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ESTABLISHING THE NOISE POLLUTION IN THE MAIN CROSSROADS IN PETROSANI CITY

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Abstract

The paper presents some elements in the analysis of noise exposure, presenting the phenomenon of noise pollution, its sources and its harmful effects. The purpose of this paper is to analyze road traffic noise, the most widespread source of noise pollution in urban areas. The object of this research is the analysis of noise recorded at major road crossings in Petrosani using a multimeter. The results of the measurements are plotted and interpreted.

Key words*:pollution,noise, Petrosani, Romania, trends.*

INTRODUCTION

Noise pollution is a very significant component of environmental pollution, not only due to its harmful traits, but also through its presence in all the compartments of modern life. This can be seen as a particularly major problem for all the economically developed countries or for the ones undergoing development. Noise pollution can be defined as a continuous aggression, which is the result of various noises produced by cars, facilities, industrial or household appliances, in the precinct of building sites or around them.

In Romania there is a tendency, which otherwise can be noticed worldwide as well, of noise level growth and vibrations production, whose sources go hand in hand with the development of all branches of the economy and of transportation. One of the disrupting factors of the environment, who influences the surroundings in which everyday activities take place, is the noise associated and identified with the noise pollution(acoustic or phonic).

The sounds are vibrations transmitted through an elastic channel, as waves. For some values of intensity and frequency, the sounds are perceived by the human ear, producing acoustic sensations.

The sounds can be simple or complex. The irritating sounds, regardless of their nature, are classified as noises. They have a harmful impact on the nervous system, inducing a state of fatigue. Because of this, sound reducing devices are necessary for both civil and industrial buildings, to stop the noise propagation which is produced inside and outside those buildings.

The sounds can travel through air – aerial noises, or through solid masses (construction elements) – structural sounds or noises. The noises made by hits are impact noises and they can propagate both through structures (elements) or air.

In the cities, the noise pollution sources are classified in:

-fixed sources, including the residential, industrial, demolition and construction sites;

-mobile sources, which are determined by the over ground network of urban means of transportation, airports.

At the Paris gathering in 1990, it was established that the road transports are the main source of noise in the modern society, with around 80% of a town's noise pollution being represented by the noises emitted by auto-vehicles.

The outcome of noise pollution on the activity and health of the environmental factors is extremely complex, the harmful effects being felt differently, according to the physical and

physiological characteristics of the perceived noise.

The significant impact of noise pollution is amplified by the reduced efficiency of sound reduction measures, by the high costs needed to fight its effects or even sometimes by the insufficient concern for the issue.Exceeding the permitted limits of the noises, according to the period of exposure and the characteristics specific to the working space on the personnel's health, may lead to:

-auditory apparatus disorders;
-organ disorders;
-reduced work productivity;
-reduced speaking intelligibility.

Auditory organs afflictions are caused by prolonged exposure to loud noises. The disorders are aggravated in the case of discontinued noises with a large spectre of frequencies which is accompanied by mechanical vibrations. The disorders which affect the human body are a consequence of the noises which go higher than 40 dB and they can manifest as it follows:

-high blood pressure;
-accelerated pulse
-intra-cranial high blood pressure
-visual acuity decline
-respiratory rhythm alteration.

In the published literature, the areas of noise levels are classified as following:

0-30 dB – area which does not affect the health;
30-60 dB – area of mental effects;
60-80 dB – area of mental and physical effects;
90-120 dB – area of pathological effects.

The harmful effect of noise on the health of organisms imposes a noise control and this can be possible in three different stages of its transmission:

-reduction of the produced noise;
-the disconnection of the sound channel;
-protecting the receiver.

Earth has become a very uncomfortable place for the animals. The loss of hearing and the fast escalation of the heart beats are only two of the effects of noise pollution on animals. The intense and loud noises induce fear, forcing the animals to abandon their habitat.

The noise can produce perturbations regarding the development of the plants as well. The plants who are located in areas where the noise is louder, tend to evolve much slower than the ones located in quieter areas.

MATERIALS AND METHODS

The allowed limits of the noise levels in the environment are established according to the characteristics of the out-in-the-open activities or of the buildings from the functional areas, considered as protected or as a source of noise.

The allowed limits of the noise levels Lech equivalent exterior to the buildings, at a 2m distance of the façade and the height of 1.3m above the ground or the level considered for the protected buildings are in the following table (Table 1):

Table 1. Buildings and corresponding admissible limit of the noise level in dB

	Protected building	equivalent admissible limit of the noise level in dB
1	Buildings, hotels, dorms, guest houses	55
2	Hospitals, polyclinics, dispensaries	45
3	Schools	55
4	Kinder gardens	50
5	Office buildings	65

To determine the noise pollution produced by the road traffic in Petrosani city, we took measurements of the noise levels in the main crossroads of the city. In Figure 1 are marked the exact locations where the measurements were conducted.

Figure 1. Measurements points

The device sued for these measurements is a PCE-222 multi-purpose instrument, which is a multi-functional decibel meter for the environment parameters (acoustic sensor, light temperature and relative humidity), with RS-232 interface and compatible software with Windows, having a ± 3.5 dB accuracy in measuring the acoustic intensity. (Figure 2)

Figure 2. Sonometer PCE-222

Air humidity during the measurements was approximately 55%, and the temperature was 22 Celsius degrees. The measurements were taken between 12 and one pm, with a low traffic. The total time of recording a chart is of 300 seconds.

RESULTS AND DISCUSSIONS

The determinations were done according to the effective STAS requirements, during the day. In figures3 and 4 are the recordings obtained from point one and two, two roundabouts situated in unpopulated areas which connect the center of the town to the city ring way. The noise pollution can reach up to 79.1 dB in these areas, where heavy duty auto vehicles also pass.

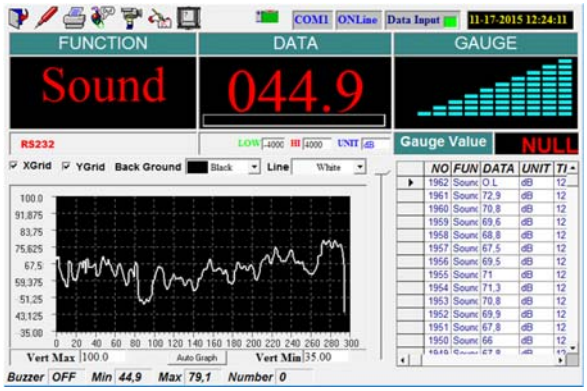

Figure 3. Recording in point one (roundabout, plane)

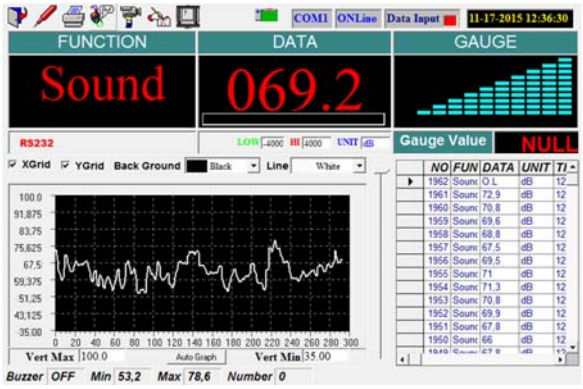

Figure 4. Recording in point two (roundabout, touristic information point)

The following two Figures, 5 and 6, are the recordings taken in two populated areas. Point number three is located nearby the emergency hospital and the Billa supermarket, with a crosswalk, a roundabout and a bus stop in the vicinity. Analyzing the recordings, we noticed high levels of noise at the departure of the means of transportation from the station.

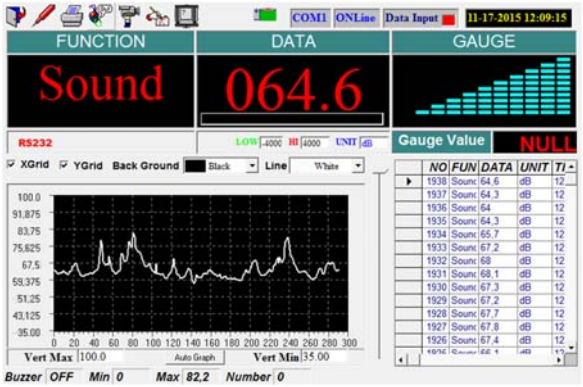

Figure 5. Recording in point three (roundabout, hospital)

Analyzing the recording obtained in point number four, the lights nearby the local market, we noticed elevated values of noise levels at the departure of the cars from the lights stop. Further analysis revealed high noise levels in the case of motorbikes.

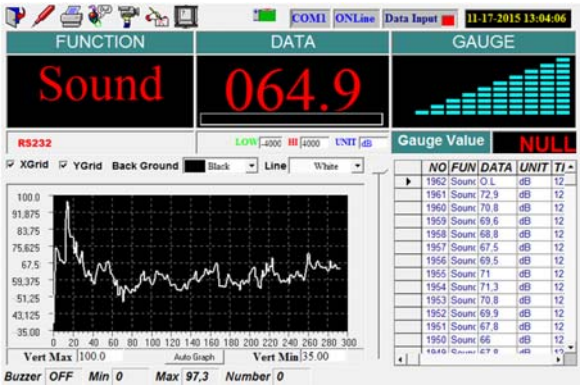

Figure 6. Recording in point four (lights, local market)

The recording in Figure 7 was obtained on the first floor of a residential building, nearby the local market, building which is not fitted with double pane glasses and which isn't soundproofed either. The recorded values don't exceed the limits permitted by the STAS for households during the day, of 55 dB .

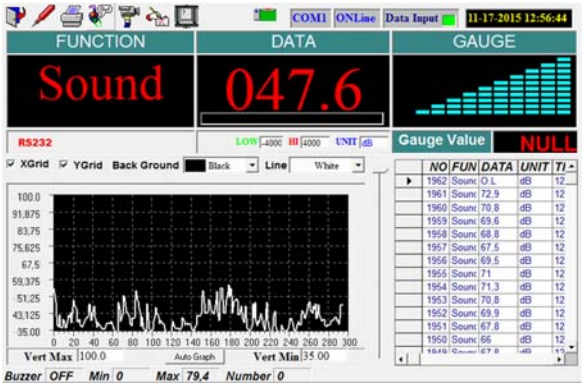

Figure 7. Recording in point five (inside building, near crossroad)

To determine the noise levels Lech equivalent exterior to the buildings, we used the following formula:

$$L_{equivalent} = L_{max} - \frac{1}{3}(L_{max} - L_{min})$$

Respecting the effective STAS, at a 2m distance of the façade and 1.3m above the ground. The results are presented in table number two.

Table 2. Measured vs permitted noise levels

Measuring Point	dB equivalent of the measured noise level	dB equivalent of the permitted noise level limit
1	67,7	70
2	70,1	70
3	74,2	55
4	65	55

CONCLUSIONS

The existence of the ring way reduces the noise pollution in the city, by diverting heavy duty traffic. The crossways and the lights are sites where the noise pollution increases due to the frequent stops and departures of the vehicles. It can be noticed that the noise levels exceed the limits in most locations, even though the hours at which the measurements were taken are not rush hours.

The consequences of noises on health population are even greater considering that they take place during the day with highs and lows according to the traffic. Noise pollution levels can be reduced by soundproofing the buildings and fitting them with double pane glasses.

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