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Noise Absorbing Panel by Using Agro Waste Material

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Abstract: ***Noise Pollution is a environmental concern , impacting on health . To mitigate this issue in the crowded locality . Noise absorbing panel wall developed using agro waste material such as maize waste , coconut fibre, rice straw waste with adhesive material for binding and moulded into 1x1ft panel with 1 cm thickness and dried under the sun . The panel was installed and tested using a sound meter app. Result show an average reduction of 10dB in noise level. The result showed that panel has good sound absorption properties, where light weight, non toxic and biodegradable. This agro waste panel can be effectively used to create low cost.***

Keywords: ***Noise pollution, Agro waste, Maize waste, Coconut fibre, Rice straw, Low cost***

I. INTRODUCTION

Noise pollution is a growing problem in cities. Noise pollution refers to disruptive sound in the environment that affects human health and financial system. It is increasing environmental issue like air and water pollution.. The population in cities expected to grow areas. The current aim is to develop an affordable and eco friendly soundproofing material from agricultural waste. This is soft material, allowing safe handling and application. Its porous structure enhances sound absorption capacity along with good thermal insulation properties and energy efficiency.

Traditional soundproofing materials like fiberglass, synthetic foam are costly and also harmful to the environment. To solve this problem we explore the use of noise absorbing panel from agro waste this approach provides a sustainable and cost effective.

The goal is to create an affordable and renewable to traditional sound insulation materials .while also reducing agricultural waste. This research evaluates the panel sound absorption efficiency and durability. The panel is suitable for offices, industries, homes, to reduce noise pollution.

II. OBJECTIVE

1) To utilize agro waste material for making sound absorption panel.
2) To casting sound absorption panel.
3) To compare noise absorbing capacity to brick structure

III. SCOPE

The use of agro waste material for noise absorbing panels is ability to reduce cost and provide effective noise control across various industries. Low income families can be used noise absorbing panel.

1) Waste material can be used for noise absorbing panel.
2) Noise reduction panel can be used in building and industries

IV. PROPERTIES OF AGRO WASTE MATERIAL AND ADHESIVE MATERIAL

A. Natural sound insulation material-

1) Maize waste
2) Rice straw waste
3) Coconut fiber

a) *Maize waste–*

Fig. 1 Maize Waste

- Maize waste involve corn husks, cobsand stalks, is a sound insulating material due to its fibrous and porous composition. Maize waste is a lightweight, porous and fibrous material that making it effective for reducing noise and enhancing sound absorption capacity.
- Maize waste can absorb 50-80% of sound waves depending on density and frequency range.

b) *Rice straw waste-*

Fig. 2 Rice Straw Waste

- Rice straw waste provides excellent thermal insulation, making it ideal for sustainable construction, soundproofing, and bio degradable composites.
- Rice straw with 15-20% silica, it enhances durability fire resistance property and making it suitable for composite material.

c) *Coconut fiber-*

Fig. 3 Coconut Fiber

- Coconut fiber is a lightweight and porous material that offers excellent sound and thermal insulation .it's high tensile strength contribute durability and flexibility.

B. Adhesive material

1. Natural latex

2. Wheat flour

a) Natural latex

Fig. 4 Natural latex

- Natural latex is a milky liquid found in about 10% of all flowering plants. Latex is a stable mixtureof tiny polymer particles in water.
- Natural latex is used for durability and also has strong holding capacity. We used natural latex as a binder material.
- Natural latex with its porous structure has a network of small porous. It enhances sound absorption by trapping sound waves and making it an effective material for sound proofing.

b) Wheat Flour

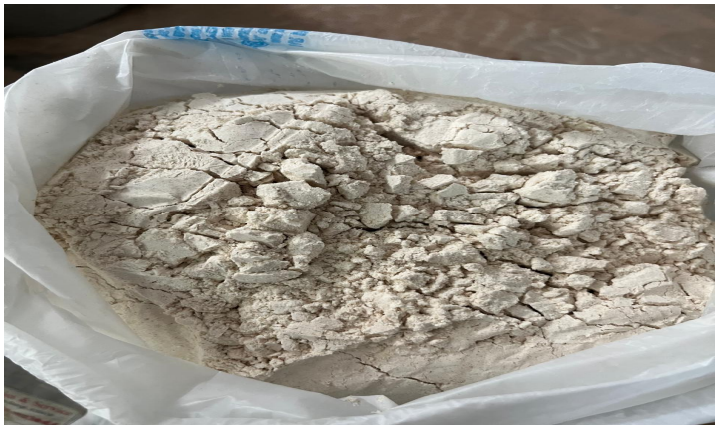


Fig. 5 Wheat Flour

- Wheat paste is a simple, natural adhesive made from mixing wheat flour with water. When wheat flour is mixed with water the starch in the flour swells and it creating gel like substance. Its natural adhesive and binding properties it helps to form solid and long lasting material when mixed with water and other ingredients.

C. Size and material of mould

- The size of mould is 304.8mm x 304.8mm x10mm
- The mound is made from plywood.

V. PROCEDURE OF MAKING NOSE ABSORBING PANEL

A. Procedure to prepare the natural adhesive-

1) Take 100 grams of wheat flour and place it in a mixing bowl.

2) Add 2 cups of water into the wheat flour and stir until a smooth and lump free mixture.
3) Mix 347.37gram of natural latex and 115.8gram of lime powder, ensuring even distribution.
4) Heat the mixture and stirring continuously until it becomes a white sticky gum like adhesive.
5) While still warm, mix this adhesive with sound absorbing material it use as binder for the final application.

B. Procedure to Make Panel –

6) We collected dried maize, rice straw, and coconut fibre.
7) In dried maize we remove the outer skin and take the white stem from it.
8) We cut the white stem from maize waste into small pieces for making it in powder form.
9) We take the rice straw and cut it into small pieces of 3 cm length.
10) We collect the coconut fibre and separate its hair and cut in length of 2-3 cm.
11) Natural adhesive is prepare as per above procedure with wheat flour powder , sugar and vinegar these materials are mixed with continuous heat adding water as per required and continuous stirring until unless it look like a gum which is white and brownish in color.
12) Then the maize waste powder, rice straw and natural adhesives are mixed together.
13) Then take a mould of dimensions 30.48cm*30.48cm*1cm
14) Apply oil or grease on panel to retain the panel to stick on mould.
15) Pour the mixture in the mould compact it evenly.
16) Now keep the mould for drying in sunlight for about 52hours (2-3 days).
17) Removing the panel after 52 hours we apply oil paint on the panel and keep it for drying. The oil paint is applied for decorative texture.

VI. MATERIAL QUANTITY FOR SINGLE PANEL

A. Resources Required:-

TABLE I
NATURAL ADHESIVE MATERIAL

Material	Quantity
Natural latex	86.84 gm
Wheat flour	175.58 gm
Sugar	75 gm
Vinegar	6.25ml
Water	100 gm
Lime powder	28.95 gm

TABLE II
NATURAL ADHESIVE MATERIAL

Material	Quantity
Natural latex	86.84Gm
Wheat flour	175.58Gm
Sugar	75 gm
Vinegar	6.25ml
Water	100 gm
Lime powder	28.95 gm

VII. SURFACE PEELING PROBLEMS IN NOISE ABSORBING PANELS

While developing our noise absorbing panel, we tested various coatings to enhance its strength and durability. Two materials we tried cement paste and gypsum powder gave us unexpected difficulties:

1) Cement paste: Cement paste appeared to be a strong surface coating, but it resulted in issues:

- The panel became heavy and it reducing it lightweight advantage.

- The surface started peeling off and showing poor bonding with agro waste materials.

2) Gypsum powder: Gypsum powder gave a smooth finish and good appearance, but it resulted in issues:

- Gypsum powder made the panel sooth finish but it didn't stay strong for long. over became the coating weak, started cracking and peeled off.

Oil paint: From observation, we decided to apply oil paints to the agro waste noise absorbing panel, after applying the oil paint there was no damages on the panel

VIII. ECONOMIC ANALYSIS OF AGRO WASTE

NOISE ABSORBING PANEL VS TRADITIONAL PANEL

TABLE III

COMPARISON

Dimension	Agro waste Noise absorbing Panel Cost	Dimension	Foam Panels (traditional Panel) Cost
60x60x1cm	154.21	60x60x5cm	372
30.48x30.48x1cm	38.5/panel	30.48x30.48x5cm	93/panel

- From this cost comparison of agro waste noise absorbing panel and foam panels it is reveals those agro waste noise absorbing panels are the more affordable choice.

IX. RESULT

Fig. 6 Without panel result

Fig.7 With panel result

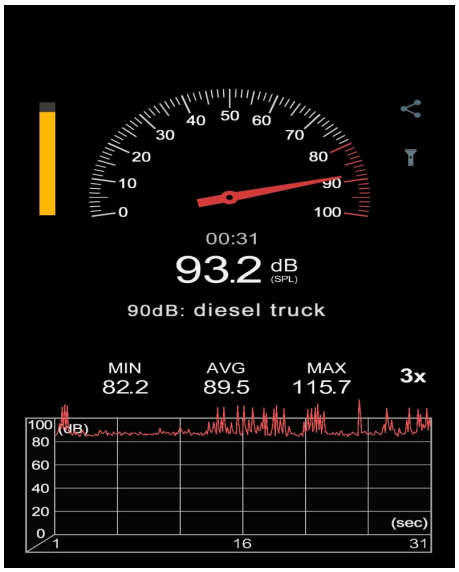
We have tested the sound test of this agro waste noise absorbing panel by using sound meter. The test was carried out in crowded area, background noise level was measured, and a Noise level was recorded without the panel and after the panel wasinstalled. Noise level dropped by 10 .7dB after the comparison:

The following were obtained by sound meter app:

TABLE IV

COMPARISON OF SOUND TEST

Condition	reading 1	reading 2	reading 3
Without panel	93.2dB	87.6 dB	89.8 dB



With Panel	82.5dB	80.6 dB	82.6 dB

Fig. 8 Without panel result

Fig.9 With panel

X. CONCLUSION

We conducted a sound test on our noise absorbing panel. For the test placing panel inside a brick structure and measuring sound levels with and without the panel installed. The initial sound level without the panel was recorded at 93.2db while the reading with panel installed was 82.5db.the level of noise decreased by 10.7dB when the panel was installed to the brick structure. These results prove that the agro waste noise absorbing panel can absorb more capacity of noise. This result prove that our agro waste noise absorbing panel is effective can be used as sustainable to reducing noise levels.

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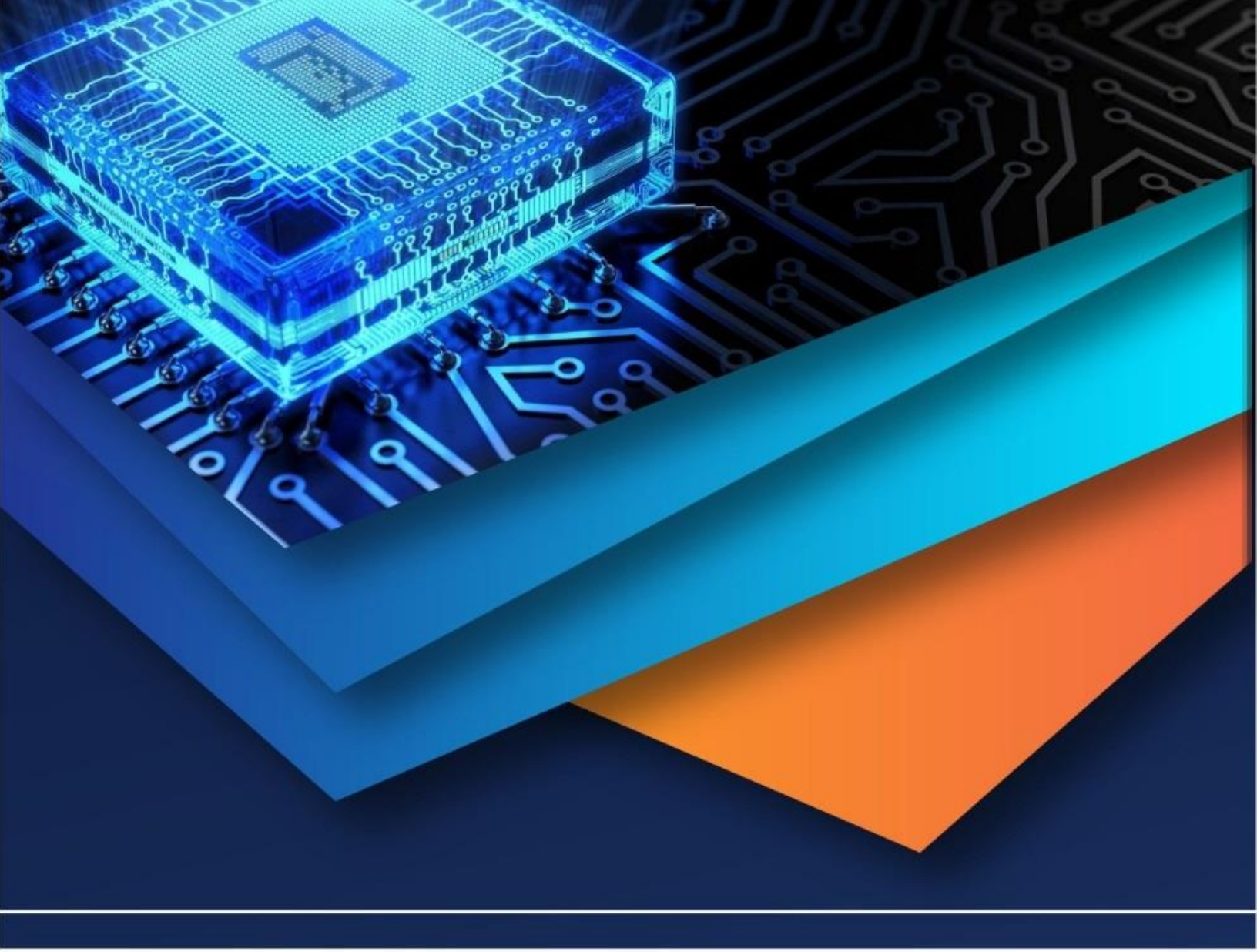

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