# CONVERSION OF BAGASSE FIBRE INTO NON-WOVEN DISPOSABLE MEDICAL TEXTILES

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**Abstract:**

In present era materials which extracted from renewable sources, eco-friendly, biodegradable etc. are preferred by everyone to save earth from future problems. Bagasse is one of the most eco-friendly resources suitable for various applications, Bagasse is the fibrous residue which remains after sugarcane stalks are crushed to extract their juice. It is mainly used as a burning raw material in the sugar mill furnaces. Also, the sugarcane mill management encounters problems regarding regulations of clean air from the Environmental Protection Agency, due to the quality of the smoke released in the atmosphere The low caloric power of bagasse makes this a low efficiency process baggase fiber is extracted from sugar cane rind in two different steps: mechanical separation and chemical extraction. .When appropriate modifications and manufacturing procedures are applied; bagasse displays improved mechanical properties such as tensile strength, flexural strength, flexural modulus, hardness, and impact strength. A composite material is made by combining two or more materials to give a unique combination of properties, one of which is made up of stiff, long fibers and the other, a binder or 'matrix' which holds the fibers in place. Further nonwoven fabric & composite sheets are manufactured from extracted fibers alone or blending it with cotton and viscose. After blending This review discusses the use of bagasse fibre and its current status of research. Many references to the latest work on properties, processing and application have been cited in this review. It also satisfies the greening requirements by being biodegradable, recyclable and reusable.

Key words: Bagasse, Environmental, nonwoven fabric, sugar mill

## Introduction:

Medical Textiles is one of the most rapidly expanding sectors in the technical textile market. Medical textile market is totally saturated with nonwoven products today, because of their easily modifiable properties and excellent performance has become indispensable in this field. In present era materials which extracted from renewable sources, eco-friendly, biodegradable etc. are preferred by everyone to save earth from future problems. Bagasse is one of the most eco-friendly resources suitable for various applications; baggase fibe is extracted from sugar cane rind in two different steps: mechanical separation and chemical extraction. Further nonwoven fabric & composite sheets are manufactured from extracted fibres alone and blending it with cotton and viscose.

The main reasons for this increased interest towards disposable medical textiles include: the promotion of healthier and physically active lifestyle; an increased awareness of the harmful effects of organisms on textiles as well as on human hygiene and freshness.

## Objectives:

- To produce an eco friendly non woven fabric.
- To produce medical textile product using bagasse fibre.
- To study the properties of bagasse fibre and its blended fibre.
- To produce antiviral fabric
- To use disposable fabric in medical field.

## Methodology:

Step 1: Bagasse fibre extraction from sugarcane waste

Step 2: Blending of bagasse fibre with cotton and viscose

Step 3: Converting the blended fibers into needle punched Non-woven fabric

Step 4: Antimicrobial Finishing

Step 5: Testing the properties of the nonwoven fabric

Step 6: End product (disposable medicinal fabric)

**Fibre Extraction Technique:**

Bagasse Fibre



**Materials and Methods**

**Blending processes:**

The overall properties of nonwoven are mainly related to fibers characteristics and the manufacturing process. In order to improve fibers cotton, viscose fibers were blended with four different ratios such us:

1. viscose 75% with bagasse 25%(3 laps)
2. viscose 60% with bagasse 40%(3 laps)
3. cotton 75% with bagasse 25%(3 laps)
4. cotton 60% with bagasse 40% (3 laps)

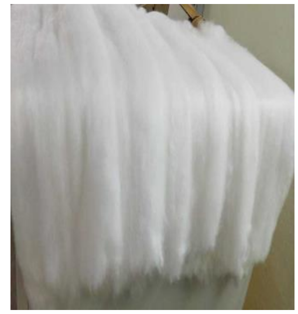
**Preparation of Needle-Punched Nonwoven Fabric**

The preparation of needle-punched nonwoven fabric was performed in four steps. In the first step, the openers ensure the raw material opening, cleaning and blending and supply regularly the carding machine. The fiber mixtures were run through the opener two times in order to improve the homogeneity of the blend. In the second step, blended fibers were carded with bagasse carding machine in the case of cotton/bagasse blend or viscose carding machine in the others cases in order to remove dirt particles, fiber alignment and web formation. The consolidation of the nonwoven fabric is provided by Needle-punching method. This method consists of mechanically interlocking fibers by repeatedly punching through the fiber web with an array of barbed needles typically, needling is used to consolidate a fibrous structure, to density it and control the porosity

The needling parameters are presented. All studied fibers webs are subjected to four needling passages to ensure good consolidation. The present an bagasse/viscose, bagasse /cotton, cotton/ bagasse and viscose/bagasse nonwoven fabric, respectively.

**Needle punching**



**The nonwoven characteristics which make them better option for medical products are:**

- Excellent barrier properties
- Greater efficiency
- Better performance in terms of comfort, porosity, thickness and weight, water vapor transmission, air permeability
- Better shielding for wearer in terms of superior physical properties like tensile, tear resistance, abrasion resistance
- Easy to sterilize
- Economical manufacturing process

Disposability is the primary reason for the hospitals and operating rooms to desire nonwoven compared woven fabrics. Nonwoven used in gauze pad must absorb exudates, protect from contamination, mitigate from trauma. Disposable mask is expected to protect 98% of the bacteria from getting into the wearer, and it must not lead to skin irritation; hence composite nonwoven structures are used. Surgical gown must protect from hazardous substances and should provide water resistance with GSM less than 35. The composite nonwovens are utilized in the application areas like gowns, laboratory coats, coveralls and other type of protective clothing. They should shield blood or infectious material from passing through under various ambient conditions. It should have better tear resistance, burst strength, abrasion resistance, cracking resistance, barrier properties and water vapor transmission.

Nonwovens may be a limited-life, single-use fabric or a very durable fabric. Nonwoven fabrics provide specific functions such as absorbency, liquid repellency, resilience, stretch, softness, strength, flame retardancy, washability, cushioning, filtering, bacterial barriers and sterility. These properties are often combined to create fabrics suited for specific jobs while achieving a good balance between product use-life and cost. They can mimic the appearance, texture and strength of a woven fabric, and can be as bulky as the thickest paddings.

**Fabric Testing**

Test of the textiles helps the authority to decide the next route. During textiles testing the variation of a fiber or fabric i.e. length, color, fineness, threads per inch, cover factor is detected properly. Thus proper raw materials are selected properly. Certain standard level should be maintained to control increase of waste, rise of cost etc. By textile testing we can easily detect the faults of machinery and materials during test of textiles. Continuous test of the textiles results an enhanced and efficient output of the production. Following were some of the tests needed for non woven fabric - abrasion resistance; air permeability; breaking strength; dimensional change; dry-cleaning; elongation; fabric; fabric bursting strength; high loft; mass per unit area; nonwoven fabric; seam strength; stiffness; tearing strength; thickness etc.

**Method of finishing**

**Anti-microbial Natural Coating Bagasse Fabric:**

**Materials**

Neem – $C35H44O16$

Turmeric – $C21H20O6$

Lemon – $C36H32CI4N6O4$

**Sample 1 (270gms)**

60% Viscose and 40% Of Bagasse –All Materials heated in 95degree and tuffed with air dry Spray Method.

**Sample 2 (300 Gms)**

75% Cotton and 25% Of Bagasse (93gms – 3 Feet) all materials Heated In 65 degree and Tuffed With air dry spray method.

**Sample 3 (250gms)**

75% Viscose and 25% Bagasse all materials heated in 43 degree and tuffed with air dry Spray Method.

**Sample 4 (295 Gms)**

60% Cotton And 40% Bagasse all materials Heated In 78 Degree and tuffed with Air Dry Spray Method.

All Process Was had done With Wet Dry Cleaning Method. after treatment all The Fabric Calenderer.


Antibacterial finishing test:

Test Name : Antibacterial Evaluation (Quantitative) - ASTM E 2149 - 13a Standard test methods for determining the antimicrobial activity of antimicrobial agents under dynamic contact conditions. Test Condition: Test Organisms used : Escherichia coli ATCC 25922 Inoculum size : 1.4 x 105 CFU/mL Sample size : 1 g Method of sterilization : NIL Media used : Plate count agar Dilution medium used : 0.3 mM KH2PO4 buffer with 0.01 % tween 80 Method of plating : Spread plate method Inoculum / plate : 0.1 mL Incubation conditions : 350C for 24 h

Observation : Test Organism Used M2002407-1 Described by the customer : Fabric: Viscose 75% Bagasse 25% Bacterial Recovery Initial (CFU / mL) Bacterial Recovery Final (CFU / mL) Bacterial Reduction (%) Control E.coli ATCC 25922 (24 h) 2 x 106 1 x 107 0 Inoculum Result : : The sample showed 0% bacterial reduction after 24 hrs incubation against Escherichia coli ATCC 25922 when tested according to ASTM E 2149 - 13a test method.

## Results and Discussions

Based on the above objectives, the 100% eco friendly fabric was produced in four combinations. The selected herbs are Neem, Lemon, and Turmeric. These selected herbal extracts were applied on the fabric based on the heating condition and tuffed with airdry spray method.

The treated nonwoven fabric is found to have the antimicrobial property even after 3 washes. It also clearly demonstrated that the treated fabrics showed increased antibacterial and antimicrobial effect. The results also demonstrated that higher antibacterial activity was observed against**E.coli** in quantitative tests.

The samples A,B,C and D was then subjected to Functional test, Physical test, Mechanical test, Comfort test and Absorbency tests such as Fabric Weight, Fabric Thickness, Fabric Count, Fabric Stiffness, Tensile Strength and Elongation, Drape, Crease Recovery, Abrasion Resistance, Pilling Resistance, Air permeability, Water repellent test, Water absorbency test, Wicking test and Sinking test. The results were analyzed statistically to improve the efficiency of Nano encapsulated fabric.

The results analyzed showed that 4 samples of treated nonwoven fabric had an increase in Differential Pressure, Mass per unit area, Water absorbency test, and Sinking test.

Hence, an innovative nonwoven disposable medical textile is approach based on the coatings of herbs extracts used as antimicrobial agents is discussed. It is very important aspect to proves that the disposable product made using this nonwoven fabric is Eco friendly and the present investigation shows that the nonwoven fabric is environment friendly without any harmful chemicals. Hence the finished antimicrobial fabric is considered to be an eco friendly fabric.

## FURTHER SUGGESTIONS

- Usage of eco friendly products has been increased using this method.
- Various medicinal herbs were identified and used for developing antimicrobial property of the nonwoven fabric.
- This method can be applied to various other types of woven and knitted fabrics such as cotton blends, jute, polyester, viscose etc..
- Medical textiles can be developed using this nonwoven fabric. E.g. Gloves, wound dressings, and other surgical items.

## End products

On this modern age the composite materials are become the primary material for any engineering production because composite materials have several specific properties such as high strength to weight ratio, low cost, and ease of fabrication, tensile strength, compressive strength, Impact strength, high resistance to thermal which does not realize in pure material or non-composite material. In this project we will be using waste materials i.e. bagasse to produce a composite material. The end product we are producing ranges from wound dressings, surgical gowns, facemasks to absorbent wipes.

**Conclusion:**

The extraction of bagasse fibres from sugar cane does not require a complicated technological process. It was determined that the influential parameters for bagasse extraction were: alkali concentration of the solution, time of the reaction, and mechanical agitation. Different nonwoven structures were created using a minimum level of technology which is used in many applications such as Agricultural, Animal Bedding and Aquaculture etc. so we are going to implement this new technology to produce a disposable fabric in medical textiles. Finally, the project highlights the future prospects for composite nonwoven materials.

**Project outcomes:**

- In todays senerio medical textile is one of the most rapidly expanding Sector in textile field. Textile market is totally saturated with nonwoven Products because of their easily modifiable properties.

- In this project we decided to convert bagasse fibre into nonwoven product due to its eco friendly resources suitable for various applications.

- Bagasse fibre was blended with cotton and viscose fibres in various ratios and four types of nonwoven fabrics were made.

- Nonwoven fabric was treated with various herbs to increase the anti microbial and anti bacterial activities.

- Treated nonwoven fabric was tested for its Physical,chemical properties and anti microbial activities.

- Finally we produced a nonwoven disposable Masks and soles which can be used in medical field.

- Our product (non woven laps) can be used for various applications of medical textiles which includes bandages, napkins, pillow stuffing's, surgical caps, gloves, bed quils etc.,

**End product produced: Masks and soles**

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