POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

DIPLOMA IN CIVIL ENGINEERING

(DCC 5191: CIVIL ENGINEERING PROJECT 1)

FINAL YEAR PROJECT REPORT JUNE SESSION 2019

S.O.S (SIEVE O' SOUND)

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POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH
PERSIARAN USAHAWAN, SESKYEN U1
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ABSTRACT

Sieve shaker is a widely used equipment in educational institutions, testing laboratories and construction sites. This equipment is used to separate coarse or fine-grained stones according to the size of the sieve according to BSI standards (British Standard Institution). In the construction world, the size of the aggregates used plays a major role in every concrete mix because it affects the durability and concrete strength. Thus, sieve shaker plays a very important role in determining the size of the aggregate to be used. However, this equipment produces sound pollution especially in test laboratories. Therefore, we want to produce Sieve O 'Sound (S.O.S) which is a sound-shield box for the sieve shaker to be used at the Polytechnic Sultan Salahuddin Abdul Aziz Shah labs. With this product, we are able to reduce the noise pollution resulting from the sieve shaker. Among the materials used to produce S.O.S are acoustic foam, Styrofoam, and cotton. The materials used have the ability to absorb sound. Based on the result we obtain through Sound Meter Level test, we managed to reduce 17% to 22% percent of noise produced from sieve shaker, after using Sieve O' Sound shield box. We also conduct a discussion to look for any problem and weakness that can be avoid and improved in the future.

ABSTRAK

Sieve shaker adalah peralatan yang digunakan secara meluas dalam institusi pendidikan, ujian makmal dan tapak pembinaan. Peralatan ini digunakan untuk mengasingkan batu kasar atau halus berdasarkan ukuran penapis mengikut piawaian BSI (British Standard Institution). Dalam dunia pembinaan, saiz batu baur yang digunakan memainkan peranan utama dalam setiap campuran konkrit kerana ianya mempengaruhi ketahanan dan kekuatan konkrit. Oleh itu, *sieve shaker* memainkan peranan yang amat penting dalam menentukan saiz batu baur yang akan digunakan. Walau bagaimanapun, peralatan ini menghasilkan pencemaran bunyi terutamanya dalam makmal ujian. Oleh itu, kami ingin menghasilkan Sieve O 'Sound (SOS) yang merupakan kotak perisai bunyi untuk *sieve shaker* yang digunakan di makmal Politeknik Sultan Salahuddin Abdul Aziz Shah. Dengan produk ini, kami dapat mengurangkan pencemaran bunyi yang disebabkan oleh *sieve shaker*. Antara bahan yang digunakan untuk menghasilkan S.O.S adalah span akustik, styrofoam, dan kapas. Bahan yang digunakan mempunyai keupayaan untuk menyerap bunyi. Berdasarkan hasil yang diperolehi melalui ujian *Sound Level Meter*, kami berjaya mengurangkan 17% peritus hingga 22% peratus bunyi yang dihasilkan dari *sieve shaker*, setelah menggunakan kotak perisai Sieve O 'Sound. Kami juga mengadakan perbincangan untuk mencari sebarang masalah yang boleh dielakkan dan kelemahan yang boleh diatasi pada masa akan datang.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Sound pollution is defined as an undesirable sound. Sound pollution depends on the sound quantity, the sound quality and the acceptance attitude of the individual who hears it. However, the sound intensity exceeding 80dB is regarded as a noise pollution if it is based on sound test instrument evaluation. Sound pollution is a subjective matter because not all individuals regard the sound as they hear. Sounds can be divided into two classes namely music and noise. Music is a sound that consists of frequencies that are in contact with each other and we are able to detect uniformity in the sound. Noise sounds consisting of frequencies and intensities vary randomly and their uniformity cannot be traced.

There are four types of noise that have been classified, namely noise gland, fluctuation noise, impact noise and alternating noise. Noise gland has constant noise intensity. Intensity change between two sound wave peaks is less than 3dB. For fluctuating noise, fluctuation changes between two high and low waves are more than 3dB. Impact noise or impulse is a high noise and the duration is short. Examples like gunfire or falling objects. The interval noise is the resulting noise within a certain time. Examples like machine sound or wood sawing.

It cannot be denied that sound pollution is also occurring within the Sultan Salahuddin Abdul Aziz Shah Polytechnic area, especially around laboratories and workshops. Among the disrupted labs are Geotechnical Labs, Highway Labs and Concrete Labs at the Civil Engineering Department. All three of these laboratories have a sieve shaker that separates rough and subtle aggregates for experimental purposes. When this equipment is switched on, it produces noisy sound, then disturbs the tranquillity of learning towards nearby classes.

From this problem we have faced, an idea was created to produce a sound shield box to reduce noise pollution resulting from the sieve shaker. The making of this sound shield box uses acoustic foam, Styrofoam and cotton. Mild steel is used as the body of this product to enhance the aesthetic value and durability of the product.

1.2 Problem Statement

Sound pollution that occurs in a place can negatively affect the audience around it. In geotechnical labs, highway labs and concrete laboratories, sieve shaker will produce noisy sound when used. As a result, it will disturb the focus and behaviour of students and lecturers who are conducting activities and learning around the area. The tranquillity and comfort of the people should be emphasized so that the activities and quality of the work being carried out are not disturbed or affected.

Noise also does affect the academic performance to some people. According to the arousal theory, exposure to moderate or high intensity noise causes an increase in arousal. Heightened arousal leads to a narrowing of an individual's attention. As a result, inputs that are irrelevant to task performance will be ignored first. As arousal increases, attention is further restricted: task-relevant cues may be ignored as well. (*Amalina & A. Hilmy, 2015*)

Therefore, the sound shield box that will be produced must meet the requirements of sound resistance and able to absorb the noise generated from the sieve shaker. The selection of materials in the production of this product is very important, especially in identifying the material's ability to absorb sound. This is to ensure the S.O.S box is capable of minimizing the resulting noise pollution when a sieve shaker is used.

1.3 Objective Of Study

Acoustic foam, Styrofoam, and cotton are the materials that will play a major role in the production of S.O.S. sound-shield box. This is because each selected material has its own ability to absorb sound waves resulting from sieve shaker. Hence, it is able to meet the objectives of the study:

I. To produce Sieve O' Sound
II. To conduct a sound test using Sound Level Meter
III. To minimize the sound pollution produced from the sieve shaker.

1.4 Scope Of Study

This study is specially developed for the Department of Civil Engineering, Sultan Salahuddin Abdul Aziz Shah Polytechnic. This is because in this area, there are laboratories using sieve shaker. Hence, Concrete Labs are the main scope of our study in the production of S.O.S. sound shield boxes. Sieve shaker is an equipment used to separate fine and coarse aggregate and is often used by students for practical work purposes, and it has disturbed people around. Undoubtedly, it is also capable of contributing to hearing impairment if the sieve shaker is used over a long and prolonged period. Therefore, this product will definitely minimize the resulting noise pollution.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In the production of sound shield box S.O.S, acoustic foam, styrofoam and cotton were selected as the main material to ensure the effectiveness of the product in absorbing and delivering sound resistance resulting from sieve shaker. Mild steel has been chosen as the materials to provide endurance and improve the aesthetic value of the product.

Selected materials play a distinctive role in order the product to be produced will meet the objectives of the study. In addition, the product created is also intended to be user-friendly and durable. When all of these materials are incorporated into a sound-shield box, the probability of scattered sound waves can be minimized as each function of the materials will join, thus reducing the resulting noise pollution. In order to prove the effectiveness of the product, sound tests will be conducted before and after the use of S.O.S. sound shield box.

2.2 Acoustic Foam

Acoustic foam is a type of foam that has an open space cell which is specially designed to absorb sound waves and reduce the amplitude of sound waves. Typically, these foams are often used in music rooms or recording studios to increase the acoustic value of a room or space. It is a light foam made of polyurethane foam, polyether or polyester. It is square cut, tile-shaped and the surface is often pyramid or oval arch.

2.2.1 How Acoustic Foam Works

Acoustic Foam seeks to reduce or eliminate echoes and background noise by controlling the echoes generated by sounds that bounce from a surface like a wall. It works to absorb sound vibrations instead of reflecting it. This material is able to respond with normal and high frequency. To deal with lower frequencies, larger acoustic foam sheets should be used. It is made of various sizes, colours and thicknesses and is suitable for the wall, ceiling or floor.

They work not only to absorb sounds, but also to enhance the quality of sound and speech in a room. Dealing with both mid and high frequencies at the same time, acoustic foam can also be counted as a type of cost-friendly heat reduction facility that is placed in corners of the room or wherever optimal sound mixes are needed as bass traps to minimize sound echoes. Reducing the amplitude of the waves, acoustic foams dissipate the sound energy as heat. (*Randolph Hoover, 2015*)

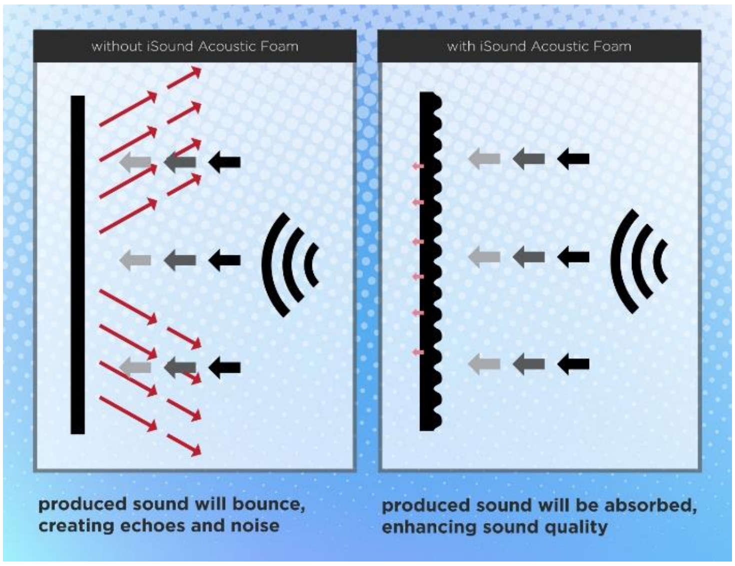


Figure 2.1 *How acoustic foam works*

2.3 Styrofoam

Styrofoam is a type of foam made from polystyrene. It is widely used worldwide. Styrofoam is often found in the form of cups and containers. It can also be found inside a wall panel or roof. The nature of this foam is thermal insulation and does not absorb water. The foam composition is 98% percent air, making it light and easy to float on the surface of the water.

2.3.1 How Styrofoam Works

This foam has proven that it is also capable of absorbing noise, not reflecting. Like acoustic foam, Styrofoam also has a lot of space for small cells, which can ease a wave of sound through it. However, this foam is not marketed as a major ingredient in the acoustic or noise industry. However, the effectiveness of this foam in absorbing sound cannot be denied because it is often used in wall panels.

The presence of pores and voids plays a crucial part as they act as the medium of sound wave dissipation. The channel or pores contains air molecule will vibrate and lose energy due to the energy of the air molecules by the sound waves being converted to heat due to thermal and viscous losses at the walls of the interior pores and channels. (*Amares, Sujatmika, Hong, Durairaj & Hamid, 2005)*

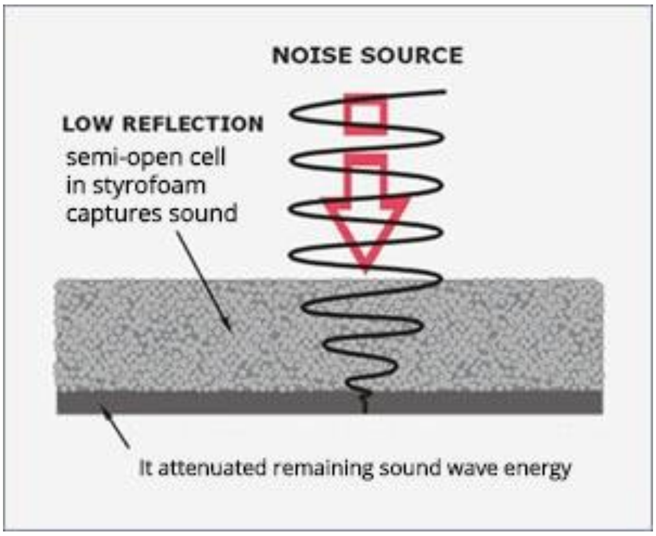


Figure 2.2 *How Styrofoam respond to soundwaves*

2.4 Wool

There are various sound absorbent materials that exist in the market. These materials provide absorption properties depending on frequency, composition, thickness, surface finish, and installation method. However, materials with high absorption values are usually porous. The porous absorbent material is solid containing the cavity and the channel so that sound waves can enter.

Porous materials are characterized by the fact that their surfaces allow sound waves to enter through many small holes or opening. Cotton is an example of porous material, made from fibrous cotton fibres. When cotton is exposed to sound waves, the surface air molecules and inside the cotton pores will vibrate, causing the sound waves to lose some of its original energy. The fibres in cotton will vibrate simultaneously under the influence of sound waves.

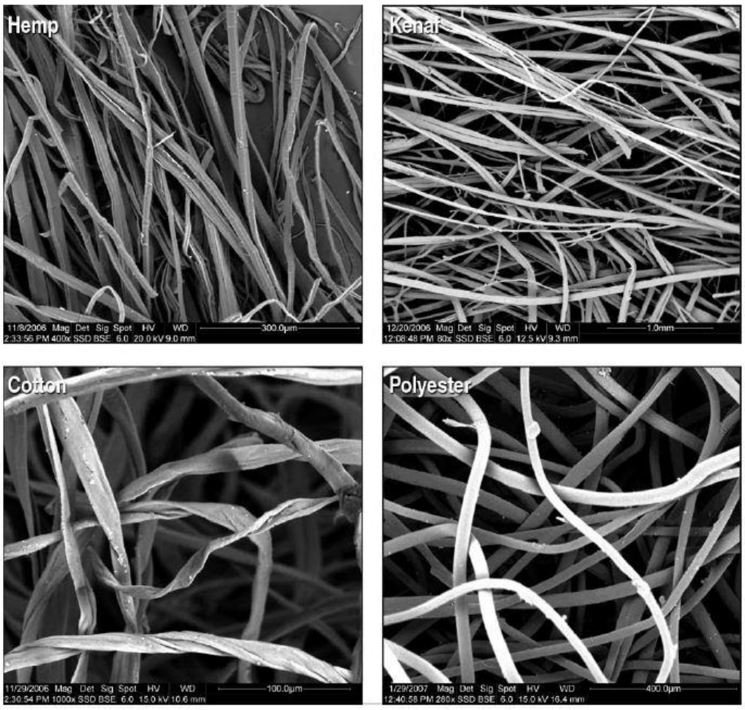
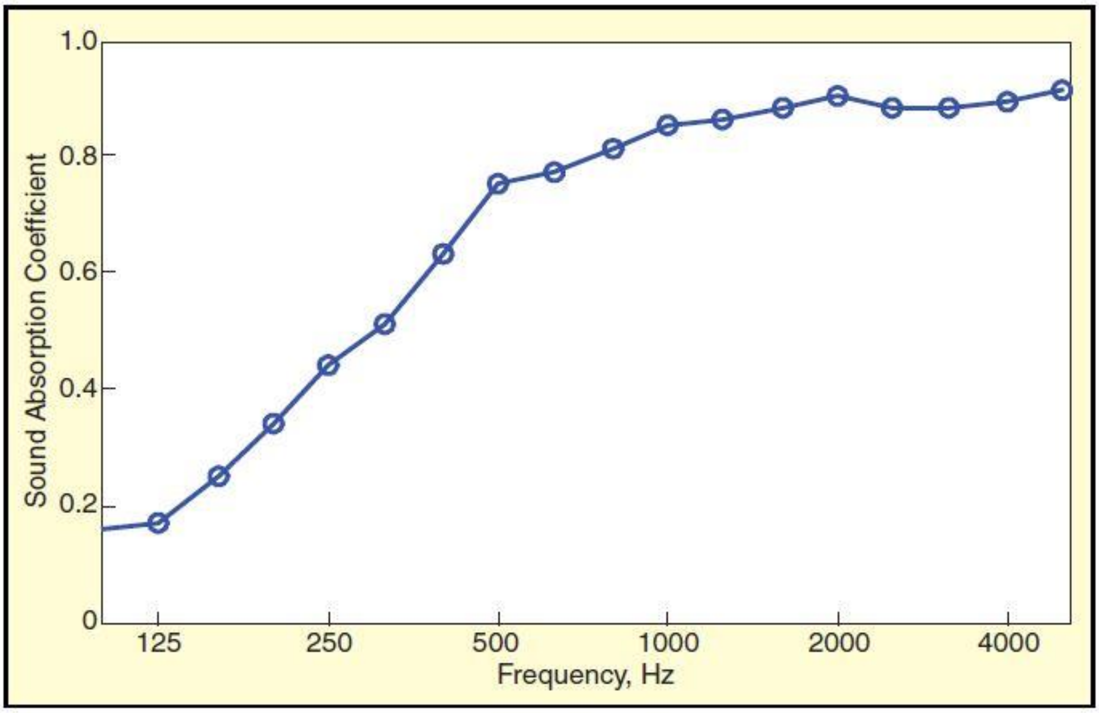


Figure 2.4 *Scanning electron microscope images on hemp samples, kenaf, cotton and polyester fibres. (Muller-BBN, Thermal Hemp 045, Measurement of Sound Absorption in the Reverberation Room According to DIN EN ISO 354, Test Report M52 297/1, Marc 2006)*

Based on the article produced by Jorge P. Arenas, University Austral of Chile, Valvidia and Malcolm J. Crocker, Auburn University, Alabama, to examine the effectiveness of the use of cotton fabrics from sound absorbing manufacturers, the study conducted successfully recorded sound absorption coefficients cotton based on different thickness. Graph 2.3.2 shows the sound absorption coefficient measured in the echo space using a 40mm thick thermal insulation wall made of 80% -85% of cotton fibres.(*Jorge & Malcolm, 2010*)

Sound Absorption Coefficient is the coefficient used to evaluate sound absorbed and reflected and is between 0 and 1 only. Value 0 means the whole sound is reflected and absorbed, while value 1 means the whole sound is absorbed and not reflected. If the sound coefficient value approximates 1, this means that the absorbed sound is higher than the reflected sound. This test has proven the effectiveness of cotton absorbing sound. Based on the graph below, previous study conducted has proven the ability of cotton fibres to absorb sound.



Graph 2.4 Graph *showing the value of sound absorption coefficient that is carried out on cotton fibres. (Jorge P. Arenas & Malcolm J. Crocker "Recent Trends in Porous Sound-Absorbing Materials" Sound and Vibration, July 2010, Pages 12-16)*

2.5 Mild Steel

Mild steel is a type of iron that contains a small percentage of carbon. It is also known as plain-carbon steel and low-carbon steel. This steel is one of the famous and common form of steel because of its low price while it provides material properties that can be use for many applications. Mild steel contains approximately 0.05–0.25% carbon. Mild steel has low tensile strength, thus making the price affordable and easy to form.

Mild steel does not absorb sound, because of its plane and non-hollow surface. However, steels have the ability to reflect sound, depending on the thickness and density of it.

Mild steel possessed good durability. Its resistant properties are highly suitable for use as a material for producing S.O.S. sound shield box. Therefore, the product will be more durable and can be used for a long time. Compared to the product previously produced by the students named Sound Fighter Box, they use wood as the body. However, wood is well known for its water-absorbing properties and easy to decay. Hence, we choose mild steel as the material to produce the body of this product. In addition to keeping the aesthetic value of the product, the steel will ensure the durability of the product, so it can be used for a long period.

2.6 Sound Level Meter

After the completion of the product, one sound test will be conducted, to evaluate the value of noise reduced based on the distance of sound waves travel. Through this test, the workability and function of the sound shield box will be proven, thus resulting data that can be recorded. The data recorded will mark the success of this project, hence fulfilling the objectives of the study.

2.6.1 How To Use Sound Level Meter

Sound Level Meter is an equipment used to assess noise or sound levels by measuring sound pressure. Often referred to as a sound pressure level (SPL) meter, decibel (dB) meter, noise meter or noise dosimeter, a sound level meter uses a microphone to capture sound. The sound is then evaluated within the sound level meter and acoustic measurement values are shown on the display of the sound level meter. The most common unit of acoustic measurement for sound is the decibel (dB). With a portable sound level meter, industrial hygiene and workplace safety professionals can measure sound levels in multiple locations.

TEST	Styrofoam	Wool	Acoustic Foam
1	1.25cm	0.5cm	4cm

Table 2.6.1 *Thickness used in sound level test*

Figure 2.6.1 *Sound Level Meter Equipment*

2.7 Sound Fighter Box

Sound Fighter Box is a final-year project conducted by student in semester 5, Polytechnic Sultan Salahuddin Abdul Aziz Shah during 2014. This product was created with the same objective as Sieve O' Shaker, to reduce the noise pollution made by the sieve shaker. However, the differences of these two products are, the body material and the sound panel used by Sound Fighter Box is wood and egg trays. The only similarity it has with Sieve O' Sound is acoustic foam as one of its sound panel.

The percentage of noise reduced by Sieve O' Sound are higher compared to Sound Fighter Box. This shows that the material chosen affects the results obtained by them. Compared to wood, mild steel has hollow surface, which traps all the sound inside, allowing no sound waves to travel or dissipated. Other than that, cotton and styrofoam deals with sound waves better than egg tray, since it has more open channel and small cavity that traps sound waves. Based on the results, they managed to reduce 12% of noise while Sieve O' Sound manage to reduce 22% of noise. Besides, we also record the sound of the room for control purpose, making our results way more accurate than the results obtained by Sound Fighter Box. Below are the results obtained by the previous student in 2014 :-

Station	Before (dB)	After (dB)	Percentage of noise reduced (%)
A1	91.1	76.1	9
A2	86.6	70.8	10
A3	80.8	63.9	12
B1	80.2	62.9	12
B2	68.5	54.3	12
B3	68.2	53.3	12
C	63.8	49.4	12

Table 2.7.1 *Sound Fighter Box results in 2014*

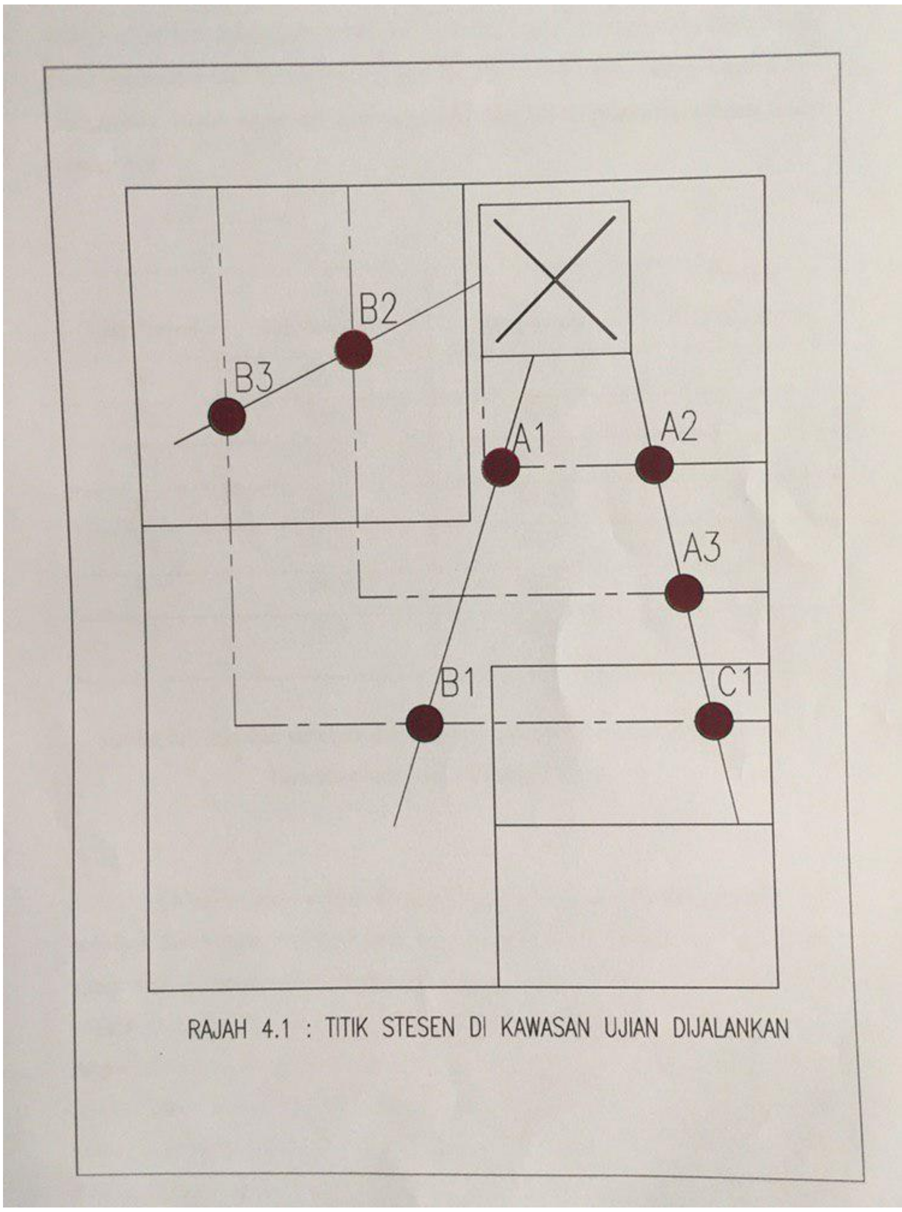


Figure 2.7.1 *Stations for Sound Fighter Box testing in 2014.*

As we can see in the figure above, no exact distance are given by the previous student. Compared to our testing procedures, we measured the exact distance from the sieve shaker. Some of the data were also recorded in classroom, with no regard of the sound of the room itself. Therefore, the results obtained by the previous student are not accurate compared the result we recorded for Sieve O' Sound.

CHAPTER 3

METHODOLOGY

3.1 Introduction

In this chapter, the subjects to be discussed are the methodology used to achieve the objectives of the study. Planning, project title selection, literature study process and selection of materials to be used will be described in greater detail in this chapter. The following is a flow chart for S.O.S sound-shield box: -

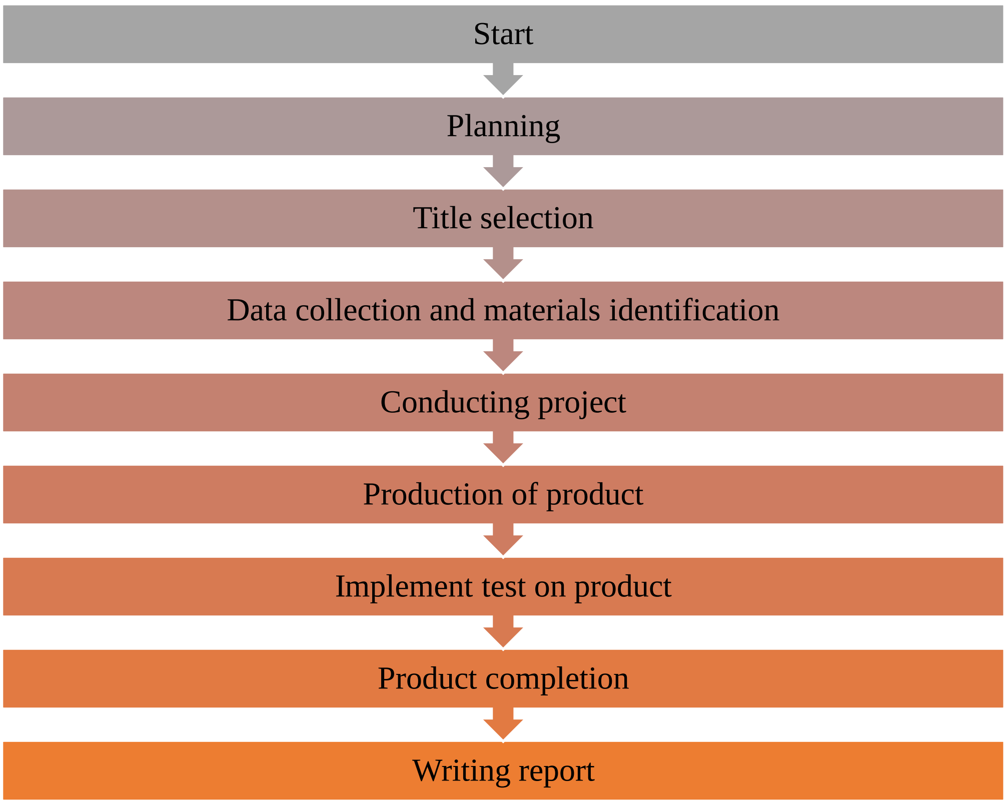


Chart 3.1 *Project implementation process.*

3.2 Materials Used

In producing the S.O.S sound shield box, the appropriate selection of tools and materials should be emphasized so that the product produced will meet the objectives of the study. This is also to ensure the quality of the product, to meet the needs of the study and to be safe. Appropriate tools are also important in order for the product process to run easily and safely. Here are the tools and materials to be used: -

Materials : Mild steel, acoustic foam, styrofoam, wool, wheel.

Equipment : Measuring tape, welding equipment, grinder, double-sided tape, scissor, glue and paint spray.

3.3 Method Of Production

In producing high quality S.O.S sound shield box and meeting the objectives of the study, every step in product development needs to be done carefully. Product production work should be designed and arranged according to priority, to ensure product production processes run smoothly and in order. The following is a procedure designed to produce S.O.S sound sealing box: -

1. Using measuring tape, the height, width and dimension of sieve shaker dimensions are measured. Height and width measures are increased in 30cm-40cm to make sure the resulting box is not too narrow.

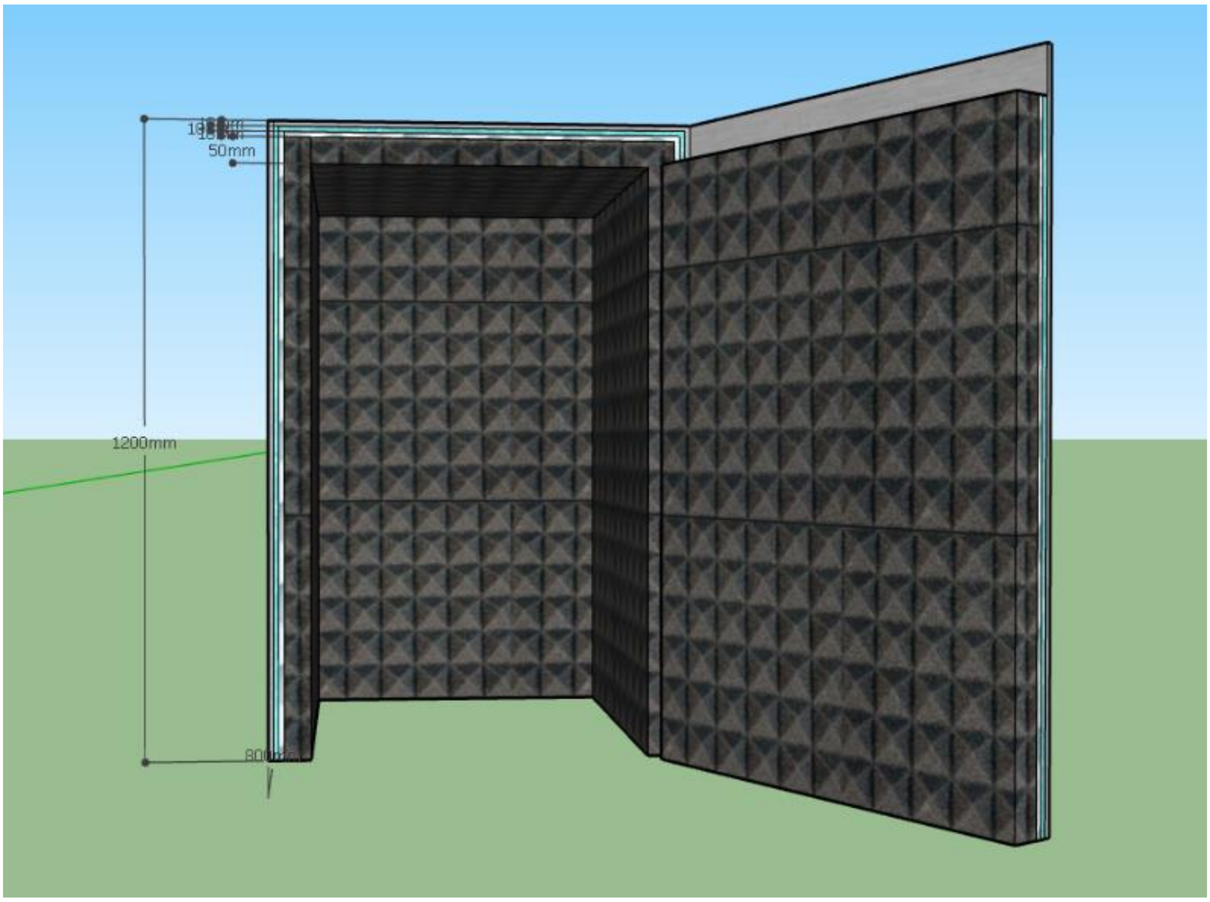


Figure 3.3.1 *Inside view of Sieve O' Sound*

2. Once the measurements are taken, the product sketches are produced according to the suitability of the sieve shaker. Functions and ways of using the product are also planned. (Height :130cm, Width : 80cm, Breadth : 80cm)

3. Then, the mild steel will be forged and moulded according to agreed design.

Figure 3.3.2 *How to move Sieve O' Sound*

Figure 3.3.3 *Welding the wheels behind the Sieve O' Sound*

4. The first function to be installed is the wheel. 2 small wheels will be installed at the bottom of the box. Two steel plate will be placed inside the sound box, to prevent damage on the mild steel. Then, the wheels will be bind using welding method

Figure 3.3.4 *Mounting the third layer of sound panel, acoustic foam.*

5. Then, the first layer in the sound shield box, styrofoams are mounted with a strong double-sided tape. The second layer are followed by cotton. Whereas, the third layer is acoustic foam where every corner is worn with thumbtack.

6. The product is then ready to be tested.

3.4 Conclusion

Based on the review, procedures and planning that have been conducted, we are confident that the product we will produced is able to give a positive impact to the community as well as those who use this study. Although we have faced countless obstacles during the production of the report and the planning of the project, we are satisfied with the results we have acquired. It is in our believe, that this product will be able to reduce the noise pollution from the sieve shaker. With the support of several literature reviews and previous studies, we hope that the product plan we are about to conduct are able to be continued in a systematic manner, and meet the goals of the project that we have set.

CHAPTER 4

RESULTS AND DATA ANALYSIS

4.1 Introduction

In this chapter, the data obtained by experiment will be evaluated and discussed. The data recorded is the evidence of whether the product created satisfies the project objectives or not. The thickness of the sound panel used is very crucial as it affects the result we will obtain. The following is the data obtained through the Sound Meter Equipment and Frequency Test.

4.2 Procedures

Equipment : Measuring tape, Sound Level Meter

1. Four different distance is measured from the sieve shaker. The distance are 3 meters, 6 meters, 9 meters and 12 meters.
2. Then, the room sound is recorded from each distance.
3. The first data is recorded 3 meters away from the sieve shaker. Two types of data were obtained, before and after the use of the product.
4. All the step above is repeated for each distance.

Figure 4.2.1 *First distance taken for Sound Level Meter test.*

Figure 4.2.2 *Second distance for Sound Level Meter test.*

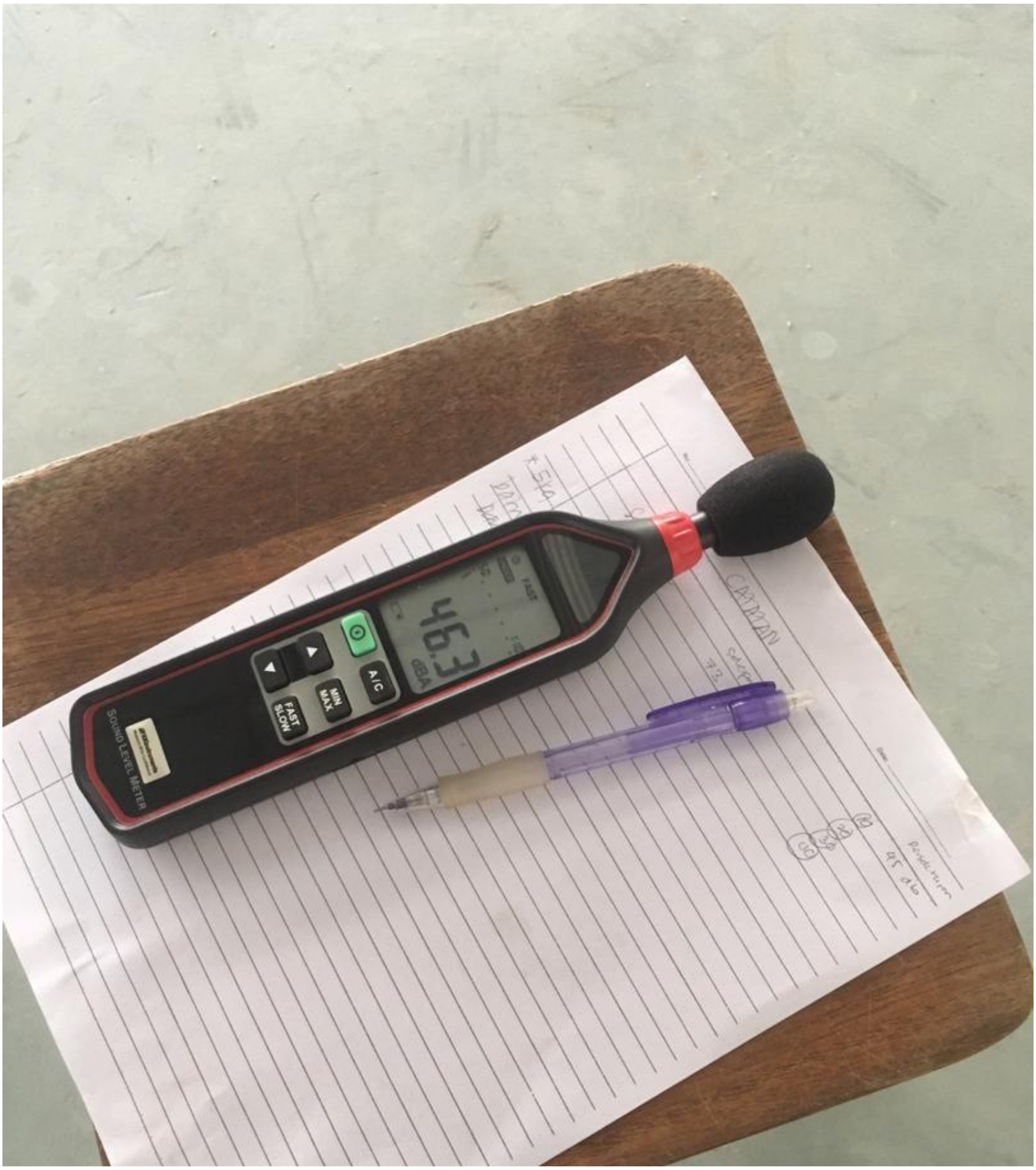


Figure 4.2.3 *One of room reading taken by using Sound Level Meter.*

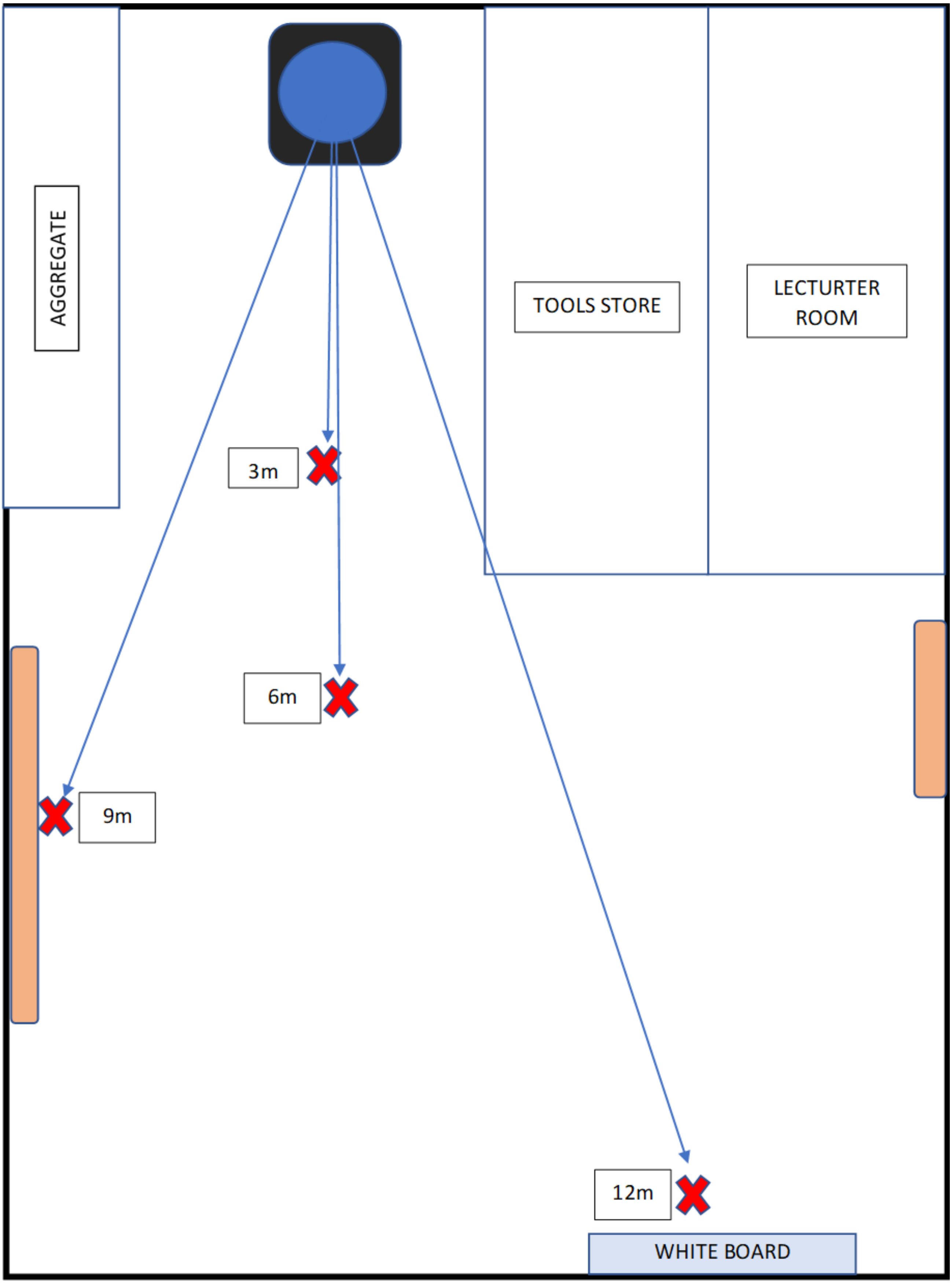


Figure 4.2.4 *Floor plan of the room and distances for testing.*

4.3 Results

4.3.1 Room Average Sound

Distance (m)	3m	6m	9m	12m
Room Sound (db)	45db	43db	47db	45db

Table 4.3.1 *Room reading obtained at every distance.*

Before the testing are conducted, the reading of room sound are taken. This is to ensure we will get the exact reading of noise produced by sieve shaker. Four reading of room sound are taken based on the distance we have planned . Every distance has its own sound reading, this happened because the sound in a room travel depends on the wall surface, room size, and the things available in the room. All of this factor affect how the sound travel and reflected in a room.

4.3.2 Sound Level Meter Test Result

	Test 1	**Test 2**	**Test 3**	**Test 4**
Distance (m)	3m	6m	9m	12m
Sieve Shaker + Room Sound (db)	91db	88.2db	85.7db	87.5db
Sieve Shaker Sound (db)	46db	45.2db	38.7db	42.5db
Sieve shaker + Room + Sieve O' Sound Box (db)	75.9db	71.4db	66.8db	68.4db
Noise Reduced (db)	15.1db	16.8db	18.9db	19.2db
Percentage (%)	17%	19%	22%	22%

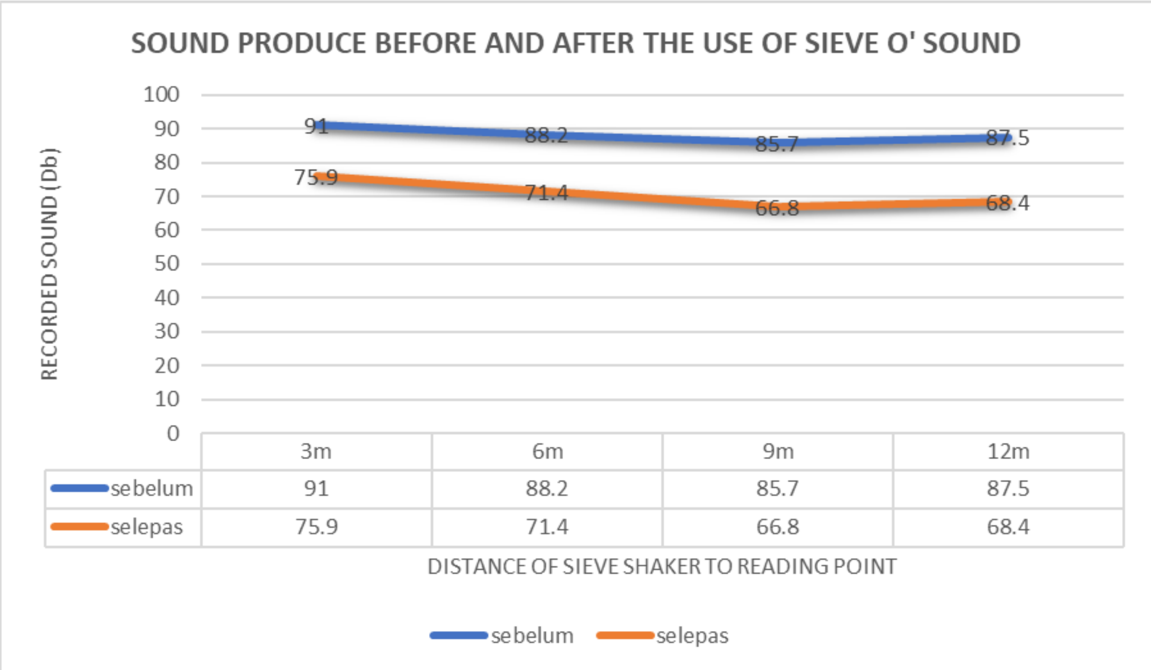
Table 4.3.2 *The results obtained through the Sound Level Meter test.*

For the first test, we record the noise produced by the sieve shaker by standing 3 meters away from it. Two data are obtained, the noise before and after the use of Sieve O' Sound. After subtracting the room sound at 3 meters distance, the exact noise of sieve shaker we obtained during the first test is 46db. When the sieve shaker is placed inside the Sieve O' Sound, 15.1db of noise were managed to be reduced. We calculate the noise reduced by subtracting the room sound and the sieve shaker sound before and after the use of Sieve O' Sound.

During the second test, the noise from sieve shaker decreased to 45.2db, and noise reduced after the use of Sieve O' Sound is 16.8db. The noise from the sieve shaker continue to drop, by reaching 38.7db during the third test, at 9 meters away from the sound level meter. At this distance, the noise reduced increase to 18.9db.

Finally, during the fourth test, which is 12 meters away from the sieve shaker, the noise from the sieve shaker slightly increase to 42.5db. However, the reading of the noise reduced continue to drop, reaching 19.2db by the end of the test.

4.3.2 Sound Reduced Graph



Graph 4.3.3.1 *Comparison of noise before and after the use of Sieve O' Sound.*

The graph above shows the reading before and after the use of Sieve O' Sound shield box. Axis-Y represent the sound reading in decibels (dB) while axis-X represent the distance taken for the sound level meter test. The blue line shows the reading before the use of Sieve O' Sound while the orange line represents the reading after the use of product.

Based on the data we obtained through this test, the effectiveness of this product was demonstrated by the reduction of noise before and after the use of the Sieve O' Sound Shield Box. The distance measured also affect the noise reduced as each point has different room sound. The noise reduced increased proportionally to the distance taken.

For the first test, the sound shield box managed to reduce 17% of noise. The reduction of noise increased for the second test as we able to reduce 19% of noise. As the distance increase, the percent of noise reduced also increase. 22% of noise were reduced during third and fourth test.

Exposure to prolonged noise can cause serious hearing problems in the human ear. As we can see in the figure above, the sound produced by the sieve shaker exceeds the level of safe sound set by the National Institute of Occupational Safety and Health. In 1998, NIOSH has issued the standards on the level of sound and time limits allowed for any individuals exposed to noise in the workplace. The standards are below :-

NIOSH Standards	
Level Of Sound (dB)	Duration allowed to be exposed (hour:min)
85	8:00
88	4:00
91	2:00
94	1:00
97	0:30
100	0:15

Table 4.3.3.2 *Standard of sound at workplace by National Institute of Occupational Safety and Health, 1998.*

4.4 Conclusion

Overall, these results have proven the workability and effectiveness of our product, thus marking the success of our project. During the test, some errors may have occurred. The data obtained may be inaccurate because the recorded sound may be affected by the noise coming outside of the concrete lab. The noise travelling around the room also affects the tests and data generated. However, we also record in-room sound readings for control purpose and for accurate data acquisition.

CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 Introduction

In this chapter, the entire project process and results are analyzed and discussed. Therefore, we are able to detect any problems and errors that can be avoided and resolved in the future. Through discussions, smarter solutions and more effective alternatives can be planned, for future use.

5.2 Problems And Errors

5.2.1 Sieve O' Sound Material Weight

The product are made using mild steel as the main material for the body. This material is selected to provide durability and strength so that it can be used for a longer period. Compared to the product material choosed by previous students which is wood, mild steel has a higher durability and strength. However, the weight of the product makes it difficult for the product to be moved anywhere.

5.2.2 Arrangement Of Sieve O' Sound Body

Although the noise pollution has been successfully reduced, the data still shows that there is still some space on the product body that allows the sound to travel out. This is because the design and installation are not done well. As a result, it can influence the data and tests performed on the product.

5.2.3 Sieve O' Sound Door

Poor production and sound panel placement have caused the door of the product cannot be closed properly, thus leaving a large space between the door and the product body. This is the main space that allows the sound to flow out of the product. Therefore, the addition of materials such as bicycle tire rubber should be added so that the product are to capture all the noise inside.

5.3 Conclusion

Based on our discussions and analysis, we have been able to identify some of the problems and causes of poor product performance. In this regard, we have also made suggestions for future improvement. Therefore, our product and overall report results may be used in future reference.

REFERENCES

1. *Stephen A Stansfeld & Mark P Matheson "Noise Pollution: Non-Auditory Effects on Health" British Medical Bulletin, Volume 68, Issue 1, 1 December 2003, Pages 243–257.*

2. *Amalina Rahmat & Ahmad Hilmy Abdul Hamid "Study Of Noise Produced By Construction Activities In Academic Area" Jurnal Teknologi, School of Housing, Building and Planning, Universiti Sains Malaysia, 1 July 2015.*

3. *S Amares, E Sujatmika, T W Hong, R Durairaj and H S H B Hamid "A Review: Characteristics of Noise Absorption Material" in Journal of Physics Conference Series 908(1), 1 January 2005*

4. *Jorge P. Arenas & Malcolm J. Crocker "Recent Trends in Porous Sound-Absorbing Materials" Sound and Vibration, July 2010, Pages 12-16.*

5. *Randolph Hoover "Acoustic Foam – Sustainable or No ?" Published on July 15, 2015* (http://www.triplepundit.com/story/2015/acoustic-foams-sustainable-or-no/33601)

6. *National Institute of Occupational Safety and Health (NIOSH) "Occupational Noise Exposure" Published on June 1998.*

7. *Che Norfatin, Nur Asyikin, Nuramalina & Nurul Nadia "Sound Fighter Box" Final Year Project Report December Session 2014, Politeknik Sultan Salahuddin Abdul Aziz Shah*

8. *Noise Pollution* (https://en.wikipedia.org/wiki/Noise_pollution)