STUDYING OF NIOSE, ACTING OF THE DRIVERS OF THE ROAD-BUILDING MACHINERY AND AUTOMOBILES

ИЗСЛЕДВАНЕ НА ШУМА, ДЕЙСТВАЩ НА ВОДАЧИТЕ НА ПЪТНО-СТРОИТЕЛНИ МАШИНИ И АВТОМОБИЛИ

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Abstract: *Drivers of road-building machinery are subjected to noise pollution variable nature of the noise. The purpose of this study is to show the values of noise experienced by drivers of different types of road-building machinery (trucks, excavators, tractors).*

Keywords: NOISE, ROAD-BUILDING MACHINERY, AFFECT DRIVERS.

1. Introduction

The noise on its health matter takes one of the first places among the adversely existing physical work environment factors. The increasing production of noise which is often accompanied by deterioration of the noisy parameters, leads to increase in both occupational groups exposed to excessive noise levels and occupational risk of noise injury and illness.

The purpose of this study is to show the values of noise experienced by drivers of different types of road-building machinery (trucks, excavators, tractors). The machines are randomly selected, and only one condition of this research is more common species in the region of Smolyan.

Therefore the noise standards apply to protect the health of the drivers of the machines, the values obtained for the noise in this article are considered as noise production. About the measured values of noise are measured at Ordinance № 6 of 15.08.2005 on the minimum requirements for ensuring the health and safety of workers at risks related to exposure to noise [2]. Methodology of measurement complies with BS ISO 1999:2004 Acoustics. Determining the impact of noise at work and assessing hearing damage reasons, but noise [3].

2. Theoretical formulation and methodology of the study

In accordance with Ordinance № 6 of 15.08.2005, the limits of the exposure and the exposure action are determined with based daily rates of exposure to noise and peak sound pressure as follows:

1. Exposure limit values: Lex,8h = 87 dB (A) and ppeak = 200 Pa, respectively 140 dB (C);

2. Upper values exposure action: Lex,8h = 85 dB (A) and ppeak = 140 Pa, corresponding to 137 dB (C);

3. Lower values exposure limits for action: Lex, 8h = 80 dB (A) and ppeak = 112 Pa, respectively 135 dB (C).

Peak sound pressure level represents ten times the logarithm of the ratio of the square of the peak sound pressure to the square of the reference sound pressure, where the peak sound pressure is the maximum absolute value of the instantaneous sound pressure for a specified period of time at a standard frequency weighting or standard width of the measuring tape.

Sound pressure is a variable which changes the frequency of sound waves. Sound pressure is the difference between the pressure at the time and static. Sound pressure characterizes the intensity of the sound wave at a given point of space and represents the variable component of the pressure, arising as a result of tremulous movements of the sound source and accumulation on pressure. Sound pressure is denoted by P and its benchmark (atmospheric pressure) - Pc.

In BS ISO 1999:2004 is a methodology for determining the "level of exposure to noise, standardized for nominal working day of eight hours - (Lex,8h)", which according to Ordinance № 6 of 15.08.2005 on a 'daily level noise exposure (Lex,8h) ".

The methods include direct measurement of "daily level of exposure to noise (Lex,8h)", standardized for nominal working day of eight hours or calculation of the "level of daily noise exposure (Lex,8h)" for the time of impact. Standard requires measurements to be made with equipment conforming to IEC 804 Class 2 or better. The device must be directly measured equivalent continuous A-weighted sound pressure level $L_{Aeq,\ T}$. This parameter is calculated automatically by the device according to the following formula:

$$L_{Aeq,T} = 10\lg\left[\frac{1}{t_2 - t_1}\int_{t_1}^{t_2}\frac{p_A^2(t)}{p_o^2}dt\right] \ , dB, \quad 1)$$

where:

t_2-t_1 is the period T for which the averaging is made, starting from t_1, and ends in t_2;

p_A - A-weighted sound pressure in Pa;

p_O - reference sound pressure - (p_O = 20 μPa in accordance with ISO 1683);

If the noise is unchanging level for the specified period, the $L_{Aeq,\ T}$ [dB] is equal to L_{pA}, which is level A-weighted sound pressure is given by the formula:

$$L_{pA} = 10\lg\left(\frac{p_A}{p_O}\right)^2 \ , dB. \quad 2)$$

Calculation of "Level of noise impacts, standardized for nominal working day of eight hours - (Lex,8h)" is carried out according to the time impacted action. Calculation is made using the following formula:

$$L_{EX,8h} = L_{Aeq,T} + 10\lg\left(\frac{T_e}{T_O}\right) \ , dB, \quad 3)$$

where:

T_e is the effective length of the working day (time of impact) in h;

T_o - length comparison (8 h).

By that method, it is clear that for longer time impact, the driver will be exposed to higher exposure and at eight-hour working day, the exposure will be equal to the figure of the device equivalent continuous A-weighted sound level pressure $L_{Aeq, T}$.

When the duration of the impact is less than 8 hours, it is necessary to do calculation of "Level of noise impacts, standardized for nominal working day of eight hours - (Lex,8h)".

The methodology allows short high equivalent continuous A-weighted sound pressure level $L_{Aeq, T}$ over the limits of exposure, since calculating the impact of noise, standardized earlier for nominal working day of eight hours may be reduced values below-the-limit levels.

Methodology in BS ISO 1999:2004 requires the measurement noise, the microphone of the device to be placed at a distance 10 cm from the ear of the driver. Under this condition, the reported noise will be a total noise of the engine, transmission, movement of vehicles on the aerial resistance, etc.

The device used is an integrated meter volume 2238 Mediator, which was calibrated by an accredited laboratory for a period of calibration until 2016. Before each measurement, the device is controlled by an acoustic calibrator, which is also calibrated by an accredited laboratory valid until 2016.

The device automatically detects the peak sound pressure level and equivalent continuous A-weighted sound pressure level $L_{Aeq, T}$.

3. Analysis of the results of the manufacturing test

Therefore the objective of the study is to show the levels of noise to which drivers are exposed to machinery, without focusing on the duration of exposure, the research focussed reported and registered by the device "an equivalent continuous A-weighted sound level pressure" $L_{Aeq, T}$. and "peak sound pressure"

Conditions under which the measurements were performed are the same for the groups of machines – type and state of road surface, movement of the car (loaded or unloaded, in no time flat, horizontal gradients) and instantaneous technical condition of machines.

During the measurement, the nature of the noise was variable.

As the researches did not focus on determining of the exposure, which requires measurement of the noise level for the time of impact, ie for the entire period of operation of the machines, the data presented in this article apply only to the noise emitted by machines measurement time of 30 min.

Each machine has been tested several numbers, as the reported and registered by the device parameters are averaged.

The object of study in this article is the noise when working on these types of road-building machinery and vehicles:

- Excavator: excavator "JCB" - 4 pcs.; wheel excavator "ATLAS 1304" - 2 pcs.; front loader "ATLAS 52 D" - 2 pc.; mini excavator "Bobcat" - 2 pcs.;

- Tractors wheel - "Universal" 651 M - 2 pcs.; UMZ 6l - 2 pcs.; "TK-80" - 2 pcs.;

- Tractors chain - T 170-1 pc.; DT 75 – 1;

- Trucks: KAMAZ 5511-12 issue.; DAF cf 85-5 pc.; MAN TGS - 10 pcs.

In the process of manufacturing the experimental study are reported and the following parameters:

- Peak sound pressure (ppeak);

- Equivalent continuous A-weighted sound pressure level $L_{Aeq, T}$;

- Type and model of trucks;

- Type and model of road construction equipment.

Results obtained from the production study of changing noise of road-building machinery for the region of Smolyan region are subjected to statistical processing and are summarized in tabular and graphical relationships.

4. The value recorded noise

Table 1. Results of measurements

Types of machines	Source of noise	Equivalent continuous A-weighted sound pressure level LAeq, T, dB	Peak sound pressure (ppeak), dB
Excavators	Backhoe „JCB”	73	93
	Wheel excavator „ATLAS 1304	73	92
	Front loader „ATLAS 52 D	72	93
	Mini excavator "Bobcat"	85	104
Wheeled tractors	Universal 651 M	78	110
	UMZ 6Л	79	88
	TK-80	81	93
Crawler tractors	T 170	81	92
	DT 75	75	98
Trucks	KAMAZ 5511	78	91
	DAF cf 85	69	90
	MAN TGS	73	89

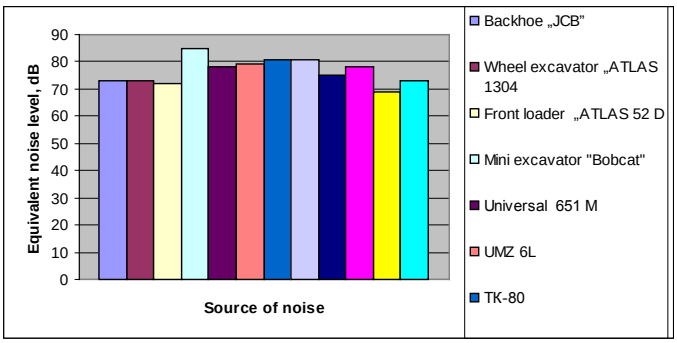

Fig. 1. *Equivalent noise level for various types of road construction machinery*

FIG. 1 shows the change of the equivalent noise level of the different road construction machinery in Smolyan. Adduced by the

histograms shows that the equivalent noise level is highest for tractors.

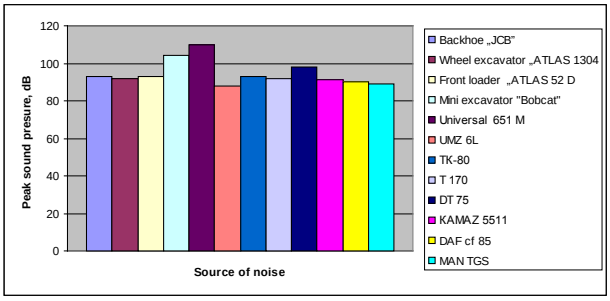

Fig. 2. *Peak sound pressure for different types of road construction machinery*

FIG. 2 shows the change in peak sound pressure various road construction machinery. From the displayed histogram shows that diesel engines of an older generation exhibited higher values of peak sound pressure.

5. Conclusion

1. It was made production experimental study of the noise effect on load drivers for various types of road-building machinery of Smolyan.

2. Incurred research and built graphical relationships indicate that drivers of tractors are subjected to higher noise levels than other drivers (Figure 1).

6. References

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[2] Ordinance № 6 of 15.08.2005 on the minimum requirements for the provision of health and safety of workers on the risks related to exposure to noise

[3] BS ISO 1999:2004 Acoustics. Determining the impact of noise at work and assessing hearing damage caused by noise

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