NOISE ATTENUATION DUE TO PROPAGATION ENVIRONMENT PRODUCED BY MINING BAND CONVEYORS FROM OPEN PIT

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ABSTRACT: *Structural noises produced by bandconveyor lose energy due to its scattering and absorption by the propagation environment. Location of bandconveyor in case of open pits requires knowledge of noise attenuation due to propagation environment, weather conditions and soil cover. In this paper we propose to determine the optimal distance to place the bandconveyors, distance necessary to reduce noise pollution in the vicinity of habited areas from open pit.*
Key words*: noise, attenuation, bad conveyors*

1. INTRODUCTION

Noise is a overlap of several sounds produced by natural sources, especially human, such as machinery, vehicles, various equipment, people. As any elastic wave, the sound frequency characteristic is defined as the number of complete oscillations per unit time.
One of the most important characteristics of the bandconveyor is noisy produced due to its size and operation of transport of materials, for which we intend to monitor and analyze noise and the effects of such bandconveyor on environment on its propagation.
In this paper we propose to determine the optimal distance to place the bandconveyor, distance necessary to reduce noise pollution in the vicinity of habited areas of careers.

2. THEORETICAL CONSIDERATIONS

Source of pollution, by noise, include:

- Use of motorized vehicles to transport workers, materials and equipment to and from career;
- Use of mobile machinery and stationary inside of careers, they typically include the tracked excavators with rotor, cross-pit spreader and band conveyors.

The main source of noise pollution from open pit is bandconveyor because of their location [3].
Part of bandconveyors used in open pit are located nearby habited area.

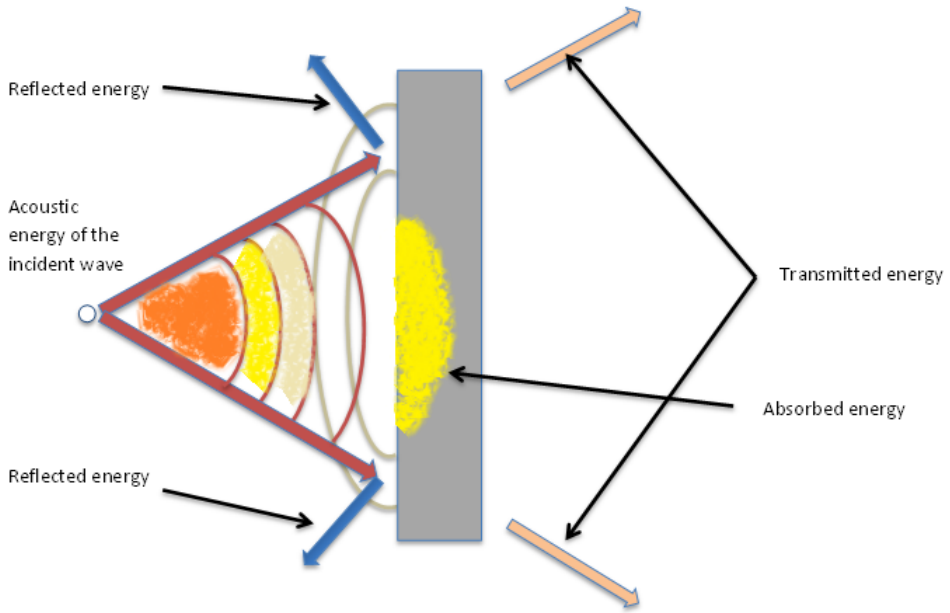

Figure. 1: Decomposition of acoustic energy in the presence of obstacles

Sound isolation of a composite material express its ability to prevent the transmission of sound energy. Sound energy transmission factor is defined as fallow: the ratio of the emitted sound energy Wt and transmitted

acoustic energy Wi, its value being then more lower than material retention capacity of the sound waves is higher (Figure. 1).
Sound isolation is the property that characterizes all separation sound-absorbing panels, and it is necessary to know it in order to indicate the level of noise isolation between the two environments.
If the acoustic energy (Wi) encounters an obstacle, consisting of a different environment than that in which it propagates, appear the phenomenon of decomposition (Figure 1): a part of the energy is reflected (Wr), a part is transmitted (Wt), and some part is absorbed by the environment (Wa) [2].
Depending on the type of material used, it changes the proportions of this decomposition respecting the laws of conservation of energy:

$$W_i = W_r + W_a + W_t \quad (1)$$

Choice of methods to combat noise is conditioned to the combined between noise sources, the propagation medium (path) of acoustic energy and receivers. In the noise control methods should be incorporated parts of this system, it distinguished: methods of noise control at source, methods of the control of noise on pathways and methods to combat noise at the receiver.
When crossing propagation environment, the acoustic waves lose some of the energy originally contained due to the following physical causes: internal friction of environmental particles which particles enters in oscillation (viscosity), thermal conductivity of the environment, radiation heat and energy of intermolecular exchange.
Attenuation due to viscosity is expressed by a coefficient dependent on the characteristics of the environment but and the frequency of the sound.
In case of bandconveyors sound wavelengths remain unchanged; which varies is the characteristics of the environment due to temperature variations.
Sound attenuation due to thermal conductivity is expressed by the corresponding coefficient of attenuation (expression given by Herzfeld and Rice) [4].
Acoustic wave attenuation is achieved by increasing energy level of the gas molecules by putting them in motion of vibration. This variation of the energy depends on the number of degrees of freedom of the molecules, so energy loss increases from monatomic to the polyatomic molecules
This attenuation is added to the produced attenuation according to the distance from the receiver to the source of sound.

3. RESULTS AND DISCUSSIONS:

To reduce the noise produced by bandconveyors affecting habited areas should be taken in consideration their location within their career or shielding and noise absorbtion with acoustic panels.
To reduce noise produced by bandconveyor we will determine the minimum distance required for noise attenuation by propagation environment, so they do not affect residential areas, namely noise recorded in residential areas should not exceed 55 dB during the day [1].
To make the measurements for noise we used digital measuring device 4 in 1 PVE-222 (Figure 2). Measurements were performed within 4 working hours, at an interval of 30 minutes.
The digital measuring device 4 in 1 with multiple functions for the environment has been designed to combine the measurement of the sound level, light, humidity and temperature.

Figure 2 - Digital meter 4 in 1 PVE-222

Measurements were taken during the day, during 5 days, to a period of 60 minutes in several points at different distances from the conveyor belts.

Table 1 Measured values of noise produced by bandconveyor at different distances

Nr. crt.	Place	Distance from the source (m)	Values (dB)
1	Bandconveyors	1	85
2	Bandconveyors	10	79
3	Bandconveyors	15	75
4	Bandconveyors	30	69
5	Bandconveyors	100	64
6	Bandconveyors	200	52

The results of measurements made on bandconveyor from Minning Unit Career Rosia in the 6 points are shown in Table 1
The amount of background noise measured near the bandconveyor before it starts, is 45 dB.

Figure 3 - Value for bandconveyor noise at 1 meter from it

Figure 4 - Value for conveyor noise at 10 meters from it

Figure 5 - Value for conveyor noise at 15 meters from it

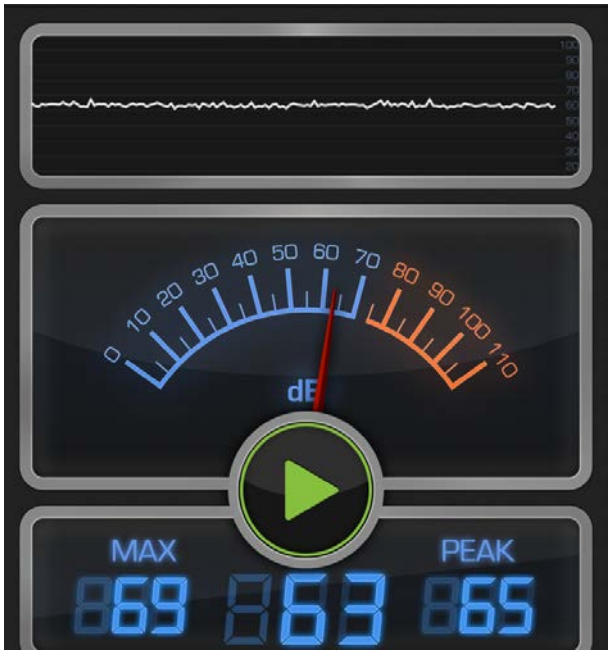

Figure 6 - Value for conveyor noise at 100 meters from it

Maximum record near bandconveyor is 85 dB. Maximum allowable noise level in the habitted area is 55 dB during the day and 45dB at night.
In order not to pollute the sound in habited area, noise should be reduced at least 30dB for the bandconveyors located near these areas.

Figure 7 - Background noise recorded before starting the bandconveyor

Optimum distance for the location of bandconveyor for the open pits, to habited areas is at least 200 m. Away 200 m enveronement propagation can attenuate noise about 30 dB.

4. CONCLUSIONS

One of the main sources of noise pollution in open pits are the bandconveyors.

Noise produced by bandconveyors can be mitigated by the propagation environment.

To not exceed the maximum allowable in residential areas, noise level should be reduced of about 30 dB.

Value of 30 dB required to not exceed the maximum allowable noise in residential areas can be absorbed by enveronement on a minimum of 200 m, as results from mesurements.

For the bandconveyor to not pollute sound in habited area located within the career, they have to be placed at minimum of 200 m from the habited area.

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