has a low mechanical resistance and a reduced humidity, especially in the hot season, fact that leads to the forming of the powders. The impact of the activities of coal exploitation on the air quality is concretized by: increasing the gas emanations (methane, exhaust gas from the transport means), dust emissions from the coal deposit, waste deposits in the dump, excavating areas. Also the access ways in the quarry and in the dump, by the action of the wind or of the great warmth, become emissions and dust generators. Another possible toxic feature is generated by the coal self-ignition in the deposits or layers that outcrop, by releasing gases with a high percentage of CO come from the incomplete burning and the road traffic pollutes with toxic emissions NO_x, CO_2, Pb, noise, hydrocarbons, smoke etc.

We must pay attention to and consider as especially important the negative influences produced by the mining activities on the environmental factors - water, soil and air – and, as a consequence, the legal regulations, meant to protect the environmental factors and, implicitly, the mineral resources, are imposed to be permanently upgraded.

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