"DEVELOPING OF NEEDLE PUNCHED NON-WOVEN FABRIC AGRO WASTE CELLULOSIC FIBRE BLEND ARECA – JUTE FOR ACOUSTIC APPLICATION"

[1]K.PRABHA KUMARI, [2]E. ARAVIND

[1]Assistant Professor, [2]Final Year Student,
[1,2] Department of Apparel Manufacturing and Merchandising,
Nift-Tea College of Knitwear Fashion, Tirupur.

ABSTRACT: *In Competitive Scenario the subject of noise has received increasing amount of attention to scientists, technologists and public as a whole. There is evidence showing that the high noise levels cause sleep disturbance , hearing loss, decrease in productivity , learning ability and increase in stress related hormones and blood pressure. Therefore unwanted and uncontrolled noise should be reduced using noise barriers and noise absorbers. Properly designed textile materials can be used as noise control elements in a wide range of applications including wall claddings, acoustic barriers and acoustic ceilings. All materials have some sound absorbing properties. In our project we have used natural agro waste cellulosic fibres such as areca & jute and formed a needle punched non-woven fabric to test their applicability in acoustics. From the tested results it has been found that the thickness, area density and air permeability play a major role in sound absorption in one or the other way. Thickness has a greater influence in sound absorption because as the thickness of the fabric increases the area density of the fabric also gets increased. Thicker the material higher the sound absorption of the fabric.*

On the other hand air permeability has the negative co relation between the thickness and the area density. The sample A/J (50:50) which has a thickness of 5.90 mm with the area density of 700 g/m^2 and the air permeability of 99.6 cm^3/cm^2/s has the higher sound absorption of about 0.10 decibel when compared to other samples A/J (60:40) and A/J (70:30).Hence it is found that equal ratio of areca and jute shows greater sound absorbency when compared to other samples and it is clearly found that decrease in the jute content gradually decreases the sound absorption.

KEYWORDS: Acoustics, Sound, Vibration, Areca, Jute, Fibre.

INTRODUCTION:

Sound is a vibration that propagates as atypical audible mechanical wave of pressure and displacement, through a medium such as air or water. In physiology and psychology, sound is the reception of such waves and their perception by the brain.

Noise pollution is undesired sound that is disruptive or dangerous and can cause harm to life, nature and property. It is often said that noise differs from other forms of pollution, once reduced, noise leaves no residual accumulation in the environment or the human body. However, this can deteriorate after continued exposure to harmful sound. So it is not true, strictly speaking, that "noise... leaves no visible evidence" sound energy travels in waves and is measured in frequency and amplitude.

The energy in a sound wave can be measured using Decibels. The Decibel Meter shows examples of things that make noise and measurements in Decibels. Amplitude measures how forceful the wave is. It is measured in decibels or dB of sound pressure. 0 dB is the softest level that a person can hear. Normal speaking voices are around 65 dB. A rock concert can be about 120 dB. Sound that are 85 dB or above can permanently damage your ears. The more sound pressure a sound has, the less time it takes to cause damage. For example, a sound at 85 dB may take as long at 8 hours to cause permanent damage, while a sound at 100 dB can start damaging hair cells after only 30 minutes of listening.

The hazardous effects of noise depend on its intensity (loudness in decibels), duration, and frequency (high or low). High and low pitch is more damaging than middle frequencies, and white noise covering the entire frequency spectrum is less harmful than noise of a specific pinch. Noise may be ambient (constantly present in background)or peak (shorter, louder sounds).

Now-a-days noise pollution has become the third pollution resource that has adverse influences on the environment, human health and economy. How to reduce the damages of noise that become an important issue. Generally, the means of controlling noise includes active control and passive control. The former is accomplished by reducing the production of noise at locations of noise sources, but it can only control the noises of a narrow frequency range. The passive control is normally achieved by utilising high sound absorption materials, which can be used to absorb noise of high frequency range by effectively dissipating sound energy on the process of propagation of the sound wave.

Natural fibre has drawn a lot of attention from material scientists in recent years due to their good mechanical properties, light weight, environmental friendly and bio-degradable. However, natural fibres as fibrous porous material have also been interested in yielding the variety of new sound absorption in more recent years. As a kind of fibres, natural fibres are supposed to have the same mechanism for acoustic absorption as other conventional synthetic fibrous material like glass fibre and mineral wool.

Automobile is the major cause for noise pollution in recent years. To control the sound there were several product used and they were vibration dampers, sound barriers, sound absorbers and gazetting materials. Three major methods of noise control were used to reduce the noise in the interior of vehicles and they were reducing noise and vibration sources, applying barriers and other treatments to block sound from entering the passenger compartment and the interior of the vehicle to dissipate sound and thus reduce the overall sound level. Sound of the material used for sound absorption in automobiles was fibre glass, light weight micro fibre and PET.

MATERIALS:

The materials used for experimental procedure for the study are presented in this Research paper.

Raw Materials:

1. Jute Fibres:

The opened jute fibres were sourced and the fibres were uneven in length, both longer and shorter fibre were used for the project.

Fig.no.1 - Jute Fibres

Composites play significant The effect of treated jute on flexural properties was more than that on tensile properties, which was due to greater stiffness of jute fibres. Chemical treatment of jute fibres' lowers the water absorption and results were comparable to glass fibre reinforced polyester composites. The addition of jute also reduced the overall cost by 22.18%.

2. Areca fibres:

The areca husk was collected from in and around perur. Selected variety of tender husks was used for the project.

Fig.no.2 - Areca Fibres

Dried areca husk was soaked in deionised water for about five days. The soaking process loosens the fibers and can be extracted out easily. Finally, the fibres were washed again with deionised water and dried at room temperature for about 15 days. The dried fibres are designated as untreated fibres.

Non –woven's:

Nonwoven fabrics are broadly defined as web structures bonded together by entangling fibres mechanically, thermally fusing the fibres or chemically bonding the fibres. Nonwovens are defined more exactly by various bodies one of the most often quoted is the International Nonwovens & Disposables Association (INDA) definition: Nonwovens are a sheet, web, or bat of natural and/or man-made fibres or filaments, excluding paper, that have not been converted into yarns, and that are bonded to each other by any of several means.

NEEDLE PUNCHING:

Needle punching is a method of bonding fibrous fleeces mechanically. The fibres are mechanically entangled to produce a fabric by reciprocating barbed needles (felting needles) through a moving batt of fibres in a needle loom.

In principle, a board containing a multiplicity of barbed needles is reciprocated at high speeds as the fibrous fleece passes under the needles. It is usually necessary to needle the fleece from each side and this can be achieved either by passing it through the machine twice, having turned it over between the first and second pass or by using a machine with two needle boards, the first one striking downwards and the second one upward. Some of the needle-punched non-woven is produced with a support layer known as scrim to support the fleece and especially to improve the strength and stability of the final product. The needle punching process is well suited to produce medium and heavy weight non-woven from 300 gsm to 3000 gsm.

RESULTS AND DISSCUSSIONS

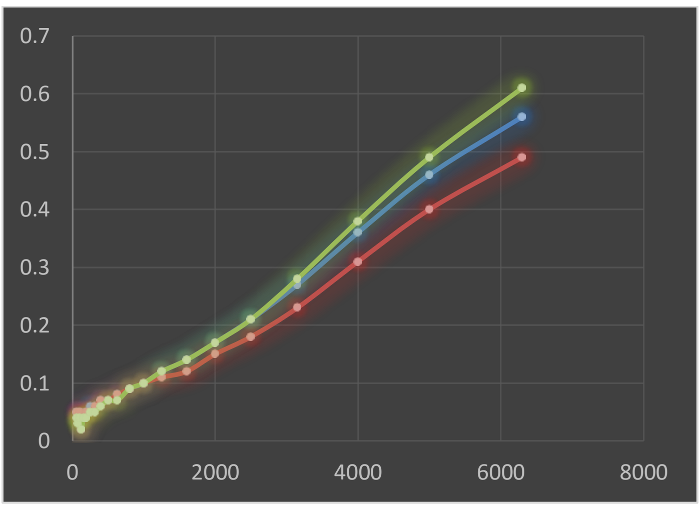

Fig.no.3 - Noise Reduction Coefficient

Areca : Jute (50:50)
Areca : Jute(60:40)
Areca : Jute(70:30)

The above Graph shows the noise reduction co efficient of the samples which clearly states that A/J 50:50 reduces the sound by about 0.10 decibel whereas A/J 60:40 reduces the sound by 0.0925 decibel and A/J 70:30 reduces the sound by 0.0975 decibel. This figure clearly reflects that the decrease in jute proportion with the respect to areca in blend shows lower sound reduction. The sound absorption is low at the lower frequencies, such as at 63Hz the average sound absorption is found to be 0.05 decibel and as the frequency increases the sound absorption also increases, such as at the frequency range of 6300 Hz all the samples show different sound absorptions . The A/J (50:50) absorbs sound of about 0.56 decibel whereas A/J (60:40) absorbs sound of about 0.49 decibel and A/J (70:30) absorbs sound of about 0.61 decibel.

CONCLUSION:

From the tested results of our it has been found that the thickness, area density and air permeability play a major role in sound absorption in one or the other way. Thickness has a greater influence in sound absorption because as the thickness of the fabric increases the area density of the fabric also gets increased. Thicker the material higher the sound absorption of the fabric. On the other hand air permeability has the negative co relation between the thickness and the area density. The sample A/J (50:50) which has a thickness of 5.90 mm with the area density of 700 g/m^2 and the air permeability of 99.6 $cm^3/cm^2/s$ has the higher sound absorption of about 0.56 decibel at the higher frequency range of about 6400 Hz when compared to other samples A/J (60:40) and A/J (70:30) whose thickness, area density and sound absorption were low with the higher air permeability. Hence it is found that equal ratio of areca and jute shows greater sound absorbency when compared to other samples and it depicts that decrease in the jute content gradually decreases the sound absorption.

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