SUSTAINABLE CONSTRUCTION MATERIAL AND TECHNOLOGY FOR ANECHOIC CHAMBER

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ABSTRACT

An anechoic chamber (an-echoic meaning non-echoing or echo-free) is a room designed to completely absorb or reduce reflections of either sound or electromagnetic waves. They are also insulated from exterior sources of noise. The combination of both aspects means they simulate a quiet open-space of infinite dimension, which is useful when exterior influences would otherwise give false results. Anechoic chambers were originally used in the context of acoustics (sound waves) to minimize the reflections of a room. Acoustics is the branch of physics that deals with the study of all mechanical waves in gases, liquids, and solids including topics such as vibration, sound, ultrasound and infrasound. A scientist who works in the field of acoustics is an acoustician while someone working in the field of acoustics technology may be called an acoustical engineer. The application of acoustics is present in almost all aspects of modern society with the most obvious being the audio and noise control industries.

Keyword : - *Anechoic , Electromagnetic waves, Acoustics, Vibration, Ultrasound, Sugarcane Bagasse*

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1. INTRODUCTION TO PROJECT WORK

The requirements for measuring sound and vibration are nowadays higher than ever. Customers demand more silent devices, whether it is a car, computer, vacuum cleaner, washing machine or refrigerator. The customer's needs are followed by the ISO standards, which provides requirements, specifications, guidelines or characteristics that can be used consistently to ensure that products are fit for their purpose such as inside the room it's so silent that the background noise measured is actually negative decibels. Many acoustic standards require the special room, fully anechoic or semi anechoic chamber, where the acoustical measurement has to be performed. To design and implement such a chamber. As this project requires more cost for the implementation of standard acoustics Material. Many companies cannot afford the cost of acoustics material. So there is need to focus on the reduction cost of material by selection of similar product to standard acoustics material. This product should satisfy or fulfill the requirement of semi acoustic chamber. The project initiates with the testing materials in various aspects such as from sound absorption to the economy of the material, Also the durability of the material. The requirements for measuring sound and vibration are nowadays higher than ever. Customers demand more silent devices, whether it is a car, computer, vacuum cleaner, washing machine or refrigerator. The customer's needs are followed by the ISO standards, which provides requirements, specifications, guidelines or characteristics that can be used consistently to ensure that products are fit for their purpose such as inside the room it's so silent that the background noise measured is actually negative decibels. Many acoustic standards require the special room, fully anechoic or semi anechoic chamber, where the acoustical measurement has to be performed. To design and implement such a chamber. As this project requires more cost for the implementation of standard acoustics Material. Many companies cannot afford the cost of acoustics material. So there is need to focus on the reduction cost of material by selection of similar product to standard acoustics material. This product should satisfy or fulfill the requirement of semi acoustic chamber. The project initiates with the testing materials in various aspects such as from sound absorption to the economy of the material, Also the durability of the material.

1.1 Problem Statement

As the motive of the project is to find replacement for standard acoustics material following are the problem which may pop while finding the suitable replacement of material and satisfy the customers need.

a) Sound absorption
b) Economical
c) Life
d) Availability
e) Application of material
f) Aesthetics

1.2 Objectives

- To reduce the echo in room or chamber.
- To achieve the economy of material as compared to standard material.
- Test the various material in sound lab test for the sound absorption or insulation of material.
- Make the wall look aesthetically better.
- Utilization of local and easily available material as sound absorber as a replacement of standard acoustic material.
- Knowing the properties of acoustics and acoustic materials

2. SCOPE OF PROJECT WORKS

The industries are growing up with new technologies there is a requirement for a quitter place, so as to get the p resides test results and for seeking the quitter environment inside the room, so this project is the approach towards the better and quite life to the people .The issue is we cannot make the machinery or the equipment fully silent, so there is need to make the room quite by providing the non-repellent sound material .

Following are the some of the places which may use this product for their benefits.

- School and lecture halls.
- Operation theaters / hospitals.
- Meditation centers.
- Various acoustic industries for testing their products i.e. microphone testing, headphone testing, exhaust of automobiles, aircraft industries, etc.
- Auditoriums halls for better sound effects.
- Audio record rooms.
- Drawing room/ study room.

3. EXPERIMENTAL ANALYSIS

Echo, a sound that can still be heard after the source stops, is an issue often found in many rooms. The repetition most often occurs in a big room with the hard wall. It can be reduced or eliminated by using an absorber panel to absorb the received sound. The absorber panel will absorb and change the sound energy becomes heat. The sound absorber can be categorized into three types, namely porous absorber, cavity absorber, and membrane absorber. Various substitutes began to be applied due to the price of glass wool, and Rockwool are expensive, such as several types of plywood and fibrous material.

Recently, natural fibers are increasingly being investigated for various usages in many structural and non-structural applications such as a substitute for synthetic fibers in composite materials and lining for automotive components. However, natural fibers such as coir fiber are also suitable as a substitute for synthetic fibers and furthermore wood-

based materials for acoustic absorption purposes. These fibers have A large number favorable circumstances a result they would cheaper, renewable.
Abundance, non-abrasive and does not pose risk health and safety during processing and handling. Research done on unprocessed egg cartons using the tone burst method showed that it was a viable sound absorber, but only for high frequencies. Sound absorber specimens from sugarcane squandered fibers need aid created and their acoustic properties need aid investigated through test. Fantastic acoustic execution will be found during 2 - 4. 5 khz with Normal absorption coefficient from claiming 0. 65 and may be similar against that from those traditional manufactured absorbers.

Fig -1: Sugarcane Bagasse Source

3.1 Material Composite
Because of their biodegradable, lightweight, cheaper, nontoxic, and nonabrasive qualities, fibers need an aid accepting a great deal consideration clinched alongside composites. Similarly, as a substitute for manufactured fibers for acoustic absorption purposes. The common fibers with alluring physical and mechanical properties achieved as high-performance composites with environmental and economic advantages.
A lot of people possibility hopefuls are accessible in the type from claiming characteristic fibers to utilization. Likewise, reasonable acoustic absorbers. Those fibers for coir, corn, paddy, sisal, and banana are exactly cases. Fiberglass, mineral wool, furthermore glass wool need aid cases from claiming engineered fibers. The acoustic execution about engineered callous absorptive materials will be higher over that for characteristic heartless absorptive materials due to their slenderer breadth What's more antifungals quality. Anyway, they bring a higher natural effect over the common fibers.
In recent years, natural fiber reinforced resin/polymer composites have earned a lot of attention due to their lightweight, abundant, cost-efficient, biodegradable, and eco-friendly nature. Moreover, these materials are cheaper and environmentally superior to glass fiber reinforced composites. However, due to low interfacial adhesion, poor moisture
Poor dampness resistance, and the low antifungal nature of regular fiber composites, these materials need aid at present not exactly. Concerning illustration prominent. Concerning illustration manufactured built composites. Analysts would be attempting should move forward the nature for characteristic fibers through concoction medication in the recent past composite creation to beat these shortcomings. It might have been news person that mercerization alternately basic medicine diminishes those fiber breadths. Also upgrades those personal satisfaction Eventually Tom's perusing enhancing its cement. Also, anti-fungus nature.
The reduction of fiber diameter enhances low-frequency sound absorption by providing a more tortuous path and higher surface area, which in turn increases the air flow resistivity of the fibrous material. The increase of air flow resistivity causes loss of sound energy through friction of sound waves with air molecules and thus improves low-frequency sound absorption. The study analyzes the limitations of natural fibers to achieve their acoustic absorption performance at the desired level. Advantages natural fiber (sugarcane bagasse), are biodegradable, cheaper, and eco-

friendly and have low specific weight, abundantly available, high electrical resistant, excellent thermal and acoustic insulating properties, low toxicity and less human health hazards during processing and handling. The disadvantages are lower antifungal, durability, moisture, fire-resistant qualities, negative impact on climate change (CO2 absorption), exhibit lower acoustic absorption compared to synthetic fibers, due to a larger diameter, have poor fiber-matrix adhesion and moisture resistance which causes an increase in volume for swelling of the fibers.

4. DENSITY OF MATERIAL

Those thickness of the material need been getting to be An significant component prevailing its callous absorption. Stated that the expansion over test thickness reasons a expand to callous absorption toward medium What's more High-recurrence locales. They demonstrated that, for increments in the amount of fibers for every unit area, the test thickness expands. Likewise a result, the vitality misfortune about heartless waves builds because of those build about surface friction, which prompts a increment clinched alongside callous absorption execution. This fill in may be finished Toward expanding sugarcoat bagasse weight to An 30mm thick example.

It is fascinating should see here that the measured absorption coefficient need no straight association with those thickness. Expanding the thickness (adding more fibers), end pores Might make shaped Also Subsequently extraordinarily increment the stream resistivity Furthermore in the end decrease the absorption ability.

4.1 Absorption Capacity of Material

These Construction from fibers into an absorber sample is divided into two stages, namely the pre-treatment stage and fabrication stage. In the pre-treatment stage, raw material was cut into 5 to 10 mm length. It was then sundried for 1 week and again heated in the oven at 900C for 15 minutes to let the excess water in the fiber evaporated. Later, raw material was cut into 1 to 2 mm length. In the preparation stage, the raw material was mixed with different composition of binder and just enough for the sample to take shape.

The absorber specimens were produced by using a simple press mold manually which were varied in some densities (0.372; 0.428; 0.470; 0.522; 0.618 gr/cm3). The sample was prepared according to the size of the impedance tube. The sample was cut into 100 mm diameter with the thickness of 30mm. They were conducted with B & K impedance tube type 4206. The frequencies used in this experiment is frequencies ranging from 200 Hz – 1600.

The result shows that the increasing of absorber specimen density causes the decreasing of noise absorption coefficient (NAC) due to the reducing of its porosity. Among them, the specimen with 0.428 gr/cm3 of density has the highest NAC (0.72) at 650 Hz of frequency. The absorber may be enhanced its absorption performance by reducing the density and increasing the porosity.

5. BINDING MATERIAL

5.1 Chemical Binder

Polyvinyl acetate (PVAc), a engineered tar ready Toward those polymerization from claiming vinyl acetic acid derivation. Previously, its mossy cup oak significant application, polyvinyl acetic acid derivation serves Likewise the film-forming element On water-based (latex) paints; it likewise is utilized within adhesives. Vinyl acetic acid derivation (CH2=CHO2CCH3) will be arranged starting with ethylene by response with oxygen Also acidic corrosive In a palladium impetus. Under those movement about free-radical initiators, vinyl acetic acid derivation monomers (single-unit molecules) might a chance to be interfaced under long, spread polymers (large, multiple-unit molecules),. Those monomers could a chance to be polymerized same time scattered On water to structure An milky-white emulsion. This liquid camwood a chance to be transformed specifically under latex paints, to which those PVAc manifestations a strong, flexible, follower film. It camwood Additionally make made under a normal family unit cement known as white paste alternately Elmer's paste. The point when utilized done coatings or adhesives, PVAc is frequently incompletely hydrolyzed to a water-soluble.

5.2 Organic Binder

As the use of chemical binders, the main motto of making the product biodegradable is the impossible so to make the product completely biodegradable us of organic binders is preferable. The organic binders such as starch, from various grains like rice wheat and corn. Are effective to improve the adhesion property. Starch glues are mostly based on unmodified native starches, plus some additive such borax and Caustic soda. Part of the starch is gelatinized to carry the slurry of uncooked starches and prevent sedimentation. This opaque glue is called a Stein Hall adhesive. The glue is applied on tips of the fluting. The fluted paper is pressed to paper called liner. This is then dried under high heat, which causes the rest of the uncooked starch in glue to swell/gelatinize. This gelatinizing makes the glue a fast and strong adhesive for corrugated board production.

5.3 Admixture

Termite proof admixture As the organic material is used for manufacturing there might be threat of termite attack. To prevent this action ant termite admixture PIDILITE Terminator Wood Preservative is used 1.0% of total mix .
Water Resistance Admixture as water comes in contact with degradable materials the material starts to decompose to prevent this action water resistance admixture Fevicol Marine oat Plywood Coating hydrophobic chemical is used 2.0% of total mix. It also prevents capillary actions as lamination joints.

6. CONCLUSIONS

The use of sugarcane bagasse waste material for sound absorption are promising natural, renewable, low cost, less weight, and biodegradable. A functional composite based on Sugarcane-Bagasse/PVAc-Glue has been successfully prepared and characterized. The optimum sound absorption coefficient of sugarcane bagasse was the thickness of 30 mm. The sound absorption coefficients were excellent from the low to a medium frequency that is from 400 Hz to 800 Hz within the range of NAC 0.46 – 0.71. The absorber may be enhanced its absorption performance by reducing the density and increasing the porosity, recovered the sugarcane will be possibly implemented in sound insulation parts.

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