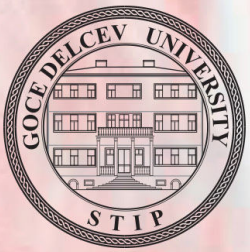

UNIVERSITY GOCE DELCEV - STIP
FACULTY OF NATURAL AND
TECHNICAL SCIENCES

ISSN:1857-6966

Natural resources and technology

No. 1 Volume XVI June 2022

UNIVERSITY "GOCE DELCEV" – STIP
FACULTY OF NATURAL AND TECHNICAL SCIENCES

Natural resources and technologies

JUNE 2022

VOLUME XVI

NO. 1

ISSN 1857-6966

NATURAL RESOURCES AND TECHNOLOGIES

Editorial Office
Goce Delcev University - Stip
Faculty of Natural and Technical Sciences

Contents

Manuscript received: 14.03.2022
Accepted: 19.04.2022

Natural Resources and Technology
Vol 16, No. 1, pp. 83 - 87 (2022)
ISSN 1857-6966
UDC: 66-057:613.644.027
DOI: https://doi.org/10.46763/NRT22161083t
Original research paper

PERSONAL NOISE EXPOSURE ON INDUSTRY WORKERS

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Abstract

With increased technological development and advanced new technologies, the number of risks and hazards to the workers` health is seriously increasing, due to excessive exposure to high noise levels. This imposes the necessity to pay more attention to the problem of noise impact on the worker, occupational diseases and harms it causes, protection from it and the introduction of measures to effectively control them.

In order to determine the personal noise exposure at certain work positions, in different industries, a measurement of personal noise exposure on 16 workers, distributed at 16 work positions, was performed. Noise measurement was performed on each worker with dosimeters within 6 hours in three working days.

The paper presents the results of personal noise exposure of workers in furniture production plant, boxes production plant, PVC windows and doors production plant, textile industry, and metal processing industry.

Key words: *production, industry, hazard, hearing loss*

INTRODUCTION

Modern society, which we can also call a “risky society”, offers us a rapid rise in industry mechanization, but it also burdens workers with unpleasant and disturbing sounds, tones, bells, which we call – noise [1]. Noise can cause physical disturbance, ill health or be the cause of an accident. Adverse effects of noise include stress, incomplete or complete hearing loss, increased risk of accidents, it may affect the cardiovascular system leading to the release of adrenaline associated with stress and increased blood pressure, and less intense noise can pose a danger to workers` safety, as it may interfere with verbal communication and affect working [2].

According to the EU OSHA, many young workers are exposed to an excessive noise level. In Denmark, since 1990, the highest exposure has been among workers aged 18-29. In 2000, 34% of workers reported being regularly exposed to occupational noise. In Finland, the difference in noise exposure between age groups is small, although the 25-39 age group has a slightly higher exposure level than others. Based on the data, noise exposure increased in all age groups from 1997-2003.

In France, according to a 1998 survey of working conditions, the younger workers were exposed to higher noise level (40% of workers under 20 years of age compared to 25% of workers older than 55). In addition, as workers were younger, the noise levels were increased over time, although the total number of workers in these age groups decreased (from 1 997 000 to 1 115 000). In the Netherlands, generally, it can be said that as older workers are, the less they are faced with high noise level at work. However, the exposure of many young workers is difficult to assess. According to EU legislation, young workers should not be exposed to loud noise [3].

The noise level and the duration of a worker’s exposure to the noise level present the most important factors regarding the noise hazards that can cause occupational diseases and they pose a serious risk to the health of occupationally exposed workers [4].

The main purpose of this paper is to determine the personal noise exposure of the equipment operators in the factories for the production of furniture, boxes, PVC windows and doors, textile industry, and metal processing industry. The measurement and monitoring of personal noise exposure are necessary in order to achieve and maintain the noise level in the working environment within the permissible limit values, to protect workers` health and to improve working conditions.

MATERIAL AND METHODS

In this paper, to determine the personal noise exposure of workers in factories for the production of furniture, PVC doors and windows, boxes, in the metal processing industry and in the textile industry noise dosimeters type CR:120C for measuring and recording of noise level data were used. The noise dosimeters have been placed on top of the workers` shoulders at a distance between 0.1 and 0.4 m from the entrance to the external ear canal, so the mechanical impact or concealment with clothes have been disabled, i.e., care was taken not to disturb the normal and safe performance of work tasks (Figure 1). Three (3) measurements were performed at each workplace for 5-6 hours.

The dynamic range of noise level detection of dosimeters is 60 dB(A), i.e., the dosimeter registers noise level in the range of 70-130 dB(A). During measuring personal noise exposure, noise level values are taken every 2.20 msec and are summed at 3.75-minute intervals (16 times in one hour). At the end of the measurement, a value for an equivalent noise exposure level has been obtained for the examined period in dB (A) and the received dose value in percentage.

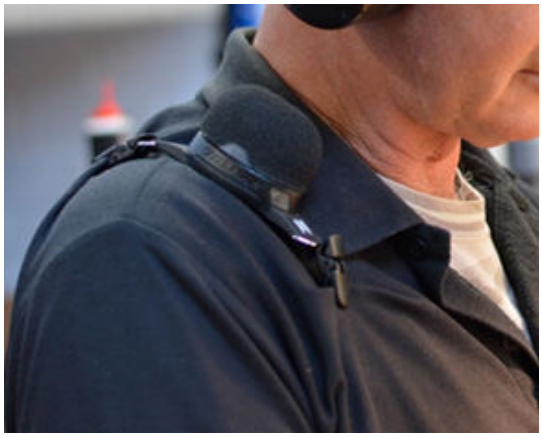

Figure 1. Microphone location during personal noise exposure measurement

The noise exposure measurements have been performed in accordance with MKS EN ISO 9612: 2010 Acoustics - Determination of noise exposure in the working environment - Engineering method. Noise dosimeters, which measure the noise level for several hours, calculate the cumulative noise level expressed as received dose for a certain time in percent [5].

The recommended limit values according to NIOSH were used for comparison of the results from measurement of the personal noise exposure of workers in different industries, because according to the Rulebook on safety and health at work of the workers exposed to noise risk (Official Gazette of RM, No. 21/08), 85 dB(A) is above action value for 8 hours of noise exposure [6].

RESULTS AND DISCUSSION

The main noise sources in the factory for the production of PVC doors and windows are machines for gluing, cutting and cleaning of materials. Personal noise exposure has been determined on 4 workers, distributed in 4 working tasks. The description of working activities is given in Table 1.

Table 1. Personal noise exposure level on workers in the factory for the production of PVC windows and doors

Workplace	Description of working activities	Min [dB(A)]	Max [dB(A)]	$L_{ex,8h}$ [dB(A)]	Dose [%]
SINGLE LINE machine worker	Gluing and cleaning of PVC windows and doors	76,3	83,5	79,6	27
Two-headed circular worker	Cutting of aluminum and PVC profiles	77,0	77,1	78,4	24
Iron cutter worker	Cutting of iron profiles	68,5	86,5	77,8	20
Worker in preparation department	Preparation of windows and doors for mounting	62,4	81,1	75,3	11

The main noise sources in the metal processing industry are the iron processing machines. Personal noise exposure has been determined on 3 workers, divided into 3 working tasks. The description of working activities is given in Table 2.

Table 2. Personal noise exposure level on workers in the metal processing industry

Workplace	Description of working activities	Min [dB(A)]	Max [dB(A)]	$L_{ex,8h}$ [dB(A)]	Dose [%]
Iron processing machine worker	Iron processing	83,6	97,1	91,6	480
Cutting machine worker	Cutting profiles and pipes	69,3	87,2	79,8	28
Drill worker	Making threads	76,7	87,9	81,3	42

The main noise sources in the cardboard box production are the machines for cutting and folding the materials. Personal noise exposure has been determined on 3 workers, divided into 3 working tasks. The description of working activities is given in Table 3.

Table 3. Personal noise exposure level on workers in the cardboard box production

Workplace	Description of working activities	Min [dB(A)]	Max [dB(A)]	$L_{ex,8h}$ [dB(A)]	Dose [%]
Gluing machine worker	Folding and gluing cardboard	74,9	81,4	75,6	12
Cutting machine worker	Cutting cardboard	64,4	84,4	78,4	19
Cutting and folding machine worker	Cutting and folding cardboard boxes	78,0	79,8	78,3	18

The main noise sources in the textile industry are the machines for sewing materials. Personal noise exposure has been determined on 3 workers, divided into 3 working tasks. The description of working activities is given in Table 4.

Table 4. Personal noise exposure level on workers in textile industry

Workplace	Description of working activities	Min [dB(A)]	Max [dB(A)]	$L_{ex,8h}$ [dB(A)]	Dose [%]
Sewing machine worker	Sewing buttons	35,0	55,2	45,5	<1
Holes machine worker	Making holes	69,6	75,1	69,8	3
Toper machine worker	Preparation for ironing	68,5	72,7	67,8	1,5

The main noise sources in the furniture production plant are the machines for cutting and gluing materials. Personal noise exposure has been determined on 3 workers, divided into 3 working tasks. The description of working activities is given in Table 5.

Table 5. Personal noise exposure level on workers in the furniture production

Workplace	Description of working activities	Min [dB(A)]	Max [dB(A)]	$L_{ex,8h}$ [dB(A)]	Dose [%]
Cutting plywood machine worker	Cutting plywood	69,0	78,8	74,2	7
Cutting of hobs and hardboard machine worker	Cutting of hobs and hardboard	75,5	80,3	75,0	9
Gluing machine worker	Gluing machine	76,3	80,6	75,2	9,5

The results obtained from the monitoring of personal noise exposure of the workers in the furniture production plant, the cardboard boxes production plant, the PVC door and window production plant and in the textile industry, indicate that the noise level at all examined noise sources does not exceed the lower exposure action value, in accordance with the Rulebook on OHS of workers exposed to noise risk (Official Gazette of RM, no. 21/8).

The results of the personal noise exposure measurements on the workers in the material processing industry (Table 2) show that the workers on iron processing, drilling and cutting machines, are exposed to a quite high noise level, which exceeds the upper exposure action value, as well as the allowable dose, which means that for these workplaces the usage of personal protective equipment is mandatory, in accordance with EN 352-1 with a noise reduction level (NRR - Noise Reduction Rating) of 10 - 15 dB.

CONCLUSION

The results obtained from the monitoring of the personal noise exposure of the workers in the metal processing industry clearly indicate that these workers are exposed to a very high noise level, which exceeds the upper exposure action value and therefore can be a risk factor for hearing loss, as well as cause for psychological problems, that may cause injuries at work. However, in order to have stable and balanced management in all industries, we must have a modern and efficient system for managing processes and workers, involving a lot of effort and responsibility to protect the workers` health. A systemic change in the perception of the importance of noise protection in global development must be set as a precondition for the sustainable development of society and economy [7].

This highlights the necessity of continuous investment in research to find more responsible, more complex, and more successful solutions to noise problems, because it is an important segment of the management of business entities. The social and economic costs arising from harmful effects of occupational noise are a cause for concern in all industries, but it is important to note that OHS is not just pointed to the prevention of injuries at work and occupational noise diseases, but there must be an overall organized system with continuous improvement of safety culture.

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ПЕРСОНАЛНА ИЗЛОЖЕНОСТ НА БУЧАВА НА ВРАБОТЕНИТЕ ВО ИНДУСТРИЈАТА

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Резиме

Со брзиот технолошки и индустриски развој, сериозно се зголемува бројот на штетностите, ризиците и опасностите по здравјето на работниците, меѓу останатото и поради прекумерната изложеност на високо ниво на бучава. Тоа ја наметнува потребата да се посвети поголемо внимание на проблемот на влијанието на бучавата врз здравјето на работниците, професионалните болести и штетности кои ги предизвикува, мерките за заштита од високите нивоа на бучава и воведување на мерки за ефективно контролирање на истите.

Со цел да се утврди персоналната изложеност на бучава на одредени работни места, во различни индустрии, беше извршено мерење на персонална изложеност на бучава кај 16 работници, распределени на 16 работни места. Кај секој работник е извршено мерење на бучава со дозиметри во времетраење од 6 часа во три работни дена.

Во трудот се прикажани резултатите од персонална изложеност на бучава на вработените во: погон за производство на мебел, погон за производство на картонски кутии, погон за производство на PVC прозорци и врати, текстилна индустрија и металопреработувачка индустрија.

Клучни зборови: *производство, индустрија, опасност, загуба на слух*