



(RESEARCH ARTICLE)



Analysis of measurement of the working environment of machine noise in the production area in packaging factory

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Abstract

Noise is an unwanted and disturbing sound that can damage comfort, work peace, hearing, blood pressure, heart rate and muscle tension. The threshold limit value (TLV) for noise in the company is 85 dB with 8 working hours of exposure. This research uses a quantitative observational method by directly observing machine noise and the noise received by workers. The way to measure noise is by using a calibrated sound level meter. The results of this research are threshold values, namely 85.7 dB and 90.5 dB. The noise is above TLV due to the many machines in one room and the additional equipment, namely blowers, on each table. However, in this situation, workers are obedient in using earplugs. Noise can cause disruption to hearing organs, workers' psychological conditions, and decreased worker productivity. This research shows that the noise condition of PT X's production area exceeds the threshold value set in PERMENAKER 5 of 2018. This research further recommends conducting safety patrols to ensure workers use earplugs or earmuffs and the use of earplugs or earmuffs correctly.

Keywords: Machine; Noise; Production; Threshold Limit Value; Workers

1. Introduction

Environment greatly influence a person's performance, both directly and indirectly. The global market with its industrialization program, currently uses mechanization with quite high technology, which is followed without technological expertise and adequate human resource readiness. As a result, various new problems arise, including physical work environment conditions that endanger the health and safety of workers. Apart from that, the condition of the physical work environment needs to be monitored because if it is not controlled and exceeds the threshold values or standards that have been set, it can weaken bodily functions and even reduce employee performance, which ultimately reduces the company's productivity level.

According to the World Health Organization (WHO), noise has been recognized as one of the threats to public health, with its detrimental effects such as hearing impairment, sleep disturbance, stress, and other health issues. Additionally, noise can also lead to disturbances in concentration, productivity, and overall quality of life. One factor that influences the work environment is noise. According to Peraturan Menteri Ketenagakerjaan No 5 tahun 2018 Noise, is an unwanted and disturbing sound or sounds, can be detrimental to comfort, work peace, hearing, blood pressure, heart rate, and muscle tension. This can accelerate the level of fatigue, ultimately having a negative impact on work productivity. Generally, noise comes from the sound of machines or other work aids used in the production process (1).

Ensure the safety, health, and productivity of workers in the workplace, the government has regulate work safety matters in Undang-undang Nomor 1 Tahun 1970. Inside is threatened that every company is obliged to ensure the occupational safety and health of everyone in the company environment, especially workers (2).

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Along with industrial development and the increasing public need for cosmetic and skincare products, PT X has emerged as one of the main players in the cosmetic and skincare packaging manufacturing industry. Various departments have large machines to produce quality products to meet customer requirements. However, in line with the operational intensity of these machines, noise is a crucial issue that can affect employee welfare and operational efficiency.

The importance of understanding and managing the work environment, especially regarding machine noise, which is a real challenge at PT X. Employee welfare and company compliance with occupational safety and health regulations are the main focus in carrying out daily operational activities. Therefore, measuring machine noise is a proactive step in ensuring the sustainability and operational safety of the PT X. Noise has a threshold limit value.. this threshold limit value is stated in the PERMENAKER 5 tahun 2018.

Table 1 Noise threshold value of PERMENAKER 5 tahun 2018

Exposure time in a day		noise intensity in dBA
8	hours	85
4		88
2		91
1		94
30	minutes	97
15		100
7,5		103
3,75		106
1,88		109
0,94		112
28,12	second	115
14,06		118
7,03		121
3,52		124
1,76		127
0,88		130

Management of noise is a crucial aspect in workplace environmental management in anufacture industria due to the presence of noise hazards above the threshold from the operation of work equipment, which can lead to hearing impairments(3). The influence of noise exposure generally depends on the intensity and duration of exposure. High-intensity noise effects (above the permissible exposure level) in manufacture industrial can result in damage to the ears, leading to both temporary and permanent hearing impairments (4). Physiologically, high-intensity noise can cause health disturbances, including increased blood pressure (± 10 mmHg), elevated heart rate, risk of heart attacks, sensory disturbances, constriction of peripheral blood vessels in the hands and feet, disruption of organ balance, and digestive disorders(5).

The aim of this research is to determine the noise picture in the entire production area of PT X. The benefit of this research is knowing the level of noise exposed to PT X production workers.

2. Material and methods

This research uses quantitative observational methods by observing directly.machine noise in the production area. The population in this study were all workers who work in the production area of PT X. The data collection technique is carried out by measuring engine noise in the production work environment at PT X using a tool called a sound level

meter. This tool belongs to PT X which has been calibrated. Data collection activities at PT X until December 1, 2023. Data collection is carried out at the same time as an internship at PT X. This noise measurement measures two places: on the machine and on the worker. so researchers can find out how much noise workers receive during 8 hours of work. analysis test are carried out using statistics descriptive. Descriptive statistics are only pertinent by explaining or giving information about data or circumstances or phenomena (6).

3. Results and discussion

Table 2 Noise on machinery and exposure to workers in the injection molding area

Machine name	machine	worker
Borche 200 T1	103,5	92,5
Nissei B1	104,9	94
Nissei B4	104	91,1
Nissei B4	83,4	79,8
Haitian 3	97,6	86,5
Nissei B17 (blow)	108,8	89,3
Borche 260 T1	83.6	84.4
Borche 260 T6	85.2	82.1
Borche 260 T5	108	85.4
Borche 260 T4	114	85.8
Borche 260 T2	111.2	82.6
Nissei B12	114.4	87.9
Nissei B11	103.7	84.8
Nissei B13	104.5	84.5
Kks 19	85.4	84
nissei A09	86,1	83,7
nissei A08	102,8	85,8
borche 320 t5	90,4	87,6
nissei A07	87	84,6
Nissei A6	95,5	91,1
Nissei A15	88,6	87,4
Nissei A2	93,8	85,8
Haitian 2	113.4	82,8
Haitian 1	96	80.3
Borche 320 T8	104.4	80.4
Borche 320 t5	96	84,1

The average disturbance received by workers from various machines in the area is 85.7. This can be said to exceed the threshold value (NAB) determined by the government as stated in the Minister of Manpower Regulation No. 5 of 2018. According to PERMENAKER 18 of 2018, the minimum NAB is 85 Db for exposure to 8 working hours. Noise that exceeds the TLV is caused by the additional blow tool on the machine. However, workers use earplugs or earmuffs to reduce noise.

Table 2 Noise on machinery and exposure to workers in the injection molding area

Machine name	machine	Workers
Mesin Novax 1	89,2	86,4
Mesin Novax 2	86,4	85,5
Vk 2000 2	92,8	88,2
BT 8423	89,2	90,9
Vk 2	97,7	85,9
b02	93	88,1
Aok-2000 workers 1	113,8	102
Aok-2000 workers 2	103,2	100,4
Parker	93	88,4
Kautex 1A	99	95,8
Kautex 2A	99	87,3
Kautex CC15	93,3	91,5
Parker 2	98,2	94,7
Kautex depan blow	99,5	86,4

The average noise that workers receive from the various machines present in the area is 90.8. This can be said to exceed the threshold value (NAV) determined by the government as stated in the regulation of the Ministry of Manpower number 5 of 2018. In accordance with PERMENAKER 18 of 2018, the policy NAV is 85 Db for 8 hours of work exposure. Noise can be understood as unwanted noise, coming from work tools and/or equipment, and to some extent can cause hearing damage. According to (7) research, noise in the work area is proven to significantly affect the performance of workers, which tends to decrease, As a result of being disturbed by noise intensity that is above normal

High levels of occupational noise exposure pose a significant risk to occupational health and safety. A UK national survey found that occupational noise exposure was responsible for severe hearing difficulties in approximately 153,000 men and 26,000 women, aged 35 to 64 years, with significantly more persistent tinnitus (266,000 men, 84,000 women) (8). This is supported by research. (9), which states that there is a relationship between noise intensity and auditory complaints in workers. Workers who are exposed to noise exceeding the threshold value (85 dB) have a 7.971 times higher chance of experiencing auditory complaints compared to workers who are exposed to noise intensity below the NAB (9).

Noise can also affect a person's psychology. Psychological disorders that occur because humans interpret the sounds they perceive in the final process of hearing, if there is damage to reception in the hearing center, namely in the part of the brain by the vestibulocochlear nerve, humans interpret the noise as a threatening condition (10). This statement is in line with research which states that there is a relationship between noise and psychological disorders of workers in the weaving loom and weaving inspection division of PT. Primatexco Indonesia Batang (Darlani & Sugiharto, 2017). His research also states that workers who work in the weaving section with noise levels above 85 dB are 4 times more likely to feel more irritable than workers with noise levels below 85 dB.

Noise is an environmental factor that can influence labor conditions on labor productivity (11). According to Manuaba in (12), tools, work methods and work environment factors influence productivity. Noise that exceeds the threshold value and is not controlled will also have an impact on work productivity because workers will have difficulty focusing on their work. This is supported by research which states that there is an influence of noise on productivity in Gemba Furniture (13). Control efforts can be carried out in several ways. Maintaining a distance between workers and machines can be done as an effort to reduce workers' exposure to machine noise. Beside that, carrying out safety briefings and checking PPE is also an effort to control noise.

4. Conclusion

Noise is unwanted sound from business or activities at a certain level and time, which can cause problems with human health and environmental comfort. Disturbances that can be caused by noise include hearing loss, mental disorders, and reduced worker productivity. PT Even though the noise is above the NAB, PT Apart from using PPE, PT However, the situation in the field is inversely proportional to the desired expectations, namely that there are still many workers who do not use ear protection for various reasons.

In accordance with field conditions and the results of noise measurements in the production area, there are several suggestions for companies, namely carrying out safety patrols every day in every shift because many workers do not use PPE but are allowed to do so, and carrying out training on the correct use of PPE periodically to reduce exposure to noise hazards. enter the auditory canal, Strengthen the rules during safety briefings and safety inductions to require the use of personal protective equipment during the production process. Beside that, companies can arrange machine locations in the production area.

Compliance with ethical standards

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No conflict of interest to be disclosed.

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