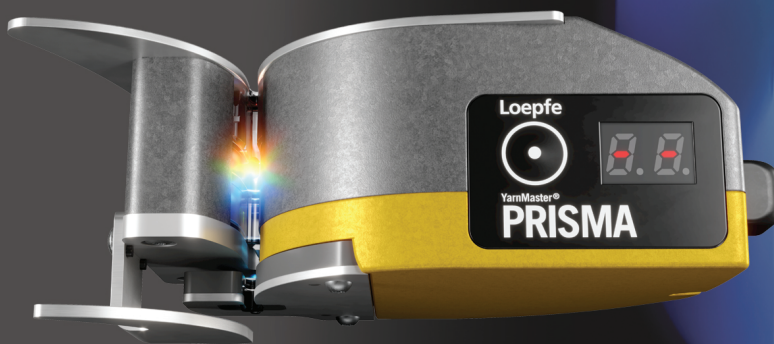




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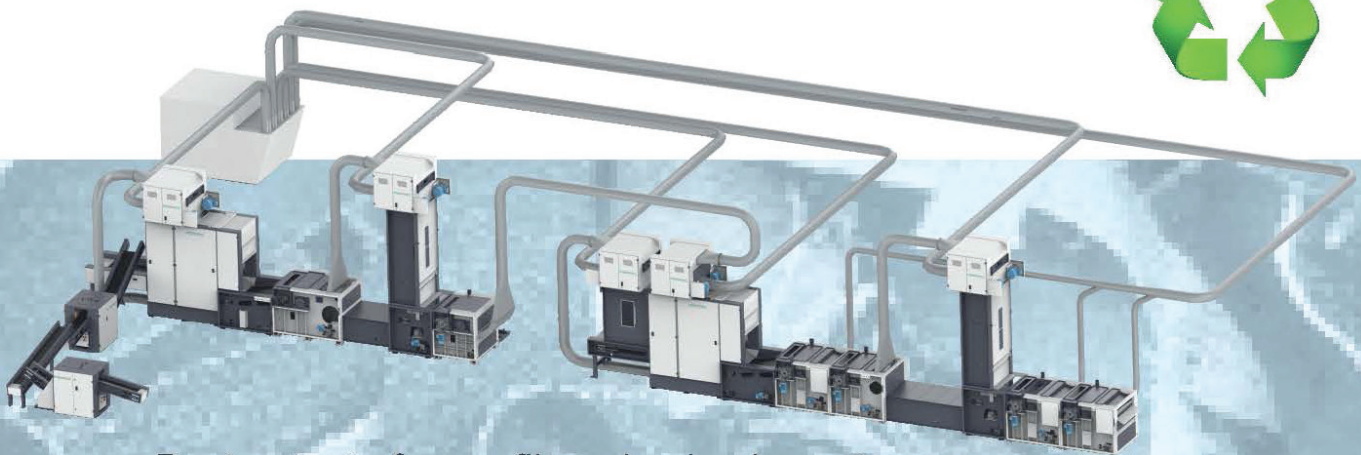


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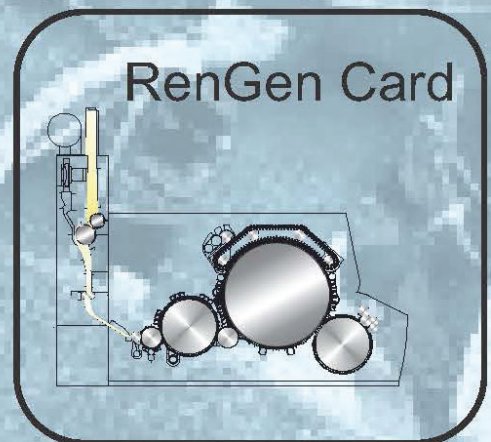
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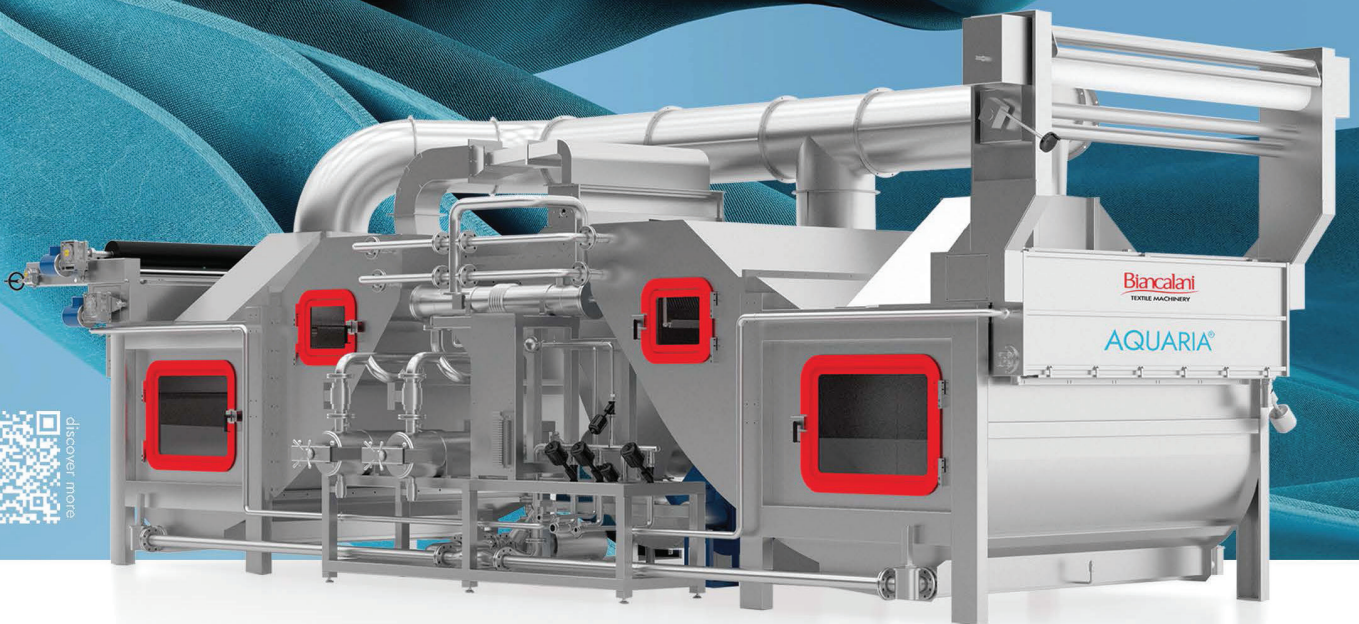
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## Fashionably responsible



Textile manufacturing is the oldest and leading generator of employment, especially among the developing economies. On the flip side, the industry is responsible for an estimated 2-8 per cent of the world's greenhouse gas emissions and accounts for 9 per cent of annual microplastic losses to the oceans. According to an estimates, around 215 trillion litres of water per year is consumed by the textile industry world over, out of which 6-9 trillion litres is consumed only for fabric dyeing.

Indian textile industry, which prides itself on being the second largest employer in the country after

agriculture, is also facing the brunt of climate change. Adding to the woes is the energy and water-intensive nature of the textile manufacturing industry. Textile processing units need large quantity of water for washing raw fabric before dyeing and then to remove unfixed colours after printing. And dyeing requires soft water, putting a big load on freshwater reserves. For using hard water, textile firms have to use chemical agents to soften it.

According to data from the Confederation of Indian Textile Industry (CITI), textile dyeing and processing units are among the largest consumers of water and energy in the industry. Textile dyeing and processing units consume approximately 200 litres of water per kg of fabric produced, highlighting the need for water conservation measures. Environment-friendly technologies are available, but they come at a cost; hence, the transition to sustainable development is slow.

International brands are putting pressure on their suppliers from across the world to mitigate emissions and follow the best environmental compliance standards. On their part, textile makers - mostly comprising micro, small and medium enterprises (MSMEs) - are responding by modifying manufacturing processes with the efficient use of coal, electricity and water and by adopting renewable energy.

There are some successful stories in India where companies have collaborated to find solutions for environment issues. Surat, which has over six lakh power looms and 450 processing-dyeing and printing units, became the first city in India to set up a tertiary water treatment plant to recycle sewage water and supply it to textile industries. Small changes such as installing a Y-valve (which reduces water wastage) and reusing the wash water (that has less impurities) have led to a lot of water saving in textile clusters.

Some MSMEs in India have installed a Programmable Logic Controller (PLC) for dyeing machines, an automation technology approved by Energy Efficiency Services Limited (EESL), to reduce usages of energy, steam, chemicals, and water while giving higher production. Digital printing is another solution for achieving sustainability goals. While digital printing is far more flexible and precise in terms of colours and designs (as compared to the traditional screen printers), there is no acidic effluent discharge from washing to get rid of unfixed colours.

India's fashion industry revenue is projected to grow from \$ 18.51 billion in 2022 to \$ 39.42 billion by 2027 at an annual growth rate of 16.32 per cent. By implementing water and energy conservation measures, the industry can reach the goal more responsibly.



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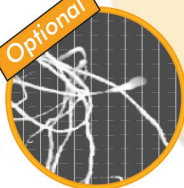
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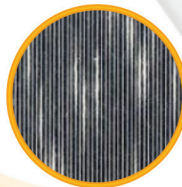


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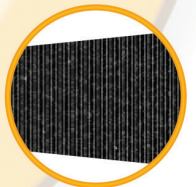
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**PM Modi inaugurates Bharat Tex 2024 India's largest textiles mega event**



Bharat Tex 2024, a global textile mega event in the textile industry, was officially launched today at Delhi's Bharat Mandapam by Prime Minister Narendra Modi. This monumental event is orchestrated by a collaborative effort of 11 Textile Export Promotion Councils, with backing from the Ministry of Textiles. Built on the twin pillars of trade and investment and with an overarching focus on sustainability, the 4-day event promises to be a tapestry of tradition and technology, attracting, besides policymakers and global CEOs, over 3,500 exhibitors, over 3,000 buyers from over 50 countries, and more than


40,000 trade visitors from 100 countries. An exhibition spread across nearly 2 million sq ft of area and encompassing the entire textile value chain, will help position India as a global powerhouse in textiles, showcasing its capabilities and generating momentum throughout the entire Indian textiles ecosystem.

Bharat Tex 2024 is a prominent international industry platform, featuring exhibitions, knowledge sessions, thematic discussions, Government-to-Government (G2G) meetings, Business-to-Business (B2B) networks, the signing of Memoranda of Understanding (MoUs), product launches, thematic and interactive pavilions and various other activities.


Inspired by the 5F Vision of the Prime Minister, the event scheduled from February 26-29 has a unified Farm to Fashion focus, covering the entire value chain.

Bharat Tex 2024 has been designed to attract top level policy makers, business CEOs, investors, textile thought leaders, industry captains, sustainability champions, multilateral organisations, global institutes, and other stakeholder to deliberate on issues and challenges faced by the global textiles industry and India's strengths that can be leveraged to address these issues.


The event has received an overwhelming response with leading global textile companies including Coach,




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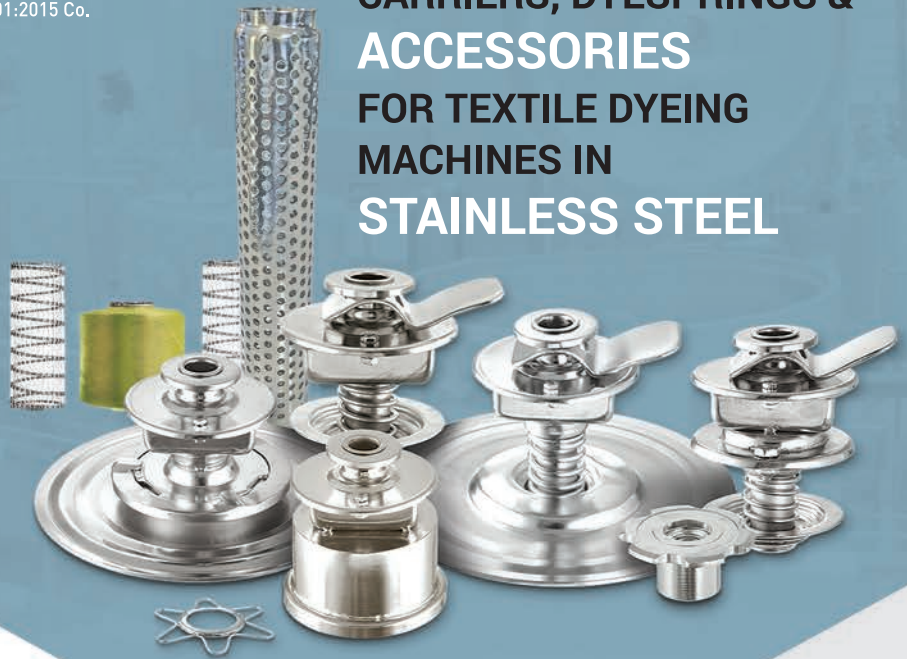
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**Mumbai edition of Gartex Texprocess India demonstrated innovation and growth**



The 3rd Mumbai edition of Gartex Texprocess India which concluded on February 3, turned out to be one of the most recognised 'one-stop' platforms for selling and sourcing exciting and innovative products in the garment and textile manufacturing sector.

The event marked the presence of Chandrakant Patil, Minister of Textile, Higher Education and Technical Education, Parliamentary Affairs State Border Defence and Virendra Singh (IAS) Secretary Textiles, Maharashtra Government along with other industry stalwarts.

In the 3rd Mumbai edition of Gartex Texprocess India, 105 exhibitors participated and 8,309 visitors explored the show floor which displayed cutting-edge garment manufacturing machinery, fabrics, advanced and new-age smart technology, textile printing solutions and others.

Gartex Texprocess India also hosted knowledge-sharing sessions – 'Gartex TALKS' on day one and 'Denim TALKS' on day two. At 'Gartex TALKS', Mr Ramesh Gosai, Principle Consultant, R R Gosai & Associates spoke on "Ease of Doing Business: In Garment Manufacturing". He briefed the attendees on what are the challenges faced by people in starting a business in the textile industry and how they can overcome those hurdles and establish their business successfully.

'Denim TALKS' conducted four sessions to discuss the latest trends and landscape of the Denim industry. It began with a fireside chat on the 'Denim Landscape' between Amit Gugnani, Senior Partner, Technopak Advisors and Aamir Akhtar, Group President and CEO, Jindal Worldwide. In the next session Manuj Kanchan, Division Director - Central Asia, Jeanologia SL shared a

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presentation on 'Water Era is Over, Air is the Future'. Through his presentation, he explained how Jeanologia SL is bringing a new era in Denim manufacturing by reducing water usage with the use of air technology in denim dying.

Madhulika Tiwari, Partner, Technopak Advisors gave an insight on 'Denim Market India'. She took the audience through the Denim journey in India and the evolution of Denim products among different demographics in India. The last session of 'Denim TALKS' was presented by Puneet Dudeja, Director, Business Development, South Asia, WGSN on Denim Trends AW 24/25.

## Indo Count embarks on a long-term digital transformation journey with Accenture



Indo Count Industries announces a strategic and long-term partnership with Accenture, a global leader in digital transformation and technology services.

This collaboration marks a pivotal moment in Indo Count's commitment to redefining and enhancing its business operations through cutting-edge digital technologies. The partnership aims to unlock operational efficiencies and chart new avenues for growth, positioning Indo Count as a leader in the competitive home textile industry.

As part of the digital transformation journey, Accenture will play a key role in standardising, optimising, and re-engineering various business processes, including manufacturing, supply chain, logistics, and procurement. The focal point of this collaboration is the design, development, and deployment of a robust digital core utilising SAP S/4HANA Cloud.

K K Lalpuria, Executive Director and CEO of Indo

Count Industries, expressed his enthusiasm about the long-term partnership, stating, "In our dynamic business landscape, the need for agility and innovation is paramount. Indo Count's collaboration with Accenture underscores our unwavering commitment to staying at the forefront of technological advancements. This partnership is a testament to our dedication to fostering a culture of innovation. We believe that through this collaboration, we will not only unlock significant value but also elevate the overall customer experience."

Accenture's expertise in the textile industry and its global recognition played a crucial role in Indo Count's decision to choose them as a strategic partner. The technology platform, powered by data and analytics, will automate and digitise operations, facilitating improved inventory management, quality standardisation, optimal energy consumption, and sustainable growth.

This partnership signifies a commitment to long-term collaboration, focusing on value addition, innovation, and customer-centric approaches. Indo Count Industries Limited is confident that, with Accenture's support, they will achieve new heights of success and provide unparalleled value to their customers and stakeholders.

## Welspun Living appoints Sunil Duggal as Independent Director

Welspun Living, a leading player in home textiles,



flooring solutions, and advanced textiles, announces the appointment of Sunil Duggal as an Independent Director, effective from January 31, 2024.

Duggal will serve his first term as an Independent Director for four years, ending on January 30, 2028. Duggal is an accomplished leader, with a Bachelor of

Technology Hons (Electrical Engineering) from BITS, Pilani, and a postgraduate diploma in Business Management (Marketing) from the Indian Institute of Management, Calcutta.

His extensive experience, spanning decades, includes

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a remarkable 17-year tenure as CEO of Dabur India. He has also chaired and cochaired significant committees, such as Indo-Turkish JBC and FICCI Committee on Food Processing. Duggal has been recognised as FMCG CEO of the year thrice and was awarded the Distinguished Alumnus Award by the Indian Institute of Management Calcutta in 2019. His expertise will be invaluable to Welspun Living.

Dipali Goenka, CEO & MD of Welspun Living, on the appointment of Sunil Duggal said, "I am delighted to welcome Sunil Duggal to Welspun's Board of Directors. His extensive experience, particularly in steering Dabur's success, aligns seamlessly with our commitment to elevating Welspun's B2C journey. As we embark on this transformative phase, his consumer-centric perspective and experience in building strong consumer connections resonates perfectly with Welspun's vision. His insights into consumer behavior and market dynamics will be instrumental as we continue to innovate and cater to the evolving needs of our audience. Together, we are poised to strengthen Welspun's position in the market, combining our passion for quality with Sunil's wealth of experience. I look forward to working with him."

Joining as an independent director with Welspun Living, Duggal added, "As an Independent Director, I am truly excited to contribute my experience and knowledge to Welspun Living's diversified brand portfolio, fostering growth and ensuring success. The company's unwavering commitment to innovation and sustainability is truly inspiring, aligning seamlessly with my values. I am eager to embark on this exciting journey, working collaboratively to further elevate Welspun Living's impact in the industry."

## Textile park spanning 1,000 acres on Lucknow-Hardoi Road to come soon

In an effort to boost the struggling power loom sector, it was announced by the Yogi Adityanath government that a sum of Rs 400 crore has been allocated for the Atal Bihari Vajpayee Powerloom Vidyut Flat Rate Yojana. Furthermore, approval has been granted for a mega textile park under the PM Mega Integrated Textiles Region and Apparel Scheme. The project, set to

be established on approximately 1,000 acres on the Lucknow-Hardoi Road, has been provisioned with Rs 400 crore.



It is anticipated that this textile park will attract investments ranging from Rs 10,000 to Rs 15,000 crore, generating approximately one lakh direct and two lakh indirect employment opportunities.

Additionally, the National Institute of Fashion Technology (NIFT) in the prime minister's constituency, Varanasi, has received a boost of Rs 150 crore in the budget.

Khadi and village industries are also a focus of attention. Under the Pandit Deendayal Gramodyog Rojgar Yojana, a provision for an interest subvention facility for beneficiaries has been made for three years, with a budget of Rs 14 crore allocated for this scheme. Furthermore, a budget of Rs 15.75 crore has been set aside for Khadi and Gramodyog Vikas Satat Rojgaar Protsahan Neeti.

Moreover, an amount of Rs 11.25 crore has been proposed for the Integrated Development Program of Clay Art, aiming to provide employment opportunities to traditional artisans engaged in clay art.

In the realm of IT and Electronics, under the Uttar Pradesh Data Centre Policy-2021, the initial goal was to develop three state-of-the-art private data centre parks and a 250 MW data centre industry in the state. However, a new target has been set, envisioning eight new data centres with a capacity of 900 MW and an estimated investment of Rs 30,000 crore.

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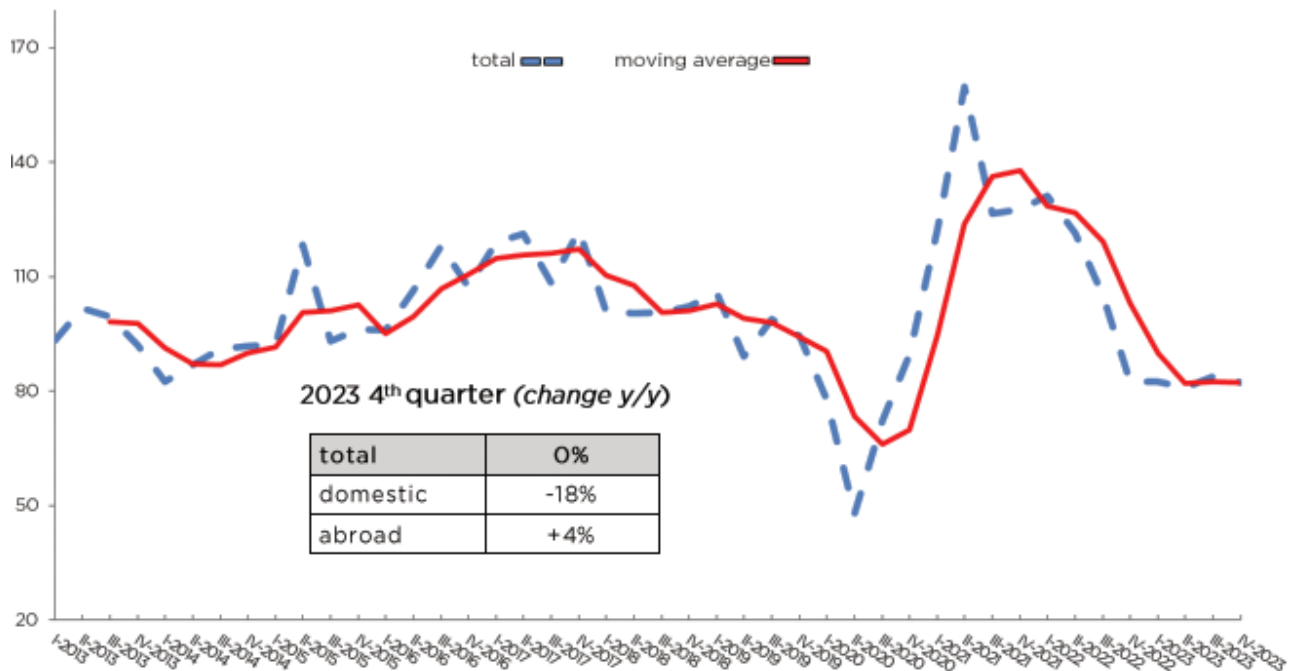
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# Italian textile machinery: 2023 fourth quarter orders remain stationary

Overall for the fourth quarter, the average order backlog yielded 3.7 months of assured production.

**ITALIAN TEXTILE MACHINERY**  
**THE INDEX OF ORDERS INTAKE AT CONSTANT VALUE (BASIS 2015=100)**



In the fourth quarter of 2023 Italian textile machinery orders index, drawn up by the Economics Department of ACIMIT, the Association of Italian Textile Machinery Manufacturers, appears to be stationary compared to data recorded for the same period in 2022. In terms of absolute value, the index stood at 82.4 points.

This is the result of an upswing in orders from foreign markets, counterbalanced by declining orders on the domestic front. While orders in Italy decreased at 18 per cent rate, a 4 per cent increase was observed abroad. The absolute value of the index on foreign markets amounted to 77.9 points, whereas it came in at 126.2 points domestically. Overall for the fourth quarter, the average order backlog yielded 3.7 months of assured production.

For the whole 2023 year, the index declined 25 per cent overall compared to the 2022 average (absolute index of 82.4). On the home front however, the index dropped 24 per cent (absolute index of 124.5), while slipping 25 per cent abroad (absolute index of 78.4).

Marco Salvadè, President, ACIMIT, commented the data, “The orders index for October – December 2023, as elaborated by our Economics Department, confirms an intake of orders that is still weak, with a negative trend in demand for machinery that is on-going for the domestic market.” Nonetheless, the orders index abroad shows a slight increase. “We estimate that the global geopolitical context is still a source of concern,” continued Salvadè, specifying that, “For the first nine months of 2023, Italian exports on major global markets (i.e. China, Turkey, India and the United States of America), confirm a widespread decline. However, some positive signs emerged in the fourth quarter of last year, as reflected by the latest orders index. For 2024 we expect a consolidation of this trend reversal.”

ACIMIT is a private non-profit making body and its main purpose consists in promoting the Italian textile machinery sector.



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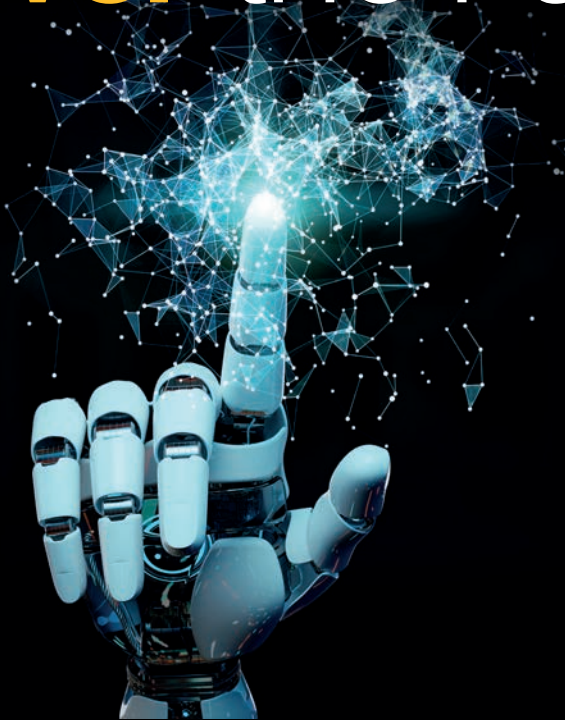
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# SIMA hails the extension of RoSCTL scheme till March 2026

Originally the RoSCTL Scheme was valid till March 31, 2020, it was extended intermittently through budgetary allocations and is currently valid till March, 31, 2024.

Indian Textiles & Clothing (T&C) sector is contributing around 8 per cent to country's overall exports. The export of T&C is stagnant at around \$ 35 to 37 billion and saw a major rise during 2021-22, due to pent up demand immediately after the second COVID wave. The Government has been effectively formulating new export promoting schemes and revising the existing ones vis., Duty Drawback, IES, RoSCTL, RoDTEP, etc., to sustain the global competitiveness of the exporters, so as to retain the existing market in addition to exploring new markets. With a view to effectively implement the principle that taxes and duties should not be exported and to enable a level playing field in the international market for Indian players, the blocked duties and levies on export products are being refunded through Rebate of State and Central Taxes and Levies (ROSCTL) scheme by the Ministry of Textiles, Government of India with effect from March 07, 2019, replacing the Rebate of State Levies (RoSL) Scheme. The Scheme applies to export of garment/apparels and Made-ups. This export incentive is in addition to the Duty Drawback Scheme applicable to export. Though, originally the RoSCTL Scheme was valid till March, it was extended intermittently through budgetary allocations and is currently valid till March 31, 2024.

When the Interim Union Budget was presented on February 1, 2024, the industry was eagerly awaiting the continuation of the Scheme beyond March 2024. Through the interim Union Budget for the fiscal 2024-25, it has been announced that the Union Cabinet chaired by the Prime Minister of India has approved the extension of the Scheme till March 31, 2026.



Dr S K Sundararaman,  
Chairman, SIMA

In a Press Release issued, Dr S K Sundararaman, Chairman of The Southern India Mills' Association (SIMA), has welcomed the visionary move of the Union Government and thanked the Prime Minister and the Union Textile Minister for extending the scheme. He also expressed that the continuation of RoSCTL scheme would help in sustaining the competitiveness of the Indian textile exporters in the global arena. The extension of the operation of the

RoSCTL scheme would enable the exporters to finalise long-term export contracts by factoring in the incentive in the costing of export products, thereby establishing strong business connections with the foreign buyers.


Dr Sundararaman has appreciably acknowledged that the move of the government to conclude the FTAs with the major exporting countries in the background of the extended export benefit, would go a long way in supporting the struggling textile exporters, particularly in today's scenario where the order enquiry is stagnated and foreign buyer order confirmations are declining, as a result of recession prevailing in the EU and other parts of the developed economies.

Dr Sundararaman has stated that the scheme extends benefits even for the exporters, who have been importing fabric, the major raw material for the manufacture of apparel/made-ups, through Advance Authorisation Scheme. He added that under the RoSL scheme the refund was to the extent of 1.70 per cent and 1.16 per cent for cotton and MMF T-Shirt and the same were enhanced to 4.9 per cent with a cap of Rs 13.8/kg and 3.8 per cent with a cap of Rs 10.1/kg respectively under RoSCTL scheme and similarly the scheme was extending 2.20 per cent and 1.40 per cent for cotton bedlinen / table linen / kitchen linen and MMF bedlinen respectively which were enhanced to 5.00 per cent with a value cap of Rs 50/kg and 3.80 per cent with a value cap of Rs 49.20/kg. He hoped that this measure would enable the Indian textile industry to achieve the export target fixed by the government to the tune of per cent 100 billion by 2030.

Dr Sundararaman affirmed that the extension of the export supportive scheme was a conscious visionary move to draw substantial investment and consequently generate additional employment.

Today, SIMA is the single largest employers' organisation representing the organised textile industry in the world and the only employers' organisation of the textile industry having in-house expertise to advice right from designing the textile project to marketing. It has earned goodwill and brand image across the textile value chain in the country and more so with the government.



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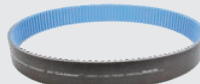
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# When every drop counts!

As the emphasis on sustainability grows, textile manufacturers are implementing measures to reduce, reuse, and recycle wastewater. Nonetheless, there are a few challenges that need to be addressed, emphasises **Divya Shetty**.

**T**he integration of new technology has brought about a complete revolution in the textile manufacturing process. However, the swift pace of industrialisation has led to a notable surge in wastewater generation. The textile manufacturing requires a large amount of water that often impacts freshwater supplies resulting in water crisis in many cities in India. Textile manufacturing units generate a large amount of wastewater, which is hardest to treat because it contains fibres and pigments that are also harmful for the environment.

These effluents must be treated and reused to reduce stress on freshwater reserves and help protect the ecosystem from pollution.

“In terms of raw water, around 61–646L kg of cloth are used in Indian mills. 58-81 per cent of wastewater is discharged from the entire amount of



**Dr Reena Mehta,**  
Professor, General  
Management, K J  
Somaiya Institute of  
Management

water consumed (Senthil, 2019),” informs **Dr Reena Mehta, Professor, General Management, K J Somaiya Institute of Management.**

The production process entails various chemical and physical processes, encompassing sizing, de-sizing, scouring, bleaching, mercerizing, dyeing, finishing, and printing. The wastewater discharged from the textile industry contains detrimental pollutants such as dyes, chromium, NaOH, starch, acid, among others.

The preservation of the ecosystem and sustainable water use are dependent upon the comprehensive wastewater management effort. Also, it is important to note that the choice of method of wastewater treatment is to be done carefully considering its impact on the environment, economic, production, and process (ease of use).

## Rapid deployment of ETPs and ZLDs

In response to the growing enthusiasm for environmental conservation and increased attention paid by brands to eco-friendly manufacturing





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techniques, various companies are integrating Effluent Treatment Plants (ETPs) in their production process.

“In India, companies like Arvind, Welspun India, Raymond, Vardhman Textiles, and Siyaram Mills have embraced advanced wastewater treatment technologies. Arvind, for instance, has invested in Effluent Treatment Plants (ETPs) and Reverse Osmosis (RO) systems, while Welspun India has implemented state-of-the-art



**Ayush Patodia - Associate Vice President, Avalon Consulting**

treatment facilities. Raymond prioritises sustainability with eco-friendly processes and wastewater treatment investments. Vardhman Textiles and Siyaram Silk Mills have also integrated wastewater treatment plants into their operations, emphasising water conservation and pollution control,” shares **Ayush Patodia - Associate Vice President, Avalon Consulting.**

Globally, companies such as Patagonia, Levi Strauss & Co., H&M Group, Gap Inc., and Nike showcase comprehensive approaches to wastewater management. These firms have implemented technologies for water reuse, invested in wastewater treatment infrastructure, and collaborated with suppliers to promote sustainable practices. For example, Levi’s WaterLess technology reduces water usage, while H&M Group works with partners to improve water management practices. Nike supports community-based



**Balkrishna Sharma, Business Head and Chief Executive of Yarn Business, RSWM**

water projects and implements water-saving technologies across its supply chain.

“RSWM treats all post-process water in its effluent treatment plant and purifies it before returning it to the environment in a cleaner state.

This helps company save 1350 kilolitres of water daily,” says **Balkrishna Sharma, Business Head and Chief Executive of Yarn Business, RSWM.**



**Narendra Dalmia, Director, Strata Geosystems (India)**

Even **Narendra Dalmia, Director, Strata Geosystems (India),** comments, “We have consistently embraced sustainable solutions in manufacturing. For instance, five years back, we opted and shifted to a cumbersome water-based coating technology, deviating from the industry’s standard practice of using easier solvent-based coating option.

The water waste generated is completely recycled and reused.”

“We operate as a melange yarn manufacturing facility specialising in spinning and supplying melange yarns.

To support this, we have our own fibre dyeing facility. Notably, our fibre dyeing facility adheres to a zero-



**Rajarathinavelu, Sales Manager, Amarjothi Spinning Mills**

discharge policy for hazardous chemicals, meaning no liquid discharges are permitted into groundwater. Instead, all water undergoes thorough recycling and reuse in the processing cycle. This fundamental practice helps prevent waste products from entering the soil and causing pollution,” shares **D Rajarathinavelu, Sales Manager, Amarjothi Spinning Mills.**

“We can utilise treated wastewater for various purposes such as processing, daily sanitation, and more. Given the limited water source, water preservation is imperative. Our printing system Epricon has been designed to conserve both water and energy.



**Nilesh Yadav, Regional Sales Manager, Zydex**

Unlike traditional reactive dyeing methods that consume substantial resources, our technique allows for a 75 per cent reduction in water usage. Additionally, Epricon enables the elimination of 3-4 printing processes, saving valuable time,” adds **Nilesh Yadav, Regional Sales Manager, Zydex.**

According to the World Bank, the wastewater created by the dyeing and finishing department accounts for around 17–20 per cent of total industrial effluent. About 300,000 tonne of synthetic dyes are reportedly discharged annually into treatment facilities worldwide. Hence, dyeing and finishing industries are also rapidly integrating the ZLD practices and ETPs in their manufacturing units.

Observing the significant volume of effluent being produced, dyeing and finishing industries are also rapidly incorporating Zero Liquid Discharge (ZLD) practices and Effluent Treatment Plants (ETPs) into their manufacturing facilities. “We have the largest pigment ZLD plant in



**Mihir Shah, Executive Director at Vipul Organics**

Maharashtra where we recycle and reuse 98 per cent of water. Whatever we are doing, it’s completely sustainable. We are operating at zero liquid discharge in most of our manufacturing,” states **Mihir Shah, Executive Director at Vipul Organics.**

“Many stakeholders are increasingly investing in ZLD systems to enable the reuse of approximately 90-95 per cent of the recovered water in their processes. This trend is exemplified by the textile industry in Tirupur, where a significant portion of the sector has adopted ZLD practices. The momentum is spreading to other regions, reflecting a growing

## Tirupur leads the way in adopting Zero Liquid Discharge Technology

Situated in the state of Tamil Nadu, Tirupur holds the distinction of being India's primary hub for the production of cotton knitwear. According to the Tirupur Exporters' Association (TEA), the garment exports from Tirupur reached Rs 33,525 crore in the fiscal year 2021-2022, constituting 1.07 per cent of India's overall merchandise exports during the same period. Remarkably, Tirupur holds an important position in India's export of knitwear-based apparel products, accounting for more than 50 per cent of the total share. The textile industry in Tirupur heavily relies on water, historically resorting to extensive use of groundwater and tankers to address the city's inadequate water supply.

Owing to the excessive water consumption, the Dyeing and Processing units in Tirupur encountered severe issues, leading to the closure of numerous units due to environmental hazards, as stated by the Tamil Nadu High Court.

Hence, the city recognised the gravity of the situation and took a significant measure. In 2012, Dr A Sakthivel, Former Chairman of Apparel Export Promotion Council (AEPCC) announced that Tirupur has become the first textiles cluster in India to arrive at the Zero Liquid Discharge Technology. At present all Dyeing & Processing units are using 100 per cent Zero Discharge technology.

Now both Common Effluent Treatment Plants (CETPs) and Individual units are following this ZLD technology and are successfully meeting the requirements of the trade and servicing the requirements.

As far as water is concerned, Tirupur is not facing any problem since it is re-using the water up to 90 per cent. Moreover, due to this ZLD technology, some marginal percentage was being used after colour processing - in the form of salt water as concentrated salt solution - called BRINE Solution re-use.

The industry both in India and globally showered accolades upon this innovation. Since then, the city has maintained an unwavering commitment to technological advancements, consistently updating its



systems. In December 2023, a collaborative pilot initiative with German involvement aimed at treating textile effluents was launched at the Kunnankalpalayam Common Effluent Treatment Plant (CETP) in Tirupur. The three-year project, funded by the Indo German Science and Technology Centre, falls under the Indo German collaboration. Following laboratory assessments, a pilot-scale electrochemical ozone oxidation process (ECOOP) reactor and CDI have been installed at Kunnankalpalayam CETP, capable of treating 350 litres of effluent per hour. This technology, spearheaded by one of the principal investigators, Indumathi M Nambi of IIT Madras, eliminates colour and Chemical Oxygen Demand (COD), avoids sludge production, circumvents two conventional effluent treatment processes, and results in cost, manpower, and space savings.

The project, initiated in 2020, will undergo field-level trials for approximately six months. According to a press release, the technology has the potential to diminish land requirements, aeration needs, and the skill and time demands associated with biological wastewater treatment. Partners in this venture include IIT Madras, RWTH Aachen University, Goeth Universität, Tamil Nadu Water Investment Company, Ibacon, and Eurofins. The pilot plant inauguration was carried out by T Christuraj, the District Collector of Tirupur.



**Umasankar Mahapatra,**  
Managing Director of  
Pulcra Chemicals

recognition of the need for water self-reliance,” opines **Umasankar Mahapatra, Managing Director of Pulcra Chemicals.**

“With a vertical setup, encompassing recycled products and garment manufacturing. With a focus on water conservation, our dyeing and printing processes are conducted ethically, ensuring treated water is responsibly managed without any discharge. This commitment to sustainability spans over two decades, contributing positively to farmers as well,” opines **A Narayanaswamy, Vice President, Armstrong Spinning Mills.**



**A Narayanaswamy,**  
Vice President,  
Armstrong Spinning  
Mills

**Dr Vandana Tripathi, Assistant Professor - General Management, K J Somaiya Institute of Management,**

comments “At KJ Somaiya Institute of Management, a Sewage treatment plant was established in 2014 and has a capacity of 1 lakh litres (daily). The treated water is being utilised for maintenance and upkeep of the physical garden in the premise. Somaiya Vidyavihar has taken the initiative and implemented a Rainwater Harvesting System, since 2010, across its entire campus. Through its initiative it aims to harvest at least 5 crore litres of water, out of which 1.5 crore litres shall be used through its storage tanks and the balance recharged into the ground.”



**Dr Vandana Tripathi,**  
Assistant Professor -  
General Management,  
K J Somaiya Institute  
of Management

## Challenges to overcome

While the industry is quickly embracing practices for conserving wastewater, there is an apparent lack of adequate knowledge on utilising such systems. Alternatively, some businesses hesitate to adopt them due to concerns about economic expenditure. BluWin is a Sustainable Textile Solutions (STS) which provides a wide range of services from assessments, verifications and consultancy to help Brands and Retailers identify potential risks in their supply chain. Sambhaji Chopdekar, Senior Consultant, BluWin, mentions, “While carrying out audits of the textile and leather mills, we realised that large quantities of water are used, considerable amounts of which turn into wastewater. On one hand, those mills strive to treat the wastewater and convert it into a high-grade one, on the other hand, by observing them, we find out that they lack expertise and knowledge. Investments might prove to be a limitation

for some companies, while others may be lacking in awareness of the technologies necessary for efficient wastewater treatment.”

For a better understanding of the appropriate utilisation of these ETPs, companies should seek guidance from solution providers, as it has the potential to enhance the productivity of the manufacturing process.

“Local governments have enforced laws that restrict the use of freshwater and the release of hazardous substances from wastewater. DuPont Water Solutions is helping to address these wastewater regulatory challenges with our Minimum liquid discharge (MLD) solution.” explains **Chrys Fernandes, Business Head – India Subregion, DuPont Water Solutions.**



**Chrys Fernandes,**  
Business Head – India  
Subregion, DuPont  
Water Solutions

Textile mill operators often use inefficient water treatment practices that are expensive. “Our MLD

solutions have the potential to minimise operating costs and maximise water recovery while reducing the amount of energy required to operate. This helps the local textile operators adopt a less expensive water treatment approach to wastewater management and adhere to government regulations,” concludes Fernandes.

## How is it lucrative?

Incorporating ETPs and ZLDs into a textile manufacturing unit is a mutually beneficial situation for the manufacturer. It has numerous benefits as it ensures compliance with environmental rules and regulations, the integration of ETPs guarantees manufacturers a positive impact on the environment by eliminating harmful pollutants/contaminants. A well-maintained ETP enables the manufacturer to achieve long-term cost savings. Therefore, a manufacturer should consider it not as a substantial expense but as an asset to the organisation.

Government officials or related solution providers should inspect manufacturing plants and provide pre- and post-analysis reports after installing effluent treatment plants (ETPs). Proper disposal of leftover salts is essential to prevent their discharge into natural water sources. The Zero Discharge of Hazardous Chemicals (ZDHC) organization educates textile companies on producing dyes and auxiliary chemicals free of harmful compounds. However, widespread knowledge of these norms does not guarantee compliance. The company should proactively undertake these initiatives and strive to contribute to creating a better place to live in.



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# "Many stakeholders are increasingly investing in ZLD systems"

**P**ulcra Chemicals is a global company with outstanding engineering capabilities and unique processing knowledge. The company has over 140 years of experience in the production of innovative specialty chemicals for the fibre, textile and leather industries. Working in specialised fields, Pulcra focuses on innovation, health, safety, sustainability and regulatory compliance of their products. **Umasankar Mahapatra, Managing Director of Pulcra Chemicals**, underscores the company's commitment to sustainable initiatives and introduces its latest offerings in an interview with **Divya Shetty**.

**Could you share recent projects by Pulcra Chemicals addressing the environmental impact of standard dyeing processes?**

During ITMA, we introduced a technology known as Sustineri Colouring, specifically designed for the dyeing process of 100 per cent cotton and polyester-cotton blends. This technology aims to significantly reduce the overall dyeing time, along with minimising energy and resource footprints. The benefits include time savings, decreased water and steam consumption, and overall energy efficiency. This promising and revolutionary technology is currently in the early stages of commercialisation and is a collaborative effort between H&M brands to enhance the sustainability of the dyeing process.

**Considering the water-intensive nature of cotton dyeing, can you discuss Pulcra Chemicals' innovations aimed at reducing water and energy usage in the process?**

The Sustineri Colouring technology enables a notable reduction of approximately 50 per cent to 60 per cent in

“

**The Sustineri Colouring technology enables a notable reduction of approximately 50 per cent to 60 per cent in water consumption.**

”



water consumption. Additionally, our widely accepted technology for denim manufacturing, specifically in Indigo and Sulphur dyeing, addresses the considerable water usage in these processes. The adoption of this dyeing technology in denim offers opportunities for resource conservation, encompassing both water and dye substances. Furthermore, through the acquisition of Devan chemicals from Belgium in 2021, Pulcra now offers a diverse range of functional finishes, predominantly bio-based with ingredients ranging from 90 per cent to 95 per cent. This not only ensures product safety for consumers but also promotes safety in manufacturing. These initiatives represent our commitment to contributing to sustainable practices in the textile industry.

**How does the company manage and treat its wastewater, and are there any challenges in implementing such facilities?**

In the realm of specialty chemical manufacturing, the process is not inherently water-intensive in terms of output, as water serves as a raw material. Contrary to a common misconception associating the chemical industry with high pollution, this is not universally accurate. In specialty manufacturing, involving formulation and reactions, water functions as an input,

and the discharge is minimal. Discharges are limited to sanitary use and occasional vessel cleaning during product changes, both of which are treated through our Zero Liquid Discharge (ZLD) process.

The Zero Liquid Discharge (ZLD) process entails the comprehensive treatment of water emanating from industrial processes to achieve a complete absence of liquid discharge. The treated water undergoes an effluent process, incorporating a series of filtration stages and membrane utilisation, culminating in an evaporator that facilitates water recovery. This ensures that no liquid is released into drainage systems. In contrast, traditional Effluent Treatment Plants (ETP) typically discharge water, subject to specific regulatory specifications mandated by local authorities.

The emphasis remains on the absence of liquid discharge, making zero liquid discharge the standard, even within the textile manufacturing sector. Notably, textile processes generate substantial effluent, with water consumption ranging from 50 to 100 litres per kilogram of finished textile.

Many stakeholders are increasingly investing in ZLD systems to enable the reuse of approximately 90-95 per cent of the recovered water in their processes. This trend is exemplified by the textile industry in Tirupur, where a significant portion of the sector has adopted ZLD practices. The momentum is spreading to other regions, reflecting a growing recognition of the need for water self-reliance.

### Kindly share current trends in the textile chemical industry.

The prevailing trend in the chemical industry centres around prioritising safety in chemistry, particularly in the use of non-hazardous ingredients during textile manufacturing. This emphasis aims to prevent the emission of toxic fumes and mitigate potential skin-related issues. Additionally, there is a concerted effort to minimise the environmental footprint when discharging chemicals, aligning with the focal points of brands, retailers, and local authorities.

Compliance requirements pose a notable challenge, with increasing demands for adherence to standards such as JTHC and GOTS. However, this proliferation of certification standards introduces duplication and, consequently, additional costs for manufacturers.

Innovation within the industry is geared towards enhancing process efficiency by reducing processing time and overall temperature requirements. This is particularly relevant in textile dyeing processes, which traditionally operate at high temperatures, consuming significant energy. Chemical suppliers are actively contributing to sustainability goals by minimising energy and water footprints and enhancing product safety.

A fourth aspect involves the creation of differentiated

“

Many stakeholders are increasingly investing in ZLD systems to enable the reuse of approximately 90-95 per cent of the recovered water in their processes.

”

and functional products, catering to both commodity and performance textiles. Chemical suppliers play a crucial role in assisting customers to differentiate their products by incorporating new functionalities, enhancing ease of use, and delivering health benefits and comfort.

In the context of Pulcra's specific products, the focus lies in providing functional finishes, such as antimicrobial solutions sourced from bio-based linseed oil, offering environmental safety. Other differentiated products include bio-based thermal regulation, providing wearer comfort, and phase-change materials for temperature maintenance, with applications in both apparel and home textiles.

### Could you please elucidate the company's short-term and long-term objectives?

The short-term objective involves significant market expansion across all countries of our presence to augment market share and overall volume. This expansion is complemented by a strategic focus on differentiation within the dynamic landscape of specialty chemicals, given the intensifying competition. Emphasis is placed on continual innovation through research and development, introducing new chemistries and processes to maintain a distinctive position. Recognising the inevitable commoditisation of existing products over time, this proactive differentiation is crucial.

Historically recognised primarily in the textile sector for fabric treatment, Pulcra has strategically diversified its product portfolio in recent years. This expansion encompasses the incorporation of various products in finishing and other domains, contributing to an extended market presence. The company is particularly committed to advancing its position in technical textiles, with a focus on developing coated products for flame retardant applications. These applications span military, commercial, and home farming sectors, representing key areas of growth and strategic concentration.



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# "Investments might prove to be a limitation for some companies"

**B**luwin is a high-impact climate solution provider whose mission is to contribute to a better world and better quality of life by providing solutions which reduce the adverse effects of the fashion, textile, and footwear industries on our planet and the climate. **Sambhaji Chopdekar, Senior Consultant, BluWin**, in this conversation with **Divya Shetty**, shares how company is promoting the water conservation practices within the textile industry.

## What is the significance of implementing wastewater treatment facilities within the textile manufacturing process?

While carrying out audits of the textile and leather mills, we realised that large quantities of water are used, considerable amounts of which turn into wastewater. On one hand, those mills strive to treat the wastewater and convert it into a high-grade one, on the other hand, by observing them, we find out that they lack expertise and knowledge. Investments might prove to be a limitation for some companies, while others may be lacking in awareness of the technologies necessary for efficient wastewater treatment.

Its importance lies in the fact that this knowledge gap should be addressed and more advanced technologies used to convert waste water to a high quality water is of both humanity and the environment well-being issue. This is where our educational outreach is aimed. The most importance thing about Zero Discharge of Hazardous Chemicals (ZDHC) program is that it entails constant monitoring of water quality in order to maintain its general use. Nevertheless, issues still remain, potentially brought about by the lack of investment or the low level of possession and expertise.

## How does BluWin help the textile companies treat their wastewater?

We typically serve as third-party auditors to top brands like Inditex. As auditors, we ask questions like if they have effluent treatment plants (ETPs) when we go and visit factories, such as textile or leather ones. Thus, when a business is holding an ETP we inspect water treatment procedures. A compulsory visit to the wastewater treatment plant makes it easier for us to know the on-going treatment stages. Furthermore, monthly pre-analysis and post-analysis reports are also demanded for wastewater.

Through our monitoring, mill operators are observed



maintain the law range that the respective states and pollution boards have prescribed. Brands also insist that the MRSL is followed to limit those chemicals found to be risky. At times, mills declare their unwillingness to perform unless it is generically required, referring to lack of up-pressure. Still, fitted by a marketer, it turns out to be compulsory.

MRSL chooses particular chemicals as hazardous because they are non-degradable or biodegradable. The chemicals are mostly from the dyes or auxiliaries, the mill may not know otherwise and they get into the water which has huge environmental implications. Our function encompasses mill education about MRSL red flag chemical groups and reference document supply. Organisations such as the Zero Discharge of Hazardous Chemicals (ZDHC) demand that the dyes and other auxiliary chemicals must be free of harmful compounds. The widespread knowledge does not necessarily guarantee that all companies follow these norms. Therefore mandatory implementation is the only possible option because otherwise most companies will only comply when these practices become law and only in relation to specific brands. This is a cumulative obstacle we face in our endeavours.



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# Emerging technologies in the field of textile processing

The environmental impact of solid waste formation, liquid effluent generation and the release of gaseous emissions during the textile wet processing is a major concern, says **Dr Ashok Athalye**.

**T**extile is a basic need of civilised human beings and is considered to be the mother of industrialisation as the start of the Industry 1.0 era is associated with the first mechanised weaving of textile fabric. The past two centuries witnessed various technological innovations in man-made fibre developments, hi-speed machines, specialised colourants, functional effect chemicals, etc, which ushered in the era of automation and digitisation referred to as Industry 4.0.

However, during the entire value chain of the textile manufacturing domain from the Farm to Fashion segments, wet processing is considered to be the weakest link owing to the numerous complexities involved in terms of varying fibres, forms in which they are processed, types of machinery used, complicated methods adopted to meet the end use expectation and the most importantly the emerging demand for sustainability.

The environmental impact of solid waste formation, liquid effluent generation and the release of gaseous emissions during the textile wet processing is a major concern. The academic as well as industrial research in technological developments is focussing on ways to minimise or harness the environmental impact of textile manufacturing. Optimising utility (conserving water, energy and time of textile processing), ensuring sustainability (in terms of ecology, economy and social aspects) and circularity (reduce, reuse and recycle) are the commonly used terms.

The use of textiles is not only restricted to apparel wear but is also rapidly increasing in the field of home décor and technical applications. The rising consumer expectations in terms of product utility and the stringent eco-conformance norms decided by international organisations/brands are pushing textile manufacturers to adopt innovative and novel technologies to cope with:

- Maintain pace with changing consumer



- requirements due to fast fashion
- Meet the basic expectation in terms of quality consistency
- Ensure business commitments for timely delivery
- Provide effective and comprehensive solutions as a smart service supplier
- Conserve water, energy, time and human resource for saving utility
- Attain sustainable growth through eco-conformance

Thus, to meet such expectations and demands of various stakeholders in the textile value chain, it is imperative to continuously innovate and develop technologies which can fulfil the growing needs.

Given below are some such recent developments in various segments of textile processing;

## Fibres

The conventional substrates are getting replaced by novel fibrous material extracted from various renewable sources.



- **Natural:** Widening gamut of natural vegetable cellulosic fibres for apparel and home furnishing applications for self-use and in combination as a blend component of varying extent. This includes fibres extracted from Banana, Hemp, Elephant grass, Napier Grass, Corn husk, etc. The innovative and cost-effective fibre extraction processes include using biotechnology to reduce time and water consumption and achieve optimum yield. These fibres are used in varying blend ratios and other conventional materials for making decorative components. Modified protein-based fibres from collagen, soya milk etc.
- **Regenerated:** Semi-synthetic fibres made out of renewable natural resources like lactic acid from sugar cane and corn to produce Poly Lactic Acid (PLA) fibre, also called natural Polyester.
- **Functional:** The emerging demand for technical textiles has prompted development in speciality hi-tech fibres, which are synthetically produced to achieve the specific end use applications. Some of these material include
  - Aramid – aromatic polyamide
  - Asbestos – silicate mineral
  - Carbon -Lightweight, high strength
  - Ceramic –Alumino-silicate
  - Glass – Alumino-boro-silicate
  - Metal – Pure and alloys
  - Modacrylic – Acrylic, vinyl chloride, vinyl bromide
  - UHMWPE – high modulus, ultra-high molecular weight polyethylene

## Machines

The conventional high liquor ratio batch-wise processing machines are paving the way to low and ultra-low liquor ratio technologies.

- **Yarn:** The modified package dyeing machines based on Pulser or Wave technology work on a very low liquor ratio of about 1:3.5. This drastically reduces water consumption along with the energy needed for the heating-cooling steps and the time required for filling and draining at each step.
- **Knit:** The soft flow machines having compartmentalised systems and working at MLR of about 1:4 substantially reduced water, energy and processing time.
- **Woven:** The pad-humidifix processing technology is getting wide recognition as one of the fastest-adopted technologies for continuous dyeing of cellulosic fabric by reactive dyes.
- **Denim:** Foam dyeing of indigo by bubbling nitrogen as an inert gas is considered to provide the desired ring dyeing of yarn by a one-step

process for optimum colour depth and avoid undesired premature oxidation.

- **Garment:** The dyeing and washing-off of made-ups and garments using Nano-Bubble Technology (NBT) by blowing air in water substantially reduces the volume of liquor and thus saves water and energy.

## Water

Being a universal solvent, abundantly available and a negligible cost component, textile processing uses water as the medium of application, this is why it is traditionally called wet-processing. However, with growing concerns over effluent generation and pollution of water bodies, the non-aqueous method of dyeing is gaining importance.

- **Air dye technique:** Polyester dyeing using low molecular weight Disperse dyes using hot air is considered a novel technique which makes use of the typical low temperature sublimation property of these dyes.
- **Super critical fluid:** Utilising carbon dioxide gas as a freely available atmospheric component by converting it into its liquid form under certain temperature and pressure conditions is another unique technology for water-less dyeing.

## Colourants

Though no new dye range was developed after the introduction of reactive dyes in 1956, many new products within the existing class of dyes were introduced, which filled the gaps in the shade gamut and enhanced the extent of colour fixation.

- **Vat dyes:** Micro and nano disperse variety for dyeing by pigmentation process
- **Cationic Reactive dyes:** For salt-less exhaust applications
- **Fluorescent pigments:** For achieving Neon shades
- **Disperse dyes:** For high wash and light fastness
- **Chromic Materials:** Colourants that behave differently under varying conditions of temperature, pH, moisture, pressure, etc

## Chemicals

Textile processing is a chemical-intensive segment, where a large quantity of non-aqueous support components is used for intensifying the application.

- **Basic:** Different acids, alkalis, salt, oxido-reductive material, thickeners, etc, are needed at various stages of processing, which eventually get discharged into the effluent stream, causing pollution issues. Such chemicals are being replaced by eco-friendly alternatives using green chemistry where the extent of chemical concentration and the environmental impact

- are minimised.
- **Auxiliary:** The conventional chemistries of support components like surfactants, dispersants, sequestrants, etc., which impart or enhance the processing parameters, are being replaced by non-toxic, eco-friendly substitutes which make use of biotechnology and plant-based products.
- **Effect:** Typically, the finishing chemicals which impart desired perspective and protective effects fall in this category. The novel fluorine-free stain repellants, nan-phosphorous flame retardants, non-formaldehyde wrinkle-free finishes are being used.

- **Ozone:** Bleaching of cellulosic material using ozone as oxidant
- **Plasma:** Surface modification for improvement in dyeing
- **Laser:** Surface modification to improve the dye uptake
- **Morphology:** Structural coloration due to interference of light

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## Processing

Many innovative technologies have been developed and are being exploratively used to evaluate performance efficacy. Some of these are listed below

- **Ultrasonic:** Generates kinetic energy for dye diffusion
- **Microwave:** Vibrational energy for optimum coloration
- **Electrochemical:** Electricity for reduction of Vat and Sulphur

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### About the author:



Colourists (FSDC-UK) and Fellow of the Indian Chemical Society (FICS).

Dr Ashok Athalye is a Professor of Textile Chemistry and Vice-President at Technological Association (ICT- Mumbai). He is also the fellow of the Society of Dyers and



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## News Snippet

# Vipul Organics receives environmental clearance for expansion of Ambernath facility

Vipul Organics, the specialty chemicals company in the pigments and dyes segment, announced the receipt of environmental clearance for proposed expansion of synthetic organic pigments and dyestuffs, pigment dispersion, naphthols, fast salts and vat dyes manufacturing at their existing Ambernath facility.



Granted by the Government of India, Ministry of Environment, Forest and Climate Change (Issued by the State Environment Impact Assessment Authority (SEIAA), Maharashtra, the clearance will help Vipul Organics increase its total production capacity from the existing 10 MT/M to 508 MT/M at Ambernath.

In the first phase, the company intends to expand its capacity to 250 MT/M. The cost of this expansion will be through a mix of internal accruals and external

borrowings. The company has already raised Rs 5 crore from the promoters through issue of warrants.

“We are firmly committed to becoming the preferred provider of colourant to all segments of the industry. Our increased capacity at Ambernath is a testimony to the seriousness of our endeavours. With the expansion, the facility will become the single largest

pigment producer in the country”, says Vipul P Shah, Managing Director, Vipul Organics.

Vipul Organics provides total colouring solutions to paint, printing ink, plastics and masterbatches, textiles, rubber & latex, agriculture, leather, dietary supplements and pharmaceuticals, food beverages and confectionaries industries. Vipul Organics clientele includes the who’s who of the industries that they service.

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## THEME: MISSION \$100 BILLION EXPORTS

The Indian Textile Industry witnessed a surge in demand with exports touching a record \$43 billion in FY22 post covid restrictions. During 2022-27, the textile industry worldwide is anticipated to witness a projected CAGR of 5.67 per cent, prompting the Government of India, on its part, to take various initiatives to revive the fortunes of the textile industry such as: formulation of the PLI scheme, launch of mega textile parks, signing of FTAs and MoUs with many countries, etc.

### ISSUE HIGHLIGHTS:

ITJ Annual 2024 will suggest steps to be taken to give impetus to the "Mission \$100 billion" target. It will broadly highlight on:

- Impact of various government schemes and policies
- How India could use the changing geopolitical situation to its advantage
- Using circularity and quality to enhance India's global appeal
- Banking on latest technologies to increase efficiency and productivity
- Leveraging on FTAs to increase exports, etc.

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# FireTrap: Development of cut and fire-resistant seating systems

Current seat systems have no chance against vandalism attacks using flammable liquids.

Modern seating systems in publicly accessible areas are required to be flame-retardant. However, the concepts available on the market do not actively control the flames.

## Issue

By spreading a flammable liquid on the surface of the seat, the flames can reach the core of the seat and thus the upholstery below, leading to a devastating fire in the passenger compartment. This is why current seat systems have no chance against vandalism attacks using flammable liquids.

## Aim and approach

The aim of the project is to develop a newly designed passenger seating system for the public sector that is not only cut-resistant and flame-retardant, but also actively

combats a fire outbreak, so that the resulting fire is automatically extinguished without external influences. The resistance of seating systems to flammable liquid substances should also be increased by providing excellent cut resistance. This prevents the fire from spreading in the passenger compartment, prevents the entire vehicle from being destroyed and minimises the risk to the passengers. The focus here is on preventing fires caused by flammable liquids such as petrol and diesel fuel or paint and varnish thinners. The application should not be limited to passenger seats for public transportation. It can be extended to other seating systems in the public sector (For eg; cinema and theater seats).

## Solution

To achieve the project goals, a new type of textile is being developed that has the desired functionalities in

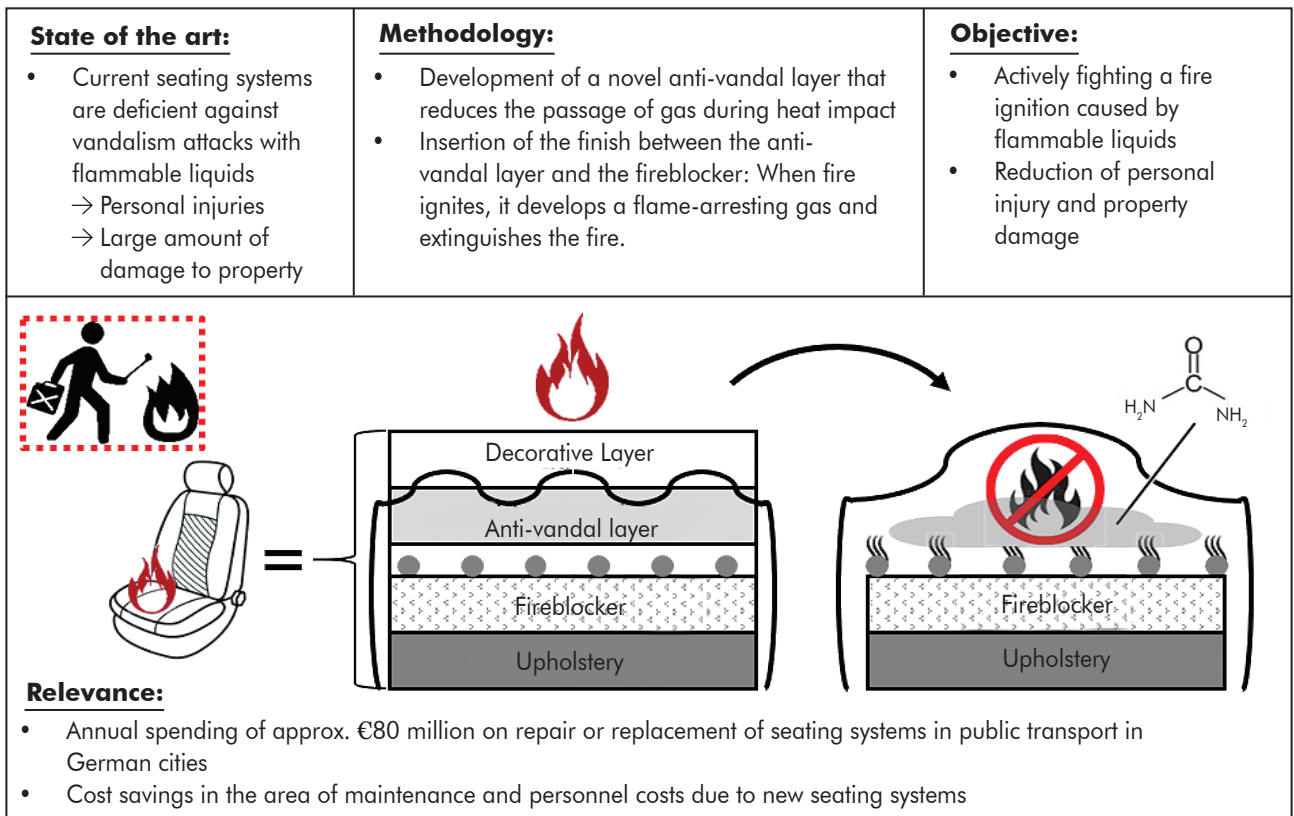


Figure 1: Schematic representation of the project approach

combination with an underlying mechanism. To this end, yarns, fabrics and energy-consuming substances (such as urea and similar gas-generating substances) for flame containment are being newly developed in the project. The functionality of the individual components is verified by manufacturing demonstrators of seating systems and subsequent fire tests. The first step at the ITA is to develop yarns that exploit the cut resistance and fire resistance of the glass fibres without causing skin irritation. The development of a yarn structure consisting of multifilaments in the yarn core and staple fibres in the cover is carried out using an alternative spinning technology, friction spinning. The project's approach is illustrated in Figure 1.

### Economic significance & benefits

Deutsche Bahn records more than 25 cases of vandalism every single day. In 2004, 190 members of the Association of German Transport Companies calculated the cost of repairing damage caused by vandalism at around € 53 million, of which around € 31.5 million can be attributed to repairing damage to the vehicles. The repair or replacement of seats accounted for around € 7 million. This does not include damage caused by

vandalism in public facilities. There are currently around 75,500 buses and coaches registered in Germany. A bus with an average of 40 passenger seats and one square metre of fabric per passenger seat results in a quantity of approx 3,020,000 m<sup>2</sup> of seat fabric for Germany alone. This corresponds to approx 420 soccer fields, which can be substituted with the new innovation. In addition, there are other potential areas of application such as cinemas, theaters or other upholstered and public seating areas.

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### Acknowledgement:

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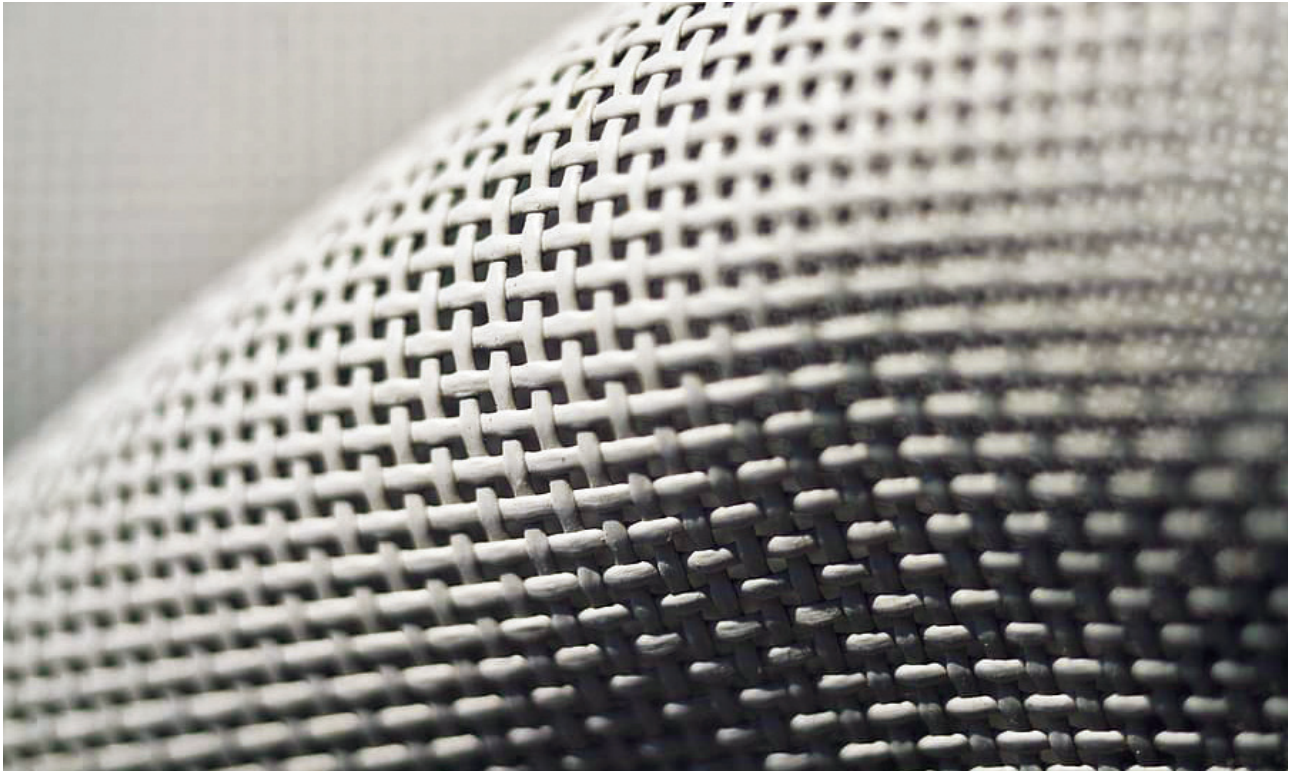
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# Innovation in the weaving of 3D seamless complex woven preforms

A limitation of 2D carbon fibre reinforcement is that, when moulds are used, problems, such as wrinkling, occur in complex shapes.



Carbon fibre-reinforced plastics (CFRPs) have a high strength and stiffness-to-weight ratio; therefore, these materials can substitute, for example, metals, and they are widely used in various industries such as the automobile and aerospace industries. Because two-dimensional (2D) fibre-reinforced plastics (FRP) have no reinforcing elements in the thickness direction, mechanical properties deteriorate in that direction. Delamination of 2D FRPs is one of the main causes of their poor mechanical properties. Various methods, including z-pinning, stitching, tufting, resin toughening, and interface strengthening, have been employed to solve this problem; however, no complete solution has been provided. To overcome the limitations of 2D FRPs, several studies have been conducted on novel 3D preform weaving methods. The three most representative three-dimensional (3D) woven structures are the orthogonal (ORT) structure, layer-to-layer (LTL) structure, and angle-interlock (AI) structure.

Numerous studies have been carried out to evaluate and characterise the mechanical properties for these three structures. In addition to these established weaving structures, research has been undertaken to explore new weaving techniques. An examination of flexural behaviour was conducted through the design of a novel weaving technology, utilising a modified heddle position system based on a self-built 3D loom, resulting in the production of four representative 3D weaving structures. Subsequently, an experimental investigation was carried out to assess the low-velocity impact performance of six types of 3D woven structures. Furthermore, studies have been dedicated to the development and multiscale characterisation of 3D warp interlocked flax fabrics with different weave structures for composite applications. Research efforts have also focused on enhancing delamination resistance and out-of-plane mechanical properties through 3D fully interlaced preform weaving. Additionally, new 3D woven ORT fabrics with improved

auxeticity are currently under development for reinforced composites. Various woven structures have been proposed, designed, and manufactured. The overall strength, delamination resistance, and impact performance of the 3D woven composites were found to be excellent owing to the effect of the thick reinforcing yarn (z-binder).

CFRPs used in industries such as automobiles and aerospace must have a specific structural shape depending on the usage. Presently, 2D carbon fibre reinforcements in the form of fabrics are laminated for this purpose and then placed into a mould of a specific structure to make a composite material. A limitation of these technologies is that, when moulds are used, problems, such as wrinkling, occur in complex shapes. Alternatively, after these reinforcing materials assume the shape of a structure, joints are added to create a shape. In the case of creating a joint, even if the problem of complexity is solved, there are weaknesses in the joint, such as a considerably long manufacturing time and difficulty in injecting resin.

Therefore, 3D woven preforms offer the best solution for high-performance applications with complex geometries. These preforms are specially woven to fit the desired shape. It also exhibits a uniform and well-aligned fibre distribution. Previous studies have reported on seamless 3D composite manufacturing technology, but only for manufacturing of fragmented specimen. Owing to the complexity of the manufacturing technology, reports on mass production technology are also lacking. Textile reinforcement forming held an advantage in terms of its process simplicity and speed. However, it suffered from drawbacks such as wrinkling, buckling, and network sliding. Surface 3D weaving excelled in producing intricate structures with fewer defects but faced limitations for fibre plies with specific orientations, and its weaving process was time-consuming. The mathematical determination of shapes of reed wires demonstrated an advantage in creating seamless and specific shapes, but it was constrained in the variety of shapes it could produce and required numerous corrections, rendering it time-intensive. Paper-folding approaches offered the benefit of seamlessness, yet they had restrictions on the shapes achievable, resulting in uneven tension and irregular surfaces. Research has been conducted to facilitate the use of these 3D composite materials as parts; however, the complexity of the manufacturing process has not been resolved. Therefore, the development of simple, continuous, and rapid seamless 3D composite manufacturing technology has great academic and industrial significance.

In this study, the equipment for 3D woven preform manufacturing has been introduced, and the weaving mechanism has been discussed. We present three



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representative 3D weaving structures: through-thickness orthogonal structure (TTO), through-thickness layer-to-layer structure (TTLL), and through-thickness all-layer-interlaced structure (TTAL). These differ according to the degree of z-binder interlacing using a novel weaving mechanism. The effect of the z-binder interlacing on the structure was also analysed. Based on the 3D woven weaving mechanism, a manufacturing process for seamless 3D complex woven preforms was established. Our weaving method, exemplified by the TTAL structure, possesses a distinct advantage in that it enables the weaving of diverse structures through careful structural design. This approach allows for the

realisation of complex shapes. Through the concept of weft and warp slices, convex and concave shapes with non-uniform heights in the z-direction were produced. This was possible because of the continuity and diversity of the TTAL structure. Furthermore, box, box lid, bowl, pyramid, and bowl-type preforms with increased complexity were produced; post-manufacturing, the internal structure was analysed to confirm continuity. Consequently, we advocate for our method as a ‘new weaving technology’ with significant potential for the effective, continuous, efficient, and rapid manufacturing of various 3D woven structures.

### 3D weaving loom and basic weaving mechanism

Figure 1 shows a schematic representation of the 3D weaving equipment developed in this study. Figure 1 (a) shows an overview of the 3D weaving equipment with key elements. The key elements include torque motors, heddle frames, reed, warp yarns, z-binder yarns, and weft yarns. Torque motors are used to supply warp and z-binder yarns. To ensure that all fibre yarns remain straightened during the weaving process, a torque motor provides a constant tension. The weft yarns are inserted at the corresponding positions according to the upward and downward movements of the heddle frame. Therefore, to insert the weft yarns at the desired position, the up and down movements of the heddle frame have to be set correctly. After the weft is inserted, a compact 3D woven structure is formed after the beating-up process of the reed. Figure 1 (b) shows the xz-plane view of the 3D weaving equipment in three parts: supplying, weaving, and taking-up. In the supplying part, the warp and z-binder yarns are only unwound to the length necessary for the next step of the weaving process. In the weaving part, the warp and z-binder yarns are arranged at the required positions to create the desired 3D structure. In this part, we determine whether the warp and z-binder yarns are situated above or below the weft yarn in the z-direction. The wefts are inserted between the warp and z-binder yarns, which are opened up and down using a heddle frame. The final 3D structure are determined by the relative positions of the warp, weft, and z-binder yarns along the z-direction. Finally, the preform is pulled in the x-direction in the take-up part, and the fibre volume fraction can be controlled through an appropriate pitch shift. Figure 1 (c) shows a built-in machine in a laboratory with key elements: torque motors, heddle frames, and reed.

The 3D weaving process takes place in eight steps and explains the mechanism of the 3D weaving equipment. Prior to weaving, both heddle frames of the warp yarns and z-binder yarns are in a lowered state without any positional distinction. As weaving commences, the position of the weft yarns along the z-axis is determined by the up-and-down movement of the heddle frame.

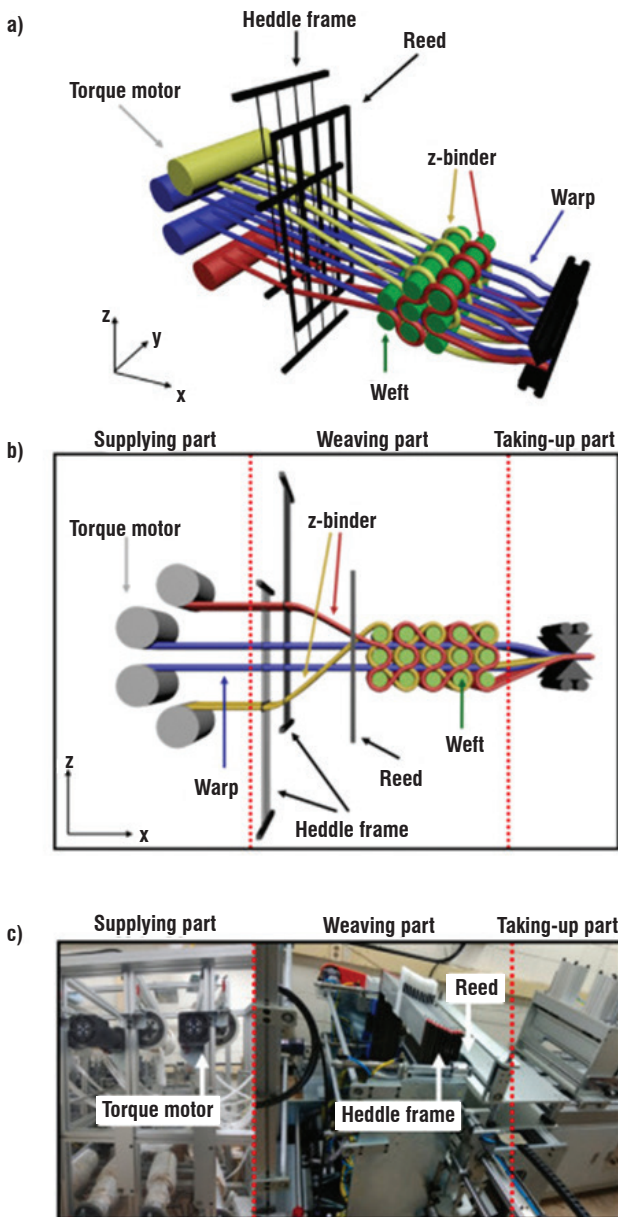


Figure 1: Schematic representation of the new 3D weaving equipment: (a) overview, (b) individual parts in the xz-plane view, and (c) built-in machine in a laboratory.



The process of inserting the first weft yarn into the top layer. The weft yarn is inserted in the space between the raised yellow z-binder heddle and the lowered red z-binder heddle, known as the weaving point. This weaving point is consistent in all the weaving processes and is marked by the intersection of the red dotted line. The insertion of the weft yarn with only the red z-binder heddle raised. The two z-binder heddles are alternately raised during the weaving process, causing the z-binder yarns to interlace with the inserted weft yarns. The insertion of the weft yarn happens into the middle layer. Because the weaving point remains the same, one of the two warp heddles must be raised. The insertion of the weft yarn goes into the bottom layer. At this stage, both warp heddles are lifted. Subsequently, one weft yarn is inserted into the bottom layer and another weft yarn is inserted into the middle layer show one cycle in which six weft yarns are inserted. The dense structure is produced by beating-up after each weft yarn is inserted.

Yarn to yarn friction is well known as the main influence on the degradation of carbon yarns. In our study, yarn degradation caused by friction was managed by preventing unnecessary contact between yarns, maintaining appropriate tension, setting the appropriate pitch shifting, controlling the temperature and humidity in the laboratory, and reducing unnecessary stress by minimising process variables.

## Materials and 3D composites fabrication

Carbon fibre yarns (A-38, A-42, DOWAKSA, Turkey) were used, and the tensile strength of each carbon fibre yarn was 3800 MPa and 4200 MPa. Three different 3D woven structures (TTO, TTLL, and TTAL) were fabricated using warp, weft, and z-binder yarns of 6K (A-38), 12K (A-42), and 3K (A-38) carbon fibres, respectively. For the example fabrication of the seamless 3D woven preforms with complex shapes, 24K (A-42) carbon fibres were used for the warp, weft, and z-binder yarns.

The matrix consisted of epoxy resin and a hardener (EpoFix; Struer, USA). The epoxy resin and hardener were mixed in a weight ratio of 25:3 at room temperature. Vacuum-assisted resin transfer moulding was used to impregnate the 3D woven preforms with the epoxy resin system. After defoaming, the mixed resin was injected into a vacuum bag, and the composite was cured for 24 h at room temperature in a sealed bag.

## Characterisation of 3D woven composites

To analyse the fibre architecture of the 3D woven composites, micro-CT imaging (Skyscan 1275; Bruker, Belgium) was used. Datasets were reconstructed using standardised cone-beam reconstruction software (NRecon; Bruker, Belgium). For 3D visualisation of the 3D woven composite, a volume rendering software (CTVox;

Bruker, Belgium) was used. Through structural rendering using an analysis and visualisation software (CTAn; Bruker, Belgium), the fiber volume fraction and porosity of the composite were measured.

The specimens for tensile testing were prepared according to the ASTM D3039 standard ( $100 \times 15 \times 2$  mm<sup>3</sup>). End tabs, each with a length of 20 mm, were attached to both ends of the specimen using an epoxy adhesive (DP460; 3 M, USA), making a gauge length of 600 mm. Tensile testing was performed using an Instron 5985 instrument (Instron, USA) at a loading speed of 2 mm/min with a 100 kN load cell. Bending testing was also performed with the specimens prepared according to ASTM D790 ( $55 \times 12.7 \times 2$  mm). A universal tensile tester (Quasar 50, Galdabini, Italy) equipped with a three-point loading system was used for bending tests. The crosshead speed was 1.0 mm/min, and the sample span-to-depth ratio was 16:1. A minimum of five specimens were tested.

## Fabrication of 3D woven preforms and composites

**Various 3D woven structures by different z-binder interlacing:** To investigate the effect of different z-binder interlacings on the 3D woven structures, we fabricated three representative 3D woven preforms in a three-layer through-thickness structure. All the three structures contained six wefts in a repeat cycle. The TTO structure contains z-binder yarns that wrap around three weft yarns covering the entire z-direction. The TTLL structure has z-binder yarns that wrap around one weft yarn and then two weft yarns, whereas the TTAL structure has z-binder yarns that wrap each weft yarn, i.e., wrap three times, one at a time. These weaving structures were fabricated by adjusting the weaving process. To clarify explain this and in fact monitor the weaving process, a weaving process diagram is devised. In the weaving process diagrams, the z-binder and warp heddles are represented by “B” and “W” and the numbers behind these denote different heddles that are used to achieve the desired weaving pattern. Note that the colours in the diagram match the colours of warp, weft, and z-binder yarns in the 3D woven structures. The lifting and lowering of a specific heddle are indicated by the filled and blank sections of the diagram, respectively. The first weaving steps for all the three structures were identical. The initial weft was inserted and woven below the raised B1, W1, and W2 heddles and above the descended B2 heddle. The second weft for the TTO structure was woven below the raised B1 and W1 heddles and above the descended B2 and W2 heddles. In contrast, the second wefts of the TTLL and TTAL structures were woven below the raised B2 and W1 heddles and above the descended B1 and W2 heddles. For the third weft, the

B1 heddle was raised in the TTO and TTAL structure, whereas the B2 heddle was raised in the TTLL structure. Although W1 and W2 were the same configuration for all three structures, different motions of B1 and B2 heddles wrapped wefts by the z-binders simultaneously, fabricating the desired pattern and structure.

3D geometrical solid models of the three representative 3D woven structures discussed above and real CT images of their fabricated 3D woven composites manufactured using proposed weaving mechanism. After cutting the samples into dimensions of  $x = 30$  mm and  $y = 5$  mm, micro-CT scanning, reconstruction, and volume rendering were performed sequentially. The micro-CT results were in agreement with the designed structures, indicating that the weaving process was successful. Upon closer examination of each structure, the TTO structure exhibited densely arranged wefts in the z-direction because of the z-binders surrounding the three wefts. Conversely, in the TTAL structure, the z-binders were wrapped around each weft, resulting in regularly spaced wefts, the TTLL structure was an intermediate form between the TTO and TTAL structures, i.e., the z-binder wrapped one and two wefts in subsequent cycle. As such, the weft yarns were not evenly arranged and were slightly twisted.

**Effect of z-binder interlacing on directional fibre volume fraction:** The three structures (TTO, TTLL, and TTAL) exhibit different z-binder waviness and patterns, which significantly influence the textile architecture of 3D woven composites. The specification of textile architecture of the fabricated 3D woven composites have been determined. The warp, weft, and z-binder fibres had counts of 6K, 12K, and 3K, respectively. The numbers of yarns per unit length for the warp, weft, and z-binder are listed in the table as ends/cm, picks/cm, and binders/cm, respectively. The areal density of the dry 3D woven preform, measured in  $g/m^2$ , and the thickness of the 3D woven composite (measured in mm) are also provided in the table. Because of the large curvature of the z-binder yarn of TTAL structure, which interlaces all wefts, a thinner yarn than the warp or weft was selected for the z-binder. The z-binder architecture significantly affects void content, directional fibre volume fraction, mechanical properties, failure mechanisms, and other factors. All the warp densities were the same, whereas the weft density and thickness varied depending on the z-binder architecture. The weft and z-binder densities vary due to these structural differences. Notably, the warp density for all these structures remains constant at 4 ends/cm. However, the weft density increases progressively from 6, 6.92 to 7.66 picks/cm, respectively. Initially, the z-binder density is uniform at 4 binders/cm across all structures, but it subsequently increases to 5.37, 9.82, and 14.24 binders/cm, respectively, based on the specific structure.

Consequently, the area density increases from TTO to TTAL. In the micro-CT image obtained, the weft yarn in the TTO structure is a long oval shape in the x-direction. Conversely, in the TTAL structure, the weft yarn closely approaches a circular shape due to the wrapping of all weft yarns by the z-binder. This z-binder influence leads to an increase in the thickness of the structure, particularly in the case of the TTAL structure.

The fibre, matrix, and void volume fractions of the 3D woven composites. The TTAL structure exhibited the highest fibre volume fraction (53.33 per cent), which is attributed to its high z-binder content. However, it also had the highest void content of 2.28 per cent because the z-binders induced more voids in the 3D woven composites than in the 2D composites. The z-binders reduced the resin flow between the warp and weft yarns, thereby decreasing the amount of resin in the area. Thus, the TTO structure had the lowest void content, and the TTAL structure had the highest void content with the most complex weaving pattern.

The directional fibre volume fractions, which were obtained by the total fibre volume fraction with the warp, weft, and z-binder contents, have been determined. From TTO to TTAL structures, the wrapping region of the z-binder yarns around the weft yarns was increased. This alteration created more space between the warp layers in the composites, leading to larger dimension in the xz-plane. Despite having the same number of warp yarns, the increased dimensions resulted in a reduced fibre volume fraction. As a result, the TTAL structures exhibited the lowest fibre volume fraction in the warp direction. Conversely, the expansion of the wrapping region of the z-binder yarn led to a higher fibre volume fraction in the z-binder direction. This is evident from the TTAL structure, which showed the highest fibre volume fraction in the direction. It is important to note that while the majority of z-binder yarns in the TTO structure were aligned with the thickness direction, in the other two cases, some sections of the z-binder yarns were not aligned. Taking into account the influence of the z-binder on the x- and z-directions, we calculated the fibre volume fraction in the x-, y-, and z-directions. The values have been determined. The TTAL structure exhibited higher x- and z-direction fibre volume fractions compared to the other two structures, owing to the high z-binder fibre volume fraction. Considering the overall thin structure and the significant curvature of the z-binder in the TTAL structure, the fibre volume fraction in the z-direction was relatively low. However, this can be further increased by adjusting the structure's thickness and a different type of yarn, making it possible to fabricate full 3D woven preform. Subsequently, the mechanical properties of the three 3D woven composites were investigated as follows.

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**(The article is divided into two parts, with the first part presented here. The second part will be featured in the upcoming edition.)**

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# The impact of high-performance interlining in garment durability

The impact of interlining on how long clothes last is clear, and it will keep shaping the future of fashion, affirms **Sivasailam G.**

**F**ashion is an ever-changing world, with trends coming and going in the blink of an eye. Yet, amidst this constant flux, there exists a crucial but often overlooked component that breathes life into our wardrobes - the interlining. Concealed from view, interlinings are the unsung heroes responsible for bestowing structure, durability, and enduring allure upon our garments. As we navigate the ever-shifting landscape of fashion, it is the high-performance interlining that serves as our unwavering guardian, ensuring that our beloved clothes withstand the test of time.

In the past, interlinings were typically crafted from natural fibres such as cotton or silk. While these materials provided adequate support, they lacked durability when subjected to repeated wear and washing. However, with the advent of synthetic fibres and the refinement of manufacturing processes, a new era of high-performance interlinings has emerged. These modern interlinings are created using state-of-the-art materials and coatings, resulting in unparalleled strength, stability, and resilience. This means that garments maintain their shape and structure even in the most challenging circumstances. The evolution of high-performance interlining has truly transformed the way garments are made, ensuring that they are not only stylish but also long-lasting and reliable.

## The role of interlining in garment durability

Throughout the lifespan of a garment, it faces various challenges such as regular wear and tear, frequent washing, and treatments like softeners and enzyme washes. These challenges can lead to issues like the delamination, forming bubbles, or changing shape. These problems not only affect the appearance of the garment but also impact its functionality. High-performance interlinings play a crucial role in addressing these challenges by acting as a protective barrier.



Garment without IL

Garment with IL

They form a strong bond with the outer fabric and are resistant to post-processing treatments, thus preventing issues like delamination, bubbling, pilling, and dimensional changes. By maintaining the shape, stability, and integrity of the garment, interlinings ensure that it retains its original appearance and performance over time. In essence, interlinings act as a shield, safeguarding the garment from the rigors of daily use and external treatments, thereby prolonging its lifespan. This not only benefits the consumer by reducing the need for frequent replacements but also contributes to sustainable fashion by promoting the longevity of clothing.

## The importance of material selection and manufacturing process

The selection of base materials, adhesive coatings, and manufacturing processes is crucial in determining the durability and effectiveness of interlinings. Different fabrics and garments require specific

combinations of interlinings tailored to their unique properties and intended uses. For delicate or heat-sensitive fabrics, it's important to use interlinings with lower fusing temperatures to prevent any damage during the bonding process. On the other hand, heavy-duty or outdoor garments benefit from interlinings with superior bonding strength and resistance to environmental factors such as moisture and abrasion. The manufacturing methods employed also significantly impact the durability of interlined garments. Proper bonding techniques, including precise temperature control and pressure application, are essential for achieving a strong and long-lasting bond between the interlining and the outer fabric. Additionally, implementing quality control measures during production is vital for identifying and rectifying any defects or inconsistencies that could potentially compromise the durability of the garment. In summary, careful consideration of material selection and meticulous attention to the manufacturing process are fundamental in ensuring that interlined garments meet the specific demands of their intended use, resulting in enhanced durability and longevity.

## Challenges and innovations

Leading the charge in sustainable fashion, the development of innovative products like biodegradable fusible interlinings, organic and recycled non-woven interlinings, and other sustainable textile solutions addresses the growing demand for environmentally friendly materials in the apparel industry. By incorporating recycled or biodegradable fibres into their product range, companies are driving positive change for humans, animals, and the environment while prioritising wearer comfort. This commitment to sustainability is evident in products like Comfortemp fiberball padding made from 70 per cent recycled polyester, which reduces the carbon footprint, and Comfortemp Tencel, the industry's first 100 per cent biodegradable padding. These initiatives propel the fashion industry towards a more sustainable future.

## Towards sustainability

In response to the growing concern for sustainability in the apparel industry, companies are introducing sustainable interlining solutions. A notable achievement is the development of biodegradable interlinings that use a natural adhesive, breaking down harmlessly and reducing landfill waste while minimizing environmental impact. These biodegradable interlinings offer exceptional sustainability without compromising performance, making them ideal for conscious consumers and environmentally aware brands. Moreover, the commitment to sustainability extends to the use of recycled materials. Introducing interlinings made from discarded polyester (rPET) bottles effectively repurposes

waste materials and contributes to a circular economy. This approach reduces resource consumption and minimises waste and environmental harm. With these sustainable interlining solutions, companies are leading the industry's efforts towards a more environmentally friendly and responsible future.

## Meeting the demands of modern fashion

In today's fast-paced fashion world, consumers expect clothes that not only look good but also work well and last a long time. Whether it's sporty outfits for an active lifestyle or formal wear for work, the versatility and durability of interlined clothing are really important. To meet these demands, companies have made big steps in creating new technologies and materials to improve how interlined clothes perform and how long they last. One important development is the Xtreme technology, which makes interlined clothes bond better and work well with lots of different fabrics and treatments. This means that interlined clothes not only stay stylish but also stay strong, even with everyday use.

## The future of high-performance interlining

As the clothing industry keeps changing, high-performance interlining will also evolve to play a bigger role in making clothes. With new materials, better ways of making clothes, and a focus on being kind to the environment, the future looks bright for interlined clothes that are tough, useful, and eco-friendly. By being open to new ideas, caring about quality and the environment, and working with others in the industry, manufacturers can keep making interlined clothes even better. This means reducing waste and using less energy while also making clothes that last longer and work well. The impact of interlining on how long clothes last is clear, and it will keep shaping the future of fashion. In short, high-performance interlining is really important for making clothes that last and stay strong in many different industries. By providing essential support and strength, interlinings help keep clothes looking good and lasting a long time, cutting down on how often they need to be replaced. The future of interlined clothes looks good, thanks to new materials, technologies, and efforts to be eco-friendly. These changes aim to make clothes that are tough and good for the environment.

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# Utilisation of pineapple leaf fibres for bio-based textiles

The phenotypic and genotypic characterisation of 100 Colombian/ Thai cultivars, will increase the general understanding of pineapple traits, informs **Thomas Gries** and **Seyit Halaç**.

Natural fibres are increasingly being used to reduce CO<sub>2</sub> emissions and environmental pollution in the production of technical textiles.

## Issue

Besides hemp and flax, the use of pineapple leaf fibres is another potential alternative. During pineapple cultivation, the pineapple leaves are left over as plant waste. Pineapple leaf fibres can be used by extracting the fibres from the leaves and be utilised as a sustainable and value added resource for a bio-based textile industry.

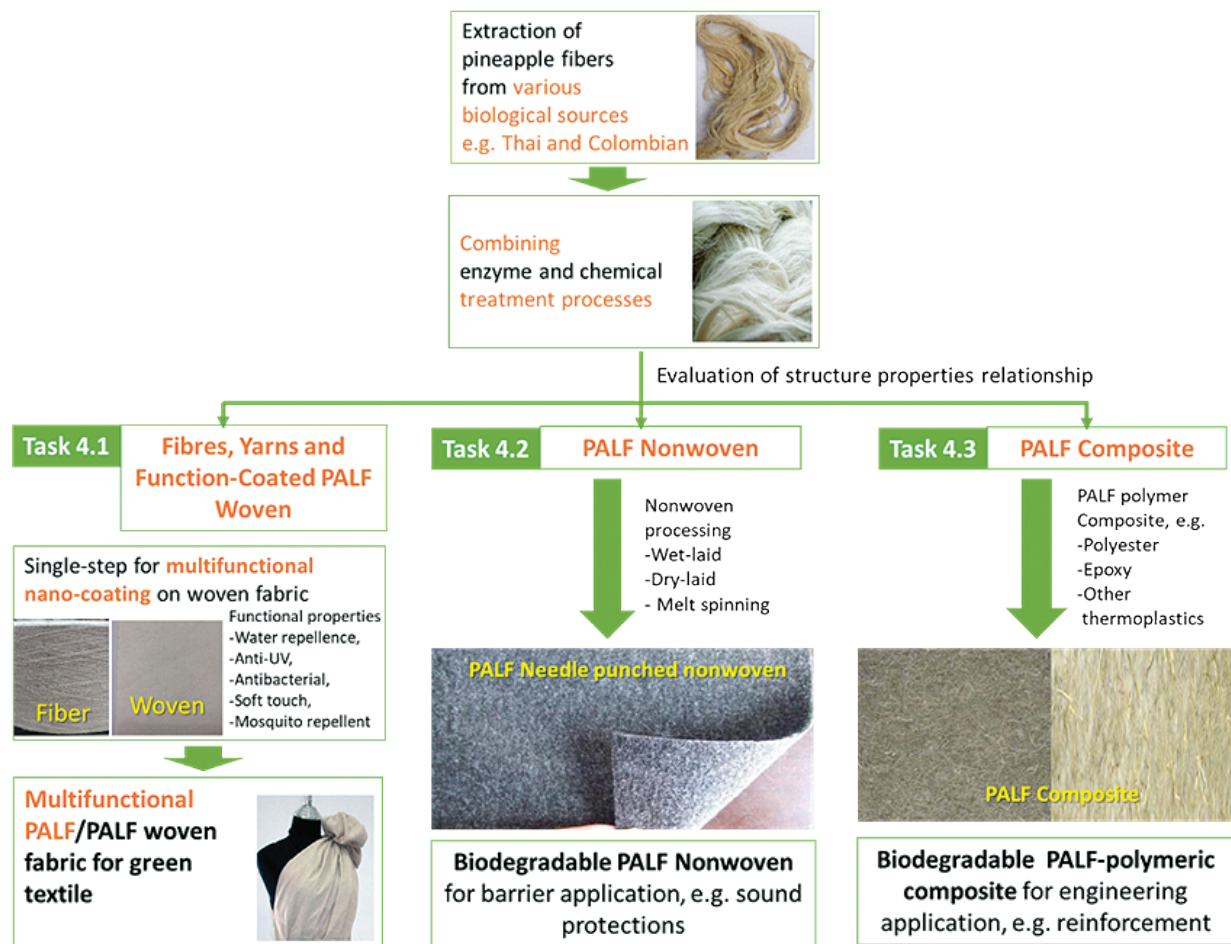


Figure 1: Utilisation of PALF, divided in three parts.

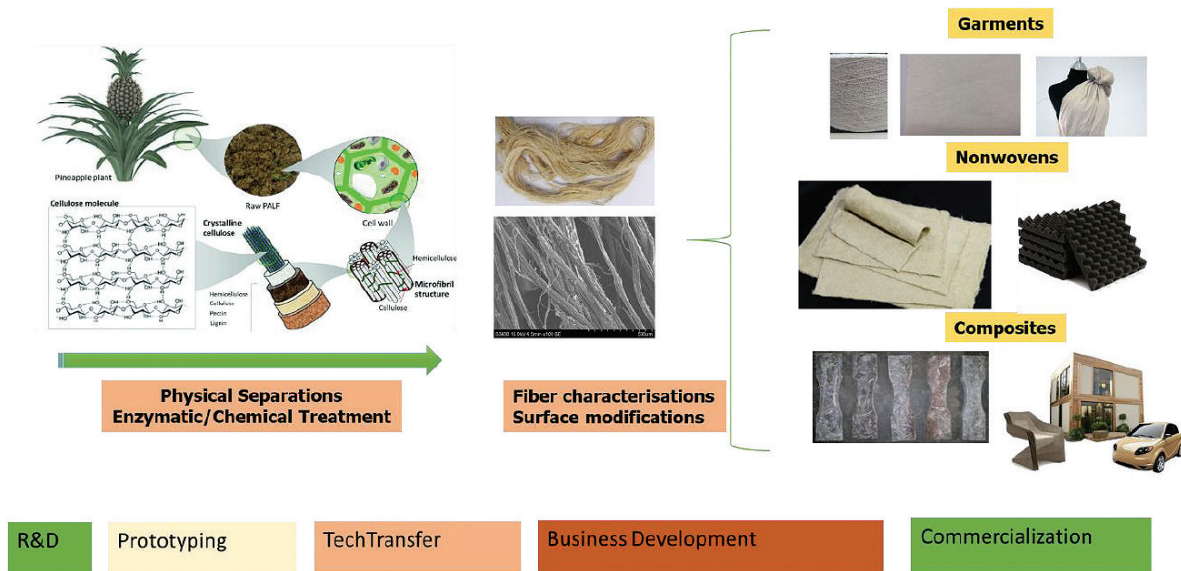


Figure 2: Development concept for pineapple-fibre prototypes in garments, nonwovens and composites

## Aim and approach

The goal of PiñaFibre project is to utilise plant waste, i.e. pineapple leaves, of the pineapple production to utilise a sustainable resource for fibres and evaluate its value chain for the bio-based industry. Therefore, value-added resources such as nano-coated fibres, composites, and exemplary yarns from PALF, will be produced and evaluated in their properties, value-chain and markets (Figure 1). Stakeholders in Germany already expressed strong interest in PALF as a sustainable resource for bio-based textile and composite production. Furthermore, the PALF will open a new market for farmers in the humid tropics and potentially a second income promoting a drought tolerant crop that produces a fruit for the local market and export as well as PALF.

## The project goals are:

- Utilising PALF as a sustainable and value added resource for a bio-based textile industry
- Evaluation of PALF and derived products value-chain and markets
- Identification genes underlying fibre content supporting the breeding process for a dual purpose pineapple

## Solution

The value-chain and markets of PALF will be evaluated, exemplary products produced, and the results will be disseminated to identify stakeholders (Figure 2). For a sustainable production, we will support breeding of new cultivars, phenotyping and genotyping methods will be established and the underlying genetics of important economic traits identified for future targeted breeding and propagation of a dual-purpose crop 'fruit and fibre'

to stakeholders. The phenotypic and genotypic characterisation of 100 Colombian/ Thai cultivars, will increase the general understanding of pineapple traits. All data of the project will be integrated, visualised and provided (open access) to the scientific community, breeders, and will enable gene discovery for future crop improvement.

## Economic significance & benefits

The transformation to a bioeconomy requires continuous, reliable and affordable production of biomass from the agricultural sector. The proposed project enables stakeholder to produce dual purpose plants (fruit and fibre), and creates additional value-added and sustainable products with importance for industry. The PiñaFibre project will contribute directly to targets of the National Strategy Of Bioeconomy 2030 (NSBE2030) and 'Nationale Bioökonomiestrategie für eine nachhaltige, kreislauforientierte und starke Wirtschaft' (NBS). The project contributes to the challenges 'Sustainable Agricultural Production' set out but the NSBE2030 by potentially improving a tropical fruit and using PALF as raw material for the bio-based textile industry. ITJ

## Acknowledgement

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# Mimaki Tiger600-1800TS reigns supreme in Sublimation Printing

Tiger 600-1800TS is designed to handle high-volume textile productions and large projects with ease.

To be at the top of the food chain, you need advantages so you can not only survive but thrive in your sector. Today's sublimation market is increasingly favouring high-volume, high-speed models, which currently make up 75 per cent of the market. Mimaki's industrial-scale sublimation transfer inkjet printer, the Tiger 600-1800TS, seeks to outpace expectations. Designed for companies looking to enhance their competitive edge, this printer delivers industrial productivity, consistent print quality, and cost-effective performance.

## An industrial tiger

As an industrial textile inkjet printer, the Tiger 600-1800TS is designed to handle high-volume textile productions and large projects with ease, without compromising the high standard quality Mimaki's printers are known for.

Due to its size and high performance, this printer would also make a clever, efficient, and cost-effective choice to replace a production line with multiple smaller printers. It can handle diversified production and applications with a flexible, quick, and high-quality process.

The printer's ability to handle lightweight paper down to 25 gsm enables users to save on paper costs, reducing the total printing cost by up to 40 per cent. Additionally, the Mini Jumbo roll unit allows for larger media rolls up to 300 kg, further reducing operational costs and providing per-square-meter advantages over standard rolls.

## Outstanding speed

The Tiger 600-1800TS doesn't share a name with one of the fastest land mammals on the planet for no reason. Thanks to Mimaki's new-generation printheads, the Tiger600 offers unparalleled speed and productive printing, reaching up to 550 m<sup>2</sup>/h— a remarkable 143 per cent of the previous model's speed. Combined with its unique features, the Tiger600-1800TS sets a high benchmark for the future of digital sublimation printing.

Due to the latest attributes, high speed printing can be maintained throughout with minimal intervention needed. A new ink system design helps to reduce the risk of nozzle drop out during operation, including components like an internal buffer tank to automatically



Delivering increased productivity, consistent print quality and cost-effective performance, the Tiger has earned its stripes as a leading industrial-scale sublimation transfer ink printer.

replace ink, regular circulation of inks, degassing directly above the printheads to avoid air from entering and flushing boxes on either side to bypass the need for additional colour bars.

It's also equipped with Mimaki's quintessential core technologies, including the Nozzle Recovery System (NRS) which allows printing to continue even if a nozzle head is clogged, are also included. Colourama, a company which specialises in fashion, home décor and other digital printing services, remark that they have only needed to replace one printhead for its four Tiger machines over the past four years.

## Dye of the Tiger

Not unlike the striking orange and black fur of a tiger, the printer delivers sharp and high-quality prints. Using high density and wide color gamut MLSb510 ink and eight advanced print heads at 240mm per pass, it delivers vivid results with almost no ink satellites, even on high speeds. The Tiger excels in black dye by achieving an extremely deep black colour – arguably the deepest in the market – all in just one printing pass.

The Tiger600-1800TS is also equipped with Mimaki Advanced Pass System (MAPS4) technology, which calculates the best way to inject the ink drops on the varied materials.

As Tiger-user Colourama primarily prints for fashion and home décor, the team is oftentimes tasked with creating colourful and highly detailed pieces. For this reason, the company chose to invest in several Tiger printers due to the vibrant solid colours and sharp details that it can produce, even on high speeds.



## Environmentally conscious

Sustainability has remained one of if not the key issue across all industries for several years now, and the Tiger 600-1800TS was created with that in mind.

Compatible with Mimaki's ECO PASSPORT certified ink, companies can create ecofriendly prints, allowing them to pursue the OEKO-TEX certification. The printer inks are also bluesign certified, one of the most stringent eco certifications in the world to certify the highest level of consumer and worker safety, and environmental friendliness.

## Improved space-saving design

Both the interior and exterior were considered to ensure that the printer is fully optimised to its environment. All the mentioned features are compacted

in a space saving unit, with the paper set up and taken out both at rear of the machine. As it doesn't need to be accessible from both sides, it takes up 50 per cent less space than the previous Tiger model. The mobile heating unit is situated underneath the machine, allowing for easy paper loading. The 300kg mini jumbo rolls reduce the need for continuously reloading the paper.

For printers considering making the leap to digital textile printing technologies, the Tiger 600-1800TS is a highly productive and self-sufficient industrial addition, with built-in capabilities to not only keep up with fluctuating demand but also thrive in a fast-paced environment.



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## News Snippet

# Mimaki to celebrate 20 years of innovation at FESPA with latest technologies

Mimaki Europe, the leading manufacturer of inkjet printing and cutting technologies, is set to bring the very latest in UV print technology, including brand new products, to FESPA Global Print Expo 2024 (March 19-22, 2024). As FESPA's official UV Excellence Partner, Mimaki will present some of its most advanced, energy-efficient UV solutions at the centre of its stand (Stand F10, Hall 12) and at its own Experience Centre, just 10 minutes away from the show grounds.

During the daily Mimaki Experience Centre tours, visitors will have the unique opportunity to further explore the extensive Mimaki portfolio, spanning sign graphics, textile, and 3D printing technologies. The tour will also include exclusive demonstrations of two new, yet to be launched products, that will assist printers in signage expand their offering even further. Registration is available online at.

Mimaki's vision for the future will be evident throughout the show, with an innovative industrial textile printing system to be launched in the company's 'Sustainability Corner'. Mimaki's energy-efficient, UV technology FESPA line-up will consist of the recently launched UJV100-160Plus and UCJV330-160. The UJV100-160Plus boasts extraordinarily low power consumption, as well as additional functionalities to increase customer profitability. The UCJV330-160 integrated



The UCJV330-160 will be one of several highly energy efficient UV technologies

printer/cutter is a new addition to Mimaki's 330 series product portfolio, offering high-speed and high-quality printing for various applications.

Following Mimaki's recent move into the DTF market, the company's latest addition, the TxF300-75, will be demonstrated at an EMEA-wide show for the very first time. Both DTF printers fulfil market demand for a stable and efficient DTF platform, and this new system, released in August

2023, helps to cater to a diverse set of printing demands, with high-quality output combined with high productivity.

While Mimaki is looking ahead to ways in which it can support a sustainable future, the company will also reflect on its rich heritage as an innovator. Celebrating two decades of success in the market, Mimaki will commemorate 20 years of technology 'world firsts', an extensive list of creative applications printed, and its many partners, customers and industry collaborators who helped make it all possible.

Danna Drion, General Manager Marketing EMEA, commented, "This milestone anniversary for Mimaki Europe presents the ideal opportunity to celebrate success but, importantly, look to the future and establish how we as a team and a business can contribute to a more sustainable world during the next 20 years. Utilising our aptitude for innovation, we will look to apply it to technologies and initiatives that contribute to this long-term goal."

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# Hanif achieves 10% productivity increase thanks to Rieter after sales

The guiding arm refurbishment and doffer kit solution offered by Rieter helped Hanif increase productivity by 10 per cent.

**H**anif Spinning Mills in Bangladesh achieved a remarkable 10 per cent increase in its ring spinning productivity, thanks to a 50 per cent reduction in doffing time and an impressive 80 per cent decrease in yarn breaks during restart. Rieter After Sales solutions do not only improve performance but contribute to the sustainability of spinning mills.



**Mohammed Hanif,**  
Managing Director,  
Hanif Spinning Mills

Mohammed Hanif, Managing Director, Hanif Spinning Mills said, “The guiding arm refurbishment and doffer kit solution offered by Rieter helps us increase productivity by 10 per cent. It improves the working performance of the machine by reducing the operators’ intervention significantly. We are planning to implement these conversions for the remaining 26 ring spinning machines.”

Hanif Spinning Mills is renowned for its ability to

consistently produce the best Ne 20 to 40 yarn in their segment in Bangladesh. The company has been running its ring spinning machines G 33 for over 20 years. Due to the aging of the components in critical areas of drafting and doffing, the customer faced two major challenges that affected the machine’s performance and the operators’ efficiency, resulting in decreased production output.

The first challenge was the load variation and random lifting of guiding arms which occurred due to key components that were worn out. This led to quality inconsistency between spindles, undrafted roving, fibre lapping on top and bottom rollers and increased yarn breaks during running. To overcome this issue, the customer was forced to maintain a higher drafting load of above 2.6 bar.

A second challenge was the inefficient doffing cycle due to unwanted machine stoppages and manual intervention, resulting in reduced machine efficiency and an increase in restarting yarn breaks. The frequency of



Figure 1: Guiding arm refurbishment and doffer maintenance kit on ring spinning machine for improved performance

Productivity increase and reduction of restarting yarn breaks  
100% cotton, Ne 24 carded knitted yarn, G 33, 1 008 spindles

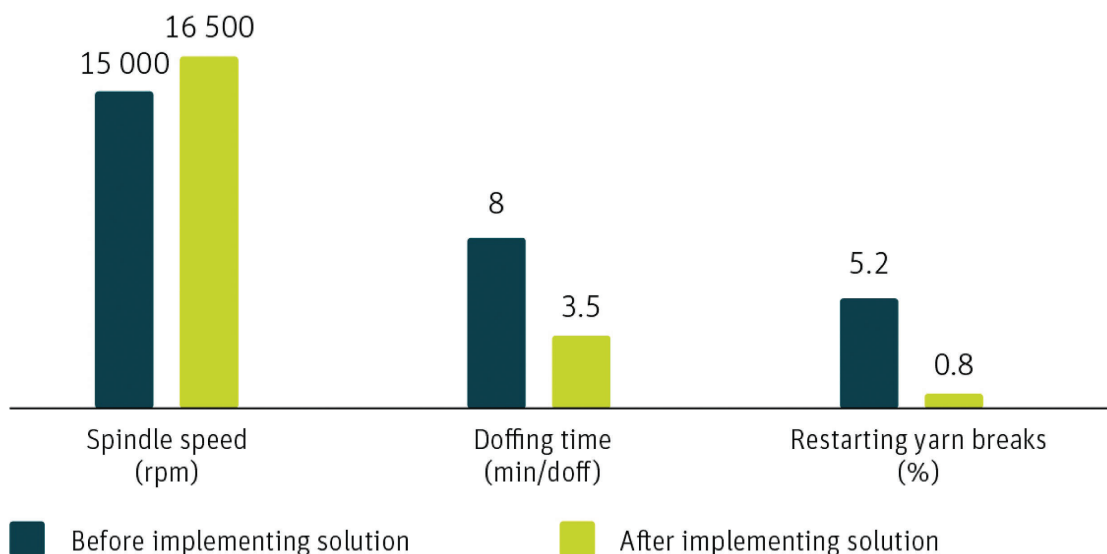


Figure 2: Impressive increase of machine performance after revision of guiding arm and doffer

the doffer operation is higher due to the coarse yarn count being processed. Hence, the impact of the doffing cycle time is key to machine efficiency.

### A solution with impact

The Rieter after sales team offered two solutions; the guiding arm refurbishment and the doffer maintenance kit. The guiding arm refurbishment consists of the pressure hose, top levers, pressure saddle and other technological components. This helps restore the original performance of the drafting system by ensuring a uniform load across the machine, resulting in stable drafting and consistent yarn quality.

The doffer maintenance kit consists of key doffer related components that help retain the doffing cycle time to its standard level of 180 seconds without any manual intervention.

### Ensuring consistent yarn quality while increasing productivity

After the implementation of these maintenance kits on two machines (Figure 1), performance improved significantly.

The guiding arm refurbishment enables load uniformity across the machine. Performance is ensured as all guiding arms are pressed evenly and the drafting pressure is maintained between the recommended 2.3 and 2.4 bar.

The doffer maintenance kit delivers the benefits of keeping doffing cycle time consistently low without any intermediate stoppages and always ensuring smooth doffing. To reduce the installation time, the doffer maintenance kit was delivered with pre-assembled parts.

The implementation of these two solutions resulted in an increase of 10 per cent in production due to the higher spindle speed and increased machine efficiency. The spindle speed has been enhanced by 1 500 rpm because of the uniform drafting operations without any undrafted roving, without lapping and reduced restarting and running yarn breaks, which leads to raw material savings. The doffing time has been reduced by around 50 per cent and the restarting yarn breaks by around 80 per cent, resulting in increased machine efficiency (Figure 2).

Replacing worn-out and aged parts helped restore the original performance of the ring spinning machines. This supports customers in optimising the performance of their operations. It further contributes to the sustainability of spinning mills by extending the lifetime of Rieter machines.

### About Rieter

Rieter is the world’s leading supplier of systems for manufacturing yarn from staple fibres in spinning mills. Based in Winterthur (Switzerland), the company develops and manufactures machinery, systems and components used to convert natural and man-made fibres and their blends into yarns in the most cost-efficient manner. Cutting-edge spinning technology from Rieter contributes to sustainability in the textile value chain by minimising the use of resources. Rieter has been in business for more than 225 years, has 18 production locations in ten countries and employs a global workforce of around 5 100, about 16 per cent of whom are based in Switzerland.



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## IPF Annual 2024

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### TRANSFORMING MANUFACTURING WITH GREENENGINEERING

IPF Annual 2024 highlights on how India can develop a vibrant low-carbon manufacturing industry to gain global competitive edge. It also showcases over 300 products, including some of the innovative new products of 2023.

### Highlights of the 52<sup>nd</sup> Edition of IPF Annual

Industry Leaders presented their thoughts on carbon-neutral strategies spanning R&D, Product Development, Manufacturing, Supply Chain & Logistics, and overall business. Some of them are:

- Zurvan H Marolia, Sr. VP, Godrej & Boyce Mfg. Co. Ltd
- Ravichandran Purushothaman, President, Danfoss India
- Manish Bhatnagar, MD, SKF India Ltd
- Hemant Minocha, Chairman, Plexconcil
- Prof R Jayaraman of S P Jain Institute of Management and Research
- Meenu Singhal, Regional MD, Socomec India
- Shubhankar Chatterji, Chief Supply Chain Officer, Cummins India
- Shivaji Waghmare, CEO, Fuji Electric India
- Bharanidharan S, Chief Business Intelligence Officer, Addverb
- Seshan Iyer, President - Industrial Business, Schaeffler India
- Wilson Lawrence, VP & GM, Trane Technologies
- Bheemsingh Melchisedec, Director - Operations, Elgi Equipments & many more...

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# Sweden AB celebrates 60 years at Eltex

As a pioneer in the adoption of electronic sensors by the weaving machinery industry, Eltex of Sweden is marking its 60th anniversary this month.

The company's timeline aligns with the acceleration of weaving machine production speeds from around 150-200 picks per minute back in the 1960s to up to 1,200 picks per minute today is no coincidence – Eltex sensor technology has made a significant contribution to enabling today's fault-free, high-speed production.

## Modest beginnings

The electronic detection of broken or missing weft yarns during production was the problem Eltex founders Åke Rydborn and Ragnar Henriksson set out to solve with the development of the world's first electronic weft-stop-motion.

Its potential was instantly recognised on its introduction at the 1963 ITMA exhibition in Hannover, Germany, leading to the foundation of the company in a modest 12-square-metre workshop in Älmhult, Sweden, in February 1964.

By 1968 the company was operating from a modern 3,000-square-metre plant and beginning to establish a global presence, introducing the first all-in-one printed circuit board (PCB) for its sensor systems in 1971.

"There were no electronics experts in the mills back then and only a few working for the machine builders themselves," remembers Alf-Gunnar Sibbeson, who has worked for Eltex for many years from 1971 onwards. "As a consequence our servicing was very much in demand, because if problems occurred, nobody else was able to solve them."

## Expansion

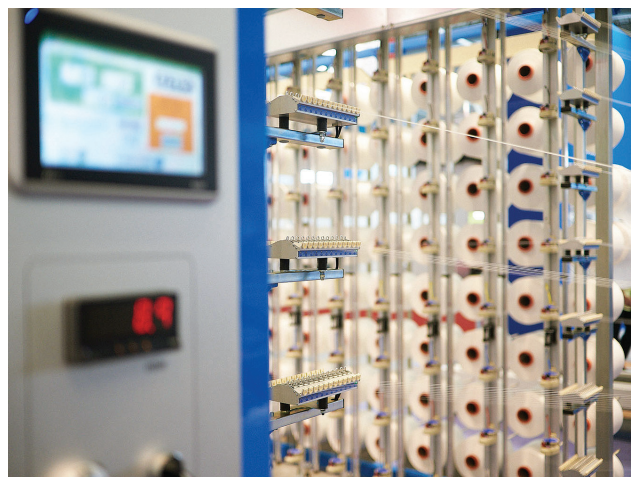
As exports increased, further Eltex operations were established in the USA and Ireland and the company expanded its product range, for a time in its history, to include energy control devices, temperature and humidity loggers, food handling safety systems, and military grade battery chargers.

Further textile milestones in parallel to advances in weaving technology included optical arrival detectors for air-jet weaving machines at the beginning of the 1980s, and the QTV system for warp preparation, which introduced digital stop-motion control to the industry at the start of the 1990s.

In 2009, the company branched out into carpet tufting, first with the CoTS clamp-on tube sensor for tufting machines, followed by the Compact sensor for tufting machines in 2013 which was an instant success. In 2019 the Compact II further cemented the company's position in this sector.

## Newly developed Eltex EyETM and ACT-R

Most recently, Eltex has launched the Eltex EyETM system for the continuous monitoring of yarn tension on warp beams. Not only does it eliminate problems when warping, but also in the subsequent weaving or tufting processes. Eltex EyETM monitors the yarn tension on all positions in real-time and a minimum and maximum allowable tension value can be set. If any yarn's tension falls outside these values the operator can be warned or the machine stopped.



Eltex has launched the Eltex EyETM system for the continuous monitoring of yarn tension on warp beams.

The Eltex ACT and ACT-R units meanwhile go beyond yarn tension monitoring to actually control yarn tension. This extends the application range greatly. The plug and play system automatically compensates for any differences in yarn tension that arise, for example from irregularities in yarn packages.



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# Recycled fibres: The machinery and services

Swiss manufacturers offer perfect matches for circularity.

**M**any end-users now expect recycled materials to be in textile products they purchase – and this is definitely driving innovation throughout the industry.

However, there are still many technical and economic issues facing yarn and fabric producers using recycled resources. Members of the Swiss Textile Machinery Association offer some effective solutions to these challenges.

Synthetic recycled materials such as PET can usually be treated similarly to new yarn, but there are additional complexities where natural fibres like wool and cotton are involved. Today, there's a trend towards mechanically recycled wool and cotton fibres. Thanks to companies like Rieter, Autefa, Steiger and Uster Technologies, such materials can now be processed. Machinery and services from these firms support further processing of recycled fibres to meet required quality standards. Swiss Textile Machinery member Stäubli also demonstrates what it means to fully embrace circularity concepts.

## Spinning recycled cotton

The use of mechanically recycled fibres in spinning brings specific quality considerations: they have higher levels of short fibres and neps – and may often be coloured, particularly if post-consumer material is used. It's also true that recycled yarns have limitations in terms of fineness. The Uster Statistics 2023 edition features an extended range of fibre data, supporting sustainability goals, including benchmarks for blends of virgin and recycled cotton.

In general, short fibres such as those in recycled material can easily be handled by rotor spinning machines. For ring spinning, the shorter the fibres, the more difficult it is to guide them through the drafting zone to integrate them into the yarn body. Still, for wider yarn counts and higher yarn quality, the focus is now shifting to ring spinning. The presence of short fibres is a challenge, but Rieter offers solutions to address this issue.

## Knitting recycled wool

For recycling, wool fibres undergo mechanical procedures such as shredding, cutting, and re-spinning, influencing the quality and characteristics of the resulting yarn. These operations remove the natural




scales and variations in fibre length of the wool, causing a decrease in the overall strength and durability of the recycled yarn. This makes the yarn more prone to breakage, especially under the tension exerted during knitting.

Adapting to process recycled materials often requires adjustments to existing machinery. Knitting machines must be equipped with positive yarn suppliers to control fibre tension. Steiger engages in continuous testing of new yarns on the market, to check their suitability for processing on knitting machines. For satisfactory quality, the challenges intensify, with natural yarns requiring careful consideration and adaptation in the knitting processes.

## From fibres to nonwovens

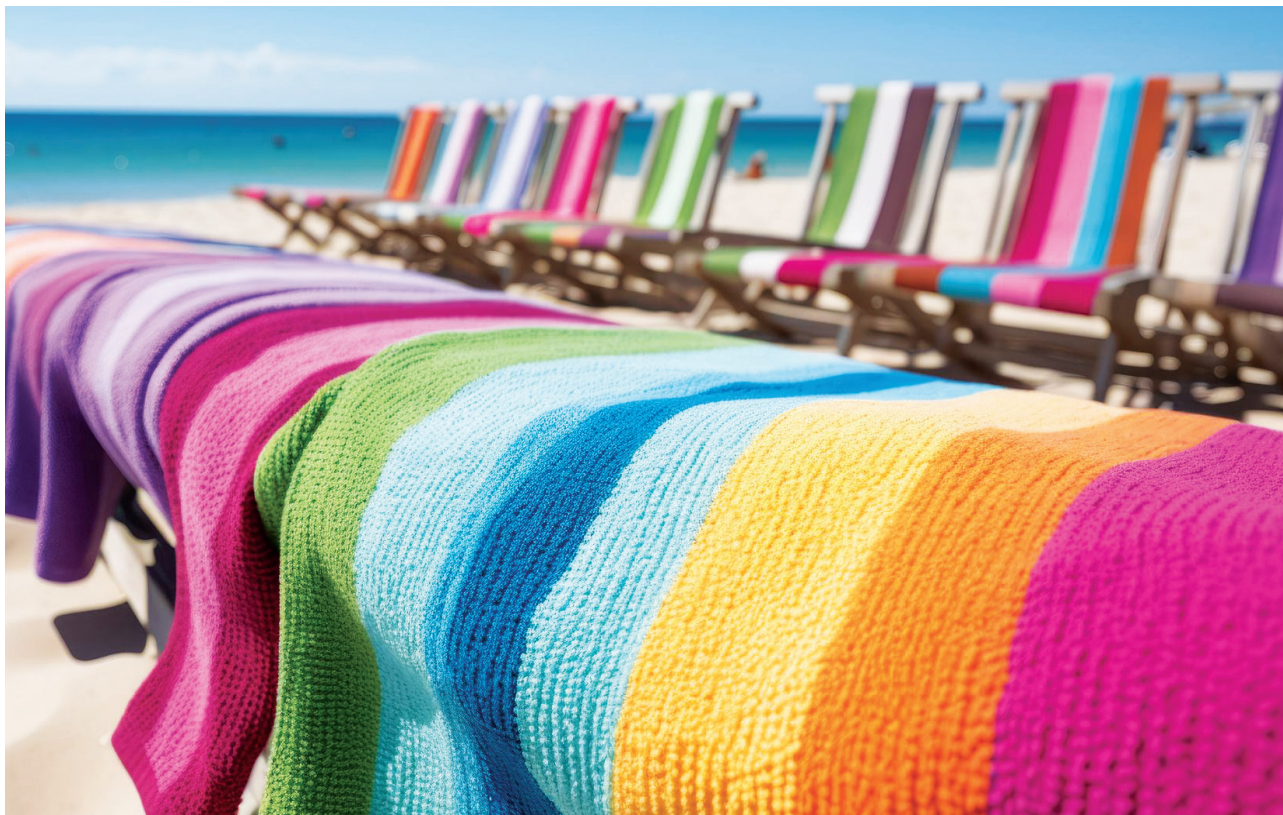
Nonwovens technology was born partly from the idea of recycling to reduce manufacturing costs and to process textile waste and previously unusable materials into fabric structures. Nonwovens production lines, where fibre webs are bonded mechanically, thermally or chemically, can easily process almost all mechanically and chemically recycled fibres.

Autefa Solutions offers nonwovens lines from a single source, enabling products such as liners, wipes, wadding and insulation to be produced in a true closed loop. Fibres are often used up to four times for one product.  Scan to read online



# The ideal yarn for towels

Velour towels are somewhat lighter, as the loops are cut open and shortened to achieve that velvety velour effect.



Beach towels

Everyday life without terry cloth towels is unimaginable. Everyone uses them every day in the bathroom, swimming pool, hotel or at the beach. For the user, it is important that they be soft, absorbent, easy to wash (at least 60 degrees), colour-fast and made of natural materials - preferably cotton. Towels should match the furnishings, be affordable for every budget and be produced as sustainably as possible without using a lot of chemicals.

A high-quality terry towel for private use weighs between 400 and 500 grams per square metre. Velour towels are somewhat lighter, as the loops are cut open and shortened to achieve that velvety velour effect.

## Saurer's Belairo yarn: A real alternative to combed ring-spun yarns

In order to meet consumer demands and be successful on the market, towel manufacturers are looking at how they can optimise the production process. One important

lever for cost optimisation is the yarn used. Up to 80 per cent of the weight of the towel is made up of the pile yarn, the yarn that comes into contact with the skin.

The classics for pile yarns are combed ring-spun yarns: durable, high quality, complex to produce and correspondingly expensive. The ring yarns are combed to reduce the hairiness of the yarns and the associated formation of unwanted fibre fluff on the towel.

The combing process ensures that the towels do not become thinner through frequent washing, during which short, less-bonded fibres are washed out. The short fibres responsible for this in the yarn are eliminated from the outset by combing, which accounts for approx. 10-15 per cent of the fibre mass. Towels made from cheaper, uncombed, exclusively carded ring yarns lose fibres over time due to the yarn structure.

But there is another way – with Belairo yarn which is similar to ring-spun yarn. The yarn produced on the Autoairo air spinning machine is a cost-effective alternative to classic ring yarns. Thanks to the yarn

## Belairo beach towels

- Higher water absorption capacity
- Shorter towel drying time
- Higher density of yarn structure
- Deeper pile
- More uniform fabric appearance
- Higher dimension stability and better washing resistance
- No fibre migration
- Up to 10 times longer life time
- More environment friendly due to less chemical usage
- Less production costs

Graph 1: Beach towel requirements

structure with parallel core fibres and the defined twisting of the wrapping fibres, all of the fibres are optimally integrated, even the shorter ones. During the air spinning process, fibres that are too short are removed pneumatically. However, this proportion is significantly lower than in a classic combing process. Belairo yarns therefore offer the best conditions for lint-free towels. Thanks to the high rub resistance of the towels, hardly any fibres come loose from the fabric composite during washing. Fibre migration is zero with Belairo yarns.

If you compare towels made from ring yarn with towels made from Belairo yarns, you will notice that the surface appearance of Belairo towels is more even, their absorbency is higher, and their drying time is shorter. These properties result from the special Belairo yarn structure and are particularly popular with private and industrial consumers (Graph 1).

The hairiness of Belairo yarn is generally very low. In order to achieve comparable values for ring yarns, these must be combed. Due to the low hairiness of Belairo yarns, their tendency to pill is also considerably reduced. Colour contrasts or motif contours in the towels are thus retained even after long periods of use. The Belairo yarn structure also gives the towels a high degree of dimensional stability. They shrink hardly at all and do not warp, even after numerous washes. Belairo beach towels keep their shape better and are more resistant to washing



Hospital towels

## Fabric quality and characteristics of Belairo beach towels with carded cotton

Yarn count	Ne 24/2 / Nm 40/2
Fabric weight g/m <sup>2</sup>	447
Warp threads/cm	17
Weft threads/cm	21
Water absorption %	484
Dimension stability 60° warp [%]	-4,04
Dimension stability 60° weft [%]	-5,03
Washing resistance, staining, worst of six materials	4
Washing resistance, colour change	4

Quality evaluation:  
Good  
Medium  
Could be better

Graph 2: Fabric characteristics of Beach Towels Belairo

than towels made from ring yarn (Graph 2).

It is not necessary to comb the Belairo yarns; carded yarns already deliver the best results for terry cloth fabrics. A sustainable process in terms of fibre utilisation, as significantly more fibres are used than with combed ring-spun yarns.

## Belairo yarn: Environmentally friendly and economical

The production process of carded Belairo yarns differs from that of combed ring yarns, and this has a massive impact on spinning costs. Belairo yarns for towels can be spun at take-up speeds of up to 400 m/min. This corresponds to 18 times the productivity of a ring spinning machine. A special feature of Belairo yarn production is that there is an increase in quality with each increase in production speed. In contrast to conventional spinning processes, where increased productivity can be at the expense of yarn quality, the opposite is often true for Belairo yarns. The faster the Autoairo produces, the better the yarn quality.

Thanks to the enormously high productivity in Belairo yarn production, towel yarns can be produced up to 45 per cent more cost-effectively. Savings can be made in terms of energy consumption, personnel requirements, space requirements and the associated costs of air-conditioning for manufacturing.

In order for the Belairo yarns to withstand the stresses of high production output on the weaving machine and to achieve optimum machine utilisation effects, they must meet minimum quality standards, particularly regarding strength, elongation, and thin places (Graph 3). Due to their specific structure, Belairo yarns are slightly weaker and sometimes less elastic than combed ring yarns, but this additional strength of the ring yarns is not fully utilised during weaving. What matters is the minimum requirements for the weaving process. Belairo yarns exceed yarn strength requirements by almost 30 per cent and yarn elongation requirements by more than 10 per cent.



	Conventional ring spun combed cotton yarn	Minimum yarn quality requirements for successful processing	Belairo carded cotton yarn
Yarn count	Ne 24/2 / Nm 40/2		Ne 24/2 / Nm 40/2
Twist	ae = 4.5 / am = 136		
Production speed m/min	25		400
Yarn strength cN/tex	19.2	14.5	18.6
Minimum yarn strength cN/tex	13.1	8.0	13.9
Elongation %	5.1	4.6	5.1
Yarn evenness CV %	11.2	16.2	14.6
Thin places -50 %	0	13.5	2.8
Thick places +50 %	10	320	149
Neps +200 %	11	350	120
Hairiness H-Index	7.4	9.0	7.8

Graph 3: Weaving requirements beach towel yarn


Yarn imperfections, in particular the number of thin places, are also relevant as they could conceal potential weak points that influence the efficiency of the weaving machines. Belairo yarns have 80 per cent fewer thin places than the maximum values permitted in weaving mills. The low dust and linting tendency of Belairo yarns is also very advantageous, whether in terry cloth-weaving or warp-knitting machines, which are often used for towels in hotels and hospitals. This extends the cleaning intervals on the weaving and warp knitting machines, even at high feed rates.

Belairo yarns and towelling - a perfect duo. The pile yarns that make up a high quality towel can be produced almost twice as cost-effectively with Belairo yarns as with combed ring-spun yarns while at the same time producing a perfect towel with a life expectancy that is up to ten times longer than a towel made from ring-spun yarn (Graph 3).

Also, the environmental balance of Belairo terry cloth towelling is also positive. Chemical softeners are often used in the final finishing of towels made from ring yarns to make them pleasant to the touch to potential purchasers. Chemical substances are however being scrutinised ever more critically by consumers. There is no need for softeners in the final finish, as Belairo yarns have an appealing feel without chemicals. In yarn dyeing, Belairo yarns require less dye and in weaving, less sizing is needed for the warp beams. The use of Belairo yarns reduces wastewater pollution and protects

the environment. The Saurer Group, founded in 1853, is a leading, globally active technology company with a focus on machines and components for yarn production. As a company with a long tradition, we have always been an innovation leader. Today, the group is a solution provider for the textile industry consisting of two segments. Spinning Solutions offers high-quality, technologically advanced and customer-specific automated solutions for staple fibre processing from bale to yarn. Saurer Technologies specialises in intelligent and economical twisting and cabling machines for tire cord, carpet, staple fibre, glass filament and industrial yarns, which allow customers to adapt flexibly to dynamic market requirements. Automation Solutions provides textile mills with an array of labour-saving systems.

Since its inception, since its iron foundry, their first embroidery machine, their first petrol engine, Saurer has powered creation. First through manpower, then through the power of steam, then diesel and today Saurer power creation through smart solutions, automation, data analytics and digital transformation.

Saurer is a leading globally operating technology company focusing on innovations for the processing of fibre and yarn, including machinery, components and software. We partner with customers, providing smart fit-for-purpose solutions to help clients achieve their business aspirations.  Scan to read online



# Gear metering pumps for complex processes

Oerlikon Barmag to display its innovation at the UTECH Europe.



**P**olyurethane (PUR) has become indispensable in many areas of modern life - automobiles, furniture, shoes, medical technology and insulation. However, its processing is extremely complex and requires customised solutions for the respective application. This is where precision gear pumps from Oerlikon Barmag come in to meet the highest demands in the chemical industry - from extremely precise metering to increased service life and efficiency. At UTECH Europe from April 23 to 25 in Maastricht, trade visitors can find out more about Oerlikon Barmag's pump portfolio (booth G19).

The gear metering pumps of the GM and GA series are mainly used for high-precision metering of demanding fluids under difficult conditions.

## Focus on gear metering pumps

The high-speed metering pump of the GM series has been specially developed for metering poorly-lubricating and abrasive media. The main advantage of the pump is the sealed product chamber. The space touched by the media is limited to the area around the gears.

The external, ball-bearing support points in the high-speed pump are externally lubricated and thus prevent the product to be metered from causing damage due to insufficient lubrication. This considerably extends the service life of the pump.

In addition, the increased speed range (30 - 500 rpm) allows an extended application range, for which several pumps of different sizes had to be used previously. This saves on production changeovers and significantly reduces the number of spare parts required. With its low weight of 1.4 kg, the compact pump (ø65 mm) promises significant space savings as well as less strain on the machine.

In addition to the proven GM pump in a square design for standard metering tasks, the GM pump in a multi-stage design conveys low-viscosity media (e.g. 250 bar, 100 mPas) under high pressure and the most difficult operating conditions. The round 2-stage GM pump has been specially developed for use in high-pressure technology. It masters the special challenge of pumping small flow rates with low viscosities. The pump is perfect for 0.05 to 20 ccm/rev feed sizes and is ideally suited for

the production of PUR moulded parts, block foam, refrigeration unit insulation or sandwich panels.

### GA series for higher viscosity media

Manufacturing companies are constantly faced with the challenge of making their products and processes more efficient. Oerlikon Barmag supplements the proven GM series with the GA series, which has been specially developed for the demanding conveying of higher viscosity media. The GA series is available for conveying volumes of 1.25 - 30 cm<sup>3</sup>/rev (0.6-144 l/h). It is designed for pressures up to 200 bar, for viscosities up to 1,500 Pas and for temperatures up to a maximum of 225°C. With this pump series, Oerlikon Barmag offers customised solutions for process engineering processes where highly accurate and uniform metering is required.

### Eccentric screw pump - robust and durable

High wear resistance, increased durability and robust appearance - the pump with a viscosity range from 1mPas to 1,000 Pas is tailor-made for pumping highly filled, highly viscous or abrasive media, such as filled adhesives, filled silicones or filled potting compounds. Eccentric screw pumps are used in sectors as diverse as the plastics industry, the automotive industry, the paint and coatings industry, the pharmaceutical industry and food technology. Customers benefit from a significant increase in productivity, as the maintenance intervals of the pumps are shortened and machine downtimes are significantly reduced.

The highlight of the eccentric screw pump is the multi-stage sealing system, which significantly extends the service life of the pump. The upstream shaft seal ring protects the slide ring seal from rapid wear caused by difficult media. The optimised alignment of the ball-bearing drive shaft, which runs centrally through the shaft seal ring, prevents any metal abrasion and thus ensures a significantly longer service life.

### The drum pump - pumping and dosing in one

With the drum pump, the pump experts at Oerlikon Barmag are presenting a pump that is specially designed for conveying and metering highly viscous materials such as adhesives, silicones and other highly viscous materials from drums and other large containers and for pressures of up to 250 bar. One of its special features is that it discharges highly viscous materials from the drum and meters them directly without an intermediate stop.

The gear pump and drum follower plate are coordinated in such a way that the plate effortlessly reaches the bottom of the container, leaving behind only a very small residual quantity of < 1 per cent. This in turn reduces material costs and has a positive impact on the production process. The dosing process, which was


previously carried out in two steps and required scoop piston and metering pumps, can now be combined with the drum pump in a single unit

Oerlikon is a leading provider of comprehensive polymer processing plant solutions and high-precision flow control component equipment. The division provides polycondensation and extrusion lines, manmade fibre filament spinning solutions, texturing machines, BCF and staple fibre lines as well as nonwoven production systems. It also develops and produces advanced and innovative hot runner systems and multi-cavity solutions for the injection molding industry. Its hot runner solutions serve business sectors, including automotive, logistics, environmental, industrial applications, consumer goods, beauty and personal care and medical. Furthermore, Oerlikon offers customised gear metering pumps for the textile, automotive, chemical, dyes and lacquers industries. Its engineering competence leads to sustainable and energy-efficient solutions for the entire polymer processing value chain with a circular economy approach.

Oerlikon Polymer Processing Solutions Division serves customers through its technology brands – Oerlikon Barmag, Oerlikon Neumag, Oerlikon Nonwoven and Oerlikon HRSflow - in around 120 countries with production, sales, distribution and service organisations.

The division is part of the publicly listed Oerlikon Group, headquartered in Switzerland.



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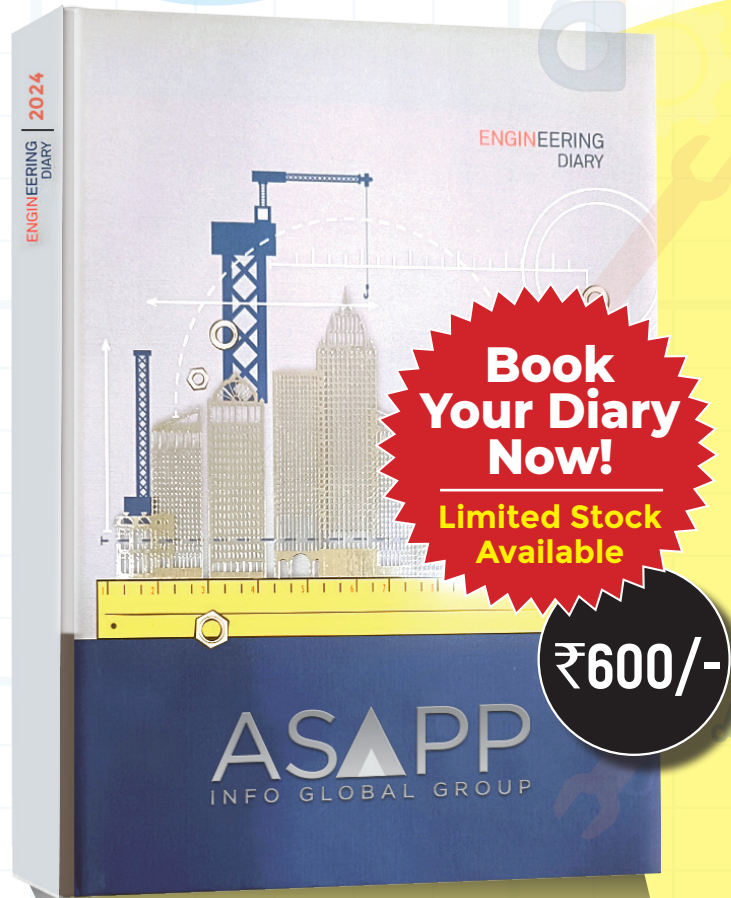
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- Rolled Steel Beams- Dimensions & Properties
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1 metre	= 3.2808	= 39.3701	= 39.3701
1 kilometre	= 3280.84	= 3280.84	= 3280.84
1 inch	= 0.0254	= 0.0254	= 0.0254
1 foot	= 0.3048	= 0.3048	= 0.3048
1 mile	= 1.6093	= 1.6093	= 1.6093
1 nautical mile	= 1.852	= 1.852	= 1.852
1 square metre	= 10.7639	= 10.7639	= 10.7639
1 square kilometre	= 1076390	= 1076390	= 1076390
1 acre	= 0.4047	= 0.4047	= 0.4047
1 hectare	= 2.4710	= 2.4710	= 2.4710
1 cubic metre	= 35.3147	= 35.3147	= 35.3147
1 cubic kilometre	= 353147000	= 353147000	= 353147000
1 litre	= 0.001	= 0.001	= 0.001
1 gallon	= 3.7854	= 3.7854	= 3.7854
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1 kilogram	= 2.2046	= 2.2046	= 2.2046
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# Lindström makes recycled garments from PET bottles into workwear

Move towards environmental responsibility by transforming plastic waste into eco-friendly uniforms.

**L**indström India, a 100 per cent subsidiary of the Finnish Lindström Oy, a global textile rental company offering workwear and cleanroom services, has reaffirmed its commitment to sustainability with yet another proactive initiative. The company is including recycled polyester from PET bottles into its workwear garments collection, aligning with Lindström's commitment to science-based climate targets and emphasising environmental responsibility.

A process that involves sorting and cleaning PET bottles, mechanically shredding them into small flakes, and then melting and purifying the material. The resulting fibres are combined with 35 per cent cotton, creating a versatile fabric that merges the comfort of cotton with the durability of polyester.

Anisha Mukherjee, Head of Procurement & Sustainability lead, Lindström India said "The primary advantage of 65 per cent recycled polyester/35 per cent cotton fabric lies in its reduced environmental impact. By incorporating recycled polyester, which is derived from post-consumer plastic bottles, the production process helps divert plastic waste from landfills. This not only conserves resources but also diminishes the need for virgin polyester production, a process known for its high energy consumption and greenhouse gas emissions".

These fibres can be used to create a variety of textiles, including fabrics for clothing, upholstery, and more. The production of recycled polyester textiles reduces the demand for new raw materials and lessens the environmental impact associated with traditional polyester production. According to estimates from the Textile Exchange, the production of recycled polyester materials could yield 30 per cent lower CO<sub>2</sub> emissions compared to virgin polyester materials, as it uses 45 per cent less energy and 20 per cent less water. Besides emissions, recycling also keeps plastic bottles out of oceans and landfills.

"This 65:35 blend offers the best of both worlds – the natural comfort of cotton and the durability of polyester. The resulting fabric is not only soft and breathable but also resilient and long-lasting. This longevity contributes to reduced demand for replacement products, promoting a more sustainable approach to workwear and reducing overall textile waste" added Jayant Roy, Managing Director, Lindström India.

Recycling polyester requires significantly less energy



compared to the production of virgin polyester and blending 35 per cent cotton with recycled polyester mitigates the overall water footprint.

This blend not only addresses concerns about resource depletion and pollution but also delivers a high-quality, versatile fabric that meets the demands of a conscientious consumer base. As the world continues to prioritise sustainability, embracing such eco-friendly materials is a crucial step towards a greener and more responsible future.

"Since the introduction of recycled polyester from PET bottles as workwear, we already have a positive response from a prominent customer in South India" further continued Roy.

Lindström Oy is amongst over 4500 companies with their targets approved by the science-based climate targets, and amongst the 2897 companies globally committed to net-zero targets. The number of companies setting science-based climate targets is growing, and now make a third of the global economy.



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# TAI Mumbai hosted a sustainability and circularity conference

The Conference received overwhelming response with 275 delegates in attendance.



(L - R): Dr G S Nadiger, Vice Chairman, TAI, Mumbai Unit; Dr Naresh Tyagi, Chief Sustainability Officer, Aditya Birla Fashion and Retail; R R Patil, Vice President, TAI, Mumbai Unit; Rajkumar Agarwal, Managing Director, SVG Fashions; A V Mantri, Vice Chairman, TAI, Mumbai Unit; Dr Sharad Kumar Saraf, Chairman and Managing Director, Technocraft Group, Seema Srivastava, Executive Director, India ITME Society; V C Gupte, Conference Convener & Chairman, TAI, Mumbai Unit; G V Aras, Conference Chairman; Rajiv Ranjan, President, TAI, Mumbai Unit.

The Textile Association (India), Mumbai Unit organised International Conference on -Sustainability and Circularity - The New Challenges for the Textile Value Chain at Mumbai. The Conference received overwhelming response with 275 delegates in attendance. The theme of Conference, topics, presentations, and speakers were highly appreciated by one and all. Some of the highlights of the conference are described as under:

V C Gupte, Chairman, TAI, Mumbai Unit and Convener of the Conference welcomed Guest of Honour; Seema Srivastava, Executive Director, India ITME Society, Keynote Speaker; Dr Naresh Tyagi, Chief Sustainability Officer, Aditya Birla Fashion and Retail; awardees,

speakers, press, media, and delegates. Gupte welcomed and congratulated two awardees Dr Sharad Kumar Saraf for The Lifetime Achievement Award and Rajkumar Agarwal for The Industrial Excellence Award. Gupte explained what is circularity and circularity model, in which all materials are viewed as a resource, there is no waste. A circular textiles system will require solutions that would enable us to recycle textiles back into textiles without degrading quality. He explained when a product reaches the end of its life, its materials are kept within the economy wherever possible, The circular economy involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. These can be productively used again and again,

thereby creating further value. This is Circular Economy which is departure from the current model of which is based on a take-make-consume-throw away pattern. However, it is now realised to relook at this model for better sustainability of the planet Earth.

He mentioned that TAI, Mumbai Unit has always selected contemporary and innovative topics in all the conferences organised and presentations by high profile speakers. This conference is also no exception to the set tradition especially the theme being of international importance.

Rajiv Ranjan, President, TAI, Mumbai Unit in his Presidential Address started with the UN definition that a sustainable development meets the needs of the present generation without compromising the ability of future generations to meet their needs. Since the textile industry was very polluting in nature and as per estimate more than five per cent of total Green House Gas (GHG) emission was due to this industry, the 3R principle of Reduce, Recycle and Reuse was never more valid. In its efforts towards sustainability, it was extremely important for the textile industry to look at steps to conserve resources, optimise efficiencies across the manufacturing process and minimise waste at every stage. If a proper mechanism was adopted by the industry to work on collection for recycle and reuse, then remarkable changes could be brought to nurture sustainable development. Environment, Corporate and Social Governance (ESG) and sustainability were essential principles that organisations must adopt to operate in a responsible and sustainable manner. These measures not only benefit the environment and the society, but they also contribute to the company's long term profitability and success.

G V Aras, The Conference Chairman and Trustee, TAI, Mumbai Unit briefed about the details of the conference, including topics and speakers. He said every attempt has been made to address the theme from the perspectives of organised industry and MSMEs apart from international perspectives. Sustainable development with circularity is emphasised by the speakers from different angles so that a holographic picture can be conceived at the end of the conference. He reiterated that sustainability and circularity are the most important aspects of manufacturing for reducing environmental impact. While sustainability is the goal, circularity is a milestone that results to achieve sustainable objectives. In circularity model, all materials are viewed as resources and as such there is no waste. A circular textile system requires solutions that would enable us to recycle textiles back into textiles without degrading quality.

Dr Tyagi, in his Keynote address, described the sustainability and various steps involved in establishing the goals set towards circularity. He emphasised that the approach to develop strategies to achieve the goals and collate with national and global perspectives.

He described the various facets of sustainability and in turn strategies developed through circularity in line with sustainable development goals set by UNO as India is a signatory for the seventeen sustainable goals. With his rich experience in sustainability solutions at Birla Cellulose, he unfolded in a lucid way the importance of the subject and relevance to textile and clothing industry. His keynote address set the pace of the theme of the conference rolling to extend the deliberations on various other aspects of sustainability and circularity.

## Honouring the best in class under the textile and trade family tree

TAI Mumbai Unit takes it as privilege to honor the distinguished achievers in the textile trade and industry every year. As a tradition, the following luminaries were honored during the international conference.


**The Lifetime Achievement Award:** The Textile Association (India), Mumbai Unit has set a precedent by felicitating the textile professionals/industrialists for their outstanding contribution to the textile industry. In this Conference, the TAI, Mumbai Unit felicitated Dr Sharad Kumar Saraf, Chairman and Managing Director, Technocraft Group with "The Lifetime Achievement Award" for his Contribution and Services to the Textile & clothing Industry. In his remarks, the awardee Dr Saraf highlighted the key features of sustainability based on his rich experience in the industry and trade.

**The Industrial Excellence Award:** TAI, Mumbai Unit also felicitated Rajkumar Agarwal, Managing Director, SVG Fashions with The Industrial Excellence Award for his contribution in the field of textile and clothing industry. Rajkumar in his remarks, emphasised the role of the textile and clothing sector in the light of international scenario.

Seema Srivastava, Executive Director, India ITME Society who was the Guest of Honor addressed the delegates. She described the importance of the theme of the conference regarding holistic approach for the development of the textile and clothing sector. She highlighted the synergy of machinery development and promotion in achieving the sustainability and circularity. She complimented the TAI, Mumbai Unit for choice of the topic and organising the international conference as it is an important topic of current interest to the textile trade and industry.

There was good interaction by speakers with the delegates during question answer sessions resulting thereon effective delivery of the though sharing on the theme of conference "Sustainability and Circularity".



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# ITM 2024 to bring textile technology leaders together with global buyers

The online invitation system that allows visitors to easily enter the ITM 2024 Exhibition has been opened.



**I**TM 2024 Exhibition, where world brand companies in textile machinery and technologies will introduce the latest products they have developed, will host a unique experience with the diversity of exhibitors, visitor profile and the business volume it creates. Visitors to ITM 2024 Exhibition will have the opportunity to discover the technologies that will shape the future of textile.

When the dates show June 4-8, 2024, İstanbul Tüyap Fair and Congress Centre will open its doors to host “ITM 2024 International Textile Machinery Exhibition”. ITM 2024 Exhibiton, which will be organised this year with the motto “Discover the Future”, will offer an unmissable opportunity for those who want to discover the latest innovations in the sector, establish new business contacts and shape the textile world of the future together. The newest products to be exhibited at ITM 2024 Exhibition, which will bring together more than 1200 domestic and foreign companies; will meet with thousands of qualified buyers. The companies that will attend in the ITM 2024 Exhibiton, where a billion euro business volume will be realised; will have the opportunity to cooperate with the pioneers of the world textile industry.

Visitors to the ITM 2024 Exhibition, where innovations from every field of textile from weaving to knitting, from yarn to digital printing, from finishing “to denim will discover innovative, nature-protecting and pioneering technologies in digitalisation for a

sustainable future. Company owners who will be able to get information from experts about the technologies they will use in their factories; will develop their products and direct their investments.

## Global investors will prefer ITM 2024

The textile machinery sector will make a big leap with the latest technologies to be exhibited at ITM 2024 and new investment decisions to be taken. Delegations and global textile investors from many countries such as Pakistan, Bangladesh, Uzbekistan, India and Egypt, where textiles are active, will prefer ITM 2024 Exhibition.







Thanks to the machine sales and business partnerships of manufacturers from all over the world; the textile machinery sector will gain a great momentum in the world and in Turkey.

### Number of halls increased at ITM 2024 exhibition which attracted great interest

Exhibitor companies, which achieved visitor numbers and sales figures above their expectations in the exhibitions they attended in the past years, requested to enlarge their stands for ITM 2024. There has also been a significant increase in the number of companies that attending the ITM 2024 Exhibition for the first time. In line with its goals of expanding the exhibitions, the ITM Team increased the number of halls from 12 to 13 in order to meet the increasing demands of companies and new exhibitors. Thanks to the expanded exhibition area, companies that have enlarged their stands and have the opportunity to take part in the exhibition for the first time will have the chance to exhibit a wider range of products and services.

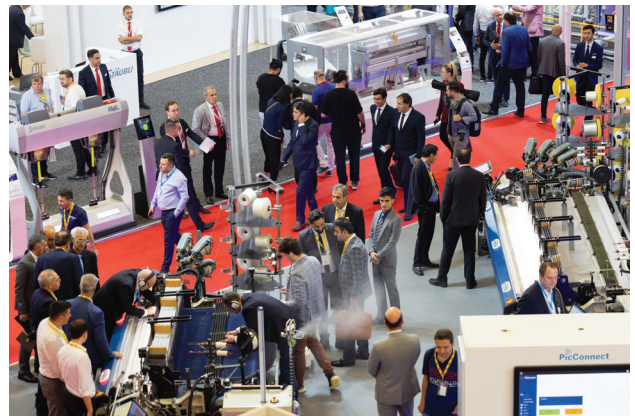
### Sustainable denim technologies at ITM 2024

The 'Denim Technologies Special Section', which was opened for the first time at ITM 2022-International Textile Machinery Exhibition, which broke records with both



exhibitors and visitors from all over the world, attracted great interest from the exhibitors. Denim technology manufacturers, which reached a visitor and sales figure above their expectations at the exhibition, wanted to expand their presence at ITM 2024. The 'Denim Technologies Special Section' was moved to Hall No. 11A, taking into account the demands of machinery and chemical manufacturers such as washing, bleaching, dyeing, cutting, patterning, finishing, drying, drying, ozone used in denim production to be close to the 'Dye-Finishing' halls. The 'Denim Technologies Special Section', which will enable companies in the denim sector to introduce their sustainable innovations and latest technologies to the whole world, will guide buyers and brands looking for reliable information on sustainable products.

### Get Your ITM 2024 online invitation at advantageous prices, enter the exhibition out of turn!




The online invitation system that allows visitors to easily enter the ITM 2024 Exhibition has been opened. Those who do not want to miss this great meeting will be able to register online by clicking on the e-invitation link at [www.itmexhibition.com](http://www.itmexhibition.com). After filling out the visitor information form, the e-invitation will be sent to the applicant by e-mail. With this e-invitation, our visitors will be able to get their badge at the entrance of the fairground and enter the ITM 2024 Exhibition out of turn.

### ITM 2024 prepares to break new records

Thousands of visitors from Europe, Central Asia and Arab countries, especially Turkic Republics, will visit ITM 2024 Exhibition. After the ITM 2022 Exhibition with 102 countries, 1280 companies and 64,500 professional visitors, ITM 2024 will break new records with the number of exhibitors and visitors.



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# Textile industry exhibits machinery innovations at ITMACH 2024

The expo gave an opportunity for networking and knowledge sharing. Here's a glimpse of the event.



(L-R): Shiladitya K Joshi, DGM-Product & Marketing and Jaideep Kokate, Sales Manager, Trützschler Spinning



Shailesh Patel from Mayur Reeds and Healds



Badal Saha, Manager-Customer Support, Peass Industrial Engineers



Ravi Mehta, Director, Pranshi Engineers



Narendra Vansjalia, Managing Director, Prism Textile Machinery



Gaurav Parmar (centre), Director, Radius and Charudatta Prayag, Project Head (1<sup>st</sup> from right)



L-R: Amit Gohel, Director & CEO, and Bhavesh Gohel, Director & CTO of Eleics Design along with their team



L-R: Vipul Panchal, Director, and Frenil Panchal, Shakti Textile Traders



Ankit Panchal, Director, Technocraft Textmach

The 4<sup>th</sup> International Textile Machinery & Accessories (ITMACH) Exhibition was held from February 21-24, 2024 at the Helipad Exhibition Centre, Gandhinagar. The expo gave the opportunity for better networking, improved interaction and knowledge sharing. It showcased the latest

technologies in the textile machinery sector. ITMACH also helped its exhibitors and visitors discover new markets, sellers and buyers. The exhibition also helps in gaining knowledge about industry.



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## EXHIBITIONS, CONFERENCES AND SEMINARS

SL NO.	EVENT	DATE	ORGANISER	LOCATION
1	<b>CMAI FAB Show</b>	April 15-17, 2024	The Clothing Manufacturers Association of India	NESCO, Goregaon, Mumbai
2	<b>ChemExpo India 2024</b>	April 24-25, 2024	ChemProTech India	Bombay Exhibition Centre, Mumbai
3	<b>Denim Expo Mumbai</b>	May 9-11, 2024	SS Textile Media	NESCO, Goregaon, Mumbai
4	<b>Yarnex Mumbai</b>	May 9-11, 2024	SS Textile Media	Bombay Exhibition Centre, Mumbai
5	<b>ITM 2024</b>	June 4-8, 2024	Teknik Ltd and Tüyap Fairs & Exhibitions Organization Inc, Turkey	Tüyap Fair Convention and Congress Center, Istanbul
6	<b>SIMA Texfair 2024</b>	June 21-24, 2024	The Southern India Mills' Association (SIMA)	CODISSIA Trade Fair Complex, Coimbatore
7	<b>HGH India-2024</b>	July 2-5, 2024	Texzone Information Services	Century Bhavan, Mumbai
8	<b>Nonwoven Tech Asia</b>	August 22-24, 2024	Radeecal Communications	NESCO, Goregaon, Mumbai
9	<b>Asian Textile Conference</b>	September 22-23, 2024	Confederation Of Indian Textile Industry	The Westin Mumbai Garden City, Mumbai

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### Inspirational Projects



### Trending Technologies

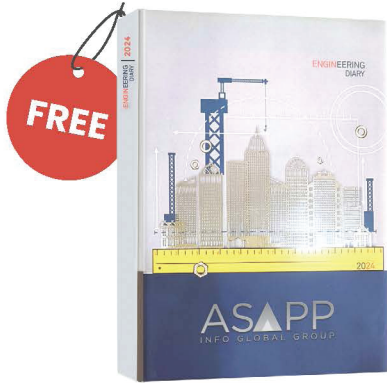


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**International Cotton Association**

In cooperation with the Cotton Association of India (CAI), the ICA will hold a training workshop on 'Quality & Trade Matters, How to Reduce Disputes, Agent's Functions and Others' in Mumbai, India on 6-7 March 2024.



**Aditya Birla Fashion and Retail**

We are thrilled to announce the grand opening of Louis Philippe and Peter England's first exclusive stores in Mauritius, in collaboration with Jetha Tulsidas. As premium menswear brands under Aditya Birla Fashion and Retail Ltd., Louis Philippe and Peter England bring their iconic styles and commitment to craftsmanship to the vibrant retail landscape of Mauritius. The flagship outlets in Tribeca and Curepipe mark a significant milestone, offering a curated selection of sophisticated menswear, blending classic and modern styles for the discerning gentlemen of Mauritius. This strategic expansion underscores our dedication to providing a remarkable global shopping experience, and we look forward to redefining men's fashion in this dynamic market.



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ALIGNING WITH THE GLOBAL 1.5°C PATHWAY NECESSITATES A 45% REDUCTION IN RAW MATERIAL PRODUCTION BY 2030\*

THIS TRANSITION HINGES, IN PART, ON THE ADOPTION OF INNOVATIVE MATERIALS THAT DO NOT RELY ON VIRGIN FOSSIL FUELS.

DESPITE THIS, VIRGIN FOSSIL-BASED SYNTHETIC FIBRE VOLUMES CONTINUE TO INCREASE, VEERING THE INDUSTRY FURTHER AWAY FROM THE DESIRED DIRECTION.



\*Textile Exchange, Materials Report 2023.

**Balkrishnan Goenka**  
Welspun Group Chairman

Continuing our investment commitment to strengthen Welspun's presence in Telangana. Proud to announce an additional investment of Rs 250 crores in the IT sector with the support of CM. @revanth\_anumula. The investment will create further jobs and empower people of Telangana.



**Rajinder Gupta**  
Trident Group Chairman

We are delighted to Welcome Back Samir Joshipura who has joined our Trident Family as Group CEO.

Samir Joshipura a Strategic Thinker and a Transformational Leader is an Engineer & an MBA with 25+ years of Strategy, Change and Transformation experience. He has transformed/consulted organisations across industries including Building Material, Auto Components, Textiles, Paper, FMCG, Banking and IT, thereby significantly revamped strategy, structure, systems, leadership, people, go-to-market approach. He is Instrumental in establishing management concepts like Balance Score Card, Branding, Viable Vision - Theory of Constraints, IT Strategic Outsourcing, Finance Restructuring, TQM-LEAN etc.



**Shahi Exports**

Shahi is mapping to reduce waste generation through:

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- Mosaic Cones: The Newest Addition to Yarn Identity in Permanent Plastic Identity in Tandem for Cones.
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