STUDY ON NOISE POLLUTION DUE TO THE MINING ACTIVITIES FROM PESTEANA NORTH PERIMETER

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***Abstract**: Knowledge noise exposure level is important because it has the effect of lowering of work ability, accuracy and efficiency of movement, and increased energy expenditure required to perform a given exercise. Also, noise is an important cause of frequency and increasing the number of work accidents by preventing perception of sound signals, decreasing and attention distractions, balance disorders, visual disturbances (mitigation of perception of colors and forms).*

Keywords: level of noise pollution, acoustic power

1. INTRODUCTION

Pesteana Northern career is part of the Rovinari mining basin from Gorj County, situated in the southern part of the basin, about 40 km away from Tg-Jiu and 15km from Rovinari. The area of operation includes the meadow area situated near the river Jiu, near Pesteana-Jiu and Cocoreni, extending to the west of the edge of the hilly area, the alignment Pesteana de Jos, Urdari and Hotaroasa.

The machines used for excavation, transport and mining waste dumping masses influence the natural noise being the major sources of noise pollution. It is important to monitor the level of noise that it does not exceed the permissible norms, both operating in area and in neighboring areas inhabited career.

2. SOURCES OF NOISE AND PROTECTION AGAINST VIBRATION

The main receptors, to which the impact can be significant localities are residents: Urdari (located in the western boundary of the perimeter at about 1300 m of coal deposit and 900 m of excavation front limit) Pesteana de Jos (located in the limit about 300m west perimeter boundary excavator and dump front), Hotaroasa (at the western boundary of the perimeter at about 300 m -800 m front limit excavator and dump), Cocoreni (situated in the eastern limit of about 1000m the coal deposit and 600 m of excavation front limit) Pesteana Jiu (included within about 800m east front excavator and dump limit).

The noise is produced by vibrations resulting from different machines and has a wide range of frequencies, often outside the human acoustic (16-20000Hz). Career emissions are from many types due to production sources, stationary and mobile. In the category of stationary sources are included the large capacity equipment, continuous action, for excavation, transport and mining waste dumping masses. The mobile source category include: bulldozers, wheel dozers, excavators, dump trucks, rollers, etc. Noise emissions resulted from mobile sources in the analyzed area occurs after activity [1]:

- Supply of material and spare parts at the work on the technological flow by car;
- Electromechanical works and power supply;
- Road maintenance works, ditches, canals;
- Environmental protection works and rehabilitation.

The personnel will generally be most exposed to the noise and vibration. According to HG no. 493/2006 regarding the minimum health and safety requirements regarding the exposure of workers to the risks changed by HG 601/2007, the exposure limit for noise is 87dB. At the limit of residential buildings, in accordance with STAS 10009/1988 must not exceed the maximum of 50dB noise level. Knowing the level of noise exposure is important because besides the aforementioned effects, sound has weak effects of labor capacity lowering of movements' accuracy and efficiency, increase energy expenditure required to perform a given exercise.

Also, noise is an important cause of frequency and increasing the number of work accidents by preventing perception of sound signals and attention decreasing a distractions, balance disorders, visual disturbances (perception of colors and forms of mitigation). Noise can occur on exposed personnel two categories of adverse effects:

- Ear effects (specific);
- Extra-ear effects (nonspecific).

Vibrations are defined as mechanical oscillations of solid bodies that are transmitted directly to the human body, frequencies, amplitudes and accelerations at different speeds, continuous or discontinuous produced of stationary machines, vehicles etc., during professional activity.

The vibrations are transmitted through the entire body by the worker's legs (when the worker sits on a surface that is wobbling) and by buttock region and (when the worker gets in a sitting position). Reception vibration frequency is depending on them.

Most authors make the following classification:

- Between 0.5 to 200 Hz, receptors are in the muscles;
- Between 40-1000 Hz, receptors are in the skin.

General acting vibrations in the frequency range 2-20 Hz with extension to 80 Hz can be grouped into the following syndromes:

- Upper digestive syndrome manifested by nausea, vomiting;
- Renal syndrome due to kidney movement favors the appearance of nephrolithiasis;
- Spine syndrome translated into an initial stage by exacerbating the physiological curvatures and later by accusing painful type during and at the end of the working day, with the pathologic substrate destructive lesions in the vertebrae. For an accurate presentation of various aspects of noise from different facilities or equipment, must consider three levels of observation:

¬ Noise at source;
¬ Noise near field;
¬ Noise in a distant field.

Each of the three levels of observation corresponds own characteristics. For noise at the source, the study is done separately for each device and supposed placed in free field. This phase of the study allows knowledge intrinsic characteristics of the source, independent of its working environment. Noise abatement measures are indispensable source for comparing both sound levels of machines in the same category, and to have definite information about the acoustic powers of different categories of equipment. If the noise in the open near one takes into account that each machine is placed in an environment that he can change the acoustic

characteristics. In this case, the interest earned on sound level meters and distances between a few tens of meters from the source. Compared to the situation where all conditions are accomplished for free field, the sound pressure level can be amplified near the source (reflection) or mitigated by interposing natural or artificial screens between the source and the measurement point. Since measurements are made near field at a distance of machinery, it is obvious that in most situations, near field noise is actually a group of machinery noise and less of an isolated machine. If in the first two levels of observation, acoustic characteristics are closely related to the nature of the machines and their arrangement, the noise in the distant field, for example a few hundred meters from the source depends largely on additional external factors such as:

- Adverse weather and in particular wind speed and direction, temperature gradient and wind;
- Absorption by the soil acoustic waves, a phenomenon called "ground effect";
- Absorption in air, dependent on pressure, temperature, relative humidity, noise spectral component;
- Topography;
- Vegetation.

In general terms, the impact of ambient noise and vibration can vary widely; depending on the distance of the front were inhabited areas or certain buildings sensitive to noise and vibration. In addition, the perception of an impact likely to generate discomfort (for example, at a level at which noise or vibrations can disrupt the normal course of daily activities) is very subjective, varying widely, depending on personal perception of each receiver. In this regard, it will consider a permanent communication with residents of neighboring areas and authorities involved in order to improve management practices of noise and vibration.

3. CHARACTERIZATION OF THE SOUND LEVEL

3.1. Mobile sources

Regarding the activity of mobile machinery on the site, because it takes place in open spaces arrangements are not required to mitigate and reduce noise and vibration than specific regulation and the proper functioning of the engines. Acoustic power for different machines is presented in Table 1:

Table 1 [2]

Machine type	Acoustic power (A)
bulldozers	115 dB
wheel dozers	112 dB
excavator	117 dB
dump trucks	107 dB
rollers	105 dB
tractor	110 dB

To calculate noise levels resulting from machinery and means of transport can be used the following equation [3]:

$$L_p = L_w - 10 \times \log(r^2) - 8 \quad (1)$$

in which:
-Lp – noise
-Lw - acoustic power
-r - distance from the noise source (use for noise propagation from a point source on flat ground).

Noise levels for machinery and means of transport at different distances from the sound source are illustrated in Table 2.

Table 2 The resulting noise levels from machinery used for the various categories of works

Distances from the sound source (m)	Bulldozer	Excavator	Wheel dozer	Dump trucks	Rollers	Tractor	STAS 10009 /1988
50	73 dB	75 dB	70 dB	65 dB	64 dB	68 dB	65 dB
100	67 dB	69 dB	64 dB	59 dB	57 dB	62 dB	
200	61 dB	63 dB	58 dB	53 dB	51 dB	56 dB	

Every time it doubles the distance from the noise source, acoustic level of pressure decreases by 6 dB. From the data presented results that noise pollution has significant effects only in the vicinity of sources working career, keeping safe the neighboring local communities.
Only the activity of vehicles, when vehicles pass through villages can produce noise and disturbing vibration noise.

3.2. Stationary sources

Regarding the work of excavation machinery, transport and dump tailings from the site, because it takes place in open spaces arrangements are not required to mitigate and reduce noise and vibration than specific proper maintenance and functioning. Noise result of the work of excavation, transport and dump the dwelling limit determined is determined by the same relationship (1) and is presented in Table 3.

Table 3 Noise results of the work of excavation, transport and dump

	Acoustic power Lw -dB(A)	Distances from the sound source (m)	Noise level dB
bucket-wheel excavator	115-125	100	67-77
		200	61-71
		300	57-67
		400	55-65
		500	53-63
		600	51-61
conveyor	85-90	100	37-42
		200	31-36

		300	28-33
		400	25-30
		500	23-28
		600	21-26
the dump car	119	100	71
		200	65
		300	61
		400	59
		500	57
		600	55

CONCLUSIONS

The management of potential impact categories generated by noise and vibration on the career staff and residents of neighboring communities, is a key factor in the design, planning and implementation of any modern mining because they can harm the working capacity of workers and comfort residents of nearby human settlements and in situations where vibrations occur - physical integrity of potentially sensitive construction.

If the predicted noise levels near the protected buildings combined with levels of noise sources may exceed the threshold levels according to STAS 10009/88, recourse to one or more safeguards:

- Action at source
- Isolation, if possible, the installation and the choice of technologies as quiet as possible;
- Encapsulation of conveyors in areas where noise is a local issue;
- Minimizing time working machinery;
- Increase the distance between noise sources and protected buildings
- Golf sound absorbing along the way (grass and vegetation)
- Shielding by:
- Descent into the excavation or construction of screens situated between systems and sensitivities;
- With a more than psychological, vegetation screens (efficiency 1 ... 2 dB for 10 m of permanent leafy dense vegetation).
- Maintenance in perfect working career running machinery and transport records;
- Orientation sensitive points depending on prevailing winds;
- Realization of their technical inspection, and if it is found faults remedy them in the shortest time;
- Approved the use of machinery;
- Transport will operate between the hours of 07-18 inhabited area;
- The movement of vehicles through populated areas will be achieved at low speeds, so noise was not shorter than allowable limits imposed by STAS 10009/1998.

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