

Analysis of Noise Measurement at Engine Room Station: A Case Study on PT Socfindo Seunagan

Irvan Mahendra^{a,1,*}, Nissa Prasanti^{b,2},

^{a,b} Teuku Umar University, Alue Peunyareng streets, Ujong Tanoh Darat, 23681, Indonesia
¹ irvanmahendra743@gmail.com *; ² nissaprasanti@gmail.com;

ARTICLE INFO

ABSTRACT

Article history:
Accepted

Keywords:
Noise
Job welfare
Noise Level
PT. Socfindo Seunagan

Noise is one of the factors that can interfere with the welfare and comfort of employees' work. Too high noise can cause hearing loss, stress, and decreased concentration. Therefore, it is important to measure the noise level in the work environment and take the necessary measures to reduce the unsafe noise level. To measure the noise level at the machine room station PT. Socfindo Seunagan, the researcher used a noise measuring instrument that corresponds to the dar booth (sound Level Meter). This research was conducted at several points at the PT machine room station. Socfindo Seunagan, including near the main machines, around the production area, and in the employee's work area. The results showed that the noise level in the machine room station PT. Socfindo Seunagan exceeds the safe limits set by the Indonesian National standard. The highest noise level detected was 174 dB(A). Based on the results of this study, measures are needed to reduce the noise level at the PT. Socfindo Seunagan in order not to harm the welfare and comfort of work of employees. Possible actions include the use of ear protection, reduction of noise sources, and rearrangement of the layout of the engine room station.

Copyright © 2023 South Aceh Polytechnic.
All rights reserved.

I. Introduction

Noise is an unwanted sound that can interfere with human well-being, comfort, and health. Too high noise can cause sleep disturbances, high blood pressure, and other health problems. Therefore, it is important to measure and control the noise level in the work environment to ensure the health and safety of the workers [1].

In an industrial context, noise in engine room stations is one of the sources of noise that needs to be considered. An engine room station is an area where large machines are operated, such as boiler engines, power generation machines, and other machines. The machines can produce quite loud and annoying sounds for the workers working around them [2].

Therefore, it is important to measure the noise level at the engine room station and take the necessary measures to control such noise. This case study aims to analyze noise measurements at PT. Socfindo Seunagan and provides recommendations for actions necessary to control such noise.

II. Bibliography Review

Some literature discusses the noise level in the engine room, the results of research from (Indrawan and Nurzikiresa, 2021) show that the noise level in the Finishing PT. XYZ is 83.88 dBA, which



affects the level of mental workload of workers who fall into the "high" category. A simple linear regression analysis showed that noise had an influence of 17.2% on workers' mental workloads. Research results from (Nabila and Sukarsono, 2022) Several areas in the noise factor of the work physical environment have a noise level of more than 82 dB, namely the Threshing Station of 84 dB, the Pressing Station of 85 dB, and the Kernel Processing Station of 87 dB. Noise occurs due to the movement of the machine which causes a very strong sound and can cause discomfort to employees and can even have an impact on employee health. and research results (Erliana and Suhada Sinaga, 2020) The results of the study and discussion showed that the average noise level at the engine room station was 97 dB, the highest was due to 3 turbine engine units and the noise level at the engine room station exceeded the Threshold Value set by the government, which was 85 dB [3]–[5].

Based on previous research, the author conducted a study to determine the value of noise in engine rooms in PT. Socfindo Seunagan to analyze the noise level and can provide information and can anticipate if the noise value exceeds the threshold.

III. Method

In this study, data collection was carried out where the data was taken at a measurement location at the machine room station at PKS PT. Socfindo Seunagan. The measurement time is carried out during the 12-hour activity by means of daylight intervals 06.00 – 17.00 WIB (11 hours)

Table.1 Hourly Data Collection in the Engine Room

Hour	Average
08.00	108.9 dB
10.00	109.2 dB
15.00	106 dB

A. Data Collection Techniques

After collecting data, the next step is to process the data from observations and interviews. The data processing used is:

1. Data Reduction

Data reduction is the process of simplifying, selecting important information, and finding patterns relevant to the research topic to provide a clearer picture and facilitate subsequent data collection.

2. Data Presentation

After the data reduction is completed, the data that has been simplified is presented in an organized and easy-to-understand manner, usually in the form of narrative texts in qualitative research.

3. Conclusion Drawing

After the data reduction is completed, the data that has been simplified is presented in an organized and easy-to-understand manner, usually in the form of narrative texts in qualitative research.

B. Measurement Methods

To measure the pressure level of the dB(A) sound, we used a simple method with a sound level meter. Each measurement is taken for 10 minutes, with readings being made every 5 minutes. We took measurements for 12 hours during the day, which is in the most active time period, from 06.00 to 22.00, and for 8 hours at night, which is from 22.00 to 06.00. Each measurement must represent a

specific time interval, with at least 4 measurements during the day and at least 3 measurements at night. Example

- the L1 measurement was taken at 08:00 which represents the time period from 06:00 to 09:00.
- L2 measurements are taken at 10:00 a.m. representing a time period from 9:00 a.m. to 11:00 a.m.
- L3 measurements are taken at 15:00 which represents a time period from 14:00 to 18:00.

Equivalent Continuous Noise Level (LEQ) is a measure used to describe the continuous noise level of a noise source over a period of time. LEQ is calculated by multiplying each noise level value (expressed in decibels, dB) by its time, then summing up all those values, and then dividing by the total time of the period. LEQ can be used to describe the noise level that occurs in the environment during a period of time, for example during a day or for a month.

LEQ is a useful measure to determine whether the noise level occurring in the environment has exceeded the tolerance limit set by the government or not. Usually, the government sets a tolerance limit for the permissible noise level in the environment based on the LEQ, so the LEQ is a useful measure to measure the level of noise that occurs in the environment and compare it with the tolerance limit that has been set.

Description :

Leq : *Equivalent Continuous Noise Level*

LTMS = Leq With Sampling Time Every 5 Seconds.

Ls = Leq During daylight

LM = Leq During the night

LBC = Leq During the day and night Ls is calculated as follows :

$$L_s = 10 \log 1/16 (T_1 \cdot 10^{0.1 \cdot L_1} + \dots + T_4 \cdot 10^{0.1 \cdot L_4}) \text{ dB (A)} \quad (\text{press 1})$$

LM is calculated as follows :

$$L_M = 10 \log 1/8 (T_5 \cdot 10^{0.1 \cdot L_5} + \dots + T_7 \cdot 10^{0.1 \cdot L_7}) \text{ dB (A)} \quad (\text{press 2})$$

Knowing that the noise level has exceeded the noise limit, it is necessary to find the L_{SM} value from field measurements. L_{SM} is calculated from the formula :

$$L_{SM} = 10 \log 1/24 (16 \cdot 10^{0.1 \cdot L_s} + 8 \cdot 10^{0.1 \cdot L_M}) \text{ dB (A)} (\text{press 3})$$

The calculated L_{SM} value is compared with the standard value of the noise level set according to the decree of the Minister of the Environment no. 48 of 1996 with a Tolerance of 3dB (A)

Peruntukan Kawasan/ Lingkungan Kesehatan	Tingkat kebisingan db(A)
a. Peruntukan Kawasan.	
1. Perumahan dan Pemukiman	55
2. Perdagangan dan Jasa	70
3. Perkantoran dan Perdagangan	65
4. Ruang Terbuka Hijau	50
5. Industri	70
6. Pemerintahan dan Fasilitas Umum	60
7. Rekreasi	70
8. Khusus :	
- Bandar Udara	
- Stasiun Kereta Api	60
- Pelabuhan Laut	70
- Cagar Budaya	
b. Lingkungan Kegiatan	
1. Rumah Sakit atau sejenisnya	55
2. Sekolah atau sejenisnya	55
3. Tempat ibadah atau sejenisnya	55

Figure 1. Decree of the State Minister of the Environment No. 48 of 1996 dated November 25, 1996

C. Data Processing

Noise Measurement Results

The average measurement results obtained for each time of data retrieval from the machine room station are as shown in the table below .

Table 2. Noise Measurement Results in the Engine Room

No	Code	Era	Clock Data Retrieval	Time/Hour	Result/dB
1	L1	06.00 – 09.00	08.00	3 Hours	108.9 dB
2	L2	09.00 – 14.00	10.00	5 Hours	109.2 dB
3	L3	14.00 – 18.00	15.00	4 Hours	106 dB

Source. Data Processing

After obtaining the results of the next measurement, determining the value of dB Equivalent throughout the day dBA must be calculated according to the decree of the Minister of the environment The value of dB equivalent at noon is stated as LS, the dB value of the night time equivalent is expressed by LM and the average value of dB (A).

Ls is calculated as follows

$$Ls = 10 \log_{10} \left(\frac{1}{12} (T1 * 10^{(0.1 * L1)} + T2 * 10^{(0.1 * L2)} + T3 * 10^{(0.1 * L3)}) \right) \text{ dB (A)} \text{ (Press 4)}$$

$$Ls = 10 \log_{10} \left(\frac{1}{12} (3 * 10^{(0.1 * 108.9)} + T2 * 5 * 10^{(0.1 * 109.2)} + T3 * 10^{(0.1 * 106)}) \right) \text{ dB (A)}$$

$$Ls = 10 \log_{10} \left(\frac{1}{12} (3 * 10^{(0.1 * 108.9)} + T2 * 5 * 10^{(0.1 * 109.2)} + T3 * 10^{(0.1 * 106)}) \right) \text{ dB (A)}$$

$$Ls = 10 \log_{10} \left(\frac{1}{12} (1.21857E+16 + 3.57069E+18 + 9.59038E+16) \right) \text{ dB(A)}$$

$$Ls = 10 \log_{10} \left(\frac{1}{12} (3.67878E +18) \right) \text{ dB (A)}$$

$$L_s = 10 \log_s 3.05339E + 17 \text{ dB (A)}$$

$$L_s = 174 \text{ dB (A)}$$

IV. Results and Discussion

A. Noise Meter Results

Measurements are carried out in a simple way, where measurements are carried out using the recommended *Sound Level Meter* according to recording and are carried out within 10 minutes with an interval of 5 seconds each sampling at 3 data collection times in a day.

This simple measurement is used according to the decree of the Minister of State for the Environment No. 48. In 1996, the results of measurements in a simple way can be seen in Table 1.

B. Discussion

Based on the standard noise level as shown in table 1. That for stassiun room machine PKS PT. Socfindo Seunagan, in terms of the standard noise level in accordance with annex II of the decree of the State Minister of the Environment no. 48 of 1996 is 70 dB, it can be seen that the results of processing The data on the engine room station takes place a measured noise level.

Table 2. dB Value Calculation Results

LsdB Location	Threshold Value	Interplay
Location 1	70	Not Meeting Standards

Source. Data Processing

Based on measurements from location 1 i.e. engine station, the L_s (Noon Measurement) value is 174 dB.

V. Conclusion

Based on the results of measurements carried out in a simple way using a sound level meter according to the recommended recording, it can be seen that the noise level at the PKS PT. Socfindo Seunagan during the day does not meet the noise level standard set by the Minister of State for the Environment no. 48 of 1996, which is 70 dB. The measured L_s value during the day is 174 dB. This shows that the noise level in the machine room station PKS PT. Socfindo Seunagan during the day is too high and it is necessary to take measures to reduce the noise level.

There are several actions that can be taken to reduce the noise level at the PT PKS engine room station. Socfindo Seunagan, including:

1. Using acoustic protection or sound insulation on noisy machines.
2. Using a muffler or silencer on the exhaust gas to reduce the noise generated by the engine.
3. Placing noisy machines in a location that is more isolated from the surrounding environment.
4. Perform regular maintenance and maintenance on machines to keep them operating optimally and not producing excessive noise.
5. Implement an environmental management system that pays attention to noise aspects such as ISO 14001.

In addition, companies must also ensure that workers working at such machine room stations get sufficient protection against excessive noise exposure, such as by providing earplugs or earmuffs according to the measured noise level.

References

- [1] Fanny, N. (2015). Analysis of the effect of noise on the level of work concentration in labor in the process section of PT. Iskandar Indah Printing Textile Surakarta. *Journal of INFOKES Universitas Duta Bangsa Surakarta*, 5(1).
- [2] Juliardi AR, N. R. (2022). *Public Health Management Technology*.
- [3] A. S. S. Cut Ita Erliana, "MEASUREMENT OF NOISE LEVELS AT THE MACHINE ROOM STATION AT THE PT. PERKEBUNAN NUSANTARA IV KEBUN ADOLINA Cut Ita Erliana and Aji Suhada Sinaga," *Industrial Engineering Journal*, vol. 9, no. 2, 2020.
- [4] N. Salwa Nabila and B. Purwanggono Sukarsono, "ANALYSIS OF WORK FATIGUE IN PROCESSING WORKERS USING SUBJECTIVE SELF RATING TEST (SSRT) (CASE STUDY: XYZ OIL COMPANY)."
- [5] V. Indrawan and R. Nurzikiresa, "Analysis of the Effect of Noise on the Mental Workload of PT. XYZ Using NASA-TLX Method," 2021.