POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

COCONUT HUSK PARTICLEBOARD

JABATAN KEJURUTERAAN AWAM

ROOBANESWARY A/P RAMACHANDRAN

08DKA20F2026

KHAIREEN BALQIS BINTI ABDUL RAHMAN

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SESI 1:2022/2023

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Laporan ini dikemukakan kepada Jabatan Kejuruteraan Awam sebagai memenuhi sebahagian syarat penganugerahan Diploma Kejuruteraan Awam

JABATAN KEJURUTERAAN AWAM

SESI 1:2022/2023

CERTIFICATION OF ORIGINALITY

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   (Hereinafter referred to as 'the Polytechnic')

2. I acknowledge that the 'Above Project' and the intellectual property contained therein is my original work/invention without taking or copying any intellectual property from other parties.

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by the said;)
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RAMACHANDRAN
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projek pada tarikh: ~~14/11/2022~~

DALIELA BINTI ISHAMUDDIN
Pensyarah
Jabatan Kejuruteraan Awam
Politeknik Sultan Salahuddin Abd Aziz Shah
31/5/2023

CERTIFICATION OF ORIGINALITY

COCONUT HUSK PARTICLEBOARD

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(IC Num:- 001018-10-2094)	)	KHAIREEN BALQIS BINTI ABDUL RAHMAN
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ABSTRACT

Over 62 million tonnes of coconut are produced worldwide each year, mostly for food and oil manufacturing. After industrial processing, large amounts of coconut husk are left unused, posing environmental issues. This falls short of utilising the coir extraction's potential, which might be used in a variety of ways. Panelised wall panelling is popular in developed nations such as Singapore, Hong Kong, Taiwan, Korea, and Japan. The usage of these pre-cast house materials is actively encouraged by their local building authorities.In this investigation, particleboards composed of coconut husk were used as insulation. This is due to the high-intensity sound that is unwanted, detrimental, or dangerous to adjacent ecosystems or people is referred to as noise pollution. This investigation is conducted because to reduce the amount of coconut wast, biodegradable sound insulation particleboard is needed and sound absorption particleboard should be effective as noise reduction instruments. The primary goals of this research are as follows produce a coconut husk sound absorption particleboard and to identify the sound absorption of the particle Based on the dry weight of the coconut husk particles, the three separate units of 50%, 40%, and 30% coconut husk were combined with resin loadings of 50%, 60%, and 70% (w/w) to create the boards to reach 350 kg/m3. By adhering to the specifications of ASTM E1050-98, the manufactured boards' noise acoustical coefficients (NAC) were assessed. The 3 samples are made into boxes in order to check their sound absorption strength with sound level meter at Lab DBP, Politeknik Sultan Salahuddin Abdul Aziz Shah.As a conclusion,the more the resin the more the ability for the particleboard to absorb the noice based on the result.Thus the particleboard with 70% of resin and 30% of coconut husk can absorb more sound.So it can be choosen as the best sound aborption in this experiment.

Keywords: Coconut husk particleboard, Coconut husk, Resin, Soundproof test

ABSTRAK

Lebih 62 juta tan kelapa dihasilkan di seluruh dunia setiap tahun, kebanyakannya untuk pembuatan makanan dan minyak. Selepas pemprosesan industri, sejumlah besar sabut kelapa dibiarkan tidak digunakan, menimbulkan isu alam sekitar. Ini tidak dapat memanfaatkan potensi pengekstrakan sabut, yang mungkin digunakan dalam pelbagai cara. Panel dinding berpanel popular di negara maju seperti Singapura, Hong Kong, Taiwan, Korea dan Jepun. Penggunaan bahan rumah pra-tuang ini secara aktif digalakkan oleh pihak berkuasa bangunan tempatan mereka. Dalam penyiasatan ini, papan partikel yang terdiri daripada sabut kelapa digunakan sebagai penebat. Ini disebabkan oleh bunyi berintensiti tinggi yang tidak diingini, memudaratkan atau berbahaya kepada ekosistem bersebelahan atau orang yang dirujuk sebagai pencemaran bunyi. Penyiasatan ini dijalankan kerana untuk mengurangkan jumlah sisa kelapa, papan partikel penebat bunyi terbiodegradasi diperlukan dan papan partikel penyerapan bunyi harus berkesan sebagai instrumen pengurangan hingar. Matlamat utama penyelidikan ini adalah seperti berikut menghasilkan papan partikel serapan bunyi sabut kelapa dan untuk mengenal pasti serapan bunyi partikel Berdasarkan berat kering partikel sabut kelapa, ketiga-tiga unit berasingan iaitu 50%, 40%, dan 30% sabut kelapa telah digabungkan dengan pemuatan resin sebanyak 50%, 60%, dan 70% (b/b) untuk menghasilkan papan untuk mencapai 350 kg/m3. Dengan mematuhi spesifikasi ASTM E1050-98, pekali akustik bunyi (NAC) papan yang dihasilkan telah dinilai. 3 sampel tersebut dibuat ke dalam kotak untuk menyemak kekuatan serapan bunyi dengan meter aras bunyi di Lab DBP, Politeknik Sultan Salahuddin Abdul Aziz Shah. Kesimpulannya, semakin banyak resin semakin tinggi keupayaan papan partikel untuk menyerap berasaskan hingar. pada hasilnya.Justeru papan partikel dengan 70% damar dan 30% sabut kelapa boleh menyerap lebih banyak bunyi.Jadi ia boleh dipilih sebagai pengguguran bunyi yang terbaik dalam eksperimen ini.

Kata kunci: Papan partikel sabut kelapa, Sabut kelapa, Damar, Ujian kalis bunyi

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Panelised wall panelling is popular in developed nations such as Singapore, Hong Kong, Taiwan, Korea, and Japan. The usage of these pre-cast house materials is actively encouraged by their local building authorities.

The key reasons for their appeal are increased productivity, site cleanliness, and improved wall finish strength. To fulfil market demand, the Malaysian Government has planned 650,000 residential units to be developed by both the government and private sectors under the 8th Malaysian Plan. The intended apartments will generate significant demand for interior wall partition systems for bedrooms, kitchens, bathrooms, and living areas.

Since the 1970s, synthetic fiber-based sound insulation has largely replaced asbestos-based sound insulation. Nevertheless, these synthetic fibres are not biodegradable and cause several difficulties in landfills, in addition to contributing to CO2 emissions. Like a result, a more biodegradable alternative to synthetic materials as sound insulation panels is required. Because of their availability and durability, natural fibres have been recognised as a good contender to replace synthetic fibres.

Sound absorption particleboard should be effective noise reduction instruments, but not at the expense of health. Synthetic fibres, particularly glass wool, are hazardous to the health of workers who install them without suitable personal protection equipment. Workers' dangers can be considerably decreased by employing natural fibres, and they can work in a safer atmosphere.

1.2 BACKGROUND OF STUDY

One of the most ignored areas of design is noise attenuation. The noise will not be taken seriously and insulated to a more bearable level until it causes too much disruption to the user or nuisance to the surrounding environment. However, noise may be more than merely annoying, especially when exposed for an extended length of time. Medical expert's studies have definitely shown that noise may influence productivity, mental health, and even the capacity to focus throughout a work.

However, present materials used for noise attenuation create a number of environmental and sustainability concerns. Natural fibers are biodegradable, and the majority of them are leftovers from other production processes. Current agro-waste treatment options include incineration, composting, and small-scale fiberboard manufacture. As a result, the availability of these agro-waste makes it ideal for future growth.

The present noise insulation in building construction from synthetic fiber, such as mineral wool and glass fiber, are extensively utilized in interior design to absorb sound. The interspaces between fiber, generate inhomogeneous density, which effectively reduces sound wave transmission. This fiber, are often formed into panels and arranged around the interior area to absorb sound and reduce sound reflection.

Furthermore, when these synthetic fiber age, they will peel off microfibers, posing a health danger to those who labour in this environment for an extended period of time. Furthermore, due of the extensive usage of chemical components throughout the manufacturing process, these artificial materials emit noxious gases such as methane. In summary, a more health-friendly substitute material is required.

The utilization of renewable resources, such as agricultural leftovers, is becoming more popular in the manufacturing of particle board. Coconut husk is a renewable resource, as well as a natural fibre harvested from the coconut and utilised in products such as flooring. Thus, we can utilise it as a material in order to make soundproof particle board with the use of resin.

1.3 PROBLEM STATEMENT

Biodegradable sound insulation particleboard is needed.Next,Sound absorption particleboard should be effective as noise reduction instruments.The particle board is tough. It offers a vibrating surface that is most easily audible at mid- and low-frequency ranges. It will therefore transmit sound from one side to the other.A bigger assembly is usually required for particle board to have any significant soundproofing effects, while it can be beneficial for blocking certain high frequency sounds. Thirdly,Coconut waste. According to Sarina Sulaiman, Abdul Aziz Abdul Ramanl and Mohammed Kheireddine Aroua, Department of Chemical Engineering, Faculty of Engineering, University of Malaya, Kuala Lumpur, n estimated 3960 metric tonnes of coconut trash are produced in Malaysia each year, the majority of which is leftover coconut oil. This waste is either used as fertiliser, fed to cows, or allowed to degrade on the fields.

1.4 OBJECTIVE OF THE PROJECT

The primary goals of this research are as follows:

i. Produce a coconut husk sound absorption particleboard.
ii. To identify the ability sound absorption of the particleboard with sound level meter.

1.5 SCOPE OF THE PROJECT

To use in construction sites and testing and learning. This project will create by using urea epoxy resin and coconut husk. Moreover,this study aims to better understand the soundproof properties of a coconut husk particleboard for use as sound insulation in the building industry. Then ,it is also to make coconut husk particleboard sample and test their ability to dampen echo soundproof quality test.Eventually,to make sample with 50%,60% and 70% of epoxy resin and compare them.

1.6 IMPORTANCE OF THE STUDY

In Malaysia, according to the Rice and Industrial Crops Centre (MARDI), Malaysia produced 382000 tonnes of coconut in 2007, with a total of 109185 hectares of land used for coconut tree growing. Approximately 63% of the coconut is utilised locally in Malaysia, while 37% is exported to other countries and industries. Malaysia also imports RM 404, 517, 380 worth of coconut from other countries, such as Indonesia and the Philippines. According to the data, Malaysia is a country with a high consumption of coconut. Datuk Seri Ismail Sabri Yaakob, Minister of Agriculture and Agro-based Industry, reported that 30,000 hectares of land were required to extra produce 72 million of coconut in a year due to Malaysia's high consumption of coconut, and he said that currently, Malaysia produces only 539 million of fruits in a year, but Malaysia consumes 611 million of coconut in a year, so there is 72 million of coconut different (TheStar, 2014). High use of coconut will result in a large volume of coconut trash, increasing the pressure on Malaysia's landfill. So with this particleboard we can reduce the coconut waste. Moreover, we can produce better soundproof particle board.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Literature survey may be a ponder conducted based on genuine hypotheses and connected in areas related to the think about such as diary, articles, books and daily paper considers. Hence, in this chapter a few hypotheses related to this consider will be put forward.

2.2 COCONUT HUSK

2.2.1 Coconut husk

The rough outer shells of the coconut are known as coconut husks. While the husks, like the meat and fluids found within the external shell, are not utilised for food, they may be used to make enriched potting soil and as chips to create ground cover for flower beds. It is possible to buy mass-produced husk items or make them at home.

2.2.2 Parts of coconut

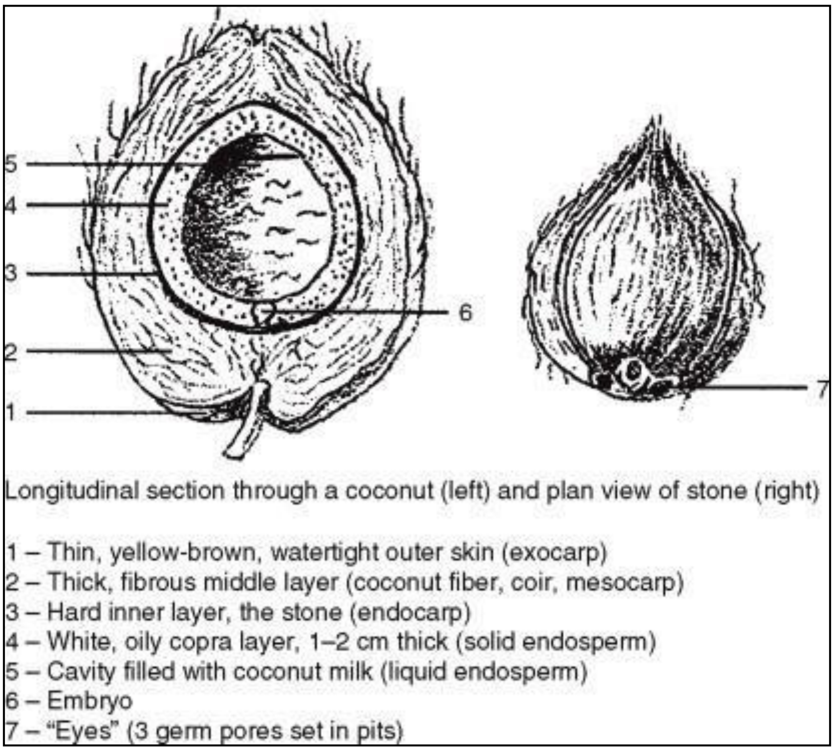


Figure 2.1: parts of a coconut

According to the case study done by (Y. Yan, in Advances in Technical Nonwovens, 2016) on Developments in fibers for technical nonwovens figure 1 shows the parts of a coconut.

Husk.This is the rough outer layer of the coconut consisting of coir (tough fibres). When there was no scouring pad to wash the dishes, the villagers used coir - mixed with sand - to clean their pots. It made the utensil really shiny.

Shell.The hard shell must be broken before reaching the sweet meat within the coconut. Today, much of this is discarded once the flesh has been extracted.

Flesh.This is the nut's edible portion. The vitamin-rich coconut kernel (the meat) may be eaten raw or cooked, and it can also be processed to make various goods. When shredded coconut is put in water and pressed (or mixed), it yields coconut milk, which is used in many Creole dishes and sweets. Oil may be extracted from the kernel once it has developed. The oil may be used to cook with, protect your hair from damage, and hydrate our skin.

Water.B vitamins, proteins, and ascorbic acid are abundant in fresh coconut water.sedia ada .

2.2.3 Uses of coconut husk

Coconut husk fibres, known as coir, are versatile and may be utilised in a range of products: Coir is used to manufacture doormats and brushes, as well as twine, particle board, and biodegradable packing material, and is even a component in mattresses and floor tiles. Coconut husks have also been utilised to form a composite material for vehicle trunk liners, live wall plants, and electric car battery pack covers. Aside from being stronger and stiffer than synthetic plastic fibres, this material is lighter and performs better, which may contribute to cost savings for businesses. Both consumers and companies are drawn to materials that recycle or include garbage, and this offers a future commercial potential.

According to a journal by (natural science), biology and medicine, the coconut husk is also used for oral health. They also mentioned that brushing one's teeth with the fibrous husk of Cocos nucifera or coconut is a traditional oral hygiene technique in rural South India.

2.2.4 Reason to choose

Firstly,it is a good sound absorber. In a final year project of (Rozli Zulkifli, Zulkarnain and Mohd Jailani Mohd Nor Department of Mechanical and Materials Engineering, University Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia), coconut coir was used as a Noise Control Using Coconut Coir Fiber Sound Absorber with Porous Layer Backing and Perforated Panel. The experiment findings show that porous layer backing may significantly enhance noise absorption coefficient at low and high frequencies. The peak value of 20 mm thick layer coconut coir fibre with porous layer backing is 0.97 for frequencies between 2750-2825 Hz. The trial findings also revealed that the coconut coir fibre with perforated plate performs better at lower frequencies ranging from 600 to 2400 Hz. For the frequency range 2600-2700 Hz, the ideal value for coconut coir fibre with perforated panel is about 0.94-0.95. They concluded that, when coconut coir fibre was backed with Woven Cotton Cloth, its noise absorption coefficient rose at all frequencies (WCC). The NAC has significantly increased at low frequency. Because WCC has a higher flow resistance than coconut coir fibres, sound can be dispersed greatly as it flows through material. The testing results suggest that it has acceptable acoustic capabilities at low and high frequencies and may be utilised as a potential replacement for synthetic-based commercial products. The sound absorber panel has the potential to be an ecologically friendly product due to its porous layer and perforated plate backing to coconut coir fibre. Thus we can also try to use coconut husk as sound absorber as coconut coir is from coconut husk.

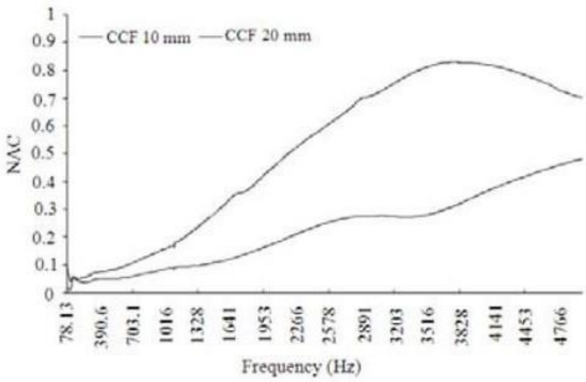


Figure 2.2.: The NAC coconut coir fiber without porous layer

Figure 2 depicts the noise absorption coefficient values when coconut coir fibre is put in front of a hard wall without a porous layer backing. The thicknesses of the samples were 10 and 20 mm, respectively. The noise absorption coefficient of samples with a thickness of 20 mm has a maximum value in the frequency range 3680-3860 Hz, according to experiment results. At frequency 3784 Hz, the peak noise absorption value is around 0.83. The greatest Noise Absorption Coefficient (NAC) value for samples with a thickness of 10 mm was 0.39 at a frequency of 5000 Hz.

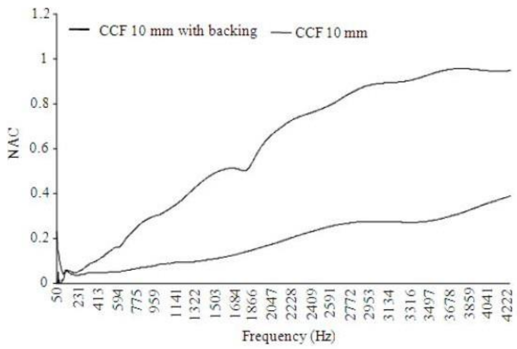


Figure 2.3: The NAC of coconut coir fiber with porous layer backing

As demonstrated in Fig. 3, the noise absorption coefficient of coconut coir fibre improved at all frequencies when it was backed with Woven Cotton Cloth (WCC). After backing with WCC, the NAC rose with highest values in 3753-3834 Hz frequency range and the peak value is around 0.96 in frequency 3800 Hz for samples with 10 mm thickness.

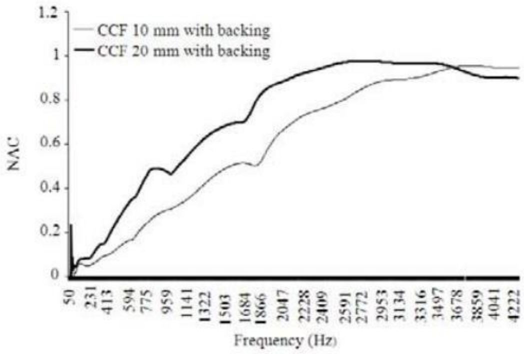


Figure 2.4.: Comparison of NAC of CCF, 10 mm thickness, with and without porous layer backing

The NAC rises significantly at low frequency, 10 mm sample thickness, as seen in Fig. 4. This is because WCC has a higher flow resistance than coconut coir fibre, allowing sound to be dispersed greatly as it flows through material.

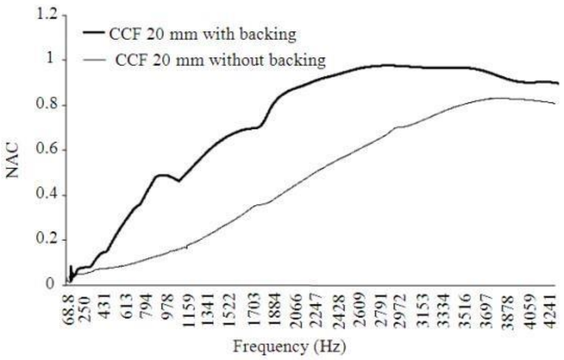


Figure 2.5: Comparison of NAC versus CCF, 20 mm thickness, with and without porous layer backing

According to Fig. 5, the NAC has greatly increased at all frequencies when compared to coconut coir fibre without a porous layer backing. The largest noise absorption values are found in the frequency band 2750-2825 Hz, with a peak value of about 0.97. However, the NAC values at 3900-5000 Hz have decreased.In this study, coconut coir fibre was used as one of the sound absorbers. The testing results suggest that it has good acoustic qualities at low and high frequencies and may be utilised as an alternative to synthetic-based commercial products. The sound absorber panel has the potential to be an ecologically friendly product by utilising the porous layer and perforated plate backing to coconut coir fibre.

Secondly,In a study of acoustic properties of coconut coir and vermiculite composite as noise insulation in vehicular application coconut coir from coconut husk was also used as sound absorber.

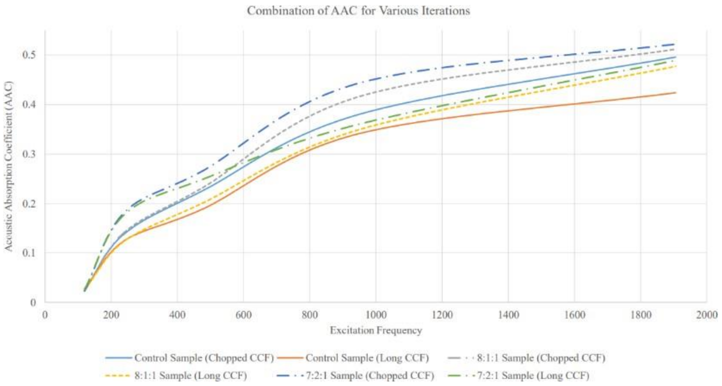


Figure 2.6: 4 overall acoustic absorption coefficient performance in this study.

Based on this study, in conclusion, the acoustic performance of a coconut coir fibre and vermiculite composite as a noise insulation material is promising enough to replace synthetic fibres like glass wool, rock wool, and asbestos.

Thirdly, based on the Utilization of coconut fibres to increase the soundproof capacity of wall partition was the study conducted by (Nuril Mahda Rangkuti, Irwan and Edy Hermanto). In this study, they used coconut fibres to produce a soundproof wall and tests are conducted to proof the ability of coconut fibre as a sound absorber.

Sound Absorption Measurement (α) Variation Coconut fiber 0%

Table 1. *Soundproof Test Table on Concrete Mix with Coconut fiber 0%*

No	Sample	Frequency 250 (Hz)	Frequency 500 (Hz)	Frequency 1000 (Hz)	Frequency 2000 (Hz)	Frequency 4000 (Hz)
1	I	0,4651	0,2355	0,5305	0,3225	0,5098
2	II	0,2172	0,4548	0,3019	0,4198	0,6067
3	III	0,3151	0,3089	0,3092	0,4306	0,7098
4	IV	0,1287	0,3768	0,3609	0,5738	0,4066
5	V	0,3846	0,4657	0,6757	0,5757	0,7539
6	VI	0,1752	0,3608	0,4094	0,5171	0,7654
Average Absorption (α)		0,2809	0,3670	0,4312	0,47325	0,6253

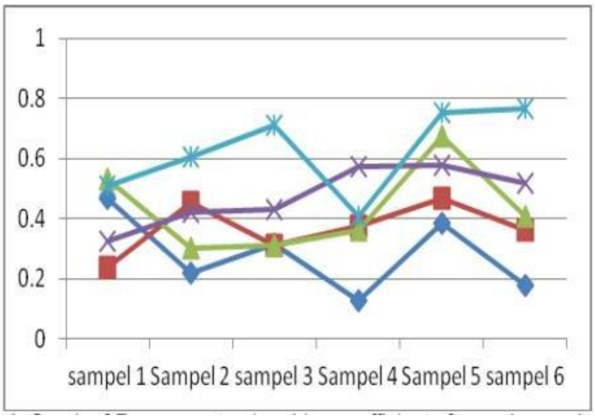


Figure 2.7: Graph of Frequency

Graph of Frequency to absorbing coefficient of sound on variation 0%The graph above demonstrates that at 0% composition, the largest absorption value is displayed; it is denoted by frequency 4000, which is equivalent to 0.75. The variances in this graph arise due to the testing of numerous factors that create higher frequency of outside sound or outside vibration, as well as differences in the low frequencies delivered to the sample during the test.

No	Sample	Frequency 250 (Hz)	Frequency 500 (Hz)	Frequency 1000 (Hz)	Frequency 2000 (Hz)	Frequency 4000 (Hz)
1	I	0,5321	0,4844	0,5244	0,5198	0,7522
2	II	0,2935	04830	0,8280	0,4199	0,9008
3	III	0,2491	0,5818	0,6641	0,5237	0,8776
4	IV	0,4847	0,4680	0,5433	0,7829	0,4826
5	V	0,5872	0,5384	0,5518	0,8796	0,9656
6	VI	0,2416	0,5001	0,3472	0,6073	0,9578
Average absorption		0,3980	0,5092	0,5764	0,6222	0,8227

Table 2.1: Soundproof test table on concrete mix with coconut fiber 7%

The data obtained in figure 9 revealed that the greatest absorption coefficient value of 0.9656 was obtained at the frequency of 4000. Differences in this graph occurred as a result of the testing of many factors that cause an increase in the frequency of outside sound or vibration outside, as well as a difference in the low frequency of the given sample in the test and the addition of fibre factor in the sample, which caused the absorption coefficient to increase from the previous variation.

No	Sample	Frequency 250 (Hz)	Frequency 500 (Hz)	Frequency 1000 (Hz)	Frequency 2000 (Hz)	Frequency 4000 (Hz)
1	I	0,3424	0,5427	0,5909	0,7992	0,9012
2	II	0,6786	0,7634	0,7721	0,6658	0,8423
3	III	0,7293	0,7030	0,6004	0,6617	0,8028
4	IV	0,7568	0,4889	0,7688	0,8460	0,9756
5	V	0,5115	0,6809	0,7647	0,7779	0,9101
6	VI	0,5553	0,5080	0,6812	0,7119	0,9098
Average Absorption		0,5956	0,6144	0,6963	0,7437	0,8903

Table 2.2: Soundproof test table on concrete mix with coconut fiber 15%

Data analysis revealed that the 15% coconut fibre mixture, as the third variation, had the highest absorption coefficient value of 0.9756 in sample 4 with frequency 4000 Hz, 0.20% absorption coefficient, and sound wave velocity of 3902.4 m/s with the method of coconut fibre stocked or placed in the middle position of the sample.

No	Mixed variations	Sound absorbance coefficient					NRC
		250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	
1	0%	0,2809	0,3670	0,4312	0,47325	0,6253	0,4355
2	7%	0,3980	0,5092	0,5764	0,6222	0,8227	0,5857
3	15%	0,5956	0,6144	0,6963	0,7437	0,8903	0,7080

Table 2.3: The results of 3 sample with different percentage of mixed variations

A specimen of a fibre composite silencer beam with a natural matrix to improve sound absorption: the use of coconut fibres at a larger percentage is proposed to get better sound absorption results. The use of finely chopped coconut fibres aided in the mixing of components during casting. To determine the value of absorption more leverage, evaluating noise absorption with Tube Impedance takes patience and accuracy. These are the conclusion that we can made based on this study. With its help it is proved that we can use coconut husk as a sound absorber.

We can reduce coconut waste.Coconut waste can lead to many environmental problems too.

Firstly,based on the study of the potential of coconut shell powder (csp) and coconutshell activated carbon (csac) composites as electromagnetic interference (emi) absorbing material by (Siti Nurbazilah Ab. Jabal, Yew Been Seok , Wee Fwen Hoon,Faculty of Innovative Design and Technology, Universiti Sultan Zainal Abidin, Kampus Gong Badak, 21300 Kuala Terengganu, Terengganu, Malaysia), their aim to conduct this project to recognize agricultural waste (organic materials) as a new absorbent material. Organic substances from living plants, such as oil palm shell, rice husk, and coconut shell, make up agricultural waste. Many natural resources (agricultural wastes) are employed as starting materials in the production of activated carbon. Sugarcane, rice husk, ground nut shell, oil palm shell, coconut shell, corncobs, durian shell, and soybean oil cake are the most often utilised absorbent materials. Coconut trash is now employed in horticultural and agricultural purposes. Carbon is the most important material for absorbing harmful electromagnetic radiation.For overall, according to the result from the four standard test that have been done, the ungrinding panel board is the stronger followed by the grinding coconut fibre and conventional panel board. The un-grinding panel board is the best because it have no swelling, less water absorption, high modulus of rupture and low modulus of elasticity. All of this test are used few constant condition such as, the size of the panel board, time taken to immersed the panel board and the room temperature of the place experiment. This project was achieved the expected outcome to become stronger than the normal panel in market. Table 3 show the advantage of panel board using coconut fibre and recycled plastic compared to wooden panel board. The coconut fibre panel board able to bear huge load in certain range which is larger than the conventional panel could do because high content of lignin in coconut fibre.

According to the research by (Short Term Grant (STG) Vote U387, Office for Research, Innovation, Commercialization and Consultancy Management, (ORICC), Center of Diploma Studies (CeDS) UTHM, Zi Yu Recycle Resources Industrial Sdn. Bhd., laboratory staff of Fakulti Awam dan Alam Sekitar (FKAAS) and Fakulti Mekanikal and Pembuatan (FKMP)) it is also long-lasting and has low absorption of water since plastic are not permeable to water. Lastly, this panel board has its own aesthetic value. Since, the PET plastic were used as the outer lining so it has colourful design and give the aesthetic value as the cover most similar to mosaic. Other than that, this panel is also slightly rough but not harmful to the user. The temperature of the hydraulic type hot or cold machine should be set up to be higher than 170 °C to make sure the PET plastic will bonding together with the panel board as the cover layer. Other than that, the plastic also should be undergoes the layering process to produce the smooth of the outer layer and fully melt to gain more aesthetic value. To overcome the glue to be spot at one point on the panel board in the mixing process,

Wooden panel board	Panel board using coconut fibre and recycled plastic
Bear a huge load in certain range is small	Bear a huge load in certain range is large
Not long-lasting	Long-lasting
High absorption of water	Low absorption of water
No aesthetic value	Has aesthetic value
Smooth surface	Slightly rough surface

spray the urea glue used the air compressor on the coconut fibre to make sure the urea glue spread evenly to all part of coconut fibre.

Table 2.4 Comparison of wooden panel board and panel board using coconut fibre and recycled plastic

In conclusion, The objective of the study was achieved which is the reason for the coconut fibre as the filler for the panel board and PET plastic as the cover is because its own strength and weakness which can be improvised. Based on the criteria to get a good panel board, test on the strength and durability of the panel can be derived. Thus, the panel board which has an aesthetic value can replace the market of wooden panel board and solve the issue about water pollution in the country. The application of the project is can be replace the medium fibre board in the market according to the size and finding such as closet, cabinet, table and the relevant product to the medium board. The product of the study also can be commercial with the low cost and more advantages than the conventional panel board. There are possibility of this coconut fibre panel board has lower cost than the normal panel board since it is using the recycled waste product and do not need any chemical treatment for processing raw materials. The authors would like to express our deepest gratitude to all parties who have contributed to this research, especially to Short Term Grant (STG) Vote U387, Office for Research, Innovation, Commercialization and Consultancy Management, (ORICC), Center of Diploma Studies (CeDS) UTHM, Zi Yu Recycle Resources Industrial Sdn. Bhd., laboratory staff of Fakulti Awam dan Alam Sekitar (FKAAS) and Fakulti Mekanikal and Pembuatan (FKMP).

2.3 RESIN

Any natural or manufactured organic compound that is a noncrystalline or viscous liquid material is referred to as a resin. Natural resins are organic compounds that are often fusible and combustible, transparent or translucent, and yellowish to brown in colour. They are produced by plant secretions and are soluble in a variety of organic liquids but not in water. Synthetic resins are a broad category of synthetic goods that share some of the physical features of natural resins but are chemically distinct. Plastics and synthetic resins are difficult to distinguish. (Thomas a xometry company)

2.3.1 Types of resins

Phenolic resins are thermosetting resins. They are sturdy, resistant to heat and impact, and have a good resistance to chemical corrosion and moisture penetration. Phenolic resins are simple to machine. They may be found in resin impregnation, brake linings, electrical components, laminate, cement adhesives, bonded adhesives, and moulds.

Alkyd Resins.Alkyd resins are thermoplastic polyester resins derived from the reaction of polyhydric alcohols and polybasic acids. They offer exceptional chemical resistance as well as outstanding electrical and thermal characteristics. They are inexpensive and are utilised in electrical insulation, electronic components, putty fillers, and paints.

Polycarbonate Resins.Polycarbonate resins are thermoplastics that are typically made from bisphenol A and phosgene. They have a high refractive index, electrical and thermal dimensional stability, stain resistance, and filtration resistance. Metal replacements, safety helmets, optics, electrical components, photography film, and insulators are all made from them.

Polyamide Resins.Polyamide resins have a recurrent amide group in their molecular chains. They are lightweight, readily moulded, and robust and resistant. They feature a low friction coefficient and are resistant to wear and chemicals. Nonlubricated bearings, fibres, gears, sutures, tyres, watchbands, packaging, and bottles are all examples.

Polyurethane Resins.Polyurethane resins are copolymers composed of polyol and isocyanate. When coupled with other resins, they have a high film elasticity and adherence to substrates. Polyurethane resins provide an excellent balance of elongation and hardness. They are utilised in insulation, elastomers, adhesives, and garment foam liners.

Silicone Resins.Silicone resins were formerly made using sodium silicate and different chlorosilanes, but they are now frequently made with the less reactive tetraethoxysilane or ethyl polyciliate and a variety of disiloxanes. They are flexible and water repellent, with high thermal and oxidative stability. Because of their three-dimensional network structure, silicone resins produce rigid films. Rubber, laminates, encapsulating resins, defoamers, and water-resistant applications all benefit from them.

Epoxy Resins.Epoxy resins, commonly known as polyepoxides, are epoxide-containing reactive prepolymers and polymers. They offer high chemical and heat resistance as well as great adhesive qualities. They're employed in laminates, adhesives, floors, linings, propellers, and surface coatings, among other things.

Polyethylene Resins.Polyethylene resins are the most popular type of resin, accounting for more than 100 million tonnes manufactured each year. They are resistant to chemicals, steam or moisture, and have a high degree of elasticity. They are utilised for laminate and film packaging, containers, cable insulation, coatings, toys, moulds, linings, and pipes and tubes.

Acrylic Resins.Acrylic resins are thermoplastic or thermosetting plastics made from acrylic acid, methacrylic acid, or other similar chemicals. They are transparent and have a high tensile strength. Acrylic resins are resistant to impact and UV light. They are utilised in structural and ornamental panels, adhesives, elastomers, coatings, signage, and transparent tiles, among other things.

Polystyrene Resins.Polystyrene resins are aromatic hydrocarbon polymers derived from the styrene monomer. They are inexpensive and simple to manufacture, with great resistance to acids, alkalis, and salts. Polystyrene resins are also clear and flexible. Insulation, pipes, foams, cooling towers, rubber, car instrumentation, and dashboards are all made from them.

Polypropylene Resins.Polypropylene resins are a form of BPA-free thermoplastic polymer resin. They are colourless and tasteless, have a low density, and are resistant to heat. Because they can be disinfected, they are frequently utilised with medical equipment. Polypropylene resins are also chemically resistant. Toys, electrical components, pipe and manufacturing tubes, fibres and filaments, and coatings are all made from them.

2.3.2 Epoxy resin

Firstly based on the study of (Phelps, Material for Sound Proofing and Sound Dampening July 4th at 1:35pm), we know that Epoxies' air resistance and dampening qualities make them useful for soundproofing. They mostly serve as an addition to other soundproof materials. They are better than conventional glue and can be used as an adhesive while putting up soundproof material. Moreover, they may be used as coatings.Epoxy resins are the thermoset resins that, when mixed with glass, carbon, or aramid fibres, generate composite materials with the best qualities of most thermosets because of their reactivity, which allows them to connect to fibres, and their toughness. There are various procedures for creating composite materials, but Table below lists the most crucial ones in the context of epoxy resins. "Wet resin" and "prepreg" processes are separated. Epoxy resin and reinforcing fibres are combined directly by the fabricator during wet resin procedures. By manually applying resin and reinforcement to a properly prepared mould, this can be completed.

Moreover,In Introduction to (Aerospace Materials, 2012), it is stated that the most prevalent thermosetting polymer utilised in aeroplane structures is epoxy resin. In carbon-fibre composites for aircraft constructions, epoxy resin is employed as the matrix phase and as an adhesive in structural joints and repairs. Epoxy resins come in a variety of forms, and Fig. 13.7 illustrates the chemical composition of one epoxy resin that is frequently used in composite materials for aerospace applications. The chemical compound known as epoxy resin has a tight C—O—C ring structure and contains two or more epoxide groups per monomer. The bonds are altered and the C—O—C rings are opened by the hardener during polymerization to unite the monomers into a three-dimensional network of crosslinked chain-like molecules.While many of the high-strength epoxies used in aviation must be cured at a high temperature (120–180 °C), the cure reaction for some types of epoxy resins occurs quickly at ambient temperature. Because to their high strength, low volatile release during curing, low shrinkage, and good endurance in hot and humid situations, epoxy resins are the polymer of choice in many aircraft applications.

According to case study about epoxy resins: production, application, and testing by (Abdul Nazeer1Assistant Professor, Department of Mechanical Engineering, SECAB Institute of engineering and technology Bijapur(Karnataka)), INDIA, the coconut fibre (coir) and epoxy resin were used, and they were made in accordance with ASTM standard (D3039). Several fibre lengths are used to construct the coconut fibre and epoxy composite depending on the dimensions. With the help of the Universal Testing Machine, the prepared specimens were evaluated (UTM).

Fouthly, according to case study about Mechanical and physical properties of the rice straw particleboard with various compositions of the epoxy resin matrix by (Ismail Ismail 2018) by combining rice straws with an epoxy resin matrix, particleboard has been created. The 20 grit rice straw particles were combined with different compositions of epoxy resin and then pressed under 5 tonnes of weight to create rice straw particleboard samples. Measurements were made of the rice-straw particleboard's mechanical and physical attributes. According to their findings, rice straw particleboard has a modulus of rupture (MOR) in the range of 2.07 to 3.31 kgf/mm2, a bending modulus of elasticity (MOE) of 408 to 1490 kgf/mm2, and a density () of 0.360 to 0.480 g/cm3. They discovered that the MOR, MOE, and p have exponential relationships with the epoxy resin composition, with MOR = 2.0668 + 6.5604e-03327 x (kgf/mm2), MOE = 344.55 + 3159.5e-0203 x (kgf/mm2), and p = 0.4414 - 0.3338e-02183 x (g/cm2). This discovery will assist the manufacturer in producing rice-straw particleboard with the desired MOR, MOE, and density values.

2.4 TEST

2.4.1 Soundproof test

Testing for sound insulation is legally required for both newly constructed homes and homes created via material change of use. In order to attempt and provide some degree of solitude between residences, Part E of the Building Regulations is in place to make sure that dwellings adhere to an established standard of acoustic performance(iKoustic,2023).

Acoustic measurements are performed using a sound level metre, often known as an SPL. Typically, it is a hand-held device with a microphone. The condenser microphone, which combines accuracy with stability and dependability, is the optimum kind of microphone for use with sound level metres.[1] The microphone's diaphragm reacts to variations in air pressure brought on by sound waves. Because of this, the device is occasionally referred to as an SPL (sound pressure level) metre. The sound pressure (measured in pascals, Pa), which causes this diaphragm movement, is changed into an electrical signal (measured in volts, V).

To ensure that a residential development can exhibit appropriate levels of noise attenuation performance, sound testing is necessary. This covers both impact noise and airborne noise, or noise that travels through the air, like the sound of individuals talking to one another or footfall on the floor. This means that testing for sound insulation essentially determines whether the home offers a sufficient resistance to the passage of sound(NOVA COUSTIC,2023).

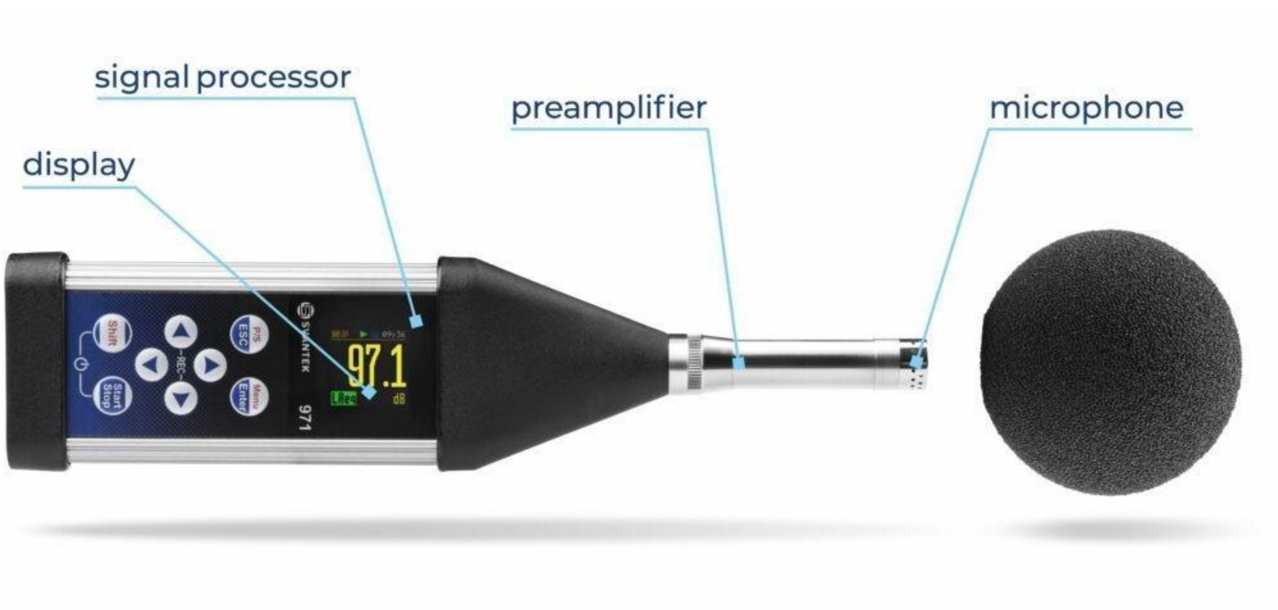


Figure 2.8 : Parts of sound level meter

2.4.2 Types of sound level meter

The majority of noise at work applications require an integrated sound level metre. It offers the Leq measurement needed to determine the LEP,d and estimate the worker's exposure. You might also get the sound exposure level (A weighted SEL or LAE) from an integrating metre. Equivalent Continuous Level (Leq).An integrated sound level metre offers this as the most crucial element. Since it measures the average energy over a set amount of time (the measurement period), it works best when noise levels are not extremely constant, which is typically the case.We are interested in the A weighted (human ear-like response) Leq for noise at work. This is measured in dB(A) and is known as the LAeq. It is actually simpler to use a Leq metre, also known as an integrating sound level metre, than it is to attempt to determine the average level using a non-integrating sound level metre. A Start and Stop button (or just a Reset button) is typically present on a Leq metre. Pressing the Start button initiates the measurement process. After then, you watch for the Leq level to stabilise on the monitor. The Leq will stabilise in a few seconds if the noise level you're measuring is reasonably constant. It is important measuring for a few production cycles to guarantee you get a good average if you are measuring a production cycle that lasts a few minutes and has varying noise levels throughout that period(NoiseMeters Inc).

Sound level metre measurements (ISO:1996-2:2017; ISO:1996-1:2016) and sound pressure level measurements are the two main methods for monitoring and measuring noise pollution. and noise mapping computations using sound sources (traffic, industrial plants, etc.) with known acoustic sound output. It can be difficult to use the sound level metre when measurements need to be densely sampled to achieve complete coverage of a particular location. The sound level metre is made up of an electronic circuit, a display, and a calibrated microphone. Small fluctuations in air pressure caused by sound are picked up by the microphone and converted into electrical impulses. The electronic circuitry of the instrument is then used to process the aforementioned signals. The display indicates the decibel level of the sound.

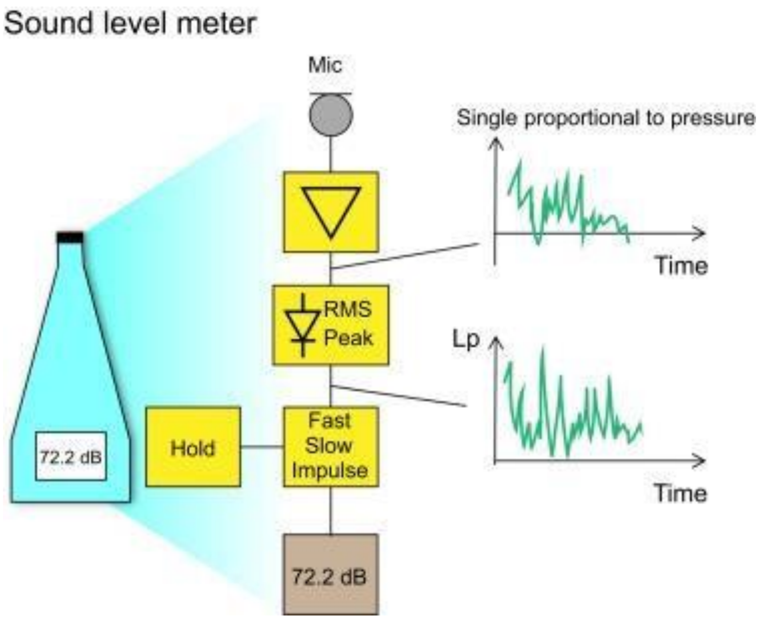


Figure 2.9 :Decibel level of sound

The "sensing" level for different frequencies (such as 100 Hz and 1 kHz) is not the same in the human ear because it is not a linear system. In order to evaluate the sound signal at various frequencies, the sound pressure filter is employed to filter the sound signal according to various coefficients. A weighting network, an electronic circuit whose sensitivity fluctuates with frequency in a manner similar to that of the human ear, may be used to process the signal, replicating the equal loudness contours. This led to the development of three distinct, globally standardised traits known as "A," "B," and "C" weightings. At low Sound Pressure Levels (SPLs), the "A"-weighting network approximates an inverted equal loudness contour; at medium and high SPLs, the "B"-weighting network corresponds to a contour; and at highest SPLs, the "C"-weighting network approximates an equal loudness contour. The "D"-weighting, a specialised characteristic, has also been standardised for aeroplane noise measurements. Sound level metres typically have a linear or "Lin." network in addition to one or more of these weighting networks. This allows the signal to pass through unaltered and does not weight the signal in any way. Since the "B" and "C" weightings do not correspond well with subjective testing, the "A"-weighting network is now the most popular. This lack of association between subjective testing and "B" and "C" weighted measures can be attributed, in part, to the equal loudness contours being based on pure tone trials. Most real-world events do not use pure tones; rather, they include relatively complicated signals with a wide range of tones. Figure 12.10 displays the "A" and "C" weighting factors for a number of tertiary frequency bands.

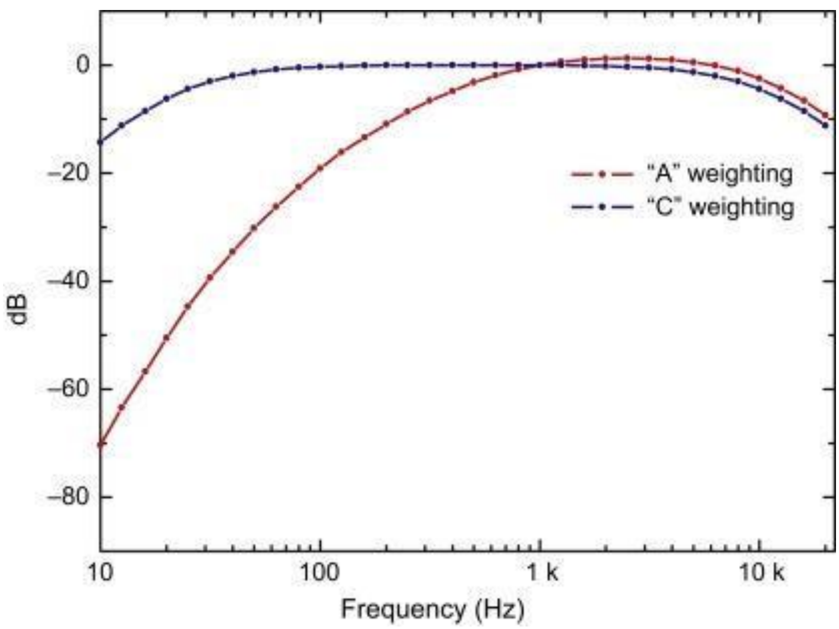


Figure 2.10 : the "A" and "C" weighting factors for a number of tertiary frequency bands.

According to IEC 60804:2000, sound level metres can measure sound level with either a fast or slow exponential time averaging: Firstly the exponential time constant of fast exponential time averaging is 125 ms, which is equal to the ear's integration time (the human ear cannot detect sounds that last less than 125 ms).Secondly,slow exponential time averaging, which has an exponential time constant of 1 s, enables more accurate assessment of the average noise level.In Fig, examples of how various integrating constants can be employed to achieve various responses to a pressure impulse are displayed.

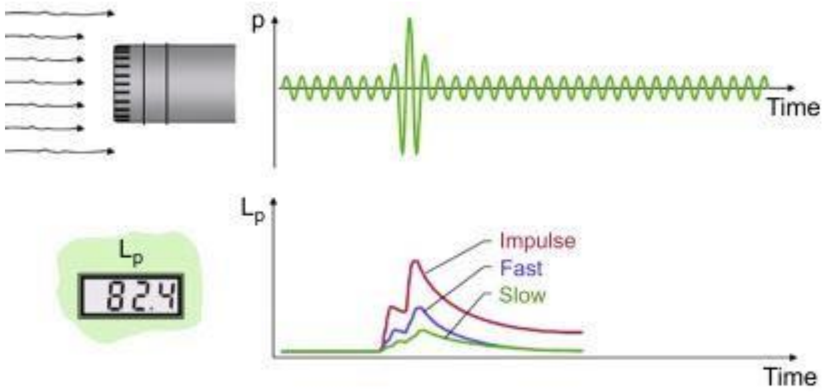


Figure 2.11 : Various integrating constant

According to International Standards (IEC 60942:2017), sound level metres are rated:Class 1 is a precision grade with a tolerance of 0.5 dB for usage in laboratories and the field. It is perfect for traffic assessments, environmental applications, building acoustics, and laboratory use.Class 2 is a general-purpose grade with a tolerance of 1.0 dB for outdoor use. It is frequently employed to quantify environmental noise, vehicular noise, construction noise, and noise in entertainment settings. There are a number of additional kinds of sound level metres as well, but they will not be described in this chapter because they are unimportant to the chapter's focus. The sound level metre also needs to be calibrated before and after each series of readings in order to collect the sound pressure level at a specific place.Utilising a pistonphone calibrator set over the microphone, sound level metres should be calibrated before to use. These calibrators create a pure tone with a nominal output of 94 dB or, in the case of some calibrators, 114 dB at 1000 Hz. Such manual data collection techniques at each measurement point can be very time-consuming and expensive when it comes to measuring traffic noise.It is important to monitor noise levels particularly densely at a specific place because of the nature of sound and noise. Due to the high cost and complexity of Class 1 sound level metres, this type of measurement is also quite expensive. As a result, you will require more sound level metres and more qualified people to conduct measurements for a longer period of time if you need to densely monitor noise levels at a lot of different locations. Utilising noise mapping computations with known acoustic sound power of sound sources (traffic, industry, etc.) is another method of data collection. According to ISO:9613-2:2000, the total attenuation of outdoor sound is the result of geometric spreading, air absorption, ground interaction, obstacles, vegetation, and atmospheric refraction. Calculating noise levels using these input variables—such as traffic density, average speed, road surface roughness, train or aeroplane type—can be particularly difficult in big cities with lots of intersections, heavy traffic, and enormous input data sets. To verify the quality of the input parameters, these noise mapping computations also need to be verified with actual measurements in a few points of interest. Additionally, the Environmental Noise Directive 2002/49/EC mandates that noise levels coming from industry plants, major airports, railroads, and road traffic be measured. The evaluation of noise produced by other activities, such as sports, social gatherings, and musical performances, is still not mandated. The creation of a noise map, which depicts the annual average noise levels at a height of 4 m above the local ground level, is a necessity for all significant cities. According to the Environmental Noise Directive 2002/49/EC, noise levels must be evaluated using Lden and Lnight. Lden is the equivalent continuous noise level over a 24-hour period, with noise levels in the evening (from 19:00 to 23:00) and the night (from 23:00 to 7:00) increased by 5 dB(A) and 10 dB(A), respectively, to account for people's increased sensitivity to noise during those hours. Lnight is the corresponding average nighttime noise level (from 23:00 to 7:00). There is no weighting for nighttime noise in Lnight.(Sanja Grubeša, ... Ivan Djurek, in Start-Up Creation (Second Edition), 2020).

2.4.3 Sound level meter

The primary acoustical instrument is a sound level metre like the one in Fig. 2.12.

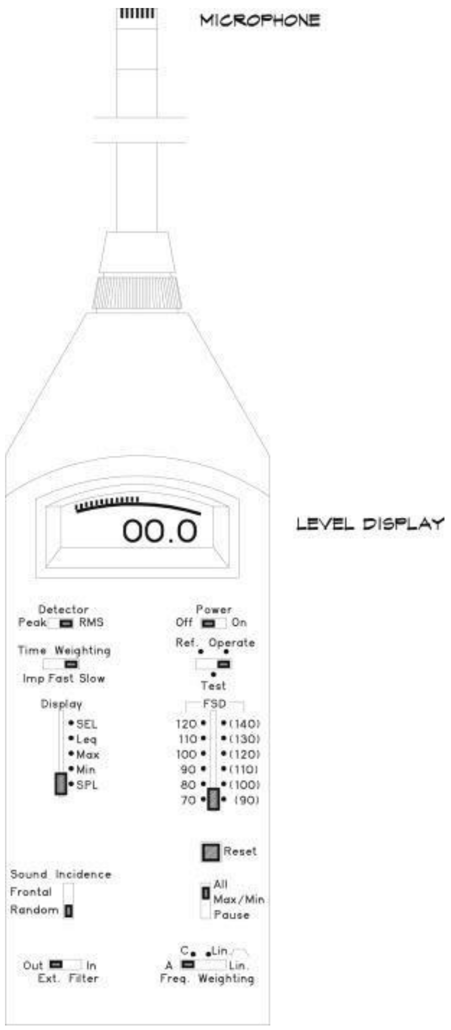


Figure 2.12 : Sound level meter

The sophistication of metres has increased, and they frequently incorporate internal computing that automates many measurement activities. Metres are battery-powered. Although the specific settings differ from metre to metre, the features are generally the same. The fundamental controls provide a choice of time weightings, representing various ballistic time constants, including quick, slow, impulsive, and integrating. Linear, A-weighted, C-weighted, and a Z-weighted (band-limited linear) scale are among the available frequency weightings. One can choose a frequency bandwidth from any of the pass, octave, and third-octave bands. The maximum and lowest values that the metre can measure can be set using a range selection. A microphone, preamplifier, range control, time averager, level indication, and numerous filters are among the components that make up a meter's internal structure. Sometimes, the filters are housed in a separate module that is either attached to the metre or is built into the metre itself. Most portable sound level metres require manual filter selection. The metre is known as a spectrum analyzer or real-time analyzer when a number of filters work concurrently and show various levels on a bar graph in real time.According to accuracy, sound level metres are divided into three types. The precise tolerance permitted varies widely for each class. The American National Standard Specification for Sound Level Metres, ANSI S1.4-1983, establishes these standards. Utilising a pistonphone calibrator set over the microphone, sound level metres should be calibrated before to use. These calibrators use an oscillating piston at one end of a tiny cavity to produce a constant tone, typically at 1000 Hz. The calibrator outputs a pure tone signal with a nominal level of 94 dB, or 114 dB in the case of some calibrators. Using a screw adjustment, the metre is set to the correct level.An equation of state can be used to convert changes in pressure caused by pistonphone calibrators into changes in cavity volume. The majority of calibrators are programmed to generate the reference level at 1013 millibars (1.01 10 5 Pa) of typical atmospheric pressure. Given that atmospheric pressure changes, Fig. provides an adjustment that should be used in accordance with height.

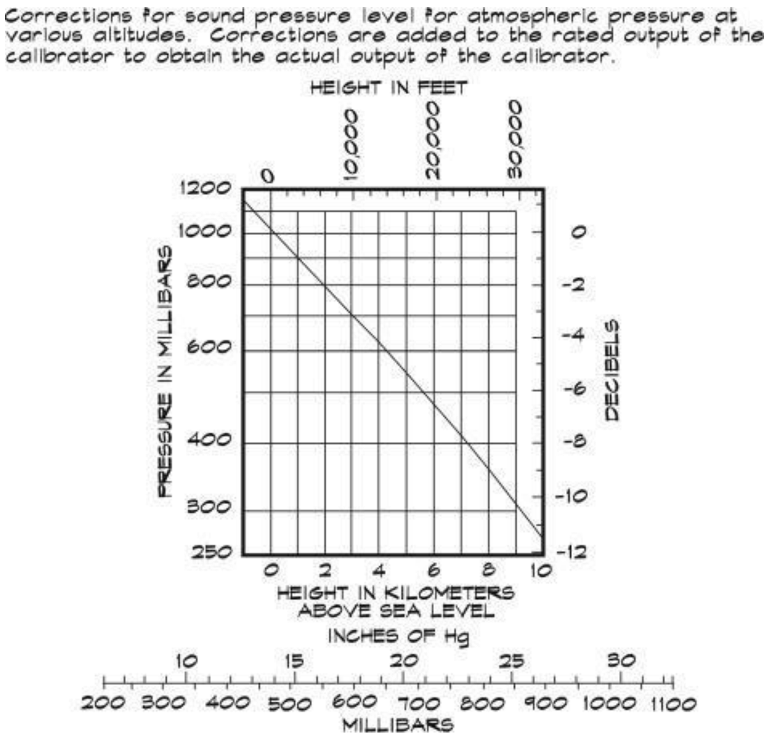


Figure 2.13 : Adjustment that should be used in accordance with height

Sound metres provide a number of programmable filters. The most basic is the linear filter, which allows sound to pass as long as it stays within the instrument's overall band boundaries, for example, 5 Hz to 100 kHz. Architectural acoustics are not particularly interested in this since it contains sounds that are considerably outside of our range of hearing. A second option, the band-limited linear setting or Z-weighting, suppresses low-frequency noises that would otherwise overload a recorder and has a band-pass filter between 5 Hz and 20 kHz. Figure displays the properties of this filter along with the A- and C-weighting networks.(Marshall Long, in Architectural Acoustics (Second Edition), 2014)

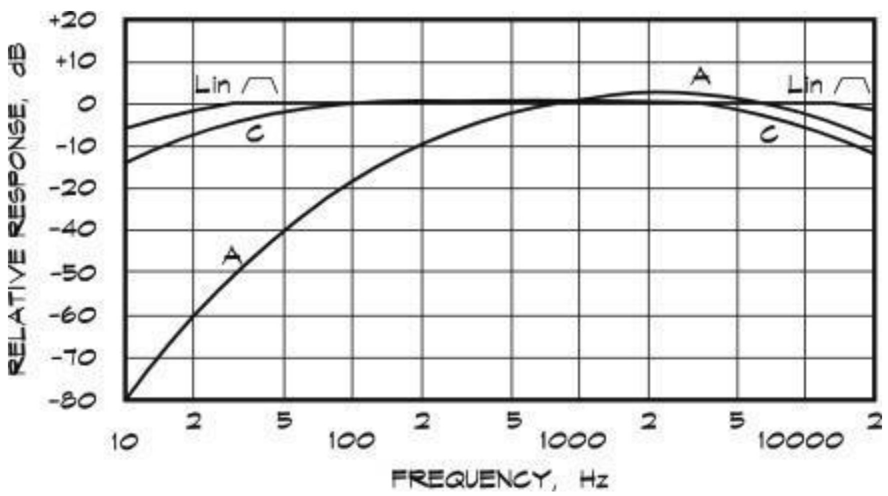


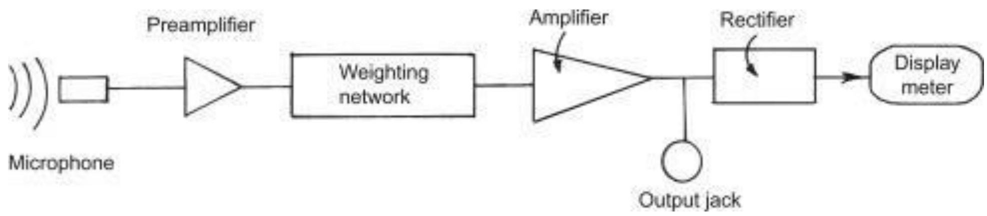
Figure 2.14 : Properties of filter

Chosed based on the previous project Kenaf Core Particleboard and Its Sound Absorbing Properties by (Mohamad Jani Saad and Izran Kamal) from Rice and Industrial Crops Research Center, Malaysian Agriculture Research.(Development Institute (MARDI) 43400 Serdang, Selangor Darul Ehsan.beza.)

2.4.4 Intensity of Sound Level Meter

A SLM determines the volume of a certain noise. SLMs come in a variety of forms. The type of sound and the level of measurement precision required determine the equipment selection. A microphone, amplifier, weighting network, rectifier, and display metre reading in decibels make up the basic components of the majority of

SLMs. A schematic diagram of these metre components is shown in Figure. The sound wave energy is transformed into an electrical signal at the microphone, where it is amplified. The weighting network may make changes to the electrical signal before the amplifier amplifies it further. The display metre measures the sound pressure level directly in decibels thanks to the rectifier's conversion of the electrical signal from alternating current (AC) to direct current (DC). There might be an output jack for recording or analysing the detected signal whenever needed. (Dilip Kumar, Deepak Kumar, in Sustainable Management of Coal Preparation, 2018)



2.15 : Schemetic diagram

2.4.5 Assessing Noise Exposure

If noise levels exceed legal limits or interfere with task performance, they should be tracked and reduced.Using a sound level metre, noise exposure levels are commonly measured in decibels (dB). An rise of 3 dB actually implies a doubling of the sound intensity since the human hearing response is nonlinear. The following sound scales are used by sound level metres A-weighting—measuring low intensity;B-weighting—measuring moderate intensity and C-weighting—measuring high intensity.

As dB(A) reflects the human range of sound detection, these are measured and recorded as dB(A), dB(B), and dB(C).Leq, which denotes the average sound level over a predetermined length of time, can be used to reflect the sustained noise level to which workers are exposed. Additional measurements comprise: peak noise levels,background noise levels and median noise levels. A map or blueprint of the workplace will often show multiple noise measurements.

This gives a general picture of the workspace and the locations of the louder sources of noise. Measurements are compared to applicable international criteria for exposure limits that take into account the various tasks being carried out and the equipment being utilised in the kind of work environment. As needed, control measures should be put in place to lower noise exposure.(E.J. Skilling, C. Munro, in Human Factors in the Chemical and Process Industries, 2016)

2.5 SUMMARY

This chapter is explaining about each and every material that used in the project with the reason. Coming topic is about the methodology.

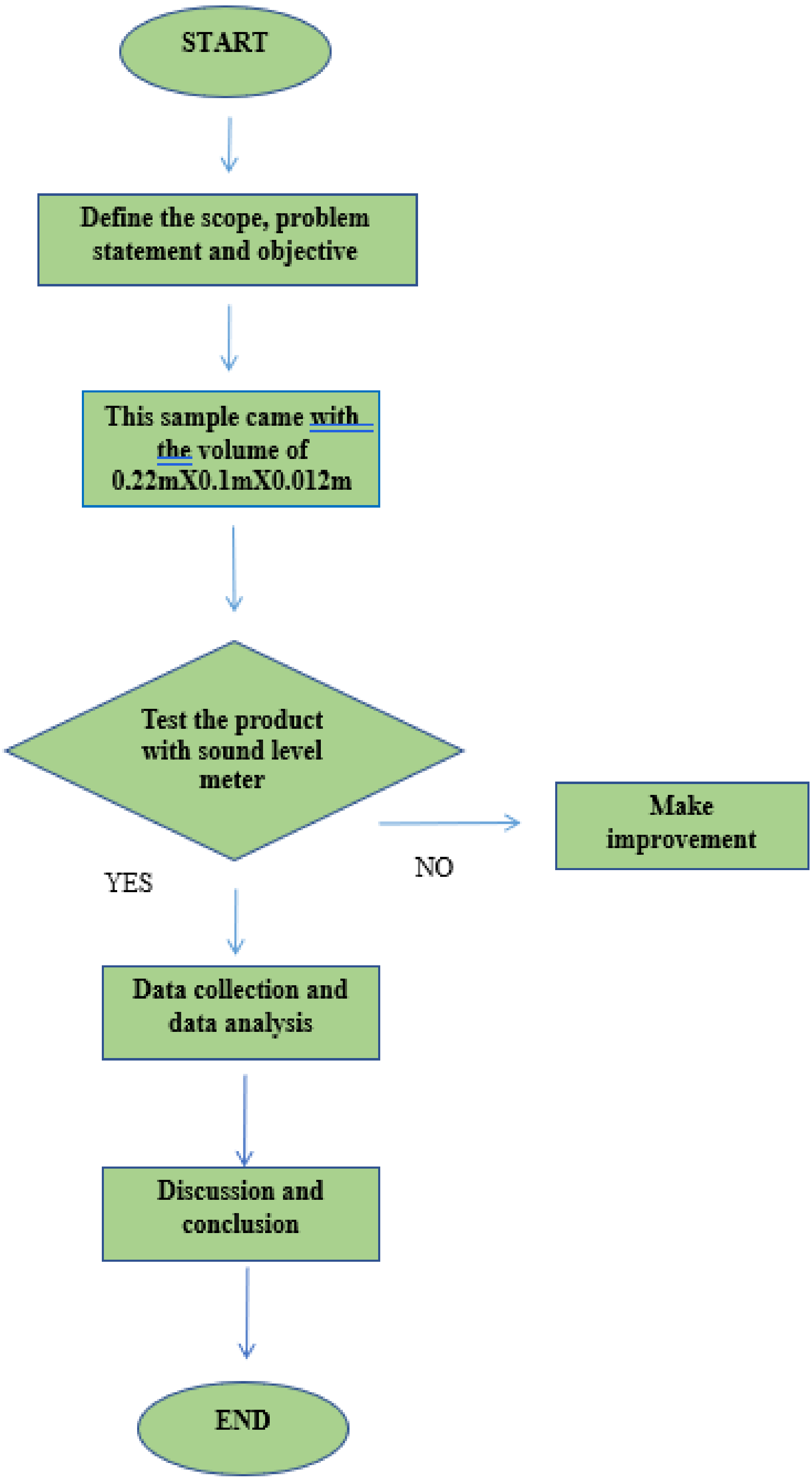
BAB 3

METHODOLOGY

3.1 INTRODUCTION

The point of the technique inquire about is to attain the destinations of the consider as expressed in chapter 1. Arranging is exceptionally, imperative in each think about to be conducted. To guarantee that the arranging for each strategy is require coordinate with the targets, which already set up and to urge the same answers for each objective. The investigate strategy will be planned to realize the objective. To clarify the usage strategy of this venture more clearly with alluding graphs, tables, chart, and drawings.This item is got to create to form simple work to the clients. On the off chance that utilize this item it'll offer assistance to create the work simpler from the manual strategy. It moreover will spare more the time for the clients. At long last, it too offer assistance to induce the same stature at both sides.

3.2 FLOWCHART OF METHODOLOGY


START
Define the scope, problem statement and objective
This sample came with the volume of 0.22mX0.1mX0.012m
Test the product with sound level meter
NO
Make improvement
YES
Data collection and data analysis
Discussion and conclusion
END

3.3 MATERIALS

There are some materials that we are used to build up the model of coconut husk panel until the test of the model. The materials and the function are shown in Table 3.1.

	**COCONUT HUSK** -It is the main material to make the model -To improve the soundproofing of the particleboard
	**EPOXY RESIN** -Is a binder, which is a chemical compound used in model so that it hardens, sets, and clings to other materials to tie them together.
	**WOOD&NAILS** - wood and nails are used to make the mould.

Table 3.1 The materials and the function

3.4 PREPARATION OF SAMPLE

The fibre, the coconut husk was dried in the sun and in oven, and then the fibres were hand removed. The coir's outermost wax coating was removed in order to ensure optimum contact between the fibre and the organic matrix. This was done according to the reaserch by (Lourdes Valadez-Carmona, 6 Sept 2016), Effect of microwave drying and oven drying on the water activity, color, phenolic compounds content and antioxidant activity of coconut husk.In this research the underutilised coconut (Cocos nucifera L.) husk is mostly made of fibre and pith components. This is a significant source of phenolic substances that might be employed as functional components. The purpose of this study was to compare the effects of microwave drying and oven drying on the antioxidant activity, phenolic component concentration, and water activity of coconut husk. The OD and MD were carried out for 12 hours each at 60 °C and 900 W, respectively. Fresh coconut husk had a total phenolic content (TPC) of 64.2 mg GAE/g dry weight, which was significantly greater than the values seen after OD and MD of 35.8 and 45.5 mg GAE/g dry weight, respectively. In both fresh and dehydrated coconut husks, ten phenols were found. While coconut husk OD and MD exhibited a decrease in the level of vanillic acid, vanillin, catequin, and kaempferol, the husk MD showed an increase in the content of gallic, 4-hydroxybenzoic, ferulic, and syringic acids as well as epicatechin when compared to the fresh. After OD and MD, the antioxidant activity reduced. MD, as opposed to OD, produced a higher level of antioxidant activity in the husk. MD of the husk produced better maintained colour, TPC, and TFC retention than OD.As a conclusion, the moisture content of the fresh coconut husk was 83.2 %, and was reduced to 4.4 % after OD and to 8.5 % with MD. The aw of fresh coconut husk was 0.98 and it was reduced up to 0.37 and 0.38 after OD and MD, respectively. The lightness (L*) of the OD decreased significantly compared with fresh coconut husk. However, MD did not change lightness of husk significantly than that of fresh one. Redness (a*) and yellowness (b*) values were higher in OD and remained unchanged upon MD compared with the fresh coconut husk. Moreover a research by (Zheng et al. 2015) reported on the relationship between TPC and TFC and antioxidant activity in loquat flowers and discovered that the effects of all drying methods on DPPH and ABTS radical scavenging activities were nearly in line with those on TPC and TFC. In this investigation, TEAC results revealed that, among the drying techniques, hot-air dried samples had the lowest antioxidant activity. The drying process, which opens the cell matrix and makes it easier for total phytochemicals to be extracted and absorbed, may be to blame for the reduction in antioxidant activity. The heating process also encourages the release of bound phenols in soluble forms with low molecular weights that are easily broken down by browning and oxidative reactions.(Mejia-Meza et al. 2010; Moure et al. 2001; Tian et al. 2016; Zheng et al. 2015).

Figure 3.1 Blending of coconut husk

Figure 3.2 Drying proses of coconut husk in the oven

We are produced the mould box with dimensions of 220mm x 100mm x 12 mm in accordance with ASTM Specifications of brick. Plywood was used as the side limit to create the mould box. To stop the epoxy glue from leaking out of the mould box, the surface was nailed. Below is a picture of the mould box.

Figure 3..3 : The box plywood

Fibers were dried under the sunlight for 24 hours. Epoxy resin and harderner, were utilised in this instance. The combination is supplemented with the 50%,60% & and 70% of resin with 50%,40% and 30% of blended coconut husk were well combined. Next the mixture was poured into the mould container. The slurry was evenly distributed throughout the mould box, and a suitable surface finish was applied. To dry the mixture, the mould box was left at room temperature for one day. The specimen was then taken out of the mould box.

Figure 3.4 : shows the mixing of resin

Figure 3.5 : The weighing of dried coconut husk

Figure 3.6 : The figure shows te end result of the sampel

Coconut husk		Epoxy resin	
Percentage	Weight(kg)	Percentage	Weight(kg/ml)
50%	0.046	50%	0.046/46
40%	0.037	60%	0.055/55
30%	0.028	70%	0.065/65

Table 3.2 : percentage pf coconut husk with resin

Figure 3.7 : Epoxy resin

3.5 SOUNDPROOF TEST

We used a sound and vibration measurement system to make our products function. This method is quit easy from the previous method. In this experiment carrying out sound and vibration measurements For evaluating the measured data, the laboratory contains a large number of exciters, sensors, signal analysers, and post-processing software. The laboratory's high-end equipment is supplied by renowned manufacturers in the field of sound and vibration, ensuring the quality and reliability of the instruments and measurements. Some of the equipment is USB powered and portable, making it ideal for field measurement.

We used sound level meter in order to conduct the test. According to research (Enda Murphy,2016) testing the accuracy of smartphones and sound level meter applications for measuring environmental noise is showed that the sound level meter is much more effective than using smartphones to check the frequecy of the sound.The conclusion Although it is still in its infancy, the use of cellphones to measure environmental noise has a lot of potential to become a type of crowd-sourced noise monitoring in the future. The ability to measure environmental noise using commonplace technology, such as a smartphone, has the potential to enhance the monitoring of the sound environment in both cities and rural areas. It also has the potential to empower and engage citizens in environmental monitoring. The findings demonstrate that the app's measurement accuracy decreases in the presence of background noise and loud noise.

Firstly, we arrange the wall.Then, we placed the sound source from 3 different length,0.5m,1.5m and 2.5m and with 3 different sound (park sound,traffic sound and construction sound). We arranged the panel inside the wall box. We placed sound level meter inside then we recorded the reading on the sound level meter. The recording then replaced to record the result. The results were recorded. This test was done in the DPB Lab of Politecnic Sultan Salahuddin Abdul Aziz Shah.

Figure 3.8 : The arrangement of wall

Figure 3.9 : Distance from the wall to sound source

Figure 3.10 : The measurement of the sound source from the panel

Figure 3.11 : The arrangement of brick (sound source)

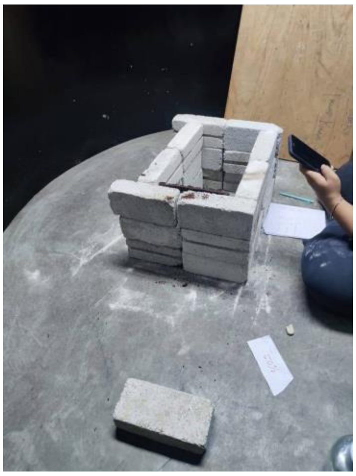


Figure 3.12 : The wall with panel before it is closed with cover(wood)

Figure 3.13 : The recording of the test.

3.6 SUMMARY

This chapter is discussed about the flow chart of methodology. Furthermore, discussed about the materials that used in this project and its functions too. Then, the explanation for method of use. The next chapter is going to show the data analysis for this project.

CHAPTER 4

OUTCOMES AND DISCUSSIONS

4.1 INTRODUCTION

Expected outcomes are predicted outcomes. Consider expected outcomes to be the desired goals of our project.

4.2 DATA ANALYSIS

To Be able to reuse discarded materials such as coconut husk skin so as to avoid contamination that occurs and can reduce unused and excess coconut husks.The sound that is projected onto the wall can be absorbed and controlled on the portion of the wall panel that has a coconut husk material that is completely in place.

Percentage of resin: coconut husk/ distance	Control (no panel)			50:50			60:40			70:30		
1-park sound 2-traffic sound 3-construction sound	1	2	3	1	2	3	1	2	3	1	2	3
0.5m	64.4	63.3	67.1	58.5	61.8	65.5	54.6	57.8	64.7	50.1	54.2	60.5
1.5m	56.0	58.7	63.8	54.7	56.2	59.0	50.3	54.4	58.1	49.3	46.3	56.4
2.5m	52.6	54.4	57.8	53.3	54.6	59.3	49.4	49.3	55.1	47.3	49.3	49.8

Table 4.1 : Shows the result of this study

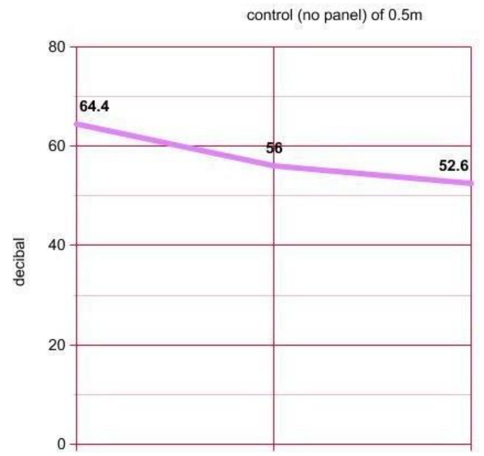


Figure 4.1 : The grarph shows the result of control from 0.5m of park sound

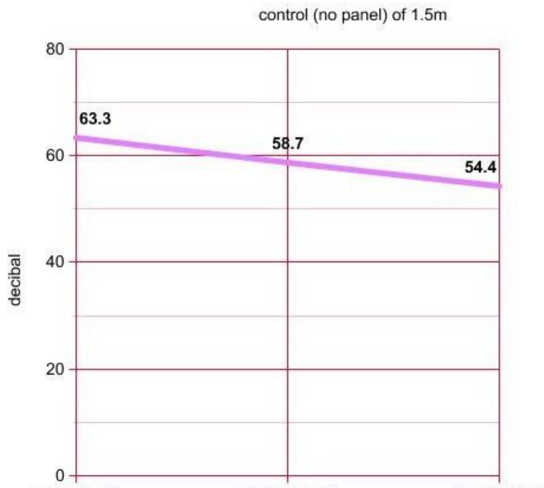


Figure 4.2 : The grarph shows the result of control from 1.5m of traffic sound

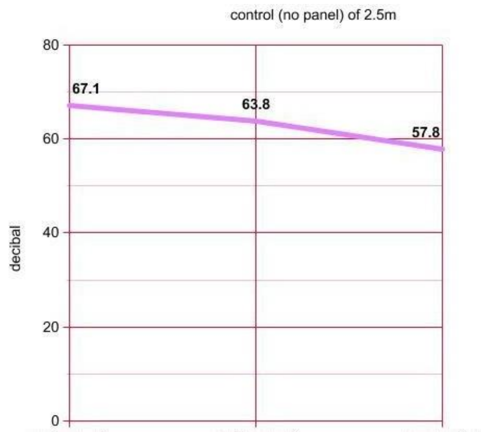


Figure 4.3 : The grarph shows the result of control from 2.5m of construction sound

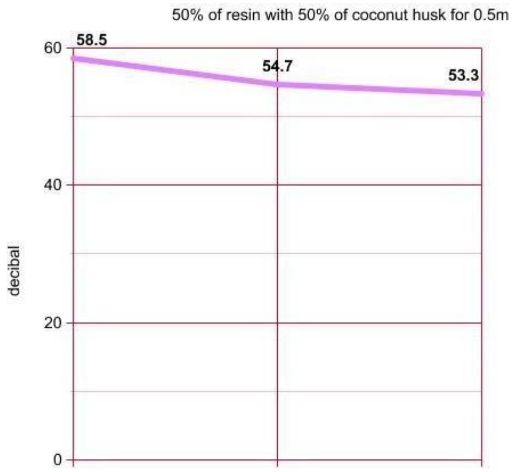


Figure 4.4 : The grarph shows the result of 50% coconut husk & 50% resin from 0.5m of park sound

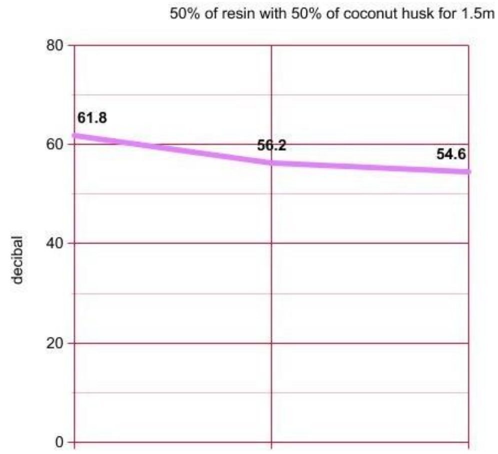


Figure 4.5 : The grarph shows the result of 50% coconut husk & 50% resin from 1.5m of traffic sound

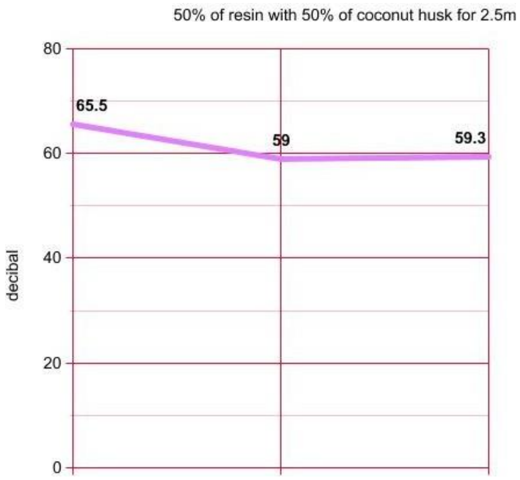


Figure 4.6 : The grarph shows the result of 50% coconut husk & 50% resin from 2.5m

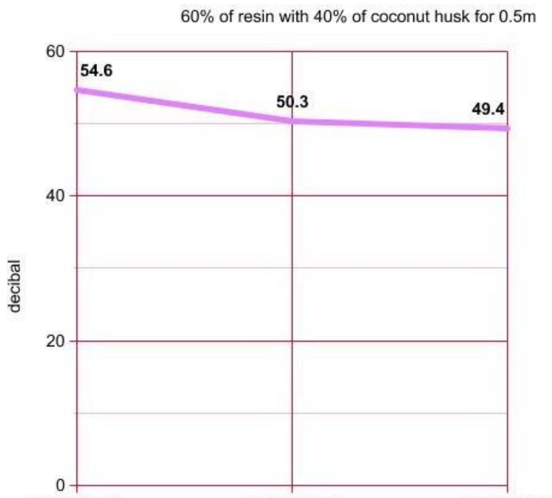


Figure 4.7 : The grarph shows the result of 40% coconut husk & 60% resin from 0.5m

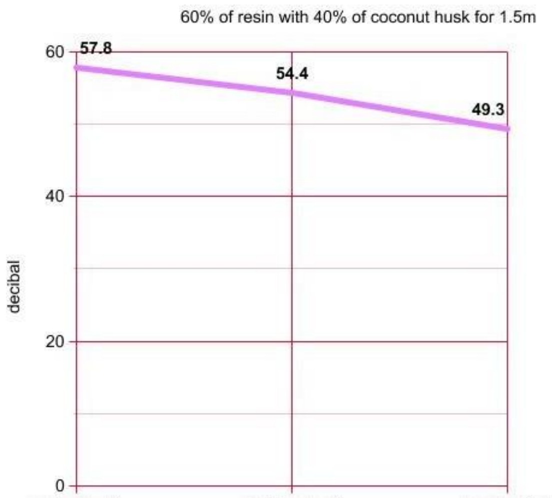


Figure 4.8 : The grarph shows the result of 40% coconut husk & 60% resin from 1.5m

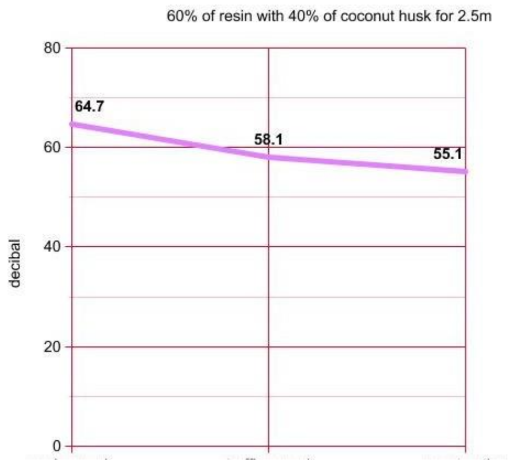


Figure 4.9 : The grarph shows the result of 40% coconut husk & 60% resin from 2.5m

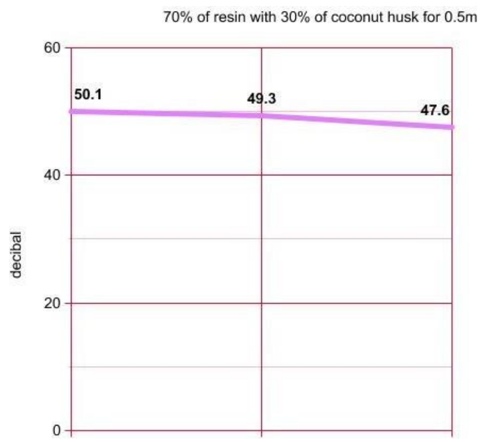


Figure 4.10 : The grarph shows the result of 30% coconut husk & 70% resin from 0.5m

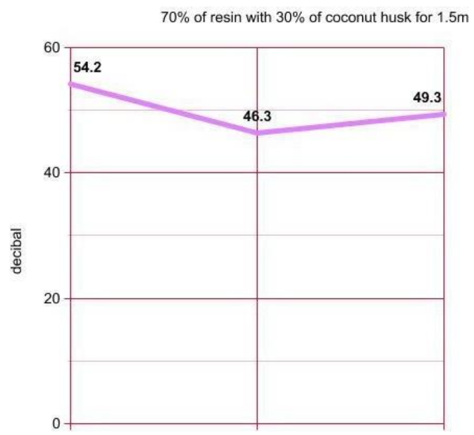


Figure 4.2.11 : The grarph shows the result of 30% coconut husk & 70% resin from 1.5m

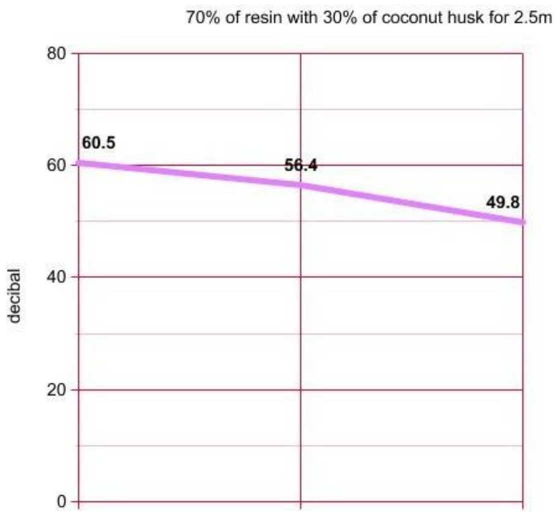


Figure 4.11 : The grarph shows the result of 30% coconut husk & 70% resin from 2.5m

4.3 DISCUSSION

Based on the result we gain it is proved that the particleboard with high resin(70% resin : 30% coconut husk) absorbed more sound compare to 60% of resin with 40% of coconut husk and 50% of resin and 50% of coconut husk. The results were compared with the control(no panel). We define the different or the sound absorption by using $Desibel\ of\ the\ room\ without\ panel\ (control) - Desibel\ of\ particleboard$. This test was conducted with the help of sound level meter at DPB Lab Sultan salahuddin Abdul Aziz Shah. The test was conducted in a covered room to get the accurate sound absorption ability of each particleboard.Moreover we also have tested the particleboard with 3 different sound(frequencies) low sound (park),medium sound (traffic) and high construction. From the result, as we expected, construction frequency id high. This was done ro compare the absorption level of particleboard in 3 different situation. In addition we also have tested the particeboard at 3 different length(0.5m,1.5m and 2.5m) from the main wall.

The particleboard is made with weighing the dried coconut husk and resin to get a same estimation density of 350kg/m^3.In the end, the product with 50% of resin and 50% of coconut husk is more heavier tha the other 2 percentage of particleboard. This is due to the less amount of the resin mixed.

When we compare the texture, the 70% of resin with 30% of coconut husk was thick,nicer and clean compare to the 50% of resin and 60% of resin. The particeboard of 50% resin with 50% of coconut husk is not stronger. The coconut husk particles can be seen fallen on the ground as it is not stronger.

By comparing the project of (Mohamad Jani Saad) the results that we can compare is not accurable. This is because their results proves lower urea formaldehyde resin (UF) with higher kenaf core is a higher sound absorber. But our project resulted that the lower coconut husk with higher epoxy resin is effective as a sound absorber panel.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

Percentage of resin: coconut husk/ distance	Control (no panel)			50:50			60:40			70:30		
1-park sound 2-traffic sound 3-construction sound	1	2	3	1	2	3	1	2	3	1	2	3
0.5m	64.4	63.3	67.1	58.5	61.8	65.5	54.6	57.8	64.7	50.1	54.2	60.5
1.5m	56.0	58.7	63.8	54.7	56.2	59.0	50.3	54.4	58.1	49.3	46.3	56.4
2.5m	52.6	54.4	57.8	53.3	54.6	59.3	49.4	49.3	55.1	47.3	49.3	49.8

Table 5.1 : Shows the reading of the sound level meter

Based on the data we get from the test we conducted with sound level meter, the more the percentage of resin, the more the ability of particleboard to absorb the sound.Thus the particleboard with 70% of resin and 30% of coconut husk can be used as a soundproof particleboard based on the data we collected. By comparing the 60% of resin with 40% of coconut husk and 50% of resin with 50% of coconut husk, the 70% of resin with 30% of coconut husk has high abilityto absorb the sound particles from the surrounding. Moreover, in this experiment we can conclude that the particleboard with high resin is effective thann coconut husk.As a conclusion the highlighted percentage of resin anf coconut husk I the best as a sound absorber particleboard.

By comparing the result of kenaf and resin particleboard with our experiment.Our experiment has more effect with the resin. But the kenaf and resin particleboard is effected by the fiber. (Kenaf Core Particleboard and Its Sound Absorbing Properties by (Mohamad Jani Saad and Izran Kamal)

5.2 RECOMMENDATION

We recommend to use different type of fiber for an example rice husk,sugar cane with resin to make particleboard and the ruslt can be compared with this the result.

Moreover we can also compare the particleboard with 100% of resin (without coconut husk) to get to know the reason of absorption .Whether resin has the ability to absorb sound naturally compare to coconut husk or it gain its ability when it ract with coconut husk.

Other than that, we recommend to use different type of resin. With this result we can compare the ability of the absorbtion level between the different types of resin. We can also compare the ability of soundproof of fiber with the ability of the soundproof of the resin.

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POLITEKNIK

BORANG PERMOHONAN
PENGGUNAAN KEMUDAHAN MAKMAL/BENGKEL

Makmal / Bengkel: MAKMAL GEOTEK
(Selain Bengkel Projek)

Bil	Nama Pelajar	No. Pendaftaran	Tarikh	Masa
1	KHAIKEEN BALQIR	08DKA20F2036	27/3/2023	
2	KOOBANESWAKY	08DKA20F2026		
3				
4				

SENARAI PERALATAN/BAHAN YANG DIPERLUKAN

Bil	Item	Unit	Tandatangan Penerima	Tandatangan Pemulangan	Catatan
1.	OVEN				
2.	DULANG				
3.	TIMBANG				

Sokongan Penyelia Projek

Saya dengan ini mengesahkan bahawa permohonan ini disokong dan keselamatan pelajar di makmal/bengkel adalah di bawah tanggungjawab saya.

(Tandatangan Penyelia)

Nama : DALIELA BT ISHAMUDDIN

Tarikh : 27/3/2023

Ulasan Penyelaras Makmal/Bengkel

Permohonan ini diluluskan/tidak diluluskan.

(Tandatangan Penyelaras Makmal/Bengkel)

Nama : SARINA TALIB

Tarikh : 27/3/2023

POLITEKNIK MALAYSIA

BORANG PERMOHONAN
PENGGUNAAN KEMUDAHAN MAKMAL/BENGKEL

Makmal / Bengkel: ....
(Selain Bengkel Projek)

Bil	Nama Pelajar	No. Pendaftaran	Tarikh	Masa
1	CHAIKEEN BALAIS	05DKA20F2016		
2	POOBANESWARY	05DKA20F2026		
3				
4				

SENARAI PERALATAN/BAHAN YANG DIPERLUKAN

Bil	Item	Unit	Tandatangan Penerima	Tandatangan Pemulangan	Catatan
1	Sound level meter	1			
	(FPT/KSA/H/14/7)				

Sokongan Penyelia Projek

Saya dengan ini mengesahkan bahawa permohonan ini disokong dan keselamatan pelajar di makmal/bengkel adalah di bawah tanggungjawab saya.

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(Tandatangan Penyelia)
Nama : DALIELA ISHAMUDDIN
Tarikh : 12/5/23

Ulasan Penyelaras Makmal/Bengkel

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....
(Tandatangan Penyelaras Makmal/Bengkel)
Nama : AZIZI MURSIDY
Tarikh : 12/5/2023

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Pembahagian tugas:-
Chapter 1 : balqis
Chapter 2 : rooba
Chapter 3 : rooba
Chapter 4 : balqis
Chapter 5: rooba