HEAR ME, HEAR ME NOT:
Engineering an Organic Soundproofing Material from Banana Peels, Corn Husks and Rice Husks

Background

Noise is everywhere. Studies have shown that exposure to constant noise can bring about not only hearing loss but stress and anxiety. While readily available soundproofing materials in the market are good options, finding a more sustainable and natural way to prevent noise would be better. Materials coming from organic sources can have inert characteristics that can help reduce noise. Exploring this option in producing soundproof materials will help us gain better health, reduce organic waste and build a more sustainable Earth.

Research Question

This project is focused on evaluating the characteristics of banana peels, corn husks and rice husks as it relates to noise reduction. To be specific, this project will answer the following questions as I engineer an organic soundproofing material:

1. Will the combination of banana peels, corn husks and rice husks be an effective mix to produce an alternative soundproofing material?
2. Will the banana peels, corn husks and rice husks soundproof panel be as effective as commonly used soundproofing materials?
3. How much noise can the banana peels, corn husks and rice husks soundproof panel filter?

Methodology

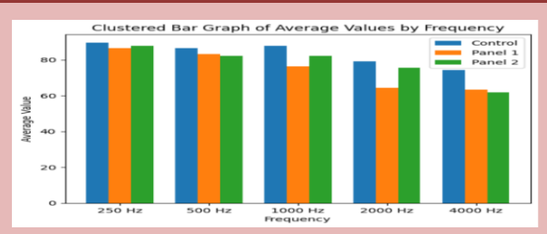
PHASE 1: Obtain and prepare the banana peels, corn husks and rice husks.

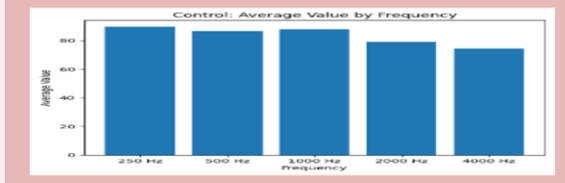
PHASE 2: Create and mold the soundproof panels from the organic mixture.

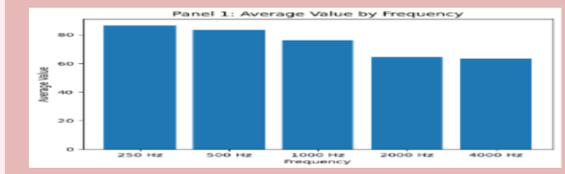
PHASE 3: Set up and test the soundproof panels.

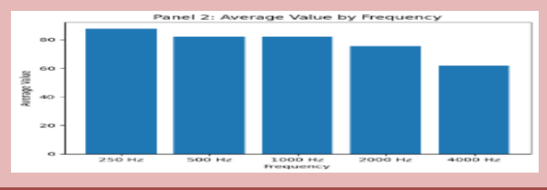
Discussion

- 2 panels of 33g banana peel, 33g corn husk and 34g rice husk mixture were tested against a styrofoam control at various frequencies ranging from 250Hz to 4000Hz.
- All panels, including the control, has shown a decrease in average dB as the frequency increased.
- However, the clustered bar graph indicates that the experimental panels, both 1 and 2, performed better in absorbing the sound frequencies as compared to the control.
- Despite making the amount of materials constant in panel 1 and panel 2, data shows varying sound absorption capacity.
- Overall, the mixture of banana peel, corn husk and rice husk show a promising response as an organic soundproofing material.









Conclusion

At the end of the experiment, **my predictions were supported.**

1. The fibrous characteristics of the banana peels, corn husks and rice husks complimented each other making it an effective mix to absorb sound frequencies and create a good organic soundproofing material.
2. Both panels from banana peels, corn husks and rice husks went beyond the expectations of being at par with the sound proofing capacity of the styrofoam making it a better alternative to reduce noise.
3. The response of the experimental panels to soundproofing increased as the sound frequency increased with panel 1 having a better noise reduction capacity compared to panel 2.

Future Plans

- Test more panels with varying ratios of banana peels, corn husks and rice husks.
- Explore and test more organic waste materials that can be used to create biodegradable soundproofing materials.
- Test the durability and strength of the initial experimental panels
- Examine factors affecting the processing and consistency of the panels.

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Physics

All photos and graphs are taken and created by the student researcher unless otherwise specified

https://www.chowhound.com/1578163

https://www.ruralsprout.com/

https://www.niir.org/blog

IT’S A NOISY CRAZY WORLD!

https://www.brownhealth.org/

- Statistics show that about 10% of the world’s population is exposed to noise pollution that could harm the sense of hearing.

- In the United States alone, around 40 million adults have hearing loss due to noise pollution.

- Noise exposure does not only contribute to hearing loss but deteriorates life quality by disturbing sleep and inducing cardiovascular diseases.

THE SOUNDPROOF SOLUTION

- Soundproofing an environment reduces stress and anxiety which brings about mental clarity.

- Noise reducing materials and objects in a room can significantly improve sleep quality giving a person's body better recovery time.

- Reducing noise exposure equates to lower blood pressure and improved heart health.

FINDING A NATURAL ALTERNATIVE

https://businesspost.ng/

- While commonly used synthetic soundproof materials bring consistent acoustic control, most of them are non-renewable.

- Using biodegradable plant materials for soundproofing will have less environmental impact.

- Organic soundproofing materials from agricultural waste are lightweight and cost-effective.

THE CHOSEN ORGANICS

BANANA PEEL

- Banana peels have strong ability to muffle sounds.
- Banana peels have a porous structure allowing sound to enter it.

https://gallatincd.org/the-banana-peel-vs-the-world/

https://stock.adobe.com/search?k=corn%20husk

CORN HUSK

- Corn husks are effective at improving acoustic sound at lower frequencies.
- Corn husks have high fiber content which converts sound energy to heat energy.

RICE HUSK

- Rice husks demonstrates high acoustic absorption.
- Fibers of rice husks absorbs frequencies that shifts into lower coefficients.

https://www.wildwesthomebrewsupply.com/product/rice-

QUESTIONS AND PREDICTION

RESEARCH QUESTIONS

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https://waseemtechnical.ae/products/

PREDICTION

If I combine banana peels, corn husks, and rice husks as alternative materials for soundproofing, then I will be able to create a panel that will reduce sound transmission better than commercially available materials.

METHODOLOGY

PHASE 1: Obtain and prepare the banana peels, corn husks and rice husks

1. Prepare banana peels by washing them and patting it dry.
2. Tear apart the banana peels and set in a tray.
3. Place the banana peel tray in an oven to dehydrate for 24 hours.
4. Once fully dry, grind the banana peels into smaller chunks.
5. Prepare commercially available dried corn husks and rice husks.

PHASE 2: Create and mold the soundproofing panel from the organic mixture

1. Measure 33g of banana peels, 33g of corn husks and 34g of rice husks.
2. Mix the organic materials together in a basin.
3. Add glue to bind the dry materials for together.
4. Pour mixture in panel molds and let it dry for about 24 to 48 hours.
5. Cut dried material into 4x4 panels.

METHODOLOGY

PHASE 3: Set up and test the soundproof panels

1. Prepare the test box and the audio sensor to be used.
2. Set up the audio sensor app in the computer.
3. Place the speaker in the test box and connect to sound source.
4. Ensure a constant volume of 50% from the sound source.
5. Fit the 4x4 organic soundproof panel snugly in the test box ensuring no sound or air is allowed to pass from the sides of the panel.
6. Position audio sensor directly above the tested panel.
7. Play the sound source for 60 seconds and note observations from the sensor app in the computer.
8. Record at 250Hz, 500Hz, 1000 Hz, 2000Hz and 4000Hz.

RESULTS AND DISCUSSIONS

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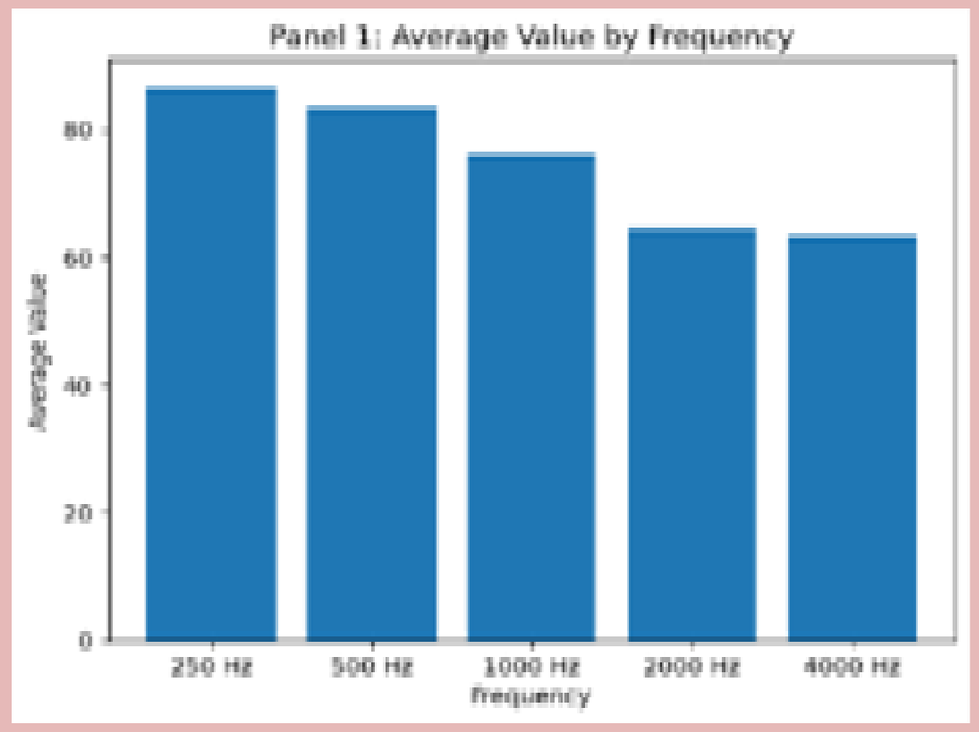

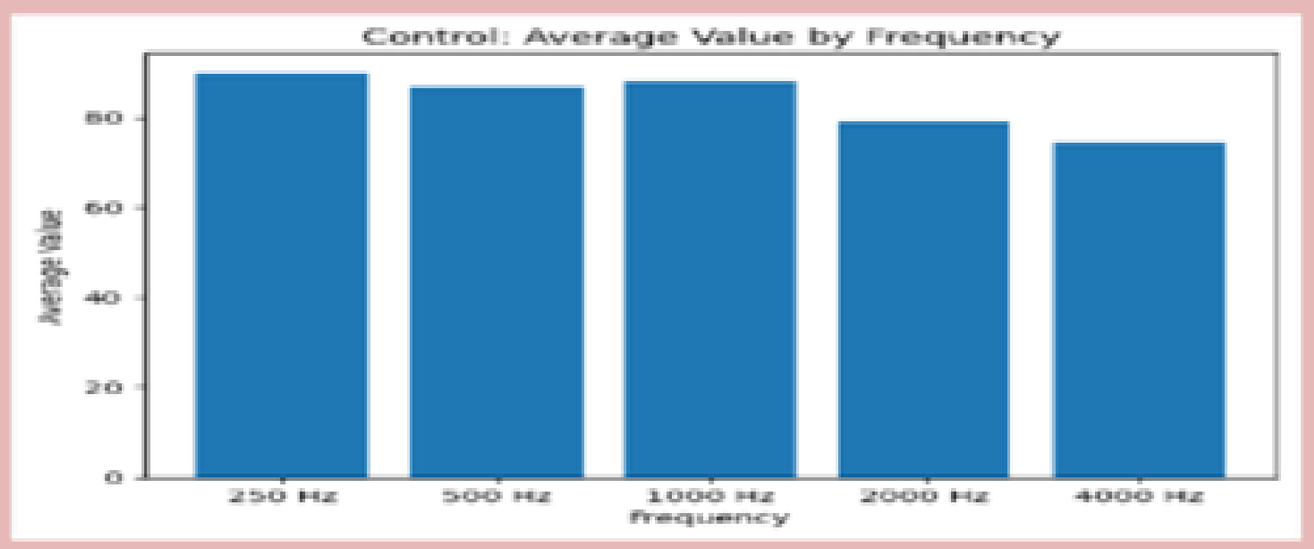

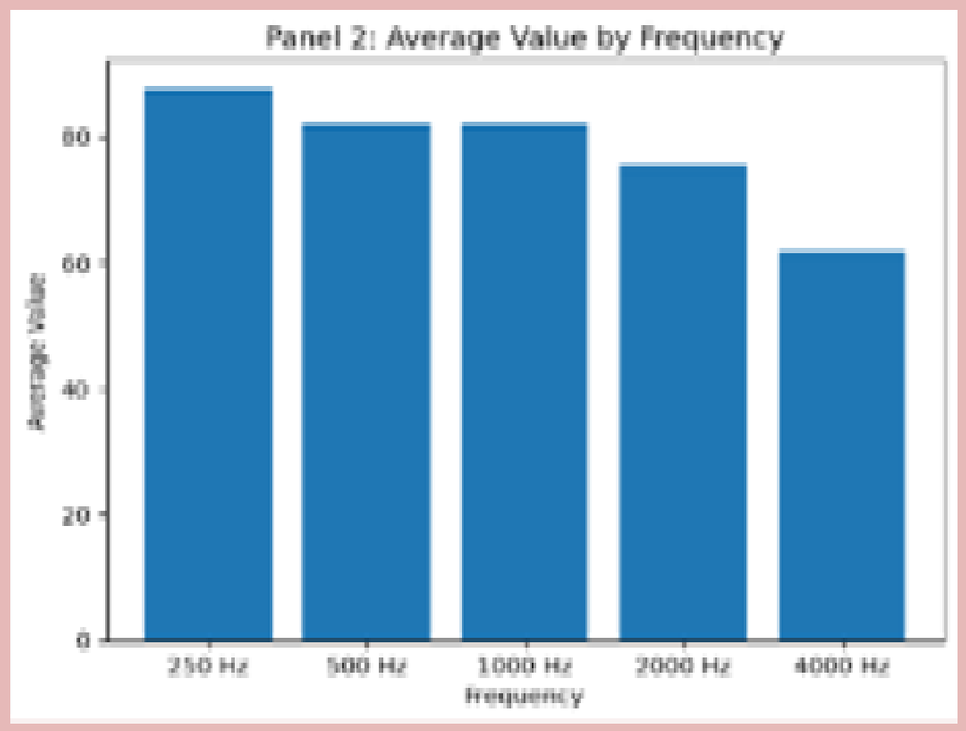

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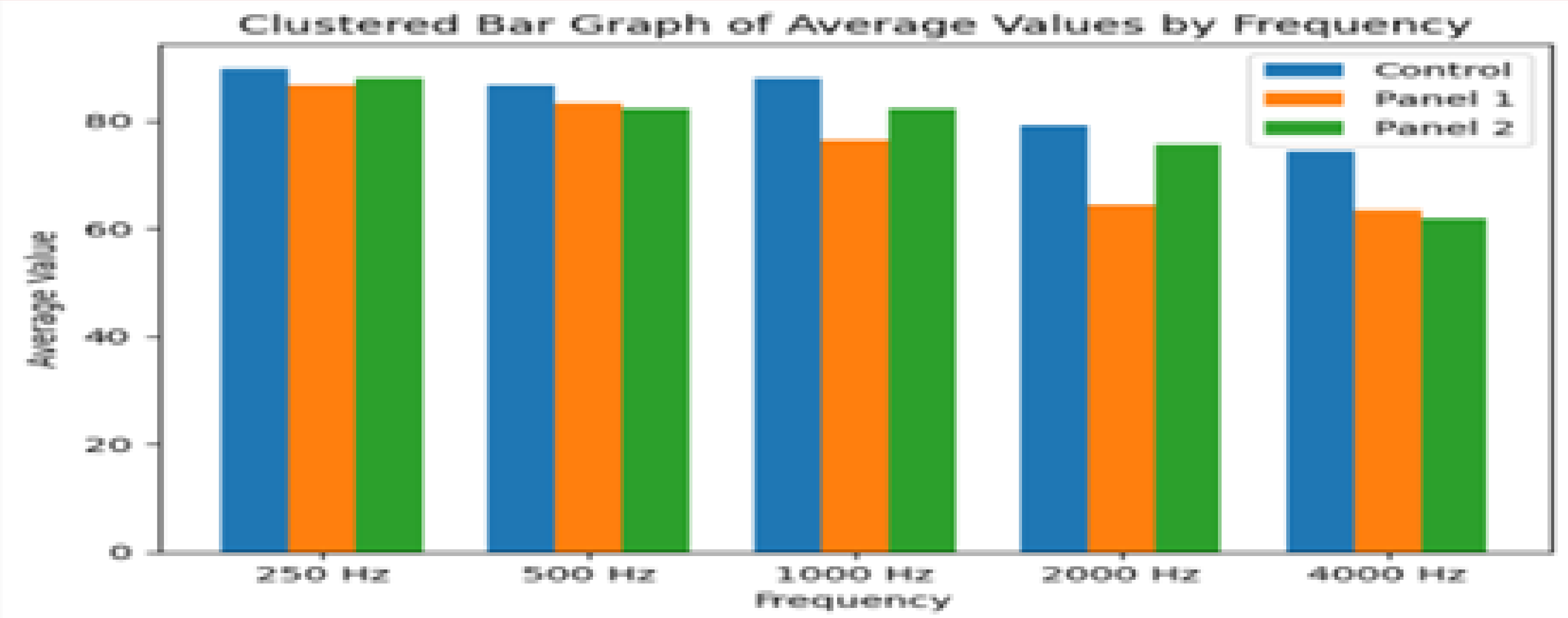

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https://www.conserve-energy-future.com/

www.newlifeonahomestead.com

https://www.eiriindia.org/blog/

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