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DEVELOPMENT OF LAPTOP MAT USING ARECA NUT FIBER (*Areca catechu*) AND BAMBOO FIBER (*Bambusoideae*)

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ABSTRACT

Laptop mats were used in order to get a better working experience by providing a flatter surface and also acts as a cooling surface which absorbs the extra heat from the laptops and extruding coolness. Combination of two natural fibres, areca and bamboo which has numerous amount of cooling properties; absorbs the laptop heat and also provide cooling surface. The two separate fibers—coarse and fine—as well as the well-considered extraction methods and production uses were all investigated. This well-structured review will result in an understanding of the uses of areca fibres in the production of fibre composites and nonwoven fabrics. Cellulosic fibre made from bamboo that has been regenerated is called bamboo fibre. Starchy pulp is produced via alkaline hydrolysis and multiphase bleaching of bamboo stems and leaves. Made from bamboo pulp, bamboo fibre is a kind of regenerated cellulose fibre. Although bamboo is a very durable and adaptable resource when utilised as a raw material, its eco-friendly qualities and manufacturing method are the primary topics of discussion regarding bamboo's sustainability. Up to 230 degrees Celsius can be tolerated by areca nut fibre. The temperature range that bamboo fibre can tolerate is 180 to 200 degrees Celsius. A laptop pad made of bamboo fibre and areca nuts can endure and resist the heat produced by a standard laptop, and it also acts as a cooling agent to keep laptops cool. Typically, a laptop can generate Cellulosic fibre made from bamboo that has been regenerated is called bamboo fibre. Starchy pulp is produced via alkaline hydrolysis and multiphase bleaching of bamboo stems and leaves. Made from bamboo pulp, bamboo fibre is a kind of regenerated cellulose fibre. Although bamboo is a very durable and adaptable resource when utilised as a raw material, its eco-friendly qualities and manufacturing

method are the primary topics of discussion regarding bamboo's sustainability. Up to 230 degrees Celsius can be tolerated by areca nut fibre. The temperature range that bamboo fibre can tolerate is 180 to 200 degrees Celsius. A laptop pad made of bamboo fibre and areca nuts can endure and resist the heat produced by a standard laptop, and it also acts as a cooling agent to keep laptops cool. Typically, a laptop can generated. Because natural fibres are renewable and biodegradable, they can be extremely important to the textile and composite industries.

KEYWORDS: Areca nut fiber, bamboo fiber, cotton fabric, fiber breathability, heat resistant.

1. INTRODUCTION

Due to the renewable, biodegradable, and environmentally benign qualities, natural fibres can be extremely important in the textile and composite industries. This project focuses in using areca nut and bamboo fibers in development of laptop mats. Laptop fans are spinning wildly but system is still hot, might soon have less worries about computer overheating. Not only could suffer a discernible drop in performance, but also run the risk of permanently deleting data and damaging internal components. To find out how to stop PC from overheating, computer overheating may soon be the least of concerns if fans are whirling frantically yet system is still hot. In addition to experiencing noticeably worse performance, run the danger of permanently deleting data and harming internal components. One of the most frequent problems that many multitasking machines encounter is overheating. In that instance, the same highways also carried computers. A laptop with a surprisingly small form factor can house a powerful processor and ample storage. The price of this efficiency is extra heat. Gaming laptops and ultra books are very powerful devices. Since portable computers frequently experience heat related problems, it's wise to think about adding more heat dissipation to prolong the machine's lifespan. Hearing laptop's fan constantly running at full speed is a dead giveaway that it is overheating. Laptops can overheat to the point that it is dangerous to touch the chassis due to inadequate cooling. Uneven surfaces indicate that laptop intake grills are located near the bottom. Overheating is a prevalent problem encountered by numerous multitasking machines. Laptops were on the same roadways in that instance as well. A laptop with remarkable processing speed and storage capacity can fit in an incredibly small size. There is a price for this level of efficiency: extra heat. Laptops designed for gaming and ultra books are incredibly powerful. Portable computers frequently experience heat-related problems, so if want to prolong the machine's life, think about adding more heat dissipation. Laptop chassis can grow dangerously hot to the touch due to inadequate cooling. If the intake grills for laptops are located at the bottom, then uneven surfaces.[1] The areca nut is one plant that has a high fibre content. Betel nut fibre is a fruit fibre that grows naturally from the beetle nut fruit's husk. The colloquial name, botanical name, genus, and family of "betel nut," "Areca catechu," "Areca," are all squandered in large quantities by a number of enterprises, most notably the tobacco industry. The advantages of areca fibres over conventional synthetic fibres are also thoroughly explained in this paper. [2] The main attraction of palm trees is their tightly packed inflorescence, which bears unisexual blooms and is carried beneath the leaves. The areca palm is an oval, fibrous drupe that grows from seeds and has colours ranging from yellow to orange to red. There are numerous constituent materials found in the areca nut leaf sheath, including cellulose, hemicellulose, lignin, and pectin.

The alkali treatment of areca nut leaf sheaths can yield long staple fibres. One plant that has a lot of fibre is the areca nut, which is wasted in large quantities by a number of companies, the tobacco industry foremost among them. Bamboo fibre is the additional fibre utilised in this project. Regenerated cellulosic fibre made from bamboo is called bamboo fibre. Bamboo stems and leaves are processed into starchy pulp by alkaline hydrolysis and multi-phase bleaching. Additional chemical Several technological analyses have demonstrated that this type of fibre has a whiteness and thinness degree that are comparable to those of regular finely bleached viscose and has a strong durability, stability and tenacity. The only fibre used to make bamboo fibre fabric is bamboo pulp fibre. Its great permeability, good hygroscopicity, soft feel, ease of dyeing and straightening, and magnificent colour effect of pigmentation are its distinguishing features. The fibre offers far superior moisture absorption and ventilation since its cross-section is full of different micro-gaps and micro-holes. When compared to cotton, it has twice the moisture absorbency and exceptional dirt release. Bamboo fibre has natural antibacterial ingredients that prevent bacteria from growing on bamboo garments. Bamboo fibre clothing has the same evaporative and absorbent properties as human breath. Even in the sweltering summer, such clothing keeps people feeling incredibly cool and comfortable while never clinging to their skin. [7]

2. METHODOLOGY

2.1 SELECTION OF FIBERS

2.1.1 ARECA NUT

Figure (1) Areca nut fiber

A species in the palm family is the areca palm, or Areca catechu. It is typically grown in tropical climates. The rigid, biodegradable fibrous fibre that makes up an areca palm's leaf sheath. This renewable source of lignocellulosic agricultural biomass is accessible, affordable, and readily available. The basic constituents of the leaf sheath include cellulose, hemicellulose, lignin, and pectin, among others. By treating the areca nut leaf sheath with alkali, long staple fibres can be removed. The fruit, frond, and stalk leaf of the areca nut palm are the origins of the lignocellulosic fibre called areca nut fibre. It is an affordable, widely available, and renewable natural fibre. [2]

2.1.2 BAMBOO

Plant-based substitutes for synthetic fibres manufactured from petrochemicals, such as bamboo, have been made more attractive via textile innovation. As a raw material, bamboo is a very flexible and sustainable resource, however the main source of dispute that undermines bamboo's sustainability is the manufacturing process.

Bamboo products, no matter how they are made, are often advertised as "eco-friendly," "bio-degradable," and "anti-microbial." It's possible that the claims don't always fairly represent the items' authenticity or true environmental impact. The viscose technique is mostly used to make bamboo fibres, yet throughout this process the inherent properties of the fibre are lost. [3]

Figure (2) Bamboo fiber

2.2 PROCESSING OF FIBERS

2.2.1 CARDING

Figure (3) Carding machine

The fibre is broken up and combined during the carding process. To start the carding process, loose fibre beds are fed into large wired rollers. This wire serves to separate the individual fibre strands, mix the components thoroughly, and align the fibre in a specific direction. The fibre appears like a web when it leaves the carding machine. This web is as thick as cotton candy and resembles the fake spider webs that are seen at Halloween. Like cotton candy, the fibre lacks strength even though this is the first time it has taken on the look of fabric. A conveyor belt is used to transfer this webbing to a cross-lapper. The lapper gives the final felt weight and thickness by folding each tiny layer of webbing over itself. The intended thickness and weight of the final product determine how many layers are used. The webbing layers will enter the needle loom after the lapper. A needle loom is an instrument of precision that punctures the layered web of fibre with barbed needles fixed on a needle board. Between 600 and 2,000 punches per minute are delivered to the fibres by the needle boards. This repeated

punching of needles entangles together which creates a strong bond. Needle looms can be “in-line” or “off-line. [4] For certain felts, this marks the end of the felt-making process. However, some receive further finishing techniques including heat treating, calendaring, singeing, laminating, or adding more layers of felt to increase density. Certain felts are also mixed with additional felt, foam, rubber, or other materials to create composite layers.

Figure (4) Areca nut and bamboo felts

The process of creating needle-punching non-woven involves two fundamental steps:

1. A machine equipped with needles made specifically for it receives the fibre web, or butt, that has been prepared by air-laying, carding, other gathering methods.
2. A metal bedplate and a stripper plate are positioned on a substrate, and the fibre web is moved there. The needles pierce both the web and the plates, reorienting the fibres to cause mechanical interlocking or bonding between them. The fabric is made of 50% bamboo and 50% areca nut, and they are needle punched together. Later on, it's nicely compacted.

2.2.2 NEEDLE PUNCHING

Needle Punching is a technique used to make nonwoven felt. A needle loom full of barbed needles is used to "needle" loose fibres together in order to force the fibre to push through and entangle itself. Furthermore, this kind of nonwoven is Bouckaert Industrial Textiles' specialty. To add even more options to the finished felt, different fibres can be mixed together in different proportions. These variations in fibre characteristics can help with various needs. Once the suitable fibres have been selected, further specifications such as weight per square yard, thickness, surface texture, and many more must be determined to provide the optimum outcome for the final user. Beyond crafts, needle punch felt has a wide range of applications, many of which are very technical. For some felts, blending different types of fibre is necessary to get the desired outcome. The fibre that goes through the bale breakers and into the next step of the process, which involves blending and carding, is carefully weighed to determine the correct percentage of the blend. [4]

3. RESULT AND DISCUSSION

AIR PERMIABILITY TEST

ISO 9237 test scope

This international Standard describes a method for measuring the permeability of fabrics to air and is applicable to most types of fabrics, including industrial fabrics for technical purpose, nonwoven sand made-up textile articles that are permeable to air.

- Handle the test specimens carefully to avoid altering the natural state of the material.
- Place each specimen onto the test head of the test instrument and perform the test as specified in the manufacturer's operating instructions.
- Place coated test specimens with the coated side down (towards the low-pressure side) to minimize edge leakage.
- Use a water pressure differential of 100 Pa (12.7 mm or 0.5 in. of water).
- Read and record the individual test results in SI units as cm3 /s/cm2 and in inch pound units as ft3 /min/ft2 rounded to three significant digits.
- For special applications, the total edge leakage underneath and through the test specimen may be measured in a separate test, with the test specimen covered by an airtight cover, and subtracted from the original test result to obtain the effective air permeability.
- Remove the tested specimen and continue testing until all the specimens have been tested for each laboratory sampling unit.

AIR PERMIABLITY TEST RESULT TABLE

S. NO	SAMPLE CODE	MATERIAL	PRESSURE	AIR PERMIABLITY	POROSITY %
1	Product	Areca nut, Bamboo and Cotton fabric material	100 p a	152 mm	40%

The above table demonstrates that the needle punched felts has the air permiablity of 152 mm and porosity of 40%.

4. CONCLUSION

Because they are eco-friendly, renewable, and biodegradable, natural fibres can be extremely important to the textile and composite industries. When areca nut and bamboo fibre laptop mat research are coupled, it can be shown that the product is heat-resistant. The heat resistance of areca nut and bamboo fibres is generally 230 degrees Celsius, while the heat resistance of these materials is between 180 and 200 degrees Celsius. A typical laptop can only generate temperatures between 10 and 35 degrees Celsius, which is the maximum range that a laptop mat made of these materials can withstand. Additionally, the cooling agents in these materials help to keep laptops cool because the natural cooling properties of these materials are superior to those of laptops. (6) Thus the product laptop mat produced out of areca nut and bamboo fibers make the mat more resistant to heat against the heat produced by the laptop. They are also considered to be an eco friendly product which do not harm the environment and living beings.

5. END PRODUCT

Figure (5) Laptop mat

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