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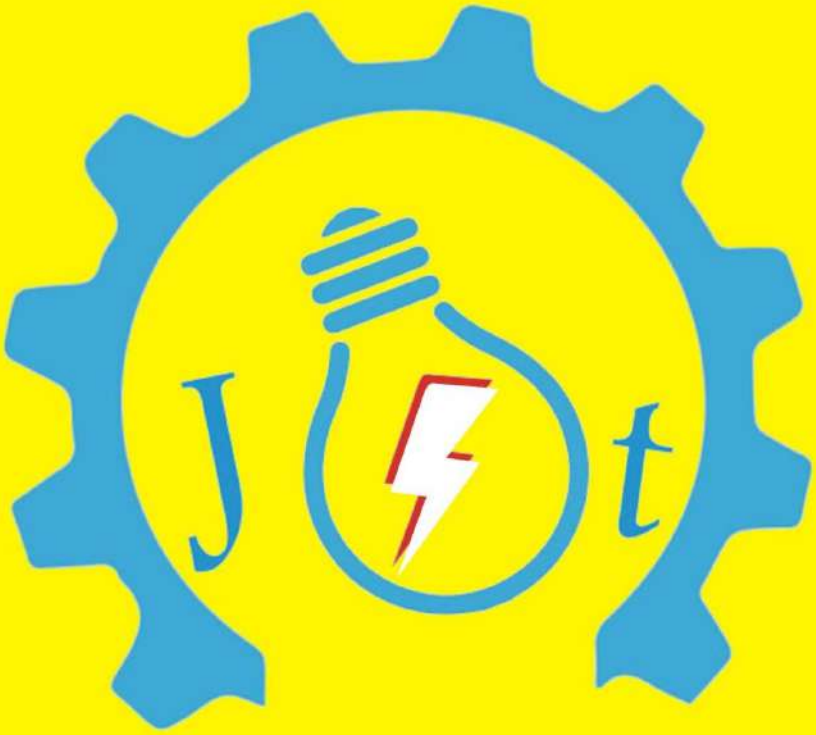

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Pengantar Redaksi

Jurnal Sains & Teknologi Fakultas Teknik Universitas Darma Persada pada Volume XII. No. 2. September 2022 ini menyuguhkan dua puluh empat (24) tulisan bidang teknologi. Tulisan tersebut ditulis oleh dosen-dosen program-program studi di Fakultas Teknik dan dosen-dosen program-program studi di Fakultas Teknologi Kelautan Universitas Darma Persada, Jakarta yang tentu saja kami harap dapat menambah wawasan pembaca.

Bidang-bidang teknologi yang dibahas pada Jurnal Volume XII. No. 2 September 2022 ini adalah bidang Teknik Mesin, Teknik Elektro, Teknik Perkapalan dan Sistem Perkalapan dan bidang Teknologi Informasi serta Sinstem Informasi. Untuk informasi lebih rinci mengenai bidang-bidang yang dibahas dapat dilihap pada dafta isi jurnal ini.

Kami mengharapkan untuk edisi berikutnya bisa menampilkan tulisan-tulisan dari luar Universitas Darma Persada lebih banyak lagi dengan informasi dan teknoligi terkini. Selamat membaca dan kami berharap tulisan-tulisan ini dapat dikembangkan sesuai dengan kebutuhan dan minat pembaca.

Jakarta, 15 September 2022

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THE EFFECT OF USING MULTI LAYER MATERIAL ON DIESEL ENGINE SOUND ABSORBER CASE

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ABSTRACT

Indonesia as a maritime and archipelagic country, makes ships the only option for people to travel outside their territory to meet their daily needs. Ship routes that operate are usually from morning to evening with an average sailing time of 2-3 hours each way where these ships are generally small in size so that the engine and passengers seem to be in the same room. As a result, like it or not, the noise generated by engine noise cannot be avoided and the noise that arises will certainly greatly affect people's health if this noise exceeds a predetermined threshold value if it occurs continuously for a long time. The threshold value (NAV) of noise (caused by engine noise etc.) has been determined by local standards, namely the Regulation of the Minister of Manpower and Transmigration Number PER.13/MEN/X/2011 concerning Threshold Values for Physical and Chemical Factors in the Workplace and The Indonesian National Standard (SNI 16-7063-2004) concerning the Threshold Value of Noise and IMO Resolution of 85 decibel A (dBA). Based on the provisions above, an experiment was carried out to make Diesel engine casing from Plywood and Polyurethane and Glasswool capable of meeting the standards with an average total noise reduction of 5.5 dBA from before but an average temperature increases of 2.3 ^{0}C.

Keywords: *Threshold Value, Casing, Noise, Polyurethane, Glasswool*

1. INTRODUCTION

The threshold value of noise (mostly caused by engine noise) has been determined by local standard, namely the Regulation of the Minister of Manpower & Transmigration Number PER.13/MEN/X/2011 concerning Threshold Values for Physical & Chemical Factors in the Workplace and The Indonesian National Standard (SNI 16-7063-2004) concerning the Threshold Value of Noise is 85 decibel A (dBA). Meanwhile, from international standard, namely IMO Resolution MSC.337(91) for ships that have a weight of 1,600 to 10,000 GT exceed 10,000 GT then the limit is 110 dBA, but due to size of the engine used on the small ship is equivalent to a Diesel engine in the Lab, so the number is adjusted to 85 dBA.

Polyurethane (PU) is a polymeric material which is produced from a mixture of 2 types of chemicals namely Polyol and Isocyanate so that a reaction occurs and forms foam. The function of PU is as temperature insulation material but also functioned as sound absorbing material.

Glasswool is an insulating material made of fiberglass fibers that goes through a certain process so that it has a texture like wool/fleece. The function of glasswool is to

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reduce the sound intensity of the resonance panel that reaches the ear. The working principle is to change the energy of motion (vibration) into heat energy due to the collision of molecules in the sound absorbing field. Sound absorbing materials are generally soft and porous materials such as foam, glasswool, rockwool and the like.

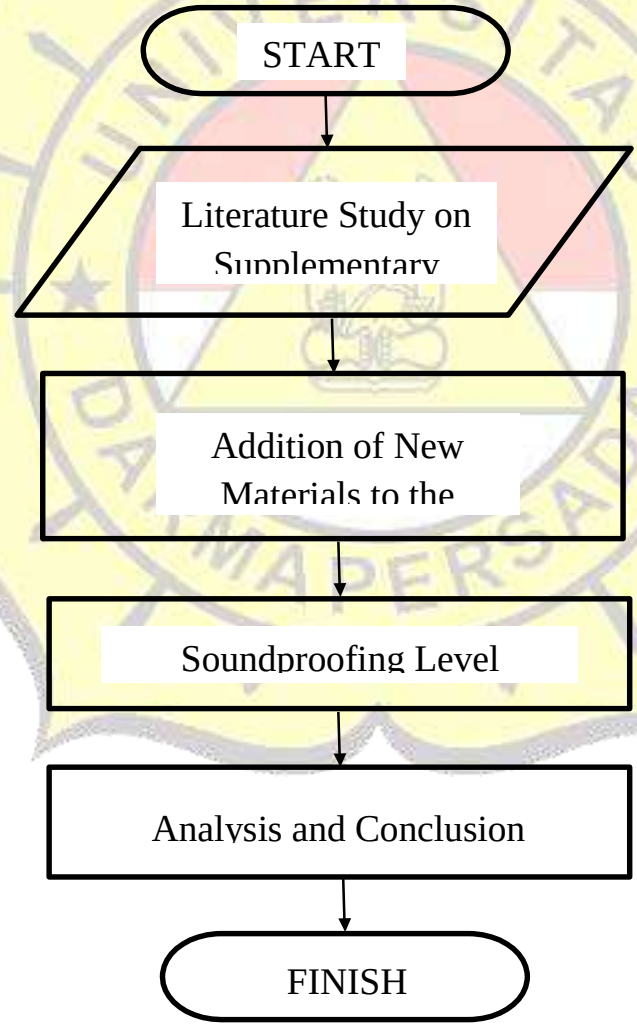
2. METHODOLOGY

These are several condition that must be implemented in order to meet the standard:

1. Measurement is conducted at range of 1 - 3 meters from noise source (machine).
2. Measurement height is between 1.2 - 1.6 meters from surface.
3. Measurement interval is 60 secs with the final measurement being the 5th minute.

In addition, measurement conditions are specified to facilitate analysis as follows:

- 1st Condition: noise source is not present (the engine is not operating)
- 2nd Condition: the engine is operating without damper case
- 3rd Condition 3: the engine is operating with damper case



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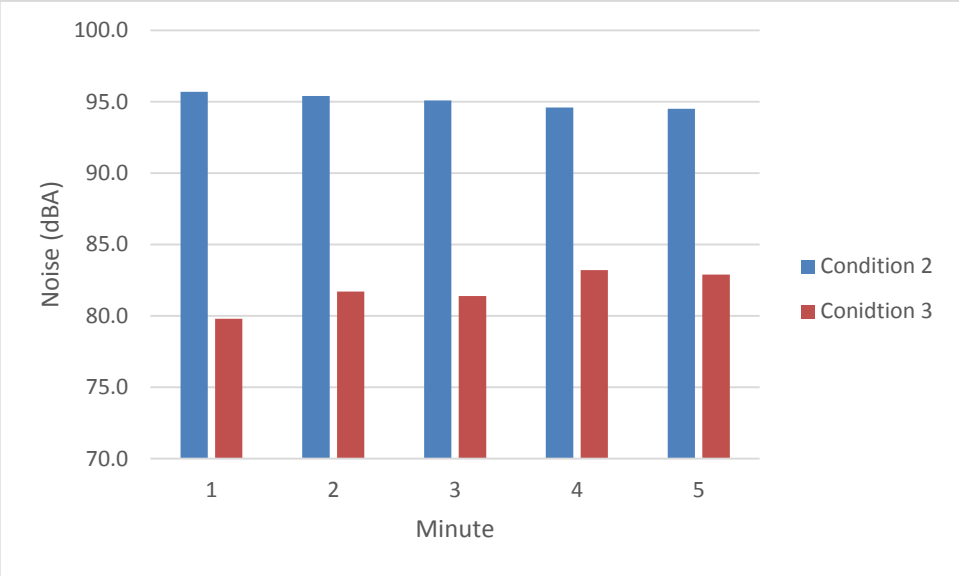
3. ANALYSIS

Measurement results can be found on tables below:

Table 1. Measurement at a distance of 1 meter (dBA)

Condition	1st Minute	2nd Minute	3rd Minute	4th Minute	5th Minute	Average
1	42.1	45.1	44.8	50.9	50.6	46.7
2	95.7	95.4	95.1	94.6	94.5	95.1
3	79.8	81.7	81.4	83.2	82.9	81.8



Pic 1. Noise Measurement at a Distance of 1 Meter

Table 2. Measurement at a distance of 2 meter (dBA)

Condition	1st Minute	2nd Minute	3rd Minute	4th Minute	5th Minute	Average
1	50.3	50.0	49.8	49.5	54.2	50.8
2	93.7	93.4	93.8	92.8	92.5	93.2
3	82.6	82.3	82.2	83.5	83.2	82.8

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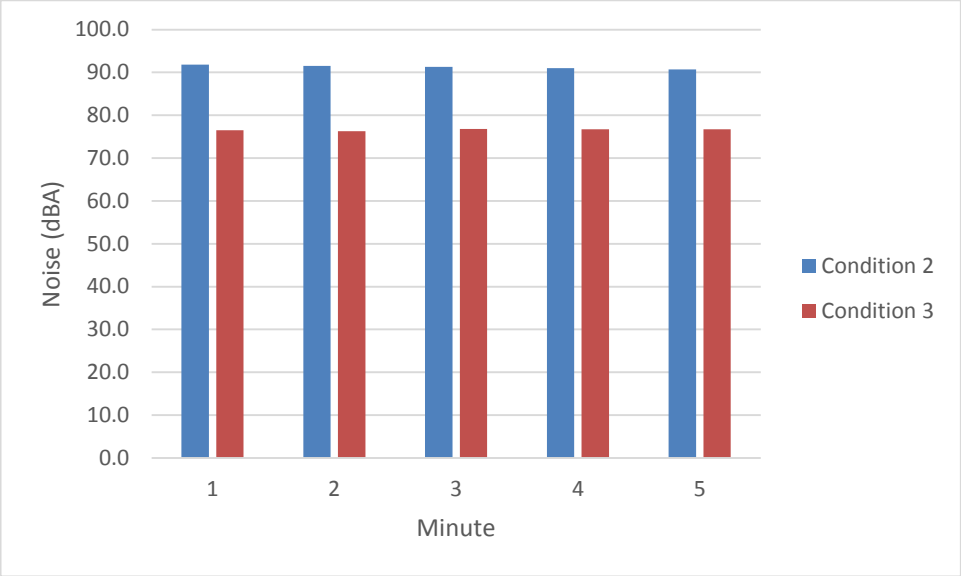
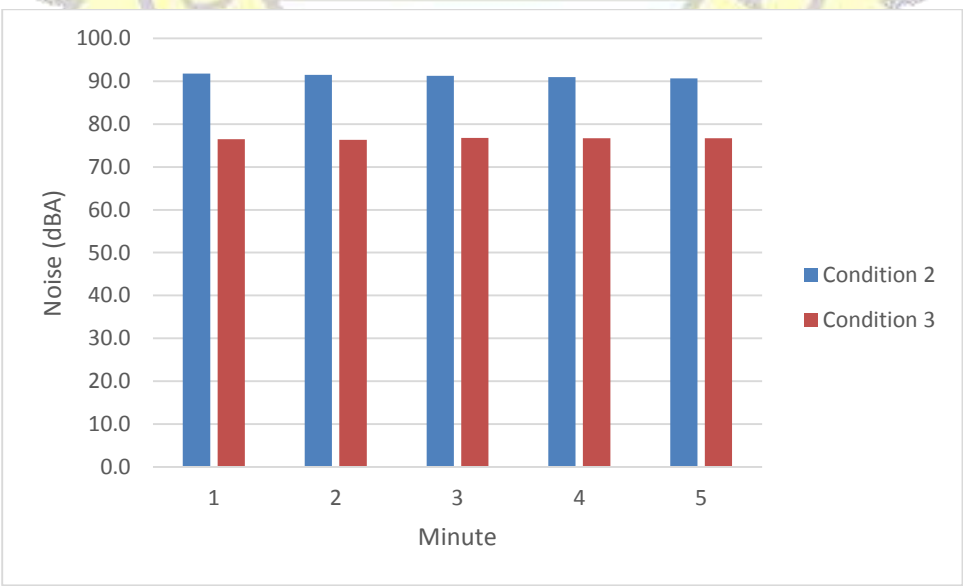


Pic 2. Noise Measurement at a Distance of 2 Meter

Table 3. Measurement at a distance of 3 meter (dBA)

Condition	1st Minute	2nd Minute	3rd Minute	4th Minute	5th Minute	Average
1	59.6	55.3	55.0	54.8	54.5	55.8
2	91.8	91.5	91.3	91.0	90.7	91.3
3	76.5	76.3	76.8	76.7	76.7	76.6



Pic 3. Noise Measurement at a Distance of 3 Meter

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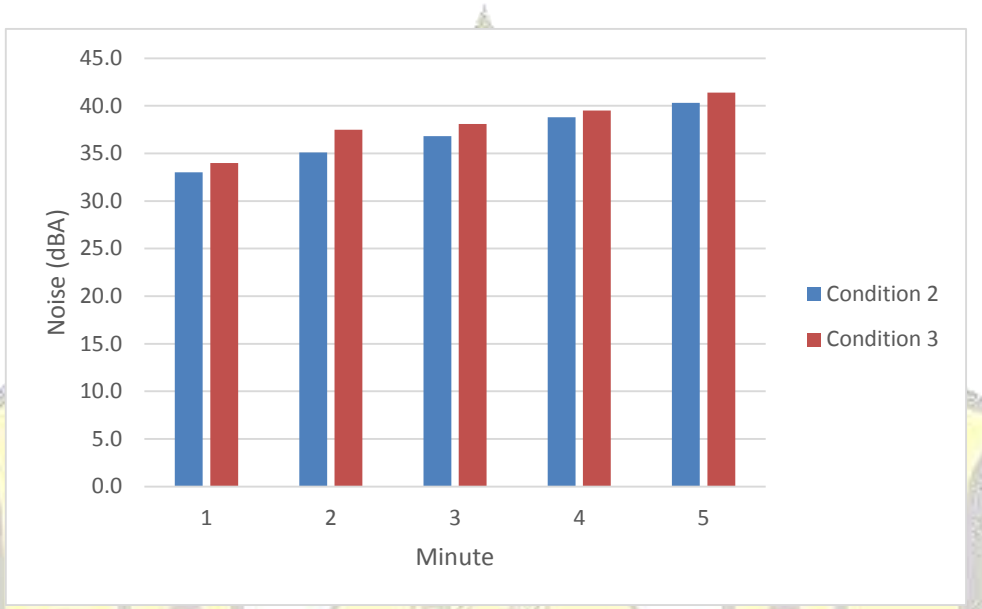
Table 4. Diesel Engine Operating Temperature Measurement

Condition	1st Minute	2nd Minute	3rd Minute	4th Minute	5th Minute	Average
2	33.0	35.1	36.8	38.8	40.3	36.8
3	34.0	37.5	38.1	39.5	41.4	38.1



Pic 3.4 Diesel Engine Operating Temperature Measurement Chart

At a distance of 1 meter where condition 2 (the engine is running without a casing) it can be seen that the average difference with condition 3 (the casing is installed when the engine is running) is 13.3 dBA, while at 2 meters distance, difference is 10.5 dBA and at 3 M distance difference is 14.7 dBA so that the total average noise reduction as a whole is 12.83 dBA. The anomaly of the measurement at a distance of 2 M is caused by the presence of external sound intervention so that the increase in the absorption rate does not run linearly while the difference in operating temperature of the Diesel engine only increases by 1.3 ^{0}C so it is not significant enough

4. CONCLUSION

From the experiments carried out, it can be seen that there is a decrease in the average noise level as a whole to meet the applicable standards (IMO, SNI and MENAKER Regulations) namely 85 dBA so that in the future Polyurethane material can be used as an alternative sound absorber in Diesel engines of small passenger ships .

REFERENCES

1. Asfahl, C. Ray, 1999, ***Industrial Safety and Health Management*****,** Prentice Hall, New Jersey.

ISSN 2088-060X (Media Cetak)
ISSN 2962-5300 (Media Online)

2. F. Alton Everest & Ken Pohlman, 2009, ***Master Handbook of Acoustics, 5th Edition***, Digital Edition
3. Jailani M, Nor M, Jamaludin N, Tamiri FM, 2004. ***A Preliminary Study of Sound Absorption Using Multi-Layer Coconut Coir Fibers***. Electronic Journal "Technical Acoustics"
4. Keputusan Menteri Tenaga Kerja No. KEP-51/MEN/1999 *Tentang Nilai Ambang Batas Faktor Fisika di Tempat Kerja*, 1991, Jakarta.
5. Lawrence E. Kinsler, Austin R. Frey, Alan B, Coppens and James V. Sanders 1982, ***Fundamentals of Acoustics, 3rd Edition***. John Wiley & Sons.
6. Lewis H. Bell, Dougals H. Bell., 1994, ***Industrial Noise Control Fundamentals and Applications***, New York.
7. S Lord, H. W., Gatley, W. S., Evensen, H. A., 1980, ***Noise Control for Engineers***, Mc Graw Hill Bo. Co., New York.
8. Standar Nasional Indonesia, SNI, 2004, ***Nilai Ambang Batas Iklim Kerja (Panas), Kebisingan, Getaran Tangan-Lengan dan Radiasi Sinar Ultra Ungu Di Tempat Kerja***, *(SNI 16-7063-2004)*, Jakarta.