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METHODS OF PREVENTING AND COMBATING NOISE POLUATION IN TRANSPORTS

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***Abstract**: This paper is part of the research study of noise pollution in the transports. The paper presents some practical methods, procedures and tools used to measure and control noise pollution.*
***Key Words**: sound, frequency, vibration, acoustic, noise*

1. GENERAL NOTIONS

2. The sounds are part of our lives, with their help we can communicate, we are warned in case of danger, information or relax listening to music. In terms of physical sounds are vibrations of the particles of a medium capable of producing auditory sensation. Sound is a form of physical energy created by vibrating objects. These vibrations are transmitted in the form of high and low pressure waves radiating from the surface of the object. These waves are physical stimuli to the ear. The sound propagates in the form of elastic waves only in the material (air, liquid, solid) and do not propagate in a vacuum. When we hear something, in fact the ear is touched by vibrations flowing atmospheric pressure. The ear converts sound waves into electrical impulses, which forwards them to the brain, which in turn decodes signals. Ear gradually gets used to the sounds, and the time and learn their meaning. [1]

2.THE INFLUENCES OF SOUNDS

Acoustic oscillations arising during operation of machinery and aggregates can be harmful factors for human body. Their perception by the human body,by the auditory organ, acoustic oscillations are classified into:
- Infrasound with frequencies below 16 Hz;
- Sounds with frequencies between 16 and 16,000 Hz;
- Ultrasound with frequencies above 16,000 Hz. [2]

3. CLASSIFICATION OF SOUNDS

3.1. Infrasound

Part belong inaudible infrasound sound spectrum with frequencies of less than 20 Hz. Infrasound is present in many jobs. Acoustic oscillations encountered in the industrial environment, usually very different frequencies.
Infrasound can occur:
- From high-speed automobiles (infrasound frequency is 16 Hz) at elicopotere (11.5 Hz),
- To close the storm (6 Hz);
- The interaction with the ocean air masses (0.1 to 10 Hz);
- Explosion;
- Earthquakes;
- On supersonic aircraft flight when such infrasound emitted.

Perception of infrasound:
Infants show before the storm insomnia, seizures, loss of appetite, nervous breath and an increase in temperature;
Birds and animals indicated by their agitated behavior storms or earthquakes occurrence.

Undesirable effects of infrasound:
-7 Hz, the nervous and circulatory systems traumatizes strong and at other frequencies can destroy alveoli.
-adults,becouse of infrasound cause dizziness, vomiting, a false euphoria effect, or cumulative effects, as it happens to someone while driving at high speed cars or buses.

3.2. Ultrasounds

Represents the vibration of an elastic medium whose frequency exceeds that of sound (frequency ultrasound is between 20 000 Hz and 2 x 109 Hz) and can not be perceived by the human ear. Ultrasonic sounds are distinguished by the fact that with a high frequency (16,000 Hz), causing no auditory sensations. In industry, ultrasonic spectrum appear either in the composition of loud noises or are generated by special equipment for this purpose.

The effects of ultrasound: adverse effects (in humans, ultrasound destroys red blood cells, occurring headaches, nausea or loss of balance) and beneficial (ultrasound destroys bacteria, viruses, for example, the bacillus tuberculosis, influenza virus, of typhus), etc.

Ultrasounds have their applications:

-medical diagnostics;

-sterilization of medical items (needles, syringes, etc..)

-fault detection for metal and concrete investigation to identify gaps, internal cracks, sulphides etc.;

-submarine-locating and / or vessels stranded on the seabed;

-ocean-drawing maps;

-researches and studies Chemicals (wear polymers, etc.)..

The biological action of ultrasound

, varies depending on the characteristics of - frequency, intensity, duration of time - and the nature of the cell or tissue exposed to the elements. The most dangerous are high intensity and frequency ultrasound down wich pays less in the air and spread throughout the workroom. Ultrasound of low intensity and high frequency are largely written in the air and practically have no injurious to the human body.

Most vulnerable tissues are heterogeneous and cell constituents.

The biological action of ultrasound effects are reflected in the mechanical, thermal and chemical.

The mechanical effect is manifested by violent and disorderly movements of molecules in the cell protoplasm, which result in "expansion" cells, degeneration of cell nuclei and chromosome alterations.

Thermal effect of ultrasound is manifested by a general increase in body temperature.

Chemical effect of the ultrasound is characterized by the onset of the oxidation and degradation of the macromolecules which lead to denaturation of proteins.

Action may be general ultrasound, interesting entire body or local, affecting only certain organs or systems. Ultrasound intensity and high frequency have a general action on living organisms and can lead to death. Critical frequency is considered to be one of 22 to 25.5 kHz at intensities of 160-165 dB. [2]

3.3. Vibrations producing sound disturbance

Since vibrations characterized by frequency and amplitude of oscillation chart, depending on many factors relating to the types of excitation, the physico-mechanical properties of materials, deformation structures, tasks etc dependence movements. viewpoints for the classification of vibration are multiple.
After the diagram of oscillation:
-Harmonic Vibration;
-Periodic vibrations, repeating the same movement after each period T;
-Vibration ascending or descending;
-Vibration certain.
-After the number of degrees of freedom:
-Systems with one degree of freedom;
-Systems with multiple degrees of freedom;
-Systems with infinite degrees of freedom;
After the causes that produce movement:

-Vibration free - oscillations that runs an elastic after removing the causes that system out of balance or out of position;
-Forced Vibration - those occurring under the action of disturbing forces that can be harmonic, periodic or some.

After deformations which occur:
-Axial Vibration
-Vibration Rack
Torsional Vibration. [2]

4. MEASURING OF NOISE

Measuring physical characteristics of noise generated by various machines and aggregates has several objectives:
- Check that the noise source is in accordance with;
- Comparison of noise emitted by machines with similar characteristics;
- Comparison of noise emitted by cars;
- Determination of sound perceived by some distance.

Noise measurement is performed according to the requirements that establish methods and measuring equipment used acoustic data, installation and operating conditions of the equipment under test.
Characterization of noise sources is done by specifying the sound power emitted spectrum and directivity index. [3]

4.1.Acoustic measurements

Are performed in rooms that are not anacoide (anacoide room = room whose walls absorb all sound without reflection-expensive!) nor total reverberant but behave in these two limits.

Reverberant room is characterized by the fact that all surfaces are covered with a tough as can be and refraction, and the fact that no other surface is not parallel surfaces create a diffuse sound field, sound energy is distributed equally throughout the room.
Making accurate measurements require Baseline:
- The acoustic field measurements are made;
- The microphone to the sound source;
- Selection criteria for the assessment of noise.[3]

4.2. Use Meters

4.2.1. Level meter

The device measures the actual sound pressure level expressed in dB. Level meter is a device that responds beep approximately the same way as the human ear and allows determination of objective and reproducible noise.

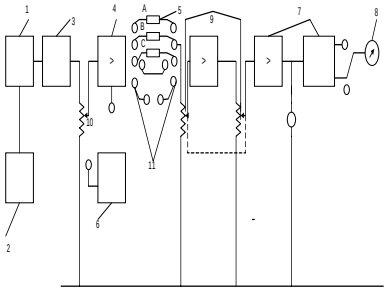

Fig. 1.The plan of the principle of a sound level meter type 2203 (Bruel and Kjaer)
1 - microphones, 2 - stable power source, 3 - attenuator, 4 - preamplifier, 5 - weighting circuits A, B and C, 6 - reference voltage, 7 - amplifiers, 8 - reading device; 9 - buttons transparent , 10 - button black 11 - connecting external filter [2]

The sound signal is converted into an electrical signal by a microphone identical quality. The best microphones in terms of precision are the condenser. Schematic diagram of a condenser microphone is in Figure 1.

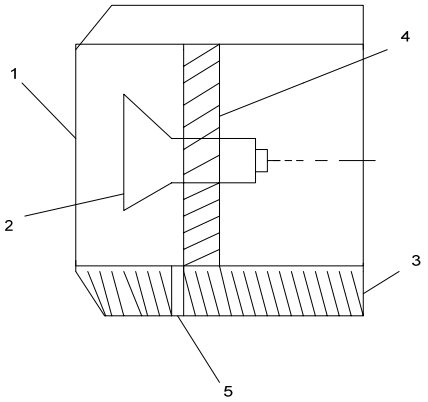

Fig. 2. Schematic diagram of a condenser microphone: 1 - Aperture, 2 back plate, 3 - body microphone 4 - insulator, 5 - hole static pressure equalization. [2]

The sound signal is low level must be amplified before being able to read it on the instrument. After the first amplifier, the signal must be passed through a network of weighting circuits (A, B, C or D) or a filter of third octave or octave, which can be connected to the outside of the machine.

Octave is the difference between two sound frequencies, one of which is twice the other. [2]

5. METHODS TO PREVENT AND REDUCE NOISE AND VIBRATION

Combat system noise is a problem of employment. In this case, means the whole system consisting of sound source, medium (propagation path) and receiver of acoustic energy. Source is the part of the system during which the acoustic energy. Generally be regarded as a source of noise-generating group which may have different physical characteristics, distributed in space and time.

Noise in point A is the sum of contributions B, C and D. noise control methods must be incorporated parts of this system, fighting occurring when any component assembly. Combating Noise is a term synonymous with noise reduction as temperature regulation is not always decreasing temperature. It is true that many noise control problems are solved by creating a favorable reduction of part of the sound power or sound pressure. There are situations in which the correct solution is to change the frequency spectrum without necessarily reduce the total sound level.

Measures to prevent and reduce noise pollution involve treating three aspects:

• a social aspect, which is to adopt the most effective measures to eliminate the effect of social contaminant;

• a technical aspect is to develop machines, aggregates and construction equipment whose noise level does not exceed the permissible limits;

• a healthcare issue that involves the application of measures to protect the individual against the harmful effects of noise, to a corresponding physical and psychological comfort.

Engineering noise control correlates with the definition exactly of objectives correlate with the above issues.

Measures to reduce noise pollution requires investment, new materials, new techniques in civil engineering, industry, machine building, rethinking of processes, facilities, equipment and systems for traffic and not least, civilized behavior of people between them.

There are the different types of noise:

a) In industrial noises of different intensities and frequencies, with continuous or intermittent action. Pneumatic hammers, for example, produce noise of 110 dB, looms 96-100 dB, 118 dB etc. Gouging. If it exceeds 90 dB in 8 hours of work, it is absolutely necessary to reduce such pollution.

b) Among the techniques used to reduce noise can be mentioned:

- Use of acoustic screens, interposed between the noise source and human personnel;
- Personal protection ear hearing aid;
- Improving the technical characteristics of the machinery that pollute intense sound;
- Use the carcasses machinery during operation;
- Correct choice of foundation equipment, noise reduction criterion;
- Use, where possible, the elastic suspension (springs, metal, rubber, fiberglass, felt, plastic, cork. [3]

6. TYPES OF NOISE BARRIERS

Fig. 6.1. Noise barrier to reduce noise [4]

Fig. 6.2. Construction of acoustic panels [4]

Fig 6.3. Barierã fonicã metalicã[5]

Fig 6.4. Rail traffic noise barrier [5]

Fig 6.5. Rail traffic noise barrier on a bridge [5]

7.CONCLUSIONS

1.The control methods consist in seeking more effective ways to reduce noise at source, while using zoning plans, building design, traffic management and other ways to minimize exposure to noise and soundscapes achieving improved.

2.The management of a modern city has to minimize noise to ensure the quality of life of residents, visitors or those who work in it.

3.The priorities for the noise can be integrated with road safety action, air quality, route buses, bicycle lanes, sidewalks and other improvements.

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METODE DE PREVENIRE SI COMBATERE A POLUĂRII SONORE IN TRANSPORTURI

Rezumat: Această lucrare este parte a unui studio privind poluarea sonoră în nmediul industrial şi în special în trasporturi. Lucrarea prezintă câteva metode practice, procedure şi instrumente folosite în măsurarea şi controlul poluării sonore.

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