# NATURAL PLANT FIBRES AS SUSTAINABLE ACOUSTIC ABSORBERS

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## 1 INTRODUCTION

The demand of using acoustic absorbers has increased over the years. Hence, the study on the acoustic properties of natural plant fibres which are sustainable, economy, and ubiquitous in Malaysia is of interest to treat room acoustic problems and replace commercial acoustic absorbers. In this project, the **Oil Palm Empty Fruit Bunch (OEFB) fibre, coconut fibre and bamboo fibre** were chosen to measure their absorption coefficients and compared with two commercial acoustic absorbers.


## 2 AIM AND OBJECTIVES

**Aims:** To investigate the acoustic properties of natural plant fibres (i.e. OEFB fibre, coconut fibre and bamboo fibre), which have the high potential to replace commercial acoustic absorbers.

**Objectives:**

- Analyse the acoustic absorption properties of the plant fibres by measuring their absorption coefficient using **PU *in situ* and impedance tube standing wave methods**.
- Simulate the acoustic performance of the plant fibres acoustic panels when it is applied in a room using CATT acoustic modelling software.
- Compare the acoustic absorption properties of the plant fibres with commercial acoustic absorbers.

## 3 METHODS

Collect plant fibre samples and measure the absorption coefficient of each sample with two different methods (i.e. **impedance tube method and PU *in situ* method**).

Average both methods results and categorise each sample with different sound absorption classes based on the method outlines in **BS EN ISO 11654:1997.**

Simulate the reverberation time of a classroom model with different sample using **CATT Acoustic modelling software.**

## 4 RESULTS

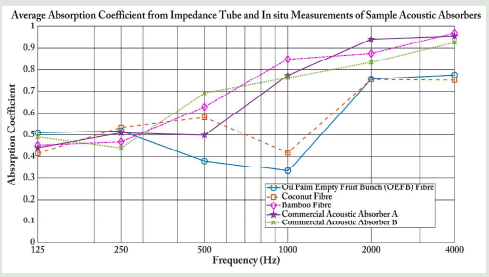


**Figure 4.1** Average absorption coefficient from the impedance tube and PU *in situ* measurement results of each sample.

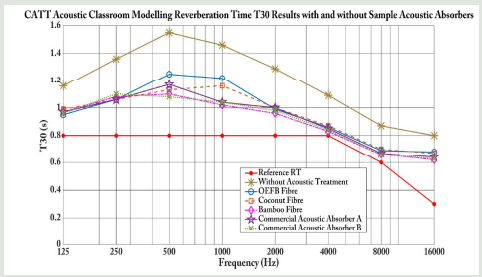


**Figure 4.2** CATT Acoustic classroom modelling reverberation time T30 results with and without sample acoustic absorbers.

## 5 CONCLUSION

This project has proven that the OEFB fibre, coconut fibre and bamboo fibre can be used as sustainable acoustic absorber as they are **sustainable, economy and ubiquitous** in Malaysia. However, among the three plant fibres, bamboo fibre is highly recommended to be used to optimise the room acoustics as it has the most comparable performance with the commercial acoustic absorbers.

| Sample acoustic absorbers | Weighted sound absorption coefficient, αw | Sound absorption class |
|---|---|---|
| Commercial acoustic absorber B | 0.80 (H) | B |
| Bamboo fibre | 0.75 (H) | C |
| Commercial acoustic absorber A | 0.60 (H) | C |
| Coconut fibre | 0.60 (H) | C |
| OEFB fibre | 0.45 (H) | D |

**Table 4.1** Sample acoustic absorbers' sound absorption class

## 6 REFERENCES

BRITISH STANDARDS INSTITUTION, 1997 BS EN ISO 11654:1997 *Acoustics – Sound absorbers for use in buildings – Rating of absorption*. London: British Standards Institution

BRITISH STANDARDS INSTITUTION, 2001a BS EN ISO 10534-1:2001 Acoustics – *Determination of sound absorption coefficient and impedance in impedance tubes – Part 1: Method using standing wave ratio.* London: British Standards Institution

For more details information about this project, please scan the QR code to read the dissertation.