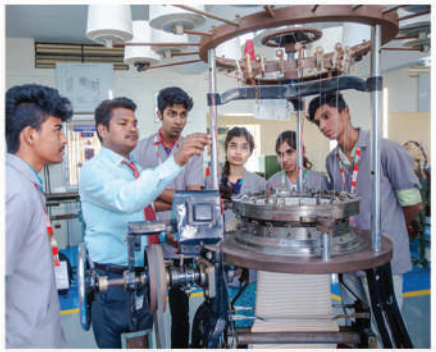
Yarn Manufacturing Laboratory



Fabric Manufacturing Laboratory

Textile Testing Laboratory

Textile Chemical Processing Laboratory

Garment Construction Laboratory

Technical & Innovative Textile Laboratory

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TEXEMPIRE

A TEXTILE TECHNOLOGY MAGAZINE, KSRCT

Department of Textile Technology
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Editors Desk

"The future belongs to those who believe in the beauty of their dream.."

Thiru. R. Srinivasan, B.B.M., MISTE

CHAIRMAN

KSR EDUCATIONAL INSTITUTION

We at K.S.Rangasamy College of Technology has begun to bestow the most pioneering magazine **"TEXEMPIRE"**, volume 10, issue 1, the biannual magazine of department of textile technology. The escalation in the field of textile is an exemplary way to serve up to the progress of a nation a boom that serves the people with intense research and development is textile the contributions made by learned textile technologist, researchers and student have made the textile to flourish in an unexpected way, with absolute faith I accept the wisdom that this magazine provides an insight towards the major thrust areas of textile provoking the minds of upcoming textile technologist. I wish to express my gratitude to the editorial board members, faculty and students of the Department of Textile Technology for bringing out this impressive magazine.

" Children must be taught how to think, not what to think."

Dr.R.Gopalakrishnan M.E., Ph.D

PRINCIPAL

KSR COLLEGE OF TECHNOLOGY

The transformed technological science that unites various interdisciplinary aspects for the welfare of each and every individual is textile. **"TEXEMPIRE"** magazine by the Department of Textile Technology of K.S.Rangasamy College of Technology will help to enhance our knowledge by promoting the exchange of experience. An encyclopedia of textile could solve all the issues related to the past and ready to answer the feature issues by indulging in the present status is Textile Technology. The thought of individual author towards the textile and technology has been compiled by the volume, editors to make the students expertise and make their contribution for the enhancement of various fields of textile. Their enthusiasm to impart knowledge to their colleagues forms the foundation of Textile and is gratefully acknowledged.

I convey my appreciation to the editorial board members faculty and students of the department of Textile Technology for their effort to bring out this magazine and wish them all success in their endeavors..

"Fashion is the armor to survive the reality of everyday life"

Dr.G. Karthikeyan M.Tech., Ph.D

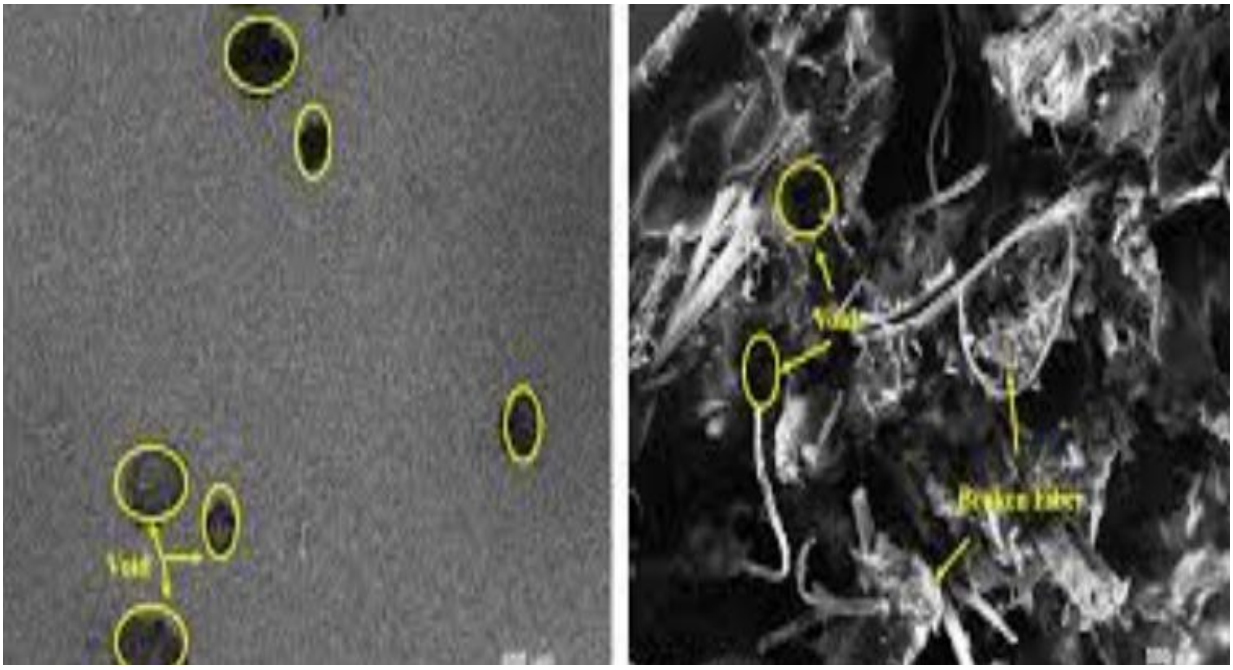
VICE PRINCIPAL

KSR COLLEGE OF TECHNOLOGY

Welcome to the inaugural issue of **TEXEMPIRE**, the magazine dedicated to the dynamic world of textile technology and fashion innovation. It is my pleasure to introduce this publication, aimed at serving as a beacon of inspiration, knowledge, and insight for all who are passionate about textiles and fashion. Our Department of Textile Technology at K S Rangasamy College of Technology has a proud history of excellence and innovation. Since our establishment in 1997, we have been at the forefront of textile education, offering B.Tech., M.Tech., and Ph.D. programs. Recognized as a research center by Anna University, Chennai, our commitment to advancing the field through cutting-edge research and industry collaboration is unwavering. In this first issue of TEXEMPIRE, we howcase the breadth and depth of our xpertise and reativity. Highlights include research on environmentally sustainable composites using banana and jute fibers, innovative fabric designs sing the miss pick effect, and the development of eco-friendly baby diapers from hemp and

kenaf fibers. these projects underscore our dedication to sustainability and nnovative solutions to contemporary challenges. We also celebrate the achievements of our students and alumni, whose projects and research reflect the rigorous education and hands-on experience they receive here. Our alumni network plays a crucial role inventorying current students, offering guidance, scholarships, and career opportunities. is you explore TEXEMPIRE, I hope you feel spired by the innovation and dedication hat define our department. Thank you for our support and interest in our work. together, We can continue to push the secondaries of textile technology and fashion.

NUMERICAL AND EXPERIMENTAL ANALYSIS OF NATURAL FIBER REINFORCED HYBRID POLYPROPYLENE COMPOSITE



Abstract The increasing environmental concerns and the push for sustainable materials have led to a growing interest in natural fiber composites. This study investigates the mechanical properties of hybrid composites reinforced with banana and rice husk fibers using a polypropylene matrix. The fibers were chemically treated with potassium permanganate ($KMnO_4$) to improve interfacial bonding. The composite was fabricated through compression molding, and mechanical tests, including tensile and flexural strength analyses, were conducted. The results demonstrate an improvement in the mechanical properties with an optimal fiber-matrix ratio, making these composites suitable for applications in automotive and construction industries.

Introduction Natural fiber-reinforced polymer composites (NFPCs) have gained significant attention due to their low density, biodegradability, and cost-effectiveness. However, the incompatibility between hydrophilic fibers and hydrophobic polymer matrices remains a challenge. This research focuses on the enhancement of fiber-polymer bonding through

chemical treatment and evaluates the mechanical performance of hybrid polypropylene composites reinforced with banana and rice husk fibers.

Literature Review Composites are categorized based on matrix type and reinforcement materials. Fiber-reinforced composites, particularly natural fiber-based, are extensively used due to their sustainability. Various studies have explored the use of fibers such as jute, hemp, flax, and banana in hybrid composites. Prior research indicates that chemical treatments improve fiber adhesion, enhancing mechanical strength and durability.

Materials and Methods

Fiber Selection and Treatment Banana and rice husk fibers were selected for their superior mechanical properties and sustainability. The fibers underwent a 5% $KMnO_4$ treatment to reduce hydrophilicity and improve bonding with the polypropylene matrix.

Composite Fabrication Compression molding was employed for composite fabrication, with a polypropylene matrix constituting 60wt% of the material. The fibers were mixed at different weight fractions to determine the optimal mechanical performance.

Results and Discussion

Tensile Properties The tensile strength ranged from 11.02 N/mm^2 to 11.78 N/mm^2, with the highest values observed at 20% banana fiber reinforcement. The improved interfacial adhesion resulted in better stress transfer within the matrix.

Conclusion The study demonstrates that chemically treated banana and rice husk fibers significantly enhance the mechanical properties of polypropylene-based hybrid composites. The optimized fiber-matrix composition provides improved tensile and flexural strength, making these materials suitable for applications in automotive, construction, and furniture industries.

Hi-tech Textiles: When High Performance is Paramount

Key Takeaways

Fabric technology offers advantages to the military, first responders, and athletes, though new performance-specific fibres remain rare. While sustainable R&D focuses on replacing oil-based materials and recycling waste, high-performance synthetics like Kevlar and Nomex continue to be vital for extreme protection and top-tier performance enhancement.Right now, new fibres and fabrics specifically developed for their performance properties – rather than their sustainable advantages – are somewhat rare.

The current focus of R&D globally is on how to replace oil-based feedstocks with natural alternatives and how post-consumer apparel waste – facing imminent bans from being

landfilled or incinerated – can best be introduced back into the textile manufacturing supply chain.

The exceptions to this are the materials that are being constantly improved upon to meet the challenging needs of the military and emergency services where sustainable credentials tend to take something of a back seat.

In addition, other fabrics still based on advanced synthetic fibres and chemicals are being designed for protection in extreme outdoor sports, or to boost the performance of elite athletes.

Invisibility with Stealth

Two UK-based fabric manufacturers, for example, Carrington Textiles and Heathcoat Fabrics, have this year announced a number of interesting new launches.

Adlington, Lancashire-based Carrington's new Stealth technology for the defence market has been designed to provide superior thermal shielding on the battlefield, effectively creating an invisibility cloak so that the fabric merges with the scenery as a result of a highly conductive new technology.

Stealth's patented fabric technology manages dynamic energy waves for mission critical security and protection, effectively shielding soldiers from the many sensors employed to track them down on the modern battlefield.

Created in collaboration with Noble Biomaterials, based in Scranton, Pennsylvania, Stealth delivers broad-spectrum short, medium and long wave infrared thermal signature management in a lightweight, durable fabric. It exploits Noble's Circuitex Sigma technology, which is designed to mitigate thermal detection in military environments.

"Initial feedback from wearer trials of this concept in military field training exercises and in camp observation, has proved that with Stealth, the thermal signature of a soldier is completely mitigated at different distances," says Carrington Textiles sales director Paul Farrell. "The material is almost indistinguishable from the surrounding terrain, regardless of viewing angles."

"Our patented Circuitex technology is designed to protect soldiers and equipment from detection by advanced sensors," adds Noble Biomaterials' founder Joel Furey. "We are proud to provide allied war fighters with an operational advantage in combat situations."

Chemical protection with NeutraliZr

Another interesting material for protecting soldiers – this time from chemical warfare agents – is NeutraliZr, developed by Heathcoat with Guild Associates, a US team of scientists based in Dublin, Ohio, US.

NeutraliZr is engineered to provide unparalleled capabilities in rapidly adsorbing and detoxifying chemical warfare agents. It features zirconium hydroxide, known for its swift adsorption and detoxification properties. It is applied to the textile in a unique dust-free, non-shedding coating formulation.

Heathcoat's material is capable of detoxifying unbroken skin coming into direct contact with contaminated surfaces, ensuring the rapid adsorption of chemical agents.

One of the flagship applications of NeutraliZr technology is the Universal Decontamination Mitt (UDM), designed to decontaminate both equipment and unbroken skin.

Crafted entirely from NeutraliZr, the UDM has demonstrated exceptional efficacy in decontaminating the surfaces of military items and unbroken skin exposed to chemical warfare agents and their simulants. In rigorous testing, the UDM achieved over 90 per cent decontamination efficacy on porcine skin, representing unbroken human skin, and removed over 99 per cent of chemical agents and simulants from contaminated items.

Shielding against nerve agents

Building on this success, Heathcoat and Guild Associates have now developed a PFAS-free CBRN (chemical, biological, radiological and nuclear) suit for the US military's Uniform Integrated Protective Ensemble (UIPE) programme. This next-generation suit offers enhanced chemical protection and detoxification against VX, GB and HD nerve agents, as well as aerosol protection. With improved comfort, reduced thermal burden and increased breathability, the PFAS-free suit sets a new standard for lightweight CBRN protection.

"We are thrilled to introduce NeutraliZr technology, a game-changer in military chemical defence," says John Stimpson, business manager for woven fabrics at Heathcoat. "Our collaboration with Guild Associates has resulted in solutions that address critical needs for rapid decontamination and enhanced protection. We look forward to continuing to push the boundaries of textile technology to safeguard military and first response personnel."

Moisture wicking for the military

For more day-to-day military applications, the new Drytec surface-to-surface moisture-wicking spacer fabric developed by Tiverton, Devon-based Heathcoat has been designed to actively draw perspiration from the skin, allowing the moisture to be dispersed through the textile to the outer fabric surface, ultimately improving the thermo-physiological comfort of the user.

The surface-to-surface moisture movement ensures personnel remain dry and comfortable when carrying heavy personal equipment.

Crafted from a special composition of polyester monofilaments and cellulosic yarns, Drytec is highly soft, comfortable and breathable, but also constructed to be durable and resistant to wear and tear. Its compressible air gap structure provides shock absorption and weight distribution, making it ideal for use in backpack straps, lumber supports and ballistic plate carriers.

Since their introduction in the 1960s, DuPont's Kevlar para-aramid and Nomex meta-aramid fibres have been staple ingredients in fabrics and equipment for the military and emergency services.

With advanced corrosion and heat resistance, extremely strong and lightweight Kevlar is woven into textile materials and is widely used in body armour and bulletproof vests, in addition to car brakes and aerospace and marine components.

Nomex is an inherently flame-resistant, high-temperature resistant fibre that will not melt, drip, or support combustion in air supplied in paper, felt, fabric and fibre forms.

For the past ten years, DuPont has recognised the design innovations of Kevlar and Nomex brand licensees using these fibres in personal protective equipment (PPE) at its annual Protection Innovation Awards.

Arc flash hazards

In 2024, the three winning products included the Kut Guard arc flash sleeve developed by Protective Industrial Products (PIP), headquartered in Latham, New York, which features both Kevlar and Nomex fibres in a single arc rated protective design in a seamless knitted single-ply shell. This latest addition to the PIP portfolio of hand and arm protection equipment provides superior comfort and protection benefits to workers who face mechanical, contact heat and arc flash hazards.

Another winner was the Mechanix Wear Leather needlestick law enforcement glove which is designed to deliver hazard protection against hypodermic needles, blades and other sharp threats that police officers, SWAT units and corrections officers may encounter while on duty.

ArmorCore needlestick resistant technology utilises a proprietary spun yarn blended with Kevlar fibres to create a flexible single-layer woven material. It has a lighter more dextrous needlestick barrier covering the entire palm and rolling over the fingertips. In addition to puncture protection, the glove integrates a 360° resistant liner to ensure protection from cuts and lacerations. An outer shell of Durahide flame retardant goat skin leather incorporates hot-stamped grip overlays on the fingers and palm for improved durability, grip and comfort.

Dexterity despite multiple layers

The third winner was Youngstown's Waterproof Extreme winter mitt which has been developed for use in the harshest environments and features a unique 'trigger finger' design for good dexterity while also keeping the hands warm.

It is designed for workers exposed to extreme conditions in the utilities, oil and gas, and construction industries and comprised of multiple layers, including a flame-resistant fleece liner and a layer of comfortable Nomex 120g insulation. The inner liner – constructed from 100 per cent Kevlar – provides cut protection, while a waterproof membrane layer – applied over a double-layered leather outer shell – provides a reliable barrier against extreme cold-weather elements.

"The demand for multi-risk hazard protection in a single glove or sleeve design continues to be a trend," says Christine Christmas, global market leader at DuPont Personal Protection. "Our licensees are investing in expanded research to find new materials that offer cut, heat, flame and electrical arc protection."Lightest outer shell for firefighters

TenCate Protective Fabrics, based in Nijverdal in the Netherlands, has partnered with PBI Products, the Charlotte, North Carolina-headquartered specialist in flame retardant fibres, for the launch of the new PBI Peak5 outer shell for fire service apparel.

The polybenzimidazole (PBI) synthetic fibres manufactured by PBI Products possess high chemical resistance and are inflammable in air. They do not exhibit any melting point so do not drip when exposed to flame, at temperatures of up to 560˚C. Further, PBI fibres retain their

strength without infringement even when exposed to extreme higher temperatures and under serious conditions emanate little smoke.

In addition to firefighter's gear, the advanced thermal stability of PBI sees it employed in protective gloves, welding apparel, astronaut space suits and aircraft wall fabrics. PBI is also used as a plastic reinforcement for heat and chemical resistant filters and for various other civil engineering applications. The fibre is often blended with DuPont's Kevlar.

REPLACEMENT OF LEATHER BY USING COCOS NUCIFERA WATER

Abstract This research focuses on developing an alternative to conventional leather using Cocos nucifera (coconut) water. The study aims to address environmental and ethical concerns by creating a biodegradable, eco-friendly material with properties similar to animal-derived leather. The process involves lyophilization, fermentation, air drying, and compression to form a durable and flexible leather substitute. The mechanical properties, such as tensile strength, tear resistance, and water absorption, were evaluated. Results indicate that the coconut-based leather alternative exhibits comparable mechanical properties to synthetic leather, making it a viable option for sustainable fashion and upholstery applications.

Introduction The leather industry contributes significantly to environmental pollution due to chemical-intensive tanning processes. Synthetic leather alternatives, such as polyurethane (PU) and polyvinyl chloride (PVC), also have environmental drawbacks. This research explores the potential of coconut water as a raw material for producing a biodegradable and sustainable leather substitute.

Literature Review Coconut water contains bioactive compounds, including phytohormones, vitamins, and minerals, which contribute to material stability and flexibility. Previous research highlights the potential of plant-based biopolymers for sustainable material production. This study expands on existing research by incorporating advanced processing methods, such as lyophilization and fermentation, to enhance the mechanical properties of the material.

Materials and Methods

Materials Use

Coconut water

Natural resins and gums

Microbial cultures for fermentation

Processing Technique

Lyophilization: Removes water content while preserving the biopolymer structure.

Fermentation: Enhances flexibility and durability through microbial activity.

Air Drying: Improves material stability by removing residual moisture.

Compression: Increases mechanical strength by compacting the material.

Mechanical Testing

Tensile Strength Test: Measures resistance to stretching forces.

Tear Resistance Test: Evaluates the material's ability to withstand tearing.

Water Absorption Test: Assesses the hydrophobic properties of the material

Mechanical Properties

The tensile strength of the coconut-based leather alternative was recorded at 195 kg/cm², comparable to synthetic leather (200 kg/cm²).

Water absorption tests showed a lower absorption rate of 8 mg/cm² compared to synthetic leather (10 mg/cm²), indicating improved water resistance.

Tear resistance tests confirmed that the material could withstand significant mechanical stress, making it suitable for various applications

COVID-19 — Lessons Learned?

J

Current respirators and face masks center on two key technologies: fine, meltblown fibers; and an electrostatic charge.

Manufacturing innovations will provide more reliable, affordable and adaptable protection in the face of the next pandemic.

By Behnam Pourdeyhimi, Technical Editor; Simon Schick; and Robert Groten

The World Health Organization (WHO) recently released the findings of its investigation into what went right and wrong as the world was faced with the coronavirus pandemic. An 86-page report noted that there were "weak links at every point in the chain of preparedness and response." A 13-member panel appointed by the WHO called the COVID-19 pandemic a "preventable disaster."Some of the recommendations resulting from the investigation included:

GLOBAL TRIENNIAL NONWOVENS SHOW MOVES AHEAD

Originally scheduled in early 2020, INDEX™20 is confirmed to move forward with a new October 2021 date.

TW Special Report

Typically, once every three years Belgium-based EDANA — the international association serving the nonwovens and related industries — and show organizer Palexpo bring together the entire

nonwovens industry at the INDEX™ trade show. The event, with its unique nonwovens focus and highly vertical format, offers four intensive days of insights, networking and rewarding business activities, according to EDANA.

But the year 2020 was anything but typical, and INDEX 20 did not escape the upheaval and uncertainty caused by the global COVID-19 pandemic. Originally planned for March 31-April 3, 2020, the show was initially postponed and tentatively rescheduled.

KNITTING TECHNOLOGY DEVELOPMENTS

Mayer & Cie.'s OVJA 1.6 EE/2 WT double jersey jacquard machine for multi-colored designs and microstructure elements.

Knitting innovations continue to add value for textile manufacturers during a difficult time.

Courses, wales, loops, gauge, warp, weft, raschel, jersey, interlock … just some of the terms familiar to people working in the knitting industry. Knitting technology comes in a variety of types and sizes and may be used to make all sorts of products from small vascular heart grafts (see "Prototype

Graft Designed To Replace Damaged Heart Vessels Shows Promise In Cell Study", **TW**, January/February 2021), to shoe uppers and apparel fabrics all the way to large-scale bedding components and anything in between that requires comfort, stretch and seamless shaping, among other attributes.

Since ITMA 2019 — ITMA typically paving the way for new innovations — and despite difficulties in the machinery market because of the pandemic, knitting technology manufacturers are still innovating and helping their customers provide value. Here is a look at a few new products available to knitters.

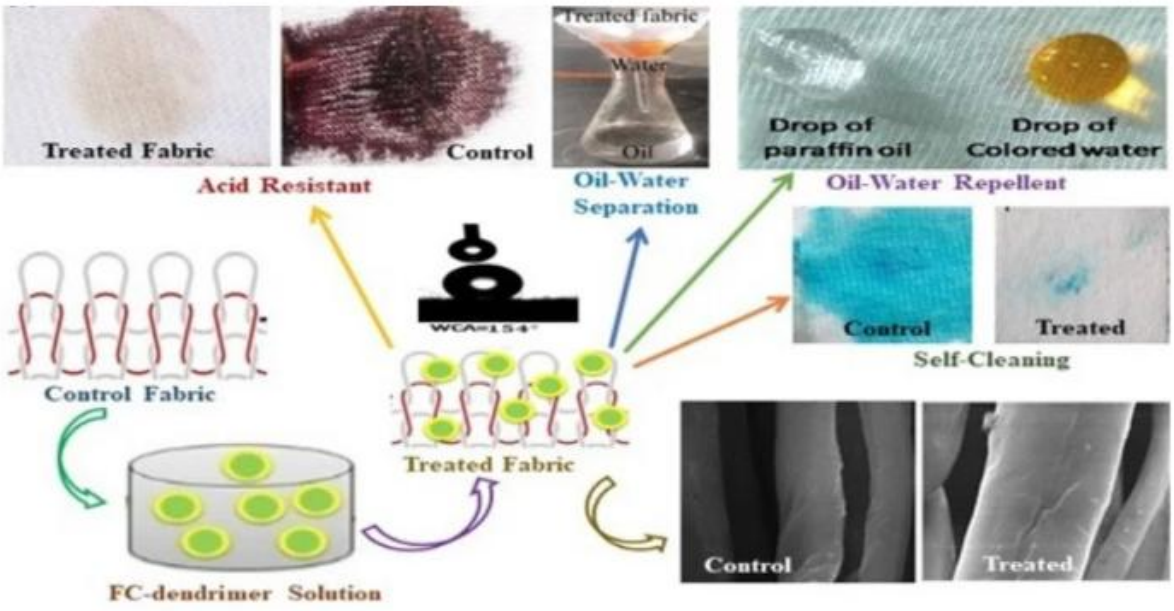
DESIGN AND DEVELOPMENT OF SNAKE-REPELLENT TEXTILES

Abstract Snake bites pose a significant threat to humans, particularly in rural areas. Farmers, outdoor workers, and children are at high risk of venomous snake encounters. This study explores the development of textiles with snake-repellent properties using natural ingredients such as garlic, clove, cinnamon, and mint. These ingredients were extracted into solution form

and applied to knitted fabric using the exhaustion method. The study aims to create protective garments such as arm and leg covers, reducing human-snake interactions while ensuring safety for both parties.

Conclusion The study successfully developed snake-repellent textiles that provide a protective barrier against venomous snake encounters. Further research into advanced finishing techniques could enhance durability and effectiveness. Collaboration with wildlife research centers for controlled evaluations could lead to commercial applications of these textiles.

ANALYSIS OF SILICONE AND FLUOROCARBON COATING ON BAMBOO FABRIC FOR SPORTSWEAR



Abstract The development of water-resistant and comfortable sportswear is crucial for enhancing athletic performance and ensuring durability in various environmental conditions. This study examines the effects of silicone and fluorocarbon coatings on bamboo fabric to improve its water repellency while maintaining breathability and comfort. Bamboo fabric, known for its natural antimicrobial and sweat-absorbent properties, was treated with both

coatings using the pad-dry-cure method. Performance tests, including water repellency and durability assessments, were conducted. Results indicate that fluorocarbon coatings provide superior water resistance and durability compared to silicone coatings, making them suitable for high-performance sportswear applications.

Introduction Water-resistant fabrics play a significant role in sportswear by providing protection from rain and moisture while ensuring comfort. Bamboo fabric has gained attention due to its eco-friendliness, breathability, and antibacterial properties. This study explores the enhancement of bamboo fabric with silicone and fluorocarbon coatings to improve its water repellency without compromising breathability.

2Literature Review Bamboo fabric is a sustainable textile with properties such as high moisture absorption, breathability, and UV resistance. Silicone coatings provide flexibility, water repellency, and heat resistance, while fluorocarbon coatings offer superior water and oil resistance. Previous studies highlight the effectiveness of these coatings in enhancing fabric performance for various applications, including sportswear.

Materials and Methodology 3.1 Materials

Bamboo fabric (100%)

Silicone coating solution

Fluorocarbon coating solution

Ethanol as solvent

Methodology

Preparation of fabric samples.

Application of coatings using the pad-dry-cure method.

Drying and curing at optimal conditions.

Testing for water repellency and durability.

Experimental Setup and Testing Water repellency tests were conducted using the AATCC spray test method. Samples were also evaluated after multiple washes to assess durability.

Results and Discussion

Fluorocarbon-coated fabrics exhibited a higher water repellency rating (Grade 4) compared to silicone-coated fabrics (Grade 3) after five washes.

Silicone coatings provided moderate water resistance but retained better flexibility and softness.

Fluorocarbon coatings showed enhanced durability and sustained water repellency after repeated laundering.

Conclusion The study confirms that fluorocarbon coatings are more effective in providing long-lasting water resistance compared to silicone coatings. However, silicone-coated fabrics offer better flexibility and comfort. Future research should focus on environmentally friendly alternatives to fluorocarbon coatings while maintaining high performance.

References

AATCC Technical Manual for Water Repellency Testing.

Studies on Bamboo Fabric Properties for Sportswear.

PREPARATION OF NON-WOVEN ACOUSTIC PANELS USING JUTE AND BANANA FIBERS

Abstract The demand for sustainable and eco-friendly acoustic materials has led to extensive research on natural fiber-based non-woven panels. This study explores the preparation of non-woven acoustic panels using jute and banana fibers, emphasizing their sound absorption properties, mechanical characteristics, and environmental benefits. Jute and banana fibers were processed into non-woven structures using needle punching and resin bonding techniques. The acoustic performance of the developed panels was evaluated using sound absorption coefficient tests, and the results were compared with conventional synthetic panels. The findings indicate that jute-banana fiber panels exhibit excellent sound absorption capabilities, making them a viable alternative for interior acoustic applications.

Introduction Noise pollution is a growing environmental concern, necessitating the use of efficient acoustic materials in buildings, automobiles, and industrial setups. Traditional acoustic materials, predominantly synthetic, pose environmental challenges due to their non-biodegradable nature. This study investigates the potential of jute and banana fibers in the development of sustainable non-woven acoustic panels.

Literature Review Natural fibers such as jute and banana have gained attention for their sustainability, low cost, and excellent sound absorption properties. Previous studies highlight their potential as substitutes for synthetic fibers in textile and acoustic applications. The

inherent porosity and fiber structure contribute significantly to their sound absorption efficiency.

Materials and Methods 3.1 Material

Jute fibers

Banana fibers

Binders (natural resin)

Methodology

Fiber Processing: Jute and banana fibers were extracted, cleaned, and blended.

Acoustic Testing: Sound absorption coefficient tests were performed in a reverberation chamber.

Results and Discussion The sound absorption tests revealed that jute-banana fiber panels exhibited high absorption coefficients in mid-to-high frequency ranges, comparable to conventional synthetic acoustic materials. The mechanical strength and eco-friendliness of the panels further enhance their suitability for commercial use.

Conclusion This study demonstrates the feasibility of using jute and banana fibers for non-woven acoustic panel production. The developed panels offer an eco-friendly, cost-effective, and efficient alternative to synthetic acoustic materials. Future research should focus on optimizing fiber composition and exploring additional bio-based binders to enhance performance.

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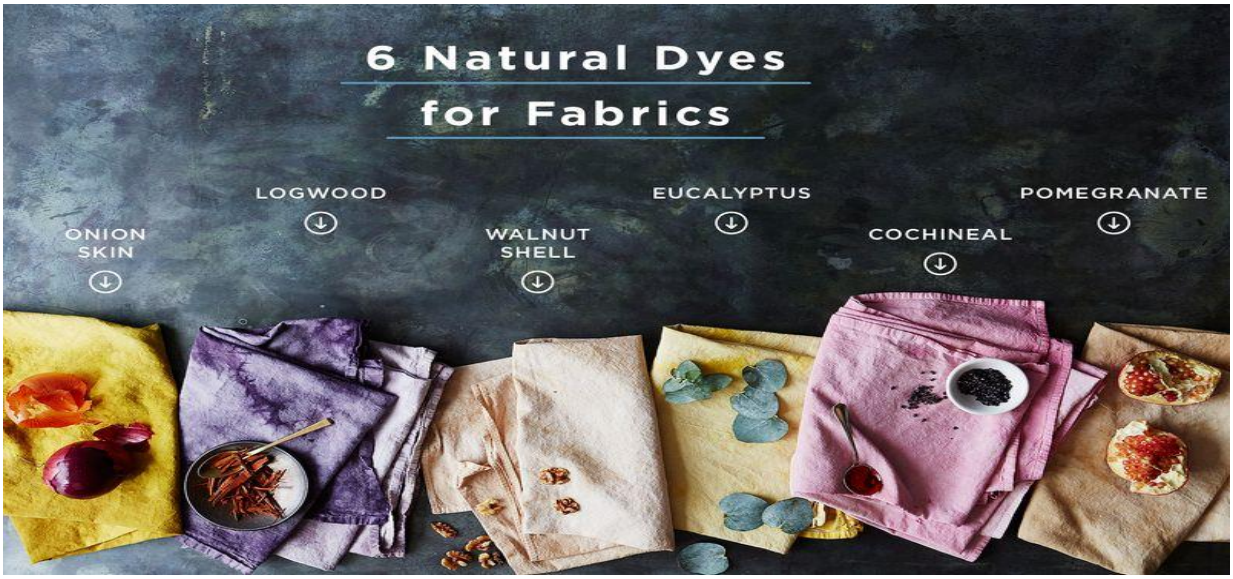
Studies on Natural Fiber-Based Acoustic Materials.

Advances in Non-Woven Fabric Technologies.

Sustainable Alternatives for Soundproofing Applications.

EUCALYPTUS BARK AS A SOURCE OF NATURAL DYE FOR COTTON FABRIC



Abstract The growing demand for sustainable and eco-friendly textile dyeing solutions has led to increased research on plant-based dyes. This study explores the potential of eucalyptus bark as a natural dye source for cotton fabric. Eucalyptus bark extracts were used for dyeing cotton fabrics under various conditions to analyze their color fastness, dye uptake, and environmental impact. The results indicate that eucalyptus bark imparts a range of natural shades to cotton fabric with satisfactory fastness properties, making it a viable alternative to synthetic dyes.

1. Introduction Textile dyeing is a significant contributor to environmental pollution, primarily due to the extensive use of synthetic dyes. Natural dyes derived from plant sources offer an eco-friendly alternative. Eucalyptus bark, rich in tannins and flavonoids, presents a promising option for sustainable textile dyeing. This study evaluates the dyeing potential of eucalyptus bark on cotton fabric and assesses its fastness properties.

Literature Review Natural dyes have been extensively studied for their environmental benefits, biocompatibility, and aesthetic appeal. Previous research highlights the role of tannin-rich plant

materials, such as eucalyptus bark, in textile dyeing. Studies suggest that natural dyes, when combined with appropriate mordants, can achieve comparable performance to synthetic dyes.

Materials and Methods 3.1 Materials

Eucalyptus bark (dried and powdered)

Cotton fabric (100%)

Mordants: Alum, ferrous sulfate, copper sulfate

Distilled water

Methodology

Dye Extraction: Eucalyptus bark was boiled in distilled water to extract the dye solution.

Fabric Pretreatment: Cotton fabric was scoured and mordanted using different mordants.

Dyeing Process: Fabric samples were immersed in the dye bath at varying temperatures and durations.

Post-Treatment: The dyed fabric was rinsed and dried under controlled conditions.

Testing: Color fastness to washing, rubbing, and light was assessed according to standard textile testing methods.

Results and Discussion The dyeing experiments revealed that eucalyptus bark produces shades ranging from light brown to deep reddish-brown, depending on mordant type and dyeing conditions. The fastness properties varied, with alum-mordanted fabrics showing the best wash and light fastness. Ferrous sulfate mordant enhanced color depth but slightly reduced fastness properties. Overall, eucalyptus bark demonstrated good potential as a sustainable natural dye source.

Conclusion This study confirms the viability of eucalyptus bark as an effective natural dye for cotton fabrics. The findings support the development of eco-friendly dyeing processes that reduce environmental pollution while offering aesthetically appealing fabric colors. Future research should explore optimization techniques to improve dye yield and fastness properties.

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Studies on Plant-Based Textile Dyes.

Advances in Natural Dyeing Techniques.

Environmental Benefits of Natural Dyes in Textile Industry.

DEVELOPMENT OF HEALTHCARE AND HYGIENE WEARS BY USING CASSAVA LEAVES

Abstract The increasing demand for sustainable healthcare and hygiene wears has led to extensive research on natural fiber-based antimicrobial textiles. This study explores the potential use of cassava leaf extracts in developing antibacterial and biodegradable healthcare

garments. Cassava leaves, known for their medicinal properties, were processed into bioactive extracts and applied to cotton and blended fabrics. The antimicrobial efficiency, durability, and comfort properties of the treated fabrics were analyzed. The results indicate that cassava leaf extracts provide significant antibacterial properties, making them a promising alternative for sustainable healthcare textiles.

Introduction With growing concerns about microbial infections and environmental sustainability, the textile industry is shifting towards natural antimicrobial agents for healthcare and hygiene applications. Cassava leaves contain bioactive compounds with antibacterial properties, making them suitable for medical and hygiene textiles. This study investigates the application of cassava leaf extracts on textiles and evaluates their performance in healthcare settings.

Literature Review Natural antimicrobial agents such as herbal extracts have been widely researched for textile applications. Previous studies highlight the effectiveness of plant-based compounds in inhibiting microbial growth. Cassava leaves, rich in tannins, flavonoids, and polyphenols, have been used in traditional medicine for their antibacterial properties, making them a potential resource for functional textiles.

Materials and Methods 3.1 Materials

- Cassava leaves (dried and powdered)
- Cotton and polyester-cotton blended fabrics
- Solvents for extraction (ethanol, distilled water)
- Mordants for fabric treatment (alum, citric acid)

Methodology

1. **Extraction of Bioactive Compounds:** Cassava leaves were extracted using ethanol and water-based solvents.
2. **Fabric Treatment:** Cotton and blended fabrics were pre-treated with mordants to enhance absorption.
3. **Application Process:** Extracts were applied using a padding and curing method.

Results and Discussion The antimicrobial tests confirmed the effectiveness of cassava leaf-treated fabrics against common bacteria such as *Staphylococcus aureus* and *Escherichia coli*. The treated fabrics retained antibacterial properties even after multiple washes. Comfort analysis showed minimal impact on fabric breathability and softness, making them suitable for prolonged wear in healthcare environments.

Conclusion This study demonstrates the feasibility of using cassava leaf extracts for developing antimicrobial healthcare textiles. The results support the potential commercialization of eco-friendly medical and hygiene garments. Further research should focus on optimizing extraction techniques and improving wash durability for enhanced performance.

SINGLE BATH DESIZING, SCOURING, AND BLEACHING USING ENZYMES

Abstract The conventional textile pretreatment processes—desizing, scouring, and bleaching—require multiple chemical treatments, leading to environmental concerns and high resource consumption. This study explores the feasibility of a single-bath enzymatic treatment to integrate these processes, reducing water and energy usage while maintaining fabric quality.

The enzyme-based treatment was applied to cotton fabrics, and its efficiency was evaluated in terms of weight loss, whiteness index, and tensile strength retention. The findings indicate that enzymatic processing offers an eco-friendly and cost-effective alternative to conventional methods.

Literature Review Enzymatic treatments have gained attention due to their biodegradability and specificity. Amylase enzymes effectively remove starch-based sizes, while pectinase and cellulase assist in scouring by degrading pectin and non-cellulosic impurities. Laccase and peroxidase enzymes aid in bleaching by breaking down natural pigments. Studies suggest that a combination of these enzymes can optimize textile pretreatment while minimizing fabric damage.

Materials and Methods 3.1 Materials

- 100% cotton fabric
- Enzymes: amylase, pectinase, cellulase, laccase, peroxidase
- Buffer solutions for enzyme activation
- Standard textile testing equipment

Methodology

1. **Fabric Preparation:** Cotton samples were pre-conditioned for enzymatic treatment.
2. **Enzyme Application:** A single-bath treatment was conducted at optimized pH and temperature conditions.
3. **Post-Treatment Evaluation:** Samples were tested for weight loss, whiteness index, and tensile strength.
4. **Comparison with Conventional Methods:** Performance metrics were analyzed against traditional chemical treatments.

Conclusion This study demonstrates the effectiveness of a single-bath enzymatic treatment for cotton fabric pretreatment. The results confirm that enzyme-based processes can achieve comparable textile properties while enhancing sustainability. Future research should focus on optimizing enzyme concentrations and exploring scalability for industrial applications.

ICE COTTON FUTURES DIP ON US TRADE POLICY CONCERNS & STRONG DOLLAR

Abstract: cotton futures closed lower amid concerns over US trade policies and a stronger dollar, making cotton costlier for overseas buyers.The March 2025 contract settled at 66.04 cents per pound, down 0.09 cents.Profit-taking in soyabeans and corn added pressure.Market sentiment weakened amid economic uncertainties.Investors await the USDA's export report for further demand insights.

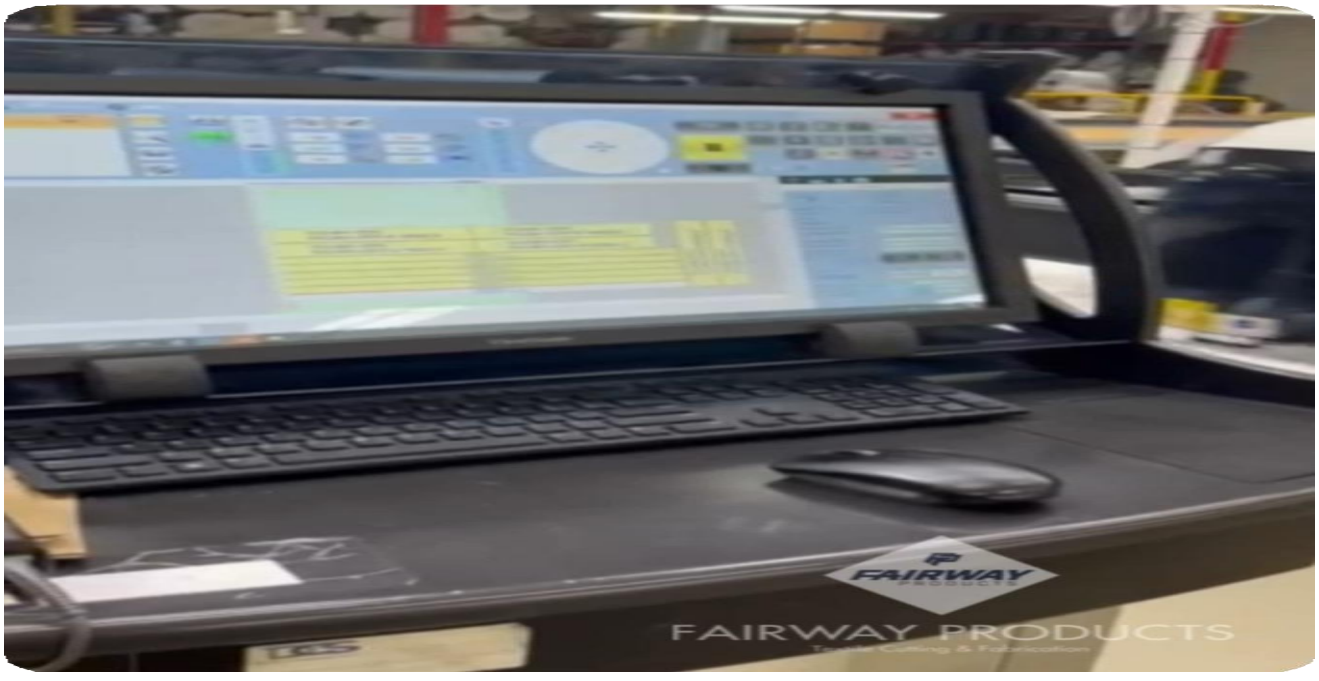
ICE cotton futures closed lower due to concerns about US trade policies and their effects on global cotton demand. Buyers were cautious amid concerns of trade tensions between the US and its major trading partners. A stronger US dollar also made cotton purchases more expensive, which hurt demand f

The US dollar index inched up again after easing on Tuesday. An increase in the US dollar makes cotton purchases more expensive for overseas buyers, hurting market sentiment in US cotton trade.

PROGRAM AND DIE-CUT CUSTOM FABRIC, FILTER, AND PAD SOLUTIONS FOR DIVERSE INDUSTRIES

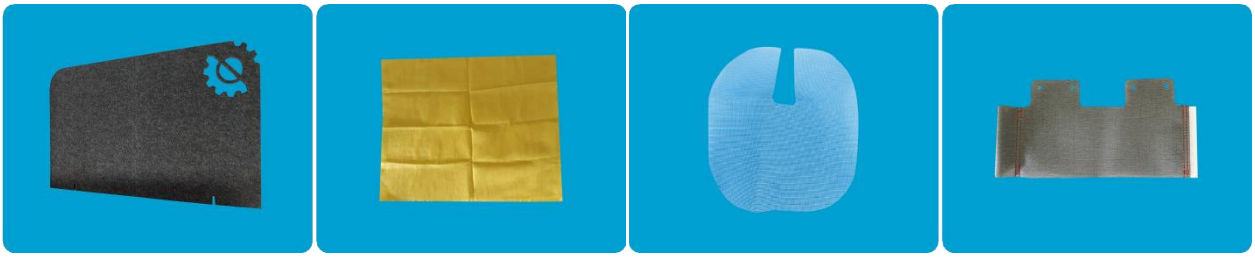
PROGRAM CUTTIN For over six decades, Fairway Products has beena leading provider of precision die-cut and program-cut components, specializing in fabrics, filters, and pads for a wide range of industries, including medical, automotive, and pharmaceutical. Our commitment to quality, innovation, and customer satisfaction has made us a trusted partner to businesses worldwide.

Leveraging state-of-the-art CAD systems, our expert team optimizes material usage to deliver cost-effective and high-quality die-cut and program-cut components. From intricate shapes to complex patterns, we offer tailored solutions to meet your exact specifications. Whether you require small-batch prototypes or large-scale production runs, we have the capacity and expertise to handle your project efficiently.



Our Filpaco filter papers renowned for their exceptional performance and versatility are available in a variety of grades, which can all be custom cut to suit the unique requirements of your filtration process. From fine particulate removal to liquid clarification, we have the ideal filter paper solution that can be cut to fit your exact application.

Our comprehensive services extend beyond die cutting and program cutting and filter paper production. We offer expert consultation to help you select the optimal materials and configurations for your specific needs. Our prototyping capabilities allow you to visualize and refine your product before committing to full-scale production. Additionally, our experienced technicians provide ongoing support to ensure your complete satisfaction.



The Power of Fairway

Do you need custom fabric, filter, or pad solutions? Fairway Products offers a comprehensive die cutting and program cutting service for various industries. We utilize advanced technology and expertise to deliver precise cuts, reduced waste, and efficient production. From medical dressings to automotive gaskets, our capabilities cater to a wide range of applications. Explore the benefits of Fairway's precision cutting and discover how we can streamline your manufacturing process.

PRECISION CUTTING:

- Gerber and Pathfinder cutters for accurate results
- Handles materials up to 90″ wide and 1.5″ thick
- Drilled holes from 1mm to 6mm
- Tension-free spreading for textiles

CUSTOM SOLUTIONS:

- No tooling required for program cutting
- Easy program modifications
- Steel rule dies for intricate designs
- Multi-ply cutting capabilities

MATERIAL VERSATILITY:

- Processes a wide range of textiles, non-wovens, films, and papers
- Cuts materials up to 2″ thick (slitting)
- Handles roll widths up to 104″ (slitting & rerolling)

ADVANCED CAPABILITIES:

- Nesting for material optimization
- Slitting and rerolling with tight tolerances (+/- 1.5mm)
- Duplex slitting for thin films and paper

Key Capabilities

Program Cutting

- Gerber and Pathfinder cutters
- Material widths up to 90″ wide
- Textile layers up to 1.5 “
- Computer guided technology
- Drilled holes 1mm-6mm
- Tension free spreader of textiles
- Easy Cut program modifications
- No tooling required
- Process a wide range of textiles

Die-Cutting

- Traveling head die cut press
- Multi-ply cutting capability
- 39″ X 39″ cutting head
- Material width up to 78″
- Steel rule dies
- Nesting capabilities

Converting

- Material widths to 70″
- Cut part size up to 70″ X 50″
- Steel rule dies
- Multi-ply material cutting

Slitting

- Processes material up to 2″ thickness
- Utilizes air score slitter knives
- Heavy duty unwind capability
- Processes material on 3″ cores
- Roll width to 60″

Slitting & Rerolling

- Wovens, non-wovens, vinyls, carpet, screen, and plastic mesh
- Roll widths up to 104″
- Roll diameters up to 53″
- Core sizes 2″-6″ on the unwind
- Core sizes 2″-3″ on roll put ups
- Cut tolerances +/- 1.5mm

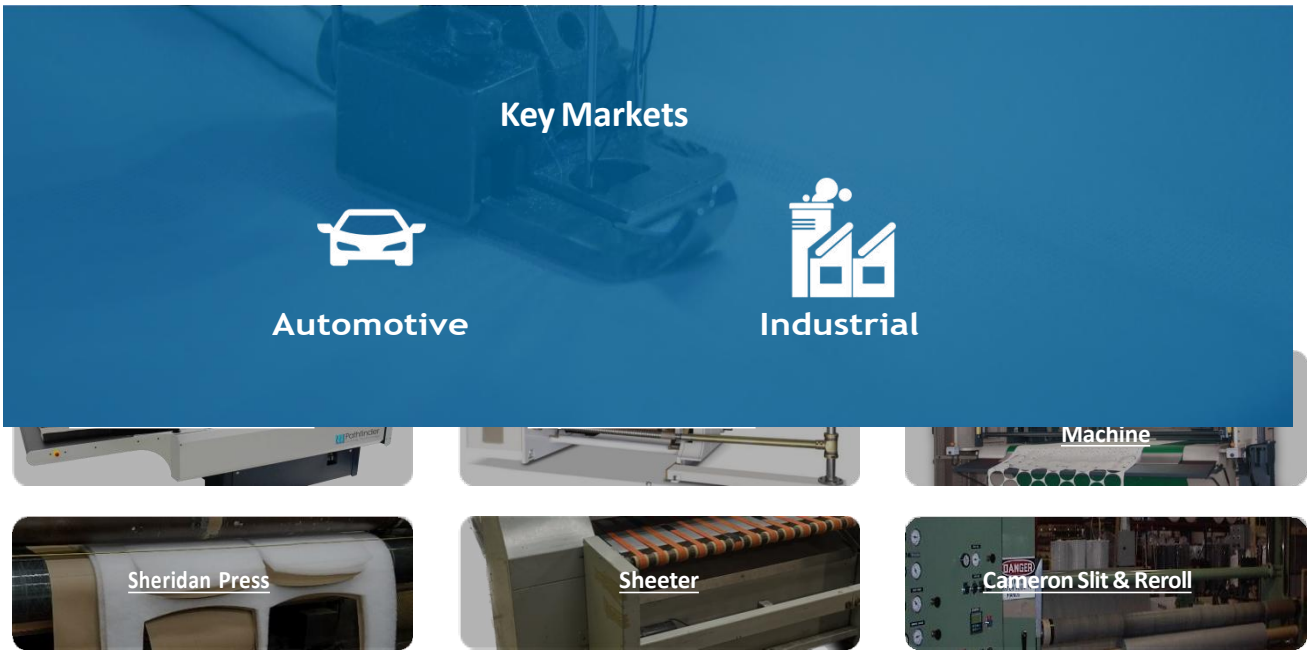
Duplex Slitting

- Unwind diameter up to 55″
- Unwind core size range 3″-7″
- Unwind roll weight up to 4000 lbs
- Rewind diameter up to 31.5″
- Rewind core sizes 2″ & 3″
- Cut widths – 1” min.
- Material: .001 – .010 in thick film (PP. PET, PE), .007 – .017 in thick paper

Materials & Equipment

Materials

- PET
- Woven PP
- HDPE
- Paper
- EPDM
- Spun PET
- Woven Screen
- Polyester
- Vinyl
- Leather
- Scrim
- Kevlar
- Foam
- Non-Wovens
- Specialty Fabrics



Precision in RV Screen Manufacturing: Fairway Products Collaborates with a Leading Outdoor Solutions Provider to Deliver High-Quality RV Screens

Summary: Fairway Products, an expert in textile and material conversion, partnered with a leading outdoor solutions provider to deliver high-quality RV screens. This project entailed die-cutting aluminum screens and attaching them to molded plastic frames through an innovative heat-staking process. The resulting product met stringent quality standards and was seamlessly integrated into the customer's assembly line, demonstrating Fairway's capabilities in precision manufacturing and value-added services.

Project Specifications

- Material: Aluminum screen
- Frame: Molded plastic
- Process: Die-cutting and heat-staking
- Product: RV screens

Uses and Applications

The RV screens manufactured in this project are designed for installation in recreational vehicles, providing durable and reliable screening solutions. These screens are essential components for RV windows, ensuring ventilation while keeping insects and debris out.

Scalability of the Project

The initial run of this project demonstrated Fairway Products' ability to scale production efficiently. Starting with a pilot batch, the process was refined and optimized to handle larger volumes, ensuring consistent quality and timely delivery. The scalability of the project underscores Fairway's capability to meet increasing demands without compromising on precision or performance.

Manufacturing Process

DIE-CUTTING
Rolls of aluminum screen are processed through a die-cut machine to achieve the required shapes.

REFRIGERATION OF FRAMES
Molded plastic frames are chilled using a refrigerated unit to ensure precise expansion during the heat-staking process.

HEAT- STAKING
The die-cut screens are heat-staked to the chilled plastic frames. As the frames return to room temperature, they expand slightly, ensuring the screens remain taut and wrinkle-free.

QUALITY CONTROL
Each RV screen undergoes rigorous quality checks to ensure adherence to specifications and ISO 9001:2015 standards.

Quality Control Steps

Fairway Products adheres to strict quality control measures throughout the manufacturing process:

- **Material Inspection: All incoming materials, including aluminum screens and plastic frames, are inspected for defects and compliance with specifications.**
- **Process Monitoring: The die-cutting and heat-staking processes are continuously monitored to maintain precision and consistency.**
- **Final Inspection: Completed RV screens are inspected for structural integrity, proper attachment, and overall quality. This includes checking for wrinkles, alignment, and durability.**
- **Certification Compliance: Adherence to ISO 9001:2015 standards ensures that all processes meet the highest quality benchmarks.**

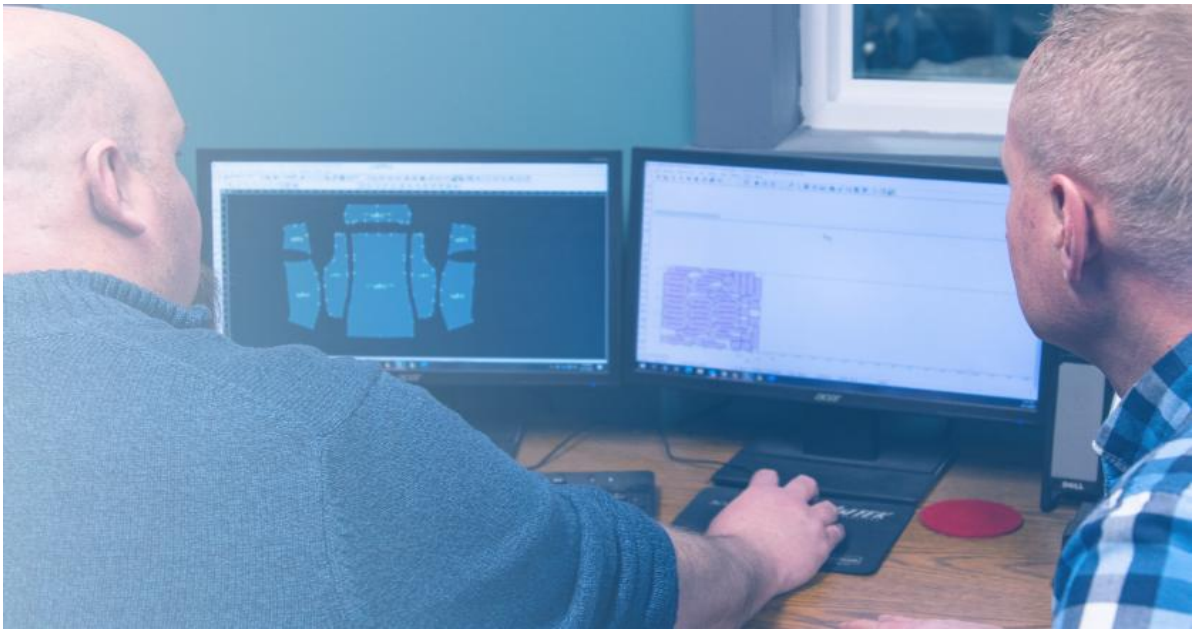
Value to the Customer: By handling both the die-cutting and the heat-staking processes, Fairway Products provided a turnkey solution that streamlined the customer's supply chain. This integration allowed the customer to receive ready- to-install RV screens, reducing assembly time and costs. The innovative use of refrigeration to maintain screen tension added a unique value, ensuring a superior product that enhances the end-user experience.

Fairway Products' ability to deliver high-quality, scalable solutions with strict adherence to quality standards exemplifies their commitment to excellence in manufacturing. This project not only met but exceeded the customer's expectations, solidifying Fairway Products as a trusted partner in the RV industry.

Product Development

From Design To The Assembly Line, We'Ve Got You Covered

Your business can count on Fairway's highly-skilled team to execute even the most complicated textile needs. Fairways process solutions are skillfully developed by our textile experts to maximize yields providing for better products produced faster.When you come to us with a project in mind, we'll collaborate with you to create a more manufacturable design that often optimizes your supply



chain.Reduce your soft goods manufacturing costs and time. Contact us for a FREE engineering consultation; click the button below to get started.

Development of disposable surgical gowns, drapes, and masks; creation of wound care dressings and filtration systems for medical equipment.

SEATING & SEAT COVERS

Design and production of transportation seating and interior components. From automotive to buses to airplanes and everything between.

INDUSTRIAL MANUFACTURING

Creation of industrial filtration systems for HVAC systems, dust collection, and liquid filtration; development of protective apparel for industrial workers.

Innovation

Our experts join forces to determine the best materials,

layout, size, etc. To make the best product for your needs.

Design

Our engineers determine the most efficient way we can make your productwhile maintaining high-quality results.

Development

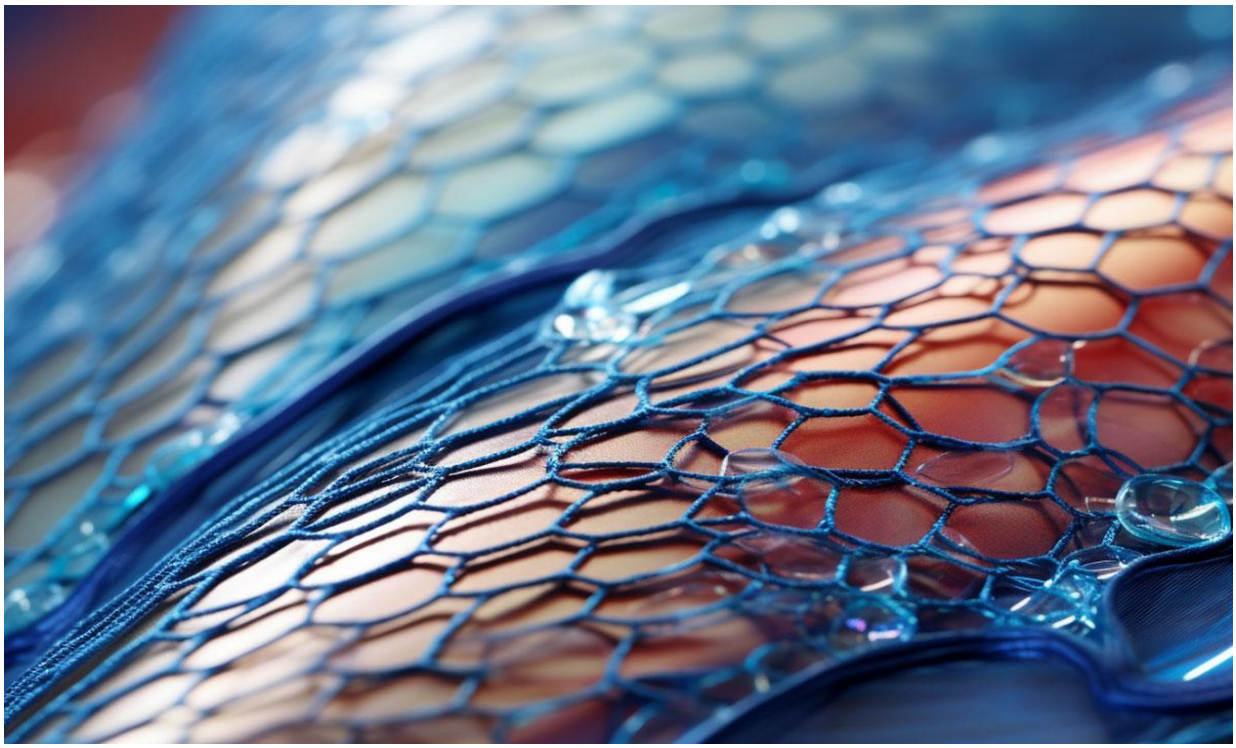
We have invested in highly effective and efficient technology to makeproducts better, faster, and for an affordable price.

Our expert employees have the skills and the experience to take even the most basic napkin sketch of an idea and transform it into a product you'll love.

When you come to us with a project, the first thing we'll do is go through the vetting process. Then, our top experts determine the best raw materials for the product based on our extended experience to determine the most efficient process.

At Fairway, we're committed to educating and empowering our employees so that the entire floor is involved in making the process and the products better, and doing so responsibly with an economy of materials and time, and a dedication to safety.

Smart textiles: Definition, uses, types, limitations, innovations



Smart textiles are revolutionizing the way we think about fabrics and their applications. Gone are the days when textiles were just about comfort and style. Today, they intertwine with technology to enhance our health and well-being.

These advanced fabrics are making waves in the health and wellness industry, from monitoring vital signs to adjusting to environmental changes.

As we explore this topic, you'll gain insights into what makes a textile 'smart', its varied uses, and its future possibilities.

Read on as we break down the essentials of smart textiles for everyone to understand and appreciate.

What is a smart textile?

Smart textiles, also called electronic textiles or e-textiles, are fabrics that contain electronic components to enhance the features of wearables and other products

They should not be confused with e-textiles, which allow electronic components such as batteries, lights, sensors, and microcontrollers to be embedded into fabrics.

Smart textile fabric can be made from a range of materials, including traditional cotton, polyester, and nylon, as well as advanced Kevlar with integrated functionalities.

These textiles are embedded with digital components or special fibers which enable them to interact with the user or the environment.

For example, a shirt that can monitor your heart rate or a jacket that adjusts its warmth based on the surrounding temperature.

Key features of smart textiles include:

Responsiveness: They can adapt or change based on certain triggers, be it body temperature, light, or other environmental factors.

Integration: Traditional fabrics are combined with modern technology. This could mean embedding sensors, microchips, or other electronic components.

Functionality: Beyond style and comfort, these textiles have a specific purpose or function, often related to health, safety, or convenience.

Interactivity: They often work with apps or devices, allowing users to access or interpret the data gathered.

To put it simply, smart textiles blend the boundaries between fashion and function, offering innovative solutions that make our lives easier and healthier.

As technology advances, the capabilities of these textiles are set to expand even further, reshaping how we think of clothing and fabrics.

What is the difference between traditional textiles and smart textiles?

Traditional textiles focus primarily on aesthetics, comfort, and basic protection. They offer colors, patterns, and warmth, but their functionalities stop there. These products have the following characteristics:

Made from traditional materials such as cotton, wool, silk, and polyester.

Do not contain electronic components.

Do not have the ability to sense or respond to changes in the environment.

Do not have the ability to perform specific functions beyond that of a traditional woven textile.

On the other hand, smart textiles stretch beyond these basic roles. They're designed with added technology or special fibers, allowing them to interact and adapt [2]. They:

Are made from traditional materials as well as advanced materials like Kevlar with integrated functionalities.

Contains electronic components such as sensors, actuators, and microcontrollers.

Can sense and respond to environmental changes.

Can perform specific functions beyond that of a traditional woven textile.

Can be either passive or active. Passive smart textiles have functionality beyond that of a traditional woven textile, but they generally do not adapt because of the information they sense. Active smart textiles are responsive to changes in the environment and user input.

While traditional textiles serve as passive materials for clothing or decoration, smart textiles actively engage with users and their surroundings, providing advanced solutions and benefits.

What materials are used in smart textiles?

Smart textiles, with their ability to sense, adapt, and react, are far from ordinary fabrics. Their uniqueness stems from the materials used in their construction. Let's explore some primary materials that make these textiles 'smart'.

E -Textiles

Weaving Electronics into WearableFabrics A Comprehensive Guide

E-textiles havetransformed the landscape of textiles by seamlessly integrating electronic components, revolutionizing wearable technology. These fabrics, blending traditional textiles with cutting-edge technology, open up a world of possibilities in materials science and fashion. The marriage of electronics and textiles has paved the way for comfortable, functional wearables that effortlessly integrate into our daily lives. This innovative fusion not only enhances the aesthetics of clothing but also adds practical functionalities to everyday garments. E-textiles, a remarkable example of research at university, enable us to interact with technology in an unobtrusive yet impactful manner.

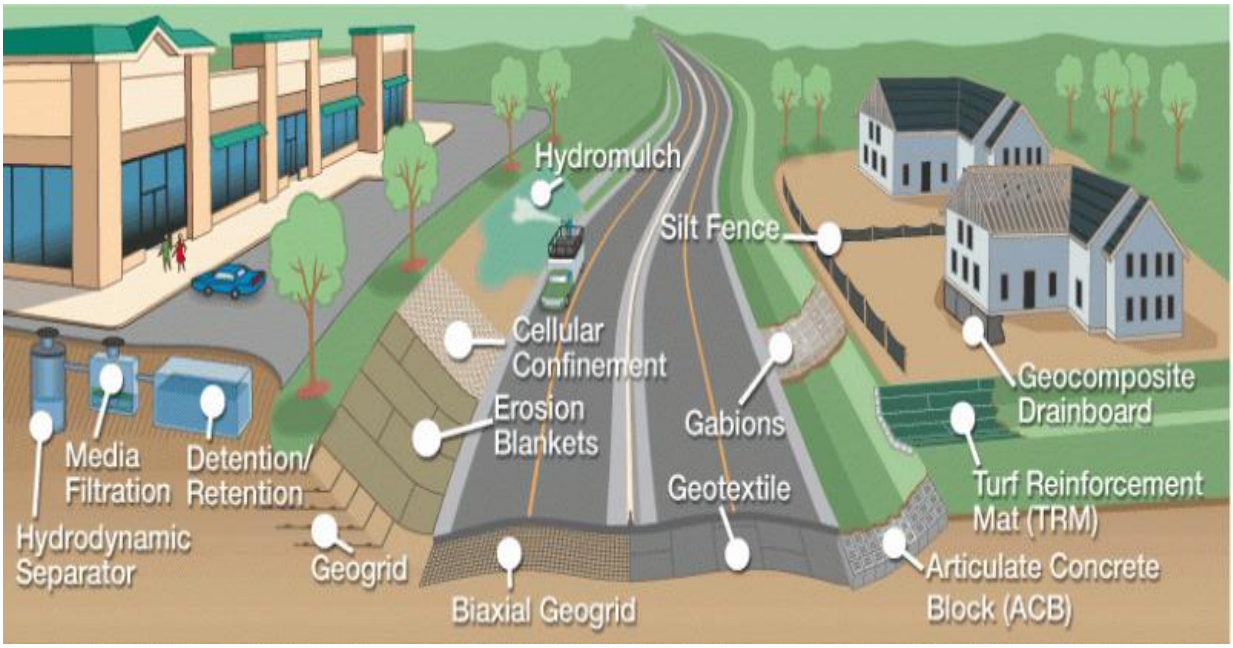
Unraveling the World of Electronic Textiles

Versatile Applications

Electronic textiles, also known as e-textiles, seamlessly integrate electronics into wearable fabrics. These innovative textiles, for example, have a broad spectrum of applications across various industries. From fashion and sports to healthcare and military sectors, e-textiles are revolutionizing the way we interact with clothing and accessories. For instance, in the healthcare sector, e-textiles can be used to monitor vital signs or deliver medication through garments. Similarly, in the military sector, these textiles can incorporate technologies for communication or monitoring soldiers' health.E-textiles are designed to be highly adaptable; they can be flexible, stretchable, and even washable without compromising their functionality. This adaptability makes them suitable for a myriad of uses, for example, where traditional electronics would not suffice due to rigidity or lack of durability. For example, in sports apparel, e-textiles offer athletes comfortable yet high-performance gear that can monitor biometric data during training sessions or competitions.

Geotextile

Geotextile is a synthetic permeable textile material used to improve the soil characteristics. It has the ability to separate, filter, reinforce, protect and drain when used in association with soils. Geotextiles are ideal materials for many infrastructure works such as roads, harbors, landfills, drainage structures, and other civil projects.



Types of Geotextile

Geotextiles are made up of polymers such as polyester or polypropylene. They are divided into 3 categories on the basis of the way they are prepared :

1) Woven Fabric Geotextiles

2) Non-Woven Geotextiles

3) Knitted Geotextiles

1. Woven Fabric Geotextile

Commonly found geotextiles are of the woven type and are manufactured by adopting the techniques which are similar to weaving usual clothing textiles. This type has the characteristic appearance of two sets of parallel threads or yarns. The yarn running along the length is called warp and the one perpendicular is called weft. (As shown in the figure below)

2. Non-Woven Geotextile

Non-woven geotextiles are manufactured from either continuous filament yarn or short staple fiber. The bonding of fibers is done using thermal, chemical or mechanical techniques or a combination of techniques.

Geo-fibers obtained from mechanical interlocking or chemical or thermal bonding have a thickness of 0.5-1 mm while chemically bonded non-wovens are comparatively thick usually in the order of 3 mm.

3. Knitted Geotextile

Knitted geotextiles are manufactured by the process of interlocking a series of loops of yarn together. All of the knitted geosynthetics are formed by using the knitting technique in conjunction with some other method of geosynthetics manufacture, such as weaving.

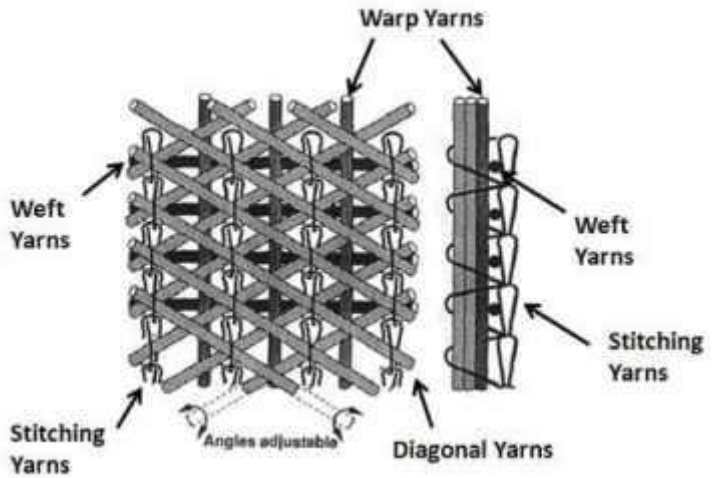


Fig 4: Knitted Geotextile.

Apart from these three geotextiles, other geosynthetics used are geonets, geogrids, geo-cells, geomembranes, geocomposites, etc. each having their own distinct features and uses for special applications.

Recommended Read: Geosynthetics in Civil Engineering and Construction Works

Functions of Geotextiles

The mode of operation of a geotextile in any application is defined by six discrete functions :

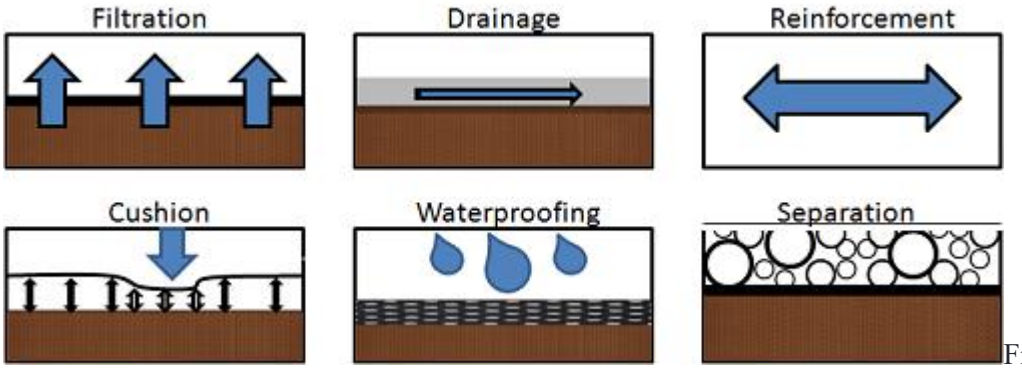


Fig 5: Functions of Geotextiles.

1. Separation

The separation function of geotextile is majorly used in the construction of roads. Geotextile prevents the intermixing of two adjacent soils. For example, by separating fine subgrade soil from the aggregates of the base course, the geotextile preserves the drainage and the strength characteristics of the aggregate material.

Some of the applicable areas are:

- Between subgrade and stone base in unpaved and paved roads and airfields.
- Between subgrade in railroads.
- Between landfills and stone base courses.
- Between geomembranes and sand drainage layers.

2. Filtration

The equilibrium of geotextile-to-soil system that allows for adequate liquid flow with limited soil loss across the plane of the geotextile. Porosity and permeability are the major properties of geotextiles which involve infiltration action.

A common application illustrating the filtration function is the use of a geotextile in a pavement edge drain, as shown in the figure above.

3. Reinforcement

Introduction of geotextile in the soil increases the tensile strength of the soil the same amount steel does in concrete. The strength gain in soil due to the introduction of geotextile is by the following 3 mechanisms :

- Lateral restraint through interfacial friction between geotextile and soil/aggregate.
- Forcing the potential bearing surface failure plane to develop an alternate higher shear strength surface.
- Membrane type of support of the wheel loads.

4. Sealing

A layer of non-woven geotextile is impregnated in between existing and new asphalt layers. The geotextile absorbs asphalt to become a waterproofing membrane minimising vertical flow of water into the pavement structure.

Uses of Geotextile in Construction

The scope of geotextile in the engineering field is very vast. The application of geotextile is given under the heading of the nature of work.

Road Work

Geotextiles are widely used in the construction of the road. It reinforces the soil by adding tensile strength to it. It is used as a rapid de-watering layer in the roadbed, the geotextiles need to preserve its permeability without losing its separating functions.Fig 6: Use of Geotextile in road construction.