EVALUATION AND REDUCTION NOISE FROM ACTIVITIES CARRIED OUT IN AN INDUSTRIAL UNIT

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Abstract: *Although noise, like other types of pollution has negative effects on the human body, it is neglected. With industrialization producing artificial noise sources have increased, this process was stressed lately because of the progress of automation and increased traffic. The population is exposed to noise, all the time, and those who are working in an environment where noise levels exceed permitted limits, namely 75dB are at risk of losing their hearing, to suffer from insomnia, stress, fatigue, pain headache, mental disorders, heart disorders, hypertension etc. The purpose of this paper is to find a solution to reduce or stop the noise from a factory porcelain produced by the devices used in the manufacture of porcelain objects, bringing added convenience to employees First they were identified sources of noise in the factory producing and using a sound meter measured noise both at source and the receiver, both during breaks and at work. Using formulas were calculated sound pressure level, the level of daily noise exposure, uncertainty coefficient of sensitivity. It has been found that the difference between the noise level and the level during the work produced during breaks noise is about 4 dB. We analyzed three ways to combat noise: noise abatement at source, combating noise propagation path and receiver noise abatement. The most effective of the three methods is the first namely to combat noise at source achieved by: installing noise source (machinery, equipment) elements Vibroinsulator, attaching silencers, modifying equipment and technologies, insulation components vibrating using a machine that emit lower noise levels*

Key words: *noise pollution, reduction of noise, noise sources. methods to combat noise.*

INTRODUCTION

Noise, is a branch of environmental pollution and noise is produced , who as a measure decibels. Noise pollution is vitiating the environment with sounds and noises harmful harmfulness being given by the source intensity and duration of exposure to the source.[1]

The noise is loud uncoordinated ; the sound is defined as mechanical vibrations in the environment that are transmitted to the hearing aid . After Larousse - noise is a set of sounds without harmony. Physicists define noise as a superposition of different frequencies and intensities disorderly and physiologists define noise as any sound annoying producing a disagreeable sensation . Man perceive sounds with a frequency between 16 and 20 000 vibrations per second and with an intensity between 0 and 120 dB. The noise of conversation is between 30 and 60 dB limits . The level of 20-30 dB is harmless to human body . Sound limit is 80 dB. The sounds of 130 dB sensation of pain , while 150 dB is unbearable .[2]

There are many types of measurement systems that can be used to measure sound depending on the purpose of the study, sound characteristics and extent of the information about noise. The use of noise measurement instruments is the meter . Portable analyzer noise , noise monitoring terminals and portable station for measuring noise are other tools that help me measure the noise level.

Sources producing noise divided into two parts: natural sources that do not have a significant impact on the urban environment (ex . Thunder) and artificial sources , which can be divided into two Categori : noise caused by transport (road, rail , air) ; and neighborhood noise (industrial, construction sites , domestic activities and leisure etc .) . [1] Noise pollution has negative effects on people who are exposed to high noise levels . These effects are divided into auditory effects and non- auditory effects . Auditory effects are fatigue hearing , whistling and buzzing in the ears (noise , hearing loss , permanent hearing loss . Some of the effects of non - aids are : discomfort , decreased work efficiency , fatigue , neurosis , hypertension, increased sweating , dizziness , nausea, reduce sleep quality.

METHODS TO COMBAT NOISE

A noise it's fighting methods :
- Methods to combat noise at source
- Methods to combat noise propagation paths
- Methods to combat the noise receiver

Methods to combat noise source

Silencers

Silencers are used to reduce noise . Noise attenuation is directly proportional to the sound absorption coefficient is necessary to use materials with high sound-absorbing characteristics .
There are several types of silencers :

a) Attenuators absorption - This type of attenuators are used to reduce noise whose spectrum is continuous and usually works as a canal lined with absorbent material. Above the perforated plates are placed absorbing material to prevent fraying at high speed.

b) Active splitters are constructed, usually as a channel lined with sound-absorbing material , material that meets the main role in reducing noise .

c) Reactive attenuators react to noise propagation , noise attenuated only by their geometric design (enlargements or reductions in the section) . They have a filter effect .

Treatment of noise at source

Treatment of noise at source is made in several ways :
- Use a machine that emits a noise level lower
- Avoiding the impact of metal on metal
- Mitigation of noise or isolating vibrating components
- Attaching silencers
- Carrying out preventive maintenance, as parts wear noise levels may increase
- Decoupling machinery physical environment work
- Modification of equipment and technologies

- Avoid sudden vibrations

Methods to combat noise propagation paths

- Absorbing materials
- Absorbing Structure
- Acoustic by box
- Acoustic by acoustic screens
- Correction acoustics of rooms
- Industrial soundproof rooms

Methods to combat noise at receiver

To combat noise receiver is recommended in addition to individual means of protection (ear earphones , earplugs , protective suit) and its protection in soundproof booths . This is possible if technological processes that can be ordered , controlled and monitored remotely , minimizing the period of exposure to noise of workers (when the equipment maintenance) .

The level of daily noise exposure in a porcelain factory

Job analysis

Daily exposure level for workers of a porcelain factory , was determined by measurement based on pregnancy. Daily working time is eight hours . We performed a total of eight measurements, the sand belt objects the porcelain cups and automatic isostatic press . These measurements were performed during the intermission and at work. The measurements were made using a sound level meter according to ISO 9612/2009 , for five minutes for each task , results of the measurements are shown in Table 1 . For the measurements it was used a portable acoustic analyzer 2250, Brüel & Kjær. Portable acoustic analyzer 2250, manufactured by Brüel & Kjær is one of the best analyzers / sound level meter / portable vibration and noise meters. It is made for advanced applications of determination, analysis and recording of noise and vibration

Table . 1

Measurement results

Measuring point	Task		Measured values	Aritmethic mean
Isostatic press	During the break		78.1 dB	78.dB
	Working period	determination 1	81.6 dB	82.3 dB
		determination 2	82.3 dB	
		determination 3	83 dB	
Automatic cups	During the break		74.5 dB	74.5 dB
	Working period	determination 1	83.6 dB	84.03 dB
		determination 2	84.3 dB	
		determination 3	84.2 dB	
Belt sanders	During the break		78.7 dB	78.7 dB
	Working period	determination 1	81.4 dB	82.03 dB
		determination 2	82.8 dB	
		determination 3	81.9 dB	

Error Handling

During these measurements it was found that there were significant risks affecting the measurements .

Calculation and presentation of results.

In this chapter we will present the results of calculations such as: noise, weighted ; contribution of each activity to the level of daily exposure to noise, combined standard uncertainty , sensitivity coefficients . All calculations were done according to standard measurement noise .

The sound pressure level weighted

It was initially calculated equivalent continuous sound pressure level , weighted for each task. This calculation was performed with the following formula according to ISO 9612/2009

$$Lp,A,eqT,M = 10\lg\left(\frac{1}{I}\sum_{i=i}^{I} 10\ 10^{\,0{,}1\times Lp,A,eqT,mi}\right.$$

Where i - number of sample task m

I - total number of samples taken from the task m

Table number 2 presents the results of calculations about continuous sound pressure level .

Table 2

Results obtained on calculating weighted noise

Measuring point	Task	Lp,A,eqT,m
Isostatic press	During the break	78.10 dB
	Working period	82.34 dB
Automatic cups	During the break	74.50 dB
	Working period	84.04 dB
Belt sanders	During the break	78.70 dB
	Working period	82.07 dB

The contribution of each activity to the level of daily exposure to noise (A-weighted)

Each task that performs workers contribute to the daily noise exposure level .. The following formula was able to track which of the three tasks contribute more to the level of noise pollution in table 3 have communicated the results .

$$LEX,8h,m = Lp,A,eqT,m + 10\ lg\frac{Tm}{To}$$

Tm - the average of pregnancy m

T0 - is the length of reference , T0 = 8h ;

Table 3

Results of the contribution of each activity to the level of daily exposure to noise (A-weighted)

Measuring point	Task	LEX,8h,m
Isostatic press	During the break	65,30 dB
	Working period	82,10 dB
Automatic cups	During the break	61,70 dB
	Working period	83,81 dB
Belt sanders	During the break	73,65 dB
	Working period	80,45 dB

The level of daily exposure to noise, weighted A

With values the contribution of each task to the level of daily exposure to noise, was able to calculation the daily noise exposure level , per all, next relationship has helped us to achieve the results shown in Table 4

$$LEX, 8h, = 10\lg\left(\sum_{m=l}^{M} 10^{0,1\times} LEX, 8h, m\right.$$

Lex , 8h m - contribution level of exposure to noise, weighted load m, the daily noise exposure level .

M - total m tasks that contribute to the daily noise exposure level .

m - number of tasks .

Table 4.

The level of daily exposure to noise, weighted A

Measuring point	LEX,8h
Isostatic press	82,19 dB
automatic cups	83,84 dB
Belt sanders	81,27 dB

Calculation Uncertainty

Uncertainty is calculated based on the total sample of tasks and noise. Following equation was used to calculate the uncertainty , standard.

$$u1, a, m = \sqrt{\frac{1}{I(I-1)}\sum_{i=1}^{1}(Lp, A, eqT, m\, i - Lp, A, eqT, m)^2}$$

I - load the total number of samples

i - sample number pregnancy

Lp , A , eq , m - media samples
L , p , A, EQT , me - each shot in hand

Table 5.

The results uncertainty

Measuring point	**Incertitudinea standard**	**u 1,a,m**
Isostatic press	During the break	0 dB
	Incertitudinea pentru sudare Working period	0,40 dB
	Incertitudinea aparatului	0,7 dB
	Incertitudinea microfonului	1 dB
Automatic cups	During the break	0 dB
	Incertitudinea pentru sudare Working period	0,21 dB
	Incertitudinea aparatului	0,70 dB
	Incertitudinea microfonului	1 dB
Belt sanders	During the break	0 dB
	Incertitudinea pentru sudare Working period	0,40 dB
	Incertitudinea aparatului	0,7 dB
	Incertitudinea microfonului	1 dB

Calculation of sensitivity coefficients

The calculation of the coefficients of sensitivity was carried out with the formula:

$$c1, a, m = \frac{Tm}{To} 10^{0,1 \times (Lp,A,eqT,m - LEX,8h)}$$

and the results are in the table below .

Table 6.

The results sensitivity coefficients

Measuring point	**Task**	**c1,a,m**
Isostatic press	During the break	0,02 dB
	Working period	0,97 dB
automatic cups	During the break	0,006 dB
	Working period	0,99 dB
Belt sanders	During the break	0,17 dB
	Working period	0,82 dB

Calculation of the combined standard uncertainty and combined standard uncertainty u1b2

We performed calculations to standard uncertainty is uncertainty when we neglect duration , then the standard uncertainty determined taking into account the uncertainty of the duration values . The results in Table 7 shows that the combined standard uncertainty is higher if it includes uncertainty duration.

3.3.6.1 When excluding the duration uncertainty , combined standard uncertainty is calculated using the equation, omitting the last part of the bracket.

$$u^2(\mathrm{L\,EX,8h}) = \sum_{m=1}^{M} [c^2 1,a,m(u^2 1,a,m + u^2 2,m + u^2 3) + (c1b,m \times u1b,n)^2]$$

3.3.6.2 When include uncertainty duration u1b2 standard uncertainty is obtained by the following relationship:

$$u\,1b,m = \sqrt{\frac{1}{J(J-1)}\left[\sum_{J=1}^{J}(Tmj - Tm)^2\right]}$$

J - the total number of observations of duration of pregnancy

Table 7 .

Combined standard uncertainty and uncertainty when u1b2 standard include / not include the uncertainty of the duration.

Measuring point	$u^2(\mathrm{LEX,8h})$	u1b,m
Isostatic press	1,58 dB	1 dB
Automatic cups	1,51 dB	1 dB
Belt sanders	1,13 dB	1 dB

Sensitivity coefficient linked to uncertainty

Sensitivity coefficient due to uncertainty related to welding duration is calculated using the following relationship and is measured in dB.

$$c1,b,m = 4{,}34 \times \frac{c1,a,m}{Tm}$$

Table 8.

Results of measurement of the coefficient

Measuring point	$c1, b, m$
Isostatic press	0,56 dB
Automatic cups	0,56 dB
Bandă șlefuit picior	0,65 dB

Calculation of the combined standard uncertainty and the expanded uncertainty

Compound standard uncertainty varies depending on the sensitivity coefficients and standard uncertainty and the expanded uncertainty varies depending on the standard uncertainty . The following two formulas we obtain the results shown in Table 9 .

Standard uncertainty is calculated with the following relationship

$$u^2(L\ EX, 8h) = \sum_{m=1}^{M} [c^2 1, a, m(u^2 1, a, m + u^2 2, m + u^2 3) + (c1b, m \times u1b, n)^2]$$

The expanded uncertainty

Expanded uncertainty can be defined as the product of coefficient 1.65 and the standard uncertainty

UL EX,8h)=1,65 x u

Table 9.

Results of combined standard uncertainty and expanded uncertainty .

Measuring point	**u^2(L EX,8h)**	**U(lex,8h)**
Isostatic press	1,90 dB	2,27 dB
automatic cups	1,84 dB	2,23 dB
Belt sanders	1,55 dB	2,06 dB

Discussions and measures

For this study were selected three locations in porcelain factory: isostatic presses, automatic cups and tape grinding, doing a comparison between the noise measured at these three we see that working point automatic cups contribute more to the level of noise exposure, weighted with a value of approximately 83 dB while the other outlets have contributed approximately 1 and 2 dB less.

Sensitivity coefficients ranging from 0.82 dB band sander up to 0.99 dB Automatic cups, during work and during breaks coefficients are very low values reaching a minimum of 0.006 dB Automatic cups and rising to 0.17 dB band sander.

Standard uncertainty has the following values: 1.900 dB isostatic press, the automatic cups 1.84, 1.55 dB at bandade grinding in comparison with the expanded uncertainty which owns nearly valorin higher by 1 dB for each site.

The sound level measured exceeds the permissible norms of environmental legislation by several percent. There are many solution to reduce noise in the factory and bring added convenience to employees.

The first solution would be to combat noise at source. Amendments to the sound source is usually considered to be the best solution to a problem of noise control. Components of a machine can be modified to effect a significant reduction in the noise emission. The main solutions to combat noise at source, consist of installing noise source (machinery, equipment) on Vibroinsulator elements. This method provides an attenuation of noise, mainly on the low-frequency acoustic oscillation between 75 to 1200 Hz.

Combating noise propagation paths can be achieved using sound-absorbing materials, which have the power to reduce noise levels in industrial activities.

Another solution would be to combat noise receiver such as wearing helmets. To combat noise receiver is recommended in addition to individual means of protection and its protection in soundproof booths.

CONCLUSIONS

Workers from porcelain factory are subjected to daily noise exposure level, weighted by 61,70dB up to 73.65 dB, during the break, and during working the highest value was obtained in Automatic cups, 83 , 82.10 81dB.urmată of the isostatic press and grinding belt with a value of 80.45 contribute to noise exposure level, weighted with a standard uncertainty of 1,900 dB up to 1.559 dB.

Comparing the values of noise with the maximum amount provided for in standard jobs with average request attention, we notice that at each site, the maximum value is exceeded by 2.3 dB at isostatic press, 2, 03 dB at baseband Moulding foot and 4.03 dB at automatic cups.

Because noise from the factory not much higher than the maximum provided for in standard jobs with environmental demands attention, it is very difficult to lower noise levels below the maximum, with materials absorbing so that workers' ensure favorable working conditions

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