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THE PRESENT STAGE OF NOISE POLLUTION IN INDUSTRIAL ENVIRONMENT

Ionela Lavinia LĂPUŞAN, Mariana ARGHIR

Abstract: *Within this theme is intended to be both a quantitative evaluation of the noise emitted by machinery and equipment as well as a vibration attenuation up to combat . In general, the highest noise levels are found in industrial units and in major urban strong motion. In order not to disrupt the quality of activity at work, were introduced a number of measures for preventing and overcoming the limitation of certain levels of noise. These measures can be: social (rules and laws prohibiting or limiting the sound level), technical (silent solutions, phono- sealants walls, etc.), organizational (helmets, arrangement of sources of noise at a distance large compared to employees) and hygiene (medical check-up, nutrition with vitamins, etc.).*
Keywords: *sound pollution, the impact of noise , industrial environment*

1. INTRODUCTION

Noise pollution (soundtrack) is an important component of environmental pollution and harmful nature and by its presence in all the departments of modern life, noise pollution is a major problem for all developed countries or developing countries [1], [5]. Noise pollution is the aggression continues, driven by different noises produced by machinery, industrial or household appliances, inside or outside proffesionals.

In Romania there is a tendency, which manifests itself in the world, and the growth of the level of noise and vibration, the sources of which occur with the development of all branches of economy, impetuous, and transport. One of the disruptive factors of the environment that influences the environment in which the work and life of man is associated with noise and generally identified with noise pollution (noise or sound).

2. GENERAL NOTIONS ABOUT SOUNDS

The following are the general notions about the sound and characteristics of sound waves. The sounds are pressure waves which have a sinusoidal shape of being capable of producing an auditory sensation..Since sound is a wave, the following is a classification of them:

1. after the shape of the surface, they are divided in :
   - **spherical wave** that propagates in all directions and the wave surface is a sphere.
   - **where flat** that spreads in one direction and the surface where it is a plane.

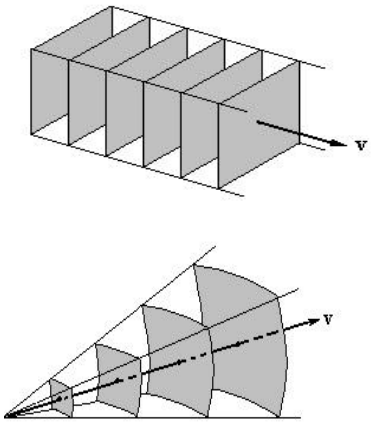

Fig. 1. Plane and spherical waves

2. according to the direction of propagation:

- **transverse displacement** of the particle: where is perpendicular to their direction of propagation

$$v_t = \sqrt{T/\mu}; \quad \mu = m/l \qquad (1)$$

t = tension; μ = linear density.

- **longitudinal waves**: :particle displacement is the parallel with their direction of propagation

$$v_e = \sqrt{E/\varphi} \qquad (2)$$

E – longitudinal elasticity module ; φ – angular density.

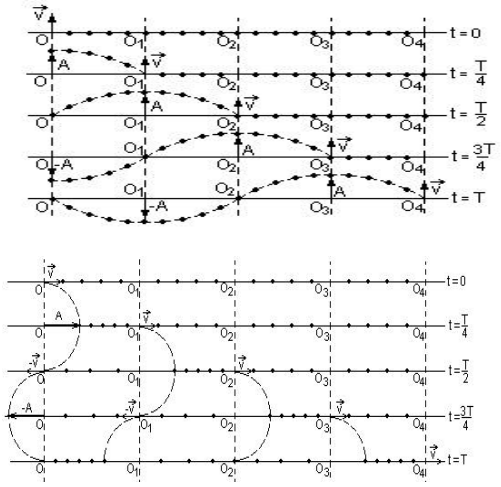

Fig. 2. Longitudinal and transverse waves.

Like any elastic, sound waves are characterized by frequency, defined as the number of complete oscillations in a unit of time. It is measured in Hertz, 1 Hz being a/s (time period, in seconds, in which there is a complete oscillation). Sounds can be characterized by the acoustic pressure, measured in Pa (Pascal, 1 Pa = 1 N/m2). For the overall intensity of sounds is also used as a unit of measure of the background (equal to the strength of a sound whose intensity changes is 1.26 times higher than lower auditory threshold) devices with which to measure sound intensity in foni are called fonometre.

Depending on the environment where the communication is transmitted soundtrack (solid, liquid or gaseous), propagation speed can have different values. Some values of the velocity of sound in different environments are presented in table 1.

Table 1.

Speed of sound in different elastic mediums

Material or medium	**The speed of sound[m/s]**
Air(10^5 Pa, 20°C)	343
Water(10°C)	1440
Rubber (dep.on hardness)	600-1500
Aluminum	5100
Steel	5000

2.2. Sound characteristics

Intensity (sound pressure level, it is write with S), is expressed by comparison with a reference level, denoted S0 and are measured in Beli (most common subunits or decibels, dB). For humans, the average affordability limit is 65 dB maximum intensity, and tolerable is around 80-100 dB, but it varies depending on the frequency..In table 2.2 shows the intensities, growing in order for some common activities [4], [5].

The duration of sound also has an impact on living organisms. If you exceed the limits of affordability can reach a dangerous psychosis.

Timbre is the quality that distinguishes between them equal sounds like frequency and intensity. Different timbre of sound is given by harmonics of sound signal. There are very few pure sounds, they contain a single frequency (for example a). Most contain several harmonics, these two different sounds with the same frequency to each other (e.g. two different instruments).

2.3. General notions about noises

Noise is defined as an overlay in a cluttered sound of different intensities and frequencies that cause a sensation and aggressive dezagreabila. Occurs as a consequence of man's industrial activity, the activity of transport after which mechanical waves, represented by vibrations sounds have a harmful effect on human health.

The main parameters considered in the analysis of noise are [1], [3]: **the intensity; frequency; mode of action; the duration of the noise; the duration of the activity in the noisy environment.**

Acoustic energy flow that passes through the surface, perpendicular to the direction of propagation is **acoustic intensity noise**, I, in

the point in question.It is defined [2] with the expression:

$$I = \lim_{T \to \infty} \frac{1}{T} \int_0^T pvdt \; I = \frac{\bar{p}^2}{\rho c} \quad (3)$$

where:

- $\bar{p}^2$ represents the average acoustic pressure $[N/m^2]$;

By definition [1], **sound intensity level**, L_I , is expressed in the following formula:

$$L_I = 10 \lg \frac{I_1}{I_0}; \quad (4)$$

Where: I_1 acoustic noise intensity, expressed in$[W/m^2]$.

Acoustic pressure level, L_p, expressed in decibels, is defined in [1] by the following relationship:

$$L_P = 10 \lg \frac{p_1}{p_0}; \quad (5)$$

where:

- p_1 – acoustic pressure measured in noise $[N/m^2]$;
- p_0 – reference pressure, in accordance with ISO 1683 ($P_0 = 2 \cdot 10^{-5} N/m^2$).

For evaluation of acoustic pressure level variations are used the following indicators:

- the level of L_{10} – is the level reached or exceeded 10% of the time and which represents the peak noise;
- the level of L_{50} – is the average statistics, representing environmental noise;
- the level of L_{90} - representing the background noise.

Integrating the entire surface acoustic intensity that surrounds a sound source, it will get from [1] acoustic power of this source. Sound power level, measured in decibels, will be:

where:

- W_1 – acoustic power of the source, *[W];*
- W_0 – acoustic power of reference (10^{-12} W).

This value of the acoustic power level represents the total acoustic energy car gear released in unit time.

There are four factors that determine the harmfulness of noise:

- v is the speed of propagation of sound wave *[m/s]*;
- ρc is the impedance characteristic of fluid, Rayl, where:
- ρ is the density in the propagation medium, $[Kg/m^3]$;
- c is the speed of sound in that medium, $[m/s]$
- The intensity or strength of the sound (measured in dB)
- Frequency or pitch (measured in Hz)
- The frequency-frequency of repetition
- Duration-period of time unfolds.

3. MEASURES AND METHODS OF PREVENTION AND REDUCTION OF NOISE POLLUTION AND VIBRATION IN INDUSTRY

Reduce noise, either at the source or along the path of propagation, must represent the core staff of noise control programmes, taking into account the design and maintenance of both the equipment and the place of work. A series of technical control measures can lead to it, by:

1. isolate the source of the noise, through its enclosures, sound insulation or depreciation vibrations through metallic or pneumatic suspensions or rack of elastomer;
2. reducing noise at the source or along the path of propagation by using premises that are put and screens, fitting of mufflers or silencers exhaust noise by reducing or cutting, the revolutions of the ventilator or the speed of impact;
3. the replacement or modification of the machine-use especially in thong transmissions through the noisy transmission by gears, or power tools instead of pneumatic;
4. application of quieter materials — such as a rubber clothing at food receptacles or collection, conveyor belts and vibrating.

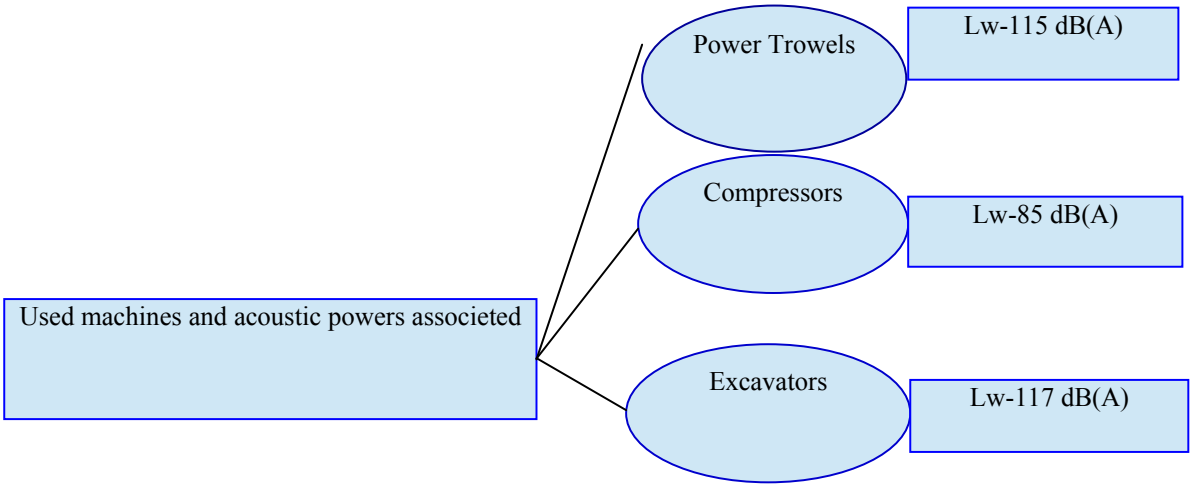

Fig. 2. .Block diagram of the noise-industrial machinery

3.1. Use the structures are put in to reduce exposure to noise on marine platforms

Phono-insulating structures are one of the most productive methods of combating the noise in the work environment. Closing (enclosures) a noise sources, the location of acoustic barriers (screens) between the source and the receiver or the receiver to ensure the protection of a silent zone is done via phono-insulating structures.

3.1.1. Acoustic Insulation meaning the air sound insulation of the acoustic energy components, which passed through the air using a construction element (wall), is an extremely efficient method in action to reduce the effects. After such an acoustic insulation element, are the possible differences of levels of acoustic pressure between two rooms side by side for about 10 ... 60 dB, and the noise of the machines can be reduced by enclosures with about 10 ... 40 dB.

3.1.2. Phono-insulating cabins

Design and implementation on properly booths are put is a suitable solution for these jobs from production platforms, installations.
The cabins phono-insulating, that allows the control and supervision of the order (and remote) of technological processes, reducing as much as possible the period of exposure, can be extremely helpful allows the completion of periods of exposure to a noise level diminished that exists in plants and thereby decrease the risk of professional deafness.

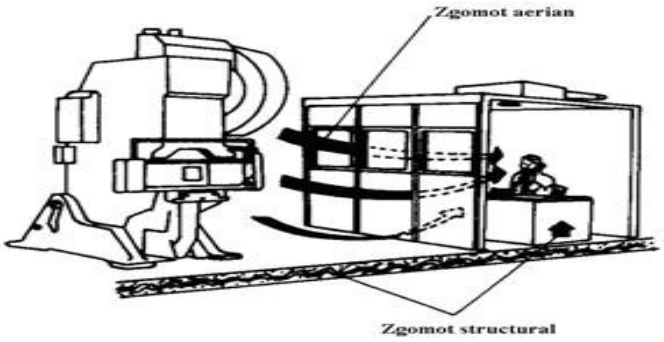

Figure 3.2. System for the production and propagation of noise.

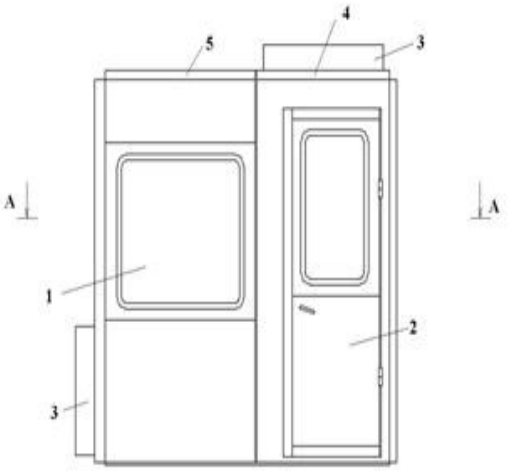

Fig 3.3. Phono-insulating booth (compressed gas drying PFCP) Legend:

1. glazed panel
2. panel with door and window glass
3. ventilation opening
4. ceiling panel attenuator
5. ceiling panel

3.2. Sound attenuators

Noise attenuators use fits in the category of methods of noise control at the source. The interstage attenuators noise according to the principle underlying the operation are:

- **Active attenuators** are provided under a canal lined with sound-absorbing material that holds the lead role in combating noise (fig. 3.4).
- **Reactive attenuators-acoustic** energy dissipation which is ensured by formation of a PDO, where that prevents the passage of sound in some common, due to the mass of air in the cells elasticity and attenuator.
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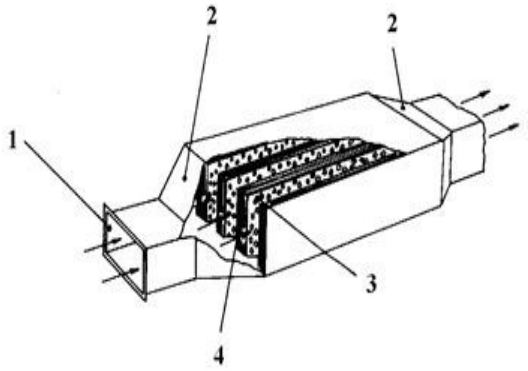

Figure 3.4. The « side walls » attenuator

Legend: 1. input the cross section; 2. transition elements; 3. polydecor transparent acoustic ; sound-absorbing material (partition item)

4. CONCLUSIONS

Elimination of noise at source is the most effective way of preventing risks and should be taken into account whenever new technical equipment are purchased or designed new jobs.A purchasing policy conducive to a work environment free from noise or low noise is the most efficient method in terms of cost, in order to prevent or control noise.

Methods of fighting or noise reduction at source in industrial environment:

- adoption of noise mitigation solutions specific to the nature of the source;
- avoiding unnecessary vibrations, shocks or their damping suppression;
- provide equipment which were not originally designed with noise attenuators;
- construction equipement and technologies change.

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Stadiul actual al poluării sonore în mediul industrial

Rezumat: În general, cele mai înalte niveluri de zgomot sunt găsite în unități industriale şi în mişcările urbane majore. Pentru a nu perturba calitatea activității la locul de muncă, au fost introduse o serie de măsuri pentru prevenirea şi depăşirea limitarea de anumite niveluri de zgomot. Aceste măsuri pot fi: sociale (reguli şi legi privind interzicerea sau limitarea nivelului de zgomot), tehnice (găsite soluții, pereți fonoizolanti, etc.), organizaționale (căşti, poziționarea de surse de zgomot la o distanță mare în comparație cu angajații) şi de igienă (control medical, nutriție cu vitamine etc.)

Ionela Lavinia LĂPUŞAN, PhD. Student, Eng., Technical University of Cluj-Napoca, Department of Mechanical Engineering Systems, no. 103-105 B-dul Muncii, Cluj-Napoca, ROMANIA.
Mariana ARGHIR, Prof. Dr. Eng., Technical University of Cluj-Napoca, Department of Mechanical Engineering Systems, no. 103-105 B-dul Muncii, Cluj-Napoca, ROMANIA, e-mail: marianaarghiryahoo.com; Mariana.Arghir@mep.utcluj.ro, Of. Tel: (+) 40 264 401 657.