Jurnal Mekintek,13 (1) (2022) pp. 7-11

Published by: IHSA Institute

Jurnal Mekintek: Jurnal Mekanikal, Energi, Industri, Dan Teknologi

Journal homepage: www.ejournal.isha.or.id/index.php/Mekintek

Design Of Noise Level Control To Reduce The Dosage Of Noise Exposure In Jakarta Electronic Companies

Mutiara N Sembiring

Department Of Industrial Engineering, University Of North Sumatra, Jl. Dr. Mansur No. 9 Padang Bulan, Kec. Medan Baru, Kota Medan 20222

ARTICLE INFO

Article history:

Received Feb 10, 2022
Revised Mar 07, 2022
Accepted Apr 30, 2022

Keywords:

Work Environment
Noise
Barrier Design
Noise Reduction (NR)

ABSTRACT

Noise is one of the physical hazard factors that are often encountered in the work environment. Continuous noise can cause discomfort at work. Jakarta Electronics Company is a company that produces electronic goods such as fans. The guard shop production unit is a production area that produces front guard and rear guard (fan product safety net). In the production unit there is a noise problem. Noise occurs at the level of 86 to 92 dB(A) and lasts for 7.8 hours/day, so it has exceeded the noise threshold value permitted by the government based on the Decree of the Minister of Manpower No. KEP.51/MEN/1999. This noise has the effect of hearing loss, feeling disturbed, fatigue, and impaired work communication.The research design used is a descriptive design using a survey method. Research variables include air temperature, noise level, duration of work, exposure to noise. Noise level and room temperature were measured using a 4 in 1 Multi Function Environment Meter. Other data is obtained from company record files.The measurement results show that the noise in the guard shop production unit has passed the threshold value with a noise range of 86 dB to 92 dB, which is in the area of Middle Ring Welding, Cutting, Outer Ring Welding, Forming, , and Projection Welding machines.The design of the noise level management in the guard shop production unit is carried out by engineering control through the installation of barriers. The installation of the barrier will not interfere with the smooth flow of production at the guard shop production unit and other work stations.

Corresponding Author:

Mutiara N Sembiring,
Department Industrial Engineering,
University Of North Sumatra,
Jl. Dr. Mansur No. 9 Padang Bulan, Kec. Medan Baru, Kota Medan 20222.
Email : mutiarasembiring@gmail.com

1. INTRODUCTION

Noise is unwanted sound or sound. Noise is defined as sound originating from production process machines which at a certain level can cause hearing loss (Decree of the Minister of Manpower, 2011).

Based on research (Agung, 2016) that the level of stress in the moderate category shows that in assessing stress symptoms, at least they experience somatic or physical (muscle) disorders such as experiencing shoulder pain, pain in which the respondent must supervise the spinning process. In addition to the complaint of shoulder pain, it is known that working close to the machine

makes the air temperature in the surrounding environment hot. With hotter air from an environment far from the engine, it can affect respiratory complaints.

The results of this study are reinforced by research (Widana, 2014) that the noise from the sound of the production machine causes discomfort to work, the air temperature around the machine is higher and causes workers to breathe faster so that they feel tired and increase the workload.

Based on research (Fithri, 2015) that the noise level in the PLTD and Boiler units on average exceeds the noise threshold value. Where the noise level that occurs is above 100 dBA while the permissible noise threshold value is 85 dBA. The impact that occurs from the noise in the form of communication disorders, hearing loss (auditory) and psychological disorders.

Based on research (Jayawardana, 2014) in the textile industry, the increase in noise due to advances in machine technology is a serious problem, especially for workers' hearing. Control is carried out by means of silencers on the machine or replacing the noise-causing material on the machine. The results show that making the damper on the machine is more effective than changing the machine material.

Jakarta Electronics Company is a company that produces electronic goods located in Jakarta. The noise problem was found in the Guard Shop Department. The source of the noise comes from various production machines that process the front guard and rear guard. The production process creates noise due to welding and cutting operations on the material, resulting in a very noisy sound.

Based on data obtained from the company's subordinates, workers check hearing loss once a year. The results of checking hearing loss showed that in both ears, 4 workers (57%) did not experience hearing loss, 3 (43%) workers experienced mild deafness. Hearing loss is one indicator of a person's hearing loss.

2. RESEARCH METHOD

This type of research is included in descriptive research. Descriptive research is a research conducted to describe systematically, factually and accurately about the facts and properties of an object in order to find solutions to problems that exist in the object and evaluation materials in dealing with problems to determine plans and decisions.

Study in do observation and collection data carried out in the following sequence of activities. Observation preliminary in units guard production shop, which have a noise problem.

a. Collection of company record files as supporting data.
b. Measurement of the working position of operators and machines.
c. Determination of noise level measurement point.
d. Perform noise level measurements at 12 measurement points.
e. Measure the room temperature at a height of 1.5 meters.

2.1 Troubleshooting Analysis

Analyzing the overall noise level on the production floor at the Jakarta Electronics Company, comparing it with the noise standard permitted by the government through SNI 6-7063-2004. If the noise level is above the threshold, it is necessary to design a noise control proposal to reduce the operator's productive time and the risk of the operator's hearing loss.

3. RESULTS AND DISCUSSIONS

3.1 Analysis of the Relationship between Noise Levels and Noise Exposure

Noise in the guard shop department is generated from pneumatic powered machines (pneumatics work by blowing air outward causing noise/hiss to flow outward) generated through the compressor, including various types of welding machines and cutting machines. Based on the results of measurement and data processing, the noise level that exceeds the threshold value based on SNI 6-7063-2004 is for the noise level threshold value of 85 dB with 8 working hours / day in the Middle Ring Welding (88.04 dB), Cutting (91.65) area. dB), Outer Ring Welding (89.95 dB), Forming (89.95 dB) and Projection Welding (87.71 dB). The relationship between noise level

and noise exposure can be seen from the correlation coefficient value which indicates a high or low level of noise relationship. The correlation value is 0.

3.2 Work Duration Analysis with Noise Exposure

Based on SNI 6-7063-2004, the noise level threshold is 85 dB with 8 working hours/day, while the results of data processing show that all areas of the Guard Shop Department have a maximum working time of less than 8 working hours/day, which is 1.50 hours. up to 6.78 hours. Thus, when compared with the current actual working time, the noise dose has exceeded the threshold value set by OSHA (Occupational Safety and Health), namely DND 1 or 100%. Noise dose that exceeds 1 or 100% is a noise condition that is harmful to the health and safety of the operator at work. Based on the processing carried out, the percentage of DND values is 118% to 478%. This indicates that the noise dose has exceeded the standard that has been set. The relationship between work duration and noise exposure can be seen from the correlation coefficient value which indicates a high or low level of noise exposure relationship. The correlation value is 0.994 high description and the regression equation is Y = -73.83+ 606.66x.

3.3 Analysis of Air Temperature on Noise Exposure

The air temperature has not been able to be specifically improved, this is considering the air speed comes from the use of an electric fan which makes the air blow around the operator so that the operator becomes more comfortable, because the temperature in the work area can reach 320C during the day and 33 0C in the afternoon. Based on data processing, it was obtained that the air temperature in the work area of the Guard Shop Department has exceeded the standard set by SNI 6-7053-2004, which is 26.70C. The relationship between noise level and noise exposure can be seen from the correlation coefficient value which indicates a high or low level of noise relationship. Correlation values and regression equations can be seen in Table 6.1 below.

Table 1. Correlation Level with Noise Exposure

Time	Variable	Mean± Standard Deviation	Coefficient Regression a	b	Regression Equation	r	Relationship Description
09.00	Air Temperature (0C)	30.29±0.37	-47	4,560	Y = -56.67+ 0.6667x	0.918	Tall
	Noise Level	91.11±1.78					
11.00	Air Temperature (0C)	32.67±0.16	-386,727	14.62	Y = - 386,727+ 14.62x	0.903	Tall
	Noise Level	91.07±2.47					
15.00	Air Temperature (0C)	33.42±0.22	-227,277	9.52	Y = - 227,277+ 9.52x	0.914	Tall
	Noise Level	91.16±2.27					

Source: Data Processing

Based on Table 1 for the three times, it shows that there is a strong relationship between room temperature and the level of noise produced. The increase in the value of the room temperature will result in an increase in the noise level. This indicates that the noise level is getting higher in line with the increase in room temperature because air temperature affects the speed of sound propagation. The higher the air temperature, the higher the speed of sound.

3.4 Noise Mapping Analysis

Based on the results of data processing taken from 12 measurement points, the equivalent value of each point representing each part of the measurement time is then used to create a noise map using Surfer 11.0 Software. based on the spatial mapping it was said that all parts of the Guard Shop Department were in a dangerous condition for the operator. This is affected because the noise level generated by the machine in the Guard Shop Department exceeds the threshold

value based on SNI 6-7063-2004, which is 85 dB, resulting in dangerous conditions for workers in the Guard Shop Department who are exposed to 8 hours of work/day.

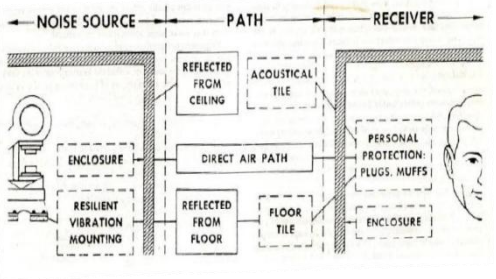

Figure 1. Vibration and Noise Control

According to (Huboya, 2013) noise control can be done in several ways, among others, technical control (engineering control) both at the noise source, sound transmission (sound path) and to the listener (receiver), administrative control (administrative scheduling control) with rotation employees and use of ear protection equipment (earplugs and ear muffs).

3.5 Noise Control Administrative Control

Noise control with administrative control can be done by rotating work and using PPE for workers, consideration of work rotation cannot be carried out because it can disrupt the smooth flow of production at guard shop production units and other work stations because of the type of production flow that must be prepared 1 batch of parts, then sent to the next work station, so that when the rotation activity takes place it will interfere with the activities of the operator and other work stations, besides the existence of different operator skills making work rotation difficult to implement.

The use of personal protective equipment (PPE) is the last step that can be taken if noise control by engineering control, sound path and administrative control can no longer be carried out.

4. CONCLUSION

The equivalent noise level in the guard shop department during the day is 86.8 dB to 92.5 dB. The work environment is categorized as noisy because it exceeds the threshold value based on SNI 6-7063-2004, which is 85 dB for 8 hours of work/day.

Noise mapping using surfer 11.0 software shows the working environment conditions that the guard shop department is dangerous from 12 measurement points which are dominated by red and orange colors.

Noise control is carried out by means of engineering control by installing barriers and sound transmission (sound path) with the installation of acoustic boards. Barriers are installed on 6 projection welding machines and an acoustic board mounted on the ceiling of the guard shop department is estimated to be able to reduce noise around 7.8 dB so as to produce the guard shop department work area in a safe condition which is dominated by green.

REFERENCES

Agung, H. D. (2016). *Hubungan Intensitas Kebisingan dan Beban Kerja dengan Stres Kerja pada Pekerja Bagian SPINNING di PT. KUSUMAPUTRA SANTOSA KARANGANYAR.* Surakarta: Universitas Muhammadiyah Surakarta.

David Abbey E. 1972. *Some Estimator of Sub Universe Means For Use With Lattice Sampling.* University Of California : Los Angles.

Fithri, P. d. (2015). *Analisis Intensitas Kebisingan Lingkungan Lingkungan Kerja pada Area Utilities Unit PLTD dan Boiler di PT. Pertamina RU II Dumai.* Padang: Universitas Andalas.

Guide Q.S. 2012. *Surfer 11 counturing* & 3D *Surface Mapping For Scientist and Enginers*. USA.

Indonesia, S. N. (2004). *Nilai Ambang Batas Iklim Kerja (Panas), Kebisingan, Getaran Tangan-Lengan dan Radiasi Sinar Ultra Ungu di Tempat Kerja.* Jakarta: SNI.

Keputusan Mentri Negara Lingkungan Hidup No. 48 Tahun 1996.

Ketut, I. W. (2009). *Kebisingan Berpengaruh Terhadap Beban Kerja dan Tingkat Kelelahan Tenaga Kerja di Industri Pengolahan Kayu.* Bali: Politeknik Negeri Bali.

Mediastika, Christina E. 2009. Material Akustik Pengendali Kualitas Bunyi pada Bangunan. Yogyakarta : Penerbit Andi.

*National Institute for Occupational Safety and Health (**NIOSH**)* 1996 *Occupational Safety and Health Administration* (OSHA).

Per.13/MEN/X/2011, P. M. (2011). *Nilai Ambang Batas Faktor Fisika dan Faktor Kimia di Tempat Kerja.* Jakarta.

Peraturan Menteri Tenaga Kerja Dan Transmigrasi Nomor Per.13/Men/X/2011 Tahun 2011

Saenz, A. Lara, dkk. 1986. *Noise Pollution (Editing)*. Paris: ICSU&SCOPE . Satwiko, Prasasto. 2008. *Fisika Bangunan.*Yogyakarta: Penerbit Andi.

Suma'mur. 1991. *Higene Perusahaan dan Kesehatan Kerja*. Jakarta: CV Hajin Masagung.