



Step Towards
Sustainability

FROM INDUSTRY 4.0 TO INDUSTRY 5.0



Eco-friendly & effective
methods for treating
textile wastewater

More at... 15

Preference for circular
and sharing business
models over recycling

More at... 28

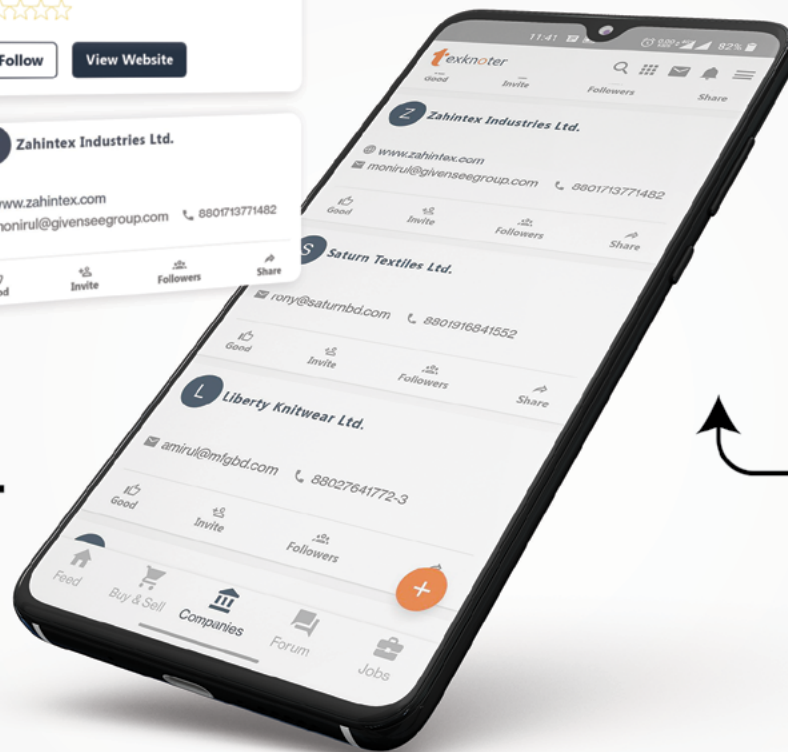
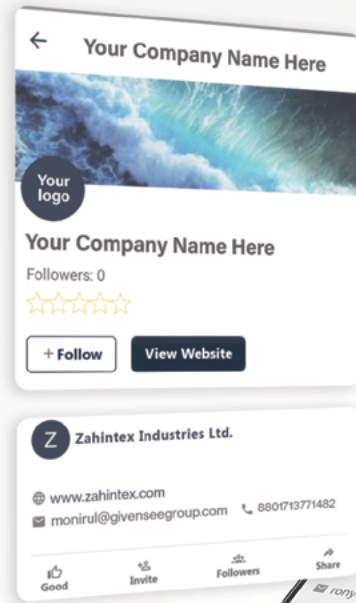
Sustainability and
digitalization took center
stage at ITMA 2023

More at... 22

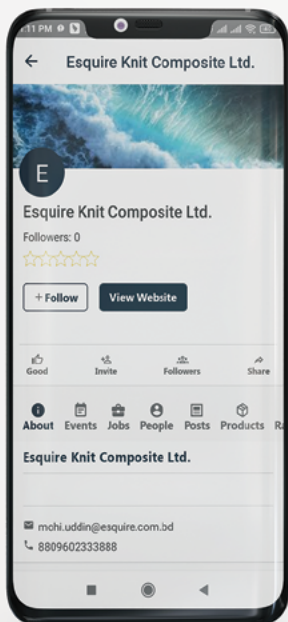
TextileToday Meta

Business and Professional **Network** for **Textile & Apparel** Industry

An initiative of
Textile Today Innovation Hub



- Post
- Buy & Sell
- Companies**
- Events
- Forum
- Jobs
- Profile
- Messages



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A dedicated marketplace to buy & sell products.

Jobs

Post jobs easily and get the right professionals.

Post

Share thoughts or views with people of the same interest.

texMeta

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Editor in Chief

Tareq Amin

Executive Chief

Eousup Novee

Managing Editors

SK Saha

Rahbar Hossain

Akhi Akter

Executive Editors

Sadman Sakib

M A Mohiemen Tanim

Sayed Abdullah

Arif Uz Zaman

Special Editors

Muddassir Rashid

Setara Begum

Head of Business

Amzad Hossain

Design

Easen Miah

Hasan Miah

Cinematographer

Ashraful Alam

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TexSPACE Today starts its journey at ITMA 2023

■ Sayed Abdullah

TexSPACE Today – an apparel media, communication & networking platform – came into being at the world’s largest international textile and garment technology exhibition ITMA 2023. As in this year’s International Textile Machinery Association (ITMA) 2023 international exhibition – it was crystal clear that the global textile and apparel industry was focusing on three key aspects. They are sustainability, circularity driven by sustainability and automation.

The launching ceremony took place at the grand reception of Bangladeshi buyers’ delegation led by Textile Today and given by ITMA Services Pte Ltd.

Andrew Lin, Assistant Director – Exhibitor Support, ITMA Services Pte Ltd said, “This is a significant milestone and I hope that TexSPACE Today will lead the way for innovation in the industry.”

Global and Bangladeshi textile industry leaders highlighted that – as the necessity of innovation, circularity and sustainability in the global textile and apparel industry has grown like never before. Keeping this aspect in mind – TexSPACE Today will cater and disseminate knowledge driven by innovation – to lead the global sector toward a more sustainable future.

TexSPACE Today is poised to redefine the textile industry on an international scale. And to bolster the future of global connectivity and cater to the future of global connectivity and information propagation.

TexSPACE Today, an e-magazine, would serve as a catalyst to transform the textile and apparel industry for good. The SPACE stands for Stainability, Precision, Automation, Circularity, and Energy. TexSPACE would stand by cutting-edge solutions, inspiring stories, shed light on best practices and cultivate practical approaches to embrace sustainability in the textile industry. By upholding success stories, research findings, and expert perspectives, we empower businesses and individuals to make informed decisions and adopt sustainable practices throughout the value chain.

Mohammad Ali Khokon, President, Bangladesh Textile Mills Association (BTMA) said, “TexSPACE Today initiative keeping in mind the global fashion industry’s sustainability, circularity and automation – will be a torch bearer. And I wish it success. And TexSPACE Today will cater to the knowledge demand of the global textile industry.”

Engr. Shafiqur Rahman, President of the Institute of Textile Engineers and Technologists (ITET) said, “In this year’s ITMA exhibition – all the technologies and innovations are focused on three key areas – sustainability, linked to circularity and most importantly digitalization. As we are seeing everywhere that digital technology is emerging.”

“Distinguished guests, we are also making an announcement that in this ITMA exhibition, we are launching a global platform – TexSPACE Today. Mainly to disseminate knowledge on sustainability, circularity and digitalization. Readers will have regular updates on sustainability, circularity and digitalization in the global textile and apparel industry,” said Tareq Amin, Editor in Chief, TexSPACE Today.

“We proudly present to you our groundbreaking creation, TexSPACE Today an unparalleled fusion of technology, journalism, and creativity: the launch of our dynamic international media platform,” Tareq Amin added.

He stressed that, “We aim to empower industry stakeholders to embrace renewable energy alternatives, boost energy efficiency, and reduce their carbon footprint.”

TexSPACE Today is a venture of Textile Today – Bangladesh-based globally leading textile & apparel media, communication & networking platform which is now functioning as an Innovation Hub. For the last 16 years, Textile Today has been continuously presenting, updating, helping & guiding the industry through various knowledge supports, trade & market analyses, trend & business forecasts, etc. We critically observe that the industry is now moving to more sustainable, precise, automated, circular, and energy-efficient solutions. It senses an urgency of concentration in this specific direction; henceforth, TexSPACE Today takes place.

Step Towards Sustainability: From Industry 4.0 to Industry 5.0

From digitizing to improving human life, both under the same roof

■ Sabiha Muntaha

4th Industrial Revolution: Addressing Problems with digitized solutions

Digitalization in the industry connects the dots and provides several solutions and a vast pool of opportunities as new technologies emerge. With the 4th industrial revolution, the industry was introduced with a cyber-physical system that allowed the manufacturer to store data and utilize the resources with precision. At the beginning of the 21st century, the world faced problems with natural resources, and industries were predicted to be closed without resources. Renewable energy and the idea of utilizing the energy with precision came to the surface as a solution. People started to find a way and industries adopted technologies to

ensure resource allocation. Intelligent sensors, actuators, 3d printers, self-learning robots, advanced materials, and augmented reality became a tool for the physical act of manufacturing. In search of precision, people learned to use the data as a tool for prediction and a new horizon was on the corner.

What is the Cyber-physical System:

A cyber-physical system is a combination of the physical and virtual worlds. Integration of physical and computation processes improved manufacturing and enabled the machines to optimize self-optimize. A typical example can be given in this regard. This figure shows that wireless and web-enabled sensors are

already used for process control. It was named as AUTOWARP concept and was introduced by a university in Germany, one of the early adopters of industrial revolution 4.0.

The Internet of Things is another core concept introduced by the 4th IR that has enabled the cooperation of smart things and objects of the neighborhood to achieve the same goal. Thus, the Idea of a smart factory came to the surface.

The Textile and apparel industry has been in this for some time now, the renowned fashion houses have introduced 3D trial houses that enable users to trial at home by giving their body measurements. This kind of technology has already taken over older ones.

HISTORY OF THE INDUSTRIAL REVOLUTION











4 th Industry Revolution	
 2011 Industry 4.0	 Cyber Physical Systems
3 rd Industry Revolution	
 1969 First Programmable Production System	 Automation
2 nd Industry Revolution	
 1870 First Production Line	 Electricity
1 st Industry Revolution	
 1784 First Mechanic Spinning Machine	 Mechanical
 1851 First Sewing Machine	
 1712 First Steam Engine	

Figure 1: History of the industrial revolution (source: Textile learner)

Pros of 4th Industrial Revolution:

Increased Productivity is one of the essential features provided by the 4th IR. The manufacturing process has long been automatic with sensors, ensuring production quality. It has enabled the proper usage of limited resources as well as the usage of renewable energy. Automation has brought the pace among the industries and the intelligent “objects” has taken over the operators’ job. Flawless production is ensured through data. People have been predicting that this revolution will bring a new surface of reality into the AI-supported world.

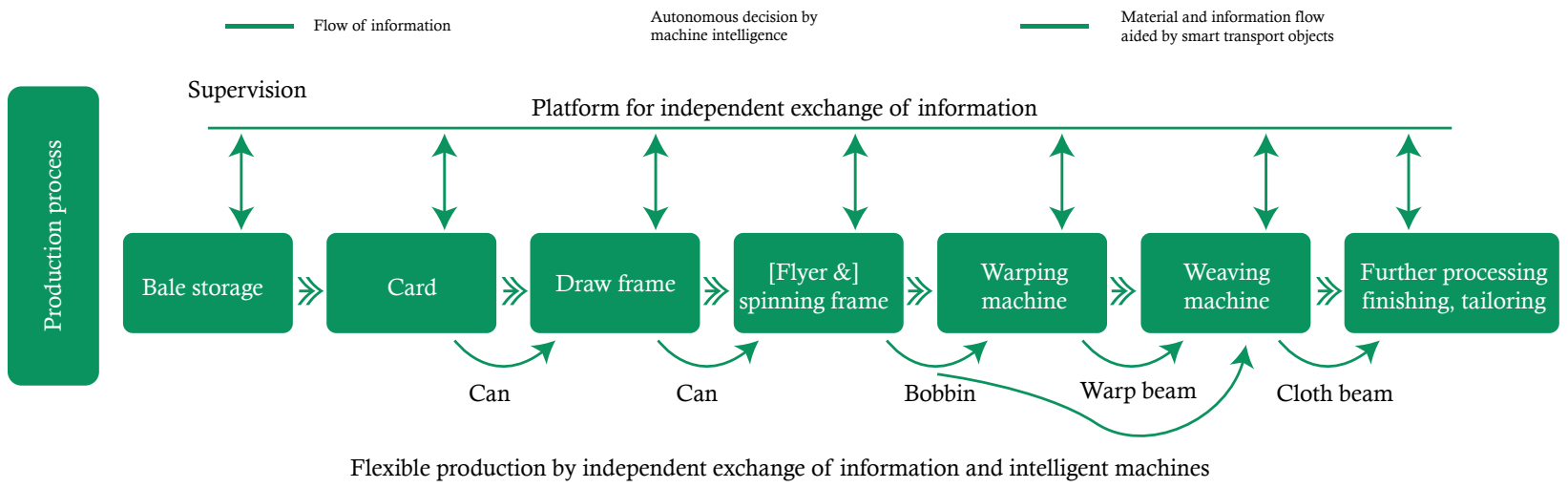


Figure 2: History of the industrial revolution (Source: Textile Learner)

Scattered pieces of 4th IR and a new Industry 5.0:

Though the problems had been addressed ideally, sustainability had yet to reach its peak. 4th industrial revolution had a major flaw that harmed human sustainability, AI replaced humans to make maximum profits. The job sector was massacred and the industrialists profited through moral degradations.

Industry 5.0 introduced the New Idea of sustainability. The term that is now has taken over the industry of textile and apparel.

Sustainability

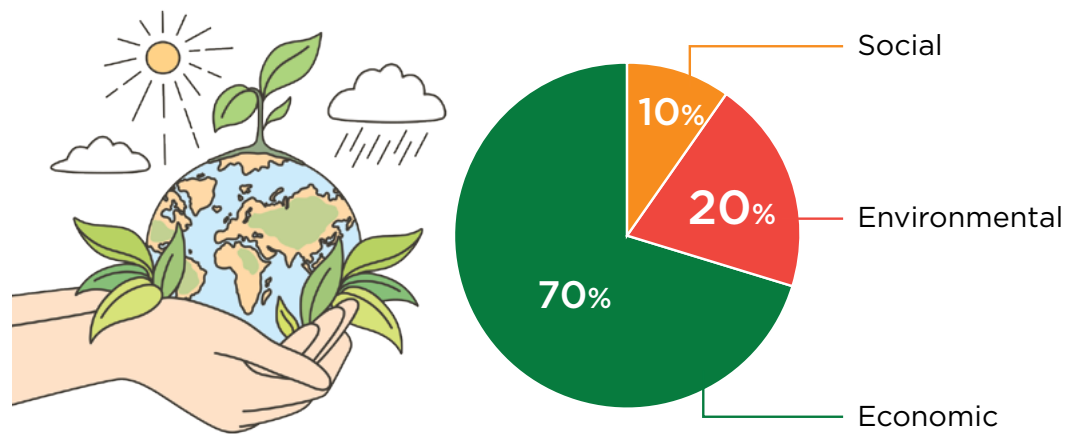


Figure 4: History of the industrial revolution (source: Textile learner)

sustainability, they are Economic sustainability, Environmental

them according to necessity. The industries adopted the AI-integrated automatic process to analyze data to provide precision in the production process. From the beginning of the process, design creating to pattern and marker making, from yarn manufacturing to processed fabric, and lastly, the ready-made apparel, every step has been through process optimization to ensure cost-effectiveness and proper allocation. This optimization was possible for cyber-physical systems, aka CPS. This perspective on responsibility promotes businesses to prioritize long-term benefits alongside immediate returns while striving to achieve inclusive and environmentally sustainable objectives. This encompasses many potential practices, including reducing emissions, minimizing energy consumption, procuring products from fair-trade organizations, and adopting proper waste disposal methods with a reduced carbon footprint. These actions contribute to the pursuit of sustainability

Tecnologies that customers believe would effect their life

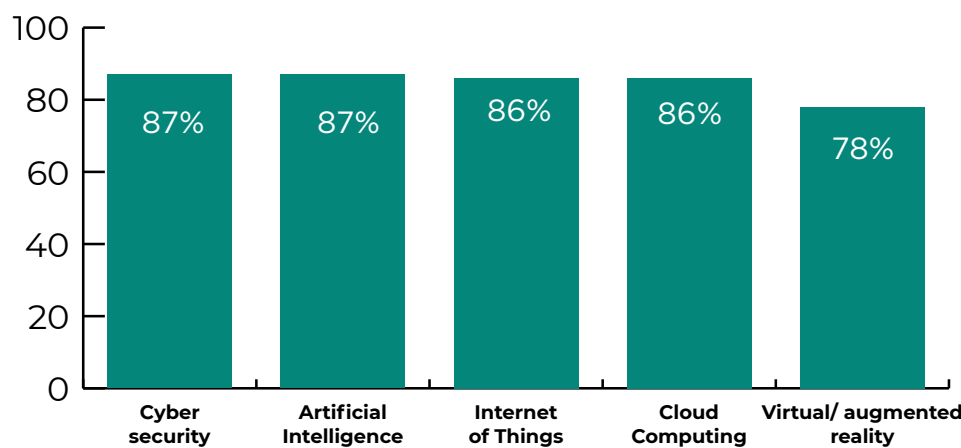


Figure 3: History of the industrial revolution (source: Textile learner)

What is Sustainability?

It is an ability to maintain and support a process continuously over time. In terms of the Textile and apparel industry, it means reducing pollution while allocating resources properly and protecting human rights.

There is a total of three pillars of

sustainability, and social sustainability.

Economic Sustainability and 4th IR:

Economic sustainability is a term attached to limited natural resources. Resources aren't abundant in the 21st century, and we must allocate

Environmental Sustainability and 4th IR:

The term itself introduces the concept behind it. Environmental sustainability includes the life support system. The textile industry is one of the leading polluting industries in this world. Fast fashion has paced up pollution through the mass production of clothing. Every step of production needs water, actively or passively. This has led to the pollution of water across the globe. The soil had been polluted because the chemicals used in textiles and lands had lost fertility.

To address this problem, the 4th industrial revolution included ETP plants and other sustainable options and is trying to find organic ways. Archroma has developed a way to produce organic colors. These kinds of steps were easier because of the CPS.

4th industrial revolution accompanied this sustainability and still is working towards a sustainable environment.

Social Sustainability and 4th IR:

Social sustainability is a term that refers to the human effects of the economic system. It includes eradicating hunger, and poverty, improving lifestyle, etc.

4th industrial revolution harmed this aspect of sustainability as the AI took the job opportunities and humans were jobless, raising the poverty in the countries.

Concept of 5th IR:

Industry 5.0 represents a forward-thinking concept that envisions the future of the manufacturing sector as a human-centric, sustainable, and resilient system. It offers a progressive vision of industry development. The Industry 5.0 paradigm emphasizes the importance of agility and resiliency in systems by applying adaptable and flexible technologies. Moreover, it endeavors to take the lead in promoting sustainability, respecting

planetary boundaries, and fostering talent and diversity.

Industry 5.0 acknowledges the influential role of the industrial sector in accomplishing societal objectives that extend beyond employment and economic growth. It aims to transform production practices to align with the limits of our planet while prioritizing the well-being of industry workers as the central focus of the production process. By doing so, Industry 5.0 strives to establish a resilient foundation for prosperity.

Difference between 4th and 5th IR:

Industry 4.0 acknowledges and tackles the challenges of human-centricity, sustainability, and resilience with a consequential perspective guided by a distinct technological approach.

In contrast, Industry 5.0 represents a significant paradigm shift, moving away from emphasizing individual technologies and adopting a systemic approach. By adopting this approach, the industry is empowered to pursue broader societal objectives beyond employment and economic growth while prioritizing the well-being of industry workers as the central focus of the production process. This fundamental distinction helps clarify why Industry 5.0 is recognized as a distinct form of the Industrial Revolution compared to previous industrial revolutions.

Some may mistake the 5th industrial

revolution as a chronological advancement after the 4th IR, but the fact is that the 4th IR and 5th IR co-exist and are just a part of each other. 4th IR teaches you how to integrate the technology and 5th IR integrates the 4th IR with social values and human life.

Impact of 5th IR on the industries:

5th IR is a new kind of revolution that is value-centric. The impact of this revolution is that this revolution will direct the profit toward human-valued companies and preach the idea that technological advancements and social trends need to co-exist.

Profit maximization while improving society is also a concept introduced by this revolution. Fulfilling all the aspects of sustainability can ensure a thriving industry and societal reformation. Thus Human life can be improved while profiting from the AI-integrated industry.

Ultimately, the industries are formed to thrive in the economy for human welfare. Digitalization is a must-choice these days as industries have no other option. They must adopt the technologies but also protect social sustainability to survive as human beings. Initial cost management is one of the problems of the 4th IR that can be reduced in the long term. Adoption is the way to survive in this 21st century. So adapt the way which will lead you to the long run business profit.

INDUSTRY 5.0



HUMAN CENTRIC
promotes talents, diversity and empowerment



RESILIENT
is agile and resilient with flexible and adaptable technologies



SUSTAINABLE
leads action on sustainability and respects planetary boundaries



Figure 5: The core concept of the 5th IR



Figure: Charles Yang, Senior Vice President of Huawei and President of Global Marketing, Sales and Services, Huawei Digital Power, delivering a keynote speech.

Huawei driving low-carbon development for a better, greener future

■ Sayed Abdullah

Intersolar Europe 2023 – Europe’s leading solar trade show, took place in Munich, Germany from June 13 to 16 –brings together players from every segment of the photovoltaic (PV) industry, presenting cutting-edge technologies, new products, and emerging trends. In the event, globally leading Huawei Digital Power

At the event, Charles Yang, Senior Vice President of Huawei and President of Global Marketing, Sales and Services, Huawei Digital Power, delivered a keynote speech, ‘Driving Low-Carbon Development for a Better, Greener Future’. Green sustainable development has become a global consensus. The push for carbon neutrality continuously accelerates the energy revolution, bringing tremendous development opportunities to the energy industry, especially in the PV, data center and green transport fields. Huawei Digital Power integrates digital and power electronic technologies to develop clean energy and energy digitalization, driving energy revolution for a better, greener future,” said Yang.

The future is here. It’s time for green development

Technology advancements and the accelerated global energy transition have led to a continuous decline in the LCOE, further fueling the explosive growth of PV installation and driving PV to become a main energy source. At the same time, the thriving PV market stimulates the rising demand for energy storage systems (ESS), driving a trillion-dollar market space.

Data and computing power are driving forces for the digital economy. It is predicted that by 2030, global general computing power will increase by 10 times from 2020 levels, AI computing power by 500 times, and global data volume by 150 times, driving further growth of data centers.

Huawei focuses on innovation, for low-carbon sustainable development

Focusing on long-term sustainable development, Huawei invests heavily in research and development (R&D) and will continue to conduct future-

oriented fundamental research to create more value for customers and society.

Green development is the only path to sustainable growth. Focusing on areas such as clean power generation, mobility electrification and green ICT power infrastructure, Huawei Digital Power integrates digital and power electronic technologies to develop clean energy, and enable energy digitalization to drive the energy revolution for a better, greener future.

Joining hands with partners and customers to build a greener, better future

Recognizing tremendous market opportunities, Huawei continues to work with partners to deliver customer success: Firstly, product quality is the cornerstone for Huawei to realize the business success of customers. Secondly, Huawei has comprehensive supply and service systems. Thirdly, Huawei’s three-decade investment in future technologies has spurred industry advancement. Finally, Huawei will collaborate with global customers for broader and more in-depth innovations.

From Waste to Worth: Textile 'waste heat' can be new source of energy, which is more efficient & green

■ Saib Khan Sami

The method of capturing and using extra heat produced due to various industrial operations, power production, or other thermal systems is referred to as waste heat utilization. This heat is collected and used for valuable reasons, minimizing environmental impact and increasing energy efficiency, as opposed to being lost and released into the environment. Depending on the source, waste heat can be found in various places, including flue gases, exhaust gases, or hot water streams.

Due to the high energy consumption and large waste heat generation in the textile sector, waste heat utilization is exceptionally significant. Spinning, weaving, dyeing, and finishing are just a few of the stages involved in making textiles, all of which require a significant amount of heat for processes including drying, curing, and steam generation. Concentrating on enhancing energy efficiency is crucial due to the industry's significant energy use. Waste heat utilization provides a solution by capturing and recycling the surplus heat produced during the manufacture of textiles. This helps bring down energy prices by reducing the industry's dependency on primary energy sources.

Moreover, the energy-intensive processes used in the textile sector add to air pollution and greenhouse gas emissions. The industry may drastically lessen its carbon footprint and environmental impact by utilizing waste heat. Waste heat utilization

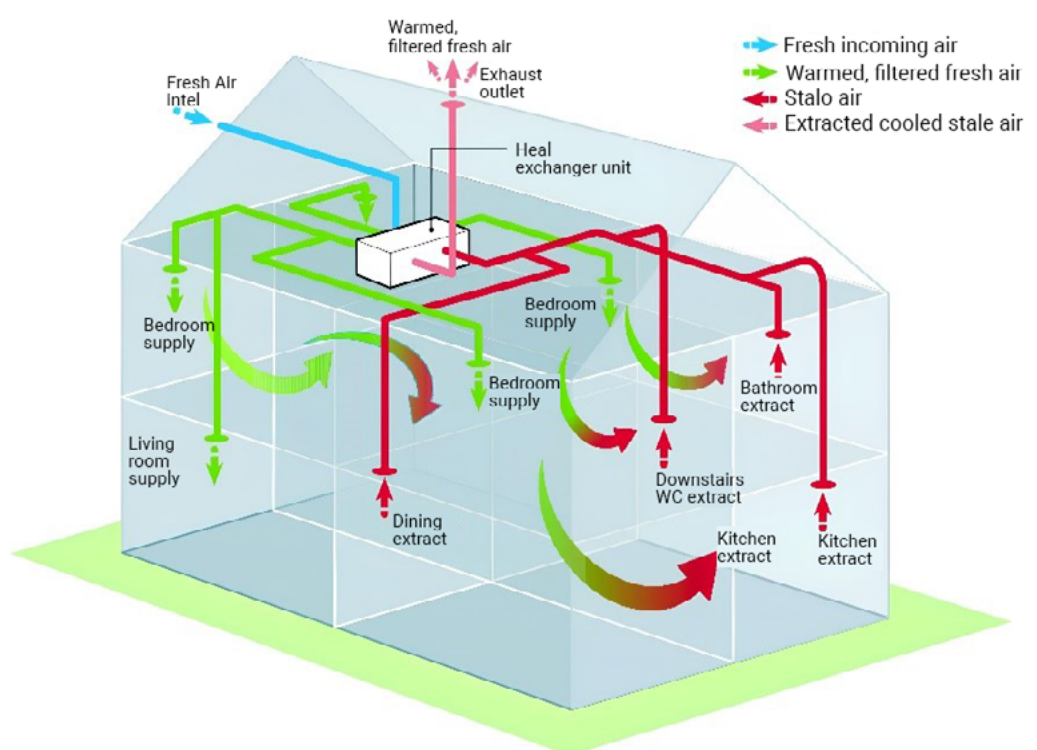


Figure 1: Air/Air heat recovery system

actively encourages sustainable practices and lessens the industry's environmental impact by lowering the energy required from non-renewable sources. Utilizing waste heat in the textile sector enables process optimization in addition to environmental advantages. To increase the effectiveness and speed of processes like steam generation, drying, or preheating, waste heat can be caught and put to use. This optimization results in an increase in overall production capacity and a decrease in operational downtime, which boosts productivity and lowers costs. Furthermore, The use of waste heat assists textile industries in meeting energy efficiency rules and criteria imposed by various countries. Textile companies demonstrate their commitment to sustainable

practices and align with regulatory requirements by deploying waste heat utilization technology, ensuring they satisfy the appropriate compliance criteria.

Waste heat from numerous sources can be used in the textile industry for waste heat usage. Here are a few examples of common sources of heat:

Boilers: Boilers are frequently used in the textile manufacturing industry to generate steam for dyeing, finishing, and fabric treatment. The exhaust gases emitted from these boilers contain waste heat that can be collected and applied to other heating applications within the facility.

Dryers: The drying of textiles, whether for finished clothing, finished fabric, or yarn, generates waste heat in the form of hot air or exhaust gases.

		Water Inlet Temp. (°C)	Water Outlet Temp. (°C)	The Amount of Water (m³)	Water Flow (m³/h)	Theoretical Stenter Waste Air Flow (m³/h)	Heat Energy From Water (kW)	Total Gained Heat Energy (kW)
		20,0	50,0	6,0	6,0	18,000	209,3	209,3
AVERAGE					6,0		209,3	209,3
							kcal/h	180.000
							For Natural Gas (m³/h)	21,82
							Daily Work (h)	16,00
							Monthly Work (day)	18,00
							Annual Work (month)	12,00
							Annual Total Natural Gas Savings(m³/year)	75403,64

Figure 2: Heat recovery from stenter machine depreciation calculation-20.000 Air water

This waste heat can be collected and used inside the building for other heating requirements, including space heating or heating water for various procedures.

Stenter machines: The Stenter machine produces heat to dry the fabric and improve its dimensional stability. This heat can be viewed as a possible source of waste heat that the facility could capture and use for other heating uses.

Utilizing waste heat has drawn much interest from businesses in various sectors, including the textile industry. Several companies are working on this waste heat utilization including AERIS, AUTEFA, BENNINGER, BRUECKNER, POZZI, BRÜCKNER, and THIES. These companies employ a variety of heat recovery techniques.

Air/air heat recovery exchanger: An air-to-air heat recovery system absorbs waste heat from a building's or industrial process's exhaust air stream and transfers it to the incoming fresh air stream. This technology recovers and reuses thermal energy that would otherwise be lost, increasing energy efficiency and lowering heating and cooling costs.

The following steps are involved in the air-to-air heat recovery process:

Exhaust Air Collection: The process of collecting warm or cool exhaust air that contains useful thermal energy.

Heat Exchange: The process of transferring collected heat from exhaust air to a separate supply air stream using a heat exchanger.

Supply Air Conditioning: Using the recovered heat to warm or cool the supply air in colder seasons.

Distribution: The process of distributing conditioned and recovered heat throughout the ventilation system of a building, giving warmed or precooled air to different locations as needed.

Overall, air-to-air heat recovery systems offer a cost-effective and long-term option for recovering waste heat and lowering energy consumption in buildings and industrial processes.

Air/water heat recovery exchanger: This method increases energy efficiency while lowering heating costs by allowing thermal energy that would otherwise be lost to be recovered and used again.

The following steps are involved in the air-to-water heat recovery process:

Exhaust Air Collection: Collecting warm or cool exhaust air containing valuable thermal energy.

Heat Exchange: The transfer of heat captured from exhaust air to a water system.

Water heating or other applications: The recovered heat can warm water for various uses, including space heating, residential hot water delivery, and boiler water preheating.

Counter-flow tubular heat exchanger: Counter-flow tubular heat exchanger allow two fluid streams to flow through them in opposition to one another. "Counter-flow" describes the configuration in which the hot and cold fluids enter the heat exchanger at opposing ends and proceed in opposite directions. The cold fluid flows outside the tubes while the hot fluid flows inside them in a counter-flow tubular heat exchanger.

Some companies have built their waste heat utilization system, as shown in ITMA 2023, like Pozzi Leopoldo RCR EOP - heat recovery system. Over the past 25 years, Pozzi Leopoldo has created a highly effective self-cleaning heat exchanger that has received widespread recognition in the textile sector. This heat exchanger has a continuously revolving central element driven by a tiny motor and made entirely of stainless steel. A hollow axle connecting two hollow discs with baffle plates allows clean water to flow through the element. The effluent flows the other way from the pure

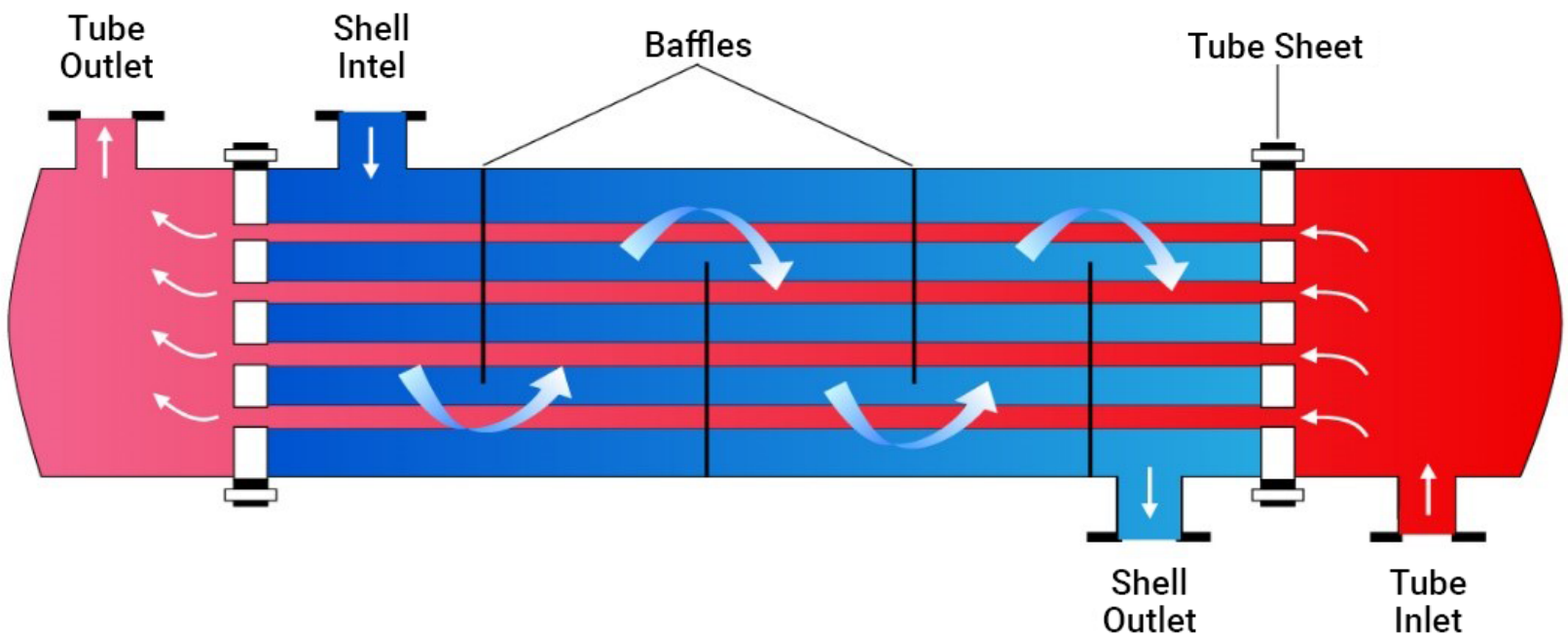


Figure 3: Counter-flow tubular heat exchanger

water inside a trough with baffles. The novel design has a number of noteworthy benefits, mainly when applied to contaminated effluents. Heat transfer is considerably enhanced by the rotating core element's turbulence in the primary and secondary flows.

Additionally, the continual rotation avoids the build-up of deposits from the impure effluent, and the centrifugal separation action brought on by rotational turbulence prevents contaminants from coming into contact with the exchanger surfaces. As a result, the system

continually maintains high heat exchange efficiency and virtually no maintenance or cleaning is required. Pozzi Leopoldo's self-cleaning heat exchanger has shown to be a dependable and effective solution, especially for textile applications with dirty effluents.

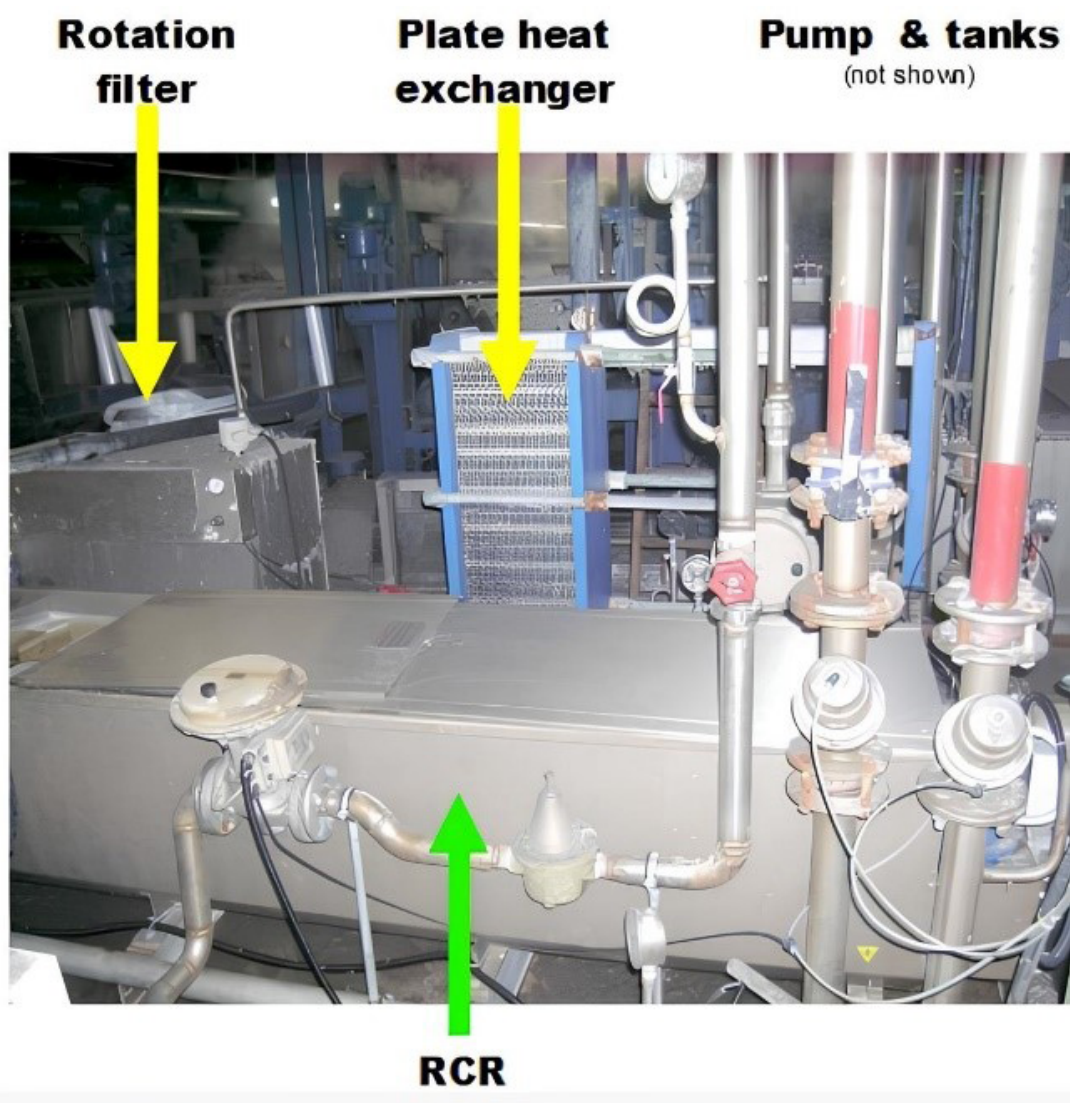


Figure 4: Pozzi Leopoldo RCR EOP - heat recovery system

The first installation of the RCR was performed on a Benninger continuous bleaching machine and has been operating for about two months.

Heat recovery efficiency:

70% Utilizing waste heat is essential for advancing sustainability and circularity in the textile sector. Utilizing waste heat lessens the need for primary energy sources like fossil fuels, which lowers greenhouse gas emissions and helps combat climate change. Utilizing waste heat is consistent with circularity because it turns waste into a useful resource. Waste heat is used as an input for other processes rather than being considered a byproduct that needs to be disposed of. This strategy advances the circular economy by reducing waste production, increasing resource efficiency, and closing the resource loop.



Archroma EarthColors®, from nature to fashion

■ Archroma Story

Archroma's patented new method EarthColors® creates warm shades from nature. EarthColors® technology creates fully traceable biosynthetic dyes derived from natural waste products of the agriculture and herbal industries; leaving the edible part still available for food consumption.

These high-performance dyes are synthesized from non-edible agricultural or herbal industries waste such as leaves or nutshells. Thanks to smart technologies, EarthColors® dyes are fully traceable – from natural waste material to the store. Currently exclusive to brand owners only.

EarthColors® ranges

EarthColors® are available in a range of six dyes that are made from waste left over by the agricultural and herbal industry, covering a palette of natural shades for cellulosic based fibres such as cotton, viscose, linen, bamboo, kapok, etc.

Diresul® Earth-Oak: Manufactured using 100% ALMOND SHELLS from the food industry.

Diresul® Earth-Cotton: Manufactured using 100% COTTON PLANT residues from the cotton industry.

Diresul® Earth-Sand: Manufactured using 90% BITTER ORANGE residues from the herbal industry.

Diresul® Earth-Clay: Manufactured using 90% BEET residues from the food industry.

Diresul® Earth-Forest: Manufactured using 90% SAW PALMETTO residues from the herbal industry.

Diresul® Earth-Stone: Manufactured using 70% SAW PALMETTO residues from the herbal industry.

Protecting the planet and its people

With EarthColors® Archroma is able to produce cleanly, closing the loop, and respecting the environment.

The EarthColors® technology helps to reduce the negative impact on water footprint, and preserve human wellness, natural resources, and climate change compared to conventional synthetic dyes*. Moreover, the fact that waste is up-cycled from other industries contributes to a circular economy.

Using natural waste based raw materials has no negative impact on any other steps of the dye manufacturing, such as water and energy consumption or waste generation. During the synthetization of EarthColors®, up to 100% of the natural raw material is transformed to a new dyestuff, guaranteeing full waste management into own production.

Lenzing expands REFIBRA™ technology to LENZING™ ECOVERO™

Setting a new responsible viscose standards for textile circularity

■ Lenzing Story

Lenzing Group, a world-leading producer of wood-based specialty fibers, has launched LENZING™ ECOVERO™ with REFIBRA™ technology at this year's Intertextile Shanghai Apparel Textile Fair and Trade Show. Building on the success of TENCEL™ Lyocell fibers with REFIBRA™ technology, the expansion of the REFIBRA™ technology to LENZING™ ECOVERO™ will help Lenzing increase the overall post-consumer content in its products. The expansion further highlights Lenzing's ongoing stride towards the transition to a circular economy in textile and fashion with its innovative, future-proof solutions.

"As climate change compels eco-conscious living, Lenzing collaborates with the industry to forge a future defined by collective engagement and systematic change, steering us toward a circular economy," said Florian Heubrandner, Executive Vice President Global Textiles Business at Lenzing.

"LENZING™ ECOVERO™ with REFIBRA™ technology is well-positioned to meet the surging demand for diverse circular design innovations. This new offering empowers like-minded fabric mills, garment manufacturers and consumer brands to embark on this transformative journey alongside Lenzing – breathing new life into post-consumer textile waste while anchoring circularity at the core of the textile value chain."

Scaling circular responsible viscose fiber production for global textile market

Through Lenzing's successful development and scaled production, LENZING™ ECOVERO™ with REFIBRA™ technology is now available to customers worldwide. Maintaining the eco-responsible benefits of the original LENZING™ ECOVERO™, the new viscose fiber with REFIBRA™ technology comprises up to 20% of post-consumer textile waste, which is sourced from cellulose-rich materials or polyester-cotton blends. The waste is collected and sorted in collaboration with key industry and innovation leaders who champion post-consumer textile recycling programs.

Unleashing unlimited product possibilities with circular solutions

Driven by its 'Better Growth' strategy, Lenzing consistently embraces circularity in

The Lenzing logo features the word "Lenzing" in a bold, black, sans-serif font. A thick green line starts from the left side of the letter 'L', curves around its bottom, and then extends horizontally across the bottom of the word.

Innovative by nature

textiles and empowers itself and its value chain partners to drive systemic change for a greener future. LENZING™ ECOVERO™ with REFIBRA™ technology plays a crucial role in this vision, filling the gaps for mills, manufacturers, and brands that seek to meet evolving industry requirements and consumer preferences globally.

This new fiber is identifiable at every stage of the supply chain, from fabric to final product, ensuring traceability and transparency. This empowers brands and retailers to offer genuine products while enabling consumers to make informed purchases.

Eco-friendly & effective methods for treating textile wastewater

■ Najmus Sakib

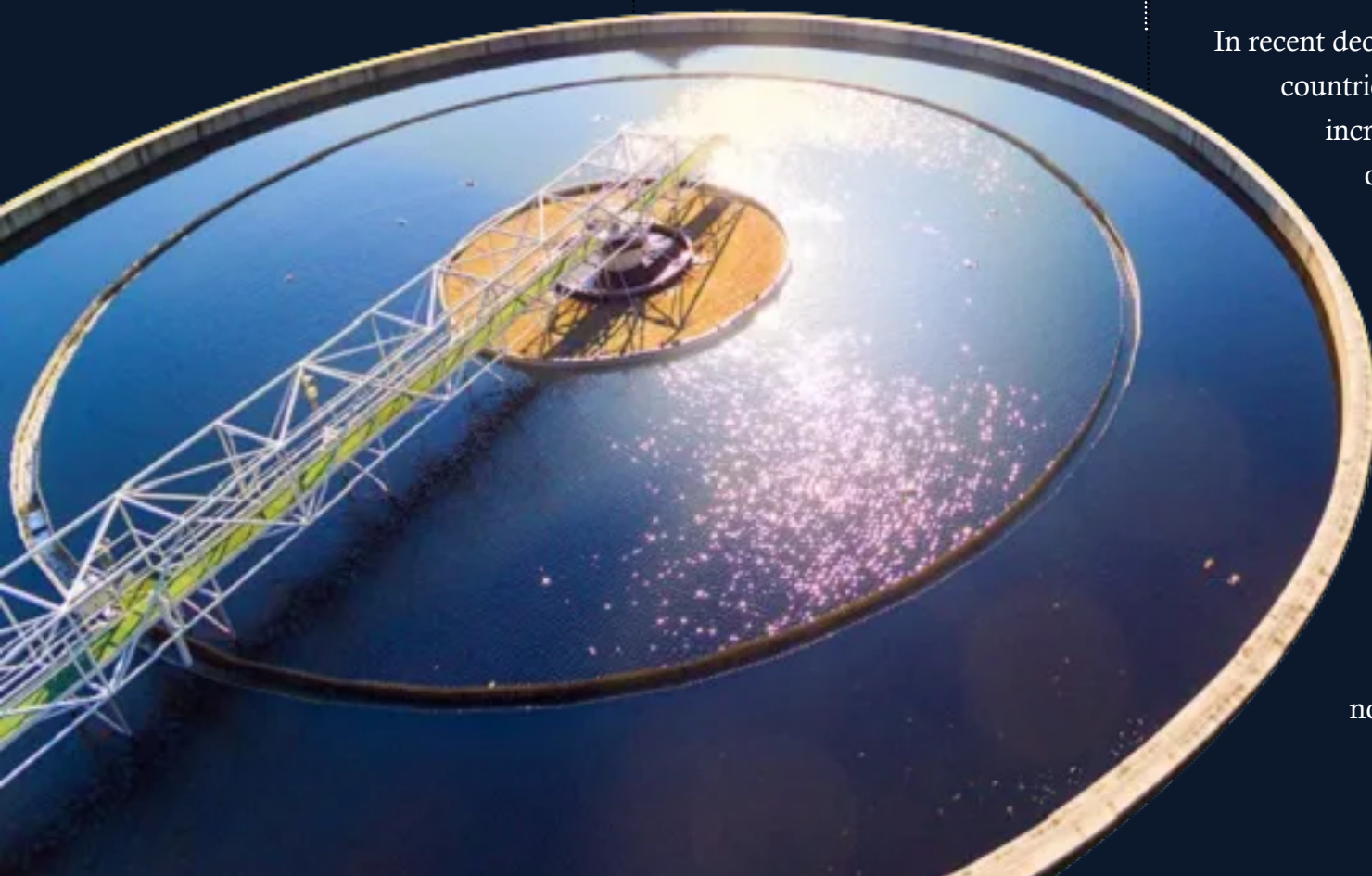
The textile manufacturing process is a major contributor to water consumption, using several thousand cubic meters of water per day. The amount of water used in textile processes varies depending on the specific technique and chemicals utilized. The wastewater produced during fabric production, which involves various operations such as desizing, bleaching, dyeing, printing, and washing, can contain colored and biodegradation-resistant pollutants. The World Bank has estimated that dyeing and finishing textiles produce approximately 17 to 20 percent of industrial wastewater. The textile dyeing industry has

increasingly used synthetic dyes because they are cost-effective and more stable than natural dyes in light, temperature, detergent, and microbial resistance. When coloring textiles, the dye does not fully stick to the fabric, which creates wastewater-containing dye. The wastewater deriving from textile wet processing factories encompasses various chemical elements, including inorganic finishing agents, surfactants, chlorine compounds, salts, total phosphate, polymers, and organic substances.

This wastewater harms the environment because it contains high levels

of pollutants like suspended solids, chemical oxygen demand, biochemical oxygen demand, heat, acidity, basicity, and other soluble substances. Azo dyes, which make up the largest group of synthetic dyes, are particularly popular due to their economic stability. However, these dyes are toxic and persist in the environment, and their byproducts are mutagenic and carcinogenic. Currently, around 10,000 different synthetic dyes are produced, with azo dyes being the most common and containing azo groups (-N=N-) in their structure. Certain dyes and chemicals in textiles can pose environmental and health risks.

In recent decades, developed countries have become increasingly conscious of the negative environmental impacts of industrial activities. As a response, regulations regarding wastewater treatment have become more stringent and there is now a greater emphasis



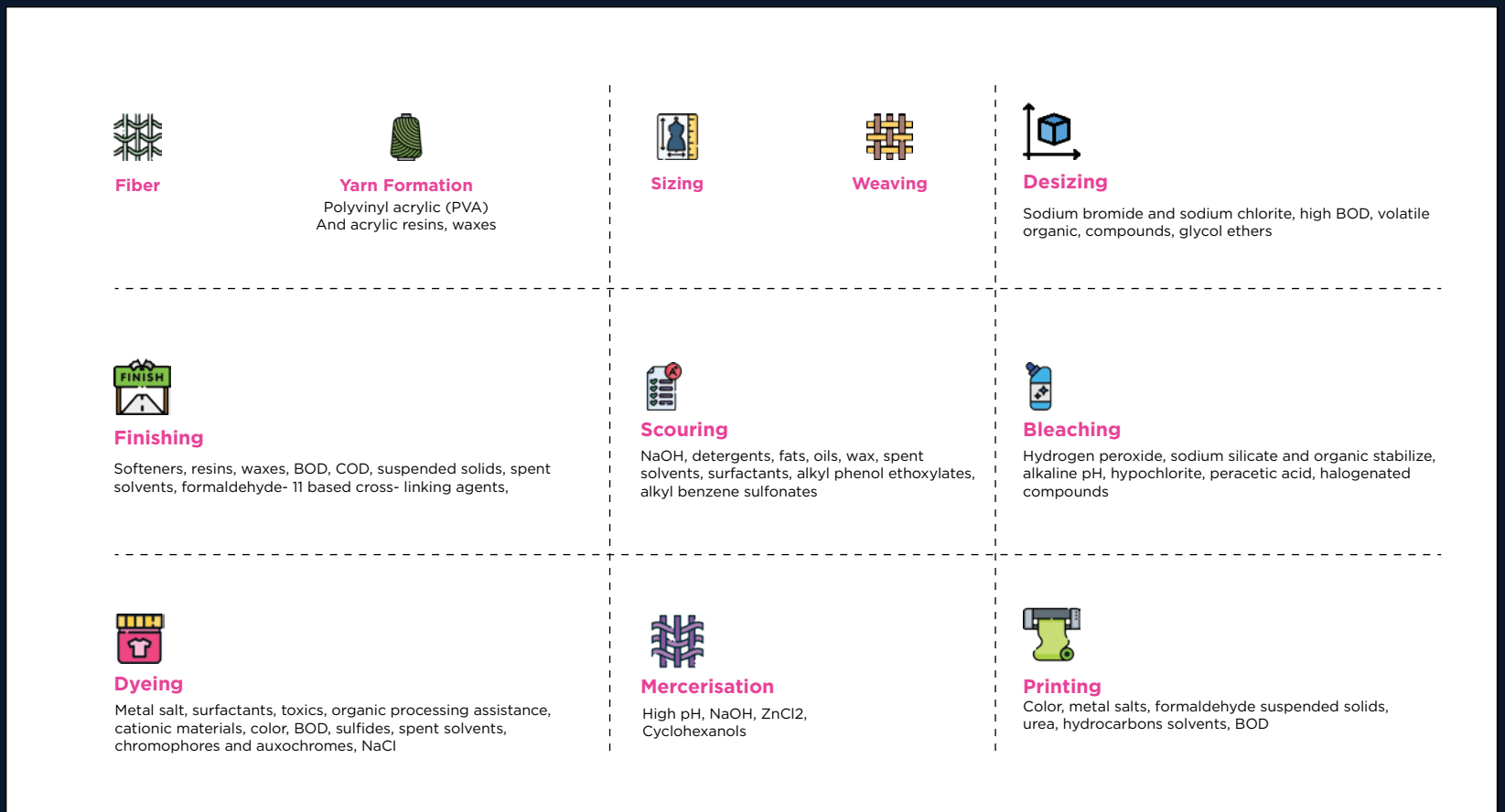


Figure 1: Typical flow diagram of textile wet processing and list of compounds released during the processing steps in the textile industry

on adopting eco-friendly methods and approaches. The objective of these measures is not only to reduce pollution but also to conserve water resources through inventive technologies that support water recovery and reuse.

Physiochemical Treatment

There are four different physiochemical techniques for decolorizing textile wastewater: Electrochemical, Flocculation, Coagulation, and Precipitation. The choice of method ultimately depends on the concentration and type of pollutants in the wastewater and the cost and regenerability of the treatment method. While coagulation-flocculation can be effective for wastewater containing disperse dyes, it is limited in its ability to treat reactive and vat dyes and generates a significant amount of sludge.

Conventional treatment methods for textile wastewater, such as chemical coagulation, adsorption processes, and membrane filtration, are expensive and produce large volumes of secondary pollutants.

Biological methods are limited due to the non-biodegradability of dyes. Electrochemical advanced oxidation processes (EAOPs), specifically electro-Fenton (EF) process, have shown promise in removing organic matter. Various EAOPs have been studied, but research has shown that the electro-Fenton (EF) process is a particularly effective and eco-friendly method for eliminating organic substances. EF process generates H_2O_2 and $\cdot OH$ radicals in situ, eliminating

the need for storing and transporting highly reactive H_2O_2 . The process does not produce secondary pollutants, and organic compounds are removed through two mechanisms in the EF process: Fenton's reaction (as shown in equation 2), which occurs throughout the solution, and anodic oxidation, which takes place at the surface of the anode (as depicted in equation 4). EF process uses high-oxygen-overvoltage anodes, and ferrous ions added into the system

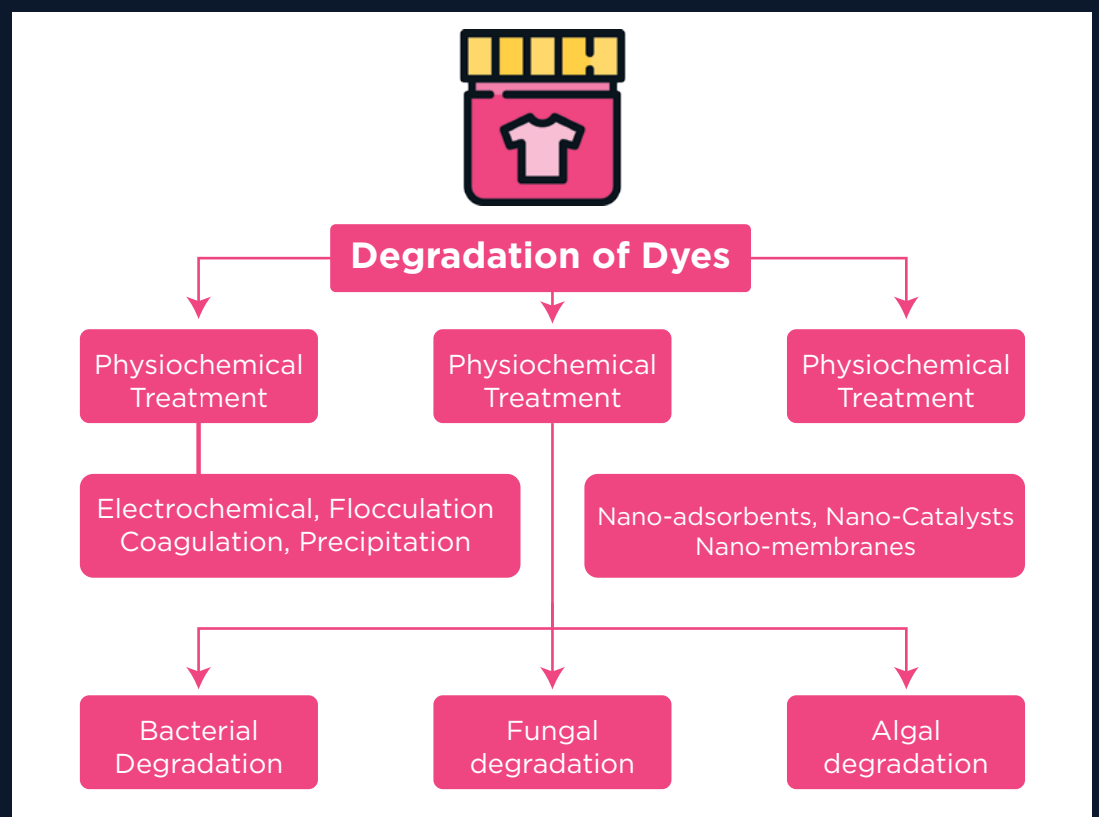
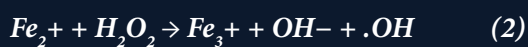


Figure 2: Flow chart showing different methods for degradation of dyes

generate ·OH radicals. The process oxidizes organics to CO₂, water, and inorganic ions and regenerates ferrous ions at the cathode reducing its further addition (as shown in equation 3).



To improve the efficiency of removing organic substances from wastewater in a parallel plate electrochemical reactor, Sparging Air (SA) was introduced. SA is common in industrial applications such as oxidation, hydrogenation, chlorination, and wastewater treatment. SA columns or bubble columns are advantageous due to their simple geometry, lack of moving parts, and ease of manufacturing. These methods have proven effective in treating discharges from ink, pharmaceutical, and textile industries, removing suspended solids, TOC, effluent color, oily emulsions, and other substances.

Chemical coagulation is an alternative method to remove color from textile wastewater. This process involves using metal salts, polymers, and polyelectrolytes to break down emulsions and suspensions. Electrocoagulation (EC), on the other hand, uses metal plates as electrodes to create highly charged polymeric metal hydroxide species in the water. It is mainly used to remove heavy metal ions from manufacturing wastewater sewage. Electrochemical methods are fast and effective in removing heavy metals from industrial wastewater.

The photovoltaic cells can supply the necessary electrical energy for EC and EF processes, which reduces the cost of energy and makes the process

sustainable by lowering carbon emissions.

kWh/kg COD (\$)	Process
3.16	EC
2.33	ECSA
3.33	EF
3.67	EFSA

Table 1: Electrical energy consumption of the effluent of a study by EC, ECSA, EF, and EFSA processes

Biological Treatment

In recent years, various physical and chemical methods have been developed for decolorizing azo dye. These methods can be expensive, produce much sludge, and require safe disposal. Physical methods such as adsorption and membrane filtration are time-consuming and require further treatment. Bioremediation through microorganisms is a more cost-effective and eco-friendly approach that can naturally develop resistant strains to remove dyes from effluent. This method may transform toxic chemicals into less harmful ones, which has advantages and disadvantages depending on the specific treatment method used.

Microalgae-Based Biodegradation of Textile Effluent

Using microalgae to treat textile effluent is the most effective process, as it can transform, degrade, and adsorb dye in natural wastewater. Microalgae have a higher rate of degradation than bacteria and fungus, making them more efficient in eliminating particulate pollution in wastewater. Green microalgae found in freshwater and saltwater ecosystems are commonly used in treating dye effluents due to their high biosorption potential resulting from their large surface area on wastewater. Algae absorb harmful

metabolites in wastewater, such as PO₄³⁻, RCOO⁻, -NH₂, and -OH, through electrostatic attraction. The decolorization mechanism of algae is different from that of fungi and bacteria. It involves three stages: conversion of algae biomass into carbon dioxide and water, conversion of chromophore material to non-chromophore material, and adsorption of chromophore by algal biomass. Studies show that algae produce the azoreductase enzyme for decolorization and utilize azo dyes as a carbon and nitrogen source for their growth.

Fungal-Based Biodegradation of Textile Effluent

Numerous efforts have been made on the use of fungus-based methods for treating dye in wastewater, with white-rot fungus being a commonly preferred organism due to its ability to degrade plant lignin and other polymers found in plant cell walls. However, other strains of fungus have also been found to be effective in decolorizing or biosorbing various types of dye. Fungi can be classified into two types based on their mode of action and surrounding environment: live cells, which can decolorize or biosorb dye, and dead cells, which can only adsorb dye. Fungi are commonly used for biodegrading or bioremediating effluent from industrial processes like textile, pulp, and paper production by producing extracellular enzymes such as lignin peroxidase (Lip), manganese peroxidase (MnP), and laccase. Different fungal cultures are often used for bioremediation due to their large biomass and unique characteristics like hyphal spectra and filamentous growth patterns that allow them to effectively degrade under specific conditions.

Global recycled yarn market expected to grow 6.3% CAGR at 2023-2029 period

■ Ahosamuzzaman Roni



According to QY research, global Recycle Yarn market size is estimated to be worth US \$4391.8 million in 2022 and is forecast to a readjusted size of US \$6769.5 million by 2029 with a CAGR(Compound annual growth rate) of 6.3% during the forecast period 2023-2029.

The expansion of this market is driven by the growing consumer demand for environmentally friendly products and a heightened awareness of environmental concerns. The global market for recycled yarn is anticipated to be led by the recycled PET yarn segment, followed by the recycled cotton yarn and recycled nylon yarn segments.

In response to the global energy crises and the increasing demand for eco-friendly energy sources, polyester fibers have gained widespread usage in the textile sector due to their notable strength, durability, and cost-effectiveness. A new method has been developed to recycle wastewater polyester bottles and transform them into fibers, subsequently employed in producing single jersey knitted fabrics. This innovative approach presents an economically and environmentally friendly solution by utilizing wastewater polyester bottles as a valuable

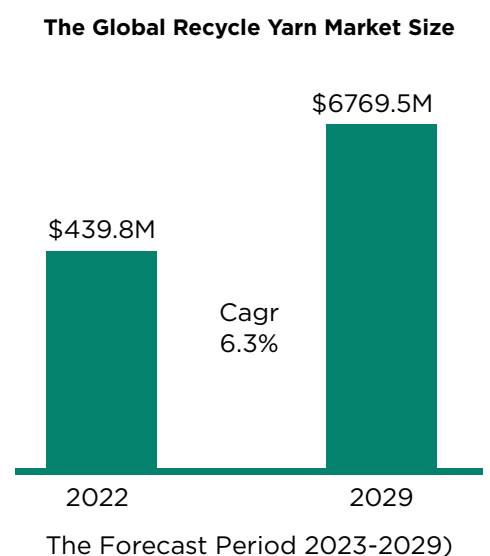


Figure 1: Global Recycle Yarn Sales Market Report 2023. Source: QY research

resource for textile applications while ensuring that the resulting fabrics exhibit properties comparable to those made from virgin polyester.

Swiss spinning technology leader Saurer, along with partners Inovafil and Renewcell, has launched a significant initiative in the textile industry. Saurer

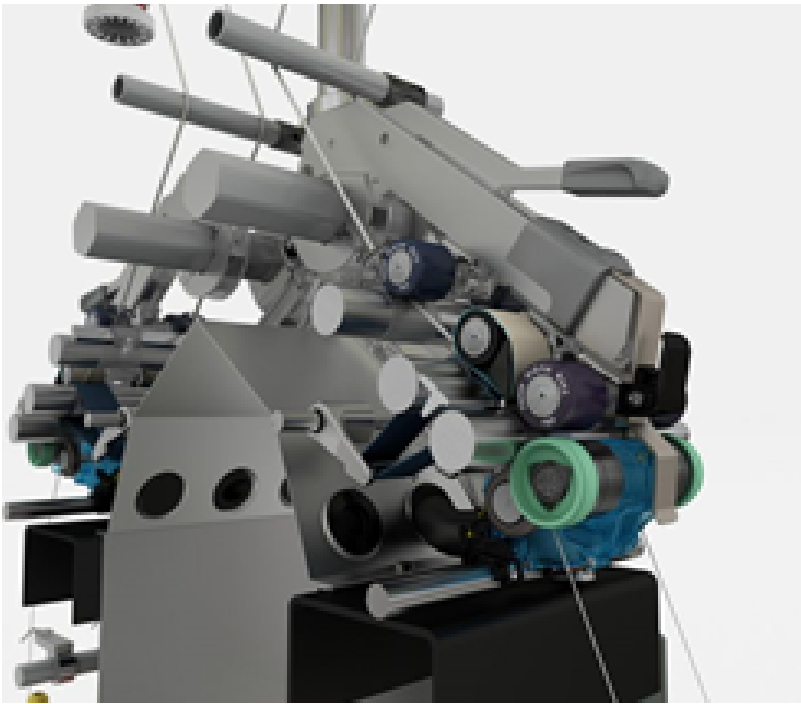


Figure 2: The Saurer Autocoro spinning machine at the Inovafil factory.

showcased the spinning of Circulose, a new fiber made entirely from textile waste, using their advanced rotor, ring, and air-spinning systems at ITMA 2023.

Renewcell utilizes its patented process to recycle cellulosic-rich textile waste, including used cotton garments and production scraps. This innovative approach transforms the waste into a pristine material known as CIRCULOSE®, which is further processed into fibers and spun into new yarn for textile production.

Säntis Textiles, a Swiss-owned company based in Singapore, partnered with Temsan from Turkey to commercially produce RCO100 technology. This innovative technology enables the conversion of pre- and post-consumer cotton garment waste into 100% recycled yarns without chemical processes. These initiatives demonstrate notable advancements in sustainable textile

production.

Recover, Rieter, and Polopiqué have joined forces to create high-quality ring-spun cotton yarns with more mechanically recycled fibers than was previously achieved. They developed a Ne 30 compact yarn comprising 40% recycled post-industrial fabric waste, above the average 20% recycled fibre content in recycled ring yarn manufacture.

The partnership uses a ring spinning method using Rieter's comber and COMPACTdrum compacting device. Recycled cotton fibers are combined in a 50/50 ratio with virgin cotton, and unwanted short fibers and neps are successfully eliminated during combing. This improves yarn quality and the performance of the ring-spinning machine.

Franziska Häfeli, Rieter's head of sales and marketing, expressed pride in the collaboration, emphasizing the importance of making recycling mainstream through spinning recycled fibers.

Local garment suppliers will need to prioritize the development of clothing made entirely from recycled materials by 2030. This obligation arises from H&M's resolve to comply with a European Union (EU)-mandated environmental and human rights due diligence law. H&M has established a goal of sourcing 24 percent of its apparel from recycled or sustainable materials by 2025 as part of these rules. This shift in sourcing practices reflects H&M's dedication to sustainability and aligns with the EU's efforts to promote responsible and eco-friendly practices in the fashion industry. Last month when the H&M Group CEO visited Dhaka, Bangladesh, the BGMEA signed an agreement with the retailer to reduce carbon emissions by 30% by 2030 and grab a bigger share of the market for recycled materials.



Tonello's Laundry Evolution, the winning concept that reinvents laundry

■ Desk Report



One of the most swiftly transforming areas of denim manufacturing technology is wet and dry processing. With growing pressure to cut water, hazardous chemicals and energy use, laundries are coming up with innovations that are delivering sustainability. Tonello's Laundry (R)Evolution is transforming the laundry concept of the present and the future, once again redefining standards and pointing the way for the evolution of the entire industry.

Only a few machines are needed to manage the entire production flow, which thus becomes even smoother and leaner, allowing productivity to be matched with the utmost care for the environment. New computer vision systems also control the cycle and thus make work even easier and safer.

Laundry (R)Evolution three single steps for simple, digital and automatic management of the entire garment finishing cycle. Three single steps are:

- **THE Laser**, fast, precise and flexible, replaces manual abrasion processes allowing to create new designs with ease.
- **The All-in-One System** performs all washing operations by bringing together 4 integrated sustainable technologies in one machine: EGO, NoStone®, UP, and Core 2.0.
- **Metro**, the Tonello software that processes true, real-time data to control all laundry consumption, optimize process times, and improve performance.

The All-in-One configuration, the concept of the ‘perfect machine,’ that is, equipped with all sustainable finishing technologies:

- **EGO**: the new ozone treatment system that incorporates 3 technologies in one, allowing garments to be treated simultaneously on multiple machines, improving performance and further reducing consumption
- **NoStone®**: the abrasive drum that allows you to say goodbye to pumice stone forever. Reusable and applicable/removable in an instant thanks to the “easy-lock” function, it allows for authentic stone-wash effects, responsibly and ergonomically

• **UP**: the patented system that, among other things, drastically cuts water and energy consumption, reduces the liquor ratio to 1:2, and is now fully automated

The DYEING AREA will also see big news:

- **The G1 Lab**, Tonello’s smallest machine ever, which will be unveiled with incredible ultrasonic technology that shortens process times, and decreases the number of dyestuffs and usage temperatures while boosting dyeing performance
- **The All-in-One system for dyeing**, here applied to the G1 325 production model, again equipped with the newest Core 2.0 and with:
 - **Wake**, the patented system for natural dyeing using only plants and vegetable waste, with no chemical additives of any kind
 - The sensational innovation of **DyeMate, the first indigo garment dyeing system** that revolutionizes and reinterprets the traditional process, taking it to a new evolutionary stage and making it automatic and repeatable, efficient and sustainable
 - **ThermoShell**, the special membrane that thermally insulates the washing machine, ensuring a constant temperature during any type of process, and that optimizes and makes washing and dyeing processes more efficient, with energy savings of up to 40%.



Figure: Tonello's Laundry (R)Evolution is transforming the laundry concept of the present and the future.



Sustainability and digitalization took center stage at ITMA 2023:

5 Innovations that caught our attention

■ Md Muddassir Rashid

ITMA 2023, the leading global exhibition for the textile and garment industry, is set to encourage innovation, research, and collaboration to propel the sector toward a sustainable and transformative future. This time, ITMA has invested in various programs aimed at identifying, showcasing, and recognizing groundbreaking innovations that will drive the industry forward. One of these initiatives is the introduction of Start-Up Valley, an exclusive platform created by CEMATEX, which shines a spotlight on early-stage companies with revolutionary solutions and technologies designed to inspire and support innovation in the textile, garment, and fashion domains.

Recognizing the increasing significance of transformation in the industry, ITMA 2023 has carefully curated a selection of 16 exceptional start-ups to feature on the grandest global stage for the textile industry. These start-ups have been handpicked by a distinguished panel of industry experts, guaranteeing the highest quality

and potential for disruption. Through their disruptive innovations, these pioneering companies are forging new markets and value networks, contributing to the industry's progression toward a more digitalized and sustainable future.

MYTH : Revolutionizing print pattern design with AI technology

In a groundbreaking move towards digital transformation, MYTH, an innovative artificial intelligence-based print pattern design tool, has emerged as a game-changer in the fields of design, gaming, metaverse, textile, and fashion. With its cutting-edge technology, MYTH aims to reshape the print pattern design process by seamlessly bringing together designers and businesses while catering to the demands of Industry 4.0.

The advent of MYTH marks a significant milestone in the

realm of pattern design, offering a state-of-the-art solution that combines green initiatives and digital innovation across various sectors. By harnessing the power of advanced AI technology, MYTH equips businesses with the tools necessary for a sustainable future while meeting the requirements of an ever-evolving industry.

One of MYTH's key features lies in its ability to provide unique, limitless, and perpetually new pattern designs. By choosing either Designers & Enterprises or Professional Model, users can access MYTH's comprehensive library of design options, allowing for personalized patterns that cater to individual needs and preferences. Furthermore, MYTH goes beyond more visual representation by seamlessly adapting these unique patterns to 3D visual models specifically tailored to the user's main product. This process eliminates physical workflows, leading to enhanced productivity and efficiency.

"Our mission is to revolutionize the pattern design process through cutting-edge technology," states the MYTH team.

MYTH offers a subscription-based software model that provides instantaneous design solutions, effectively removing human dependency in the fields of game design, metaverse design, textile, and fashion.

JF-888: Redefines industrial ironing with energy-efficient machine

Officina Meccanica Montenero, a renowned manufacturer of professional products for industrial ironing, is revolutionizing the industry by introducing the JF-888, a high-performance ironing machine that combines exceptional results with remarkable energy efficiency. With a steadfast commitment to customer satisfaction, Officina Meccanica Montenero offers cutting-edge solutions that not only deliver outstanding technical reliability but also prioritize environmental sustainability by reducing energy consumption. At the forefront of the JF-888's impressive features is its ability to maintain top-notch productivity while significantly lowering operating costs. Equipped with a state-of-the-art steam generator with nanotechnology insulation that mitigates heat loss ensuring optimal performance and energy conservation. By harnessing innovative design principles and advanced technology, Officina Meccanica Montenero has created a machine that meets the specific needs of its customers in the most efficient way possible.

One of the standout features of the JF-888 is its steam release mechanism. Steam is intelligently released from the working surface and can be regulated by the operator, who has control over emission time and quantity, thereby preserving the integrity of the fabric being ironed. Officina Meccanica Montenero ensures that the JF-888 combines

innovative design elements with cutting-edge technology, making it an ideal choice for even the most demanding customers.

The machine's nanotechnological insulation within the steam table minimizes heat dissipation, and steam is channeled precisely where it is needed, further enhancing energy conservation. Officina Meccanica Montenero has crafted the entire machine to prevent unnecessary energy dissipation, guaranteeing optimal utilization of stored energy.



Figure 1: Pattern Room at ITMA 2023. Source: Pattern Room Instagram

Pattern Room: downloadable & ready to use clothing pattern library

Pattern Room, an Australia-based company, is disrupting the fashion industry with first-of-its-kind downloadable clothing pattern library. Unlike traditional pattern resources, Pattern Room's collection are not just tried and tested; they're also loved by fashion enthusiasts worldwide. With a commitment to quality and a dedication to keeping production in-house, Pattern Room sets itself apart by offering over 300,000+ quality clothing patterns, all designed under the direct supervision of founder, Julia. With an impressive 28+ years of industry experience, Julia's expertise ensures that every pattern in the library meets the highest standards of quality.

One of the standout features of Pattern Room's pattern library is the best possible fit and cut property. This library includes pretty much every pattern one can think of, from sports clothing to fashion basics. Plus every single one has already been tried and tested ensuring the perfect fit.

Pattern Room's patterns are not only prioritize fit, but they are also designed for comfort and performance.

Pattern Room's patterns are renowned for their versatility and adaptability across various industries and clients. With their sizing consistency and premium fit, this pattern library successfully achieves the attention of fashion makers. The library has become a go-to resource, trusted

by fashion professionals and enthusiasts.

By embracing the digital format, Pattern Room empowers designers and creators to bring their visions to life with ease and precision. Pattern Room is redefining the concept of pattern libraries, revolutionizing the way designers source and utilize patterns.

AiDA: AI based interactive design assistant by AidLAB

AidLab, a collaboration between the Hong Kong Polytechnic University (PolyU) and the UK's Royal College of Art, is making waves in the fashion industry with the launch of AiDA, an AI-based Interactive Design Assistant for Fashion. This first-to-market technology empowers fashion designers to harness the power of artificial intelligence and seamlessly collaborate with it to create original and innovative designs. With just a few clicks, designers can now effortlessly develop fashion collections, bringing agility, efficiency and flexibility to conventional and intensive studio processes. AiDA automatically



Figure 3: TAILR at ITMA 2023.

seamless collaboration between human creativity and AI technology.

Tailr : A SaaS platform to streamline fashion production and drive sustainability

Tailr, a cloud-based Software-as-a-Service (SaaS) platform, is revolutionizing the fashion industry by offering a comprehensive solution to streamline production processes, achieve sustainability goals, and ensure consistent sizing for clothing brands. With a mission to alleviate the challenges faced by fashion brands in garment design and production, Tailr aims to simplify workflows, reduce sampling time, and enhance overall efficiency, ultimately minimizing e-commerce returns and landfill waste.

The fashion industry often grapples with complex production supply chains, disconnected teams, and communication gaps, resulting in prolonged sampling cycles, discrepancies between final production and approved samples, and inconsistent sizing that leads to high production costs. Tailr was launched as a response to these burning issues, born out of frustration with a broken fashion system. Beyond operational efficiency, Tailr also places a strong emphasis on sustainability. By optimizing production processes and minimizing errors, the platform contributes to the reduction of e-commerce returns—a significant environmental challenge for the fashion industry. Tailr's arrival signals a new era of progress and innovation in the fashion industry. As brands increasingly prioritize sustainability and seek ways to enhance operational efficiency, Tailr stands as a valuable partner, revolutionizing the production process and ushering in a future where fashion is both profitable and environmentally responsible.



Figure 2: Pattern Room at ITMA 2023. Source: Pattern Room Instagram

generates designs for both single fashion items and collections based on designers' creative inspirations. Designers can explore a virtually limitless number of design proposals, sparking creativity and enabling them to push the boundaries of their imagination. Moreover, AiDA ensures that the signature design elements of particular fashion brands can be seamlessly integrated into the new designs, maintaining the brand's style and identity.

One of the remarkable advantages of AiDA is its ability to accelerate time to market. AiDA's user-friendly and intuitive interface further enhances its appeal, making it accessible to designers of all skill levels and establishing a

Uster Fabriq Assistant – the whole story for quality info

■ Arif Uz Zaman

The new Uster Fabriq Assistant is a central platform for automated processing, analyzing, and visualizing quality data from Uster fabric inspection systems. Its three value modules – AI Classification, Quality Reporting and Central Management – give fabric producers the whole story for quality, saving time and driving operational excellence.

Uster’s latest innovation in the field of fabric inspection is an online tool giving a user-friendly summary of quality performance data from every fabric roll inspected in the mill. A range of statistical analysis tools highlights key info through various charts, histograms or trend diagrams. With the new Uster Fabriq Assistant, there is no need to toil over manual data. It’s all automated, so decision-making is simpler and much faster for fabric manufacturers.

Classification and reporting tasks

Fabriq Assistant introduces three value modules. AI Classification is at the heart of the system, delivering levels of accuracy and performance that human operators could never match. The Artificial Intelligence attaches codes to each image generated by the Uster Fabriq Vision products. Without this AI Classification, mill personnel would have to spend time and effort inserting codes to each defect at a PC, to carry out a data review. Artificial Intelligence means data classification is fully automated, so producers can save over 80% of the time taken by manual methods.

With Fabriq Assistant, old-fashioned manual data collection and analysis are consigned to history. Fabriq Assistant automatically gathers all

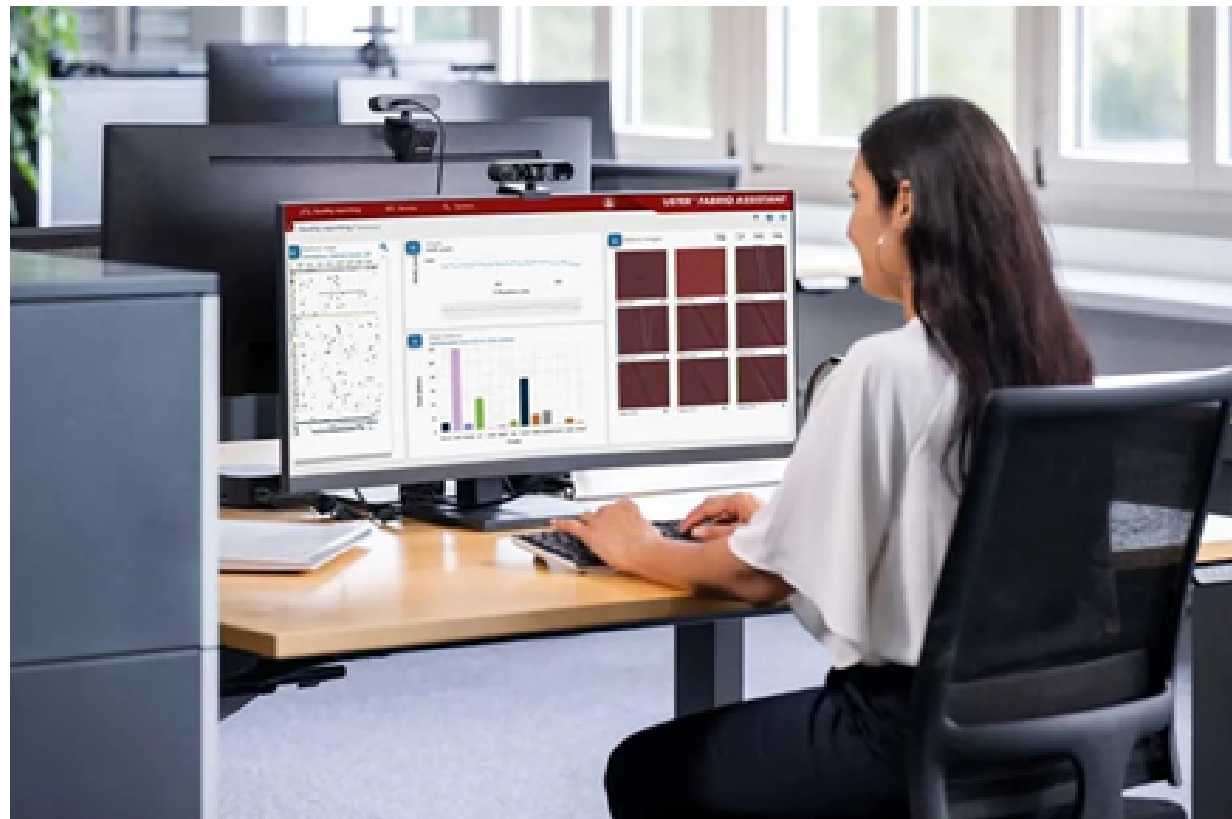


Figure: Uster Fabriq Assistant – The central fabric quality platform.

the information from connected Uster fabric inspection systems – and applies smart analysis principles to calculate the most meaningful results.

Benefits from synergies

Fabriq Assistant unites all the data from AI Classification and Quality Reporting. Combining classified details of defects with smart analysis of inspection data gives producers a valuable advantage: Fabriq Assistant not only gives alerts of issues, it also goes a stage further by both describing and locating a problem. This is the knowledge required to enable continuous and systematic improvements to be made.

Combining data from AI

classification and Quality Reporting unleashes the full power of the value modules. The real impact comes from meaningful data which is automatically analyzed. “Using the synergies from AI classification and Quality Reporting maximizes the business value for all stakeholders

in the production and the quality department,” says Michelle Salg, Product Manager Fabric Inspection at Uster Technologies.

Centralized efficiency

Fabriq Assistant cuts down the unnecessary workload on managers, allowing them to focus on steering profitable production. The third value module, Central Management, makes this benefit clear, as all the required data is presented on a unified platform at the manager’s desk, in a real time-saving benefit. Fabric inspection info for all connected Uster systems is readily available at this central platform.

Indispensable assistant

Data from fabric inspection builds a reliable picture, as a sound basis for decisions. Cutting-edge hardware can be seamlessly integrated into production – at line, running speeds up to 1,000 meters per minute – for consistent and efficient defect detection. After that, Uster Fabriq Assistant takes over.

Innovations that signified ITMA 2023: ITMA Sustainable Innovation Award

■ Homayra Anjumi Hoque

Three projects nominated for the 2023 ITMA Sustainable Innovation Award in the Industry share the goal of improving resource efficiency and reducing waste while improving resource efficiency, fabric performance and ensuring sustainability.

Cematex's President, Ernesto Maurer said, "CEMATEX launched the ITMA Sustainable Innovation Award in 2015 to encourage and recognize the collaborative efforts of our exhibitors and their customers for the industry excellence category."

This year, the three companies who have received this award are:

- Limonta, nominated by Navis TubeTex for the new Bio-FREED dyeing system.
- Candiani SpA, nominated by Bergamo, Italy-based partner FKgroup, for developing the Candiani Custom services package.
- Denim Moda, nominated by Jeanologia for establishing the Denim Moda Urban Factory in Italy.

The era of protein fabrication on textiles

Limonta, a vertically integrated textile group, worked with New Jersey-based protein biochemistry company Modern Meadow and ITMA exhibitor Navis TubeTex to develop the product. Bio-FREED, powered by Bio Alloys. Leveraging Modern Meadow's

biomanufacturing expertise and Navis TubeTex's extensive knowledge of textile machinery, Limonta is poised to revolutionize the industry and promote sustainable practices.

Their collaboration has recently showcased a QUAD-B innovation basket which includes:

1. BIOFABRICA BIO-TEX: Bio-Tex™ is the first innovation powered by Bio-Alloy™ Technology, a coated fabric that delivers outstanding performance and color vibrancy while reducing GHG emissions by more than 90% compared to a traditional, LCA-based tan. Bio-Tex™ is a material system consisting of a Bio-Alloy™ coating applied to a fabric backing, giving designers unparalleled flexibility in colour, touch, and more.

2. BIO-VERA:

VEGAN ENGINEERED

RENEWABLE ALTERNATIVE:

Bio-VERA™ is a new, sustainable, animal-free biomaterial that looks and feels as natural as traditional leather, suede or chamois. Bio-VERA™ eliminates animal-derived inputs in favour of renewable, traceable inputs origin. Available in rolls, Bio-VERA™ requires no special storage or storage conditions and is available on a large scale with reduced production costs and complexity. This non-woven material is designed to surpass the durability of leather while providing the look, feel, and durability of

traditional leather. With a wide choice of colors and finishes, Bio-VERA™ redefines the possibilities of durability and aesthetics. Bio Vera's unique features are:

- Design freedom with less waste
- More than 90% of the content is sustainable before completion
- Available on request
- Vegetarian and no animals
- Stronger than leather
- Simplify supply chain

3. BIO-FREED: FAST RESOURCE EFFICIENT ENHANCED DYEING PROCESS

Bio-FREED is a highly efficient, foam-based, one-step dyeing system that uses 95% less water, 75% less energy, 80% less dyes and chemicals, and no salts compared to conventional dyeing. With Bio-FREED, textiles of any type can be dyed with reactive or acid dyes without limitation or color migration up to 10 times faster. Bio-FREED brings sustainable innovation and reduced environmental impact to the textile manufacturing process.

4. BIO-TEX SHIELD:

WATERPROOF & BREATHABLE

MEMBRANE: Bio-Tex Shield™ is a high-performance waterproof and breathable bio-based membrane with reduced input materials and increased durability. Its high wear resistance eliminates the need for an additional outer layer. Bio-Tex Shield™ is made without PFAs or solvents.

New Dimensional Denim for a green world:

Candiani Denim was first established in 1938, a short distance from Milan and the Alps mountain. Candiani Denim is an internationally renowned vertically integrated denim factory. Specializing in stiff and stretch denim, as well as full-length and edge denim, Candiani is today the largest denim factory in Europe. It now has a strong supply chain with some of the world's most prestigious fashion brands like Denham, Jonathon Mannion, Swiss Jeans Freak etc. The innovations of Candiani are-

A maestro of circular fashion which has completely replaced synthetic yarn with 100% biodegradable cotton.

1. COREVA:

- The first fully natural and compostable stretch denim that is completely free from plastics and microplastics.
- A maestro of circular fashion which has completely replaced synthetic yarn with 100% biodegradable cotton.

2. PREMIUM REGENERATIVE DENIM:

Regenerative cotton improves soil health, restores natural ecosystems, safeguards biodiversity, and keeps more CO₂ below the ground.

3. PREMIUM RECYCLED DENIM:

- The fibers obtained from the recycling of old jeans are mixed with Blue Seed cotton
- PCR fabrics are more durable despite containing a great amount of recycled cotton, ranging between 21-26%.

4. LEGGERA:

- Lightweight denim combining original denim flavor and

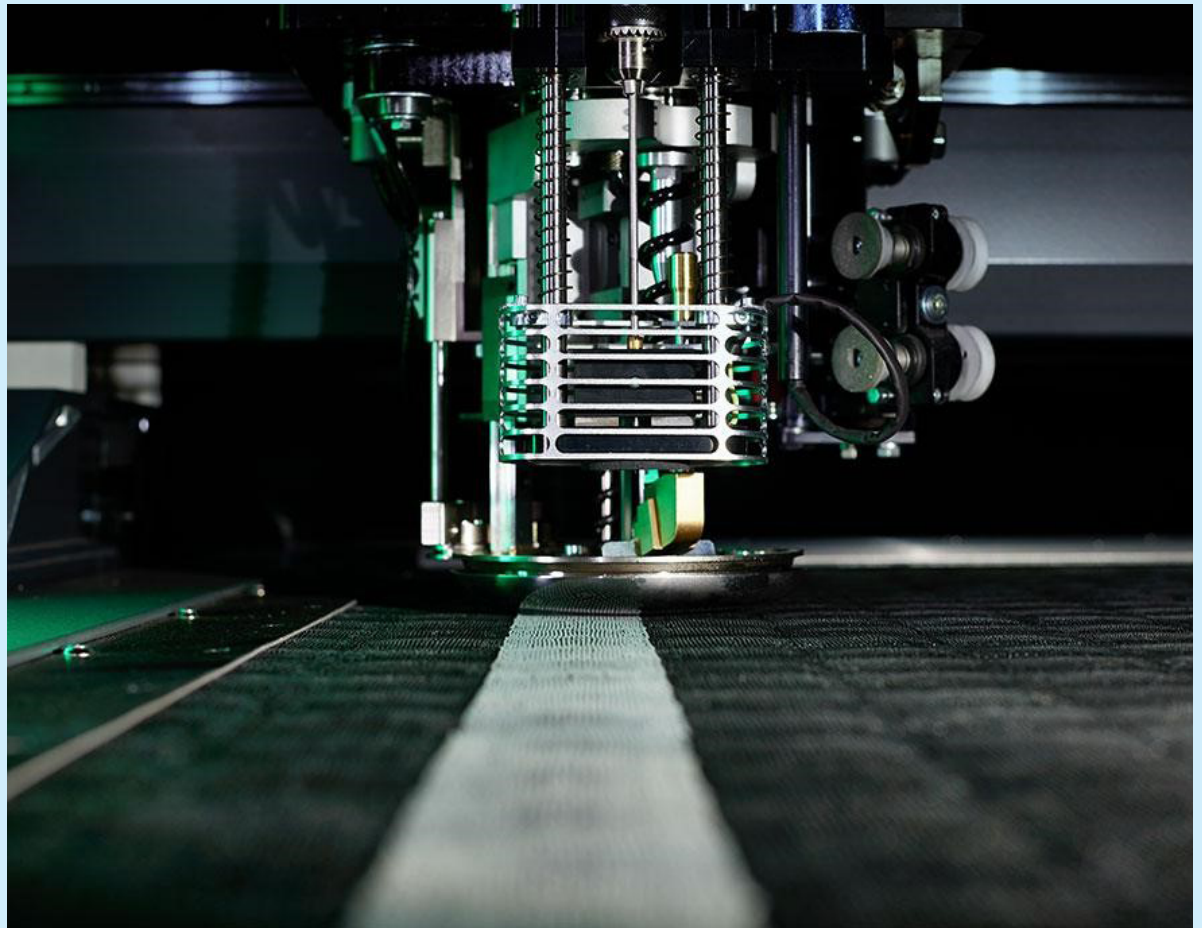


Figure 1: IRON, The newest cutting tool of FK group.

regenerative cotton for an airy body sensation.

- Looks classic in appearance, and can be the best fit for summer.

5. ReLAST:

- The first stretch denim fabric in the world produced with a unique, pre-consumer recycled elastomer.
- 100% organic and pesticide-free fertilization.

6. ReSOLVE:

- Made of organic cotton and sized with a vegetal compound that is 100% biodegradable, non-toxic, and microplastic-free.
- The main ingredients are- organic cotton, Indigo juice, N-denim, and V-sizing.

7. SELVEDGE:

- Features 3x1 weaves in both right-hand and left-hand twill sp, giving authentic, vintage, loose constructions that recall denim's classic salt-and-pepper effect.
- High-density yarn constructions create a more straightforward, clean and sophisticated look.

Sustainability questionnaire of

Candiani Denim: According to Alberto Candiani, owner and global manager of Candiani Denim, the sustainability manifesto is situated on 4 criteria:

1. Lasting Legacy contributes to the sustainable development and economic vitality of a community.
2. Intelligent ingredients that are eco-friendly, R&D innovated materials and transparent to the proper value chain.
3. Trusted transparency ensures all-purpose communication with stakeholders and customers about their demands.

Microfactory and Mesmerizing Engineering development of apparel technology:

1. AURORA Cutting system

- 4KW double turbine system, one of the lowest in market
- Energy saving, decrease in noise

2. UNIVERSAL Cutting machine

- Eco power vacuum system for generous power saving
- Cutting flexibility for all types of materials

3. AUTOMOTIVE Cutting machine

- Refrigerated air blade cooling system
- Eccentric bearing system

4. CNC knife cutter

- Fully computerized system
- Remote controlling
- Precision of work

Preference for circular and sharing business models over recycling

■ Ahosanuzzaman Roni

UK fashion brands, designers, and retailers are stepping up to promote sustainability and responsible consumer choices, according to a recent report by the British Fashion Council's (BFC) Institute of Positive Fashion (IPF) and Vanish. The focus is on adopting circular and sharing business models (CSBMs) that prioritize reusing existing garments over traditional recycling practices.

Vanish's research reveals that, in the UK, 64% of consumers wear clothing items only once, resulting in 350,000 tons of clothing being sent to landfill yearly. Additionally, 50% of consumers own an item they have never worn.

To thrive in the future, fashion brands and retailers must adopt circular and sharing business models (CSBMs) that prioritize reuse and service provision

over traditional consumption. Circular models promote keeping products in use for as long as possible, but their implementation beyond resale remains limited. However, recent initiatives by leading brands indicate an opportunity to drive change in the industry. By focusing on garment utilization and offering services like styling, maintenance, repair, redesign, and rental, businesses can reduce environmental impact and find more stable revenue streams.

To embrace circular and sharing business models (CSBMs) in the fashion industry, brands and retailers should focus on the following key recommendations:

Manufacturing on demand: Brands should adopt technology like predictive analytics to produce only the exact quantity of clothing needed,

reducing waste and overproduction.

Repair and care services: Brands should form partnerships with repair providers to offer affordable and accessible repair services, incentivizing consumers to shop with them.

Rental and subscription models: Brands should offer convenient and affordable short-term clothing options to meet consumer demand for trendy styles and occasions, reducing the flow of lower-quality new items through rental and subscription models that prioritize low-carbon logistics and sustainability.

Product take-back and circular innovations: Brands should implement take-back schemes and circular economy innovations to increase revenue while minimizing the need for new materials.

Boosting re-commerce: Brands should actively promote the resale of their products through existing platforms or by launching their own resale platforms, encouraging consumers to buy and sell used clothing.

"There is momentum now on resale, and making sure items retain their value is one of the best ways to ensure products are kept alive for longer," said Simon Platts, Responsible Sourcing Director, ASOS.

The fashion industry's environmental impact, highlighted by the IPCC's (The Intergovernmental Panel on



Figure 1: Reuse garments use for new fashion.

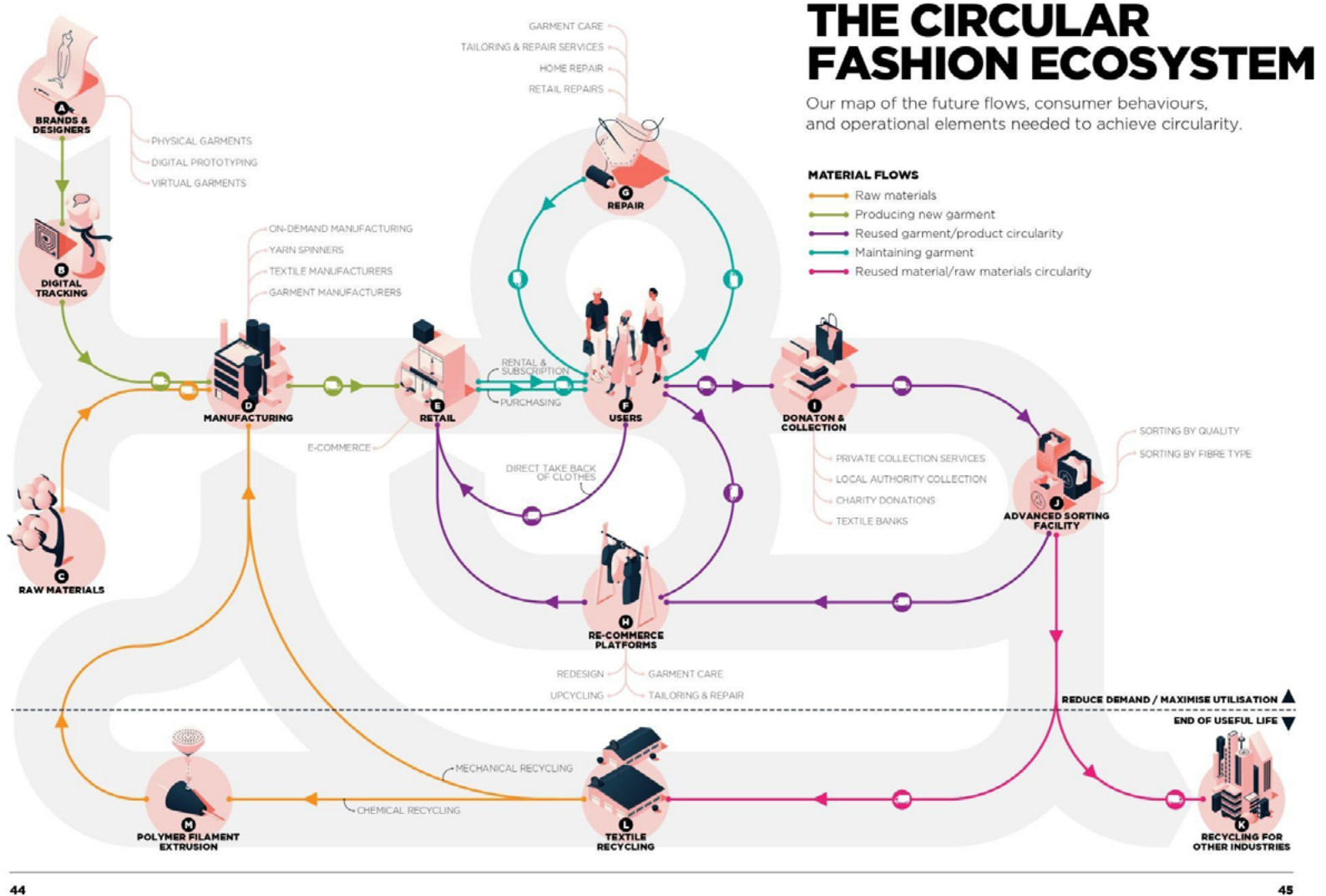


Figure 2: The circular fashion eco-system map.

Climate Change) warnings and staggering emissions statistics, calls for a shift to circularity. Embracing a circular economy presents opportunities for sustainable growth while tackling these challenges effectively.

The fashion industry is on a mission to become more sustainable, and three key target outcomes are driving the change. First, reducing the demand for new clothing to minimize the environmental impact. Second, maximizing clothing utilization through circular practices to capture more value from garments. Third, investing in recycling technologies to optimize material recovery and reduce harmful inputs.

Achieving the target outcomes in the UK fashion industry requires significant changes across the value chain:

A - Brands and Designers: Use circular design principles through

digital prototyping for virtual and physical garments.

B - Digital Tracking: Track garment characteristics and journeys accessible to all stakeholders.

C - Raw Materials: Use renewable or recycled inputs for manufacturing.

D - Manufacturing: Implement zero-waste manufacturing, on-demand production, and reuse of materials.

E - Retail: Mainstream pre-owned, virtual, rental, and subscription options online and offline.

F - Users: Consumers buy less, opt for pre-owned, higher-quality items, and wear them longer.

G - Repair: Consumers actively maintain and repair clothing.

H - Re-commerce Platform: Consumers return clothing to retail for resale, rent, or re-commerce platforms.

I - Donation and Collection: Expanded, convenient access to clothing collection and donation

channels.

J - Sorting: Utilize sophisticated sorting technologies for efficient determination of the next garment destination.

K - Recycling for Other Industries: Non-reusable materials utilized in agriculture, homewares, and construction.

L - Textile Recycling: Non-wearable garments channeled to mechanical recycling facilities, with chemical recycling as a long-term destination.

M - Fibre manufacturing (polymer filament extrusion): Increase fiber production from recycled chemical inputs using polymer filament extrusion in the long term.

“Our goal was to create a practical plan that would propel the shift towards a thriving circular fashion economy, setting an example for other countries to follow and take inspiration from.” said Caroline Rush CBE, Chief Executive, British Fashion Council (BFC).

Circular Textiles: How to find and trust different certifications

■ Asif Iqbal

Textiles play a crucial role in our daily lives, while also exerting a substantial influence on the environment and society.

Various stakeholders in the textile value chain are actively pursuing a sustainable and circular approach. This involves designing, producing, and consuming textiles in a manner that minimizes negative impacts and maximizes their value. Circular textiles are characterized by their durability, repairability, recyclability, and use of recycled or renewable materials. The products are also free of hazardous substances and manufactured in compliance with social and environmental standards.

Material Certification

Material certification is a process that verifies the origin and quality of materials used in textile products. It has the ability to encompass various aspects like the utilization of recycled or renewable materials, the assessment of hazardous substance content, ensuring traceability and purity of recycled materials, and evaluating the recyclability or biodegradability of materials.

Examples of textile material certifications include:



Figure: Circular Economy in Textiles Courtesy: Sympatex

- **The Global Recycled Standard (GRS)** verifies the recycled content of products and addresses environmental, social, and chemical aspects throughout the production chain.
- **The Recycling Claim Standard (RCS)** verifies the recycled content of products, excluding other environmental or social aspects.
- **The Cradle to Cradle Certified Standard** assesses products in five

areas: material health, material reutilization, renewable energy and carbon management, water stewardship, and social fairness. The certification program awards products with varying levels of certification, ranging from basic to platinum, based on their performance.

- **The Organic Content Standard (OCS)** verifies the organic content of products made from organic raw materials like cotton or wool.

- **The Global Organic Textile Standard (GOTS)** encompasses the entire supply chain of textiles made from organic fibers, including processing, manufacturing, packaging, labeling, trading, and distribution. It encompasses environmental and social criteria throughout the supply chain.

Material certification can help consumers identify and support brands that use sustainable materials. It can also incentivize manufacturers to employ recycled or renewable materials instead of virgin ones. Material certification encounters obstacles like the lack of clarity or consensus on what constitutes recycled or renewable resources, the difficulties of assuring recycled material traceability and purity across complicated supply systems, potential trade-offs between circularity features like recyclability vs. biodegradability or recycled content vs. organic content, and the necessity to balance certification costs and benefits for diverse stakeholders.

Here are a few examples of textile system certifications:

- **The EU Ecolabel** identifies products with reduced environmental impact throughout their life cycle. The criteria encompass energy efficiency, water consumption, waste generation, hazardous substances, and durability.
- **The Nordic Swan Ecolabel** identifies products that meet rigorous environmental standards throughout their entire life cycle. The criteria covered include energy efficiency, water consumption, waste generation, hazardous substances, durability, and recyclability.
- **The Fairtrade Textile Standard** encompasses the entire textile supply chain, including cotton farming and garment manufacturing. The objective

is to enhance labour conditions and wages and address the environmental and social effects of production.

- **The B Corp Certification** evaluates companies' social and environmental performance in five areas: governance, workers, community, environment, and customers. Additionally, companies are mandated to incorporate their purpose and stakeholder interests into their business model in accordance with the law.

Role of the EU:

The EU supports circular business models in various sectors, including textiles, through circular certifications. The EU's circular economy strategies include:

The European Green Deal: The EU's 2050 plan to become the first climate-neutral continent. The Circular Economy Action Plan, Industrial Strategy, Farm to Fork Strategy, and Biodiversity Strategy revolutionise the economy and society.

Circular Economy Action Plan:

The European Green Deal's core component. It proposes a comprehensive plan to make all EU products more sustainable and circular and reduce waste and environmental damage. Textiles, electronics, polymers, and construction are also targeted.

The Circular Economy Action Plan will include the EU strategy for sustainable and circular textiles. It will cover design, production, consumption, waste management, and secondary raw materials to create a circular textile sector. It will also discuss social and global aspects of the textile value chain.

EU Ecolabel: This optional label identifies items with a lower environmental impact throughout their life cycle. It considers energy

efficiency, water use, waste, toxic substances, and durability. Textiles are also categorised.

Product Environmental Footprint (PEF): Measures and communicates product and organisation environmental performance. Climate change, water, land, and resource depletion are covered. Textile pilots are included.

The EU promotes circular business models and certifications in the textile industry through innovation, research, and stakeholder collaboration.

Examples are:

The European Innovation Partnership on Raw Materials: Industry, public agencies, academia, and NGOs collaborate to find new raw material supply and usage solutions. It funds textile resource efficiency and circularity projects.

The European Commission and the European Economic and Social Committee launched the European Circular Economy Stakeholder Platform. Stakeholders share circular economy best practices, knowledge, and skills. It also offers textile circular economy resources.

The EU's goal, direction, and support for a circular economy enable textile circular certifications. The EU cannot do this alone. National governments, corporations, consumers, civil society, and international partners must also participate.

The Way Forward:

Circular certifications in the textiles industry contribute to legitimacy, transparency, and accountability in the sector. Additionally, they have the potential to foster innovation, drive market demand, and garner policy support for circular textiles. However, it is important to acknowledge the limitations and challenges they encounter.

Plant-based dyes are getting popular

■ Najmus Sakib

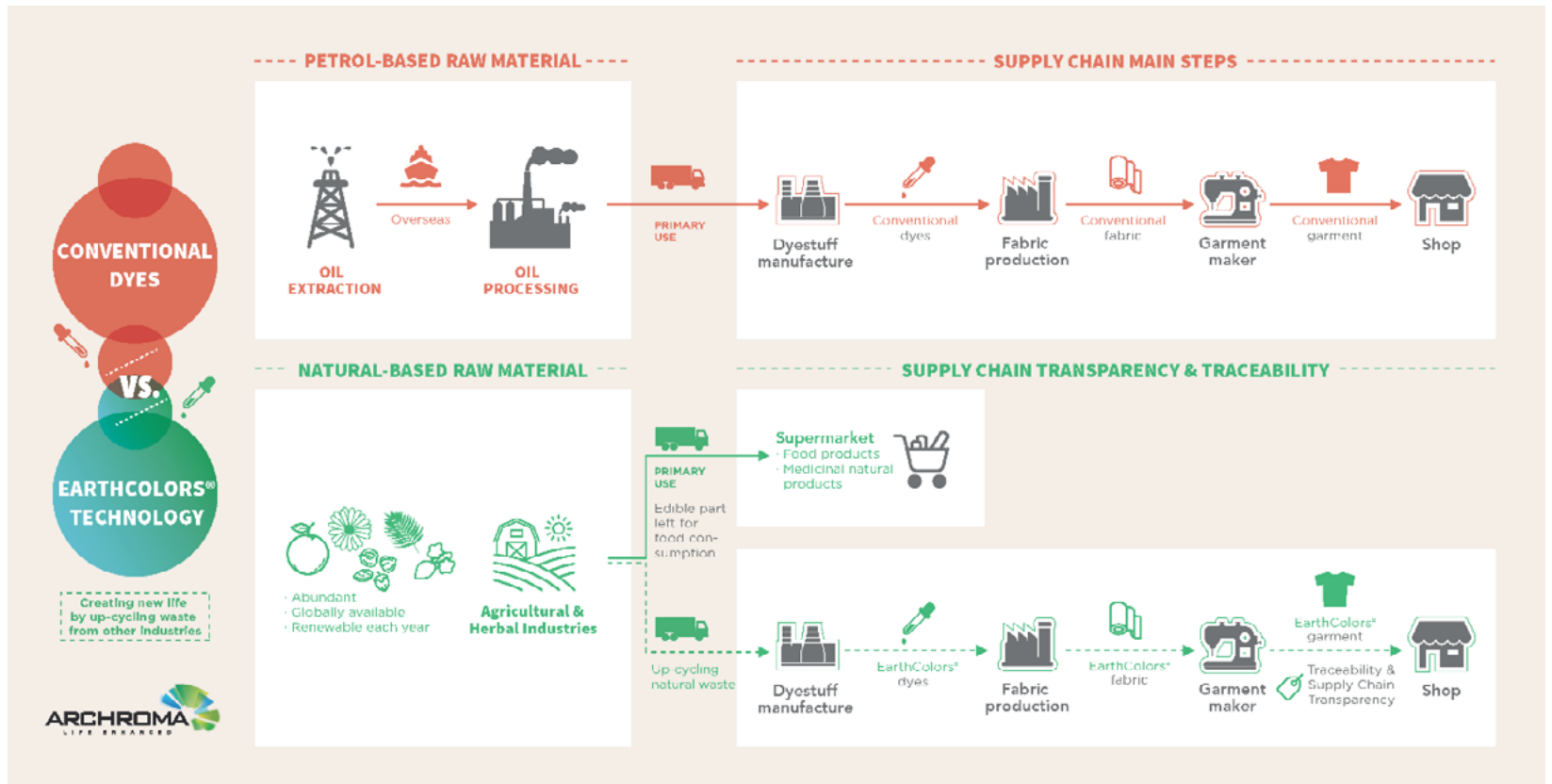


Figure 1: Archroma's Circularity model to reduce the cost of natural dyes

EarthColors®	Manufactured using
Diresul® Earth-Oak	100% of ALMOND SHELLS from the food industry
Diresul® Earth-Cotton	100% of COTTON PLANT residues from the cotton industry
Diresul® Earth-Sand	90% of BITTER ORANGE residues from the herbal industry
Diresul® Earth-Clay	90% of BEET residues from the food industry
Diresul® Earth-Forest	90% of SAW PALMETTO residues from the herbal industry
Diresul® Earth-Stone	70% of SAW PALMETTO residues from the herbal industry

Table 1: Archroma's EarthColors® Dyes and their sources

The textile industry consumes a lot of water, with up to 200 tonnes used per tonne of fabric. The inefficiency in the dyeing process results in a considerable amount of synthetic dyes being wasted yearly, with up to 200,000 tons being lost to effluents and eventually polluting waterways. This is a significant problem in China, as reported in the documentary RiverBlue (<https://riverbluethemovie.eco>), where over 70% of rivers are polluted due to pollutants from textile and garment factories. These highly stable dyes often escape conventional wastewater

treatment processes, persisting in the environment due to their high stability to light, temperature, water, detergents, chemicals, soap, and other parameters such as bleach and perspiration. Wastewater treatment plants in textile industries face the challenge of removing the color from these compounds, especially since dyes and pigments are specifically designed to resist biodegradation, causing them to persist in the environment for extended periods. For example, the hydrolyzed dye Reactive Blue 19 has a half-life of roughly 46 years at 25°C and pH 7,

further highlighting its resistance to degradation. Azo dyes are the largest group of colorants in number and production volume, making up around 60-70% of all organic dyes produced globally. Their popularity can be attributed to their ease and low cost of synthesis compared to natural dyes. The production of azo dyes that create 22 highly lethal amines has been banned by many countries, including Germany, the USA, the EU, and the UK, due to their hazardous effects. Due to growing environmental concerns, people involved in trade and

consumption are increasingly opting for eco-friendly products. Producing, supplying, and using these products should be carefully examined, with a special emphasis on reducing waste and environmental damage. To address these concerns, manufacturers are developing sustainable dyes that are cost-effective, socially responsible, and environmentally friendly.

Many people believe that sustainable solutions come with a premium price tag. However, this is not always the case. When considering plant-based textile dyes, raw materials, processing, and equipment costs can be substantial, resulting in higher prices for end-users. Adopting plant-based dyes has been limited due to higher production costs

friendly natural dyes.

Archroma's EarthColors® technology's use of up-cycled waste from other industries contributes to a circular economy. They use raw materials derived from natural waste, which has no adverse effects on other stages of the dye manufacturing process, such as water and energy usage or waste generation. During the production of EarthColors®, all of the natural raw material is transformed into a new dyestuff, ensuring full waste management. These sustainable natural dyes are known to have a reduced negative impact on water resources and aid in protecting human health, natural resources, and climate change, compared to traditional synthetic dyes.

has garnered the attention of many industry experts, leading to the company being chosen as one of just three focused on the dyeing and finishing sector in the Start-Up Valley at ITMA 2023. Colorkim's MERDAN dyes are not only sustainable but also increase productivity! Founder Yuksel Baris notes that Merdan dyes are 50% faster than conventional cotton dyeing methods and reduce energy consumption by 70%. Although this sustainable dye may cost more than synthetic dyes, opting for options with lower running costs can result in significant long-term savings. This becomes particularly relevant in light of the rising energy prices the textile industry faces.

Reducing energy consumption through sustainable processes can overcome the higher short-term costs of sustainable alternatives, leading to substantial long-term cost savings. For ColorKim to grow, they must change industry perceptions and thought processes and ensure their dyes perform better than conventional solutions. Baris believes increasing demand for Merdan textile dyes depends not solely on cost-effectiveness, so he has chosen not to reveal their price.

Sustainability is a critical issue facing the textile industry, and CEMATEX, the show owners of ITMA, believes that innovation is critical to addressing this challenge. The demand for Merdan textile dyes is highest in Europe, where strict regulations promote sustainable manufacturing practices. In contrast, regulations in Asia tend to prioritize economic growth over sustainability. ColorKim aims to cater to both regions but needs to focus on performance and price to increase demand in Asia. Consumers also have the power to drive industry practices towards sustainability. The availability of innovative products like Merdan textile dyes is a positive step towards this transition, and experts believe that greater consumer transparency can further accelerate the shift towards sustainability.

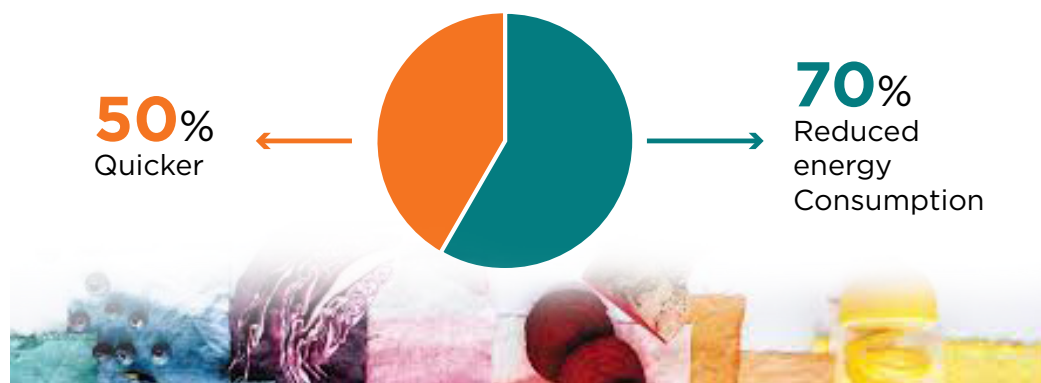


Figure 2: Benefits of MERDAN dyes

than synthetic dyes. Lower production costs can be achieved through circularity and reduced operating expenses. Based on these two principles, certain producers are leading the charge towards economical and environmentally

Currently, EarthColors® can be used for cellulosic fibers like cotton, viscose, linen, bamboo, and kapok. At the ITMA 2023 event, Colorkim showcased their unprecedented MERDAN natural dyes. Thanks to their incredible compatibility,

these dyes are a sustainable solution that works perfectly on natural and synthetic fibers. Circularity is being taken to the next level by using organic production waste of MERDAN dyes as an alternative source of animal nutrition instead of letting it go to waste. This innovative approach to sustainability



Figure 3: YUKSEL BARIS at the COLORKIM stall in Start-Up Valley, ITMA 2023



Figure: Trützschler OPTIMA machine, Courtesy: ategroup.com

Trützschler group showcases game-changing IDY and carpet yarn production machine 'OPTIMA' at ITMA 2023

■ M A Mohiemen Tanim

Trützschler Group, a renowned leader in textile machinery, made a significant impact at ITMA 2023 with the introduction of their latest innovation: the OPTIMA machine series. Designed specifically for Industrial Textured Yarns (IDY) and carpet yarn production, OPTIMA represents a culmination of Trützschler's expertise and dedication to providing cutting-edge solutions to the textile industry.

The flagship model in the OPTIMA series is the OPTIMA MO60, a state-of-the-art machine featuring a six-process configuration. This impressive machine incorporates two FW13 binders and two three-and-winders, offering unrivaled capabilities for producing IDY and carpet yarns. Let's delve into the technical aspects that make the OPTIMA MO60 a game-changer in the industry.

Filament forming excellence

One of the standout features of the OPTIMA MO60 is its exceptional

filament-forming capabilities. Trützschler has developed an advanced system that ensures the production of consistent and high-quality yarns. The machine's OPTIMA spinning system is designed to meet the specific requirements of each polymer, spinning process, and plant conditions. With a modular design, it allows for both small (4-ends) and large (up to 16-ends) production units, providing flexibility and scalability to match production needs.

Perfect cooling for optimal yarn quality

Efficient cooling is crucial for maintaining yarn quality, and the OPTIMA MO60 excels in this aspect. The machine is equipped with cross-flow quenching units that provide pulsation-free cooling. The cooling air temperature, relative humidity, air velocity, and profile can be adjusted according to the specific product requirements. This precise control over cooling parameters guarantees optimal yarn cooling and enhances

the overall quality and performance of the yarns produced.

Winding perfect bobbins

Achieving high-quality bobbins is crucial for smooth downstream processes, and the OPTIMA MO60 excels in this area. Trützschler has integrated their proven FW11 2-end winders into the machine, ensuring precise and efficient winding. These compact winders are fully automatic and feature optional step precision winding, guaranteeing perfect bobbins for uncomplicated downstream operations. The OPTIMA MO60 also offers high transfer efficiency when using plastic or paper tubes, even when paper tubes are reused multiple times. This feature enhances sustainability, reduces material waste, and improves overall production efficiency.

Central Monitoring Unit (CMU) system

CMU system allows for the free



Figure: Trützschler Central Monitoring Unit (CMU) system combines all functionalities to control the extrusion line. Courtesy: ategroup.com

selection and combination of trends, providing real-time insights into operating data. This feature is handy for monitoring and analyzing key performance indicators, identifying potential bottlenecks, and making data-driven decisions to optimize production processes.

OPTIMeye Industry 4.0 package

OPTIMeye provides manufacturers with comprehensive information for analyzing and optimizing production. By offering an overview of the performance of Trützschler plants, OPTIMeye enables users to monitor operations without leaving their office. Trend and alarm archives, production data, and energy consumption are made available on a password-protected web server, ensuring data security and accessibility.

The data collected by OPTIMeye can be seamlessly integrated into existing production planning processes through OPC UA or MySQL. This

integration allows for the effective scheduling of maintenance actions and facilitates the development of an intelligent supply chain, ultimately minimizing production costs.

Pro-Active lifecycle management & Modernized Maintenance

Trützschler Group understands that maintaining the performance and efficiency of an extrusion system over time is essential for sustained success. With their pro-active lifecycle management approach, they offer comprehensive technical and technological services to ensure that the OPTIMA MO60 continues to deliver optimal results year after year.

The company has a large stock of over 2,000 different spare parts that can be shipped on short notice. This ensures minimal downtime and quick replacement of critical components when needed.

Trützschler offers secured parts for electrical systems, along with electrical

upgrades and retrofits.

Trützschler provides services such as heat-pipe and recoating, as well as a motor overhaul for DSR (Double-Shell Roll) draw rolls to address the maintenance needs of fast-rotating parts. Additionally, chuck service involves the replacement of defective and worn parts, oil changes, and balancing. These services help to extend the lifespan of crucial components, ensuring optimal performance and minimizing the risk of breakdowns.

OPTIMA MO60 is a remarkable machine designed to meet the specific needs of IDY and carpet yarn manufacturers. OPTIMeye Industry 4.0 package ensures efficient production, real-time monitoring, and data-driven decision-making through its advanced features, such as perfect bobbin winding & the Central Monitoring Unit (CMU) system.

Trützschler Group ensures that the OPTIMA MO60 remains a reliable and high-performing machine throughout its operational lifespan.

Energy-harvesting E-textiles: Generating electricity from your every move

■ Saiful Saad

E-textiles are the criteria of smart textile which poses the way of integrating sensors, chips, and elements into the fiber or directly into the structures. Energy harvesting technologies have gained significant attention for capturing and converting ambient energy into usable electrical power. Energy harvesting capabilities can be integrated inside textiles, generating electricity from wearer's movement. Our concern in this report will be the exact topic, even working in wet conditions. For e-textiles to function as comfortable and maintenance-free wearables, batteries should be replaced with energy-harvesting devices.

Piezoelectric sensors use the piezoelectric effect to measure changes in pressure, acceleration, temperature, or force by converting them to an electrical charge. The piezoelectric effect is the property of certain

materials to generate an electric charge when they are mechanically stressed when an electric field is applied. Electronic textiles (e-textiles) are poised to play a key role in developing the Internet of Things. With recent developments in energy storage in the form of knitted and woven supercapacitors, textiles are now being used as autonomous power sources.

Piezoelectric effects are now enabling textile garments to create energy by making the impact of a small amount of potential into a major one. Piezoelectric materials or polymers have the potential to show outstanding flexibility and tensile strength. Poly (vinylidene fluoride) (PVDF) offers the highest piezoelectric coefficient. The ability of PVDF to convert biomechanical energy to electrical power is being used in various applications.

PVDF with piezoelectric effects can be advanced and gratified through water usage. Melt-spun continuous fibers are attached with a core-sheath structure where one electrode is hidden inside the core. To complete the device, the second electrode, a conducting yarn, is wrapped around yarns of bicomponent microfibres by weaving. Thus small particles of piezoelectric polymers are spun into the inner segment of the textile. plain weave, piezoelectric warp, twill, piezoelectric warp, conducting weft.

The conducting core aids in the storage of generated electricity within the material. The efficiency of the conducting core determines the overall product quality. Another remarkable function of the conducting core is the flow of electricity throughout the textile product. The efficiency of electrical flow in a piezoelectrical structure should be maintained to maintain longevity over a long period.

Benefits of piezoelectric integration into textiles:

When integrated into textiles, they can harness energy from human movements, vibrations, or even natural elements like wind, rain, or friction. This can create a few amounts of electrical power generation. However, this energy is the main idea behind these innovations toward a greater goal. Piezoelectric materials can be seamlessly integrated into textile structures by weaving, and knitting, into fabrics. Thus they can easily be embedded into textile products without



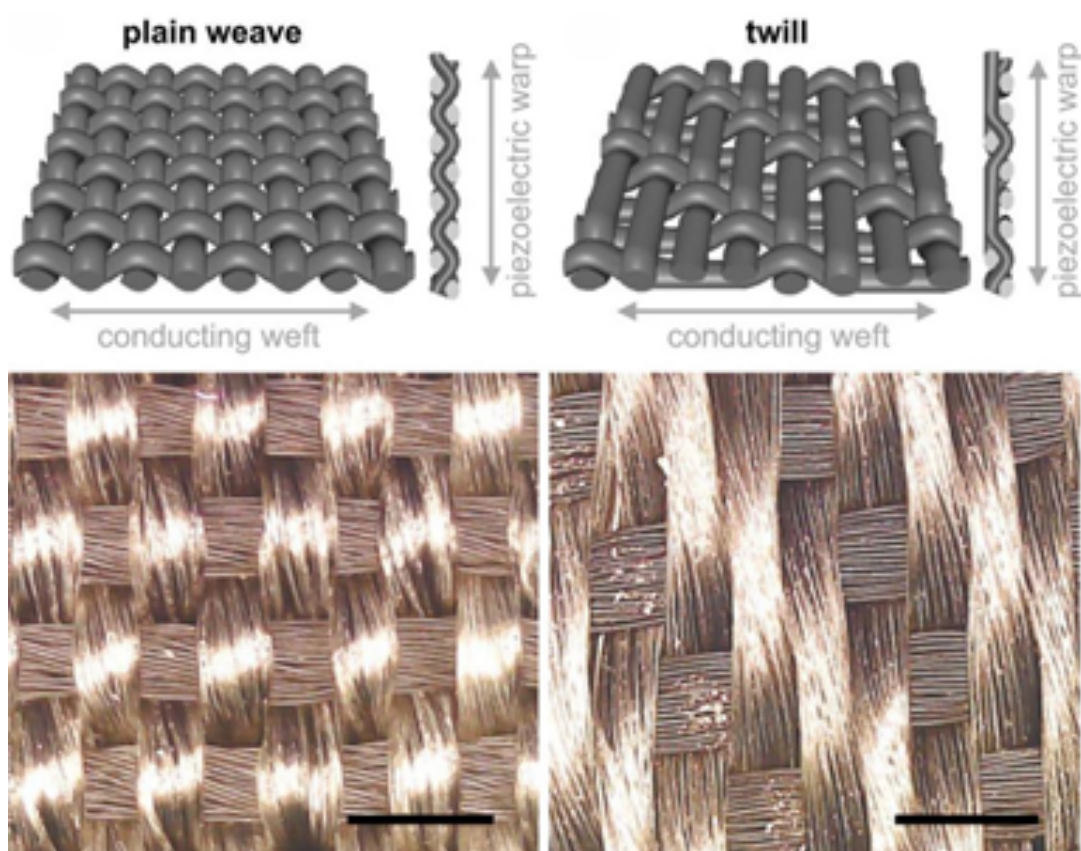


Figure: Schematics (top) and photographs (scale bars are 1mm) of the plain weave and twill textile architectures.

Limitations of this energy harvesting process:

The overall energy density is a concern for these types of energy generation. Usually the pressure from raindrops, body deformation, strain, and heat can create a meager amount of dense energy in the desired product. Sometimes the environment is not in our favor at all. Raindrop dependant deformation needs a rainy day etc.

Exposure to moisture, difficulty in repeated electricity, usage of conductive core for a long time, heavily dependent functions etc can degrade the cloth over time. Thus the versatility of the product can be lessened after a calculative period.

The manufacturing of these special garments can be overly expensive. Typically in the recent industrial 4.0 approach, the core competencies of production are huge globally. The particular usage and limited demand for piezoelectric materials can be an extra burden on the industrial facility.

Still, the technique is somewhat in an early development and research stage. These products' limited knowledge and applicability without a proper design and infrastructure can be a natural hazard to the weaving, knitting production process. In future textile applications, large-area woven piezoelectric fabrics may be used in the upholstery of passenger vehicles or as fillers in structural composites to convert ambient vibrations in combination with biomechanical movements from the user to electrical energy. Such an approach can create more energy simultaneously than the traditional approach.

While energy-collecting textiles provide intriguing potential for sustainable power generation, there are constraints to this development. Ongoing research and technology improvements can be made gradually to make this product available to the commercial market soon.

compromising their functionality.

Although integrating piezoelectric components and structure, the textile has the same drapability, flexibility, strength and comfort. No extra bulk has been added to the existing dimensions of the desired product. The flexibility enables the generation of electricity by the increased friction of body movement. The light weight is also noticeable in these textile products. Even after the implementation of piezoelectric components, the garment can adhere to its lightweight characteristics.

Energy-harvesting textiles based on piezoelectric materials can practically contribute to sustainable energy practices. Converting mechanical energy into electrical energy, piezoelectric textiles promote energy efficiency. They can potentially promote sustainability and environmental friendliness in various infrastructures. The energy generated is limited and can be used in certain projects or causes.

Energy harvesting piezoelectric material applications:

Energy-harvesting textiles can be

incorporated into outdoor garments and sportswear, allowing users to generate electricity. Athletes can easily use these products with comfort and versatility. This harvested energy can charge small electronic devices like smartphones or GPS trackers for enhanced activity.

The piezoelectric textile can be applied to smart home appliances like bed covers, cushions, and sheets. The applicable places like light bulbs, desk lights, emergency bulbs etc, can also utilize these energies. Thus this research can empower future smart home building.

This exposure can also benefit the automotive industry. The industry can help with renewable energy by implementing the desired property into the seats and vehicle interiors so that the vibrations from the vehicle and temperature can create enough energy.

This fantastic invention can also be used in military equipment. This energy can enable extra flexibility for special equipment like sensors, commuters etc. The impact of the abrasion on the surface of textile products can be a good application for generating electricity.

Antimicrobial textiles: Where science meets fashion for a healthier world

■ Faujia Mushtari

Antimicrobial textiles, which involve the application of natural antimicrobial substances to fabrics, have been used since ancient times. Egyptians, for example, used spices and herbal coatings on mummy wraps, while the Chinese used antimicrobial bamboo fibers. Another significant advancement was using antibiotics to protect textiles from decay during World War II. However, concerns about conventional antimicrobial agents' environmental and health effects have arisen, prompting the search for safer alternatives and the emergence of antimicrobial textiles.

Antimicrobial textiles are in high demand in environments prone to harmful microbes, such as hospitals and areas where controlling the spread of infectious microorganisms is critical. These textiles are classified according to their ability to target bacteria, fungi, or viruses. Antimicrobial textiles are also required in public places such as hotels, restaurants, and trains, where items such as towels, curtains, and carpets can potentially contribute to spreading infections.

The importance of antimicrobial textiles stems from their ability to reduce the presence of microbes on clothing and thus prevent infection transmission. Textile surfaces are modified using various techniques to provide functional properties such as water repellency, flame retardancy, and antibacterial activity. Antimicrobial textiles provide numerous advantages, including antimicrobial winter wear, non-plastic bags, and antimicrobial food packaging.

Active antimicrobial agents

Coatings comprising nanoparticles can be applied to both natural and synthetic textiles. Silver nanoparticles (AgNPs) are known for their potent toxicity against various microbes and their long-lasting durability. AgNPs



Figure 1: Antimicrobial Textiles

also exhibit antiviral activity against SARS-CoV-2. Various metal and metal oxide nanoparticles, such as titanium, tin, zinc, gold, and copper, can be used in different textiles. Copper oxide nanoparticles (CuONPs) coated on textile materials demonstrate antimicrobial properties by releasing copper ions, coming into direct contact with bacteria, and generating reactive oxygen species.

The biosynthesis and application of nanostructured inorganic materials, like selenium brooms produced using almond skin extract, possess antimicrobial activity. Sustainable antimicrobial textiles can be developed using natural compounds such as cyclodextrins, lignin, and chitosan. Cyclodextrins, with their hydrophilic outer surface and lipophilic central cavity, are increasingly gaining popularity in the textile industry. Fabrics coated with lignin derived from sugarcane bagasse and fabrics coated with chitosan exhibit antibacterial properties. Chitosan-based silver nanoparticle films display effective antibacterial activity and can be used in food packaging.



Figure 2: Types of antimicrobial textile

Leaching and Non-Leaching-Type Antimicrobial Textile

Textiles are tested for the leaching of antimicrobial agents to determine if they are leaching or non-leaching types. The diffusion of the active compound into agar during agar well diffusion assays determines leaching potential. Non-leaching textiles retain their activity for longer and are considered safe for direct skin contact. Various treatments, including fluoroquinolone derivatives, isocyanate group-containing quaternary ammonium salts, and quaternary ammonium-modified triethoxysilane coatings, have been developed to create non-leaching antimicrobial textiles.

The choice between leaching and non-leaching fabrics depends on technology availability and production costs. Leaching fabrics tend to be more biocidal, while non-leaching fabrics can be biostatic or biorepellent. Natural, synthetic, and blended fabrics have been used to develop antimicrobial textiles for enhanced efficacy against microorganisms.

Applications and Future Perspectives

Antimicrobial textiles find applications in diverse fields such as apparel, commercial settings, healthcare, and households. In the apparel industry, antimicrobial sportswear, winter wear, and designer undergarments have gained popularity due to their ability to prevent microbial growth and odor. Commercial settings benefit from antimicrobial textiles used in carpets, vehicle coverings, and military fabrics. In healthcare, antimicrobial textiles are utilized for bandages, masks, and lab coats, aiding in infection control. Antimicrobial textiles also enhance household hygiene and safety, including bedding, curtains, and towels.

The future of antimicrobial textiles lies in combining functionality with aesthetics. Developing attractive colors, prints, and designs will further increase the acceptance and adoption of antimicrobial textiles. Additionally, advancements in nanotechnology, biotechnology, and surface modification techniques will contribute to developing more effective and eco-friendly antimicrobial textiles. Emerging areas such as dermatology, bio-functional textiles, fashion design, and space travel offer exciting opportunities for antimicrobial textiles. The COVID-19 pandemic has accelerated the production of metal nanoparticle-based antiviral textiles. Several brands and companies have introduced antimicrobial fabrics in various products, such as clothing, curtains, medical devices, and home furnishings.

However, challenges remain in optimizing antimicrobial textiles' efficacy, safety, and sustainability. Continuous research is needed to evaluate long-term antimicrobial effectiveness, potential resistance development, and the impact of leaching antimicrobial agents on the environment. Collaboration between textile manufacturers, scientists, and regulatory bodies is crucial to ensure the development and application of antimicrobial textiles align with industry standards and regulations.

Antimicrobial textiles have a long history and are still evolving in response to increasing demand for safer and more effective antimicrobial solutions. Using nanoparticles, natural compounds, and novel coating techniques has paved the way for broad-spectrum antimicrobial textiles. Antimicrobial textiles, which have applications ranging from healthcare to fashion, have significant potential for improving hygiene, preventing infections, and overall well-being. Future research and development efforts should concentrate on improving antimicrobial textiles' efficacy, safety, and sustainability to meet the changing needs of various industries and consumers.

Applications of antimicrobial textiles

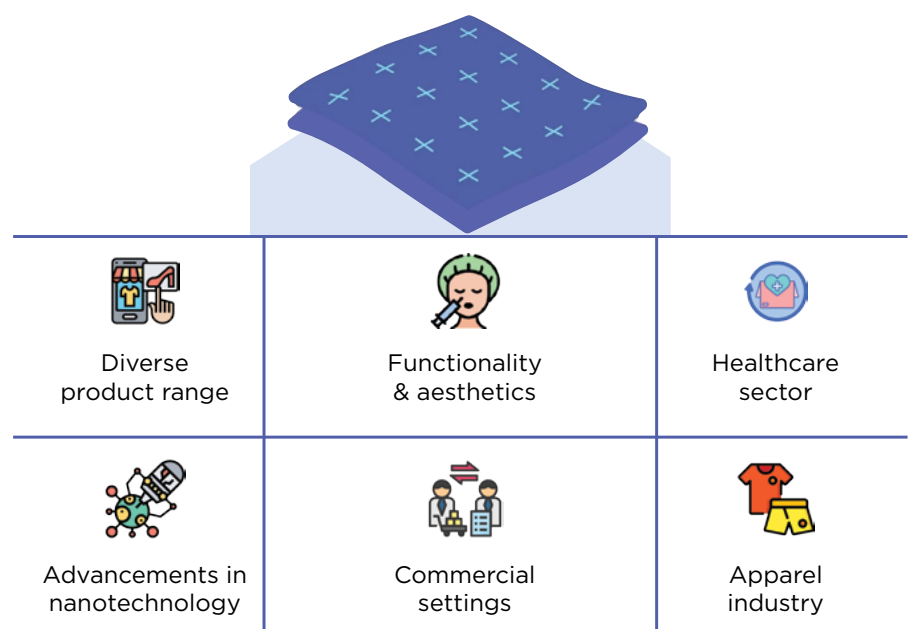


Figure 3: Applications of antimicrobial textiles.

LAIP: the present is an expression of a future project

■ Sayed Abdullah

This is one of the keys to comprehending LAIP's productive strength, a desire for constant renewal, acceptance of new market challenges, new technologies, and the ability to have a constant dialogue with customers, not only before and during the sale, but also after sale.

The desire for innovation is expressed in the ability and courage to change to be more efficient, more present, including communication, and in the flexibility and ability to respond to market needs. Driven by the desire for the best performance, which is not only technical, the company complied with the new business languages, guaranteeing competence and speed in answering the many requests of customers and especially to those customers who look to LAIP for a personalized response to their needs for industrial dyeing.

LAIP has thus supplied dyeing machines of entire compartments in factories specially made by customers to insert LAIP products, this is a sign of the established trust that the market places in the company and in its machines.

The difference can be seen in the passion that everyone puts into their work, from the engineers to the assemblers, everyone committed to taking care of even the smallest detail, seeking solutions closest to the customer's needs and innovation and to the quality of all the elements of the machines.

A constant success that saw the company as a protagonist at the recent ITMA: great affirmation of esteem from customers who came to visit the booth at the fair and excellent feedback from a great number of new customers

who appreciated the work and production capabilities.

LAIP presented new and higher-performing machines in addition to its great classics:

198 HT the highly demanded machine for tow – packages and fiber dyeing, it allows the same liquor ratio to be maintained even with partial loads!

BID (Bobbins Injection Dyeing) ensures absolute repeatability, productivity, and reliability for multicolor printing and dyeing of yarn in bobbins.

Nautilus is a cutting-edge machine. Conceived with a double belt, it is suitable for dyeing delicate fabrics keeping the low liquor ratio constant by the maximum fabric load up to 40 %. Low water consumption means low electrical consumption and energy saving.

250 HT Jet is an easy machine that never stops getting perfectly dyed fabrics with no abrasions or creases.

Beam the ideal machine to dye high-end silk and technical fabrics, tubular and warp knit for sportswear enabling the optimization of production times and superlative technical performance.

One constant is to be able to make machines that can prove effective in all-around energy savings, not an easy task in the dyeing sector, and LAIP, as always, meet the challenge and the results are manifest. Less water consumption, more efficient components, more automation and indeed, significant energy savings.



Reducing carbon footprints and water consumption through sustainable dyeing and finishing

■ Najmus Sakib

Sustainability and digitalization in the textile finishing industry are dependent on the level of intensive relationship between the finisher, the machine supplier, chemistry suppliers and other technology providers is crucial to imminent success.

As the textile finishing industry is known for its significant water and energy consumption – there are two elements to saving water and energy – modern plant technology and process optimization.

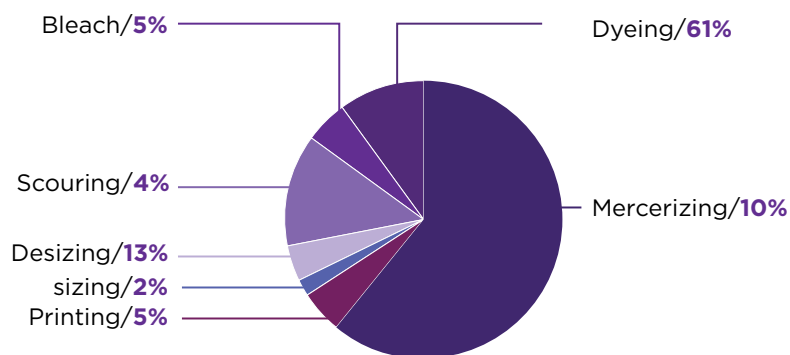


Figure 1: Water consumption by percentage in the textile wet processing.

Innovative approaches are being introduced to reduce water and energy consumption in textile processing to address these challenges. Especially in the recently concluded ITMA 2023 leading exhibitors showcased modern machine concepts with digitalized intelligent control systems that are expressively decreasing the consumption of water, chemicals and energy consumption and the use of these machines leads to a huge drop in environmental footprint compared to older models.

By reducing water usage, optimizing dyeing techniques, and exploring sustainable dyeing solutions, the textile industry can significantly reduce its environmental impact and achieve greater sustainability.

There are several approaches for low carbon and water consumption in textile dyeing and finishing. Some of the approaches are described below:

The technologies bought in ITMA 2023 for low carbon

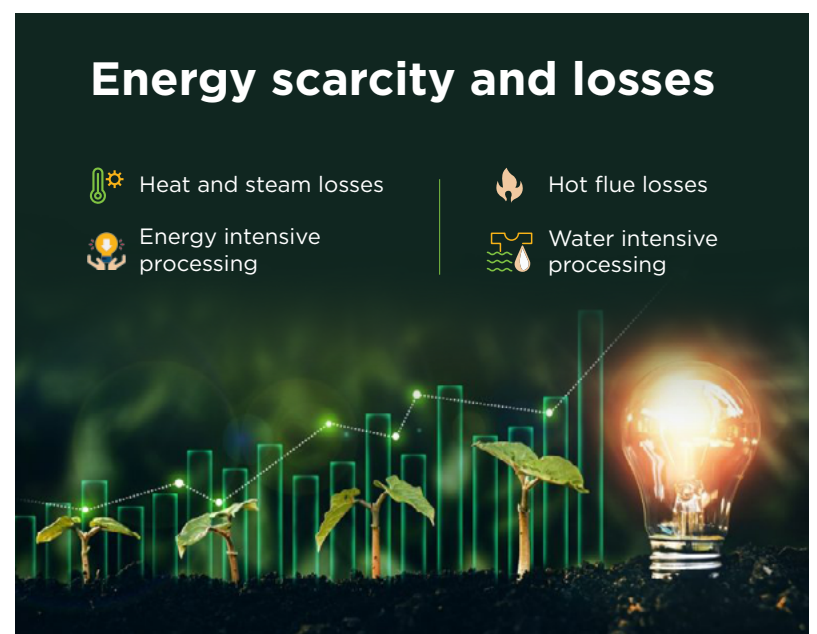


Figure 2: Water consumption by percentage in the textile wet processing.

and water dyeing and finishing are showcased below:

The ‘laundry revolution’

Methods	Brief Description
Foam dyeing	The main dyeing element in this process is foam, using air instead of water to carry the chemistry or dye onto the fabric.
Air-Dye Technology	It uses hot air to inject dye gas into fibers. Benefits include vibrant, long-lasting colors compared to traditional methods.
Microwave technology	The fabric is washed and put in a container with hot water and dye powder. The container is microwaved, then the dye solution is added and repeated. After filtering, the fabric is dried in shade, but uniform and deep dyeing is difficult, and lots of dye is lost in the rinsing process.

Methods	Brief Description
Supercritical Fluid Dyeing	The CO ₂ dyeing method involves adding dye and fiber to a reaction vessel, pressurizing it with CO ₂ , and maintaining it at high temperature and pressure conditions for 2 hours. Low energy usage, no need for a drying process, no wastewater discharge, and non-toxic supercritical fluids that allow for faster dye diffusion.
Bio-based Dyeing Technology	Bio-based dyeing is a safe, eco-friendly, and cost-effective alternative that uses natural sources like plants, animals, and microbes. Microbe-based dyeing is remarkably efficient and can be done in batch or continuous mode.

Tonello presented its “Laundry (R) Evolution” at ITMA 2023. Tonello’s all-in-one system for washing incorporates



Figure 3: Tonello presented its “Laundry (R) Evolution” at ITMA 2023. The four technologies into a single machine.

EGO: This technology uses ozone in both water and air to create bleach effects without hazardous chemicals. It reduces water consumption by up to 80% compared to traditional bleaching methods, simplifies wastewater purification operations, and lowers treatment costs.

NoStone®: NoStone® achieves stone-washed effects without using pumice stone, which has associated environmental impacts. It eliminates the need for a pumice stone supply & thus resets the emissions associated with it to zero. It generates no dust, sludge, or micro-particles and saves water by eliminating specific steps required in traditional stone-washing processes.

UP: The UP system ensures a continuous and regular water flow inside the machine, which is then recovered and recirculated. This approach reduces the water needed for dyeing and finishing processes, resulting in water and energy savings. The liquor ratio reaches a low level (LR

1:2), and it also reduces energy consumption during the filling and draining times of the machine.

Core: Core produces a fine mist inside the basket, producing uniform or contrasting effects on garments. This process uses significantly less water than traditional bath application methods, reducing water consumption by up to 96%. It integrates the Obleach process, which achieves authentic bleach effects using ozone instead of harmful chemicals.

The THEN Smartflow TSF

The THEN Smartflow TSF dyeing machine from Fong's Europe reduces water and energy consumption through the following features:

1. Smart Fabric Transport System: This system ensures extremely even dyeing of the fabric by accurately controlling the nozzle pressure and pump power by minimizing the need for excessive water usage.

2. Low Liquor Ratio: The machine operates with a low liquor ratio of down to 1:2.5, requiring less water to dye a given amount of fabric compared to traditional dyeing machines.

3. Heat Exchanger: The machine is equipped with a heat exchanger that quickly and efficiently heats the dyeing liquor, reducing energy consumption associated with the heating process.

4. Bath Preparation and Chemical Dosing System: The machine ensures precise dosing of chemicals, dyestuff, and salt, reducing chemical waste and optimizing the dyeing process.

5. Closed Loop Regulation and Digitalized System: The fabric transport system manages fabric movement without a winch, reducing power consumption and minimizing tension on sensitive fabrics.

6. Efficient Control Panel: The control panel allows operators to program and monitor dyeing processes easily, ensuring optimized energy and water usage throughout the dyeing cycle.

Rotor spray minimal application system

The German manufacturers, WEKO and RotaSpray, are exhibiting their rotor spray minimal application systems for textile dyeing, finishing, coating, and moisture management at ITMA.

The conventional continuous dyeing ranges have several problems:

- It consumes high energy & chemicals

- Generates a high load of effluent
- A cost and scrap-efficient production of small lots is nearly impossible (while the market is increasingly demanding smaller batches)

The companies propose using a minimal rotor spray application method to close the gap in conventional continuous dyeing ranges.

CO₂ dyeing technology (DyeOx)

DyeCoo Textile Systems has developed a breakthrough technology for yarn and fabric dyeing using carbon dioxide (CO₂) as the dyeing medium. This eliminates the need for significant water usage and reduces energy consumption associated with the heating and cooling of water in the dyeing process. At ITMA DyeCoo is showcased how its dyeing products work with materials beyond polyester, such as polylactic acid (PLA) and acetate.

Its fourth-generation CO₂ dyeing machines, the DyeOx4, are designed to ensure consistent color penetration and exceptional color fastness in various fabric constructions, including knit fabrics, woven fabrics, and yarn. The machines facilitate a complete water- and chemical-free dyeing process in a single machine, making it efficient and environmentally friendly.

Alchemie Technology

Alchemie's innovative technologies, Endeavour and Novara, disrupt manufacturing processes that contribute to more than 3% of global CO₂ emissions and 20% of global water pollution. "Our solutions both dramatically reduce the environmental impact and the cost of dyeing and finishing, which has proven to be a compelling combination," said Alchemie founder and CEO Dr Alan Hudd.

ENDEAVOUR (Waterless Smart Dyeing)

Endeavour is a new way to dye textiles that saves energy, eliminates wastewater, and reduces costs. It uses a high throughput process to replace five traditional dye baths with just one machine. This technology also allows for dyeing in water-poor regions and reduces environmental pollution. Overall, Endeavour offers 85% energy savings and a 50% cost reduction, making it a profitable and sustainable option for textile colouration.

NOVARA (Digital Textile Finishing)

Novara is a digital textile finishing solution that offers precise coating and digital control of finish location, resulting in cost savings of over 30% compared to pad applications. It also benefits sustainability by reducing

chemistry and energy consumption by 30% and 85%, respectively. Novara offers various finish chemistries, including water-repellent and antiviral options, to deliver advanced new functionality combinations.

Everzol ERC reactive dyes

Everlight, a leading expert in chemical technology, is presenting its latest innovation, the Everzol ERC reactive dyes, at ITMA 2023. These dyes offer companies an opportunity to reduce their environmental impact. By utilizing Everzol ERC, businesses can enhance productivity by eliminating process steps and minimizing water and energy usage compared to traditional reactive dyeing methods.



Figure 4: DyeCoo Textile Systems has developed a breakthrough technology for yarn and fabric dyeing using carbon dioxide (CO₂) as the dyeing medium.

Smart-Indigo

Sedo Engineering, an innovation specialist based in Switzerland, has introduced an innovative dyeing process called Smart-Indigo. Unlike traditional dyeing methods that use toxic chemicals, Smart-Indigo utilizes only electricity and caustic soda to dissolve indigo dyes. This innovative approach -

- Eliminates the generation of toxic wastewater, resulting in significant environmental benefits
- Reduce water consumption by 70%, energy consumption by six times, and carbon emissions by 10 times.

Flexible fabric dyeing machinery

Sclavos has developed a new fabric dyeing machine that they were showcasing at ITMA. The Athena series machine is flexible, produces high-quality dyeing results, and reduces water and energy consumption. It can handle many types of fabrics, including synthetic, elastane blended, and cellulosic materials.

During ITMA 2023, companies demonstrated their dedication to achieving sustainability goals and satisfying the increasing demand for environmentally-friendly products by showcasing solutions that minimize carbon emissions and water usage.

Biodegradable diapers: Next big circular economy concept for plastic elimination

■ Saiful Saad

In the search for a sustainable and circular economy, the degradation of biodegradable diapers is the way to go for waste management of the global plastic consumption issue.

Single-use or disposable diapers containing several chemical ingredients, including plastic, are now a global villain for waste. According to Newswire, the global diaper market was worth more than US\$ 54 billion in 2016 and is expected to exceed US\$ 71 billion by 2022. These single-use and disposable diapers are on the market because they are inexpensive and easy to use; however, the short-term benefit is that they place a heavy burden on the environment.

The relentless degradation of the environment is being influenced by the overuse of plastic in the ocean, with landfill posing a severe threat to marine life and ecological balance. The use of microplastic in a limited amount has a significant impact on single-use products. Thus, eliminating plastic, replacing single-use plastic with a sustainable alternative, and developing a new delivery system are all necessary steps to take today.

Single-use diaper problems:

1. The faecal contents of a single-use baby diaper can quickly go into the groundwater and create waste in the watery region.
2. More greenhouse emissions to the environment in its entire lifetime.



Figure: Problems regarding single-use diapers in the environ-



3. Plastic originating from petroleum and other harmful chemicals are released into the environment.
4. Used diapers are discarded in landfills containing more and more carcinogenic materials.

Bryan Haynes, technical director of global nonwovens for Kimberly-Clark, spoke about this issue with concerns at the ITMA Nonwovens Forum on June 10. “Every minute, over 300,000 diapers are either destroyed, disposed of in landfills, or pollute the environment,” he said. This equates to 38 million tons of plastic waste annually, or approximately 167 billion diapers. Furthermore, diapers and other organic waste degrade in landfills, producing methane gas 20 times more harmful than carbon dioxide.”

According to some studies, producing single-use diapers for one baby per year requires more than 22 kg of petroleum and 136 kg of wood. As a result, the amount of used plastic and absorbent polymers is a significant concern for these issues. According to the EPA, single-use diapers take nearly 500 years to degrade, making them the third most common consumer item in US landfills. Every day, an estimated 3.75 million disposable diapers are used in Australia, contributing significantly to waste production. The daily use of disposable diapers in Europe is estimated to be eight million.

These excesses of diapers and hidden plastic should be replaced with new and adaptable waste management and circularity technology.

Plastic consumption and its effect:

Plastic consumption is among the most challenging and contentious issues at international or environmental conferences or meetings. According to the Organization for Economic Cooperation and Development, approximately

460 million tonnes of plastic are produced annually (OECD) globally. This figure more than doubled between 2000 and 2019, showing no signs of slowing down. By doing so, global production will nearly triple by 2060, reaching 1,231 million tonnes.

Plastic waste is one of the leading causes of aquatic pollution, as evidenced by the number of marine animals that die each year from ingesting plastic. Plastic has the potential to last for more than 100 years on Earth. These plastics have a form known as microplastic, which can easily mix with food, air, and drinking water, causing kidney and lung damage in children and even harming adults if consumed in large quantities. Single-use diapers are a gold mine for people's plastic consumption.

Plastic consumption also contributes significantly to greenhouse gas emissions. According to Human Rights Watch, if current trends continue, plastics-related emissions will account for 15% of the global carbon budget by 2050.

The solution to these issues is undeniably biodegradable disposable and renewable diapers made of materials that decompose quickly in the environment without generating harmful and toxic materials, which aligns with global circularity goals.

Biodegradable disposable and recyclable diapers - way forward to sustainability:

Biodegradability refers to a material's ability to degrade naturally and

dispose of it with a green aspect in its core, which is the inverse of compostability. Diaper biodegradability can occur due to natural humidity, pressure, temperature, or microorganic activity. This solution may aid in reducing the environmental footprint and reducing plastic pollution.

Biodegradable diapers are typically made from cellulosic fibres or other animal fibres. Cotton, silk, wool, bamboo leaves, and other novel materials can be used. Absorbent hygiene products (AHP) are disposable systems for household or sanitary products that can absorb certain fluids. The biodegradable use of AHP can be highly beneficial. The raw materials used to manufacture single-use diapers are primarily made of fossil fuels. Some manufacturers are now attempting to use bio-mass-based materials in their manufacturing processes. Using biodegradable materials and renewable products can help reduce greenhouse gas emissions and reliance on fossil fuels. However, implementing such innovative projects is still in its early stages, but it has enormous potential.

The biodegradability of such diapers promotes circularity and closes the loop because the diapers do not end up in landfills but can be degraded naturally without requiring additional land, processing, or chemicals. Finally, recycling is a much simpler approach.

Urine and faeces typically occupied a large portion of single-use baby diapers. The traditional method of diaper renewability is not the best way to go. Many countries, including

England, Germany, and the United States, attempt to implement strategic diaper recycling procedures. The procedure for removing waste, plastic, and chemical particles is complicated. It can include collecting, grinding, separating, washing, and granulating stages. Some manufacturers also take a different approach to the process, such as collecting, chemical separation, mechanical separation, heating, etc. Using enzymes, used single-use baby diapers can also be recycled into garden compost or soil fertilizer. Plastics can be converted into fuels under certain conditions and procedures.

In many ways, a biodegradable diaper is superior to single-use diapers. The sustainable approach employs sustainable materials, a circular process that degrades in a matter of years, uses less fossil fuel, mitigates, and so on. However, it is more expensive than a single-used diaper and less widely available. Biodegradable diapers are also better for the skin of children. On the other hand, a reusable approach frequently consumes more water and electricity, but the environmental benefit outweighs the additional cost in some ways.

Many nations struggle to address environmental issues, and retailers and producers with an eye toward sustainability still have few options. For this reason, the diaper industry must adopt eco-friendly inventory and supply chain practices. All environmentally conscious businesses in the diaper industry agree that using only biodegradable materials from start to finish in a fully circular system is the only option.

Table: This table contains the differences between single-used and biodegradable diapers.

Factors	Single used diapers	Biodegradable diapers
Economical roadmap	Linear	Circular
Sustainability	Not particularly sustainable	A sustainable approach
Degradation	A long time for degradation	A few years, more or less
Fossil fuel usage	More	Very less
Plastic	It has loads of plastic materials	Free from the plastic approach
Price	Less	More
Availability	More	Less
Environmental impact	Heavy	Very less

Innovate: Zero carbon co-locates with COP28 in Dubai

■ Sayed Abdullah

World Textile Information Network (WTiN) will co-locate the Innovate: Zero Carbon conference with COP28 in Dubai, UAE, this year.

Reducing carbon emissions and achieving 'net zero' is one effective way the textile & apparel sector can rise to the climate emergency. Not only this, but it is also a way in which the supply chain can reduce costs, increase confidence, and streamline operations. As a result, WTiN has launched Innovate: Zero Carbon – an innovation-driven and action-oriented conference enabling knowledge sharing around technology, materials, and operational strategy. Taking place live from Dubai, the event will provide insights into delivering tangible reductions in the carbon footprint of companies in the textile & apparel value chain.

Hosted at the Dubai Global Connect, the conference will explore:

- Decarbonisation legislation: an international overview
- How a 'materials transition' can support the net-zero agenda
- Reinventing dyeing & finishing for net zero transition
- How digitalization is driving decarbonization
- How circularity can contribute towards net zero supply chain
- Designing and communicating net zero targets
- Empower teams to drive zero-carbon

action in the supply chain

“We are thrilled to partner with WTiN to host the highly anticipated Innovate: Zero Carbon event at our facility in Dubai,” said Paul Boots, head of business development, Dubai Global Connect “Dubai Global Connect has been designed as the premier international sourcing and wholesale hub for the fashion & textile



WTiN will co-locate the Innovate: Zero Carbon conference with COP28 in Dubai, UAE, this year.

industry with a vision of providing a convenient and seamless experience for all industry professionals. We look forward to welcoming the delegates to Dubai.”

Mark Jarvis, WTiN managing director, said: “Innovate: Zero Carbon promises to be an exciting event for the whole of the textile & apparel value chain. We are increasingly getting approached by companies across the sector looking for help in reducing carbon emissions and transforming to more environmental practices.

“With this event, we can do that on a wider, global scale with help from key industry figures and experts as speakers. The opportunity for

networking and discussion with this crucial topic at the forefront is also invaluable in the current climate. We look forward to welcoming delegates from across the world to Dubai.”

Chinky Tyagi Khare, head of business development at WTiN said, “Dubai is strategically placed as a hub for the global textile & apparel industry to meet in the post-Covid-19 era. Co-located with COP28 and the World Climate Summit, it is the ideal place to open an actionable discussion around the long road to net zero while maintaining business growth.”

Event partners include digital textile and finishing technology experts Alchemie Technology, and EcoLactam®, which can reduce your scope 3 emission by cutting Nylon-6 footprint by up to 70%. Both partner technologies have a strong commitment to sustainable production.

Giovanni Henssen, business development manager of sustainability at Fibrant, producer of nylon-6 precursor caprolactam, added, “Innovate Zero Carbon is an exciting opportunity for us. EcoLactam® is Fibrant’s caprolactam with an ultra-low carbon footprint achieved through continuous process improvements and innovations. With this new and extraordinary generation of products, we can contribute to significantly lowering scope 3 emissions in the value chain. The action-oriented aims of Innovate Zero Carbon, therefore, align perfectly with our mission.”

Re_fashion: Accelerating transformation of fashion industry towards a circular economy

■ Sayed Abdullah

For centuries European lifestyles of use and disposal were damaging the environment. As the supply chain is spread across the globe – means the bulk of the impacts happens around the globe.

As the EU is now insistent on cleaning up the fashion industry — and the standards the EU set could force retailers to fix dirty supply chains in other parts of the world. Which is pushing responsible behavior among European fashion consumers re-using fashion apparel has seen a steady rise.



*Figure: courtesy: Re_fashion is accelerating the transformation of the industry towards a circular economy.
Courtesy: Re_fashion*

The word ReFashion denotes clothing and other textiles that are reused, resold, or somehow totally reimagined into any garment. Although it is hardly a new concept. After all, Asian fashion consumers and especially Muslims have been thrifting, mending, lending and embellishing clothes for centuries.

In the 21st century, global climate change – in addition to the pandemic and global economic crunch – has focused the runway spotlight on circular fashion.

One such initiative is Refashion – which is the textile, household linen and footwear industry's eco-organization. It manages the prevention of waste and management of the end-of-service life of products on behalf of the 5000 companies placing goods onto the market.

After 10 years of existence, France-based Refashion with its founding origins and opens up new fields of possibilities and activities: repairing, reusing, recycling, redesigning, rethinking, reinventing, and reconsidering alongside our partners and the general public. The company helps brands to engage in an eco-design approach and supports downstream actors to develop the recycling industry in France.

Refashion is there to federate: simple, accessible, and understood by all. At the heart of the industry's ecosystem, Refashion provides tools, services and information that facilitates and accelerates transformation and participates in funding the transition towards a circular economy.

Refashion has three pillars:

Responsibility: At the heart of the sector, Refashion carries out a mission of general interest that mobilizes a range of stakeholders. The company supports all these players and provides them with the keys to achieving the circular economy.

Circularity: Achieving a circular model in the industry is at the heart of Refashion's concerns and it is this conviction that guides its actions every day.

Collective: The collective and the valorization of all the actors who contribute to Refashion's project is a central characteristic of its activity.

To put it in a nutshell, Refashion is accelerating the transformation of the industry towards a circular economy. With its vision to make a 100% circular textile and footwear industry. Better produce, better consume, better reuse, better recycle - all of the industry's stakeholders are concerned.

According to the Resale Report 2023, the global resale (or secondhand) apparel industry is expected to grow from \$96 billion in 2021 to \$218 billion in 2026, far outpacing the growth trajectory of traditional retail apparel.

British label Couture To Your Door (CTYD) promotes slow fashion practices

■ Faujia Mushtari

Couture to Your Door (CTYD) is revolutionizing the fashion industry with its sustainable and personalized approach. Founder Maria Loria aims to bridge the gap between high-end fashion and individual preferences while prioritizing environmental consciousness. This report examines the vision, mission, and operational strategies of CTYD, highlighting its unique offerings in the fashion market.

CTYD's approach:

CTYD counters mass production and the disappointment of online shopping. Loria noticed the dominance of fast fashion and luxury conglomerates, resulting in generic mid-market garments and excessive polyester use. CTYD focuses on upcycling, made-to-measure, and made-to-order services to address these issues. The brand aims to provide personalized, perfectly fitting clothes, fostering a stronger connection between customers and their clothing.

Sustainability and circular practices

CTYD's commitment to sustainability is evident in its participation in The WearMyWardrobeOut Collective, a community of fully circular, sustainable, and zero-waste fashion services. CTYD's mission is to transform discarded textiles and remnants into one-of-a-kind, fully customizable couture garments. By sourcing limited edition vintage

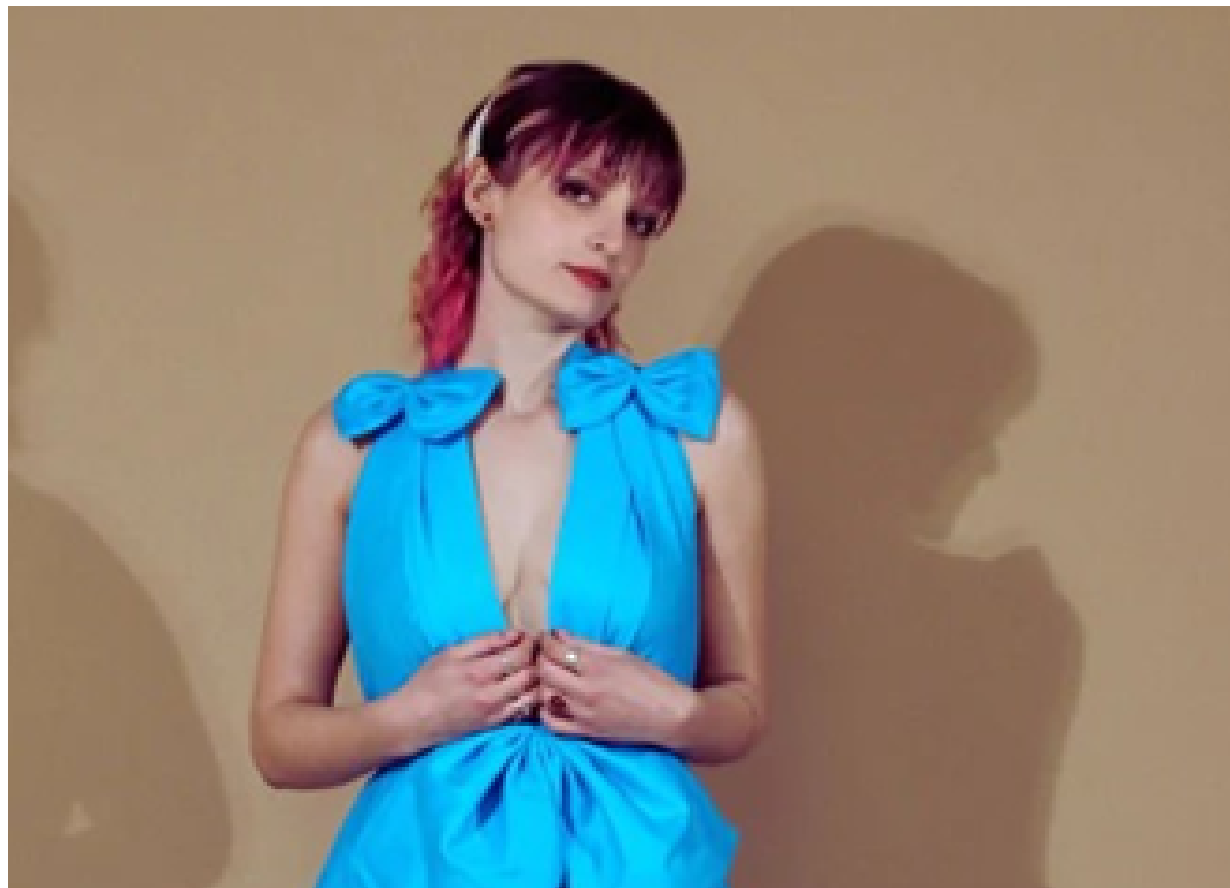


Figure: Couture to Your Door (CTYD) is revolutionizing the fashion industry with its sustainable and personalized approach. Courtesy: Couture To Your Door

and pre-loved prints in all sizes, CTYD breathes new life into existing textiles, promoting authenticity and individuality.

The brand's up-cycling practices reduce textile waste and allow customers to own unique pieces with a story. CTYD ensures that each creation has a distinct and personal touch by repurposing materials and incorporating them into made-to-measure garments. This approach contributes to the circular economy by extending the lifespan of textiles and reducing the demand for new materials.

CTYD also caters to diverse style preferences through its offering of full-pallet garments and multi-pallet contrast garments. This variety

allows customers to express their individuality while promoting the reuse of existing materials. By embracing circular practices, CTYD demonstrates its commitment to reducing the fashion industry's environmental impact and fostering a more sustainable future.

Diversity, equity, and inclusion

Diversity, equity, and inclusion are foundational principles for CTYD. The brand's service is designed to be inclusive and accessible to everyone. Customers can select a base size and add their exact measurements at no extra cost, ensuring that CTYD provides clothes that fit each customer perfectly. This emphasis on personalized garments highlights the

CTYD's Approach & Processes: Sustainable and Personalized Fashion

Upcycling

- Sourcing discarded textiles
- Repurposing materials creatively
- Creating unique couture garments



Made-to-Measure

- Customer selects base size
- Provides exact measurements
- Garments tailored to fit perfectly

Circular Practices

- Extending textile lifespan
- Reducing demand for new materials
- Promoting authenticity and individuality

Sustainable Material Sourcing

- Vintage cotton, linen, and organic textiles
- Limited edition vintage and pre-loved prints
- Emphasizing sustainability goals

Collaborations & Partnerships

- Local boutiques and influencers
- Sustainable fashion advocates
- Amplifying brand visibility and reach

importance of individual body shapes and aesthetic preferences, promoting body positivity and celebrating diversity.

By offering made-to-measure garments, CTYD challenges the traditional sizing norms imposed by the fashion industry, which often exclude individuals who do not fit into standard sizes. CTYD recognizes that everyone deserves to have clothing tailored to their unique bodies, and by providing this service, they empower customers to embrace their individuality and feel confident in what they wear.

Future prospects and industry trends

CTYD has received incredible customer reception and support, with its plunge neck, full skirt, and bow finish dresses gaining popularity. The brand's emphasis on fit, cut, and structured fabric creates a transformative and empowering customer experience. As the fashion industry evolves, CTYD anticipates a decline in traditional designer trajectories and retail models.

Increasing awareness of sustainability and the negative impact of fast fashion has shifted consumer preferences towards more conscious and personalized fashion choices. CTYD's innovative approach aligns with these industry trends and positions the brand for future success. By staying attuned to market demands and consistently delivering high-quality, sustainable, and personalized garments, CTYD is well-positioned to meet the evolving needs of fashion-conscious consumers.

Challenges and mitigation

While CTYD's approach brings numerous benefits, it also faces several challenges. These challenges include:

Sourcing Suitable Materials: Sourcing suitable vintage and pre-loved materials can be time-consuming and requires dedicated efforts. To overcome this challenge, CTYD plans to partner with textile recycling organizations and develop a network of reliable suppliers. These partnerships can streamline the material sourcing process and ensure a consistent supply of high-quality vintage textiles.

Balancing Affordability and Sustainability: CTYD acknowledges the need to balance affordability and sustainability. Personalized couture garments may have a higher price tag than fast fashion alternatives. To mitigate this challenge, CTYD intends to emphasize their products' long-term value, durability, and versatility. By highlighting the positive environmental and social impact of investing in slow fashion, CTYD aims to encourage customers to prioritize quality over quantity and make conscious choices that align with their values.

Couture to Your Door (CTYD) offers a unique and sustainable approach to fashion, prioritizing personalized, made-to-measure garments and up-cycling practices. With its commitment to environmental consciousness, inclusivity, and high-quality craftsmanship, CTYD is poised to significantly impact the fashion industry. By fostering a connection between customers and their clothing and promoting slow fashion principles, CTYD paves the way for a more sustainable and fulfilling future in fashion.



Figure 1: RecoverTM, Rieter and Polopiqué collaborate to promote recycling in textile industry.

Recover, Polopiqué and Rieter's collaboration to explore textile recycling tech

■ Homayra Anjumi Hoque

The environmental impact of textile waste is one of the biggest concerns in today's world. Every second, the equivalent is a garbage truck full of clothes burned or buried in a landfill. To solve this big problem, the fashion industry is promoting a shift to a circular economy. Pioneering companies have already been thinking about taking rapid steps toward circularity. To accelerate the adoption of the circular economy, the wise thinking of designers, brands, manufacturers, recyclers and consumers is the key driver. Only collaboration among the companies can foster innovation and develop more efficient recycling technologies. This article will look into the highlighted developments that took place in ITMA 2023.

RecoverTM, Rieter and Polopiqué collaborate to promote recycling in textile industry

Rieter, RecoverTM & Polopiqué started working together to solve a significant textile industry challenge. They revealed their collaboration at ITMA 2023.

Combining Recover's mastery of the latest in recycling, Rieter's expertise in spinning systems and machines, and Polopiqué's textile manufacturing proficiencies, the three companies have created high-quality, sustainable garments. It's made from high-quality 30Ne compressed yarn, containing 40% recycled post-industrial fabric scrap in the yarn. Only 20% of the

recycled fiber content is used to produce recycled ring yarn. The ring-spinning process used for this project combines a Rieter comb and a Rieter COMPACT drum compactor.

Recover's high-quality recycled cotton yarn is blended with virgin cotton in a 50/50 ratio. When combing the blend, very short fibers and unwanted neps are effectively removed, significantly improving the yarn quality and improving the operating efficiency of the ring spinning machine. In addition, combs removed fibers are perfectly suited for processing in Rieter rotor spinning machines. The process aims to be GRS Global Recycling Standard certified. Polopiqué is one of the few complete vertical textile industries in Europe,

controlling production from spinning, weaving, knitting and finishing to manufacturing high-quality garments for clothing and home textiles. The collaboration between these three companies results from increased demand for high-quality and fine ring-spun cotton yarns with more recycled fibres.

Andritz, Nouvelles, Pellenc ST develop an innovative approach to textile recycling

International technology group Andritz has partnered with Pellenc ST and Nouvelles Fibres Textiles to establish the first automatic textile sorting line on an industrial scale in France. This partnership combines the three partners' expertise in sorting technology, textile machinery and the post-consumer textile value chain.

The new textile sorting line will utilize Pellenc ST's automated sorting technologies and Andritz's recycling technologies for post-consumer textile waste treatment, production of recycled yarn for the spinning industry, and nonwovens and synthetic materials.

The line is expected to enter the industry in mid-2023 and will serve as a new Textile Yarn production line, an R&D line for partners, and a test and demonstration center for their customers. This line can sort finished garments by composition and color, achieving maximum purity through precise and fully personalized settings. This adaptability meets the requirements of the post-consumer and post-industrial waste markets. In addition, the versatility of the line meets the requirements of nonwoven manufacturers and spinning mills, providing them with the highest quality fibers best suited for the yarn industry, as well as the manufacturing process and shaping and finishing bonding of nonwoven. Ultimately, the line will provide traceability



Figure 2: Nouvelles Fibres Textiles' partners also work closely in R&D at the ANDRITZ Laroche and Pellenc ST technical centers to keep pushing technical boundaries. Courtesy: Andritz

throughout the entire supply chain, from collection to production of new recycled yarn. This function is essential to assist companies in the textile and apparel industry's search for value and circularity and to help them achieve the goals of the environmental, social and governance (ESG) program.

€10 million funding of EU Life in Collaborative recycling project of Lenzing group and Södra:

Austria-based supplier of speciality fibres for textile and nonwovens, Lenzing Group, and the Swedish pulp producer Södra working on 'OnceMore' have received their largest funding of € 10 million from EU Life. OnceMore is a textile recycling project named "Life Treats" whose core goal is to pave on circularity. The Lenzing Group will apply its "Refibra" technology with full resources to process and recycle a wide variety of colorful and complex textiles. This project aims to enable

the production of 60,000 tons of pulp at the Södra plant by combining 50% recycled materials and 50% renewable pulp with the capacity to process approximately 50,000 tons of post-consumer textile waste. Södra reports that the European Union throws away 5.8 million tons of textiles yearly, equivalent to 11 kg per person. In addition, consumption is expected to increase by 60% by 2030 from current levels. Lenzing and Södra have been working together in textile recycling since 2021, making an important contribution to promoting circularity in the fashion industry. During the partnership, the companies plan to share knowledge and jointly develop methods to facilitate the wider use of used cellulose textiles on an industrial scale. The OnceMore® pulp developed by the two companies will then be used for various purposes, including as a raw material for producing Lenzing's TENCEL™ branded speciality fibers using REFIBRA™ technology. LIFE TREATS aims to reach an annual treatment capacity of 50,000 tons



Figure 3: Södra's mill in Mörrum, Sweden. Courtesy: Lenzing Group

of textile waste by 2027. The project is set to significantly contribute to the EU's Circular Economy Action Plan by diverting large amounts of colored and mixed textile waste from recycling, landfilling or incineration. Stakeholders in the circular textile value chain will be actively involved here, from raw materials to production, distribution, collection and recycling.

Pulcra chemicals and Inditex's joint venture 'Sustineri Coloring' bringing sustainability to dyeing:

Sustineri Coloring is based on newly engineered process chemicals which allow a one-bath pretreatment and dyeing process for dark, medium and light shades of cotton and polyester/cotton fabrics by exhaust method. This results in shorter processing time and less use of water and energy. The process is already used in selected factories, and has been

shown by Sustineri Coloring to reduce the processing time by up to 60 percent and reduce water and energy consumption by up to 80 and 60 percent in both pretreatment and dyeing. As state-of-the-art products are used here, they allow a one bath treatment, which is the main reason for saving resources.

This process results from joint research of Pulcra chemicals and Inditex, which can be used for both cotton and polyester/cotton. This project aims to reduce the effect of standard dyeing with low energy consumption.

ZDHC collaborates with OEKO-TEX for environmental chemical management

ZDHC (Zero discharge of hazardous chemicals) and OEKO-TEX® have partnered to improve sustainable chemical management and cleaner chemistry principles. This partnership aims to promote sustainability

and meet the needs of chemical manufacturers/formulas, suppliers, brands and retailers. The goal is to create a consistent approach to the sustainable management of chemicals and products in the global value chain.

The agreement provides a framework for the work of the two groups. It includes an Oeko-Tex Eco passport that certifies conformity against the ZDHC MRS L V3.1.

The Passports can be obtained from any Oeko-Tex eco-passport laboratory, but chemical formulations must register the product with the ZDHC gateway to display the certificate.

It also smooths alignment with the upcoming ZDHC Chemicals to Zero Program and maximizes knowledge sharing between technical groups from both organizations. In addition, both groups agreed that Oeko-Tex would promote ZDHC products and platforms such as Gateway, ClearStream, and InCheck to reduce duplication of effort and promote industry harmonization.

Waterless Carbon Dioxide Dyeing is a powerful solution for Sustainable Coloration

■ Saib Khan Sami

Carbon dioxide dyeing, sometimes called CO₂ dyeing, is a cutting-edge and sustainable method of dyeing textiles. Traditional textile dyeing methods frequently use enormous amounts of water, chemicals, and energy, which has a negative impact on the environment and pollutes the water supply.

Supercritical carbon dioxide, which has the characteristics of both a gas and a liquid, is used in CO₂ dyeing. CO₂ may effectively dissolve and transfer dyes into textile fibers in this form, acting as a solvent. Pure powder chromophores are the main dyeing component in CO₂ dyeing. CO₂ dyeing ensures that garments are efficiently and effectively colored by employing powdered colors. This method can precisely control the dyeing procedure, resulting in brilliant and durable colors on the dyed textiles.

In the procedure, the fabric is loaded, the system is pressurized to achieve a supercritical CO₂ state, the cloth is colored, and finally, the system is depressurized to release the dyed fabric.

Loading: The fabric, required dyes, and auxiliary materials are loaded into a high-pressure dyeing tank.

Pressurization: The vessel is filled with carbon dioxide, which raises the pressure and temperature to reach the supercritical state.

Dyeing: The dyes dissolve and enter the textile fibers in the supercritical CO₂ state, producing the desired coloring.

Depressurization: When the pressure is reduced, the CO₂ turns back into a gas, leaving the colored fabric behind within the fibers. CO₂ dyeing has proven effective for PET (polyethylene terephthalate) materials, providing efficient and thorough coloring with outstanding and long-lasting results. The dyeing medium of supercritical CO₂ ensures high dye penetration and homogeneous dispersion throughout the fabric structure. CO₂ dyeing dramatically reduces water consumption compared to traditional dyeing procedures, harmonizing with sustainability goals and lowering environmental impact. While CO₂ dyeing has been chiefly used for PET fibers, attempts have been made to employ CO₂ with dispersion dyes to color other synthetic textiles such as nylon, polylactic acid (PLA) fibers, and PP fabrics. However, due to their nonpolar aliphatic structure and high crystallinity, these fibers provide problems. These

synthetic fibers have a low dye sorption rate and poor fastness quality. To improve fastness quality, dispersion dyes that interact with the polymer and establish covalent connections with functional groups must be carefully chosen. CO₂ dyeing, on the other hand, is less effective for natural textiles like cotton and wool. Natural fibers are hydrophilic and contain polar groups, making using nonpolar supercritical CO₂ for coloring

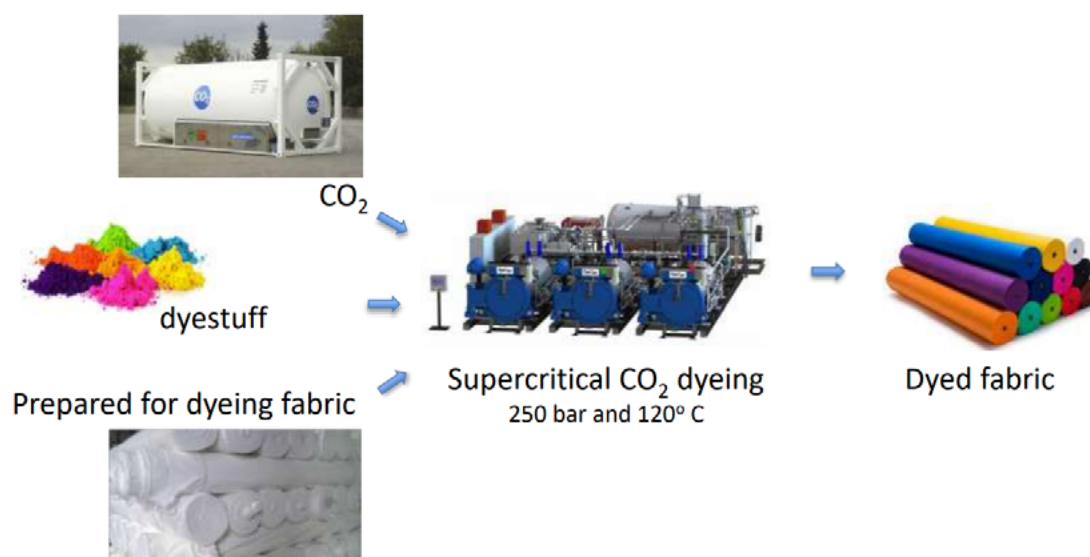


Figure 1: How CO₂ textile dyeing works

Material	Structure	Shade	Remarks
100% PET	Knit, Woven, Non-woven, Yarn & Spacer	Any shade	No reduction cleaning for fastness
100% PET	Micro fiber (filament)	Any shade	Dark/med shades might require reduction cleaning for fastness depending on D/F ratio
100% PET	Mechanical stretch (T400, PBT & Sorona)	Any shade	No reduction cleaning for fastness
PET/EA	Knit, Woven, Non-woven & Spacer	Any shade	Reduction cleaning required for fastness
PET/CO	Knit & Woven	Any shade	Only the PET is dyed, cotton remains unstained

Figure 2: material scope in supercritical CO₂ dyeing

difficult. Natural fibers' complex structure and composition make it challenging for CO₂ to accomplish sufficient dye penetration and uniform color distribution. As a result, natural fiber CO₂ dyeing frequently results in poor color fastness.'

The advantages of CO₂ dyeing over traditional dyeing techniques include their efficiency, sustainability, and circularity.

The considerable decrease in water consumption is one noteworthy advantage. Contrary to conventional techniques, CO₂ dyeing does not require vast quantities of water for dye baths and rinsing. The procedure reduces water consumption, saving valuable water resources and lessening the environmental effect of water use in textile dyeing by using supercritical CO₂ as the dyeing medium.

The reduced dependency on chemicals is another benefit. Using chemical auxiliaries and additives is reduced while using CO₂ dyeing, further increasing its eco-friendliness. This decrease in chemical use benefits both the environment and the safety and well-being of dyeing process workers while reducing the environmental effect.

CO₂ dyeing emphasizes energy efficiency as a crucial component. Compared to conventional dyeing methods, CO₂ dyeing uses less energy because it operates at lower temperatures. This contributes to a cleaner and more sustainable dyeing process by lowering carbon emissions and energy consumption.

CO₂ dyeing saves time. The procedure shortens the whole dyeing time, increasing productivity and using fewer resources because it does not require prolonged dye bath heating and rinse cycles.

Dyeing without water equates to being entirely free from the availability of pure water wherever you are. In the middle of the Sahara, the fabric can be dyed. This creates new prospects for the textile sector by enabling closer production to the market, shorter lead times, and disconnection from

water, the planet's most precious resource.

Dyeco introduced its waterless dyeing technology at ITMA 2023, revolutionizing traditional dyeing processes by eliminating water usage and delivering significant environmental benefits. DyeCoo is the first manufacturer of industrial CO₂ dyeing machines, offering a chemical- and water-free dyeing method for polyester fabric and yarn. LCA studies have verified this innovative approach, demonstrating considerable reductions in carbon and water footprints compared to standard methods. Big brands and merchants have successfully adopted the most recent machine, DyeOx4, lowering their environmental impact significantly. DyeOx4, the fourth generation of CO₂ dyeing equipment, has three independent dyeing vessels, allowing for a batch capacity of 120-180 kg for fabrics (depending on width, weight, and permeability) and up to 200 kg for yarn dyeing. These machines are intended explicitly for polyester dyeing and can be used on knit, woven, and yarn fabrics. Notably, the entire dyeing process is water-free, which ensures environmental sustainability. The machines run without needing to process chemicals and have a phenomenal 95% CO₂ recycling rate, making them energy-efficient and environmentally beneficial. Leading businesses and retailers are implementing CO₂ dyeing to fulfil sustainability goals, decrease environmental impact, meet consumer demand for sustainable products, stimulate innovation, and potentially save money.

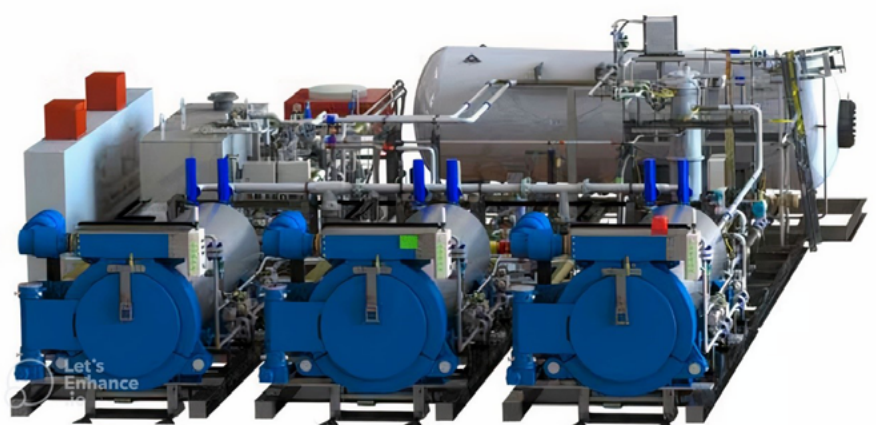


Figure 3: The DYE OX4 Machine

Loepfe's YarnMaster® EOS providing unprecedented yarn quality on open-end machines

■ Sayed Abdullah

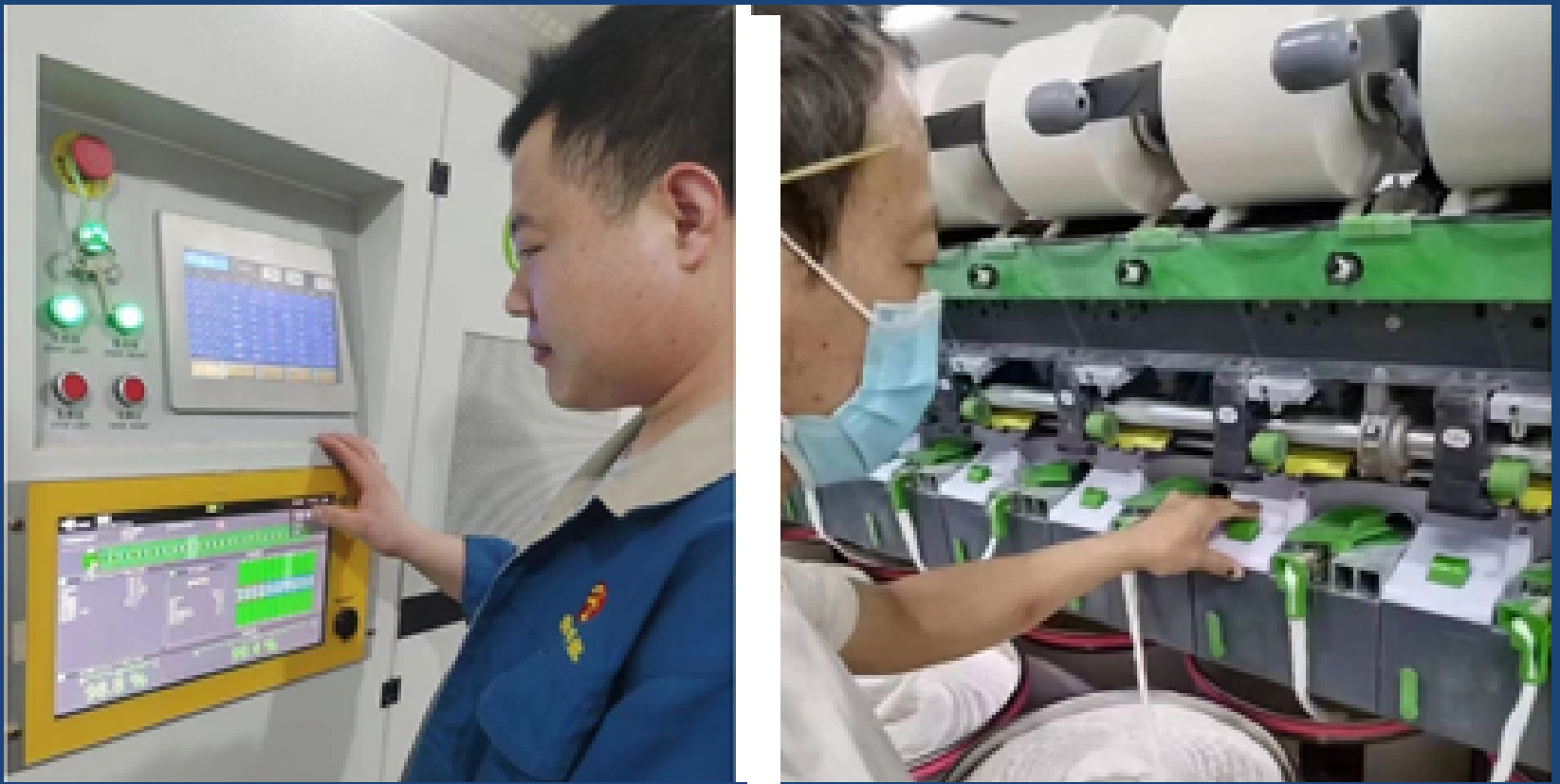


Figure: Loepfe's customer Shandong Dezhou Lan Tian Textile Co. Ltd. has chosen the Loepfe YarnMaster® EOS rotor yarn clearer and has been using it for various applications with consistently good results.

Loepfe Brothers Ltd.'s new YarnMaster® EOS is a state-of-the-art optoelectronic technology, this is the latest in a range of products designed and launched to support maximum productivity for spinning mills.

Loepfe's customer Shandong Dezhou Lan Tian Textile Co. Ltd. – located in Shandong Dezhou Lingxian Economic Development Zone – has chosen the Loepfe YarnMaster® EOS rotor yarn clearer and has been using it for various applications with consistently good results. Shandong Dezhou Lan Tian Textile Co. is one of the largest-scale professional production bases producing open-end yarn in China. And the company produces 50,000 tons of various open-end blended cone yarn annually, mainly OE Ne 5 - 35 polyester cotton yarn, viscose yarn and similar yarn. They have 75 Taitan open-end machines with

a total of 40,000 spinning positions. Most of them are equipped with Swiss-made electronic yarn clearers, Loepfe YarnMaster 1N1 and EOS.

YarnMaster® EOS has proven to be a dependable solution that meets the customer's high standards in terms of efficiency and quality.

“The decisive factor for YarnMaster® EOS was the reliable performance and fewer required maintenance compared to other options we considered,” said Tian, Equipment Director at Shandong Dezhou Lan Tian.

“YarnMaster® EOS significantly contributes to improving our production efficiency through its accurate cutting capabilities. The precision of the system ensures that each cut is executed precisely as intended, reducing errors and waste. This leads to improved overall productivity and

cost-effectiveness in manufacturing processes,” Tian added.

Support for the daily challenges thanks to a simple operation

One feature that Tian really likes about YarnMaster® EOS is the control unit, which is easy to navigate, presents information like yarn classification data, and provides online yarn quality monitoring in a simple and user-friendly manner. This makes it easier for the team to operate and interact with the system. YarnMaster® EOS supports Tian day-to-day by providing a valuable feature: the ability to identify a faulty rotor directly from the control unit (LZE-V). This functionality saves time and effort, allowing the customer to quickly identify and address any issues that may arise.

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H/O: 25A, Lake Drive Road, Sector 7, Uttara, Dhaka 1230, Bangladesh
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