

**Short Research Article****Sound Reduction Technology by using Agro waste- A Preliminary Research****K. Nagasahadeva Reddy ; B. Chidambar Reddy, M. Bhavya, J. Sailaja, J. Jaisai**

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ARTICLE INFORMATION

ABSTRACT

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*Increasing use of electrical and mechanical appliances at home and industries has created a concern for noise pollution created by them. Urbanization and heavy growth of construction work in every neighbourhood further emphasize the need of new technologies for noise reduction. Noise created by different machines can be controlled either by suppressing the noise generating factors or by using the noise proofing materials which help to reduce the acoustic wave's energy by blocking or absorption. Traditionally, noise is controlled by using expensive and non-biodegradable sound absorbing materials such as glass wool, polymer foams, and fabric filler and polymer fibres, posing an additional harm to the environment. The health risk factors associated with glass-and mineral-fibre materials, also provide an opportunity to develop the sound proofing material made of naturally available materials. At present the focus, is to develop a cheap, renewable and biodegradable sound proofing material with the help of maize (natural fibre) fibre/felt which is a non-abrasive, porous, good insulator, hygroscopic and combustible material for automobile, home appliances and architecture applications. Methodology of this project is that collection of rice straw, maize waste and gypsum from near by village. Rice straw is making into a small pieces of size 3 cm and maize waste is turned into a powder, these two ingredients is mixed in proportion and with the help of natural adhesive making into a acoustic board of size 150*150*10 mm finally tested were conducted to the boards. Results obtained for tests are 1) At 320°C acoustic board is turned into ash 2) compression of acoustic board is 2mm 3) water absorption test is about 40% and finally 4) sound absorption capacity is 37 decibels. As an alternative in our research project we are concerned with maximum utilization of agro-waste Material Such as maize to develop Noise absorbing Composite with Rice straw as reinforcing material and study of acoustical and flammability properties of Composites.*

Introduction

Now a day's, commercially available sound absorption materials for acoustic treatment used in the building construction industry consists of glass or mineral fibre materials. However, they are growing concern health and safety issues due to the potential health risks associated to these fibers when exposed to the human such as the effect from the fibre shedding from glass or mineral fibre to human lungs and eyes. These issues provide an opportunity for an alternative material from organic materials. In Malaysia, agricultural waste such as maize waste and rice straw are abundance and usually burnt or used as agricultural by-products. Recently, natural fibres from agricultural are increasingly investigated for various usages in many structural and non structural applications such as substitute for synthetic fibres in composite materials and lining for automotive components. However, natural fibres such as rice fibre are as suitable as a substitute for synthetic fibre. These are cheaper, renewable and abundance, non-abrasive and does not give rise to health issues during processing and handling (Wikipedia).

Materials and methods*Study area*

This study was conducted in the rural area of Andhra Pradesh state this study was held in Beedupalli village, Puttaparthi mandal, Anantapur district. People who are living there they are mentally disturbed due to noise of air craft landing and takeoff time to make them free from that disturbance we are going to create acoustic board with locally available material.

Sample collection method

Sample waste collected manually by visiting the site in beedupalli the selected sample was transported to the laboratory to examine the properties of materials.

Materials used

1. Rice straw
2. Maize waste
3. Adhesive
4. Gypsum

Maize waste

The maize stem was composed of 24% soluble, 26% hemicelluloses, 43% cellulose and 7% lignin components. The bundles occurring towards periphery are smaller in size and more crowded, whereas those at the central region are larger in size and more spaced. All the bundles are common to the stem and leaves, the central ones from the median veins of the leaf blade and small peripheral ones form the marginal bundles. Un-like most of the grasses maize stem is not hollow in the intermodal region.

Rice straw

The biochemical composition of rice straw and wheat straw is characterized by a typical composition of an agricultural-based lignocelluloses residue: it contains on average 30-45% cellulose, 20-25% hemicelluloses, 15-20 % lignin, as well as a number of minor organic compounds. Rice straw is poor in nitrogen, but relatively high in inorganic compounds, often referred to as ash.

Properties of Rice Straw:

- 1. Water or moisture does not pass through the surface of straw due to presence of wax nature on its outer surface.
- 2. Due to presence of hollow space it exhibit light weight property.
- 3. It has good thermal resistance nature.

Gypsum

Gypsum is one of the widely used construction material mainly in interior designing. Properties and products of gypsum to be used as building material in construction works are discussed. Gypsum is used as surface materials. Its application is prominent in wall and ceiling construction. The use of gypsum can also be done at the field in the form of plaster. It is also manufactured as a prefabricated unit, like gypsum board which is bought at the time of installation. Gypsum is a white to gray mineral found in the earth’s crust. It is chemically known as hydrous calcium sulphate (CaSO4.2H2O) which is obtained through mining from vast veins. It gains different forms. It is seen as sand in certain areas. (Wikipedia)

Methodology

Steps involved in the preparation of acoustic boards

1. Collecting of dried maize plant from the beedupalli and rice straw is also collected along with maize plants.
2. Dried maize plant skin is removed then white colour stem is present inside that material is used in this project.
3. Taking that white colour stem making into small pieces which is comfortable for making powder.

4. Rice straw is cutting into small pieces with 3 cm length wise.
5. Taking the maize waste powder and rice straw in the ratio of 2:1.
6. Natural adhesive is prepared with flavour powder, sugar and vinegar these there are mixed in hot water and stirred it well.
7. 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 150mm*150mm*10mm apply any oil or grease to it because to remove the sticky nature.
10. Place the mix into the mould compact it well evenly.
11. Let it dry in sunlight about 24 hours.
12. After 24 hours apply 200gms of gypsum powder to the board and again dry it in sunlight about 2-3 hours.
13. Repeating this procedure for different ratios like 3:1, 4:2 etc.....



Acoustic board before applying gypsum



After applying the gypsum powder

Experimental tests conducted for the acoustic boards:

1. Fire resistance test
2. Moisture absorption test
3. Compression test
4. Sound absorption test

Results

Fire resistance test results:

Table 1: Properties of acoustic board at different temperatures

S.no	Specimen	Temperature	Remarks
1.	Acoustic board	50	There is no change.
2.	Acoustic board	100	Board surface colour is going to change
3.	Acoustic board	150	Acoustic board is going to lose its physical properties.
		200	Loose its mechanical properties.
4.	Acoustic board	250	Starts burning
		300	Burning with flames.
		320	Totally converted ash.

At 320 degree centigrade acoustic board become ash. Up to 120 degree centigrade the acoustic board will be safe.

Water absorption test result

Initial weight of the acoustic board (w1) = 39 grams

Final weight of the acoustic board (w2) = 65 grams

The amount of water absorbed by the acoustic board = $(w2 - w1)/w2 * 100$

Water absorption = $(65-39)/65$
= 0.402

Water absorption in percentage = 40.2%

The amount of water absorption by the acoustic board is 40.2%.

Compression test results:

Initial thickness of the acoustic board (h1) = 10mm

Final thickness of the acoustic board (h2) = 8mm

Compaction height = $h1 - h2$
= 10mm-8mm
= 2mm

The compression or compaction height of the acoustic board is 2mm.

Sound absorption test result

This method is done with the help of mobile application so result is shown automatically. The result shown is 37 decibels.



Figure showing sound absorption frequency in mobile application Interpreting the results: from above study and experiments we got a final result as 37 decibels according to iso average sound level in residential area should be 40 decibels by comparing our acoustic board results with this our results are within the limit and it is suitable for residential areas and materials unused in this are bio degradable and these boards are very light weight and when we come to cost compression it is very cheap and it is available in half of the cost of market products.

Conclusion

By using acoustic board we can reduce the sound which is producing unnecessarily. But our them is to reduce sound with along economy .by using agro waste as a acoustic material we experimental we concluded that this agro material is good sound reducer and produced in less economy .this project is a solution of one of social activities that is sound pollution . People belongs to poor background they can't adopted high cost acoustic boards .we can put a check to this problem by agro acoustic boards because they are less cost to adopt.

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