

Review Article**Engineering Modified Concrete for Sound Absorption and Environmental Sustainability– A Review**Anuja N ¹,¹ Assistant Professor (Sr.Gr), Department of Civil Engineering, Mepco Engineering College, Sivakasi, Virudhunagar District, Tamilnadu, India.**Abstract:**

This paper reviews the sound absorption properties of various modified concrete from the existing published works. Researchers have proposed several methods to treat the foam concrete to also capable of absorbing sound and thus improving the sound quality in a room. Concrete is usually employed as rigid wall in building and act as sound barrier in highway, roads etc, due to its high density. In this study, it was aimed to determine the density for autoclaved foam concrete for sound absorption performance of concrete. Water (0.60), cement (0.25) and aggregate (0.62) ratios were the foam concrete produced at a dry density of 300, 400, and 500 kg/m³. The concrete is made using the Portland cement, powdered quartz, hydrated lime and synthetic foaming agent. The compressive strengths increased in autoclaved foam concrete specimens and flexural strengths also increased but the thermal conductivity coefficients is decreased due to its increasing density. Autoclaving improved both the mechanical and thermal properties of foam concrete at a density of 300 kg/m³. From the review, it was concluded that the sound absorption of the concrete or cement-based material that can be improved by creating porous structures namely lightweight aggregate.

Keywords: Acoustic, sound, concrete, lightweight, density.**1. INTRODUCTION**

Concrete is preferred product to block noise transmission into a room (one side to another side) example. Echoes. Its excellent performance acts as sound reflecting materials. Therefore, the researches explore the acoustic performance of the cement-based product act as a sound absorber. In cement based product like granular materials have positive impacts sound quality control due to their light mass with porosity inside a room. For example, crumb rubber bottom ash and expanded clay. The paper highlights the method of measuring performance of sound absorption related to published works. In this published works it discussed various types of modification done to improve sound absorption performance of a material [1].

In day-to-day life demand for quality buildings increases depending on usage purpose. Among the sought-out features of buildings are strength, low cost, high thermal and acoustic insulation. In recent, light weight concrete have

applications in wall and slabs to reduce load in high rise building, off shore platform, sound walls, construction of partition walls, and thermal insulation in roof. Newman and Owens stated the density of lightweight concrete range of 300-2000 kg/m³ and cube strength 1-60 MPa [2]. The production methods such as 1) Whole or partial replacement of normal aggregates. 2) Structure containing 30-50 % of voids by physical or chemical means. 3) Removal of fine aggregate from normal aggregate. To correct defect of air voids autoclave curing process is used [3].

In this study it is aimed to develop wall filling and thermal insulation materials from autoclaved foam concrete with fire resistance and economical. In the present study the effect of different densities (300, 400, 500 kg/m³) and curing condition on foam concrete were evaluated.

2. ACOUSTIC MEASUREMENT

Sound reflection, sound absorption and sound transmission are the common three

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mechanisms occurring when sound waves pass through an acoustic material. There are two methods for acoustic measurement to determine the

performance of acoustic material they are measurement of sound absorption coefficient, α and sound transmitted loss, TL.

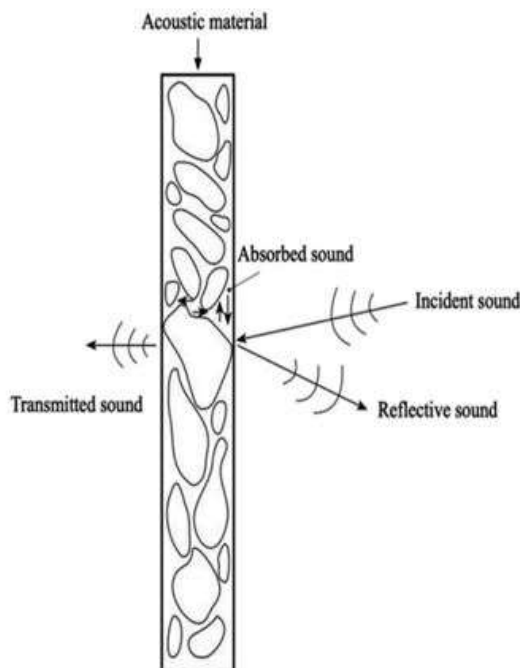


Fig 1: Mechanism of sound energy loss in a acoustic material [4]

The value of α varies from 0 to 1, $\alpha = 0$ means material reflects the incident sound energy and $\alpha = 1$ means material completely absorbs the sound energy. The value of TL is expressed in unit of decibels (dB) which represents the amount of energy (in dB) blocked by material. The better the material as sound barrier means the greater the dB value which prevents the sound energy that is transmitted from exterior to interior of a room. Fig 1 majorly focused only on the sound absorption rather than the sound transmission.

2.1 Impedance Tube Method

According to standard ISO 10534-2 specification Impedance tube method is one of the well-known techniques to quantify the sound absorption of acoustic materials. In the impedance

tube the specimen is mounted at one end of a straight, smooth and air tight circular tube. There are two techniques for impedance tube measurements, namely standing wave method and transfer function method [5].

2.2 Standing Wave Method

In the standing wave method, a single tone is emitted by the loudspeaker and the sound pressure level inside the tube is maximum-minimum observed through an oscilloscope. In standing wave method at the end of the tube a small movable car to move a microphone probe inside the tube used to detect maximum and minimum sound pressure at the specific tone frequency of interest. Fig 2 represents the standing wave method of measuring sound.

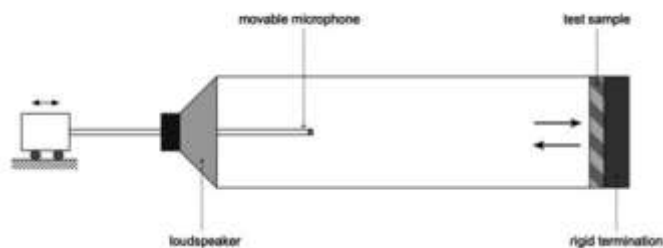


Fig 2: Schematic diagram of the standing wave method [6]

2.3 Transfer Function Method

In this method, two microphones are to be mounted within the tube. As like the standing wave method for each frequency a tone signal is used to

measure the absorption coefficient for each frequency, the absorption coefficient is calculated from the measured transfer function of the spectra from two microphones. The illustration of this method is depicted in the Fig 3.

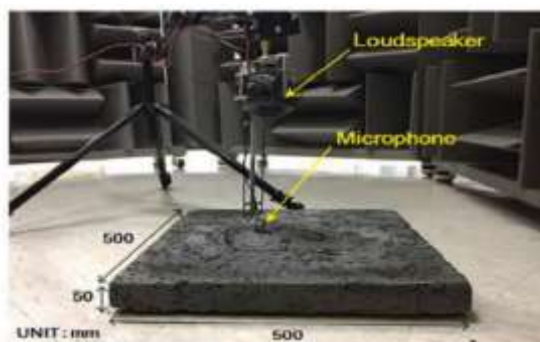


Fig.3. Measurement of acoustic properties for concrete using transfer function [7]

3. MATERIALS AND METHODS OF CONCRETE

Portland cement is one of the foam concrete components, lime was supplied in it. And ultra-fine micronized quartz was supplied from Turkey also fly ash from Thermal Power Plant. Synthetic foaming agent Lightcon 28 is a product of Ayodos Chemical Company [8]. Tap water is the other component of foam concrete. In the first step of the preparation of foam concrete the densities of 300 kg/m³, 400 kg/m³ and 500 kg/m³ to

homogenize the other components [9]. And the next stage is the synthetic foaming agent was added with the help of a mixer. For curing, the Autoclave Foaming Concrete specimens is kept in an autoclave for a temperature to 170°C and a 14 bar pressure for a 12 h and the outdoor temperature was 20°C and above[10].

4. CONCLUSION

The density of autoclaving foam concrete with dry densities ranging between 322 kg/m³ – 523 kg/m³ are summarized.

- Autoclaving result in smaller density for 300 kg/m³ and this density gave the coefficient of thermal conductivity.
- Due to autoclaving the capillary absorption coefficients were reduced.
- In concrete the acoustic performance is increased by utilizing lightweight aggregate and incorporating foaming agent to produce cellular concrete.
- By this review, the formation of pore structure will reduce the density of the concrete
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