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CONTRIBUTIONS TO THE EXPERIMENTAL STUDY ON THE SOUND POLLUTION IN INDUSTRIAL ENVIRONMENTS - THEORETICAL JUSTIFICATION

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Abstract: *Through the work aims to carry out a quantitative noise assessment issued by equipment and machines in the industry. The first part of this study contains theoretical justification and substantiation of the necessary steps of the execution evaluation. This paper is a part of the important study regarding the sound pollution evaluation in the industrial activity.*
Key words: *sound pollution, experimental study, industrial activity.*

1. INTRODUCTION

Noises produce irreversible diseases for workers or for any category of population, which is subject to long-lasting action of the pollutant. It is important to identify the source of the case, and the mode of transmission of noise to make an objective correlation with adverse effects of this pollutant on people.

Noise pollution is part of the general environmental pollution along with air pollution, water and other forms of pollution. Within the sound pollution, road noise produced by vehicles in motion or stationary is the most important factor alongside noise from other means of transport as it is rail transport, aeronautical, naval and industrial, commercial activities, associated public works, building exterior equipment (compressors, picks, excavators, generators) and, more recently, lawnmowers, suction and exhaust ducts air vents, etc. [ARG 08].

2. DETERMINATION OF SOUND POWER LEVELS FOR INDUSTRIAL UNITS WITH NUMEROUS SOURCES

Reduction of sound propagation in air with noise indicators, calculation for the noise caused by industrial activities [ISO 9613-2] is a detailed procedure for calculating the environmental noise levels generated by point source, noise sources as: surface type and line type.

Through instructions of ISO 9613-2 calculate the sound pressure level, A-weighted, continuously, equivalent, in weather conditions favourable to the propagation of acoustic emission sources are known, as well as sound pressure levels, weighted, averaged per period of time.

2.1. Experimental study area

The study was made at the industrial park from TERAPLAST, Bistriţa-Năsăud, a manufacturer of pvc pipes and pvc profiles. The aim of these measurements is to perform analysis of industrial noise inside the hall.

Extrusion lines for tubes and pipes of plastics with applications in sectors from civil and industrial buildings, aqueducts, irrigation and drainage, mining, hydraulic and pneumatic equipment and other industries in the last period of time have gained momentum because of the special advantages of new plastics used and the programs of modernization of water supply and sewage from towns and villages.

Profile extrusion of plastics or composites has known in the last period of time a significant

increase of the requirements and the production of such systems, in particular due to the development of the sectors of furniture and interior decoration.

Lines of stamping pipes and profiles made of pvc have big area for promoting and producing a noise enough strong, so it was necessary to achieve this study. It shows lines of stamping punches from pvs pipes (Fig. 1, and Fig. 2) stamping punches from profiles (Fig. 3, and Fig. 4).

Fig. 1. Line pipe stamping punches pvc. Side view.

Fig. 2. Line pipe stamping punches pvc. Longitudinal view.

2.2. The principle of measurement process

Plot a line of simple closed shape (contour measurement) that surrounds the area of the plant. Measure the sound pressure level of microphone equidistant positions along the contour and calculate the average sound pressure level.

Error correction is performed for the near-field microphone directivity and absorption of air. Calculate the area of the corresponding surface of the measurement taking into account the area enclosed by the contour, contour length and the height of the microphone and use it to determine the acoustic power level v [SR ISO 8297:1999].

Fig. 3. Moulding line profiles from pvc. Longitudinal views.

Fig. 4. Moulding line profiles from pvc. Side view.

3. MODE OF WORK

Shall take into account all the standardized indications, that include:

1. The positions of the microphone must be located on a closed trajectory (stroke measurement) around the plant;
2. the average distance, d, must be greater than the largest value of 0.05 $\sqrt{S_p}$ or 5 m, but it must not be greater than the largest value of 0.05 $\sqrt{S_p}$or 35 m; the average distance, d, shall be the maximum

permitted noise effects; the ratio $d/\sqrt{S_p}$must be determined with an accuracy better than ± 30%;

3. from any point of the stroke, the area of the plant must be seen under an angle of perspective, ø, smaller 180%;
4. distance measurement, between the adjacent measuring positions of D_m must be less than 2d.

Preliminary measurement contour around the facility are using a parcel / plot plan or a map appropriate to match the conditions 1. and 2. from the way of working, and on this outline report measuring positions to match the conditions 3. from work. Then measure the distance level d_i in meters, at each position of the measurement to the nearest point on the perimeter of the plant and determine the mean d, given by relation:

$$d = 1/N\sum d_i \quad (1)$$

In this relation „N" in the maximum number of measurement points.

After drawing the satisfaction outline of a plan for measuring, it is determined the following dimensions, with an accuracy of better than ± 5%:

• stroke length measurement, l;
• surface measurement, S_m;
• the average height of the noise sources in the installation, h_k;
• height characteristic of the installation, H.

The height H characteristic of the plant determines is the average of the sources of noise in the installation from the lists of equipment and elevation plans, using the following relationship:

$$H = 1/N\sum h_k \quad (2)$$

The „k" number contains the points in which there are the measurement potisions for the height level.

If the installation contains ten or more sources with the height less than two metres, the height of the average can be considered one metre and their number in the above relation can be estimated with a precision of ± 10%.

In each position, the height measurement of the position of the microphone towards the ground, must be the greater of the value of 5 m or the value calculated with the relationship

$$h = H + 0{,}025\sqrt{S_m} \quad (3)$$

Whether the condition for the height of the microphone cannot be achieved in practice, the microphone shall be located as high as possible toward the minimum height of 5 m and this is passed into the report.

In each position, the direction of the microphone shall be paid, in accordance with the indications of the plant surface, as CEI 60651 so direction must be horizontal and perpendicular to the contour measurement.

4. CONCLUSIONS CONCERNING THE LOCATION OF THE MEASUREMENTS

Measurements in industrial park tries to highlight the problem of Teraplast noise pollution in the industrial environment.

In the lower layers of the atmosphere, the temperature gradient and wind speed varies with height above the ground, so it can be negative (normal case) or positive (temperature inversion) and gradient wind speed increases, generally with height above ground. The combination of these two gradients, gradients can create negative or positive velocity noise.

This paper is the following preparatory of a paper who will present the measurements in industrial park, where they develop and apply theoretical considerations presented in this paper.

From the multitude of possible combinations to determine the weather parameters were identified and three condiţii for simplicity:

- homogeneous propagation conditions (sound waves are straight/direct);
- favourable conditions of propagation (gradient noise vertical speed is positive, i.e. the noise propagation is done for the purposes of wind, sound waves downward sloping);
- adverse propagation conditions (speed gradient is vertical noise, sound waves are inclined upward).

The accuracy of strategic noise maps for industrial noise depends on the nature of the sound power levels used industrial noise sources and the precision with which it was digitilizată 's industrial area and the geometry of the surroundings, on the other hand. The best accuracy is obtained on the basis of actual measurement of sound power levels of industrial installations in full or, if possible, even of individual noise sources.

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[C125-2012] Normativ privind acustica în construcţii şi zone urbane/ indicativ C125-2012

Contribuţii la studiul experimental asupra poluării sonore în mediul industrial. Fundamentarea teoretică.

Rezumat: *Prin lucrarea prezentă se doreşte să se realizeze o evaluare cantitativă a zgomotelor emise de echipamentele şi utilajele din industrie. Prima parte a acestui studiu conţine fundamentarea teoretică şi a etapelor necesare realizării evaluării experimentale. Această lucrare este o parte a unui studiu important în ceea ce priveşte evaluarea poluării sonore în activitatea industrială.*

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