STUDY ON SEDIMENTARY DUST POLLUTION IN THE AREA OF INFLUENCE OF EXPLOITATION ROSIA CAREER

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Abstract: *This paper presents the study of sedimentary dust pollution in the area of influence of exploitation Rosia career in 2012-2013. To monitor the content of sediment particles settled seven sampling points, of which five in the influence area of the deposit of coal and two in the influence area of Rosia career. Interpretation of results for sediment particles was performed according to standard 12574/87. The highest concentrations were measured in sediment particles belonging to the winter season months and January and February. But in this period there were a number of values that have been located, some, well below the permissible limit. Low values of the period of interruption due to mining activities in December and January.*

Key words: *mining, monitoring, pollution, sediment particles*

1. INTRODUCTION

Mining contributes in great measure to the pollution of the environment, both through large amounts of pollutants they produce and by their diversity.

Studies developed on the future development of global mining activity led to the conclusion that this activity will increase, in particular by extending the daily operation of the quarries, where you can get yields significantly higher than those obtained in the underground, which will allow operation at reasonable prices to large deposits of low content useful components.

The negative impact of mining activities on the environment is straightforward, which is strictly the work of extracting the actual deposits of useful minerals and other indirectly related to the processing and use of mining products.

For lignite deposits in Romania located at shallow depths and conditions appropriate relief to all, designed and implemented by exploiting their careers. Quarries have been designed to production capacities between 1 and 8000000 tons/year.

Today, most of the mining areas are becoming more common landscape changes induced as a result of human activities.

Career Rosia de Jiu is located in the mining basin Rovinari, on the territory of the city Rovinari and Farcasesti and Balteni municipalities. It is currently administered by Oltenia Energy Complex.

Opening Rosia de Jiu career started in 1973 and excavation was done by digging a trench's E2000-01 opening from east to west along the entire length of his career.

Career is located in the interfluve between the river and the river Jiu Jilt develops regulated and third in Jiu meadow area and the rest in the hilly area.

Sources of pollution sediment particles in Rosia quarrying are rotor excavators, conveyors and coal depot.

The main sources of dust pollution of Rosia coal deposit are:

- Discharge points on the circuit of coal;

- Coal crusher crushing;
- The end of the coal mill;
- Discharge stack coal deposit by car type ASG;
- The area around the wheel's buckets of KSS to loading operation;
- Motor vehicles in storage

Dumping waste from the coal strata outcropping in Rosia career is the inner dump. Tailings deposition is achieved by direct stockpiling plants dump.

Thus, the steps in the dump tailings deposition can form dust.

This paper presents the study of sedimentary dust pollution in the area of influence of exploitation Rosia career.

2. EXPERIMENTAL

The locations of sampling sediment particles has been considered primarily populated areas closest to the pollution sources mentioned above.

In the context of sampling points for the concentration of sediment in the area of influence pubescent career Rosia were established mostly in these areas.

To monitor the content of sediment particles settled seven sampling points, of which five in the influence area of the deposit of coal and two in the influence area of Rosia career. (Fig. 1)

The location of these points is as follows:

• S1 - located northwest from coal deposit, a distance of about 600 m, and at about 5 m section of the tape carrying Rovinari Thermal coal deposit;

• S2 - V from the storage location to the coal at a distance of 1000 m from it;

• S3 - set to SV to deposit distance of about 300 m;

• S4 - set to S to deposit about 350 m;

• S5 - located northwest to deposit about 150 m away from it and the nearest block of flats in the city Rovinari;

• S6 - located in the influence area of Career Rosia southeast, a distance of about 150 m;

• S7 - located southeast career at a distance of about 300 m.

The determination of the settled powders was realized in conformity with STAS 10195-75 by using the gravimetric method. For the gathering of the samples the figure 2 device is recommended.

In the cold season of the year , to prevent freezing, it is introduced in the collecting recipients a mixture of distilled water and ethyl alcohol instead of distilled water in a proportion of 3%.In the hot season of the year, to prevent the development of microorganisms , it is added in the distilled water from the collecting recipients a quantity of copper sulphate. The collecting recipients' exposure period will be of 30 days. In the event that the water (abundant precipitations) crosses the volume of the collecting recipient, those samples are not taken into consideration.

The recipients that contain settled powders are covered and placed into the laboratory, taking care not to be polluted or to be spilled during transportation. The recipients' exterior is wiped first with a wet gauze and, after with a dried one. By means of a pincers the leafs, the insects and other foreing bodies are lifted, being washed with a jet of distilled water. The content of the recipient is quantitatively passed in a beaked glass with the help of a glass stick provided with a rubber collar at one end. The passing of the sample in the glass is done by means of a bolt with the side of a mesh of 1 mm, the impurities on the bolt then being washed with a jet of distilled water that is placed also in the glass. The sample in the glass is evaporating almost to the point of dryness and the content of the glass is then quantitatively passed in a saggar (porcelain capsule), brought previously at a constant mass at a temperature of 105^0C. The solution from the saggar (porcelain capsule) is evaporated to the point of dryness on the water bath or on the electric hob, being careful that the temperature will not get beyond 100^0 C. After evaporation , the capsule with the sample is wiped at the exterior with clean gauze and kept in the stove at a 105^0 C temperature for two hours . It is cooled in the exicator for one hour and then weighted at the analytic balance. The

drying, cooling and weighting operations are repeated until the constant mass.

Interpretation of results for sediment particles was performed according to standard 12574/87. "Air of protected areas. Quality requirements. "Under this legislation acceptable quality of sediment particles in the air protected areas is 17g / m^2 • month

Figure 1. Location of sampling points for sediment particles

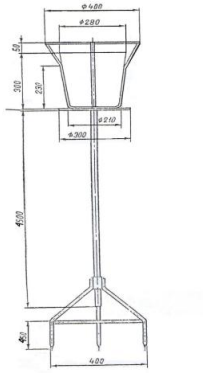

Figure 2. The settled powders sampling device

3. RESULTS AND DISCUSION

The content of settled powders is expressed in g/$m^{2/}$month and is calculated with the ratio:

$$P_{sed} = \frac{(m - 0{,}0177 \cdot V)}{S} \cdot \frac{30}{n} \quad [g/m^2 \cdot \text{lună}]$$

Where:

m- the mass of the settled powders from the sample ,[g];

0.0177-quantity of $CuSO_4$+H_2O added [g];

V- the volume of the collecting recipient, in [l];

S - the surface of sedimentation,[m];

n - the numbers of days for exposure

Table 1 presents the results of measurements made during two years (2012 and 2013).

The analysis of data obtained during the two years of study can make some comments on the statistical data monthly and annual air quality with respect to sediments.

Thus, the sampling point S1, located close to the ribbon section carrying coal to thermal power Rovinari, during 2012 a total of 12 measurements, only two were above the maximum allowable concentration, registering a frequency of exceedances of 16.67%.

Table 1. Values sediment particles in the Rosia career

Year	Sampling point	Month												CMA
		I	F	M	A	M	I	I	A	S	O	N	D	
2012	S1	12,38	18,81	12,99	15,73	7,14	11,52	15,57	14,09	20,54	16,21	14,24	10,85	17g/m^2·month
	S2	12,72	29,05	11,07	14,18	8,60	9,48	10,99	10,16	14,44	12,51	10,54	9,96	
	S3	14,12	45,92	10,96	29,99	21,15	22,69	27,29	31,85	22,33	27,53	21,73	23,27	
	S4	12,65	25,97	14,84	16,29	13,45	12,84	13,28	23,82	25,04	27,97	17,30	15,24	
	S5	13,21	15,34	15,37	15,18	13,23	13,04	16,00	13,06	13,89	15,16	20,84	11,49	
	S6	9,63	33,04	17,66	30,83	24,83	12,76	25,85	9,28	9,83	22,59	7,03	4,64	
	S7	8,81	18,49	14,37	13,01	9,67	18,12	6,76	7,89	11,56	14,73	5,18	8,55	
2013	S1	17,10	16,28	14,16	5,13	10,68	12,65	13,52	12,57	15,13	13,36	12,61	9,63	
	S2	15,72	7,11	9,75	8,29	11,46	8,01	9,74	11,08	10,89	10,13	14,43	10,72	
	S3	25,25	19,69	17,67	14,07	23,95	21,11	21,96	22,32	12,69	18,80	12,13	15,68	
	S4	17,61	17,37	7,96	9,14	14,72	19,07	16,84	15,21	12,98	9,96	13,62	11,74	
	S5	27,18	17,26	13,32	11,21	14,37	15,63	7,01	14,11	17,71	7,76	19,11	13,21	
	S6	12,29	21,48	20,84	7,49	12,58	13,48	11,51	20,43	11,03	17,20	15,24	7,22	
	S7	4,94	12,90	12,04	9,06	6,63	15,03	11,07	10,63	10,76	11,35	9,63	7,16	

Exceedances were recorded in February and September and were by 10.65% and 20.3% respectively over the maximum allowable concentration.

The lowest was recorded in May (7.14 g/m^2 • month) it hovering below the 58% limit.

In 2013, the frequency of exceedances in S1 was lower than in 2012, only 8.34%. The only value that was outside the permissible limit was recorded in January and was approximately 0.6% above the maximum allowable concentration. The lowest concentration of this point in the year 2013 was measured in April (5.13 g/m^2 • month) accounted for only 30.18% of the maximum permissible concentration.

The next point S2, located at a distance of approx. 100 m to deposit carbon, a total of 12 measurements made in 2012, only one was above the permissible limit, which is a frequency of exceedances of 8.34%. It was recorded in February and represented the highest concentration in the year 2012, it being situated approx. 71% above the maximum allowable concentration.

Lowest value was recorded and this time all in May and accounted for nearly half of the limit.

In 2013, the S2 all values obtained were below the maximum permissible concentration. The highest value of settled particles was measured in January and was by approx. 7.5% below the limit.

The lowest S2 earlier this year, was recorded in February and accounted for nearly 42% of the maximum permissible concentration.

The sampling point S3, located at a distance of approx. 300 m south-west of the depot, and near an access road for vehicles, to the highest frequency of exceedances as well as increased values.

Thus, a total of 12 determinations gravimetric made during 2012, 10 were above the permissible limit, which represents a 83.34% frequency of overflows.

Highest concentration during the year was measured in February and stood 2.7 times the limit.

The lowest value was recorded in March and represented approx. 65% of the maximum permissible concentration.

And in 2013 the frequency of exceedances was growing, it represents 75%, which means that out of 12 measures, nine were above the limit.

Even if the number of exceedances is close to the previous year, however, the sum of the concentrations recorded in 2013 is almost 33% less than in 2012, which indicates that the values recorded are smaller.

The highest concentration of sediment particles in 2013 was recorded in January and represented almost 49% more than the maximum permissible concentration and 82% less than the highest value in 2012.

The lowest concentration was measured in November, she hovering approximately 28% below the limit.

S4 sampling point represented a frequency of exceedances of 25%, both in 2012 and 2013, in three months in 12 of each year recorded values over the limit.

In 2012 the largest amount of sediment particles was measured in October, which is 64.5% above the maximum permissible concentration, and the lowest in January and represented 74.4% of the limit.

For 2013, the highest value was recorded in June but was only 12% above the limit. The lowest concentration was measured in May, which is just under half the maximum permissible concentration.

Sum of the concentrations of sediment particles in 2012 was higher than in 2013 by about 25%.

The next sampling point, S5, is located in the influence area of the deposit of coal at a distance of approx. 150 m.

In 2012, out of 12 measurements only one was above the maximum allowable concentration, which represents a 8.3% frequency of overflows. It was recorded in November, and the calculated value was by 22.6% over the limit.In the other months of the year, recorded concentrations showed similar values.

During 2013 there was a frequency of overflows four times higher (33.3%) compared to 2012. The largest amount of sediment particles was measured in January and was exceeded in January and presented a exceeding the maximum permissible concentration by 60%, the other showing

values close to exceeding the permissible limit.

Lowest amount of sediment particles was measured in October and represented 45.6% of the maximum permissible concentration. If the number of samples exceeding the allowed limit is higher than 2012, however, is very close to the sum of the concentrations being greater than 11% in 2013.

S6 sampling point, located at the southeastern limit of the career of a total of 12 measurements made during 2012, 50% were above the maximum permissible concentration. Highest concentration of sediment particles was measured in February and presented a value that was by 94.3% over the limit.

Lowest value was recorded in December and represented only 27.3% of the maximum permissible concentration, this being the lowest concentration recorded during 2012 in the seven sampling points.

During 2013, the frequency of exceedances was 33.3% lower than in 2012, four measurements hovering over the limit.

The highest value was recorded all in February and presented exceeded permissible limit by about 26% and the lowest was measured in December and represented 42.5% of the maximum permissible concentration.

S7 sampling point is located throughout the southeastern limit of the career, but at a distance of approx. 300 m south to S6.

For the academic year 2012, the frequency of exceedances at this point was only 16.6%, which means that 12 measurements, 2 were above the maximum permissible concentration.

The highest value was recorded in February and was by 8.8% over the limit.

The lowest concentration was measured in November and represented 30.5% of the limit.

During the year 2013 in this sample no value was above the maximum permissible concentration.

Highest concentration was measured throughout the month of February and accounted for nearly 76% of the maximum permissible concentration, and the lowest in January and represented 29% of the limit.

All these factors, plus others specific to each lignite pits make it possible to increase the number of points in the mining area or in the coal deposits concentrations in sediment

3. CONCLUSION

Activities in the analysis and monitoring of career in terms of emissions sediment particles allow drawing conclusions about the impact on the environment.

• impact on local and regional environment is one that occurs throughout the life of the coal mining.

• environmental factor air is affected particularly coal transportation and storage activities, activities that take place on the surface, and less of the actual work of excavation of mineral masses, which runs below the natural ground.

• of all the activities related to the exploitation of lignite extraction to date, the storage, loading and transport has a major impact on the environment, particularly through large amounts of dust results.

In this respect, career Rosia most representative sampling point was S3, where the frequency of exceedances in the two-year study was 83.3% and 75%.

The Rosia career highest concentrations of sediment particles were recorded in February of 2012 and January 2013.

• Implementation of measures to reduce the quantity of dust in the air is most often based on emission source. The most used measures consist of enclosures and / or wetting powder production points. Other measures implemented consist in planting plant protection curtains or rerouting a section of tape being applied to reduce noise in residential areas, the economic impacts lower than other application methods.

• effectiveness of the measures to reduce dust in the air depends on a number of

meteorological factors such as wind direction and speed, precipitation, pressure.

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