

Noise pollution control using agriculture waste

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Abstract

Rapid and more use of electric appliances such as mixer, fan at home and heavy machinery use at industries have created noise pollution. The available noise absorption acoustic boards are made up of glass and fibres. They have harmful effect on the human eyes and lungs. They also are very costly and out of reach of middle class. This project emphasises on creating the sound absorbing blocks using agriculture waste. We have selected Maize waste, Rice straw, coconut fibre as it have sound absorbing qualities. Methodology of this product is to collect the rice straw, maize waste and coconut husk. The Rice straw is cut into 3.5 cm pieces and maize is powdered. The coconut husk is also shredded. three ingredients along with natural adhesive are casted into block. Finishing is done using gypsum. Then the blocks are tested in areas of pune, Katraj and wagholi in a wood box. Results obtained for the sound absorption test are In 1st sample we used 70% Maize, 5% Coconut Fibre and 25% Rice Straw. From the 1st sample we found that sample has 34.89% for Katraj area & 30.89% for wagholi area is the noise absorption capacity. In 2nd sample we used 88% Maize, 2 % Coconut Fibre and 10% Rice Straw. From 2nd sample we found that sample has 44.13 % for Katraj chowk and 43.13 % for wagholi is the noise absorption capacity. In 3rd sample we used 91% Maize, 8 % Coconut Fibre and 1% Rice Straw. From 2nd sample we found that sample has 37.65 % for both the area noise absorption capacity. After comparing both the sample it was found that the noise absorbing capacity of 2ND sample is more than 1st and 3rd sample. Therefore, Proportion 88% Maize, 2 % Coconut Fibre and 10% Rice Straw sample gives maximum noise absorption.

Keywords- Noise pollution , Methodology, Sound Absorbing , Adhesive, Sound level meter.

Introduction

Generally the boards used for noise control are made up of glass and fibre. These materials are harmful for human health. The fibre and glass provides a potential harm to human eyes and lungs due to more exposure. The constant exposure to glass and mineral fibres can led to harmful effects on the eyes and lungs which

can cause permanently damage. Another disadvantage of these boards is the cost of it. The cost of the noise control boards is pretty high. It is not feasible for common man or people with poor background. These problems provide an opportunity to find alternatives for the acoustic boards which are cheap as well as not harmful for the human. As India is a agriculture based country the generation of agriculture waste is high. The agriculture waste of Maize, Rice straw and coconut husk is available in large quantity. The waste is generally burnt or used as fertilizers. Nowadays several researches are going on for use of natural fibre in civil engineering constructions which can be used as substitute for the synthetic fibre. It is found out that rice fibre can be used as substitute for synthetic fibre. These products are cheaper, renewable and have high availibility and don't affect health while handling and process. We are trying to achieve a alternate noise control board which is cheap and doesn't affect the health, it will also help in proper use of agriculture waste.

Materials and Method

Study area –

This study is conducted at two distinctive places in Pune, Maharashtra. Firstly the study is conducted in heavy urban area of Katraj and other area selected for this study is Wagholi which is developing area. People living in both the areas are heavily affected by the traffic noise.

Selection of agriculture waste-

For our project we collect all agro waste material from different area. All materials were collected from different part of the Pune area.

Location of collected Agro-Waste

Rice straw from - Karad.

Coconut fibre from - Wadzire.

Maize from - Lonikand.

Materials used-

1. Maize waste

2. Rice Straw

3. Coconut husk

4. Adhesive

5. Gypsum

Properties of waste material-

Maize waste-

The maize stem was composed of 30% soluble, 25% hemicelluloses, 38% cellulose and 7% lignin components. The bundles occurring at the end sides are much more packed and at the centre there is space. This makes the material perfect for the sound absorption. It absorbs 60% sound capacity.

Rice waste-

The composition of rice straw is same to the maize. It is poor in nitrogen. Rice straw does not allow the water to pass through it which makes the board water resistant. Due to hollow space in-between it is light and has thermal resistant nature.

Coconut Fibre-

Coconut fiber is obtained from the fibrous husk (mesocarp) of the coconut (*Cocos nucifera*) from the coconut palm, which belongs to the palm family (Palme). Coconut fiber has high lignin content and thus low cellulose content, as a result of which it is resilient, strong and highly durable. The remarkable lightness of the fibers is due to the cavities arising from the dried out sieve cells.

Adhesive Material-

Wheat paste (also known as flour paste or simply paste) is a gel or liquid adhesive made from wheat flour and water. We used wheat flour as adhesive material. Wheat flour has stickiness properties and also has binding capacity.

Natural latex as found in nature is a milky fluid found in 10% of all flowering plants. It is complex emulsion that coagulates on exposure to air consisting of protein, alkaloids, starches, sugars, oils, resins and gums. In most plants latex is white, but some have yellow, orange or scarlet latex. We used natural latex as adhesive material.

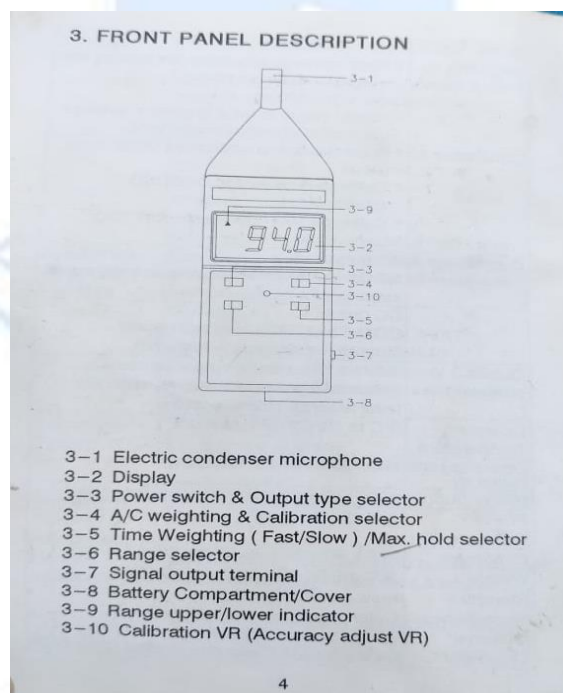
Gypsum-

Gypsum is one of the most used construction material. It is used for interior designing. In this case gypsum is used to give finishing to the blocks. Gypsum is white to grey mineral found in earth while mining. It gives smooth Finishing to the product.

Noise Absorption Equipment

Sound Level Meter

- A Sound Level Meter (SLM) is an instrument (commonly hand-held) that is designed to measure sound levels in a standardized way.
- It responds to sound in approximately the same way as the human ear and gives objective, reproducible measurements of sound pressure levels.



Working of Sound level Meter-

- A sound level meter comprises a microphone, a pre amplifier, signal processing, and a display.
- The microphone converts the sound signal to an equivalent electrical signal.
- The most suitable type of microphone for sound level meters is the condenser microphone, which combines precision with stability and reliability .
- The electrical signal produced by the microphone is at a very low level, so it is made stronger by a preamplifier before it is processed by the main processor.

- Signal processing includes applying frequency and time weightings to the signal as specified by international standards such as IEC 61672 – 1, to which sound level meters conform.

Casting Mould-

The size of mould is 200mm x150 mm x 10mm. The mould is made up of plywood.

For testing of absorption test of sample 1 and we used 300mm x 300mm x 300mm box size. This box is made up of plywood



Methodology-

1. Collection of rice straw, maize waste and coconut husk from various locations.
2. Maize waste skin is removed then white colour stem is present inside that material is used.
3. Take that white stem cut into small pieces which is comfortable for making powder.
4. Rice straw is cutting into small pieces with 3.5 cm length wise.
5. Collect coconut fibre separate the hairs of coconut are cut into 2 to 3 cm pieces.
6. For sample 1 we took maize waste 70 %, rice straw 25%, coconut fiber 5.0% .
7. Natural adhesive is prepared with Wheat flavour powder, sugar and vinegar these there are mixed in hot water and stirred it well. It will look as a gum which is white in colour.
8. Then the maize waste powder, rice straw and natural adhesive is mix well.
9. Take a mould of dimensions 200mm*150mm*10mm apply any oil or grease to remove the sticky nature.
10. Place the mix into the mould compact it well evenly. Let it dry in sunlight about 24 hours.
11. After 24 hours apply gypsum powder to the board and again dry it in sunlight about 2-3 hours
12. Repeating this procedure with different contents of rice straw and maize waste along with coconut husk.



Procedure for testing sample-

1. Take the wooden testing box of size 30 cm*30 cm*30 cm with top side open. Then take the testing box on site of testing.
2. Put the testing box at place of testing. Put the sound level meter into the box and note down the reading.
3. Then put the sample on all side of the box and set the sound level meter inside the box. Cover the top of the box with video recording arrangement and record the result.
4. Repeat the step no.3 for all three samples.

Note down the reading for all samples into the observation table and compute the difference between the sound level with sample plate and without sample plate. And make the average of the sound reduction.

Calculation-

$$\frac{\text{Original value} - \text{new value}}{\text{Original value}}$$

Result-

This method is done with sound level meter and mobile application to determine the sound absorbing capacity of the board. The average sound absorbed by 3 boards at both the area are as follows-

Sample 1- 70% Maize, 5% Coconut Fibre and 25% Rice Straw

Noise absorption is 34.89% for Katraj area & 30.89% for wagholi area.

Sample 2-88% Maize, 2 % Coconut Fibre and 10% Rice Straw

Noise absorption is 44.13 % for Katraj chowk and 43.15% for wagholi area.

Sample 3- used 91% Maize, 8 % Coconut Fibre and 1% Rice Straw

Noise absorption is 37.65% for Katraj chowk and 37% for wagholi area.

Conclusion

In 1st sample we used 70% Maize, 5% Coconut Fibre and 25% Rice Straw. From the 1st sample we found that Agro material sample has 34.89% for Katraj area & 30.89% for wagholi area is the noise absorption capacity.

In 2nd sample we used 88% Maize, 2 % Coconut Fibre and 10% Rice Straw. From 2nd sample we found that Agro material sample has 44.13 % for Katraj chowk and 43.13 % for wagholi is the noise absorption capacity.

In 3rd sample we used 91% Maize, 8 % Coconut Fibre and 1% Rice Straw. From 2nd sample we found that Agro material sample has 37.65 % for both the area noise absorption capacity.

After comparing both the sample it was found that the noise absorbing capacity of 2nd sample is more than 1st and 3rd sample.

Therefore, Proportion 88% Maize, 2 % Coconut Fibre and 10% Rice Straw sample gives maximum noise absorption.

Therefore, it can be suggested to use Agro-waste material as an alternative for controlling noise pollution. Also it is environmental friendly and economically affordable.

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