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Wishing all the JTA readers a very Happy New Year 2020!

The New Year for TAI has come with a lot of new developments, starting from the new office bearers and the ideas and activities that the new committee wishes to deliver.

The new office bearers of TAI, wish to make TAI more connected with the industry through its various ground activities carried by different units across the country. Needless to mention, TAI is the oldest & maybe the first association formed in 1939 by the Textile Technocrats. We may have to expedite the changes in order to prove our existence.

One of the initiatives, which I personally wish to start is interaction through JTA, we welcome more and more industry engagement through JTA. The readers can send us their contributions in terms of Expert Articles, Researches, Reports and Developments in their workspace. This will add to everyone’s knowledge.

Textile industry, as all of us know, is passing through a difficult time, not only in India but across the world. Raw material prices have shot up in the last couple of months making exports as well as domestic industry less competitive. So much so, last year Indian cotton prices were higher than international cotton prices in India. Obviously, such a situation would not only increase imports but will also reduce our export competitiveness.

Thankfully, the budget had a very welcome step taken by the government, in the manner of abolishing anti-dumping duty on PTA. This will have a long term and very deep impact on the entire supply chain of polyester, right from fibre to the garment and fashion industry at the retail end.

All industry leaders across the board have applauded the removal of anti-dumping duty on PTA. This will potentially open up the MMF value chain, and give a fillip to the entire MMF industry and enhance its global competitiveness.
The government has also agreed to review FTA that has an impact on the Indian fabric industry, as in recent years through Bangladesh, a lot of Chinese fabrics after getting converted into garments in Bangladesh are entering the Indian domestic retail industry.

A detailed budget review has been done in this issue.

The very unfortunate spread of an epidemic, Corona virus that has caught China into a very depressing situation, causing the death of many Chinese and has also brought Chinese life into a standstill. The epidemic is spreading further to Japan and many other countries. Besides a very unfortunate natural calamity, it has started impacting the entire business dynamics of the world.

China being the largest exporter as well as leading importer of all products: finished as well as raw material, has crippled the entire supply chain of the world. Since it coincided with the Chinese New Year vacations, the impact has been much graver.

This is not only a blow to the business but to the entire humanity. We all should pray to almighty God, for taking the world out of this crisis.

Looking forward to much more active and engaging interactions through JTA,
Let us work together for the betterment of the Textile Industry.

Ashok Juneja
(President - TAI)
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KNITTING AS AN ART and Its Prevalence in India

Shivanand Sharma
Assistant Professor & Centre Coordinator - Knitwear Design Department
NIFT Hyderabad

Abstract
The art of knitting is practised in diverse cultures and countries. Its traditional textures, colours vary greatly across time and distance. The earliest example of true knitting is a pair of knitting socks found in Egypt, dating back to 1100 A.D. Hand knitting has gone in and out of fashion many times in the last two centuries, and at the turn of 21st century it is enjoying a revival. In the past few years, the use of knitting for an aesthetic purpose emerged in U.S. and U.K. and spread worldwide. But in India knitting is practised only for the functional aspect of clothing, while the potential of the knitting as a serious medium for self-expression is untouched. As a result people are least aware of the use of knitting as an art. Hence a need was felt to introduce knitting as a fiber art in India to spread the awareness among people. The purpose of the study was to explore the current scenario of knitting art in India so as to document the artefacts and to explore the potential of knitting as a medium for self-expression. The present study was conducted in two steps viz a viz an interview of renowned fiber artist of India & a survey to understand the awareness level of knitting art. It was found that in India knitting is mostly practised only for the functional aspect of clothing & apparel like sweaters, pullovers, t-shirts, inners, gloves, socks, slippers etc. and very few people were aware of the use of knitting in the art forms.

Keywords
Knitting, Fiber art, Fiber & Textile artists, Artefacts

1. Introduction
Since the antiquity people have used textiles for all range of purposes. From blankets for warmth, to elaborate fabrics for commerce, they have been at the very centre of human life. The need for textiles, combined with our desire to embellish the world around us, has given rise to a huge range of fabric based art[1], everything from basic colored cloth to complex knitted textiles. Hand knitting has gone in and out of fashion many a times in the last two centuries, and at the turn of 21st century it is enjoying a revival. More people are finding knitting a recreation and enjoying the hobby with their family. Knitting parties are also becoming popular in small and large communities around U.S and Canada. In the past few years, the use of knitting for an aesthetic purpose emerged in U.S. and U.K and spread worldwide. But in India where the hand knitting still remains a hobby of womenfolk, is practiced only for the functional aspect of clothing, while the potential of the knitting as a serious medium for self-expression is untouched. As a result people are least aware of the use of knitting in the fiber art. Hence a need was felt to introduce knitting as an art in India to make the people aware of it, along with the following main objectives.

◆ To understand the present scenario of knitting art in India to document the artefacts.
◆ To explore the potential of knitting as a medium for self-expression.

2. Literature Review
Fiber Art
The term fiber art refers to that style of fine art which consists of natural and synthetic fibers and other fiber based components such as yarn and fabric. It emphasises on the material and the effort made by the artist as part of the work significance, and prioritizes aesthetic value over utility [2]. Art works of this type communicate some sort of message, emotion and go beyond just the literal meaning of the materials. While contemporary fiber art is often preoccupied with materiality and technique [3].

The term fiber art came into use by curators and art historians to describe the work of the artist-craftsman...
following World War II. Those years saw a sharp increase in the design and production of "art fabric." In the 1950s, as the contributions of craft artists became more recognized—not just in fiber but in clay and other media—more number of weavers began binding fibers into non-functional forms as works of art [2].

In 1960s and 70s, an increasing number of trained artists, who were working with the fiber and fabric media, produced great works of miniature to monumental in size using a variety of techniques such as knotting, twining, plaiting, coiling, pleating, lashing, and interlacing and combinations, which explored the limitations of traditional textile forms and techniques, declared that a new art form had been developed, and that, like painting and sculpture, textiles could be used as a medium to express the emotions and ideas of individual, which liberated the concept of art of the twentieth century. The notable artists of that time such as Lenore Tawney, Ed Rossbach, and Claire Zeisler, and Magdalena Abakanowicz "Abakan" investigated in depth the potential of the materials of textiles and constructive possibilities for those pliable, linear elements. Fiber, and the ways in which it could be constructed became content. During 1970s in United States, the Feminist Art Movement sought equal museum and art gallery exposure for women artists and for the feminine perspective, which often was expressed through the use of women's work. These events lead to an exciting climate of artistic innovation and gained recognition throughout the world [4].

Although sharing a common tradition with tapestry, since 1980s fiber art moves beyond this historical textile form and has become more and more conceptual, influenced by postmodernist ideas. It is the work of one individual, who originates and creates after long standing experimentation with materials and techniques.

Generally the techniques and materials incorporated with fiber art are: spinning, weaving & its various types, felting, needle feltling crochet, sewing, beadwork, various methods of dyeing and printing including batik, tie-dye, natural dyeing; embroidery, appliqué, cutwork and other needle arts; mixed media, macramé & braiding, knotting, quilting, lacework, knitting and many more[3]. Each of these techniques has its own potential and challenge to express the ideas and emotion in an interesting and unique way.

The art of knitting is the technique in which loops of yarn are interlocked with the help of two or more needles to create the fabric. Originally, knitting was done with the help of single needle made of bone or wood, and was known as "nalebinding". Later it was done using two needles, which gradually moved to three and more. The earliest example of true knitting is a pair of knit socks found in Egypt, dating back to 1100 A.D. This evolution continued and the art of knitting has evolved from hand to machine method [5].

However originally this craft & art was entirely limited to making socks and stockings. Since 1960s, knitting has been evolving as an art form, expanding and enriching the fiber art field. In early 1960, Mary Walker Philips (1924-2007) aspired to elevate the knitting domestic craft to the professional arena and thus became the first professional art knitter in US. The number grew slowly during 1970s and 1980 in U.S, more rapidly in Europe & U.K. and many of the artists like Janet Lipkin, Jack Lenor Larsen, ArlineFisch, Rober Hillestad had explored knitting with a variety of materials and yarns to express their idea and showcased creativity in the form of wearable art, abstract knitted pieces as wall hangings, sculptures and installations [6].

During the past decade, in the search of burgeoning ways to make life more meaningful, knitting has been re-establishing itself in people's everyday lives. More people are finding knitting a recreation and enjoying the hobby with their family. Knitting parties are also becoming popular in small and large communities around U.S and Canada. In past few years, the use of knitting for an aesthetic purpose expanded in US and UK and spread worldwide.

Hand knitting has become popular as "yarn bombing" (guerrilla knitting), graffiti or street art, which employs colourful displays of knitted or crocheted yarn or fibre rather than paint or chalk. The practice is believed to have originated in U.S. with Texas knitters trying to find a creative way to use their leftover and unfinished knitting projects [7].

To provide with a snapshot of the current art knitting scene, I would like to mention the name of few artists, who have explored knitting's artistic potential since 1980's. Although regrettfully I cannot include everyone who is doing exciting work in knitting, here [4][6][8,9,10,11].

Some renowned US fiber artists using hand knitting to develop the contemporary art pieces are:
Kathryn Alexander: Kathryn Alexander is an internationally acclaimed US textile & fiber artist-a spinner, weaver, dyer, and knitter whose work is characterized by an abundance of color, richly textured surfaces, and whimsical designs.

Kathryn Cobey, Sculptural Knitter: Fiber artist Kathrine Cobey is an England based fiber artist. She uses spinning and knitting techniques and creates unique knitted sculptures pieces.

Barb Hunt is from Winnipeg and currently lives in New found land. Her recent art practice has focussed on the rituals of mourning, and her current work is about the devastation of war: knitting antipersonnel land mines in pink wool.

Donna Lish is a textile artist who is widely known for her innovative, energetic, knit and beaded sculptures. A sought after teacher and lecturer, Lish lives and works in Clinton, New Jersey.

Karen Searleis a fiber artist specializing in knit and crochets sculptural works. Her artworks have been exhibited in the United States and abroad since the late 1970s. She lives in St. Paul, Minnesota. Some famous UK fiber artists using hand knitting to develop the contemporary art pieces are:

◆ Fiber artist Kerry Mosley with hand knitted wire, creates both abstract and figurative wall hangings and framed pieces. His enduring interest is in the human form particularly portraiture.
◆ Fiber artist Max Alexander is using hand knitting to create the sculpture form.
◆ Ruth Lee is an associate lecturer at Cumbria Institute of the Arts (Carlisle, UK). She is a fibre artist, international tutor and writer and knitted textile designer. Ruth has participated in an exhibition for Bendigo Art Gallery, Victoria, Australia spring 2007, and authored a book "contemporary Knitting for Textile Artists". Ruth is passionate about moving knit forward as a challenging relevant working method within contemporary fibre arts practice. Ruth's current body of work explores knit, stitch, print and off-loom techniques in a wide range of manmade and natural materials including paper yarn, wire, wool and basketry materials. Applications include small-scale wearables, knitting patterns for publications, exhibitions and site-specific fibre-arts work for exterior spaces.
◆ Textile artist Patricia Bown is using knitting to create tactile contemporary art pieces for exhibition, installation and interior design. Her latest work centers on the versatility of recyclable and discarded materials.

◆ Shane Waltener is a textile artist who is using the hand knitting for two and three dimensional art installation for public exhibition.
◆ Sally Spinks works mainly with textiles including hand and machine knitting. Using predominately domestic materials she produces either installation works or sculptural pieces. Since graduating Sally has exhibited in UK and US and continues to develop her artistic practice in both knitting and other textile medium.
◆ Fine art background artist Françoise Dupré’s using looping, and other techniques to makes sculptures and installations. Françoise Dupré’s textiles-based installations are conceived as portals for imagination through which artist, participants and public can articulate and engage with their multiple cultural and spatial experiences and celebrate becoming cosmopolitan subjects.

◆ Steve Plummer: Steve Plummer was a maths teacher earlier for many years. Artist does mathematical knitting which is also known as illusion knitting & shadow knitting. (In illusion knitting a piece of work will look like alternate stripes of two different colors when viewed directly in front but when viewed at an angle a picture or pattern appears)

◆ Inga Hamilton is driven by a life-long obsession with knit crafts. She spends her life travelling the globe, gathering textile and ceramic skills and applying them to unusual materials in order to create large installations and sculptures for galleries around the world. She has created blends for the people like late Alexander McQueen at Gucci. Joy and humour are always present in her work.

◆ Houston artist Bill Davenport had created and exhibited crochet-covered objects in Houston in the 1990s. As per the Houston Press release, "Bill Davenport could be called the grand old man of Houston crocheted sculpture."

Dave is a contemporary sculpture artist who practised knitting as graffiti for a large-scale public art installation in Melbourne Australia for the Big West Arts Festival in 2009.
Figure 1: Katharine Cobey’s knitted Boat with Four Figures (source: http://fiberartnow.net/kathryn-cobey-sculptural-knitter)

Figure 2: Antipersonnel - knitted yarn - variable dimensions (life-size replicas) by artist Barb Hunt (source: http://barbhunt.com/images/antiper/03.antipersonnel.landscape.jpg)

Figure 3: How My Mother Dressed Me (Detail); copperwire, handknitting; dresses 6” high by artist Karen Searle (Source: http://www.karensearle.com)

Figure 4: Knitted Spirit Dress by Ruth Lee (Source: https://www.textileartist.org)

Figure 5: Le Pachamama Cape (back view) 2014 by artist Inga Hamilton (Source: https://www.pinterest.co.uk)

Figure 6: Knitted portraiture by Kerry Mosley (Source: https://www.lilavert.com/blog_lilavert/mixed-media-textile-artist-kerry-mosley/)
According to an article "Threading Art" by SandhyaBordewekar (2009) in Art & Deal magazine [12] and my research work, in India a major part of textile art actually deals with embroidery, weaving, painting dyeing and printing rather than actual fibers. The first person to have started using fibres (sutli, hemp / jute) to create contemporary art pieces ranging from painting to three dimensional sculptures and murals was late artist MrinaliniMukherjee(1949-2015) [13]. She had used natural fibers as medium with knotting and braiding techniques.

The next one was Ms. Nita Thakore who began using textiles - patchwork, stitching, embroidery, and quilting - as part of her ‘paintings’ in 1981 and has continued till date. Presently in addition to the above Dr. Nita is using various mix medium, quilting, tufting and relief technique stitching. In her current artwork she has incorporated flat weaving technique. When Nita made a work titled "Friends", the process led her to create...
one more visual dimension, making the ‘painting’ more of a sculpture. It reinforced her view that in textile art, one can go beyond coloured threads being colour lines and textured or printed cloth being the canvas. After having a dozen solo shows of Textile Art and participating in numerous group shows internationally, she has been more involved in the teaching of textile art, designing curriculum, being on jury panels, conducting workshops related to textiles and textile art at NID, Ahmedabad, NIFT campuses all over India, Pearl Academy of Fashion, Jaipur, Indian Institute of Craft & Design, Jaipur and so on. In 2001 she had started the Vadodara Centre for Contemporary Fibre and Textile Arts.

Artist and retired NID faculty, Errol Pires has used technique of braiding yarn which is known as ply-split braiding, since mid eighties and created many beautiful textiles. [14]

Fiber artist Parul Thacker started working with silk threads with a plain embroidery needle and created webs and interlaced patterns. Later she progressed to exploring other fibers and material like nylon monofilaments, acrylic tubes, paper yarn and created sculptures and three dimensional art pieces. Her trademark stitch is the angle stitch with which she creates a trail of triangles, sometimes knotting crystals and minerals into the fibres to create the contours of a rugged landscape.

The popular textile and fiber artist Gopika Nath is inspired to embroider, rather than paint on canvas. She believes that Textile Art is a key element in defining the future of India’s hand-crafting legacy. Working with needle and thread, exhibiting her work as an artist/craftsperson in the environs of the Art Gallery, she hopes to be able to lend dignity to the notion of handcrafting as ‘Art’, elevating it beyond mere skilled labour, as it is largely considered today [15].

In addition to these artists, there are a number of others such as Shatrughan Thakur, Lavanya Mani, Delhi based Ranjith Raman, Manish Nai from Mumbai, Kruti Thacker Gupta from Saurashtra; Gujrat, Pravena Mahicha Soni, Ahmedabad-based senior weaver-artist R.P Rajen, artist & faculty of NIFT prof. Kripal Mathur, Smiriti Dixit, Boshudhara Mukherjee, Nilima Sheikh, Hemali Bhuta from Baroda and others who are also experimenting with textiles in an interesting way. But I did not come across anyone, who is using knitting as a technique for fiber art in India.

3. Methodology
The present study was carried out with the key objectives - to explore the current scenario of knitting art in India so as to document the artefacts and to explore the potential of knitting as a medium for self expression. The following methods were adopted to achieve the above objectives.
1. Existing literature from various books, magazines and websites has been reviewed and analysed.
2. India’s renowned Baroda based textile artist Dr. Nita Thakore was interviewed over the telephone.
3. A survey was conducted in NIFT Hyderabad among the students of 2nd year Knitwear Design dept. A questionnaire was structured with close and open ended questions and a judgemental sampling method was used, keeping in mind that it might be more appropriate to judge the awareness level of knitwear students as they are studying the knitting and related subject and their awareness level might be little better than others. Also it was felt that, since they have already been taught the basics of knitting and exposed to development of various structures, they might be the right people to comment on the potential of knitting technique as a medium for fiber art. However the students from 3rd year onwards are exposed to the related topics, therefore they were not included in the sample. A total of 30 respondents were selected and collected data was analysed using percentage method.

4. Findings
As per the information shared by Dr. Nita Thakore during her telephonic interview, where she has thrown some light on the present scenario of Indian contemporary art.

In India the textile and fiber art has now slowly started making its presence. The artist who is having affair with the art and wants to use fibres and textiles to create the various art forms has the endless heritage backlog to experiment, innovate and create with its strongly rooted varied traditional and cultural textiles in woven, knitted, dyed, printed, patch work, embroidered with the use of different type of thread, mirror work etc.

However in India, very few artists are following textiles and fiber art practices as a medium for self expression as compared to western artists, where its use is countless in the contemporary art scene. Here only the artists who are passionate about doing differently
are following it. Since most of the artists are working independently, the recognition is very less and as such there are few formal galleries to showcase and support the work of fiber artists.

Fiber art as a style of art is not being included in the curriculum of most of the art and design colleges, therefore its movement at the institutional level is lacking as a result the art & design students are least aware of its use to express the idea & art.

According to Nita Thakore, the present scenario of textile and fiber art is not as serious and up to the mark, as it could have been in a country like India, which is very rich in terms of its diverse heritage of textiles. Although, presently artists have started exploring and working with a wide range of materials from paper to metal by incorporating various techniques of fiber art but the use of different handmade textiles of woven art, incorporating various surface ornamentation techniques such as embroidery, patchwork, dyeing and printing etc. is very less. Only very few artists, who have affair with fiber, fabric and its components, are following fiber as a medium to express art and there is no one who is using knitting as a technique for fine art in India. Although she has stated that knitting as a technique has a vast potential to create art forms and further could be explored like western countries.

She has also mentioned that this is the time when each one of us, all art lovers should take a necessary step forward to spread awareness of textile & fiber art and India should lead the fiber art movement of 21st century.

A survey was undertaken to understand the awareness level of people and also to explore the potential of knitting as a technique for fiber art. Where a questionnaire was prepared with close & open ended questions and the total of 30 students of knitwear stream were interviewed. Since the students were aware of knitting, therefore directly they were asked the following questions.

On being asked that in what form you see the use of knitting, around 87% people said that they generally see its use in the form of functional clothing such as apparel and accessories. And very few people around 13% responded that they had seen its use in both clothing and art form and not even a single person mentioned that they had seen its use only in art form. Although it is a fact that knitting has always been seen as a technique to create the functional cloths and not the art pieces. But on the other hand this is a clear indication that its use as an art form has never been explored to the limit it could have been to bring to the notice of people as an art technique in India.

Majority of the people approx 77% were not aware of use of knitting in fine art pieces before. However 23% were aware of the knitted art pieces and out of which 13% have already answered in previous question that they had seen the use of knitting in art pieces. Hence the remaining 10% might have been aware of the use of knitting as a technique for art but they have not seen its use here.

On the question: what is your comment on the potential of knitting as a technique for fiber art: almost all the respondents have supported and described very positively about the potential of knitting as a technique for fiber art. However only few have been mentioned here as describing all of them is not possible. To quote a few...

"Knitting makes the art look more aesthetically appealing and hence it shall be practised in our beautiful Indian culture".

"It is an innovative approach and I have never perceived knits in the form of an art piece, it would be great to see creativity in the use of knits".

"Knitting as a technique itself is an art and its expres-
sion as art piece has great potential to surprise the world”.

Also I personally feel that compared to other fabric construction techniques, knitting is very versatile and many innovative structures, surfaces and forms can be created through it.

5. Conclusion

Based on this study and analysis it can be concluded that in India knitting, a practical and creative craft still remains a hobby of womenfolk and it is practised only for the functional aspect of clothing and apparel like sweaters, gloves, caps and socks. However the foreign artists, who use knitting to create contemporary art offers us a platform to think, create, grow and develop this technique in to an expression of art. Although textile and fiber art has also now started making its presence in India, but during my study I did not come across to any artist who is using knitting as an art technique for self-expression and aesthetic purpose. This shows people are least aware of the use of knitting in the art forms. Hence being a knit & art lover, with due hope my idea to choose such topic with the aim to introduce knitting as an art technique in India may widen its awareness among people.

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1. Introduction
The conventional use of handwovensaree as a traditional dress for Indian women dates back to the Indus Valley Civilisation. This nine yard piece of cloth is testimony to the exquisite weaving skills of the Indian weavers. The drift of younger generation from the unstitchedsarees to the more comfortable stitched dressesis having an impact on the socio-cultural identity of the Indian woman. Further the cheaper fabrics from the power-loom and mill-made sector has made the situation even worse. It has led to a disruption of the handloom industry and is adversely affecting the handloom weavers in rural India. With reduced demand for the traditional textiles, the weavers are losing interest in continuing with this art form as a result of which the danger of losing the techniques of weaving exquisite traditional textiles particularly the sareesis looming large. With the continuation of this drift, our progeny will probably be oblivious to the refined mastery in designing, weaving and draping these exquisite textiles. So far the initiatives undertaken to support the weavers have not been much successful. The sareesare partly surviving through government aids, subsidies, elite patronage and cost-cutting strategies.

Handloom weaving is an integral part of the rich and vibrant Indian cultural heritage. The handloom sector is second to agriculture in providing livelihood to rural and semi-ruralpopulation. It contributes about 15% of the cloth production in India, while the country has the pride of contributing 95% of handloom fabrics to the entire world [1]. Sustainability of the handloom sector is important to the nation’s progress. Several researcheshave pointed out to the difficulties faced for survival by the handloom industry [2-4]. In spite of this, some researchers feel that if properly managed, with commitment, the handloom industry can continue provide wealth and prosperity to rural India. This is why the products evolve continuously with respect to design, raw material, process of production and styles adapting to the changing needs of the contemporary society [5]. While there is an existing demand for new designs in sarees, product diversification may also be considered as an alternative. The production of the diversified products should be utility-based and economically viable. It must respond to changes in markets, consumer needs, fashion and usage. This will enable traditional craftsmen to utilise their skills more meaningfully with respect to the new market situations and will expectedly expand employment opportunities thereby attracting younger generations to take up weaving as a profession. Some models based on inno-

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Abstract
India has over hundred varieties of traditional handloom fabrics, many of which have lost their original glory and popularity and are almost lost to oblivion. This includes some tribal weavesthat have also contributed to the uniqueness and diversity of the Indian handloom textiles. Many of the hand woventextiles are on the brink of extinction with the younger generation drifting from Indian ethnic wear to western wear, and with the weavers not finding the production economically viable. Kotpadweaves from Koraput in Odisha is one such unique hand wovencotton textile dyed with the Aal roots that is struggling for survival. It is believed that initiatives through innovation and diversification with respect to designs andfibres, broadening the scope of its end-use from traditional to a more contemporary one and adoption of aggressive marketing will help this elegant textile to live on.

Keywords
Aal, Diversification, Handloom, Kotpad, Saree, Traditional textiles

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Sustaining the Future of the Traditionally Woven Textiles of Koraput

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vation have also been developed to support this survival [4].

2. Tribal Sarees
Most tribes in India have contained themselves in their isolated surroundings and as a result of their minimal interaction with the outside world; they retain their ethnicity and thus develop unique cultural practices. Since the lifestyle of most tribes is based on self-sufficiency, many weave their own clothes. Tribes across India, exhibit a wide variation in their textiles and costumes. Even by a conservative estimate, more than 200 varieties of tribal sarees and drape variations exist in India [7]. Some of the popular ones include the traditional two-piece saree or the mekhla-chaddar woven on a simple backstrap type or frame-loom and worn by the Assamese women [6]. The fine-cotton saree from Manipur with narrow borders woven using Jamdani designs and temple motifs are another example of exemplary tribal weaving in India [7]. The Chattisgarh region, in central India, is known for its beautiful Kosa or Tussar silk sarees. The motifs on the Kosa or Tussar silk saree of Chattisgarh are woven with small dobby designs derived from nature, religious beliefs and tribal deities [6]. Another type of kosasaree having extra warp borders with adjoining rows of 'temple' motifs is woven in the Janjgir of the Champa district of Chattisgarh [6]. The tribal women from Sarguja and Raigarh districts of Madhya Pradesh wear Tura, attire woven in coarse cotton with intricate weft patterns that resembles a saree and has two end-pieces, one on either side [6]. Tribal women from the Raut, Mahar, Gadva, Gond and Bhatra of Bastar district in Madhya Pradesh wear a coarse off-white cotton saree woven on the throw-shuttle pitlooms with borders in rib or basket-weave and known as patas or muriapatkas [7]. The major tribes in Bihar and its adjoining regions of Munda, Oraon, Kharia, Sauria, Paharia and the Santhals wear luggar made in coarse cotton and having a red border woven with three shuttles [7]. The Santhal women traditionally wore a two-piece uncut fabric called the panchiparham. A wedding saree of this tribe known as khanddi usually has geometrical motifs woven with extra weft on the end piece [7]. Sarees from Nayagarh and Sukalgadia in Odisha are primarily cotton sarees woven on the handloom dobby [7]. Although the traditional characteristics are somewhat smudged in the context of new developments, due to their unique and potent design elements, modern fashion finds them very innovative and inspiring [8].

3. Kotpad Weaves
The immense richness of Indian textiles is reflected in a vast variety of handloom products many of which are produced by tribal communities. Koraput in eastern Odisha is one such centre of weaving that produces exquisite kotpad cotton sarees. Kotpad is a small tribal handloom cluster situated at 18.480 North (latitude) and 82.420 East (longitude), about 70 km away from Koraput in the state of Odisha, bordering Madhya Pradesh and Andhra Pradesh [9]. The plain weaves of Aaldyed yarns by the tribal weavers (Mirgana caste) of this cluster have occupied a prominent place in the map of Indian Handloom Industry. The cluster is surrounded by the dense forest of Malkangiri and Umerkote area of the district. Due to favourable climatic condition Aal trees grow abundantly in these forests which are not found in any other forest of the country [10].

The Malkangirijungles lying in the interiors of Eastern Ghats is home to a number of tribes like the Santhal, Kondh, Gond, Munda, Oraon and Bondo. The region has enjoyed greater immunity as it has been isolated from the rest of the country by a range of hills on the West, and Bay of Bengal on the East. Consequently, the textiles of this region have retained a distinct native identity. The members of these tribes are totally self-sufficient and cultivate their own land; spin, dye and weave fabrics for their own use.

The Panikars (weavers) of Mirgan caste have been weaving textiles for all the tribes living in these eastern hills of Odisha probably since 3rd Century BC [11]. They dye thick rough hand spun cotton yarns directly purchased from Jagdalpur (Chattisgarh), Rayagada and Sambalpur (Odisha) in varying shades of red using locally available Aal roots through an indigenous process. The men weave these naturally dyed yarns on rudimentary pit looms using three shuttle weaving technique. Motifs are mostly inspired from nature, have symbolic meanings and are specific to occasions. They are woven using extra weft. In spite of being rough spun, these sarees are simple and elegant.

The patas (sarees) were woven in short length of about eight haath (elbow to fore figure) and has two muhasorend-pieces. One of the pata is worn like a skirt and the other is draped over the shoulder and fixed using a knot. Pata, a single piece of calf length fabric, is draped across the body and ends are tied on one side of the shoulder (usually left). Traditionally the tribal women do not wear blouses.
3.1 Raw Materials
Earlier women artisans would hand spin wild cotton and/or silk into yarn [12]. This "katchasuta" or unprocessed cotton yarn is used to weave the cloth [11]. Today the cotton yarn is purchased from Sambalpur in the form of muda(rolls) packed in peti(box or cartoon). The number of mudain a petidepends on the count (Table1). Tussar yarns are purchased from Jagdalpur, Rayagada and Sambalpur.

<table>
<thead>
<tr>
<th>Count</th>
<th>No. of Muda (Cotton Rolls) in a Peti</th>
</tr>
</thead>
<tbody>
<tr>
<td>10s</td>
<td>10</td>
</tr>
<tr>
<td>20s</td>
<td>20</td>
</tr>
<tr>
<td>60s</td>
<td>30</td>
</tr>
<tr>
<td>80s</td>
<td>40</td>
</tr>
<tr>
<td>100s</td>
<td>50</td>
</tr>
</tbody>
</table>

3.2 Pre-treatment before Dyeing
The cotton / tussar yarns are dyed in shades of rust, deep rusts, maroons, rusty pinks, coffee browns and deep blacks using Morinda citrifolia also known as Indian mulberry (Aal) roots at Batsama, a village about 10 km away from Kotpad. It takes about a months' labour to dye unbleached cotton. Dyeing is mostly done during the winterseasons, i.e November to March. Earlier Aal roots (Aalkichaal) are collected soon after the rainy season from trees that are more than 40 years old that grow wild in the forests. Today the trees are cultivated and the roots are dug out when the plants are 3-4 years old. The roots are generally 4 to 8 cms in diameter; the barks of thinner roots give intense colour. Roots thicker than 1.3 cm. are discarded as worthless. The bark is removed from the roots and further broken into smaller pieces, washed, dried in sun and stored in gunny bags. When required, the bark is dried and pound into powder in a dhenki (an equipment similar to that used for removing husk from rice). Today the barks are ground into powder in electrical grinders and stored in earthen pots for further use.

Colour from Aal has no direct affinity for the cotton yarn and hence the yarn is treated with castor oil, cow dung and alkaline water before dyeing.

3.2.1 Treatment with castor oil
Castor oil is a glyceryl ester of ricinoleic acid. 4 knots is immersed completely in water and after squeezing excess water it is spread on a chatai or a wooden plank. 500g of good quality castor oil mixed in maand (rice water) is sprinkled on the yarn. The yarn is rubbed with the palm for about 15 min and further kneaded with the feet for another 15 min.

3.2.2 Treatment with cow dung
2 to 3 kg of fresh cow's dung is mixed with water to make a thick paste and slowly smeared and rubbed on the castor oil treated yarn. The yarn is then dried in presence of sunlight. For darkershades, both the processes maybe repeated.

3.2.3 Treatment with kharapani (alkaline solution)
2 kg of ash from burnt wood or Niger seed husk (Ramtil/ kalatil) or gingili/ season stalk (safedtil) is added to 25 litre of water in an earthen pot. The solution is stirred well and allowed to settle. The clear water from the top is poured in another earthen pot and heated to a temperature of around 50 to 60°C. The oil and dunged yarn is spread evenly on wooden plank/ chatai. The kharapaninis sprinkled by hand on the dried yarn till it is totally drenched. They are kneaded by hand and foot for 15 min and spread to dry. The sprinkling of kharapani is repeated 3 to 4 times every day and is done for about 8 consecutive days till the yarns start oozing foam. The yarn is then dipped in clean water, washed thoroughly and dried. After washing, the yarn looks yellowish brown and is ready to absorb the Aal dye.

3.3 Dyeing Process
About 1 kg of Aal powder is mixed with 10 litre of water and stirred well to get a good suspension in an earthen pot. 4 knots (650 g yarn) pre-treated cotton yarn is immersed in the pot. The soaked yarn is then taken out and spread on a wooden plank. Another 500 g of Aal powder is sprinkled over it and the yarn is further rubbed and kneaded for 10 to 15 min. The yarn is then put back into the earthen pot with Aal suspension and the pot kept in the sun for a day. The pot is then put on fire and the suspension boiled till the water evaporates. The yarn is stirred intermittently using a wooden stick. The yarn is then washed and dried in the sun. Dyed yarn is called Achi.

Pre treatment with kharapani and dyeing with Aal powder maybe repeated several times to achieve richer and deeper shades of red. Once the desired shade is achieved the yarn is thoroughly washed in clean flowing water and dried. This dried yarn is ready for weaving.

Ferrous sulphate (kumaharpather) is used to dye the yarn in shades of blackish bluish red. The slag ob-
tained from the local cottage iron smelting industry is mixed with jaggery and water and fermented in mud pot till the solution becomes black. Thereafter, this solution is mixed with Aal powder suspension and dyeing process continued as before. For a deeper bluish black-red colour 500-250 g of copper sulphate is also used in the third bath.

It takes a minimum of 3 weeks to complete one dyeing cycle. Kotpad weavers work with only shades of red, ranging from dull brick red (jyotilancha), bright brick red (Kariyaancha), deep maroon red (Jyotilgahir), blackish maroon (Kariyagahir) to chocolate brown (kala) along with "kora" shade of cotton (unbleached white). This combination makes their textiles unique.

Research has shown that the alumina contained in the ashes of some plants might help in the formation of lakes [12] during dyeing with Aal roots. They may thus act as a mordant. Further during the treatment with the khar (alkali) solution containing sodium carbonate, castor oil forms soap during the dyeing conditions and expectedly helps in the wetting of the yarns. The enzyme present in cow dung helps in saporation of the castor oil and also helps in partial bleaching of the yarns [10].

3.4 Weaving Process

3.4.1 Preparatory to weaving

Before weaving, the dyed yarns undergo some preloom operations like winding, street warping with shorter length of 5-10 m. Starch made from flour and water is applied on the yarn when it is stretched out before being set on the loom to provide strength and prevent it from breaking and tangling.

3.4.2 Warping

The master weaver carries out the process of warp making depending upon the requirement of the design. Since the process requires space, warping is done in the open area. The yarn rolls are put on a movable vertical frame. The ends of the yarns are made to pass through a grid like frame that guides the yarns. The yarns are spread on the field in the required lengths; generally one length of a saree is taken. Toraoil is applied on the threads to strengthen and lubricate them. They are then wound on a warp beam or the taana. The tightly wound thread on this log is set on the loom and conveyed to a long wooden block or cylinder called the cloth beam in front of the loom. Supported on the loom frame between these two cylinders (the warp beam and the cloth beam), the warp yarns ready to be interlaced by the filling yarns.

3.4.3 Weaving

The Kotpad weave are woven on simple pit-looms using plain weave. The loom is rudimentary with thread healds tied to two foot pedals that are alternately pressed by the weaver to make a shed. Mostly 3 throw shuttles are used to develop a solid border temple design locally called 'phodakumbha'. The width of the fabric varies from 18” to 48” depending on the end use. Ornamentation is achieved by inserting extra weft, 'nan' wherever required by hand (manually) using small shuttles and not with the help of extra loom attachments like dobby, jacquard or jalla.

Today about 60 to 70 families belonging to the Mirganacaste in and around Kotpad are engaged in dyeing and weaving of these sarees. The pre-treatment of the fabric and dyeing is done by women. Earlier the Daspanika caste from Madhya Pradesh was also involved in dyeing and weaving but today they do not practice the art. Till 2017 there were only 14 looms in Kotpad; today this number has increased to 18 (Information gathered from weavers of Kotpad through personal communication). Another 35 looms for weaving running fabric is expected to come up. Special training to the inmates of a jail of neighboring village Dansriguda by an NGO has been undertaken (through personal communication from weavers of Kotpad). The dyed coarse cotton yarn, ranging from 10s - 20s Ne is woven in a simple three-shuttle Mongthasaard (pit loom) with extra weft patterning for motifs. Solid border effect of the fabric is made with the interlocking three shuttle process. Table 2 describes various tools used during weaving process.
3.5 Washing
After weaving is completed, Shikakai and Reetha are used to wash the fabric. This also makes the colour permanent and fast.

4. Designs and Motifs
The Panikars (Weavers) from the Mirgan community in Kotpad have developed a number of motifs inspired from nature which have underlying symbolism that connect religion and social beliefs with art. Most symbolism refers to women as the cloth is meant mainly for the womenfolk. The lady of the house is considered as a Goddess who brings peace, prosperity and happiness to the entire family. It is believed that the saree with symbolic motifs on it will make the women virtuous and protect them from evil. The weavers derive their inspiration straight from their immediate surroundings, and their weaves depict certain socio-religious concerns and the folk culture.

One distinctive motif is a pyramidal pattern called by weavers as phool, cheeta, chauk which can be translated as flower, leopard, and seat respectively. Many discontinuous supplementary weft motifs placed in rows on the field of the saree such as leaves, snakes, axes are popular. Simplified motifs like fish, crabs, scorpions, birds, animals, trees, pots, umbrellas, huts, daggers, etc are also common. Some non-traditional motifs like umbrellas and aeroplanes have also emerged. Earlier bold tribal motifs were favoured, but in the current times, finer motifs with detailing are preferred. Thus the weavers are creating textiles in comparatively finer yarn counts and different widths to suit the urban tastes and markets.

Table 2: Tools used for weaving

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of the tool</th>
<th>Description and function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bharni</td>
<td>A wooden frame on which the yarn reel is fitted and then single threads are rolled on the Tossar. This is done to separate individual threads of the yarn from each other.</td>
</tr>
<tr>
<td>2</td>
<td>Tossar</td>
<td>A long wooden stick with a circular head. The yarn from the Bharni is wrapped on the Tossar so that it can be mounted in the shuttle.</td>
</tr>
<tr>
<td>3</td>
<td>Pawan/ Warping Board</td>
<td>A wooden frame used to separate cotton yarn and prepare it for the warp. This is a device which is used to measure the thread that will be held under tension during weaving.</td>
</tr>
<tr>
<td>4</td>
<td>Purni</td>
<td>A hollow cylindrical pipe made of bamboo used to arrange the yarn on the Pawan from the Bharni for warping.</td>
</tr>
<tr>
<td>5</td>
<td>Kangi/ Comb</td>
<td>The comb through which the warp passes</td>
</tr>
<tr>
<td>6</td>
<td>Nathi/ Spindle</td>
<td>The conical wooden frame, which is motioned in circles to wrap the separated yarn</td>
</tr>
<tr>
<td>7</td>
<td>Chipana</td>
<td>Flat wooden sticks, which are parted from the centre like tongs They are used to hold the combed yarn together and prevent it from tangling.</td>
</tr>
<tr>
<td>8</td>
<td>Dongi/ Shuttle</td>
<td>The shuttle is a boat-shaped device containing a supply of weft thread on a spool. There are two types of shuttles used for this weaving: (a) smaller shuttle for borders and (b) bigger shuttle for weaving the main body of the saree.</td>
</tr>
</tbody>
</table>

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Raise your profile in global technical textiles
Table-3: Symbolic connotation of motifs used in Kotpad weaves

<table>
<thead>
<tr>
<th>Symbol / Motif</th>
<th>Symbolism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilai Khoj or Cat’s paw</td>
<td>A cat walks silently without making any noise. Similarly, a young girl with good values must have the virtue of quietly serving her family and fulfilling their needs.</td>
</tr>
<tr>
<td>Peeplior Butterfly</td>
<td>A butterfly never sits idle and keeps moving from one flower to another for collecting nectar. A young lady must imbibe this attribute.</td>
</tr>
<tr>
<td>Padma or Lotus</td>
<td>The lotus rises from mud but is still beautiful. This symbolizes a virtuous lady, who despite adversities must deliver.</td>
</tr>
<tr>
<td></td>
<td>A lotus is also associated with Laxmi - the Goddess of Wealth, Saraswati - the Goddess of Learning and Lord Brahma - the Creator. Lord Vishnu’s smile is known as Padmehasa, eyes as Padmashyka, the lotus in his navel as Padme Garva. His palm and feet are also compared with lotus. Further, he also holds a lotus in his hand.</td>
</tr>
<tr>
<td></td>
<td>The eight petals of a lotus represent the five elements of nature and three inner elements related to human thought and behavior - prithvi (earth), agni (fire), vayu (air), aakash (ether), jal (water), mun (mind), budhi (intellect) and ahum (ego). These eight elements are expected to help one to attain supreme knowledge or gyan.</td>
</tr>
<tr>
<td></td>
<td>A virtuous lady is also referred as Padmini.</td>
</tr>
<tr>
<td>Machha or Fish</td>
<td>The fish that is agile and never static symbolizes a virtuous woman who is aware about her duties and strives towards providing comfort to her family.</td>
</tr>
<tr>
<td></td>
<td>Child in womb is also compared to a fish.</td>
</tr>
<tr>
<td></td>
<td>Fish is also symbolises prosperity.</td>
</tr>
<tr>
<td>Machha Chakshuo</td>
<td>Eyes of a fish symbolizes the alertness that a woman must possess to safeguard her family.</td>
</tr>
<tr>
<td>Fish’s Eye</td>
<td></td>
</tr>
<tr>
<td>Kankraor Crab</td>
<td>Virtues of a crab that can walk forward as well as sideways and withdraw into its own shell when required is compared to a woman who needs to be malleable.</td>
</tr>
<tr>
<td>Kachim or Kachua, Tortoise</td>
<td>A tortoise celebrated as the reincarnation of Lord Vishnu. Its ability to pull itself into its own shell when required is compared to a virtuous woman who must have this skill to look after her family.</td>
</tr>
<tr>
<td></td>
<td>It is also a delicacy for farmers.</td>
</tr>
<tr>
<td>Mayur or Peacock</td>
<td>A peacock signifies festivity, beauty, immortality, courtship, fertility, and virtuous strength.</td>
</tr>
<tr>
<td></td>
<td>It is also used as a charm to protect the newly wedded from the evil.</td>
</tr>
<tr>
<td>Hamsa or Swan</td>
<td>The slow and smooth gait of a lady is comparable to that of a swan.</td>
</tr>
<tr>
<td></td>
<td>It symbolises dignity and humbleness and even after conquering air, water and earth it remains humble.</td>
</tr>
<tr>
<td></td>
<td>It is the vehicle by Goddess Saraswati.</td>
</tr>
<tr>
<td></td>
<td>It also symbolises soul (atman).</td>
</tr>
<tr>
<td>Mruga or Deer</td>
<td>A virtuous woman should have virtues of a deer - beautiful, innocent, peace loving, agile with love for her progeny.</td>
</tr>
<tr>
<td>Hastior Elephant</td>
<td>A virtuous woman should symbolize the strength and non-violent nature of an elephant</td>
</tr>
<tr>
<td></td>
<td>Elephants associated with Goddess Laxshmi and symbolize prosperity and welfare.</td>
</tr>
<tr>
<td>Simha or Lion</td>
<td>Lion is also associated with bravery, valour and gallantry; it symbolizes authority.</td>
</tr>
<tr>
<td></td>
<td>The thin waist of a woman is compared to that of a Lion’s.</td>
</tr>
<tr>
<td></td>
<td>Simha is the mount for Goddess Durga (Shakti) an embodiment of power.</td>
</tr>
<tr>
<td>Lataor Creeper</td>
<td>A virtuous woman should be mobile, agile, flexible and beautiful like a creeper.</td>
</tr>
<tr>
<td>Laharioor Waves</td>
<td>The waves in continuous motion resemble the various sentiments and moods of a woman - happiness to sorrow, anxiety to anger and jealousy.</td>
</tr>
<tr>
<td>Handi/ Mathia/Kalasha/ Handi/ Mathia/Kalasha/ Kumbhaor Earthen Pot</td>
<td>The earthen pot symbolizes a womb and means to carry water and nectar (Amrit). It also symbolises abundance and good fortune.</td>
</tr>
</tbody>
</table>
Amongst the other motifs used in Kotpad weaves are objects of daily use, like Patawaar (oar) used for fishing, arrow-head for hunting, Angi (chopper) used to sacrifice animals during rituals, Chata/Chatrito protect farmers during rains. Motifs inspired from the day to day life and festivals are also popular like farmer ploughing field, woman drawing water from a tube well, dancers performing, drummers beating his drum and many more. Plate 1 - 7 shows different motifs used in Kotpad weaves.
5. Layout of Kotpad Sarees

Originally the sarees that the tribals wore were short length and were called (Faltual). The length of the saree is 8 Munda-nakh (elbow to nails) by 2 Munda-nakh. One munda-nakh is 18". Thus the length of the saree is 144" and the width 32". The seamless rectangular piece of fabric (pata jis divided into three parts: a field or body, border and end-piece or aanchal/ pallu. While warping, a different colour yarn is used for the border. The body is the central portion of the saree. The ornamentation of this part is done by using motifs (butis) at regular intervals, normally one bitta (8") apart. The body may be plain without any ornamentation. The border, a relatively heavier part than the body, runs through the entire length of the saree along the selvedge. It enhances the saree’s aesthetic appeal. The border is created by using a different coloured yarn while warping. Kotpadsarees traditionally use 3 shuttle techniques to create phoda Kumbh motif in the borders. Traditionally the body of the saree is white and border buti and pallu are done by aal dyed yarn. The pallu for simple daily wear saree (faltual) consists of border with flat stripes (PatliPata). The border is created by changing the colour of the warp yarn. Temple (Kumbh) is woven in the border using 3-shuttles with flat stripes in the pallav area. The pallav consists of 2 flat stripes and a few scattered motifs. The pallu is of 2 bitta. The distance between the motifs is one bitta (8") or one panja (4"). These sarees have pallu at both ends.

The ornamentation increases with the sarees that are used for various ceremonial occasions and for the affluent class. The thickness of the borders is varied. The thinnest border is 1 ungli or approximately 1". It can go up to 6". The Kumbh may be within the border, may be half protruding or totally after the coloured warp yarn ends. The size of pallu varies from 16" to 1 m. The pallu has flat stripes with rows of bundgi or flat stripes with a temple motif (chul) in the centre of the width of the saree facing the body. Today elaborate sarees are made with 48" width and 6 m length. Some sarees have stripes across the width of the saree created by rows of bundgi along with plain stripes at a distance of one munda-nakh (elbow to finure nails) (18"). Plate 8 - 11 describes various motifs used in Kotpadsarees.
6. Conclusions

Women folk are involved in the process of making Kotpad sarees. This helps in empowering them through livelihood and has prevented migration of the labour from the tribal belt to the urban cities. These textiles are originally sold in the Adivasi haats of Koraput and Jagdalpur districts. These eye-catching, sophisticated and outstanding textiles were not known to the rest of the world until they were exhibited in the festival of India’s Viswakarma exhibitions during early 1980s. Government exhibitions and fairs helped Koraput weaving to develop an identity in national markets. Weavers started getting orders from Delhi, Hyderabad, Madras, Bhubaneshwar etc. With the expansion of their markets, weavers expanded their product range from short length sarees (Faltual) to full-length sarees, dress materials and dupattas. Under the ‘Kalinga Vastra Programme’ of the Government of Odisha and the Weaver’s Service Centre, the Kotpadpanikasare trained and encouraged to weave 6 m sarees, yardages and stoles as per the popular demand. The exquisite textiles have also got a GI registration in 2005 [14].

Inspite of these efforts by the Government, the sarees are not so popular and faces the threat of disappearance. The cotton yarn used to make the saree is expensive and there is poor availability of Aal roots. Further, the extraction of the dye involves a complicated and time consuming process. This has forced the tribals to use cheaper, more colourful and easy to maintain mill-made sarees. With this, art of making the sarees is getting lost and many even in Koraput not know about these ethnic textiles. The limited design vocabulary, variations in colour and yarn quality have made the demand for Kotpad textiles static and added to the woes of the weavers. With the weaving process being tedious and time consuming, the children of the weavers have no interest in such labour intensive, repetitive and less lucrative work and are attracted to better job opportunities outside their villages. About fourteen weavers are still engaged in weaving the sarees, but in the absence of a local market they sell their produce directly to designers/consumers in bigger cities. Unless appropriate and quick steps are taken, the beautiful Kotpad sarees may become a thing of the past. Intervention through versatile designing, and faster weaving techniques has become imperative. Use of other natural dyes may be explored. The younger generations will have to be motivated to weave the traditional designs. Strategic knowledge-driven support system with the initiation of a new consumer base is desperately needed to sustain and preserve this icon of cultural identity.

7. Acknowledgement

Authors are very much thankful to Dr. Debjani Ray Moulik, Assistant Professor, Department of English, Barasat Government College, Kolkata.

References

5. Prempee A, Songkoon C, Wannajun S, The integration of traditional knowledge in the design and development of mudmee, praewa and yok tong silk products for enhancing community economy, Indian Journal of Traditional Knowledge, 13(2)
Application of Graphene Oxide on Cotton for Multifunctional Finishing

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DKTE Society’s Textile & Engineering Institute, Rajwada

Abstract
Application of reduced Graphene Oxide on Cotton fabric by Pad-Dry-Cure method was carried out. Reduced Graphene Oxide was characterized by Raman spectroscopy, XRD, and SEM technique. Antimicrobial finishing as well as Ultraviolet Protection Finishing effect of treated fabrics were evaluated by using standard testing methods. The result shows that treated fabrics exhibit excellent antimicrobial effect and improvement in UPF values. This technique can open new doors for nanostructured materials with improved functional properties.

Keywords
Graphene Oxide, Ultraviolet Protection Factor, Antimicrobial finish etc.

1. Introduction
Carbon materials are known for their environmental and biological friendliness than inorganic materials since the carbon is one of the most common elements in our ecosystem. In particular, graphite is a naturally occurring material that has been used in our daily lives for hundreds of years without critical toxicity issues. Thus, one can expect that graphene, a single layer of graphite, would be also safe and useful for industrial and biological purposes [1-4].

Graphene is a 2-D structural crystal obtained through the close packing of monolayer carbon atoms. Its thickness is only 0.35 nm and has been recognized as the thinnest material in our universe [5-7]. The unique properties of Graphene and the recent development of methods of its manufacture have caused strong interest in this novel material [8-11]. Lot many studies are in pipeline to exploit this unique material in the development of smart textiles like textile based biosensors, medical textiles and alike [12,13]. Graphene has been predominantly synthesized by both top-down and bottom-up approaches[2].

2. Experimental
2.1 Materials
The following table summarizes the details of Cotton fabric used for the study.

Table 1: Fabric specifications

<table>
<thead>
<tr>
<th>Details</th>
<th>Woven Fabric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiber composition</td>
<td>100% cotton</td>
</tr>
<tr>
<td>Structure</td>
<td>Plain weave</td>
</tr>
<tr>
<td>Grams per Sq.Meters</td>
<td>164</td>
</tr>
<tr>
<td>Ends/inch</td>
<td>60</td>
</tr>
<tr>
<td>Picks/inch</td>
<td>59</td>
</tr>
<tr>
<td>Warp &amp; Weft count</td>
<td>1/20s</td>
</tr>
</tbody>
</table>

All the chemicals of highest purity purchased from Sisco Research Lab, Mumbai were used for the synthesis of Graphene Oxide nanomaterial. Well Scoured and Bleached Cotton woven fabric having above specifications were used for the experiment.

2.2 Synthesis method for Graphene Oxide nanomaterial
To carry out the synthesis of Graphene Oxide, graphite was taken as a raw material and a modified Hummers method was used. 3.0 g of flake graphite (99.8% carbon, ash color) was added to 120 ml solution of 98% sulphuric acid (H2SO4) and 98% phosphoric acid (H3PO4) in a 500 ml conical flask in ratio 9:1. The mixture was stirred vigorously and maintained at 100°C for 2 hours. The mixture was then allowed to cool to room temperature and kept below 10°C by placing the mixture in an ice bath. 15.0 g of potassium permanga-
nate (KMnO₄) was added gradually over a period of one hour after which it was continuously stirred for another hour in order to obtain a homogeneous mixture. It was then removed from the ice-water bath, placed in a warm-water bath maintained at 45°C and stirred for an hour. After this, the mixture was allowed to cool to room temperature. It was observed that the color of the mixture changed to yellowish green. Subsequently, 250 ml of distilled water was added to the mixture. The color of the mixture changed gradually from yellowish green to reddish brown as the reaction proceeds. In order to stop the reaction, 20 ml of 30% hydrogen peroxide was added to the mixture until the color changed from reddish brown to dark brown. This shows that oxidized graphite has been synthesized. The obtained mixture was left overnight. The mixture was then centrifuged and re-dispersed in dilute hydrogen chloride. After this, it was repeatedly washed in distilled water and centrifuged three times. The mixture was tested with blue litmus paper each time it was washed in distilled water until the litmus paper color remained unchanged. This showed that the residual acid has been removed. Finally, the mixture was filtered and oven dried. The powder obtained was sieved to obtain uniform particle size.

2.3 Reduction of Graphene Oxide
The obtained Graphene Oxide was reduced using the method reported by Park et al. [14,15]

2.4 Characterization studies
The Characterization of the nanomaterial was carried out by using Raman Spectroscopy, X-ray Powder Diffractometry (XRD), Transmission Electron Microscopy (TEM) and Scanning Electron Microscopy (SEM).

2.5 Finishing of the fabrics with the nanomaterial
To impart the fabrics with the desired multifunctional effects the samples were treated with the rGO nanomaterial using pad dry cure method. The cotton fabrics with dimension 30 cm X 30 cm were immersed in the solution containing a dispersion of rGO (0.5%, 1%, and 2%) for 5 min and then padded through a padding mangle. A 60% expression was maintained for the treatments. The speed of the pad mangle was kept at 10 m/min. Thus padded fabric was air-dried and cured for 3 min at 140°C.

2.6 Functional testing of finished fabric samples
The sample fabrics treated with the nanomaterials were tested for the evaluation of UV absorption & transmittance (AATCC TM 183) and evaluation of antimicrobial activity (AATCC 100-2004) standard test methods with Staphylococcus Aureus for gram-positive bacteria and Klebsiella Pneumoniae, for gram-negative bacteria.

3. Results and discussion

3.1 Characterization of GO
Raman Spectroscopy

It is clear from the figure that the synthesized material is in reduced form. Further, values of intensity show the higher purity of the synthesized product.

X-Ray Diffraction:

From the figure 2, it can be seen that the material is fully oxidized to GO. Further, blurred lines, as well as small peaks at a various 2θ angle, confirm the presence of other functional groups like -OH and -C=O. This confirms conversion of GO into rGO.

Transmission Electron Microscopy
TEM micrograph reveals that the material is in a two-dimensional sheet form. Further details show that average thickness of the graphene oxide sheet is roughly around 2nm while the average numbers of layers are in the range of 3-6.
From the TEM and SEM studies, the thickness of rGO is calculated and following table summarizes the results.

### Table 2: Size of rGO Nanomaterial synthesized

<table>
<thead>
<tr>
<th>Method of Synthesis</th>
<th>rGO thickness in nm</th>
<th>Morphology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modified Hummers</td>
<td>Approx. 2 nm</td>
<td>Sheet and Flakes like structure</td>
</tr>
</tbody>
</table>

#### 3.2 Functional properties of treated samples

Functional testing of antibacterial activity

The values of test results confirm that the treated fabric samples have shown excellent antimicrobial activity against both the representatives of the bacteria used. Further, from the data, it is also seen that as treatment concentration of rGO in the pad bath increases, the efficacy of antibacterial finish also increases.

Functional testing of UV absorption function:

It can be seen from the table that all the fabrics treated with rGO nanomaterial have significantly higher UPF values than that of the untreated fabric sample. The values of the ultraviolet protection factor (UPF) for UV-A and UV-B ranges reflect the higher protection against UV radiation provided by all the GO nanomaterial treated fabrics. Higher values of UPF are obtained with higher rGO concentration.

<table>
<thead>
<tr>
<th>Fabric Particulars (Treatment with rGO in %)</th>
<th>Percentage reduction Staphylococcus Aureus</th>
<th>Klebsiella Pneumoniae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Treated with 0.5 %</td>
<td>96</td>
<td>97</td>
</tr>
<tr>
<td>Treated with 1 %</td>
<td>98</td>
<td>99</td>
</tr>
<tr>
<td>Treated with 2 %</td>
<td>99</td>
<td>99</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample Particulars</th>
<th>UPF values of Samples treated with GO nanomaterial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated Samples</td>
<td>Samples treated with GO nanomaterial</td>
</tr>
<tr>
<td>UV-A</td>
<td>UV-B</td>
</tr>
<tr>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Untreated</td>
<td>4.59</td>
</tr>
<tr>
<td>Treated with 0.5%</td>
<td>-</td>
</tr>
<tr>
<td>Treated with 1%</td>
<td>-</td>
</tr>
<tr>
<td>Treated with 2%</td>
<td>-</td>
</tr>
</tbody>
</table>
4. Conclusion
Conditions used for the synthesis of Graphene Oxide decide the thickness of the material. Treatment of rGO with Cotton fabric imparts antimicrobial and UV protection functionalities. Further, as the concentration of rGO in the pad bath increases, the efficacy of finish also improves. This may be attributed to the photocatalytic effect of GO. Moreover, the treatment has no adverse effect on the physical properties of fabrics except whiteness. Due to excellent antimicrobial characteristics, this finish has the potential of being commercialized.

References:
Performance of Hydrophilic Polyamide Membranes in Nanofiltration for the Recovery of Water from Dye Effluent

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²Department of Dyestuff Technology, Institute of Chemical Technology Mumbai

Abstract
Enormous quantum of wastewater is generated in the dyes and textile industry. Membrane separation using nanofiltration membranes is a promising technique to recover water from the effluent streams. In this paper, we study the influence of different operational variables (trans-membrane pressure, feed concentration and pH of feed) on the removal of two dyes, namely, Reactive Yellow 105 (Procion Yellow HE4G) and Acid Red 94 (Bengal Red B) was carried out using polyamide flat sheet membranes in a dead-end stirred cell filtration setup. The surface of the membrane was characterized using Scanning Electron Microscopy (SEM) to check the degree of fouling and membrane morphology. Membrane performance was examined by changing various parameters such as the concentration of feed, transmembrane pressure, stirring speed on the feed side, etc. For Reactive Yellow 105, permeation experiments at 25 bar transmembrane pressure resulted in a flux of 263 L/(m².h), while the rejection obtained was 98%. Similar experimental conditions gave lower flux value of 222 L/(m².h) for Acid Red 94, but the rejection was found to be practically independent of transmembrane pressure. The filtration process with continuous stirring gave about 86% higher flux than the unstirred case, depicting the importance of stirring in case of dead-end flow. Membrane cleaning using ultrasound was found to be the best among all the methods studied which gave 95% flux recovery at low frequency and low power. Nanofiltration using polyamide membranes is a prospective solution to treat hazardous dye effluents and to reduce its impact on the environment.

Keywords
Nanofiltration; Wastewater reclamation; Membrane cleaning, Dye effluent

1. Introduction
Almost every textile industry in the world uses water as the application medium and scarcity of water makes it very important that this water must be treated and reused if possible. Dyes are listed as organic compounds with complex conjugated unsaturated structures and possess low bio-degradability [1]. They are used to impart colour to a substrate or a solution, for example - fibres, fabrics, polymers, paper, etc [2, 3]. Most of the dyes involve water as the main solvent in the manufacturing process. After processing, during the removal of dye from water, it is practically impossible to recover the entire dye from the solution and some part of it goes into the effluent, thus increasing the chemical oxygen demand (COD), biological oxygen demand (BOD), total suspended solids (TSS), and total dissolved solids (TDS) of the effluent stream [1,3,4]. It also imparts colour to the wastewater and makes it harmful due to carcinogenicity and mutagenicity of dyes. Therefore, a significant amount of dye-containing effluent is generated in dye manufacturing and textile industries [5]. Moreover, due to good water solubility of most of the dyes, and water being the cheapest solvent for application, it becomes the quintessential medium of application of a dye onto fabric or any other substrate.

Only a fraction of the dye from the solution goes onto the fabric and the rest of it goes into the effluent stream. This percentage depends on the type of dye i.e. direct dye, reactive dye, disperse dye, etc. Usually, dye effluent undergoes two or three stages of treatment to fulfil mandatory parameters of wastewater released into water bodies. These parameters are formulated and governed by Pollution Control Boards (PCBs) [6]. Conventionally, primary treatment includes methods such as sedimentation, flocculation and set-
major concern while using nanofiltration is fouling advancements in scale-up to be used on a large scale. It needs further research and feasible and economic to some extent but benefited technique of membrane separation has become industrially pH of the effluent [6,11]. Currently in India, the technology in the industry are membrane fouling and (PVDF), polyvinyl chloride (PVC), polyethersulphone (PVA), polyacrylic acid (PAA), polyvinylidene fluoride (PVDF), polyvinyl alcohol (PVA), polyacrylic acid (PAA), polyvinyl alcohol (PVA), polyacrylic acid (PAA), polyvinyl chloride (PVC), polyethersulphone (PES), etc. The major problems while applying this desalination process [10]. Membrane pore size, material of membrane and its nature, type of membrane module (e.g. hollow fibre, flat sheet, etc), type of liquid flow (dead-end flow or cross-flow), operating pressure, type of effluent (dyes, oil-refinery, pharmaceutical), molecular weight cut-off (MWCO) and concentration of solute in the effluent are the parameters that govern a membrane separation process. Molecular weight cut-off refers to the solute with the lowest molecular weight of which at least 90% gets rejected by the membrane. Biological degradation or other such conventional processes contribute to the addition of some microorganisms or chemicals to the effluent, hence membrane filtration has proven to be more fruitful, where the treated effluent can be released directly into water bodies. Due to all these adjustable parameters to control the treatment process, easy operation as well as its economic viability for application in the industry, membrane separation using nanofiltration (NF) membranes has been studied in this paper.

Membranes made from cellulose acetate (CA) in an anisotropic form were invented and synthesized for the first time by Loeb-Sourirajan between 1950-1960 for a desalination process [10]. Eventually, newer materials were used, namely, polyamide (PA), polyvinyl alcohol (PVA), polyacrylic acid (PAA), polyvinylidene fluoride (PVDF), polyvinyl chloride (PVC), polyethersulphone (PES), etc. The major problems while applying this technology in the industry are membrane fouling and pH of the effluent [6,11]. Currently in India, the technique of membrane separation has become industrially feasible and economic to some extent but benefited only by few industries. It needs further research and advancements in scale-up to be used on a large scale.

A major concern while using nanofiltration is fouling and the problems associated with it as it results in a decrease in membrane performance with time. Fouling is caused by various deposits (external and internal) on the membrane surface. Fouling is a result of one or more mechanisms: concentration polarization, adsorption of particles on the membrane surface and pore blockage. Potential fouling material in most of the industries is natural organic matter (NOM), as organic fouling is sticky and it is very difficult to clean. This organic matter may serve as “cement” to bind other particles present in the effluent and can form a strong cake layer. Inorganic particles alone would not cause much fouling, but, inorganic particles mixed with NOM could cause substantial fouling on the membrane surface. Fouling results in an irreversible drop in performance due to increased hydraulic resistance and reduced permeability of the membrane.

Due to the high costs of polymeric membranes and highly concentrated effluents from the industries make it necessary to clean these membranes frequently. Physical cleaning or backwashing is effective in case of reversible fouling where particles are loosely attached with the surface or they are adsorbed on the porous membrane surface. Inorganic particle layer can be easily removed by backwash. But, in case of irreversible fouling (e.g. NOM fouling), caustic cleaning (e.g. NaOH) and strong oxidant (e.g. H2O2) are very effective. In the case of dyes effluent, wastewater contains mostly dyes and some chemicals from various processes. The fouling caused due to these chemicals fall between reversible and irreversible fouling. Therefore it is important to study which cleaning method has good efficiency to clean the fouled membranes, which were used to treat the dye wastewater.

In the present study, a synthetic thin-film composite (TFC) nanofiltration (NF) polyamide membrane with molecular weight cut-off (MWCO) of 500-700 Da was used for evaluating its ability to retain two dyes, namely, Reactive Yellow 105 and Acid Red 94 from their aqueous solutions. The membrane performance was studied by varying operating parameters such as concentration, transmembrane pressure, stirring effect, etc. Results of this study show the effectiveness of polyamide nanofiltration membranes for efficient dye removal from aqueous effluents. Field Emission Gun-Scanning Electron Microscopy (FEG-SEM) analysis has also been performed to see the effects of this operation on the membrane and also if cleaning processes are changing the membrane structure and its morphology.
2. Experimental

2.1. Materials

Polyamide membranes were procured from Synder filtration (USA) having MWCO 500-700 Da. The characteristics of these membranes are given in Table 1.

Reactive Yellow 105 (Procion Yellow HE4G) and Acid Red 94 (Bengal Red B) were received from Department of Fibres and Textiles Processing Technology, Institute of Chemical Technology, Mumbai. Their general properties are mentioned below in Table 2.

2.2 Experimental Setup

Batch experiments were conducted using the dead-end filtration setup equipped with a magnetic stirrer (Figure 1).

Table 1. Characteristics of the investigated membranes

<table>
<thead>
<tr>
<th>Membrane (MWCO)</th>
<th>Polymer</th>
<th>MWCO (Da)</th>
<th>pH range</th>
<th>Working pressure</th>
<th>Characteristics</th>
<th>Max. Temp. (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NF (500-700)</td>
<td>Polyamide (TFC)</td>
<td>500-700</td>
<td>4-13</td>
<td>5-25</td>
<td>Hydrophilic, Anisotropic</td>
<td>50</td>
</tr>
</tbody>
</table>

Table 2. Properties of Dyes

<table>
<thead>
<tr>
<th>Dye</th>
<th>Molecular Weight</th>
<th>λ max</th>
<th>Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactive Yellow 105 (Procion Yellow HE4G)</td>
<td>1606 Da</td>
<td>355 nm</td>
<td><img src="image1" alt="Structure" /></td>
</tr>
<tr>
<td>Acid Red 94 (Bengal Red B)</td>
<td>1050 Da</td>
<td>548 nm</td>
<td><img src="image2" alt="Structure" /></td>
</tr>
</tbody>
</table>

An SS-316 make Sterlitech HP4750 high-pressure stirred cell dead-end filtration setup was procured from Sterlitech Corporation, USA. UV-VIS spectrophotometer was used for dye concentration measurement and ultrapure deionised (DI) water with conductivity 0.046 μS/cm was obtained from Milli-Q (Millipore ultrapure lab) water system. The dyes used were of analytical grade and they were used without any further purification. Sodium hydroxide pellets were procured from Sigma Aldrich, India. An ultrasonic bath (Dashin, India) with internal dimensions (300mm×150mm×150 mm) and fitted with five transducers (in a zigzag manner) at the bottom, was used. It was equipped with two set frequencies (24 kHz and 40 kHz) and variable power dissipation.

The magnetic stirrer was used to provide sufficient stirring on the feed side and was operated at 500 rpm for homogenization of feed and to minimize concentration polarization (CP). The effective membrane operational area for filtration was 14.6 cm², the maximum volume of feed liquid to be filled was 300 mL, and the maximum transmembrane pressure of 70 bar. Commercial polyamide membranes were cut into circular shapes having a diameter of 47 mm for nanofiltration. The membrane was then placed over a significantly porous metallic support to allow perme-
Filtration experiments were carried out within the range of 5 to 25 bar transmembrane pressure. The pressure was applied to the system with the help of nitrogen from nitrogen cylinders. Compressed air cannot be used as it may cause pH shifts due to dissolution of carbon dioxide in the feed side of the solution.

2.3 Compaction of membranes
Membranes were dipped in DI water for 24 hours to remove any solid particles present on the surface. After each experiment membranes were stored in DI water, which was replaced every week. Membrane compaction process was carried out by employing the membrane over the porous metallic surface inside the dead-end setup and permeation experiments were carried out using DI water. DI water run was started at 5 bar. After getting a constant water flux reading pressure was increased. The pressure was increased up to 25 bar while maintaining a step increase of 5 bar per 30 minutes. This was continued until the maximum operating pressure of 25 bar. A constant value of pure water flux (PWF) at the end is the sign that the membrane compaction is complete. This ensures that all membranes undergo the same pressure treatment and can be assumed to have the same properties at the start of each experiment.

2.4 Permeation experiments and calculations
For each experiment, a new identical (freshly compacted) membrane was used. Dye solutions of both dyes, Reactive Yellow 105 and Acid Red 94, with varying concentrations, were prepared in DI water. All the nanofiltration experiments were carried out in the dead-end filtration setup wherein the system was pressurized using nitrogen which entered the setup from the top. Pure water flux was studied before and after treatment of the membrane. This was done to study the effect of fouling on the flux of the membrane. Performance of these membranes was evaluated at various pressures ranging from 5 to 25 bar, and at various concentrations such as 100 ppm, 200 ppm, 500 ppm, 1000 ppm, and 2000 ppm. Permeate flux for dye solution was compared with stirring and without stirring at 15 bar to address the importance of stirring on the feed side. A magnetic stirrer at 500 rpm was used to stir the feed side of the cell. All experiments were performed in triplicates. The flux of permeate solutions of both dyes was calculated by the Equation (1):

$$J = \frac{Q}{At} \quad (1)$$

where $J$ = Permeate flux (L/(m²h)), $Q$ = Volume of Permeate (L), $A$ = Effective area of filtration (m²), and $t$ = running time of permeation (h).

Permeate was collected from the bottom of the dead-end setup. The concentration of both dye solutions on the feed side and permeate side were estimated using UV-VIS Spectrophotometer. The dye rejection ratios were calculated using Equation (2):

$$Rejection \, (\%)=\left(1-\frac{C_p}{C_f}\right) \times 100 \quad (2)$$

where $C_p$ = Concentration of dye in permeate and $C_f$ = Concentration of dye in the feed.

The flux recovery (FR) can be calculated using Equation (3), which can be defined as the ratio of pure water flux after fouling to before fouling.

$$FR=\frac{\text{Pure water flux after fouling}}{\text{Pure water flux before fouling}} \times 100 \quad (3)$$

2.5 Membrane cleaning
Due to the high cost, research on membrane cleaning is very important. The studies in the past on membrane cleaning have been trial and error based using conventional methods [12,13]. The selection of the cleaning method depends on parameters such as ease of conducting cleaning operation, nature of foulant, physical and chemical properties of the membrane, the time needed for cleaning and cost of the operation, etc. Physical cleaning is an application of liquid turbulence...
to remove foulants which are loosely attached to the membrane surface and hence this method is easily applicable for robust membranes (membranes used for MF and UF). Most commonly used physical method is backflushing. This is performed with a reversed flow where DI water is pushed from the permeate side to the retentate side. The pressurised reversed flow helps to remove the fouling particles from blocked pores. The chemicals used in chemical cleaning alter the solution chemistry and dissolve the foulant particles by reacting with them resulting in detaching them from the membrane surface [14,15]. Physical and chemical cleaning can also be applied in series for enhanced cleaning of the membranes [16]. Physical cleaning is not suggested in most cases due to its low effectiveness whereas chemicals used in chemical cleaning mostly offer problems in terms of membrane suitability as some chemicals might harm the polymeric layer on the membrane. Also, it generates additional effluent due to the usage of chemicals. Besides, an overdose of chemicals may result in an additional membrane resistance which in turn block the pores by forming a film over the membrane surface [17].

Different approaches, including the conventional ones, to study the extent of membrane cleaning were performed to restore the PWF by removing fouling from the membrane. These approaches include physical (backflushing), chemical and ultrasound-assisted cleaning. Physical cleaning is based on turbulence to remove fouling and hence can be applied to remove loosely attached foulants from the membrane surface. For this membrane was reversed and DI water was passed through it for 30 minutes at 15 bar. This flow helps loosen the foulants and extricate some particles from membrane pores. Chemical cleaning offers greater efficiency than backflushing but it generates additional effluent due to the usage of chemicals. Therefore, the effect of chemical dosage over the extent of cleaning was studied. For this membrane was removed from the setup and put into a beaker containing 500 mL chemical solution. To help to dissolve of foulants in the chemical solution, a stirrer at 100 rpm was employed. Low speed of stirrer ensured that there is sufficient turbulence to agitate the liquid medium but it should not form vortex and move membrane from its place. After chemical cleaning, the membrane was again placed in the setup and DI water was passed through it for 30 minutes to check the cleaning efficiency. The third approach is an ultrasound (US) assisted cleaning of the membrane where US waves are used to break the fouling cake and remove it from the membrane surface. In the end membrane performance after the cleaning was again checked by taking DI water run for 30 minutes.

2.6 Characterization of Membranes
Membranes were analyzed using a field emission gun scanning electron microscopy (FEG-SEM). Membrane samples were rinsed with DI water, then dried in an oven (Thermo Scientific Precision Gravity Convection Model 1226S04) at 50°C for 2 hours to remove moisture content. The membrane was cut into appropriate shape and size so that it could be loaded into SEM. As the material is non-conductive, it was coated in JFC1600 Auto fine coater (JEOL Ltd, Japan) with platinum to make it conductive. After coating, samples were loaded for analysis in Mira3 field emission gun scanning electron microscope (Tescan-Orsay, France). Voltage was maintained at 10 kV with a photo angle of 45° from normal and maximum bar scale was maintained at 100 µm throughout the analysis. The analysis was performed in triplicates.

3. Results and Discussion
Many important factors must be considered to study membrane performance and hence certain experiments were designed. These factors include the concentration of dye on the feed side, transmembrane pressure, rejection ability of membrane, effect of stirring, the effect of fouling and it's cleaning on the performance of the membrane.

3.1. Separation performance of membrane in dye solutions
3.1.1. Pure water permeation studies
Figure 2 shows the comparison between pure water flux before and after membrane filtration experiments. The pure water flux at 15 bar pressure was found to be about 156 L/(m²h) before fouling and about 123 L/(m²h) after fouling, for Reactive Yellow 105, while 140 L/(m²h) before fouling and 100 L/(m²h) after fouling for Acid Red 94. After the experiments with dye solution, there was a significant decrease in the pure water (DI water) flux. This reduction was due to concentration polarization dominantly. But after some time some dye molecules get adsorbed on the membrane surface and it results in a layer on the membrane surface due to which it starts resisting the flow of permeate through the membrane.
3.1.2. Influence of dye concentration on permeate flux

Membranes were treated with aqueous dye solutions of 5 different concentrations (100, 200, 500, 1000, and 2000 ppm) and for each concentration, change in permeate flux was observed with increasing pressure. Figure 3 shows the variation of permeate flux at different dye feed concentrations and increasing pressures for Reactive Yellow 105, while Figure 4 shows permeate flux at different dye feed concentrations and increasing pressures for Acid Red 94. Highest permeate flux was obtained at the lowest concentration, i.e. 100 ppm and at 25 bar, for both the dyes. Permeate flux was found to be directly proportional to pressure and inversely proportional to the concentration of the dye solution. Accordingly, it can be said that minimum flux was obtained at higher concentration (2000 ppm concentration in this case) [18]. Also, the reduction in permeate flux with time was much lesser in case of 100 ppm as compared to that in 2000 ppm. This means that with higher concentration, more is the bulk flow of the dye and hence the resistance to the water permeation due to solute particles on the feed side and hence greater is the reduction in flux. Also, there is a great chance that pores may be getting blocked at higher dye concentrations in feed. Due to this, there is a decline in the flux of permeate through the membrane was observed. The solute particles from the effluent are deposited on the membrane surface thereby hampering the performance of the membrane. This collectively results in a decrease in permeate flux. Due to lesser permeate flux, the membrane separation process requires more time for completion. Therefore, in the industry, it becomes time-consuming to treat solutions of higher concentrations directly using nanofiltration membranes and hence primary treatments are needed to speed up the separation. At 100 ppm concentration at 25 bar pressure, the highest permeate flux was observed to be about 268 L/(m²h) for Reactive Yellow 105 (Figure 3(a)), and about 222 L/(m²h) for Acid Red 94 (Figure 4(a)). The permeate flux for Acid Red 94 is less than Reactive Yellow 105 due to hydrophobicity of Acid Red 94.
3.1.3. Rejection trend under varying trans-membrane pressure

Freshly compacted membranes were treated with different concentrations at variable pressures to check the rejection of dyes. Permeate flux values were noted down at the end of each experiment and dye rejection ability of membrane in % was calculated using Equation (2). As can be seen from Figure 5 a) and b), rejection ability of membrane increases with increase in pressure.
Also, higher dye rejection is obtained at higher concentration (from 100 ppm to 2000 ppm, the rejection has increased). This explains that Solute rejection is directly proportional to the operating pressure and concentration of the solution. Highest Dye rejection values of 91.52%, 96.41%, 97.76%, 98.09%, and 97.51% were obtained for solutions with 100, 200, 500, 1000, and 2000 ppm concentrations, respectively (Figure 5 (a)) for Reactive Yellow 105.

![Figure 5(a)](image)

Figure 5(a)

Figure 5 : Effect of pressure on dye rejection for (a) Reactive Yellow 105 (b) Acid Red 94

More promising results were observed for Acid Red 94 and rejection values of 99.9%, 99.93%, 99.92%, 99.89%, and 99.93% were obtained for solutions with 100, 200, 500, 1000, and 2000 ppm concentrations, respectively (Figure 5 (b)). Similar observations were made by Abid et al. in the case of Lancron dye (Acid Red) with nanofiltration membranes [19]. In another study, Xing et al. prepared a negatively charged nanofiltration membrane made of sodium 4-styrene sulphonate for dye purification [20]. They obtained 80-90% dye rejection for Reactive Red 4. The membrane was observed to have comparatively much higher rejections for the acid dye as compared to the reactive dye. This may be due to hydrophobicity of Acid Red 94. Dye structure plays an important role in this matter. Reactive Yellow 105 has six sulphonic acid groups in its structure that make the dye highly hydrophilic, while Acid Red 94 has only one carboxylic acid group and no sulphonic acid group. The dye rejection was observed to increase till a certain limit with increasing pressure and then the rejection decreased with an increase in pressure. The rejection reduced in many cases when the pressure was increased from 20 bar to 25 bar. The reason for this could be the excess operating pressure forcing dye molecules to permeate through the membrane leading to lesser rejection on the feed side. Thus, it can be said that a pressure of 20 bar gives an optimum result for dye rejection in polymeric nanofiltration membranes studied by us.

3.2 Effect of stirring on permeate flux and membrane fouling

Figure 6 shows the permeate flux values obtained with and without stirring. A stirring speed of 500 rpm was employed. Permeate flux obtained for Reactive Yellow 105 was about 102 L/(m²h) averaged over a period of 30 minutes under stirred conditions. An averaged value of about 37 L/(m²h) was observed under unstirred conditions. It was observed that the permeate flux under stirred conditions was about 64% higher than that of an unstirred one. This may be due to concentration polarization phenomenon. In concentration polarization, there is an accumulation of solute on the feed side of the membrane due to which the concentration of solute in the bulk decreases and this leads to an adverse concentration gradient. This increases the resistance towards the permeation of water from the bulk fluid to the permeate side.

![Figure 6](image)

This leads to a reduced flux through the membrane and may result in fouling of the membrane pores. The turbulence created by stirring prevents or minimises
concentration polarization on the feed side by homogenising the feed. Therefore, the resistance was mitigated using constant stirring which helps in getting higher flux than the unstirred experiment.

3.3 FEG-SEM characterization of membrane
The membranes used during the experiments were analysed in triplicates. The SEM micrographs of the membrane at various stages are shown in Figure 7. Physical morphology of the membrane surface at the micro to nanoscale was observed in these images. As can be seen in Figure 7(a), a pore on the surface of membrane has a diameter of 500 nm approximately (which matches with the MWCO of membranes used i.e. 500 - 700 Da). These membranes were used for the separation of Acid Red 94 and Reactive Yellow 105 dyes. The distribution of pores on the surface of the membrane can be seen in figure 7(b). In some regions, the pores are uniformly spaced while there is a higher density of pores at some parts of the membrane. Due to this, experiments were done in triplicates and average were reported in the results.

Figure 7(a)

Figure 7(b)

Figure 7(c)

Figure 7(d)

Figure 7(e)
Along with this, the pore size distribution is broad. Such a case can lead to a phenomenon known as channelling. Channelling results in increased flux through a certain region of the membrane while lower flux in the other portions. This is an undesired scenario since subsequently, it can also lead to non-uniform fouling of the membrane. Separation of Reactive Yellow 105 dye was studied on the freshly compacted membrane from figure 7(c). In Figure 7(d), the membrane was fouled by Reactive Yellow 105 to such extent such that the pores are no longer visible due to excessive deposition of dye molecules on the membrane surface. Figure 7(e) shows the micrograph of membrane fouled due to deposition of Acid Red 94 dye. It can be easily concluded that there is less fouling in case of Acid Red 94 than the membrane fouled with Reactive Yellow 105. Here, the physical and chemical properties of the solute particle are most influential. When fouled using Reactive Yellow 105 for 90 minutes more, membrane pores are blocked totally with the fouling layer and flux was reduced to its lowest value. This fouled layer can be seen by naked eyes on the membrane surface. The membrane was dried in an oven at 50°C for 2 hr and examined under FEG-SEM. The particles of dye can be seen adsorbed in the form of a layer on the membrane surface as well as fouling can be seen inside the pores of the membrane (Figure 7(f)). Such pore-blocking leads to decrease in flux with time since voidage of the membrane decreases. The thickness of this layer again implies a reduction in flux since flux is inversely proportional to the thickness of the membrane. With more such deposition of dye, the flux will reduce even further.

### 3.4 Membrane cleaning studies

Membrane fouling is mitigated using conventional methods of cleaning. Ultrasound-assisted approach to clean these membranes was also tried and the results were compared with each other. For backwashing, the membrane was reversed and placed back in the assembly. DI water run was passed through it for 30 minutes at 15 bar. Backflushing uses turbulence to remove loosely attached particles from the membrane surface. Pure water flux before and after the cleaning was noted down and flux recovery was calculated using Equation (3). Similarly, for chemical cleaning, 1 M NaOH solution was prepared and it was passed through the membrane for 30 minutes at 15 bar. Here NaOH solution used dissolution phenomena (to some extent) to remove tightly attached particles in addition to turbulence to scrape off adsorbed particles from the surface. This way cleaning can be achieved to a greater extent. In the case of ultrasound-assisted cleaning, the membrane was placed in a beaker and then beaker was placed in an ultrasonic bath at 3 cm distance above the bottom of the bath. According to literature, low frequency and low power give best results of membrane cleaning. Also, high frequency and high power can harm the membranes and may alter membrane morphology by damaging them permanently. Therefore, values of 24 kHz frequency and 135 W power were chosen and the fouled membrane was treated with ultrasound for 5 minutes. Microstreaming and bubble collapse helps to break the fouled layer of dye and remove the particles from the surface resulting in the cleaning of the membrane. After this DI water run was taken for 30 minutes at 15 bar to measure PWF after US cleaning and the value was noted for further calculation. Table 3 gives a comparison of the cleaning abilities of applied methods for membrane fouled using Reactive Yellow 105.

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**Texttreasure**

*Science without conscience is the soul’s perdition.*

- François Rabelais
As predicted backflushing gave poor cleaning with 82.05% flux recovery. Chemical cleaning using NaOH recovered flux to 89.10% of the original value. Ultrasonic-assisted cleaning was most effective amongst all and recovered the flux up to 95.51%.

### 4. Conclusions

Permeation of dye solutions and rejection of dyes with the help of synthetic polyamide nanofiltration membranes were studied. Higher permeate flux could be obtained by increasing the operation pressures, but higher pressures were found to affect the dye rejection after a certain pressure value. Industrially, nanofiltration can be used in the workup process of synthesized dyes (to isolate the product) or to recover water from the dye effluents by removing dissolved impurities. Stirring was found to be much more beneficial as compared to unstirred operation due to inhibition of concentration polarization in the former one. The data generated by stirred experiments is more reliable for scale-up to continuous processes, wherein high turbulence can be designed. Since polyamide is one of the commercially available cheaper membrane materials, it can be economically viable to scale up a nanofiltration process using polyamide membranes.

The unstirred membrane separation process resulted in about 64% lower permeate flux than the stirred process. This proves that concentration polarization has severe effects when membranes are employed to separate water from dye effluents. Highest permeate flux of about 268 L/(m²h) and dye rejection of about 98% was obtained for Reactive Yellow 105 dye. Highest permeate flux of about 222 L/(m²h) and almost complete dye rejection was achieved for Acid Red 94 dye. Membrane cleaning was studied using backwashing, chemical and ultrasonication. Cleaning of the membrane using ultrasound was found to be the most effective method with 95% flux recovery. These findings show that the polymeric membrane nanofiltration process can be a prospective answer for dyestuff product isolation as well as dye wastewater treatment.

### 5. Acknowledgements

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### References


### Table 3. Effectiveness of cleaning methods

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<tr>
<th>Cleaning method</th>
<th>PWF before fouling L/(m²h)</th>
<th>PWF after fouling L/(m²h)</th>
<th>PWF after cleaning L/(m²h)</th>
<th>Flux Recovery (%)</th>
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<td>Backflushing</td>
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<td>Chemical Cleaning</td>
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<td>89.10</td>
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<tr>
<td>Ultrasonic Cleaning</td>
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<td>123</td>
<td>149</td>
<td>95.51</td>
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Marketing Strategy -
Growing a business is easy

First of all, you should have professionally viable idea & then you need to discover a profitable niche, define a target. Have something of value to sell them. Whether you are peddling products, services or information, getting the word out has become increasingly burdensome. And without the right marketing strategies to fuel your growth, churning a profit and staying afloat is virtually impossible.

However, identifying the right strategies to market your business is often likened to rocket science.

How do you get your message to the right audience and do it effectively? How do you boost visibility and increase sales while sustaining a profit?

The truth is that what made you to this point in business is likely not going to get you to the next level. If you are feeling stuck, join the fray. Most entrepreneurs are busy working "in" their businesses that they fail to work "on" their businesses. As a result of dealing with the day-to-day operations of a company that includes customer-handholding, supply-chain demands and more, we often neglect to wield the right marketing strategies that will help fuel our business's growth.

What are the best marketing strategies to use? There's a clear need for increased visibility to drastically improve sales. But in order to get more visibility, businesses have to spend more money. When that well runs dry, what are you supposed to do?

There is no obvious and clear answer to that question that covers all situations. But there are things that can be done today, right now, even on a shoestring budget, to reach more customers without breaking the bank. However, it all boils down to time. If you lack the money, you sure better have the time to put in the sweat equity.

Either way you slice it, as long as the fundamentals of a sound business are there and you are working tirelessly to build an authentic relationship with the consumer by sincerely trying to add value, then there are 10 strategies you can use to increase your business.

1. Use social media
You can't ignore social media. That's where all the so-called magic is happening. Some businesses have been built solely on the backs of social media. It can be intimidating at first. Sure. But as you build momentum, you'll find posting on social media to get easier and easier.

Of course, you could also hire a social media manager if you have money to burn. But if you don't, just be yourself. Be authentic. Post your thoughts. Post your products. Post anything that you find relevant and useful that will help your audience either learn more about you and your business, or about the industry that you're in.

Use direct messages on platforms like Instagram and even Snapchat or Twitter to reach out to other successful businesses or even to communicate with potential customers who might be looking for your products and
services. This is very powerful marketing.

2. Create video tutorials
One of the most effective ways to get the word out on your business is to create video tutorials. Teach people something useful. Walk them through it. Hold the irhands. Step-by-step tutorials are all the rage. The better you are at this, and themore value you provide, the quicker you can boost your visibility, and ultimately,your sales.

Today, YouTube is the second largest search engine in the world behind Google. Whenever someone wants to learn something visually, they head there. You've likely done it yourself countless times. So just ask yourself what you could teach in your business that would help consumers solve some pain point? What got you into business in the first place?

3. Start blogging now
If you don't have a blog for your business, then you need to start oneimmediately. But you don't just have to blog on your own blog. Most people findblogging mundane because they lack the visibility. The truth is that your blog isgoing to be like a barren desert unless you know what you're doing. You should start authority blogging. Use platforms like Answer questions on Quora and Reddit. Or get out there onto LinkedIn's publishing platform. Theseare all authority domains that anyone can post on, which have massiveaudiences, giving you instant and immediate reach right now.

When you do blog, ensure that you blog effectively. Don't post thin content. Think about adding value. Worried about revealing all your business secrets? Don't be. Give away the farm. Give people so much value that you instantly become anauthority in their eyes. This is one of the most powerful strategies you can use to market any business.

4 Search Engine Optimization
This is an area of marketing that is surprisingly effective. But it's also an area thatmany people are deathly frightened by. Yes, SEO can be frightening. But it canalso be powerful.

There are companies out there who teach you how to use shady PBNs and otherlink schemes to “trick” Google. It might get short-term results, but in the long-term. You can't take shortcuts with SEO. Just like in business, you have to put in the work and the time if you want to see the results.

Some tips for doing this the right way? Don't spam keywords. Hands down. This is one of the biggest mistakes most people make. Create your content for humans while also paying homage to search engines. But more importantly, ensure that whatever it is that you're conveying is insightful, engaging, unique, and adds a tremendous amount of value.

5. Leverage influencers
If you want to get the word out there and boost your visibility on social mediawithout taking years to build the audience? Then you should certainly leverageinfluencers. But the key is to find the right influencer. You don't have to go withinfluencers with millions of followers. You could opt for micro-influencers with tens of thousands or even a hundred thousand followers.

Find the right influencer in your niche so that you're targeting the right audience. It's not just about spreading your message. It's about spreading your message to the right consumer base. If you can do that properly, then you can likely reach a sizable audience.

If your sales systems and products are in place, then this makes sense. If you have an offer that's clearly converting, and it's simply about more visibility, then this is likely the right marketing strategy for you right now.

6. Build a great lead magnet
Right lead magnet presented to the right audience can have explosive results. The best way to do this is if you can identify the right pain points and present a solution in your lead magnet, then you're well on your way.

What problem are consumers facing in your niche? What made you get into business in the first place? Ask yourself these questions before building out your lead magnet. The better you identify the problem or pain points at the outset, the better you'll be at actually addressing that with a solution in your lead magnet.

What type of lead magnet should you build? That could either be an e-Book, a cheat sheet, a checklist, a video and others.

7. Use Facebook ads with re-targeting
One of the most powerful methods you can use to market just about anything these days are Facebook ads. With Facebook, you can reach a very specificaudience and you can do it very easily. You can target by interest, age, relationships status, geographic location, and so much more.

But the trick here to getting great results isn't just about click-traffic. You have to focus on conversions and re-targeting through pixels. If you don't know how to install the Facebook Pixel on your site, then you absolutely must learn how to do this right now. Even if you're not running Facebook ads, you can build your
Pixels track everyone who comes to your site, and you can build custom audiences around them. For example, if you post content about how to learn to drive a semi-truck, and you track visitors with pixels, you can then market truck driving certification to people who have already shown an interest in that already because they visited that specific page. And your conversions will skyrocket.

8. Use LinkedIn the right way
Do you have a video on your LinkedIn profile? Did you know that you can easily add one? Why not take the time to introduce yourself and your business? Link that to your profile description. This is an easy way to passively market your business, and when it’s done right, it can lead to shocking results.

If you have lots of connections on LinkedIn and you’re not really posting on there, start immediately. You can reach a large audience, especially when your posts go viral. This is a great place to convey the entrepreneurial journey. Talk about your challenges and tell stories. The more effective your stories, the larger your potential reach when you go viral.

You can also reach out to other businesses and collaborate with like-minded entrepreneurs on LinkedIn. It’s a great go-to resource for all things business and too many people overlook this.

9. Create an affiliate program
Most people don’t understand the power of affiliate marketing. Affiliates can provide massive fuel for growth. But approaching the right partners isn’t always that easy. You have to have good conversion if you want the bigger affiliate to take you seriously.

I’ve found that navigating the affiliate minefield can be tricky. It takes persistence and it takes true grit to make it through. Most of us get discouraged after a few setbacks, but you can’t allow emotions to get in the way when it comes to affiliate. Build an affiliate program and start reaching out to potential affiliate who can assist you.

10. Use Email Marketing Sequences
Part of any good sales funnel is going to be an email marketing sequence. These are the automated messages that go out to users once they subscribe to your list. Use your email sequence to build a relationship with the subscriber. Be authentic and transparent. And convey your journey.

Use the email responses and clicks to segment your list. For example, if someone clicks on a specific link, they’ve clearly shown an interest in something. Tag that subscriber to market to them later. If someone buys, tag them as a buyer. Identifying your buyers and the interests of your subscribers is huge for segmenting.

When you do send broadcasts, split test. Split test everything, in fact, you never really know what’s going to be the most effective until you pull the trigger and really test it out. This will help you understand what your audience responds to better, making you a better communicator, and better able to sell to your customers.

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**Awards:**
Mr. Gharat was awarded with Best General Manager Award in MSTC - National Award for energy conservation for Simplex Mills & MSTC and Best Vendor Award from Johnson & Johnson.
Mr. Gharat was awarded with FTA by The Textile Association (India) in 1999.

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**Professional Training:**
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The series of chapters under the title, 'Graphene A Wonder Material' are being published in the Journal of the Textile Association. The nanomaterial Graphene has been attracting a lot of attention over the past few years. Thankful to its unique combination of a simple structure of bonded carbon atoms with its multitudinous and complex physical properties. This series covers the extraordinary features of graphene, its different methods of preparation and isolation, useful applications in various fields of science and technology, its science involved in the technology of textiles, and finally ending up with its future prospects.

This series is written primarily as an introductory text for the readers of those interested or already working in graphene and putting up its essence in the textile related areas, who wish to acquire a broad knowledge of graphene and its application in textiles.

The previous chapter threw some insights upon the recent theoretical and experimental studies over versatilities of graphene and its derivatives for carbon capture. Imposing effective carbon dioxide remediation strategies as one of the top urgencies of 21st century requires state-of-the-art, materials development and graphene could play a game-changing role in this regard.

The present chapter briefly describes most recent advances in graphene-based biosensors by selectively highlighting a variety of different examples for the detection of some molecules of biomedical interest. Biosensors can be utilized for the identification of biological analytes such as antibodies, enzymes, organelles and microorganisms. Graphene is a carbon material in a honeycomb structure with one atom thickness that is successfully being employed in the development of new biosensors.

Chapter 18

GRAPHENE A WONDER MATERIAL : Biosensors

Saptarshi Maiti, Pintu Pandit, Geetal Mahajan, R. V. Adivarekar & M. D. Teli

Graphene, a 2D carbon material with one-atom thickness, has become one of the hottest research areas in the field of biosensors. In view of their astonishing structural configurations, graphene and its derivatives exhibit various extraordinary properties that includes high mechanical properties, high elasticity and thermal conductivity, quantum hall effect at room temperature, very high electron mobility, tunable optical properties, and a tunable band gap. Graphene being a conductive and yet transparent material, with a low cost and low environmental impact, it is an ideal material for the construction of sensors and biosensor-based devices in various transduction modes, from electrical to electrochemical transduction to optical transduction.

What is Bio-sensing?

Bio-sensing is of paramount importance for improving the quality of human life. Biosensors and bio-sensing protocols are able to detect a wide range of compounds, sensitively and selectively, with applications in security, health care for point-of-care analyses of diseases, and environmental safety. This chapter describes biosensors and bio-sensing systems employing graphene. Graphene is a zero-gap semiconductor material, which is electroactive and transparent. Owing to its extraordinary properties, graphene has found its way into a wide variety of bio-sensing schemes. It has been used as a transducer in bio-field-effect transistors, electrochemical biosensors, impedance biosensors, electro chemiluminescence, and fluorescence biosensors, as well as bio-molecule labels.

The detection of biologically active molecules is of critical importance from a biomedical, environmental, and security point of view. Such detection can be carried out by biosensor or by bio-analytical protocols. A chemical sensor is a device that quantitatively or semi-quantitatively converts information about the presence of a chemical species to an analytical useful signal. Sensors consist of two segments: a receptor and a transducer as shown in Figure 1. A receptor can be any organic or inorganic material with preferably a specific interaction with one analyte or group of analytes. In the case of biosensors, the recognition element is a bio-molecule. The second key element of the sensing platform is the transducer that converts chemical information into a measurable signal. Bio-analytical protocols usually include more than one processing step.
There are mainly different kinds of graphene-based nanomaterial and their type is closely related to the method of production. Graphene can be produced in varied ways; by chemical vapor deposition (CVD) growth, mechanical exfoliation of graphite, or exfoliation of graphite oxide. Neither CVD-produced graphene nor mechanically exfoliated graphene contain large quantities of defects or functionalities. However, bulk quantities of graphene-based materials are generally produced by other methods most likely as thermal exfoliation of graphite oxide or sono-chemical reduction of graphene oxide. Thermally reduced graphene oxide (TRGO) contains large amounts of defects and significantly differs from pristine graphene which has a perfect honeycomb lattice structure. However, the presence of such defects is not disadvantageous. To the contrary, it is well known that heterogeneous electron transfer in the electrochemistry of sp²-carbon atoms occurs at the edges and defects, and not the basal plane of graphene sheets. Graphene oxide has a structure that is not fully planar because the sp²-carbon network is heavily damaged. It contains large amounts of oxygen-containing groups, which can be beneficial to the functionalization through the action of the biomolecules for bio-recognition events during bio-sensing. Graphene oxide can be chemically (CRGO) or electrochemically (ERGO) reduced. Such materials have a partly restored sp²-lattice that also contains some degree of oxygen-bearing groups. When compared to carbon nanotubes, it is clear that the structural differences play a major role in the nanoarchitectonic design of biosensors.

**Graphene in bio-field effect transistors**

Field-effect transistors (FET) have received a great deal of interest in the area of bio-sensing as they can provide full electronic detection that is fully integrated into the electronic chips. Therefore, it is not only academia that is fascinated by these devices, but there is a strong demand from industry as well. Field-effect transistor-based biosensors rely on bio-recognition events between molecules at the gate of the FET. Upon bio-recognition between the probe and target bio-molecules, the electric charge distribution changes the charge carrier density at the bio-recognition layer and thus, the conductivity of the channel between the source and drain. Graphene is an ideal material for the construction of FET biosensors because it is a zero-band gap semiconductor, and the band gap can be tuned from the surface modification. Graphene-based FETs can be employed for DNA sensing since DNA has a charged phosphate backbone.

Dong et al. demonstrated that large-scale (CVD) grown single- and few-layered graphene films are highly sensitive to DNA hybridization. The shift in gate voltage was found to be sufficiently large for detection even at a concentration of 10 nM of single stranded DNA (ssDNA). The addition of gold nanoparticles to the probe surface led to an extension of the linearity of the response to 500 nM as this increased the amount of probe DNA immobilized on the FET surface. Stine et al. used reduced graphene oxide modified with DNA for real-time detection of ssDNA with a detection limit of 10 nM.

**Graphene impedimetric biosensors**

Electrochemical impedance (EIS) platforms provide very high sensitivity for bio-sensing. Pumer et al. were one of the first groups to develop a graphene platform for the detection of DNA hybridization and polymorphism using electrochemical impedance spectroscopy as a detection technique. They compared the performance of three different graphene platforms, and showed how different number of graphene sheets can affect detection. It was observed that few-layered graphene provided the best sensitivity for the detection of a single nucleotide polymorphism. A higher sensitivity was obtained with impedimetric detection compared to that obtained with a similar platform using fluorescence methods. A number of schemes for the immobilization of single-stranded DNA on graphene surfaces can be used, e.g., a chemical bond between the carboxylic group of graphene sheets and NH2-modified ssDNA. Upon hybridization with target DNA, the conformation of ssDNA changes from a "lying" structure to a "standing" double helix. Such change of DNA conformation and distribution of charges at the surface...
of the electrode results in changes in impedance of the electrode surface and to a measurable analytical signal.

**Graphene in electrochemical biosensors**

Electrochemical detection is highly sensitive to electroactive molecules. In addition to sensitivity, it also offers detection selectivity as different molecules can be oxidized/reduced at different potentials. Graphene is an excellent conductor of electrical charge. Heterogeneous electron transfer (the transfer of electrons between graphene and the molecule in the solution necessary for the oxidation/reduction of said molecule) occurs at the edges of the graphene or at defects in the basal plane. Thus, the high surface area of graphene facilitates large amounts of defects and thus, electroactive sites. Graphene has been employed in many schemes for sensing glucose. This is reflected by the fact that electrochemistry is paramount to sensing glucose for diabetic patients. The glucose oxidase enzyme is used as a biorecognition element: glucose oxidase oxidizes glucose to gluconic acid and shuffles electrons into the oxygen which is dissolved in the solution, and then reduced to hydrogen peroxide. Hydrogen peroxide is typically detected electrochemically. However, in several examples, direct electron transfer from the enzyme (without the need of O2 as an electron acceptor) is possible, making this an analytically valuable signal. Ultrathin multilayer graphene platelets (also called graphite nanoplatelets) have been used as a transducing material for the bio-sensing of glucose.

Graphene has also been used for electrochemical immunosensing. In immunosensing, the direct electrochemical detection of antibody-antigen recognition is usually not possible and electrochemically active labels must typically be used. There are two strategies in which graphene can be used. First, graphene can be used as an electrode surface for sensitive detection of a label. This case was employed for the graphene-enhanced detection of α-fetoprotein, which is a cancer biomarker. Graphene sheets were modified with antibodies, then the α-fetoprotein was added and consequently secondary antibodies loaded with microspheres bearing horseradish peroxidase enzyme as a sensitive label. The second approach employs graphene as a label-bearing nanocarrier. More specifically, a gold nanoparticle electrode was modified with a probe antibody, to which phosphorylated protein was entrapped. The secondary antibody was conjugated with graphene oxide and horseradish peroxidase to generate large amounts of electroactive molecules and thus a larger signal.

Electrochemiluminisence (ECL) or electrochemically generated luminescence is a type of chemiluminescence where one or more reactants are generated electrochemically. ECL is highly sensitive and is used for the detection of thrombin in the presence of interference on graphene platforms.

**Fluorescence**

Fluorescence is a highly sensitive platform for biomolecular detection. Graphene is applied in various roles as a substrate in fluorescence quenching detection schemes. For example, the quenching principle was used for the aptamer-based detection of thrombin. Aptamer specific to thrombin was labeled with fluorescent dye. Graphene was used as a substrate for the nonspecific adsorption of the fluorescent dye-labeled aptamer for non-covalent assembly. In such a configuration, graphene quenched the fluorescence signal due to a transfer of fluorescence resonance energy from dye to graphene. The addition of thrombin results in the formation of quadruplex-thrombin complexes, which have a weak affinity to graphene. The change in conformation leads to a configuration where the dye is no longer in contact with the graphene sheet and thus the fluorescence is no longer quenched. Fluorescence detection can be used for virus detection in the format of a graphene microarray. A rotavirus-specific antibody was chemically linked via -NH₂ groups to -COOH groups present on graphene oxide. After binding of the rotavirus to a chemically attached antibody, a secondary antibody linked to gold nanoparticles was added as a label. The gold nanoparticles act to quench the fluorescence of the graphene oxide.

**Summary**

This chapter describes how biosensors can benefit from graphene as a transducing material and also covers the fundamental differences of the different types of graphene and their influence on applications in biosensing. Because graphene is a zero-gap semiconductor and an electroactive and transparent material, there are many possibilities for its application as a transducer or label in biosensing schemes like enzymatic biosensors, genosensors, and immunosensors based on different transduction approaches, such as field-effect transistors, electrochemistry and electrochemiluminiscence, impedance, and fluorescence measurements. Although it would be beneficial to have side-by-side comparison of CNTs and graphene-based biosensors, such reports are very scarce. It is known that graphene nanoribbons, which have the dimensional restriction of a graphene
sheet of tens of nanometers, exhibit significantly different electrical properties from large-sheet graphene. This is yet to be integrated in bio-FET design and promises even higher sensitivity and selectivity for FET devices. It is also expected that zigzag and armchair graphene edges will exhibit different electrochemical properties and, although fabrication of purely zigzag or armchair edges is difficult, a breakthrough in this area is expected. Because the field is still young, it is expected to branch out into many more applications to meet the needs of society in the areas of safety, enhanced health care, and a clean environment.

Bibliography

TAI developed Online Membership Registration Form

The Textile Association (India) developed an Online Membership Registration Form, which is uploaded on TAI website www.textileassociationindia.org/membership/

It is made simple to enroll Life Time / Patron Membership online.

Following process is to fill-up the form:

* Open TAI website, click on Membership on Main Menu Bar.
* Click on Application Forms, where there are two sub-menu titles (Manual Form and Online Form).
* Before filling the Online Form, Bank payment transaction is required for New Members.
* Also, Scan copy/file of your Photo and Aadhar Card should be kept ready for attaching to the form.
* Clicking on Online Form, A MEMBERSHIP Online Registration Form will appear.
* Entire form to be filled and ensure that all columns are filled. There are some Mandatory Fields. If any columns are not filled in, it will show an error.
* Once fully filled Form is SUBMIT ted, a reply will be seen as Your FORM is received successfully. Thanks.

Confirmation of membership is subject to the approval of the Scrutiny Committee.

In case, if you are unable to open the website, please write below link in Browser to fill-up the form.
https://www.textileassociationindia.org/membership-online-form/

For any assistant, please contact TAI Central Office.
UNIT ACTIVITY

TAI - Marathwada

TAI Marathwada Unit developed Textile Digital Library

The Textile Association (India) - Marathwada Unit and Textile Department of Shri Guru GobindSinghji College of Engg. & Tech. (S.G.G.S.), Nandedjointly initiated and prepared a Textile Digital Library with 440 various Video web links on the subjects of Textile Spinning, Weaving, Processing, Garment etc. and uploaded on their Web Portalhttps://taimu.org/digital-library/.

Anyone can click on the link and can read and download. This is really a big exercise created and excellent compilation has madewhich is very useful to all Technologist and particularly to Textile Academic Students, Faculty members, Learners etc.

It was one of the objectives of TAI as “To establish, run & maintain reading room & Library having books, papers & periodicals for study & references on Textile Technology & related subjects”.

TAI Marathwada Unit & SGGSIE &T successfully organized Texplorer Fashion Show

The Textile Association (India) Marathwada Unit and Department of Textile Technology of SGGSIE&T, Nanded organized Texplorer Fashion Show on 03rd January, 2020.

Texplorer Fashion Show inaugurated by Marathi actress Ms. Sonalee Kulkarni at SGGSIE&T Nanded. Ms. SonaleeKulakarni walked on the ramp and inaugurated the fashion show. She cheered up the audience by her dance from NATRANG movie song. She addressed the students, “Many students are from rural background. They have equal art, knowledge, talent in comparison with urban students. You should fix your target, come in metro cities with self-confidence, put all energy behind your goal, definitely you will get the success”.

21 teams including 220 fashion designers from different textile and fashion institutes of Maharashtra have walked on the ramp with their own designed garments. 1000-1200 audience were enjoyed the event in the SGGS auditorium.

SGGSIE&T Nanded won the first prize (Rs. 21,000 & trophy) and CNCVW Kolhapur won the second prize (Rs. 15,000 & trophy). The prizes were sponsored by alumni of Textile Dept. Mr. Mahesh Yernalele (Vice President TAI Marathwada Unit) and Mr. Chetan Chopkar.
The event was organized on the occasion of SGGSIE&T Nanded technical event PRAGYAA2020. Director Dr. Yashwant Joshi, Coordinator Dr. R. N. Joshi, Dean Dr. S. N. Talwar, student coordinators VaradWagh, Pratik Sanegwar, Nikhil Nakod were present on the dais during inauguration. The coordinator were Dr. R. N. Joshi (Faculty coordinator), VaradWagh & Pratik Sangevar (student coordinators).

The Textile Association (India) Marathwada Unit and Department of Textile Technology of SGGSIE&T, Nanded organized a Motivational Speech on 03rd January, 2020 on the topic "FIT INDIA" by Mr. Madhav Sulphule, IFS (Consul, Consulate General of India, San Francisco), who is an Alumnus of Textile Dept.

He has given the message to the audience that, "In today's competition era, the young generation is under tremendous work pressure and stress. In early age 30s, they are affected with BP, Sugar, Heart Stroke, Brain Stroke etc.

It is must to stay physically and mentally fit. Person should have the harmony amongst mind, body, heart and diet. Students must do daily physical exercise for 45 minutes, meditation and balanced diet to stay healthy and happy. In this way, they can contribute the FIT INDIA movement which is initiated by Hon Prime Minister of India Mr. Narendra Modi.

Dr. Y. V. Joshi (Director) was the President for the function. Dr. R. N. Joshi (Hon Secretary of TAIMU) was the Coordinator of the event. Mr. P. Kar, Dr. P. G. Solankar, Dr. R. S. Holambe, Dr. Suhas Gajre, Dr. A. K. Chakrabarti were present for the program. Open discussion on UPSC preparation was also held during the session. Mr. Sulphule also conducted a meeting separately with the students of UPSC chapter of the Institute.

Around 120 students and faculty members of the Institute participated in this event.
TAI M.P. Unit conducted Cancer Awareness Program

The Textile Association (India) - Madhya Pradesh Unit along with TYA Can Foundation, conducted a Cancer Awareness program on January 12, 2020 at SV Tiwari Auditorium, Aurbindo Medical College, Indore.

Objectives of the Program
◆ Connecting people with cancer to the mainstream of society
◆ To encourage cancer sufferers to win cancer.
◆ To awaken the common people against the possible cause and prevention of cancer.
◆ Providing information to cancer doctors and clarifying how the cancer victim should be treated by the society.
◆ To encourage and entertain cancer afflicted textile association and doctors by organizing a program together.

Chief Guest Dr. P. N. Mishra along with others took a tour of the hospital with sloganeering slogans to win cancer. The program was followed by National Anthem. Then the Chief Guests Dr. P. N. Mishra along with other dignitaries on the dais Mr. Ashok Veda, National Vice Chairman Mr. Awdhesh Kumar Sharma, Mr. Hemant Ambekar, and Dr. Vinod Bhandari (Chairman-Aurbindo Hospital) lighten the lamp.

Dr. Vinod Bhandari welcomed TAI MP and others and thanked everyone for their support. The Chief Guest appreciated the support of the TAI MP and expected the cooperation in the future as well.

MR. Ashok Veda along with Mr. Awdhesh Kumar Sharma presented the Memento and the Gift to Dr. Vinod Bhandari and the Chief Guest.

Mr. Awdhesh kumar Sharma in his words tried to encourage the cancer sufferers saying "Cancer to Matraekroghai, ussekyadarnaurghabrana,logone to Ahankar, Irshyaur Swarthjeserogpaalrakhehai"

Mr. Awdhesh Kumar Sharma took the command of the program and felicitated Mr. Ashok Veda, Mr. M. C. Rawat, Mr. Hemant Ambekar, Dr. Chitalkar, Dr. Rajesh Patidar, Dr. Vijay Bhargav, Dr. Asati. Mr. Ambekar, being a cancer survivor narrated his journey and how he won his battle over cancer.
Dr. Kurkure from Mumbai requested TAI MP for further co-operation, which TAI MP Unit agreed.

The program was melodiously ended by songs sung by husband-wife Mr. Vijay Sonia Patak who have recently joined TAI MP Unit.

**TAI - Mumbai**

**TAI Mumbai organising Seminar at Vapi**

The Textile Association (India) - Mumbai Unit organizing a Seminar on "**Opportunities for Textile Industry in Challenging Scenario**" on 29th February 2020 at Daffodil Hall, GIDC, N. H. No. 08, Vapi (Gujarat).

The Textile Industry, a key sector that generates substantial revenue and employment. The Indian Textile Industry has demonstrated immense potential for nation-building. However, it involves huge investments to convert the potential into performance by way of modernization, environmental compliance and cost competitiveness along with aiming for achieving international quality standards in the products. Government schemes like TUFS laid the foundation for investments in the textile sector for enterprise promotion, modernization, and expansion. The shift in focus to the Technical Textiles sector which has opened up high-performance products have been a very positive development.

One of the key factors for the integrated development of the textile industry is "Technology Upgradation" to create the level playing field in the global market with the appropriateness of Technology to meet the quality, environmental compliance, productivity, design development, and product diversification and cost competitiveness in the entire value chain. Every the sector of the textile industry has to address the concurrent issues to face the diversified challenges. In this pursuit, weaving and Knitting and processing sectors play a crucial role as the best quality fabric with price competitiveness should be made available through innovative technologies emerging in the global market? The technological challenges have discoursed in various forums and The Textile Association (India), Mumbai Unit, is organizing this event in other tier cities and clusters to bring home, the important issues to the doorsteps of the practicing technologists and technicians in the Vapi cluster.

Participation in this seminar by way of sponsorships, advertisements, and delegates would provide a common platform to meet the experts from the trade and industry. The main advantage will be an opportunity to exchange views on the latest developments in the field of the Weaving and related areas. TAI Mumbai Unit appeals for generous support for the seminar and invites you to be part of this event.
After its enormous success in Vapi, The Textile Association (India), Mumbai Unit once again organized One Day Seminar on "Opportunities for Textile Industry in Challenging Scenario" on 29th February, 2020 at Hotel Fortune Park Galaxy, Vapi (Gujarat).

The seminar was inaugurated by Mr. Rajnikant S. Bachkaniwala, Chairman, Palod Himson Machines Pvt. Ltd.

Inaugural Session:

Mr. V. C. Gupte, Chairman, TAI, Mumbai Unit welcomed the Chief Guest, Key Note Speaker and Guests of Honour. He also welcomed the Awardees, Speakers, Press, Media and delegates.

Mr. Vilas Gharat, President, TAI, Mumbai Unit said that our Unit always takes keen interest in the latest developments in the textile industry and had organised seminars on important topics like weaving, fabric forming, etc in Vapi region which were very successful. He further said that Mumbai Unit recently organised two important International Conferences on the latest topic of "Textile 4.0" which were very successful and appreciated by all.

Mr. Haresh B. Parekh, Convener of the Seminar while giving the highlights said that this seminar is organised to discuss the Opportunities for the textile industry in the challenging scenario. The Speakers and Panel Members will show the roadmap for the opportunities available in the upcoming trends of business and he was sure that the interaction in the seminar will be highly productive and beneficial.

Mr. G. V. Aras, Director, Textile Engineering Group, A.T.E. Enterprises Pvt. Ltd. delivered the Key Note Address and said that there are lot of opportunities in the textile industry but we are not able to grab them to prove ourselves in the international market. We don't have the capacity for bulk manufacturing which can fulfil the requirements of big buyers. He also explained that due to logistics and disintegrated activities in the textile industry causing the increase in the cost of product.
He also emphasized that due to Corona Virus problems in China the production capacity has been considerably reduced and hence Indian textile industry has tremendous opportunity to increase the productivity and grab the international market.

Mr. A. A. Bambardekar, Works Director, Raymond Limited (Textile Division Vapi) while addressing the gathering said we must adopt new technology to reduce the cost which will automatically increase our profitability. He further said that the young students should enter into textile industry as they have innovative ideas and explained that working of his entire unit can be accessed on a mobile app developed by this new generation.

The Textile Association (India), Mumbai Unit felicitated Mr. Madhubhai Mangukia, Chairman & Managing Director, Yamuna Machine Works Pvt. Ltd. with "The Lifetime Achievement Award" and Mr. Haresh Panchal, Managing Director, Rabatex Industries with "The Industrial Excellence Award" for their outstanding contribution in the field of textile industry.
Mr. Navin P. Agrawal, Jt. Convener of the Seminar gave the introduction of the Chief Guest.

Mr. Rajnikant S. Bachkaniwala, Chairman, Palod Himson Machines Pvt. Ltd. while giving his inaugural address said that whenever there is a crisis there is an opportunity. The Global Corona virus problem in China has given the Indian textile industry an opportunity which we should not miss. India has the potential and the young generation now has to take up this task and plan a strategy to achieve success.

Mr. A. V. Mantri, Hon. Secretary, TAI, Mumbai Unit, proposed Vote of Thanks.

Technical Session:
During the technical session, following papers were presented by the eminent speakers.

◆ Mr. Vikram Shah, Vice President, Rabatex Industries presented the paper on "Advanced Development in Preparation of Fabric Sampling".

◆ Mr. Apurva Jariwala, Branch Head - Surat, Textile Engineering - Fabric Forming, A. T. E. Enterprises Pvt. Ltd. presented the paper on "New Developments in Warp Knitting".

◆ Mr. Babasaheb V. Alugade, Regional Sales Manager, Picanol India Pvt. Ltd. made the presentation on "Latest trend in Weaving".

◆ Mr. S. Ramasubramanian, Dy. General Manager, Batiboi Textile Machinery Group presented the paper on "Revolutionary Continuous Modular Overflow Washing Range Wanny by Pentek, Italy".

◆ Mr. Badruddin Khan, Sr. Manager - Product Management Team, Multi Commodity Exchange of India Ltd. (MCX) presented the paper on "Awareness Programme on Kapas & Cotton Price Risk Management".

◆ Mr. Deepak Sabarad, Sr. Sales Manager, Voltas Limited presented the paper on "Whole Garment by Shima Seiki".

◆ Mr. N.S.K. Srinivasan & Mr. Hasmukh Shah, Umta Management & Texstyles Academy made the presentation on "Smart Textiles an Opportunity for Textile Industry In Challenging Scenario".

Panel Discussions:

A Panel Discussion on the topic 'Developments in Textile Industry to meet Emerging Market Trends' was featured as the last event of the seminar. The discussion moderated by Mr. Rajiv Ranjan, ED & CEO of Hindoostan Mills Ltd., had leaders from the textile industry on the panel who came up with some radical thoughts which could be helpful to the textile industry.

Mr. Sumit Gupta, Dy. Director, Global Organic Textile Standards (GOTS) talked about the importance of compliance to global standards in today's business especially as our business grows in the field of organic textiles.
Mr. Vikas Sharan, Director-India Operations, Saurer Textile Solutions Pvt. Ltd., stressed upon the importance of working towards increasing our scale and competitiveness in the field of apparel manufacturing and branding especially in the current scenario of an opportunity to increase our market share in this field.

He also touched upon the importance of taking steps to increase India's global market share in man-made fibre products, where we are lagging. He talked about the importance of logistics playing a pivotal role in catapulting India to that platform from where rapid and on-time delivery to any destination in the world could be possible.

Mr. Pratik Bachkaniwala, Director, Palod Himson machines Pvt. Ltd., spoke upon the subject as a whole concept. He said that to meet the demands of the market we not only need to focus and innovate upon the product services, supply chain, logistics, marketing, finance and distribution network but most importantly also focus on the importance of attitude building which is very critical in today's marketplace.

Mr. R. R. Patil, MD & CEO, Gokak Mills Ltd., took up the point on cost effectiveness for increasing our competitiveness. Power cost being a major burden in the current scenario, companies could look at solar power, where the rates are going down every day, as a major cost reducer.

Mr. Navin Agrawal, Vice President, Textile Engineering-Fabric Forming, A.T.E. Enterprises Pvt. Ltd., spoke about the need to upgrade to modern machines with high productivity and automation to maintain cost and quality competitiveness. Productivity was becoming a key factor across the entire textile value chain. He also stressed upon the need for skilling workers through proper training so as to increase their efficiency to meet global standards.

The talk by the panellists was followed up with some very good questions and comments by members of the audience. Mr. Gurudas Aras talked about the importance of various associations across the industry value chain putting up a united face to the world while Mr. Rahul Bhajekar mentioned about the need of integrity in doing business today. This was followed by probing questions from the group of students and others attending the seminar on the issue of employment in the industry and other topics which was ably handled by the panel members.

The seminar was a grand success and was attended by over 225 delegates.

TAI - South India Unit organized Technical Seminar at Guntur

The Textile Association (India) - South India Unit organized an inauguration function of establishing a new TAI Guntur Unit at Guntur and organized a Technical Seminar on 'Smart Process Control in Spinning' on 26th January, 2020 at The Capital Hotel, Guntur.

Chief Guest Shri Danda Prasad along with other dignitaries on the dais lightening the lamp

Chief Guest of the function was Shri Danda Prasad, Hon. Chairman, A.P. Textile Mills Association, Shri ThavasiVijayakumar, Director, Sri WijayaTextech Solutions, Indonesia, Shri E. Sathyanarayana, Vice President, TAI - South India Unit and Shri Ashok Juneja, National President, TAI Central Office and Shri
Gandhiraj, Hon. Secretary, TAI South India Unit were present on the dais.

The inaugural function of TAI Guntur Unit was commenced with the prayer song. Shri. E. Sathyanarayana, Vice President TAI - SIU delivered welcome address.

Shri. E. Sathyanarayana, Vice President TAI - SIU delivered welcome address

Shri Ashok Juneja, National President, TAI Central Office delivered his Special Address on this inaugural function. He made the power point presentation on successful journey of TAI during last 80 years since its inception in 1939 and the roll in formulating the National Textile policy every now and then.

He also highlighted about various activities performed by TAI central and other affiliated TAI Units. He also motivated the delegates for enrolling new members of TAI and strengthen to serve much better in coming days. He also said that there are lots of potentials and getting enough technical knowledge for development and innovations in textile and garment industry.

Shri Thavasi Vijayakumar, Director, Sriwijaya Textech Solutions, Indonesia delivered the Technical Presentation on 'Smart Process Control in Spinning', containing various factors contributing to the consistency of yarn quality in manufacturing. He explained the importance of Bale Management, raw material quality and other process parameters influencing the overall quality at micro-level. He also explained the way in which the Bale Management System and other process parameters affect the consistency in yarn quality. He shared his rich experience in cotton spinning with the delegates during question and answer session and it was very much useful.

The Chief Guest Shri Danda Prasad, Hon. Chairman, A.P. Textile Mills Association addressed the gathering. He emphasized the importance of continuous learning, sharing the experience and knowledge with other professionals for the betterment of the textile industry and he stressed the importance of every individual's contribution to the industry and society. His speech was very valuable and thought provoking.

Shri ThavasiVijayakumar, Director, SriwijayaTextech Solutions, Indonesia delivered the Technical Presentation

Chief Guest Shri Danda Prasad, Hon. Chairman, A.P. Textile Mills Association delivering his inaugural address
As a part of recognizing the textile competence, Shri T. S. Subramanian, leading Textile Technocrat and consultant, Shri Ch. Jogha Rao, President, Sree Satyanarayana Spinning Mills Ltd. were honoured for their valuable contribution to the Textile Industry. Shri Kamaraj and Shri Soundarajan were also honoured for their significant contribution in making the function a grand success.

At the end Shri K. Gandhiraj, Hon. Secretary, TAI South India Unit proposed the vote of thanks and ended the function with the National Anthem.
Seminar on TAI for Business Growth

The Textile Association (India) - South Gujarat Unit (TAI-SGU) organized a seminar on "TAI for Business Growth" on 11th January 2020 at Hotel Lord's Plaza, Surat.

The seminar was supported by TAI - Mumbai Unit and TAI - Ahmedabad Unit. Journal of the Textile Association (JTA) and Textile Graph (A voice of textile) were the event Media Partners.

The seminar was a remarkable, considering the Theme of the Seminar. More than 120 delegates and invitees attended the seminar. The seminar included two presentations. First presentation covered detail of TAI Association and the second one briefed about New Projects in fields of textile industry and others.

Program was started with National Anthem.

Mr. Minesh V. Adhvaryu - President of TAI-SGU delivered welcome address along with keynote speech. He briefed about requirement of local region. Surat is a major hub of textile in India but the industry there is scattered in SME & MSME sectors. Most of the people having ventured in the industry are through finance only. They are not textile technocrats. Objective of the TAI association mainly is to work for textile industry through textile technocrats. There is a big gap between Surat textile industry & TAI association. Business growth is a prime objective for any SME & MSME sector. There are chapters of other organizations working for business growth in all fields across India. And they are doing quite well. Mr. Adhvaryu came charted new horizons for TAI. He suggested that TAI can use its platform for business growth of the members. For that, members should understand the structure of TAI.

Mr. Haresh B. Parekh - Hon. General Secretary TAI Central Office & A renowned Textile Consultant presented paper on "TAI for Business Growth". He explained in detail about the TAI association, its various objectives and its glorious history. He also informed about the different educational activities conducted & awards offered by the association to the industry & individuals.

Mr. Kamal Shah of Positive Aggression Consultant - Ahmedabad presented paper on "New Projects". He informed that his company is assisting in setting up of New Projects. He started very nicely by explaining the illusion of recession in textile & in general as well. With real figures of Indian economics he convinced the august gathering about his agenda. Later he showed various profitable projects not only in textile industry but others than textiles also. He briefed about projects right from small investment to very huge ones. The question answer session became the most interactive as the delegates came up with range of questions to speakers and other dignitaries attending the event.

Dr. Prakash. A. Khatwani - Chairman of TAI-SGU in his speech on the occasion informed delegates that TAI-SGU has provided skills to more than 100 persons including entrepreneurs, managing staff, technical staff & even workers in past one year. This is also one of the way in which TAI helps the textile industry for its development.

Mr. Krushnaram Kharwar - Vice president of TAI-SGU delivered Vote of Thanks. Special thanks were conveyed to the committee members of TAI Ahmedabad unit, Mumbai unit & Vadodara unit who travelled from a distance & graced the event.
Mr. Neeraj Modi - Managing Committee member of TAI-SGU provided a remarkable service as MOC of the seminar. He is very popular in the region for his unique style of managing events with wisdom and wit. He made the event memorable for everyone using his trademark style quotes & poetries.

**Joint Meeting of Neighboring TAI Units**

The Textile Association (India) - South Gujarat Unit (TAI-SGU) organized a Joint Meeting of TAI Neighboring Units. In this meeting, Managing Committee Members and G. C. Members of TAI Ahmedabad, Mumbai, Vadodara & Saurashtra Units were invited. The objective of this gathering was to have introduction and to build bridge amongst neighboring units.

Mr. Virendra P. Jariwala - G. C. Member of TAI-SGU & Hon. Treasurer at TAI Center office delivered a welcome address on the occasion and opened the forum.

Mr. Minesh V. Adhvaryu - president of TAI-SGU gave his keynote speech explaining need of this kind of joint meeting. His concept was to have good interaction between neighbouring units. A good communication between the units creates healthy relationship & encourages members to take benefit of events hosted by other units. This kind of tie-ups can solve many managerial puzzles of small or inactive units. Every member of each of the units was provided with opportunity to introduce himself.

Mr. T. L. Patel - Trustee & Past President of The Textile Association (India) - Ahmedabad Unit motivated committee members of TAI-SGU. He explained the working system of Ahmedabad Unit & the process of getting in whatsoever activities they do in detail. He appreciated the initiative taken by TAI-SGU. He also guided local members for how to work for next AITC which is going to be hosted by TAI-SGU.

Mr. A. V. Mantri - Hon. Secretary of The Textile Association (India) - Mumbai Unit gave a very inspirational speech for managing TAI unit. He explained in detail the working system of Mumbai Unit. He described his career in detail & that even without being a textile technocrat, how was he able to achieve the position & honour he is at today. He congratulated TAI-SGU for hosting joint meeting. He even appreciated the management of today’s event.

Members of other units were invited for sharing their valuable views on the subject.

Mr. Hemal A. Sakkai - Hon. Secretary TAI-SGU delivered Vote of Thanks. He specially thanked Ahmedabad and Mumbai unit for their fullest co-operation and making the meeting a successful one.

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January - February 2020
Kusumgar partners with DRDO for manufacturing parachutes

Kusumgar Corporates, a leading manufacturer of Technical Textiles in India, has proudly partnered with DRDO and acquired the TOT (Transfer of Technology) for manufacturing of Combat Free Fall (CFF) Parachute system in India.

The TOT was handed over to the Managing Director, Mr. Siddharth Kusumgar during the DEFEXPO by the Chairman of DRDO, Dr. G. Satheesh Reddy in the presence of Hon'ble Defence Minister, Shri Rajnath Singh and Hon'ble Chief Minister of Uttar Pradesh, Shri Yogi Adityanath.

"We have always been focused on building strong capabilities within India to support our defence establishment and reduce dependence on imports. This is an important step in that direction," said Siddharth.

CFF parachute system provides total solutions to Paratrooper for jumping from a height as high as 10000 m can glide up to 30 km range and can land at the desired target. It can be used in High Altitude High Opening (HAHO) as well as in High Altitude Low Opening (HALO) modes.

Kusumgar has been working with DRDO for several years and has partnered with them in development of various solutions to meet the needs of our armed forces. In future as well, Kusumgar will continue to enhance their strengths in the manufacturing of specialised products by bringing latest technology to serve the country better.

LANXESS showcases innovative water treatment in line with the trends

Specialty Chemicals Company LANXESS is presenting its comprehensive range of products and services relating to process water, drinking water and wastewater at Water on 13th February, 2020 at Water Expo in Chennai from 13 - 15 February, 2020.

A custom selection of products and technologies is often vital. In many cases, optimum results can be achieved only with the smart combination of several technologies. LANXESS has many years of combined expertise for this in the areas of ion exchange, absorbers, reverse osmosis and ultrafiltration.

Current trends such as electro mobility provide LPT's operations with additional impetus. Recently implemented improvements to processing technology and process efficiency in the production of ion exchange resins in Leverkusen are already bearing fruit. Thanks to the resulting capacity enhancement, LANXESS is able to successfully satisfy the recent rise in demand from the battery industry. Special grade ion exchange resins from the Lewatit product range are also being produced at the plant in Jhagadia for use in the food industry.

"Innovative solutions for water treatment are gaining in importance in an attempt to use this resource responsibly. LANXESS can make valuable contributions to this in all application areas," emphasizes Prakash Shanmugam, Head - Liquid Purification Technologies (LPT) business unit at LANXESS India.
High Performance (HP) RO membrane elements a market success

The range of Lewabrane high performance (HP) RO membrane elements for energy-efficient brackish water treatment, which was recently launched on the market, is already well established. On the basis of an optimized membrane structure, they offer improved rejection with a higher flux rate compared with standard elements. “We are seeing very healthy demand, particularly in the conservative European market,” explains Shanmugam. On the whole, he is also contented with the market development for reverse osmosis elements and looks into the future with confidence.

The company’s involvement in the Multi-ReUse research project shows just how important reverse osmosis is to LANXESS, especially for wastewater treatment. One aim in this context is to take suitable action to minimize fouling and thereby ensure stable operation in the long term. The project also showed that micro pollutants such as pesticides, pharmaceuticals and contrast agents are safely separated through reverse osmosis.

On the basis of a sales partnership with French company Polymem SA, which was agreed in 2018, LANXESS has added Gigamem ultrafiltration elements to its portfolio for water treatment. The first projects to result from this cooperation have been successfully launched in the Mediterranean region.

Reverse osmosis and ion exchange hand in hand

The combination of reverse osmosis and ion exchange opens up new areas of application for water treatment, for which a single technology would be no match. For example, after an initial filtration step, pig manure is concentrated via reverse osmosis. Ammonium ions can then be removed from the highly alkaline permeate using a cation exchanger and the acidic medium subsequently neutralized with a mixed bed exchanger. The water purified in this way can usually be discharged directly into surface water. This process is already being used successfully in the Benelux countries.

The current version of the LewaPlus software developed by LANXESS that is used for designing combined systems of this kind now also features a cost module for ion exchange, so that - in combination with the integrated cost calculation for reverse osmosis - it is easy to estimate the total investment costs and operating costs.

Bayoxide Synthetic Iron Oxide Adsorber - For Arsenic, Phosphate and Other heavy metal removal

Bayoxide® is a granular iron oxide media specifically designed for use in technical applications in which it serves as an effective filter adsorbent for removal of various species, especially arsenic. It is a crystalline nanoparticulate?-Ferric oxide hydroxide with a very high surface area and adsorption capacity. At the same time, it also offers high abrasion stability.

Bayoxide® E 33: Arsenic pollution is one of the most dangerous forms of drinking water contamination. Some very high concentrations of arsenic occur in the groundwater in many regions of the United States, South America and Asia. Elevated arsenic levels are also found in Europe - in the United Kingdom, for example. Using Bayoxide iron oxide adsorbers, LANXESS is providing an efficient technology for the removal of arsenic from drinking water and wastewater. The core of the Bayoxide system is a solid bed of iron oxide beads. The beads have finely structured surfaces that adsorb pollutants when contaminated water flows over them.

Bayoxide® E IN 20 is applied for purification of non-drinking water sources in a simple passive pump-and-treat system applying the technology of fixed bed adsorption. When water from a source is pumped through a vessel or a series of vessels containing Bayoxide® E IN 20, it passes through a fixed bed of the media where the relevant species is adsorbed quickly and selectively.

The LPT business unit

The LPT business unit is part of the LANXESS Performance Chemicals segment and offers a comprehensive range of tailor-made ion exchange resins and reverse osmosis and ultrafiltration membrane elements for various applications in the field of water treatment. You can find more detailed information about products from the business unit on the website at http://lpt.lanxess.com.
LANXESS is a leading specialty chemicals company with sales of EUR 7.2 billion in 2018. The company currently has about 15,500 employees in 33 countries and is represented at 58 production sites worldwide. The core business of LANXESS is the development, manufacturing and marketing of chemical intermediates, additives, specialty chemicals and plastics. LANXESS is listed in the leading sustainability indices Dow Jones Sustainability Index (DJSI World and Europe) and FTSE4Good.

Forward-Looking Statements
This company release contains certain forward-looking statements, including assumptions, opinions, expectations and views of the company or cited from third party sources. Various known and unknown risks, uncertainties and other factors could cause the actual results, financial position, development or performance of LANXESS AG to differ materially from the estimations expressed or implied herein. LANXESS AG does not guarantee that the assumptions underlying such forward-looking statements are free from errors nor does it accept any responsibility for the future accuracy of the opinions expressed in this presentation or the actual occurrence of the forecast developments.

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Pre-budget Consultation-2020 - Stakeholders' Dialogue

Annual Budget making is an important exercise which impacts economic roadmap ahead. Series of the Pre-Budget meeting was organized at the various levels.

This time economic affairs section of the ruling party BJP also invited various stakeholders for such a meetings segment wise. 12 such a discussion was held at the BJP Head Quarter, New Delhi.

The Textile Association (India) was also invited on "Pre-budget Consultation-2020 - Stakeholders' Dialogue" on the topic Heavy Industries- Land, Labor and Contract Enforcement on 7th January, 2020 at Party Headquarter, New Delhi in separate small groups with others sectorial experts and Association's Office Bearers to interact and to have their inputs and suggestions.

On the special invitation from Shri Gopal Krishna Agarwal, National Spokesperson of BJP on Economic Affairs, Shri Ashok Juneja, National President (TAI) and Shri R. K. Vij, Vice President participated in this important deliberation and gave suggestions on how to improve Indian Textile Industry.

Compilation of all inputs/suggestions/pain point was shall be sent to Hon. Union Finance Minister after due discussion with Party President & other office Bearers.
Ritu Kumars Iconic laid out prints for her collection

Ritu Kumar's iconic laid out prints for her "Natur's Origami" collection in collaboration with LENZING™ ECOVERO™ was the perfect finale for sustainable fashion day at LAKME Fashion Week Summer/Resort 2020.

The finale of "Sustainable Fashion Day" at Lakmé Fashion Week Summer/Resort 2020 made way for a new perspective on sustainability on 17th February 2020. Padma Shri Ritu Kumar, India’s most respected designer unveiled her environmental friendly collection "Nature’s Origami" with her iconic laid out prints in collaboration with Austrian fibre brand LENZING™ ECOVERO™. Actress Aditi Rao Hyadri made a perfect showstopper as she walked the ramp effortlessly in a hand embroidered silk organza asymmetric hem black and indigo dress, inspired by appliquéd work of Orissa.

The show was collaboratively designed and conceptualized by Ritu Kumar and Amrish Kumar; an amalgamation of sustainable fabrics in vibrant and off beat hues and incorporation of vintage prints into very modern silhouettes that gave a feel of an organic look. The collection resonated with an urban chic vibe of a contemporary woman featuring dresses, skirts, jackets, lungis, etc. engendered on the central theme of tribal and contemporary Indian art forms which allude to nature and rejuvenation. The show set-up represented a contemporary outlook featuring artisanal installations curated with sheer fabrics, ropes, metal accents and with hints of gold threading, materials used in the making of the garments. LENZING™ ECOVERO™ fabrics that formed the base of the collection, complements the aesthetics through their features of amazing drape, lustre, color vibrancy, exquisite softness and overall visual appeal. All these features comes with one of the highest sustainability standards for which Lenzing is renowned globally.
January - February 2020

Aditi Rao Hydari walks for the Ritu Kumar X Ecovero showcase at LFW SR20

The Ritu Kumar X Ecovero showcase at LFW SR20

Speaking on the occasion, Ritu Kumar added; "I am very happy to see a great turnout for the show. We are extremely proud to showcase our designs that interpret rich Indian heritage with clean lines and edgy silhouettes that celebrates the spirit of a contemporary Indian woman".

Managing Director Amrish Kumar added; "Our collaboration with LENZING ECOVERO was a thoughtful initiative in bridging the gap between fashion and a healthier environment. Nature's Origami is a perfect blend of sustainable fashion that caters to young and urban Indian woman who is ready to take the world fearlessly with humility'.

Speaking about the association, Mr. Avinash Mane, Commercial Head, South Asia, Lenzing Group said, "We are pleased to reintroduce LENZINGTM ECOVEROTM at the Lakmé Fashion Week SS 2020 this year. Our past associations at LFW have helped in building the narrative of sustainable fashion among designers and influencers in the fashion fraternity. We look forward towards our association with Ritu Kumar this season. Through this collection, we hope to create a larger outreach among the industry on adopting alternative resources and processes in their brand".
Nature's Origami by Ritu Kumar

Since the brand's inception, five decades ago, Ritu Kumar's relationship with nature has always been strong and apparent. Whether it is through processes using natural fibres or natural dyes, the brand's efforts have been dedicated to fulfil the void left by the harrowing exploitation of nature. This partnership with LENZING™ ECOVERO™ has further built a dialogue on sustainable fashion, thus focusing on the brand's ideology on sustainability and ecological harmony, contributing to a cleaner, eco-responsible environment.

"Nature's Origami" was a collection of four stories. It featured Mrinalini Mukherjee's exhibit at the MET, Neo Origami, Flora and Fauna and Sundarvan. "Mrinalini's" work with knotted textiles was well known so Ritu brought creations with amazing fabric manipulation and the grand revival of heritage textile techniques. For the "Neo Origami" segment it was the beauty of the festivities when chevrons met florals and lace was layered to perfection. In the "Sundarvan" collection it was the intricate pleats and burnout velvet that offered large doses of La Dolce Vita.

The profusion of embroidery, prints, cutwork, knots and tassels added amazing elegance to the myriad silhouettes that ranged from asymmetric kaftans both long and short, maxis with moulded construction, lacy ponchos, breeches, harem pants, gypsy and sarong skirts as well as an array of printed palazzos.

Ritu's colour story was a grand mélange of vegetable dyes that were painstakingly turned into deep burgundy and then moved on to faded ochré and finally to mix of violets and leaf green. The "Nature's Origami" collection by Ritu Kumar in collaboration with LENZING™ ECOVERO™ was a grand offering of fashion and style that blended sustainability with trendy creations.
Textile companies are facing increasingly complex challenges: higher labour costs and employee turnover rates, not to mention the need to automate material flow, reduce lead times and boost productivity. Furthermore, companies increasingly require comprehensive automation solutions due to greater demands on yarn quality and ease of use as well as the trend towards large and heavy packages.

Saurer already has 30 years of experience in planning and installation of transport systems, especially between roving frames and ring-spinning machines. The company has successfully implemented over 100 systems worldwide.

The new product line Saurer Automation Solutions serves as customers’ expert engineering partner for integrated automation solutions across the entire textile value chain. It consists of specially designed automation elements that the project engineering team combines into tailored system solutions that are seamlessly integrated into customers’ processes. Thanks to these solutions, Saurer is meeting the growing demand for cost-effective automation of spinning and further processing in staple fibre spinning and twisting mills as well as in filament yarn processing.

Comprehensive data management with innovative quality functions has become indispensable along the entire textile value chain. With Senses, the digital mill management system from Saurer, customers can consolidate and analyse company-wide production, quality and performance data, even for machines from other manufacturers.

Saurer Automation Solutions offers tailor-made automation solutions in the following areas:

**Staple fibre spinning and twisting:** can transport using automated guided vehicles, transport systems for roving bobbins, palletising systems, conditioning, packaging, transport systems for cross-wound packages from the winding/spinning machine to the yarn warehouse.

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**Attention All TAI Members**

**THE TEXTILE ASSOCIATION (INDIA)**

Please update their contact information by Sending us e-mail to update our mailer data taicnt@gmail.com
The Union Minister for Finance & Corporate Affairs, NirmalaSitharaman, has announced a proposal to set up a National Technical Textiles Mission with a four-year implementation period from 2020-21 to 2023-24 at an estimated outlay of Rs. 1480 crore to position India as a global leader in Technical Textiles. In her Budget speech she said that India imports significant quantity of technical textiles worth USD 16 billion every year. Following opinions are of some industry personalities.

Sanjay Jain welcomes on removal of Anti-dumping & DDT

Textile specific

◆ Anti-dumping has been removed from PTA to ensure polyester based raw materials are in line with international prices. However similarly there is anti-dumping on Viscose staple fibre that has made the entire domestic viscose chain expensive leading to huge imports in viscose yarn and fabric in the country. Further honouring the spirit of ensuring that raw materials are competitively priced, anti-dumping duty proposals for mEG and Pdf should be quashed.

◆ The new scheme for rebating taxes, duties, remissions outside the GST net being currently borne by the exporters needs to be announced urgently so that the industry can plan and prepare in advance for procuring orders.

◆ Imports currently only bear GST, however many taxes and duties borne by domestic producers are not being borne by imports like electricity duty, duties on fuels and GST/other taxes on fertilisers/pesticides etc. that are agro inputs and hence GST on the same cannot be utilized as agro products attract no GST.

General:

The DDT removal is a welcome move, however as there is a shift in taxation from company to shareholder, hence the net impact is not as desired. Further its a clear move where foreign shareholders gain as in most countries dividend is taxed at 5 to 10%, while now in India it would be taxed at full rate. The impact for a promoter of a large company is so high, that it will act as a clear deterrent to earn and pay divided. The taxation on dividend income can be as high as 67% if we include corporate and individual income tax paid on the income used for paying dividend.

Dr. A. Sakthivel, compliments FM on steps for promoting investment and innovation in textile and apparel sector. Looks forward to clarity on policy support for the apparel sector

On behalf of apparel industry I would like to thank Hon'ble Prime Minister of India, Hon'ble Finance Minister, Hon'ble Minister of Textiles &Hon'ble Minister of Commerce and Industry for announcing a positive, progressive, growth oriented and forward looking budget and also for fulfilling a long standing demand of industry of abolishing the Anti-dumping duty on PTA. This will give the much needed boost to the entire textile & apparel value chain.

The Apparel Export Promotion Council congratulates the Finance Minister on effectively addressing some of
the key issues of the sector especially in the areas of Ease of Doing Business.

A dedicated Investment Clearance Cell proposed to be set up will provide "end to end" facilitation and support, 9000 Km of economic corridors, quality standard orders as per PM's vision of "Zero Defect-Zero Effect" manufacturing, National Logistics Policy with single window e-logistics market with focus on generation of employment, National Logistics policy for making MSMEs competitive, Rs.1.7 lakh crore for transport infrastructure in 2020-21, simplified return with features like SMS based filing for nil return and improved input tax credit flow, enhancing digital connectivity, support for working capital, financing for MSMEs, 5 year exemption from audit for MSMEs & easing of tax filing for startups are some important steps towards easing the day to day functioning of MSMEs as also providing a conducive ground for investors.

The new NIRVIK scheme for higher export credit disbursements with greater coverage, reduced premium and simplified procedures for claiming settlements is a welcome step given the increased uncertainties in the global market. We look forward to further details of the scheme.

For the Textile & apparel sector the National Technical Textiles Mission to be set up with four-year implementation period from 2020-21 to 2023-24 at an estimated outlay of Rs 1480 crore can position India as a global leader in Technical Textiles (Development of rainwear, sportswear, retarded Apparel, fire resistance garment). The proposed strengthening of the Indian standards &Rs. 3000 crore for skill development in 2020- 21 are complimentary steps in overall encouragement toward higher value & innovative products which can significantly contribute toward value added growth in exports.

The council is studying the proposed Scheme for Revision of duties and taxes on exported products in which Exporters to be digitally refunded duties and taxes levied at the Central, State and local levels, which are otherwise not exempted or refunded. This is an important area where there has been significant shrinkage in policy support in last few months. The council is keenly looking forward to an effective substitution of MEIS scheme that has been withdrawn for the sector. The apparel sector presently has the ROSCTL scheme for refund of embedded taxes. However, the same is not adequate to provide a level playing field with other countries with preferential market access and to mitigate the still prevalent relatively high transaction cost.

Taxpayer Charter to be enshrined in the Statute will bring fairness and efficiency in tax administration which is laudable. The DDT removal will make India a more attractive investment destination. The personal Income tax benefits will boost purchase power and boost consumption. Demand growth will increase GST tax collection

We would also to thank Hon’ble Finance Minister for the proposed review of the Rules of Origin criteria for FTA countries as we can see huge surge in import of garment from Bangladesh. However, a complimentary step in this direction would be expediting the FTAs with EU, Australia, Canada & initiating FTA with UK.

Shri Ashok Juneja
National President - TAI

What Budget 2020-21 has for the Textile & Clothing industry?

The Budget 2020-21 had some important changes that is bound to have significant impacts on textile, apparel and fashion industry.

Anti-Dumping Duty on PTA abolished
The budget proposed to abolish anti-dumping duty on PTA (Purified Terephthalic Acid). PTA being a critical input for textile fibres and yarns, It is easy availability at competitive prices is desirable to unlock the immense potential in textile sector which is a significant employment generator.

The textile industry has been demanding abolition of anti-dumping duty levied on PTA for a long time, to remain globally competitive. All industry leaders across board have applauded the removal of anti-dumping duty
on PTA. This will potentially open up the MMF value chain, and give a fillip to the entire MMF industry and enhance its global competitiveness.

India often faces shortage of PTA that curtails capacity utilization of polyester segment industry. Abolishment of anti-dumping duty shall greatly help the country to enhance its global competitiveness, boost exports and enable domestic manufacturers to compete with cheaper imports.

National Technical Textiles Mission
The budget proposed setting up of a National Technical Textiles Mission with four-year implementation period from 2020-21 to 2023-24 at an estimated outlay of Rs 1,480 crore.

This can position India as a global leader in technical textiles; it will lead to capacity building and import substitution. It has tremendous scope, technical textiles has to be encouraged as a lot of fabrics we use in the sector are being imported, the move will help in starting production of specialised input in our country, a lot of investment will come which will also boost employment in the sector.

Rules of Origin to be reviewed
The intent to review the rules of origin in FTAs is really welcomed. It was being observed that imports under Free Trade Agreements (FTAs) are on the rise. Undue claims of FTA benefits have posed a threat to domestic industry. Such imports require stringent checks. As per the Budget announcement, suitable provisions are being incorporated in the Customs Act and in coming month’s review of Rules of Origin requirements, particularly for certain sensitive items, shall be done, to ensure that FTAs are aligned to the conscious direction of our policy. The move will help reduce imports from Bangladesh etc, which is plaguing textile industry.

RODTEP and NIRVIK schemes
Announcement of soon implementation for exporters, the Schemes for Remission of Duties & Taxes levied on export products (RODTEP) and NIRVIK for extending competitive credit facilities and higher insurance coverage with lesser premium and also simplified procedure for claim settlements is a welcome step given the increased uncertainties in the global market.

Union Budget 2020 : Not Much For Conventional Textile but good initiative for Technical Textile Industry
Union Budget 2020 proposals focus mainly on streamlining the financial sector, strengthening the MSME sector, easing and simplifying of GST system, infrastructure development, and technological advancement.

A quick analysis of the budget proposals for the textile industry:
National Technical Textiles Mission: Boost investments, reduce imports
Technical textiles has to be encouraged as a lot of fabrics we use in the sector are being imported, the move will help in starting production of specialized input in our country, a lot of investment will come which will also boost employment in the sector. India imports significant quantity of technical textiles worth US$ 16 billion every year.

To reverse this trend and to position India as a global leader in technical textiles, a National Technical Textiles Mission is proposed with a four-year implementation period from 2020-21 to 2023-24 at an estimated outlay of Rs 1480 crore.

This can position India as a global leader in technical textiles, which includes development of rainwear, sportswear, retarded apparel, fire resistance garments.
Scraping of anti-dumping duties on PTA will boost exports: Industry

In this budget a historic decision taken by our PM, Finance minister and Textile minister by removing Antidumping on PTA.Govt. is now focusing to increase the consumption of MMF in line with Global consumption.

Benefit to Indian Textile and Polyester Industry
- Downstream industries start from PSF and Filaments in Polyester till Garments
- PSF and Filament export will increase which was stagnant from last four years. Total textile export which was at 38 us billions dollar from last four years. Now we will be competitive in export market
- Import which increased app 6 % in last years in textile and Apparel will reduce
- This will increase domestic capacities. Once domestic consumption will increase and capacities will increase
- Then with more capacities utilization cost of production will decrease. Indirectly will increase in domestic and export margins
- Now whenever any PTA plant will go in Maintenance or shut down due to breakdowns then Industry can plan import of PTA in advance
- Last year IOCL plant was closed app 8 months .PTA was short
- Now we can import PTA after duty paid and we can export or use in domestic
- If Export of Polyester increases then PSF and filament will be benefited
- Import of 100% Polyester spunyarn will reduce then PSF consumption in spinning mill will increase. This will give benefit to PSF producers
- As on today there is max import of Polyester fabric will reduce and increase the domestic consumption of Filaments and PSF

Mr. Ashok Juneja, National President of the Textile Association (India) was invited for live interview by National TV Channel ET Now on "Impact of Coronavirus on Indian Textile Industry". It was telecasted live on 26.02.2020 morning. This was the first time that TAI President is live on National TV Channel.

During his interview he delivered his opinion as under on Impact of Coronavirus - A natural tragedy, is already impacting Global as well as Indian business.

The Textile Association (India) is body of professional & Technocrates working in Textile Industry. It is first association formed in 1939 having 25000 members with 26 Units pan India. I am proud to be President of this association.

It is very unfortunate that spread of epidemic, Coronavirus has caught China into a very depressing situation, causing deaths of many Chinese and has also brought Chinese life into standstill. The epidemic is spreading further to Japan, Singapore and many other countries. Besides a very unfortunate natural calamity, it has started impacting the entire business dynamics of the world. This is not only a blow to the business but to the entire humanity.
China being the largest exporter as well as leading importer of all products; finished as well as raw material, has crippled the entire supply chain of the world. Further as it is coincided with the Chinese New Year vacations, the impact has been much graver. We all should pray to almighty God, for taking the world out of this crisis.

In textiles and clothing global business, China has 40% share, which is huge. China is the largest supplier of finished goods specially to west and all advance economies, China also is the largest supplier of textile raw material like fibres, yarns fabrics, dyes practically to all the garment manufacturing countries.

We have to analyse the impact in both way Positive & Negative, Threat & Opportunity. Further we have to analyse the impact segment wise.

We are doing lot of export of Cotton Yarn & Raw cotton to China. Initially for 3 weeks it has impacted the business severally. Shipment was not going, LC against the order was not coming. Resulting drop in price by nearly 5% due to excess availability in domestic market. Our share of yarn export to China is around 40% of total cotton yarn export. Just to quote the example price of Ne 30s Combed was @ Rs.215/- per Kg. which drop near to Rs.205/- per Kg. Cotton Raw Material whic was @40500/- per Candy comes down near to Rs.38500/- per candy roughly. But since last one week indication are there of improvements. Shipments are started to various port except some port which are in effected area. Prices are improved @ 2-3%.

Majority of pigments & colour are being imported from China. Shortages are being felt and resulting increase in prices of dyes app.@10%. It may increase cost of processing for Grey fabrics to finish fabrics.

In case of Apparel & Garments, majority of garment accessories are imported from China. It is in short supply.

Garment exporters import lot of fabrics mainly synthetics which is also ishort of supply. Garment manufacturers are running to Ahmedabad / Surat etc to get fabrics to ship their order. There is an additional business opportunity for Domestic Fabric Manufacturers.

Another opportunity is some global order of finished goods i.e. for Garments, are shifting from China to India as well as other countries. It is upto garment manufacturers to utilise the opportunity. It may be short term but can be converted on long term bases on encashment of opportunity.

There are also many opportunities already rising for raw material like yarns, fabrics, dyes for all garment exporting countries in Asia like Bangladesh, Sri Lanka, Vietnam etc , the countries which are largely dependent on China for all their raw materials.

For example, Bangladesh depends on China for 50% of their raw material requirement for garment manufacturing and exports, which is very big, whereas India has just 20% share in their imports. So, as of now huge demand from Bangladesh is coming for all kinds of raw material including yarns, fabrics etc.

According to a survey done in China manufacturing, during the first half of 2020, even if epidemic doesn't further spread, China's manufacturing business would be impacted around 20% during the first half…considering manufacturing volume China has, 20% is very big, no country in the world can immediately substitute, hence the demand would be up.

Manufacturing activity has already started in China, however slowly, the sectors those have lot of depends on workers like garment manufacturing, will be slow to start, whereas upstream manufacturing like fibres, yarns etc have more technology driven manufacturing and huge capacities, are already catching up with their production capacities. Hence fibre and yarn producers are worried for the over production that will be dumped in India at low prices, once the epidemic is over, India fears on this front.

Hence, there would be different impacts at different levels and impact would be much more than anyone can count as of now!
Textile mills need to calculate more than the immediate benefits, says Sivakumar Narayanan, Executive Vice President Uster Technologies.

When market demand is relatively low, textile mills have to perform a balancing act, involving many delicate choices. The deployment of capital and management of personnel levels are critical, not only to current profitability but also to long-term business success when an upturn arrives. When the going gets tough, customers become more demanding, especially regarding quality and value for money, making markets ever more competitive for suppliers.

It means that the initial capital investment can actually be dwarfed by these running costs: capital expenditure on the yarn clearers would turn out to be only a small fraction of the total lifetime spend. In fact, making prudent choices can result in the mill saving up to a million dollars over this time, depending on yarn type, quality and production conditions.

Of course, it's all too easy in a difficult trading environment, to seize an apparent bargain in terms of initial investment cost, especially where there's a product upgrade promising a quick fix for a current problem. Not all investors take this short-term view, but those which do will often have some unpleasant surprises when starting to use their equipment.

**Investments: the bigger picture**
A profitable investment - as a general principle - should always focus on operational costs and savings opportunities as part of the essential 'bigger picture'. Evaluation of investments should factor in the differences in operational costs between competing choices, instead of focusing too much on what will likely be quite small differences in the initial capital cost.

Decision-makers should evaluate operational costs and capital expenditure as two totally different aspects of a new investment. Proper assessment of operational expenditure requires a closer look. It's essential to find the real drivers of running costs and take product lifecycle into account, to calculate the savings. This is highly relevant in today's difficult market environment - but it would be no less important even in better times.

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For the sixth time now, Oerlikon Nonwoven will be showcasing market- and customer-oriented solutions for hygiene, medical, filtration and other technical applications at the globally-leading nonwovens trade fair INDEX in Geneva, Switzerland. Between March 31 and April 3, 2020, visitors to the trade fair can convince themselves of the Neumünster-based systems constructor’s extensive product and process know-how.

**Focus on nonwoven products - the perfect manufacturing process for every application**

Cost-efficiently manufacturing meltblown nonwovens

New, unique and highly sophisticated filter media can be easily and efficiently manufactured thanks to Oerlikon Nonwoven’s optimized meltblown technology. Whether as a stand-alone system with one or several positions, as ‘plug & produce’ installations for already existing systems or in conjunction with other technologies: the Oerlikon Nonwoven meltblown process already enables the cost-efficient manufacture of melt blown nonwovens with the quality requirements of tomorrow. Even more producers are choosing the meanwhile extensively tried-and-tested and consistently further-developed Oerlikon Nonwoven meltblown solutions.

Airlaid technology for the nonwovens of tomorrow

Pulp or cellulose fibers as raw material for manufacturing nonwovens are currently virtually unrivaled with regards to sustainability and environmental compatibility. The Oerlikon Nonwoven airlaid process is the ideal solution for processing this raw material into high-end products for a wide range of applications.

Today, there is huge demand for manufacturing solutions for high-quality, lightweight airlaid nonwovens with economically attractive production speeds and system throughputs. In this area, the patented Oerlikon Nonwoven formation process - which also permits the homogeneous mixing of the most diverse raw materials, while simultaneously guaranteeing superb evenness and homogeneous fiber laying - is setting standards even for nonwovens with low running meter weights. And the benefits of this technology are increasingly gaining significance in sustainable recycling applications.

Comprehensive spunbond portfolio - always the right solution

Oerlikon Nonwoven meanwhile has a very broad range of spunbond technology products and services. The process for manufacturing geotextiles from polyester or polypropylene has been optimized; it is characterized by high production capacities and yields, with simultaneously low energy consumption for producing benchmark nonwoven products.

For the manufacture of hygiene nonwovens, Oerlikon Nonwoven offers its new QSR (Quality Sized Right) systems. Here, the benefits of the Chinese machine construction partner’s nonwoven formation are integrated into the complete solution. The advantage for nonwovens producers: highly competitive solutions at attractive prices with comparably low investment.
Grasim Industries sets up a RO plant in MP for safe drinking water for villagers

Grasim Industries has been one of the pioneers of 'Make in India' success stories with its first viscose staple fibre manufacturing plant in Nagda. Right from its inception in 1947, Grasim Industries has been committed to giving back to society, leading to an impressive transformation of Nagda town and its surrounding villages.

On Sunday, 23 February 2020, Shri Thaawarchand Gehlot, Union Minister for Social Justice & Empowerment, Government of India, Shri Dilip Gurjar, MLA - Nagda and Khachrod along with Shri Dilip Gaur, Managing Director, Grasim Industries inaugurated and dedicated the first RO plant to the villagers of Parmarkedhi.

Grasim Industries has set up a Reverse Osmosis (RO) plant in Parmarkedhi village, Nagda MP for safe drinking water for villagers

Safe and readily available water is important for public health. Improved water supply and sanitation, and better management of water resources, can boost countries' economic growth and can contribute greatly to poverty reduction. United Nations Sustainable Development Goal target 6 calls for universal and equitable access to safe and affordable drinking water. Also the JalJeevan Mission announced by Prime Minister Narendra Modi, aims to provide tap water to all of households by 2024. In a bid to provide clean and safe drinking water to the villagers of Parmarkhedi in Nagda, Madhya Pradesh, Grasim Industries has constructed a state of the art modern Reverse Osmosis (RO) plant at a cost of Rs. 20 lacs with a capacity to process 1500 liters of drinking water in one hour.

On the auspicious occasion, Mr. Dilip Gaur, Managing Director, Grasim Industries said, “The welfare of the local community at Nagda is core to our strategy. For
decades we have been investing in the economic and social transformation of the region.

As part of our relentless efforts to improve living standards we are pleased to dedicate a new RO plant to the people of Parmarkedhi. Excellence in water management practices is integral to our commitment towards water stewardship.

With the new RO plant in Parmarkedhi, we are confident of positively impacting several lives in the region by providing safe clean drinking water."

In Parmarkedhi and surrounding villages, Grasim Industries has been actively supplying 70,000 liters drinking water through 14 tankers on daily basis from last 2 years. It has also installed 3 Water drinking tanks of 2000 liters for the benefit of villagers.

Grasim Industries has already constructed four dams in Nagdaon the river Chambal, which benefits over 2,00,000 people. In the last three years, Grasim’s Pulp and Fibre business has reduced water consumption by over 50% through focused water management efforts.

Grasim Industries state-of-the-art technologies, such as membrane processes help in the clean-up and recycle of wastewater. These innovations improve the efficiency of processes, which allows reuse of water several times over and provides additional water to the villagers. Today, the plant meets daily water requirements of the entire city and kachrod along with railways through 30 billion liters storage capacity built by the company. Grasim Industries unrelenting focus has had a significant impact on numerous villagers residing in the plant vicinity.

Along with providing clean water, Grasim Industries has also been committed to community engagement in areas of education, healthcare, sustainable livelihood, infrastructure development and social reform. The community engagement program spans 55 villages and 25 urban slums, reaching out to over 1 lakh people. In healthcare, Grasim Industries every week provides free health services and medicines through Mobile Medical Van. In sanitation, it has supported the construction of individual toilets under "Swachh Bharat Abhiyan" drive.

Grasim Industries has also provided LED streetlights and school furniture, as well as conducted cattle vaccination and treatment camps in collaboration with veterinary departments. The women are also trained on tailoring skills, and stitching machines have been distributed to empower them.

International Business News

◆ China cuts electricity prices to support struggling manufacturers
Two of China's largest power distributors will cut electricity rates for most of their business customers by an average of 5%, in Beijing's latest move to assist manufacturers struggling under restrictions and other limitations aimed at controlling the Covid-19 outbreak, reported Caixin.

The new cuts are effective from Feb. 1 and will run through June 30, according to a notice issue late Saturday by the National Development and Reform Commission (NDRC), China's state planner. While the policy will apply to most commercial enterprises, regardless of size, it excludes the most power-intensive users.

The NDRC’s latest assistance plan applies to State Grid Corp. of China, the nation’s largest electricity distributor, and China Southern Power Grid, a major provider in the nation’s affluent south. State Grid estimated the 5% reduction would save its customers a total of RMB 36.4 billion ($5.2 billion), while Southern Power said its customers would save RMB 7.4 billion.

◆ China bans trade, consumption of wild animals due to coronavirus
China's top legislature said it will immediately ban the trade and consumption of wildlife, in a fast-track decision it says will allow the country to win the battle against the coronavirus outbreak, reported Reuters.

The announcement, made late on Monday comes after an initial suspension of the trade and consumption of wildlife in January.

"There has been a growing concern among people over the consumption of wild animals and the hidden dangers it brings to public health security since the novel coronavirus disease (COVID-19) outbreak," said Zhang Tiewei, a spokesman for the top legislature's Legislative Affairs Commission.
The decision, made by the National People's Congress, stipulates the illegal consumption and trade of wildlife will be "severely punished" as will be hunting, trading or transporting wild animals for the purpose of consumption.

◆ **PBOC steps up lending support for companies fighting virus**

China's central bank expanded companies' access to cheap loans Monday from six major state-owned lenders through a special relending program in a move to bolster businesses struck by the deadly coronavirus, reported Caixin.

The People's Bank of China told the country's biggest banks to provide low-interest loans to selected companies shortlisted by 10 provincial and municipal governments, using a RMB 300 billion ($42.6 billion) special relending fund set up Feb. 7 to support companies involved in fighting the Covid-19 epidemic.

The order means more companies are now eligible to get low-interest loans from the country's biggest banks - the Industrial and Commercial Bank of China, Agricultural Bank of China, Bank of China, China Construction Bank, Bank of Communications and the Postal Savings Bank - under the special relending project, according to a notice from the People's Bank of China.

Previously, only companies on a national list picked by the National Development and Reform Commission and the Ministry of Industry and Information Technology could access the cheap funding from the state lenders.

◆ **Chinese carmakers accelerate drive into India**

Chinese carmakers are accelerating their entry into India to counter falling demand at home with a new market where mass car ownership is in its infancy, reported the Financial Times.

Manufacturers such as Great Wall Motor and FAW Haima this month launched their first vehicles for the Indian market. SAIC Motor has been selling MG cars there since 2019. BYD, which makes electric buses in the country, has announced plans to launch electric vans too.

"They have been planning their India entry strategy" for years, said Puneet Gupta, an analyst at IHS Markit. "Finally we're now seeing a lot of action."

The push comes as China's car market shrinks - vehicle sales fell 8% in 2019. While India fared worse with a 13% drop in sales, analysts expect a recovery and that its growth rate will overtake China.

◆ **China's CMC Capital raises over $950 million in its biggest private equity fund**

Chinese private equity fund CMC Capital Group said it raised over $950 million in its biggest private equity fund to date, bolstering its ability to cut deals in the world's second-largest economy, reported Reuters.

CMC Capital Partners III, the firm's third dollar-denominated fund, surpassed its original target size after securing commitments from global investors, the firm said in a statement on Tuesday. It initially targeted about $800 million, said a media representative of the fund.

Its investors, known as limited partners (LPs), included pension funds, sovereign wealth funds, insurers, endowments and family offices across North America, Europe, the Middle East, and Asia Pacific, it added, without naming any of them.

Like the previous dollar funds, the latest fund will continue to invest in innovative growth companies with a China angle across sectors, including media and entertainment, technology and consumer, it added.

◆ **Coronavirus outbreak sets back China's biggest political assembly**

Chinese state media said on Monday that senior officials at China's national legislature and a related government-advisory body have proposed delaying their annual meetings in Beijing, which would have drawn some 5,000 delegates from across the country for a roughly two-week gathering, reported the Wall Street Journal.

Known locally as the "Two Sessions," uncertainty has loomed over the meetings as the outbreak of the virus, has sickened more than 70,000 people and claimed more than 1,770 lives. President Xi has declared a "people's war" against the disease, calling on officials and ordinary citizens to spare no effort in containing the epidemic.

Top officials at the National People's Congress, China's legislature, believe postponing their annual session is necessary for ensuring that the proper focus is kept on fighting the epidemic and safeguarding public health and safety, according to Zang Tiewei, a spokesman for the legislature's legal-affairs committee.
Many congressional deputies are regional and local officials who play important front-line roles in China’s efforts to contain the epidemic, Zang said in remarks carried by the official Xinhua News Agency.

◆ Securities regulator vows to keep IPO money flowing despite epidemic
China’s top securities regulator said it would maintain a normal pace in reviewing proposed listings so that new share sales won’t be hurt by the coronavirus epidemic, reported Caixin.

The China Securities Regulatory Commission (CSRC) will meet to review initial public offerings (IPOs) at an appropriate time based on the virus situation and will maintain consistency in such reviews, said Caixin sources.

The securities regulator reaffirmed its support for companies’ need for funding to cope with the slowing economy and damage from the epidemic. Yan Qingmin, deputy chairman of the CSRC, said on Saturday at a press briefing that the commission would ensure normal reviews of IPOs and merger and acquisition deals. The commission also established a special channel for virus-stricken companies to raise funds through bond and securities sales, Yan said.

◆ China virus threatens global antibiotics supply: EU Chamber of Commerce
The world could face a shortage of antibiotics if the pharmaceutical industry’s supply problems posed by the coronavirus outbreak in China cannot soon be resolved, the head of a European business group in China warned on Tuesday, reported Reuters.

EU Chamber of Commerce President Joerg Wuttke told a roundtable in Beijing that the synchronization of supplies in China was being hampered by the outbreak, also highlighting problems in the car industry, while inventories were surging.

He also noted that companies were running out of packaging material and faced challenges with regulatory uncertainties.

◆ Coronavirus fears force China into mass chicken cull
China is to begin importing live chickens from the US as feed shortages due to the coronavirus force poultry farms in the world's second-biggest economy to start culling millions of young birds, reported the Financial Times.

The culling of poultry follows the mass slaughter of pigs in China due to African swine fever over the past year and threatens to worsen a protein shortage in the country that has sparked rising inflation and soaring meat prices.

"There is no question China's chicken population will fall sharply in the coming months,” said Qiu Cong of Jinghai Poultry Industry Group, a leading chicken producer. "The chicks are gone and farmers are struggling to make ends meet.”

Farmers have slaughtered at least 100 million young chickens because travel restrictions imposed to control the spread of the coronavirus have blocked shipments of animal feed, according to a report by Wang Zhongqiang, former director at the China Animal Husbandry Association, and Ning Zhonghua, a professor at China Agricultural University.

◆ Second batch of experimental Gilead Coronavirus Drug arrives in Wuhan
A second batch of Gilead Sciences Inc.’s experimental antiviral drug remdesivir has arrived in Wuhan, where it will be tested on patients infected with the Covid-19 coronavirus that has killed more than 1,500 people, reported Caixin.

The drug was transported from the US to China by FedEx to be distributed to hospitals in Wuhan, the epicenter of the virus, for two ongoing clinical trials on a combined 760 patients.

It is not known how many doses of the drug were shipped, but they follow some 3,400 doses of the drug and 900 placebo doses that reached Wuhan’s Jinyintan hospital last week as part of Phase 3 trials, which began on Feb 6.

The trials are randomized, controlled and double-blinded, meaning neither doctors nor their patients know whether they are using the active drug or a placebo, so researchers can determine whether patients truly benefited from the new treatment or recovered on their own.

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The new MULTIGUARD yarn monitor gives advance warning of a yarn breakage

Modern sensor technology and data processing systems can be used to control all the important processing parameters and also to implement a wide range of optimisation measures. The production sequences can be optimised, as well as entire value-added chains. The efficient monitoring of yarn tension and feed during warp preparation can increase weaving efficiency by up to 5%. The new MULTIGUARD stop motion from KARL MAYER can make an important contribution here. This innovative system gives a warning in the event of yarn breakages or tension peaks, and generates parameters that can be used for internal production data management as well as external quality assurances within the framework of a quality management system.

All the yarn tension levels at a glance
MULTIGUARD continuously determines the tension values of each individual yarn at the exit of the creel and transmits the data to a computer for comparison with the target values. This generates a clear status report. The coloured indicators show the customer immediately which creel position lies within the tolerance, warning or stop ranges. This enables him to intervene quickly in the warping process if there are any deviations from the target values. The specific, measured tension values are displayed in a compact diagram. They can be used for internal analyses and for quality management of the warping process. KARL MAYER has also developed the PROACTIVE-Warping three-level, modular recording system, whereby each level contains more information. Module 1 manages all the basic data supplied by sensors on the warping machine relating to the warping or beaming quality. For example, the data relates to the exact positioning of the bands in relation to the drum axis. Level 2 complements these values with optical analyses from an integrated camera on the machine, whereby the focus is on the width, position and parallel arrangement of the bands. In module 3, the data is also transferred to the quality record from the creel monitoring system, i.e. the individual yarn tension values from the MULTIGUARD system.

A good start on the market
MULTIGUARD was launched as a prototype for the first time at ITMA 2019, and this innovative system generated a huge level of interest. “The possibility of detecting critical deviations in yarn tension levels early on, and to intervene in order to adjust them was well received by our customers,” says Martin Fuhr, the Head of Development in KARL MAYER’s Warp Preparation Business Unit. A Belgian customer has already ordered the new yarn monitoring system. Further promising projects are currently being negotiated.

MULTIGUARD is suitable for every type of creel. It is integrated into the machine’s software and monitor on new machines.

Press Release
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Son makes his Mother's dream come true with Truetzschler machines
Sangam, in district Solapur, is a small village which is about 320 kms south of Mumbai. In the early 80’s a young boy saw his mother and father working in the nearby cotton fields. The thoughts of his parent’s working day in and day out stayed in his memory. Even when he completed his school education in the local government school, the memories didn’t fade. As he grew up, he decided to create his future in the cotton sector but didn’t know the background nor did him have any technical knowledge. The young man started a small business of pumps agency but the cotton fields always remained in his mind. By sheer hard work and backing of his father the young man decided to set up his own mill. During that time luckily, he met Prof Chandrakant Patil who later became his mentor and guide. Prof. Patil meticulously taught him the basics of textiles and took him to visit many mills in India.
The young man today, Mr. Sanjay Tate-Deshmukh is the Chief Managing Director of one of the most modern textile mills in India - Dhanasmruti Textile Mills. Equipped with Truetzschler blow-room line, 12 TC 10 cards, 3 TD 7 draw-frames, 1 TD9T draw frame, 1 TSL 12 sliver lap, 5 TCO 12 combers and 5 TD 8 draw-frames, this 25,000 spindles project was recently fully commissioned.

During the planning phase Mr. Sanjay Tate-Deshmukh found out that the existing mills having Truetzschler preparatory and KTTM ring-frames had better yarn quality record than the mills having all the machines from a single manufacturer. Even the earlier experience of his father and now the Director of Dhanasmruti Mills, Mr.Naryan Rao Tate-Deshmukh echoed the same thoughts. Along with Prof Patil, he also found out that almost all major spinning mills in India who had their own retail labels, had Truetzschler machines in their mills. After these findings it was but natural to have the latest Truetzschler machines in their mills.

Mr. Sanjay is ably assisted by Mr. Vijay Tate-Deshmukh, Director and Mr. Vishal Magar, Director, in their sales and marketing strategies. In the near future they plan to have a 40% export component.

Mr. Balasaheb Koratkar, Deputy GM, who is responsible for the day to day production and maintenance, is all praises for all Truetzschler machines. He is happy that in a very less time they were able to attain 5% Uster yarn quality norms with minimum noil levels. As a result, Dhanasmruti Mills has started to carve a name as a quality yarn supplier in India. He also said "Even though its early days we are happy about the fact Truetzschler machines are very easy to maintain and are running smoothly since their commissioning. Especially the TCO 12 combers which I feel are better than the combers of other leading suppliers."

Mr. Sanjay Tate-Deshmukh said "My mother had a dream that one day we, the sons of the farmers, would create big names for ourselves in the cotton industry. Keeping this in mind we have a vision to be the best quality fabric provider to the world by the year 2023."

Mr. Sanjay's mother, Smt Shamal Tate-Deshmukh exclaimed "Hya machines mule jar maj hyamul achibhar bharaat jhaliahe tar nakkichhyaa machines changl yaasnaar"(If these (Truetzschler) machines are responsible for my son's success, then definitely they must be good).

Mr. Narayan Tate-Deshmukh also praised the important role played by the sales team of A.T.E. during the project's initial and also the implementation phase. He happily informed "They were even available at midnight for discussions and gave expected satisfactory feedback to our queries"

Mr. Sanjay Tate-Deshmukh was upbeat in informing that they would proudly repeat Truetzschler machines in the next 25,000 spindle project.

As Smt. Shamal's dream has come true, it's safe to say Its True Its Truetzschler!
Technology transfer that is creating waves

For more than a decade now, the Manmade Fibers segment of the Swiss Oerlikon Group has been hosting a comprehensive technology symposium at the beginning of each year in the Indian region around Silvassa/Daman. Numerous Indian manmade fiber producers have settled in this area, around a four-hour drive north of Mumbai. Fed from Oerlikon polycondensation and extrusion systems, these companies manufacture polyester, nylon and polypropylene on large-scale installations with Oerlikon Barmag WINGS POY, WINGS FDY, IDY and DTY product lines and using Oerlikon Neumag’s staple fiber and BCF technologies. Reason enough for the Manmade Fibers segment’s experts to regularly provide their clientele with detailed specialist presentations in India on the latest developments of the product and service portfolio.

And this was once again the case at the event held at the beginning of 2020, where around 450 managers and employees from local businesses took the opportunity to exchange ideas and information. For the third time in succession, Oerlikon also entered into dialog with the next generation of managers at major Indian polyester and nylon manufacturers in a separate event hosted in Mumbai beforehand. The technology symposium was again held - for the very first time - just a few days later and in a slightly modified form at a second venue: in Kolkata in West Bengal, a potential second future key location for manufacturing manmade fibers in India according to plans revealed by the Indian government. Here, the discussions held by the Oerlikon experts focused above all on the transfer of technologies for manufacturing polyester, nylon and polypropylene. Oerlikon is able to offer the entire process chain - from the melt to the textured yarn or the fibers and including the necessary semi- and fully-automated logistics process - from a single source. This is of interest above all for potential new customers and investors in West Bengal and neighboring Bangladesh, as some do not have decades of expertise in manufacturing manmade fibers, as is the case for most companies in the region around Silvassa/Daman.

Clean Technology. Smart Factory.
The focus of all events was on the latest product and service developments from the Oerlikon Barmag, Oerlikon Neumag and Oerlikon Nonwoven brands. With their ‘Clean Technology. Smart Factory.’ motto, the engineers from Germany presented selected machines and systems specifically designed for the Indian market, along with the associated services. Needless to say, the innovations unveiled at the last ITMA were of particular interest to all attendees.

eAFKEvo and WINGS FDY PA6 promise greater productivity
Philip Jungbecker, Senior Technology Manager for texturing machines at Oerlikon Barmag, presented the new Oerlikon Barmage AFKEvo generation of machines. “The eAFKEvo promises superior speeds, greater productivity and consistently high product quality, along with lower energy consumption and simple operation vis-à-vis comparable market solutions”, comments Jungbecker. In particular, the machine concept’s numerous
new value-added features include two that are excelling with fantastic technology: the optimized, innovative Evo Heater and the EvoCooler, a completely newly-developed active cooling unit. These proved to be of huge interest to the attendees of the technology symposium.

WINGS FDY is now also available for the polyamide 6 process. To this end, the new 24-end winding concept makes the efficient production of FDY PA6 yarns a reality”, explained Guido Dresen, Regional Sales Manager at OerlikonBarmag. Extending the polyamide yarn production from 12 to 24 ends with DIO and WINGS FDY pays yarn producers dividends, particularly in terms of investment expenditure (CAPEX) and operating expenditure (OPEX): significant savings with regards to energy, footprint and - due to the more ergonomic design - string-up time are among the concept’s most convincing arguments. The enclosed draw unit ensures low spin finish emissions, offering a safe working environment.

Offering swift string-up, the optimized yarn path of the tried-and-tested WINGS FDY PET system is united with the high relaxing performance of conventional polyamide systems to create a completely new concept. The 24-end WINGS FDY PA hence profitably combines the benefits of both processes. The result: outstanding yarn properties, superlative dyeability, optimum process performance and high full packagerate. A perfect package build guarantees excellent further processing properties in the downstream processes.

With a 116-mm stroke, this winder makes high package weights possible, therefore delivering added-value yarns for further processing. As a consequence, yarn manufacturers can give themselves a competitive advantage in the marketplace.

The BCF S8’s impressive performance data
With the new BCF S8 production platform, Nis Lehmann-Matthaei, Sales Manager at Oerlikon Neumag, promised manufacturers of carpet yarns greater performance within this fiercely-competitive market: "Superlative spinning speeds, up to 700 individual filaments and fine titer of up to 2.5 dpf - our new system's performance data and technological finesse are truly impressive. Our customers’ feedback on this new system is outstanding”, comments Lehmann-Matthaei.

Zero-waste philosophy successfully implemented
With the new VacuFil® recycling range, Oerlikon Barmag is now offering - in cooperation with its jointventure partner, BBEngineering - a zero-waste philosophy solution. Decades of experience in the areas of extrusion, filtration and spinning systems have been bundled into a new, innovative core component - the vacuum filter. It unites gentle large-scale filtration and controlled intrinsic-viscosity build-up for consistently outstanding melt quality. The vacuum unit - located adjacent to the filter - swiftly and reliably removes volatile contamination (such as spinning oil, for example). The excellent degasification performance additionally relieves energy-intensive predrying”, explained Dr. Klaus Schäfer, Managing Director of BBEngineering. The modular structure of the VacuFil® range offers numerous possibilities for the process guiding system. Whether as a standalone solution with downstream granulation or as an inlinevariant with 3DD additive feed - customer requirements can be optimally catered for with various system configurations.

Exciting podium discussion on digitalization, automation...
and recycling
In addition to presenting the four 2019 world premières, the program also included talks on further technology innovations. To this end, the latest developments of the relatively nascent Oerlikon Nonwoven brand were unveiled and the upgrade packages for the CW and ACW winder generations were explained. Within the context of a podium discussion, Jochen Adler, Chief Technology Officer of the Manmade Fibers segment, together with further Oerlikon experts, answered questions relating to the future of digitalization, automation and recycling along the textile value chain, among other things.

Here, Jochen Adler stated: "Digitally upgrading our machines and production systems for manufacturing yarns, fibers and nonwovens along the textile value chain is increasingly becoming a focus of our customers' interest. Here, our promise is: creating digital value-added beyond our excellent hardware. We want to further optimize the efficiency of our systems and the quality of the end products with our digitalsolutions. True to our e-save philosophy, our mission is to protect the environment and to promote the sustainability of our solutions - in future undoubtedly also with a focus on recycling. For this, we are deploying the know-how of our entire large-scale systems engineering team, including full-automation, transport, packaging and warehouse logistics and end-product automated quality control. We combine these with our process competencies and digital data handling using our Plant Operation Center, or POC for short, and our artificial intelligence-based software solutions - known as 'AIM', our abbreviation for 'Artificial Intelligence Manufacturing'. This has created innovative Industrie 4.0-solutions for our customers - with integrated storage and communication capabilities, wireless sensors, embedded actuators and intelligent software systems. In turn, this allows us to build bridges between data and material flows and between the virtual and real worlds.

Complex large-scale systems from a single source
Michael Roellke, Head of Global Factory Sales, showed the interested audience how the Oerlikon Manmade Fibers segment experts execute complex large-scale systems, simultaneously accompanying its customers with its decades of experience and expertise from day one. In his talk, he also once again emphasized the Oerlikon Group's performance, including supporting the financing of projects as well. Roellke also explained the benefits of executing a factory project with Oerlikon: "Our customers have an contract partner who assumes the responsibility. There is a project manager as the primary contact partner. This reduces the number of interfaces and means less organization on the customers' part. We have a huge network of experts. All core components come from Oerlikon's in-house manufacturing facilities. We offer planning reliability, high efficiency as a result of continual process optimization, an optimized CAPEX/OPEX ratio as well as comprehensive handling of quality data - from the raw material all the way through to the individual package." This is absolutely unique in this form within the manmade fiber industry.

Economic center of gravity returns to Asia
Eagerly anticipated by the audience, André Wissenberg, Vice President, Head of Marketing, Corporate Communications and Public Affairs, spoke about the uncertain times amidst the global trade conflict between the US and China and the emerging countries suffering as a result. He determined that the manufacture of manmade fibers in countries such as India and Bangladesh has tremendous potential for the future. He stated: "Over the next few years, the manmade fiber industry will - to an above-average extent - continue to benefit from market growth and the shift of market shares from cotton to manmade fibers. Currently, growth of polyester lies at +2.4% CAGR. According to a study compiled by Wood Mackenzie, the anticipated growth rate for all polyester fibers between 2016 and 2030 is +3.3%, with +2.1% for staple fibers and even +3.8% for filaments. The per-capita consumption in India, which was 5.9 kg in 2018, is expected to reach 8.5 kg by 2030."

New challenges for China, India and Bangladesh
"This rapidly-changing global scenario is presenting us all with new challenges", continues Wissenberg. "Almost 50% of the population will in future live in cities, and the demand for water, food and energy will rise considerably, above all in Asia and Africa. The quest for political and economic solutions for emerging countries will impact on all aspects of life, and the textile industry in particular. The economic center of gravity will continue to shift towards Asia. And we have to be ready for this." The US and Europe will definitely lose ground to China and India. In terms of gross domestic product, China ranked no. 1 in 2016, followed by the US, India, Japan and Germany. By 2030, India will be ranked second, with US shifting to third, while Indonesia displaces Japan to take fourth. And - with Africa a new demographic giant will emerge, whose young and growing population could become a powerful growth engine for the continent, as long as there is sufficient
investment in education, health and the economy. Africa's population growth will be responsible for around 58% of global growth between 2018 and 2050.

Commenting on the situation in China, Wissenberg stated: "The trends in China in 2019 have shown us that the country has transitioned from a high-speed economy into a society with high-quality growth. China's economy slowed from 6.9% in 2017 to 6.6% in 2018, which is predominantly down to the tightening of financial supervision within the banking sector and the expanding trade conflict with the US. A further slowdown of 6.2% and 6% respectively is forecast for 2019 and 2020. Here, the impact of the coronavirus epidemic has not been taken into account." The reforms in China have progressed in several key areas, including: 1. Strengthening of the financial rules; 2. Control of local authority investments; 3. Slowdown of debt accumulation; 4. New FDI law and redrafting of the list of FDI entries. The general government deficit is currently estimated to be 11% of GDP. If the trade dispute were to further escalate, there are rumors emanating from China that fiscal incentives, above all, would be justified.

Overall, the global economy would benefit from a more open, more stable and more transparent rule based international trading system. Wissenberg listed the biggest challenges for the Indian economy: maintaining and achieving annual average growth of between 9 and 10%, providing investor-friendly rights and taxation systems, limiting financial reporting and budgetary deficits, developing a world-class infrastructure for maintaining growth in all economic sectors, reducing currency devaluation, removing environmental obstacles for foreign direct investment, controlling inflation and permitting foreign direct investment in various areas. Overall, Wissenberg therefore sees an optimistic mood for the man made fiber industry in India in this new decade, but simultaneously warns of the above-mentioned global risks.

Cultural highlights
Both technology symposiums were each accompanied by a cultural highlight. In Daman, a musical and dance performance showcased the history of Kashmir, while the 'Amar Sonar Bangla' program entertained the attendees in Kolkata. Here, Debabrata Ghosh, General Manager Sales at Oerlikon Textile India Ltd., demonstrated particular commitment and created both programs with the internationally-renowned 'Sukalyannd'entourage' dance studio in Mumbai and Toronto.

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Huntsman Textile Effects will be featuring its award-winning coloration technology and HIGH IQ® intelligent effects at the upcoming 2020 OutDoor Retailer Snow Show in Denver, Colorado.

As the industry leader in innovative and environmentally sustainable textile solutions, Huntsman Textile Effects offers mills and brands a comprehensive suite of high performance products that meet the fast-changing market needs. With its wealth of textile industry knowledge and experience, Huntsman Textile Effects is the preferred partner to help mills around the world achieve greater productivity and efficiency.

Huntsman's featured products:
Unparalleled PFC free solutions
◆ Huntsman Textile Effects' PFC free solutions including extensive PHOBOTEX® RSY non-fluorinated durable water repellents and Teflon EcoElite™ renewable sourced water repellents from its long-term alliance with Chemours. They are a perfect combination of excellent water repellency with extremely high washing resistance and meet the stringent requirements of the Huntsman Textile Effects HIGH IQ® Repel performance assurance scheme. The HIGH IQ® Repel program is designed to help mills, brands and retailers meet global demand for eco-friendly apparel with rain and stain protection. Combining innovative durable water repellent finishes with unparalleled technical expertise, the HIGH IQ® Repel program provides durable eco-friendly and sustainable protection for every performance need: everyday, outdoor and extreme adventures.

Huntsman Textile Effects' HIGH IQ® assurance program includes a comprehensive range of products from cutting edge moisture management technology to UV protection. Backed by the industry's leading range of innovative, eco-friendly intelligent textile effects, fabrics treated with our intelligent effects are sustainable textile products that deliver the performance and benefits consumers expect of high-quality brands.

State-of-the-art sustainable inks
◆ Digital inks solutions include the range of NOVACRON® ADVANCE reactive inks that lets you achieve remarkable coloristic performance and shade intensity with superior fixation and fastness results. Our range of ERIOFAST® VISTA inks is a unique sustainable digital printing solution for polyester-cotton blends which uses a simple urea-free system to outperform the best alternative solutions in terms of brilliancy, gamut, color depth and fabric handle at reduced energy consumption and emissions. Easier and more efficient to use, these digital ink ranges require minimal maintenance and result in greater saving while meeting stringent industry standards.

Visit Huntsman Textile Effects at the OutDoor Retailer Snow Show at stand 55059-UL.

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Union Finance Minister, Nirmala Sitharaman in her Budget presentation on 1ST FEB 2020 announced a National Technical Textiles Mission with a four-year implementation period from 2020-21 to 2023-24 at an estimated outlay of Rs. 1,480 crore. This is expected to give thrust to production of a wide variety of textiles used in Technical Textile sectors such as healthcare, personal protection, infrastructure, automobiles, defence, and agriculture. The National Technical Textiles Mission aims at positioning India as a global leader in technical textiles.

The Indian Technical Textiles Association congratulates the Union Finance Minister and the Union Textile Minister, Smriti Irani and the Government for their proactive steps in making India as a power house of Technical Textiles. The Mission on Technical Textiles to the tune of Rs. 1,480 crore over the next four years should give fillip to most crucial and interesting segment of Indian textile industry.

India imports significant quantity of technical textiles worth approximately Rs. 14000 crore every year. To reverse this trend and to position India as a global leader, a National Technical Textiles Mission is proposed. According to Dr. K.S. Sundararaman, chairman of the Indian Technical Textiles Association, the size of the technical textile industry in the country is approximately Rs. 1.16 Lakh crore. Few years ago, the sector received focus to set up eight centres of excellence (COE) across the country. With the need to create a domestic base for raw material production, push for manufacture of high end technical textile products, boost investments, and increase per capita consumption, there is a need for a Mission. "We need to see how this Mission will be implemented. There should be an empowered nodal office that will coordinate all the efforts and make the Mission beneficial to the industry," he said.

Another major announcement in the Budget, which is expected to give a thrust to the polyester fibre sector, is abolition of anti-dumping duty on PTA (Purified Terephthalic Acid). This is the raw material for production of polyester fibre. This was one of the long-pending demands of the industry. Abolition of anti-dumping duty will bring polyester fibre price in India on a par with international price. Polyester will be the future growth driver for the Indian textile industry. However, it is to be seen how the issue of non-availability of high performance fibres, namely, Aramid, Carbon, Glass, Nylon 66, Antistatic, FR Viscose, etc will be made available in India for which technical textile industry is totally dependent on imports, as they are not manufactures in India.

**Lenzing Group opens its first supply chain solutions hub in India**

- Lenzing Group plans to expand in its physical footprint in India, starting Mumbai
- The LENZING Hub will provide solutions and support for TENCEL™, Lenzing™ ECOVEROTM, VECELTM and Lenzing™ Industrial applications.

The Lenzing Group - world market leader in wood based cellulosic fibres, has opened its first supply chain solution hub in Mumbai which is designed to provide supply chain and product solutions as per the requirements of Indian customers. Lenzing, being the pioneer in the industry for sustainable fashion and innovations, the hub becomes a centre of innovation and excellence by building accessibility across its customers in India, bringing together Lenzing’s global expertise and network connections in the industry. The launch of this hub will build connections between the supply chain and brands looking to adapt sustainable practices that are need of the hour.

For Lenzing, India serves as a key market for exports as well as a huge domestic consumption. Lenzing has been present across all major apparel categories in
India such as ethnic wear, intimate wear, general outerwear, denims and home furnishings. The company has been associated with ace designers such as Anita Dongre, Rajesh Pratap Singh and Abraham & Thakore to leading brands such as AND, Global Desi, Marks & Spencer, H&M, D’ décor, Levi’s, to name a few. With a huge response garnered by their flagship fibre brand - TENCEL™ and sustainable viscose fibre brand LENZING™ ECOVEROTM, Lenzing Group has recently introduced its nonwoven specialty fibre - VEOCEL™ and LENZING™ Industrial solutions diversifying the reach among the beauty and industrial application segments.

A prominent trend observed in the textile and fashion industry over the past few years is to incorporate sustainable solutions in close conjunction with end consumers through brand and designer associations. To build on the growing needs and requirements put forth before by the consumers, this hub will give access to global solutions and innovations across the country.

Along with the specialty fibers solutions, the hub will house the products and innovations created using TENCEL™ and LENZING™ ECOVEROTM fibers to attract both buyers and supply chain experts in India.

The hub would also display products that have been made in collaboration with top designers and brands across India and the globe, seen at key fashion events, on a regular basis. This platform will bring forward global innovation capabilities to help to build on the sustainable fashion conversation among the Indian Textile Industry. Additionally, the hub would cater to an information center for textile suppliers, garment makers, designers and traders to enable quick solutions.

Mr. S. Jayaraman - Commercial Director - Asia Pacific & South Asia with Lenzing AG, said, "Since its inception in India in 2007, Lenzing India has seen a massive growth in India. With the warm response we have received towards various associations initiated by us, this hub will be another step for our expansion in the country. We aim to build Lenzing's global legacy through the launch of the hub. As part of the company's country developments, Lenzing plans to increase its footprint by launching multiple hubs across key textile centres in India in the next couple of years. We hope these strategic hub launches will help our partners offer sustainable solutions with an ecologically responsible footprint to ease out the supply chain process.

Commenting on the launch, Mr. Avinash Mane, Commercial Head - South Asia, Lenzing Group said, "Lenzing Group is pleased to have launched its first hub in India. Through this step, we aim to provide the right raw material to the brands in order to strengthen their sustainable resolution, making the supply chain viable. Our vision is to provide sustainable lifestyle solutions to consumers and sensitizing them on sustainable and ethical fashion is the need of the hour. Through this launch, we hope to build a direct connection with people driving the supply chain, further creating a ripple of change in the textile industry."

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LIVA Launches LAPF Studio in Jaipur

Fluid Fashion enters the Women's-wear Capital of India

The $48.3-billion Aditya Birla Group's leading fashion ingredient brand Liva on Thursday inaugurated a state-of-the-art Liva Accredited Partner Forum (LAPF) Studio in Jaipur in association with Garment Exporters Association of Rajasthan (GEAR).

This is the fourth such Studio after NOIDA, New York and Tirupur.

LAPF Studios act as a one-stop customer experience centre for innovation, technical, product and marketing solutions.

The Jaipur Studio will display a collection of more than 2000 fabric innovations of Viscose, Modal & Excel. Technical specifications, uniqueness of the fabric and marketing details will be available in wide variety including Woven, Knitted and Flat Knitted fabrics. LIVA's seasonal collection specially designed by its in-house designers will also be showcased in the Studio to service global buyers.

The studio was launched in the presence Mr. Rajiv Dewan, President, Garment Exporters Association of Rajasthan (GEAR), Mr. Navin Advani, Vice President, Garment Exporters Association of Rajasthan (GEAR), Mr. Rajeev Gopal, Global Chief Marketing and Sales Officer, Pulp and Fibre Business, Aditya Birla Group and Mr. Manohar Samuel, Sr. President, Marketing and Business Development, Birla Cellulose.

On the occasion, Mr. Rajeev Gopal, said, "Customer demand from the textile industry is increasing, mandating the companies to step up their game. We at LIVA have always been the pioneers of change in the industry and yet again have proved the same through the launch of this Studio which is beneficial for Jaipur Cluster".

Mr. Rajiv Dewan, President, Garment Exporters Association of Rajasthan (GEAR) said, "Our vision in GEAR has been always to work towards excellence in buyer engagement, infrastructure and product innovation through collaboration. In this direction we see LAPF Studio as a platform for fuelling business growth for the Jaipur cluster. We look forward for innovations in fabric and Liva seasonal collection".

The collaboration between GEAR and LIVA brings seamless alignment with global innovation, ensures preference for the cluster's products with global brands and with focus on sustainability credentials.

Along with this, clear focus on quality and cost will be paramount for greater operational efficiency.

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LIVA Miss Diva 2020 completed the first stage

Strong, Dynamic & Confident Divas take One Step closer to LIVA Miss Diva 2020 title at the Mumbai Preliminary Event. The winner of LIVA Miss Diva 2020 will represent India at Miss Universe. The winner also stands a chance to win prizes worth Rs 10 lacs.

The 8th season of Miss Diva completed the first stage of its search for that strong, dynamic and confident face of the country. The nationwide auditions for LIVA Miss Diva 2020 began in early November giving the winner the once in a lifetime opportunity to attain a ticket to Miss Universe.

The 10 city auditions that traversed through the length and breadth of the country from cities like Lucknow, Kolkata, Indore, Hyderabad, Pune, Jaipur, Bangalore, Chandigarh, Chennai and Delhi culminated into the final leg of auditions at Mumbai in December 2019 and announced the TOP 20 finalists of LIVA Miss Diva 2020 who shall now compete for the coveted crown. The winner will represent the country at the coveted pageant Miss Universe.

Collaborating in this incredible journey of bringing forth Indian beauty and talent at the global beauty platform, Lara Dutta who is the mentor and face will take over
the mantle of finding that one girl who will revolutionize the definition of Fun, Adventurous, Witty, Sporty, Sassy, Sensual, Fit, Compassionate& Captivating.

Speaking on the occasion, Mentor Lara Dutta, said "As we come closer to the final stage of the pageant, the excitement and thrill has doubled. It's been a tremendously stimulating journey so far mentoring the girls and I look forward to guiding them further in the pursuit of their dreams."

Associating with a beauty pageant for the first time as a Title Sponsor is LIVA, the fashion ingredient brand. LIVA has redefined fashion with its fluid fabrics to create garments synonymous with comfort and freedom. LIVA's brandethos, # Live Your Flow, encourages women to be spontaneous, confident, unhindered and free as they live in th emoment.

LIVA's flawless drapes and breathable fabric give every rising Diva an edge to breathe and flow as they conquer the age. Made with 100% natural fabrics, LIVA's lightweight feel is perfect for aspiring Divas to chase success, unrestricted. It resonates with every nascent Diva, making this partnership a seamless fit.

The Top 20 finalists are now undergoing vigorous training & grooming from the best in the industry and will also participate in 4 city sub-contest preliminary event that shall be complimented by a thematic night.

The first preliminary event took place in Mumbai at the Hilton Mumbai International Airport that has come on board as the impeccable hospitality and venue partner. The following preliminary events will be held at Bengaluru, Delhi & Jaipur. The Mumbai preliminary event had a set up by the pool to sash the sub contest winners of LIVA Miss Diva 2020.

The glamorous evening that was flagged off by Yami Gautam and hosted by Anusha Dandekar, also saw a power packed performance by Shirley Setia, a singer and performer from New Zealand and DJ Stetson.

The girls were pre judged for sub-contests and sashed for LIVA Miss Body Beautiful, DrTvacha Miss Glowing and Times Miss Sudoku.

Deme by Gabriella Demetriades has collaborated with fashion ingredient brand, LIVA to create a capsule collection of uber sensual and striking gowns with the signature deme cuts and aesthetics, incorporating drapes, surprise cut outs and playing with forms of the luxurious fabric. The collection was made fluid with LIVA fabric. LIVA is a fabric available in garment form at leading retail outlets. Look for the LIVA tag while purchasing the garment.

Catch the exciting journey of the Diva on February 21 at 7 pm & the deferred live telecast of the grand finale on 2nd February at 10 pm on MTV-India's No.1 youth brand.

Partners and Sponsors Credit Box:
- Title Sponsor: LIVA
- In Partnership With: MTV
- Co-Sponsor: SubodhBajpaiPhotography
- Lifestyle Partner: Rehau
- Skin Care Expert: DrTvacha
- Designer: Designed by Deme made fluid with LIVAfabric
- Radio Partner: RadioMirchi
- Multiplex Partner: Carnival Cinemas
- Show Choreographer: Lubna Adam
- In House Stylist: Bharat Gupta, Petula Browne and Meghna Sahijwani
- Hair & Make up Designer: Bianca Louzado
- Décor Partner: Vivaah
- Celebrations Partner: Living Liquidz & Kingfisher Ultra
- Outdoor partner: Minimax Ads Pvt Ltd
- Venue Partner: Hilton Mumbai International Airport

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Solutions That Can Enhance Your Brand
Add life to your business ideas with our Brand Building Solutions
Mr. Ashok Juneja elected as President of TAI Central

New Office Bearers elected for the term 2019-2021 of The Textile Association (India), Central Office in the elections held on 14th November, 2019 in the Governing Council meeting held at Chandigarh.

Mr. Ashok Juneja, B.Text, from TITS, Bhiwani, MIE, Charted Engineer having 38 years wide work experience with groups like Vardhman, Mahindra & Mahindra, Birla, Inarco, Kirloskar Toyota, and Saurer.

He started his career in 1981 with Vardhman Group as TGT. Last assignment was M/s. Saurer India as Director - Sales and Service. He has enjoyed his time in the industry, spending maximum duration of 18 years with Toyota Group. He is now venturing into his own business as Management Consultant.

Mr. Juneja is actively associate with The Textile Association (India). He has worked with various capacities in TAI Delhi Unit and as well in TAI Central. He was instrumental in successfully organizing 7th Asian Textile Conference hosted by TAI Delhi Unit as Conference Secretary in the year 2003. He organized various workshops, seminars, and conferences at TAI Delhi Unit.

Mr. Ashok Juneja was awarded with Service Memento in the year 1999 & Service Gold Medal in the year 2008 by The Textile Association (India) for his enormous contribution to the TAI during All India Textile Conferences.

Mr. R. K. Vij once again re-elected unopposed & unanimously as a Vice President of The Textile Association (India) - Central Office for the term 2019-2021.

Mr. R. K. Vij is MBA from Delhi University, Post Graduate Diploma in Management from YMCA, New Delhi and Bachelor of Technology in Textiles from The technological Institute of Textile & Sciences, Bhiwani (Haryana).


Mr. Vij has an extensive experience of over 46 years in successfully managing business of Textiles and Fibers in dynamic and competitive business scenario. He is Advisor - Polyester at M/s Indorama Synthetics (India) Limited. The history of Indo Rama Synthetics (India) Limited dates back to 1995, when it first forayed into the business of polyesters. The Company offers a wide range of polyester products which include Polyester Staple Fibre (PSF), Partially Oriented Yarn (POY), Draw Texturised Yarn (DTY), Fully Drawn Yarn (FDY) and Polyester Chips.

He is a Sports man and represented Punjab state as a Badminton player, also Secretary General in PTA (Polyester Textile and Apparel Association) and Secretary of RWA of Safdarjung Enclave, New Delhi.

Mr. Vij is actively involved with The Textile Association (India), Delhi Unit and also with the Central. He is a recipient of Service Memento, awarded in 2007 by the Textile Association (India) at All India Textile Conference held at Ahmedabad.
Other Office Bearers as under:

Mr. V. D. Zope  
Chairman

Mr. Ashok Veda  
Vice Chairman

Mr. Haresh B. Parekh  
Hon. Gen. Secretary

Mr. Virendra P. Jariwala  
Hon. Treasurer

Mr. Mahendrabhai G. Patel  
Jt. Hon. Gen. Secretary

Mr. S. Shivakumar  
Jt. Hon. Gen. Secretary

Obituary

Shri HariNand Jain (H. N. Jain), Past Vice President, TAI Central (2015-17) passed away on Sunday 5th January, 2020.

He was B. Text. from Delhi Polytechnic, Delhi University, in the year 1961 and went on to get his MBA from FMS, Delhi University. He retired as General Manager from NTC, after 36 years of meritorious service. He was a Patron Member of TAI-Delhi. He was Hon. Treasurer of TAI-Delhi in 2009 and subsequently elected as Hon. Secretary in 2012. He was Governing Council Member for the term 2013-15 and 2015-16. In 2016, he became Vice President of TAI Central Office for the term 2016-17, re-elected as Governing Council Member for the term 2017-19. Currently, he was serving TAI-Delhi as Hon. Treasurer and Governing Council Member for the term 2019-2021.

Shri H. N. Jain was always an upright, straight forward and vocal gentleman, who kept the interests of TAI above all else. He possessed an immense knowledge of the constitution and the working of TAI and remained dedicated till the very end. His energy and drive, even at the age of 81, was admirable, and his integrity and dedication unquestioned. He was a friend, philosopher and guide to all his colleagues, always courteous to one and all, regardless of age or office. He was a gentleman to the core and a remarkable human being.

In his passing, TAI Central and TAI-Delhi has lost a stalwart, a dedicated and humble guiding spirit and a wonderful person. His demise has left all of us in a shocked daze because of its suddenness. He departed the way he had lived - quietly, without any fanfare, without any trouble to anyone. He simply took a final bow.

The Textile Association (India) wish him peace and happiness and hope he keeps smiling on us from the heavens above.
Rabatex Inks JV With Italian Company to produce Advanced Electric Operated Material Handling and Storage Equipment.

Rabatex Industries Pvt. Ltd. is one of India's most prominent textile machinery manufacturer. The group was established in 1962 with the vision and mission to develop cutting edge technology in the textile machinery sector. Through its passionate R&D team, the company has stood firm on its goals, which has led to its success in 28 countries across the globe.

Rabatex is on a growth streak and recently, strengthened its capacities with full technical support and know-how from Alexander & Giovanelli Group, an Italian textile machinery systems provider. The group is has made its mark in developing and producing equipment with quality materials from Europe. Combining technology and tradition, they have grown in this industry in a seamlessly progressive way.

The teal strength of this group is the centenary family's experience in this sector and the constant commitment, dedication, respect and care for details that make their work unique. The group also specialises in design and installation of advanced material handling and storage equipment. With its technical support and cutting-edge technology, Rabatex aims to produce state-of-the-art weaving transportation trolleys in India.

This joint venture agreement of Rabatex with the Alexander & Giovanelli Group will bring unique expertise in manufacturing and sales of advanced, electric operated, handling equipment to the Indian market. The A&G Group currently has an extensive range of electric trolleys for weaving room, which it will now manufacture on Indian grounds instead of exporting them from Italy. However, throughout the production, quality and production standards of the Group will be maintained. Mr. Luca Giovanelli, Director at Alexander & Giovanelli Group, said "The main reason for tying up with Rabatex is to use their world-class manufacturing facilities and proficiency. It will reduce our production costs and we will be able to offer products with the most competitive prices in the world market. The supply from India will surely shorten the delivery time to supply to India and other Asian countries as well. We hope to have progressive association and partnership with the Rabatex Group".

This joint venture will also complement Rabatex in offering a complete range of material handling equipment for the textile industry, including the mechanical trolleys and electric operated trolleys. The company is well established in the Indian and global market with more than 5000 trolleys working successfully in leading textile mills. With the industry moving towards automated technologies, Rabatex foresees a good demand for the electric operated trolleys. And, due to increased capacities with this tie-up, their market share for trolleys is all set to increase in India and 28 other countries as well.
Additionally, the company's customers will have several advantages. According to Mr. Sandeep Panchal of Rabatex Group, "Rabatex produces mechanical trolleys but is looking forward to catering to the demands of automated equipment. This may ease the functioning of any unit with a lesser operational cost to the weaving department, by enhancing productivity and reducing downtime. Also, the electrical trolleys are equipped with several safety features, so the chances of accidents will be minimized".

Mr. Luca Giovanelli also wants to explore a new concept of renting trolleys to mills. The company would be the first to start such a service. It plans to rent the trolleys to the mills and provide the service of regular upkeep of these trolleys. This will ensure that the trolleys are always maintained as per the strict European safety standards and will also be cost-effective for the mills.

After this amalgamation of resources and expertise, the Rabatex Group is looking to diversify manufacturing by focusing on Material Handling and Storage Solution Equipment as well. Rabatex is also aiming for more technical tie-ups in this field in the coming years. Another addition to its list of joint ventures is a tie-up with world-renowned Karl Mayer for manufacturing of warp preparation machinery in India. These companies are known for their innovation and ability to produce futuristic technology for the industry. With several such contributions, Rabatex has set benchmarks in the industry and will continue to move further with the same spirit and dedication.

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RITU KUMAR with Lenzing Ecovero Showcasing the Collections at Lakme Fashion Week 2020

RITU KUMAR Collaborates with LENZING™ ECOVERO™ to showcase their AW20 Collections ‘NATURE’S ORIGAMI’ at LAKME FASHION WEEK 2020
- The designer will showcase her collection at the finale of Sustainable Day at LFW
- Fabrics made of LENZING™ ECOVERO™ sustainable viscose fibre
- Iconic laid out prints of Ritu Kumar legacy

Making way for a new perspective on 'Sustainability', country's most respected designer Ritu Kumar is all set to foray into the world of environment-friendly creations with the showcase of her AW’20 collection at the finale of Sustainable Day at Lakmé Fashion Week 2020. Ritu Kumar is partnering with the Austrian fiber brand, LenzING™ ECOVERO™ to create iconic laid out prints.

Talking about the association, veteran designer Ritu Kumar added; "Sustainable Living is one of our core values and we are proud to partner with LENZING™ ECOVERO™ at the root level for the showcase of Nature's Origami at the Lakme Fashion Week. Through this collection, our aim is to provide trend-setting styles made of sustainable viscose fiber; a shift to responsible fashion. The fashion industry is doing their bit to promote ecofriendly clothing and we believe that our creative outlook and LenzING's commitment would result in contributing to a healthier environment"

Speaking about the association, Mr. Avinash Mane, Commercial Head, South Asia, Lenzing Group said, "We are pleased to reintroduce LENZING™ ECOVEROTM at the Lakmé Fashion Week SS 2020 this year. Our past associations at LFW have helped in building the narrative of sustainable fashion among designers and influencers in the fashion fraternity. We look forward to our association with Ritu Kumar this season. Through this collection; we hope to create a larger outreach among the industry on adopting alternative resources and processes in their brand."

Nature's Origami is engendered on the central theme of tribal and contemporary Indian art forms which allude to nature and rejuvenation. The collection is a culmination of four stories - Mrinalini Mukherjee's exhibit at the MET, Neo Origami, Flora & Fauna, and...
Sundarvan. Owing to Mrinalini’s work with knotted textiles, the capsule encompasses fabric manipulation and the revival of age-old textile techniques. At the crossroads where modern chevron meets classic florals, you see laces and layering surfaces in Neo Origami. Festive felicity meets pleats and burnout velvet, and the abundance of la dolce vita in the potpourri of Sundarvan. The color palette is an amalgamation of vegetable dyes and carefully crafted hues from deep burgundy to faded ochre and an infusion of violets and leafy greens; it can be an agent for positive change in social, economic and environmental dimensions.

Since the brand’s inception, five decades ago, Ritu Kumar’s relationship with nature has always been strong and apparent. Whether it is through processes using natural fibers or natural dyes, the brand’s efforts have been dedicated to fulfilling the void left by the harrowing exploitation of nature. This partnership with LENZING™ ECOVERO™ has further built a dialogue on sustainable fashion, thus focusing on the brand’s ideology on sustainability and ecological harmony, contributing to a cleaner, eco-responsible environment.

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Shri Vaishnav Institute of Textile Technology of Shri Vaishnav Vidyapeeth Vishwavidyalaya organized a Fashion show- "Vinirmah 2020" on 29th January, 2020. Mr. Virendra Goel, MD, Deepak Woollens Ltd. was the Chief Guest of the Vinirmah-2020.

The Director, SVITT Dr. R. K. Datta informed that more than 100 students from various Institutes have participated. This Fashion Show was conducted with more than 10 themes as Wedding, Banjara, Khadi, Aghori Sadhu, Jocker, Retro, Billioneri etc. It was amazing piece of small cloth become great outfit fashion industry is the developing in our country. This fashion show will provide platform for our young adults to develop and get face fame in the fashion industry.

On this occasion, Hon. Vice Chancellor, Dr. Upinder Dhar also encouraged the students and expressed the congratulations to them.

The Chief Guest, Mr. Virendra Goel said that ‘Fashion is not about is to enhance the person feel good fact or
the occasion, fashion start from the fibre, different types of fibre, by the great different impact weaving is also of the different types. Textile industry is growing fast now; It is the opportunity for the upcoming artists'.

The different titles have been given i.e.

- Mr. Vinirmah
- Ms. Vinirmah
- Best Dress-up (Male) - Mr. Pratik Patel
- Best Dress-up (Female) - Ms. Khushi
- Best walk (Male) - Mr. Gaurav
- Best walk (Female) - Ms. Hasmeet Kaur
- Best Designer - Mrs. Madhurima

Mr. Amitabh Singh Chauhan, Mrs. Seema Mishra and Mr. Harish Sharma were the Judges of the event. The students from B.Sc. Fashion Design of SVVV have also participated with their own designed dress. At last everybody enjoyed the DJ Night.

At the end convener Mrs. Yogita Agrawal proposed the vote of thanks.

Women's day was first celebrated in 1909 in the USA where this observance was termed as National Women's Day. It was in 1975, when the UN officially proclaimed 8th of March as International Women's Day. The hassle has continued for over 45 years. Women across the globe are still working towards establishing gender equality. Though this evolving international agreement of stopping discrimination on the basis of gender has become more acceptable, change has remained very slow to mark a significant difference in the lives of women who face the fiercest forms of suppression.

"The latest figures show the global gender gap narrowed slightly to 68.6%. But gender equality is still almost a century away at the current pace of change." - World Economic Forum

Not to one's surprise, there is not even a single country that can claim to have achieved total gender equality. The laws are supportive for women, but there still are multiple obstacles, especially cultural and patriarchal that block the road to women empowerment.

A rising aspect of gender equality is equal pay for equal work. Women worldwide are underemployed and sadly they also have limited career options. Those who manage to break the shackles of narrow-mindedness and step out of the virtual barricade they're confined by, often struggle to gain respect and acknowledgement for their work.

Economic inclusion and education have helped women come a long way, yet there are not many women in positions of power. Women, even today, face multiple forms of violence at home and in public owing to the widespread misogyny.

The theme for International Women's Day (8th March) 2020 is - I am Generation Equality: Realizing Women's Rights - aiming at bringing in different generations to collectively tackle the challenges to gender equality.

Women empowerment and gender equality are particularly important for industries as standing up against the malpractices and working towards equality is a win-win situation for every organization. Still, there are not many business groups who are dedicated to bring about this change. Sitting on the fence and supporting the cause without taking action is support in no form. Now is the time to pick up the torch and march ahead.
As a company working with Spinning industry - predominantly considered a Men’s only arena - we visited several spinning mills in India to find out where do we actually stand on the grounds of gender equality and we did find quite a few gems. We were also glad to know there are people who are earnestly willing and working to provide women the rights and respect they deserve.

Chitra and Elakkiya of KPR Mills

KPR Mills, known for its superior quality yarns is located at 23 kms east to the city of Coimbatore in South India. This unit has 84 high production Truetzschler cards. Well carded is half spun and the settings and maintenance of these card surely contribute to the quality of yarn manufactured by KPR. Ms AElakkiya, a 22 years old cheerful young girl, is responsible for doing all the settings of these 84 cards. She is working at KPR mills for last 4 years and is very comfortable with Truetzschler carding machines owing to their ease of doing gauges and the safety aspects of the machines.

She is ably assisted in the duties by Ms K Chitra who is also working in KPR since last 4 years. Coming from a very humble village back ground, both the girls have thoroughly mastered the latest German carding technology. KPR management also has a major role to play in their success by providing them good hostel facility, learning opportunities and a safe working environment. Ms Elakkiya, is the first and perhaps the only Forewomen of the Indian spinning industry. In a message to other women, both the girls said that they would continue to work even after their marriages and all women should develop their own skills to compete with men.

The Vardhman Group believes and strives to achieve excellence through a culture of innovation and continuous improvement and is committed to investing in the business with initiatives directed at long-term sustainability. Their unit Vardhman Yarns is located 30 kms South of Bhopal in Central India with women forming a considerable part of the work force.

Ms. Vidhi Raghuvanshi completed B. Tech in Textiles Technology with Honours from Shri Vaishnav Institute of Technology and Science, Indore in 2015.

She is working in the production department since the beginning of her career at Vardhman. Hitherto, it was a man's speciality to allocate labour, dedicate machines as per the spin plan, count pattern and the production requirements received from the management. It was challenging for her at first, to manage staff and machines besides achieving daily targets. However, with the support of seniors, now she not only performs her duties well, but also confidently works in the night shifts.

Ms Priya Kumari, B.Tech in Textile Technology from NITRATechnical Campus, Ghaziabad, has recently joined the production department. She is well versed with Truetzschler's as also other machines including ring-frames. Ms Priya and Ms Vidhi dream to be a part of the higher management of Vardhman and lead a team independently in the coming years. Ms Priya expressed her opinion on gender equality by saying that "the efforts to empower women transform into an endeavour to develop the entire Nation". While Ms Vidhi in her message on Women's day said that "An independent woman raises empowered children who build an open-minded next generation dedicated to reform the society".
Ms Shivani Agarwal, M.Tech from IIT Delhi, is working in the R&D department of Vardhman since July 2019. She studies the effect of changing parameters and settings on Truetzschler cards on the product quality including waste and the outcomes of maximum yarn realisation at best quality norms. Ms Shivani very emphatically said that “Women who are in a position to bring about a change must act as a mentor to other women and try to change the stereo-type mentality prevalent in our country”.

Ms. Aarti Bangde, B.Tech, associated with Vardhman from 2015 started her career in the production department after being selected via campus interview. She is working in the Learning and Development department and eagerly interacts with other women coming from rural backgrounds. She is also a part of the PACE (Personal Advancement and Career Enhancement) program wherein training is provided to females via different modules including communication skills, problem solving, decision making, stress management, financial literacy etc. About 200 female workers in the campus have undergone this specialised training that enhances skills, builds self-confidence and develops their personality. Ms Aartifeels delighted as she can, even in the beginning years of her career, contribute to the society and help transform the lives of several women.

Purani Textile is a very small mill on the outskirts of Coimbatore city. Ms N Poornima, B.E and MBA, is assisting her father in handling the day to day activities of the mill for last 1 year. She is confident that soon she will take the reins of the entire mill in her hand and be a role model as to how to successfully run a textile mill. In the same mill Ms Subbulaxmi, B.E in Computer Sciences is working in the quality department. She aspires to be a Textile Technologist. Coming from an entirely different background, Ms P Devi Priya works in the carding department as a tenter. She has done I.T.I. course in electrical. Her mother and father work as daily labourers at different places and she has 2 brothers and 1 sister in the family. In spite of this penurious situation Ms Devi Priya wants to do higher studies and get a government job.

Shri Cheran Synthetics is part of the Pallava Group. Their units are at Veppadai, 120 kms east of Coimbatore. The group is known for 40 years of reliability, integrity and reverence in the spinning and weaving industry. Initially focussing on the high-end fashion fabric industry, now the same is made available to the masses which is a revolution created by modern day brands. Ms S.Deepika, 24 year young Diploma holder in Textile technology from the reputed SSM college is working in the Quality department since 6 years. Her father and mother work in a nearby weaving unit while her brother is pursuing costume designing course. One of her job is mainly to check the hank, CV%, Uster%, thick spots, trash and neps in the card sliver. Over the years she has so much confidence on the Truetzschler technology that the values shown on the card commander and the values shown on the latest MAG testing equipment’s in their laboratory are same. She has a dream to start a business for her father. On asked that which cards would she prefer if she were to start a spinning mill, she smilingly replied “Obviously Truetzschler”. For the women empowerment she remarked “All women are special and we should not compare working and non-working women. Every woman is a role model and contributes to the society in her own special way”.

Truetzschler - With so many entities making an effort, how can Truetzschler lag behind in Women empowerment. At the Truetzschler factory in Ahmedabad, the scenario is upbeat as the management has recruited many women candidates purely on their educational qualifications and thereby pushing aside the traditional gender bias.
Ms Pooja Patel, B.E. (Mechanical), is working in the Truetzschler Training Centre, where she imparts training to young persons from rural backgrounds. The courses include CNC operator, Welding operator and Fitter mechanical assembly. The courses last for one year wherein they are also given training in soft skills development. This course is totally free and a stipend of Rs.6000/month is also given to the students. Till now about 30 students have been absorbed in the Truetzschler factory.

Ms Krishna Patel, B.T (Mechanical), started to work in the production department since 2017 and today works in the Quality assurance department. She is happy that she has proved her mettle in the manufacturing unit. She feels that women and men should not be compared as they are both individual entities. She is proud about the fact that her parents supported in all her ambitions.

Ms. Varsha Jamkhedkar, Masters in Textile Technology, mother of one child, is working in the Project Engineering department for last 2 years. She helps in preparing layouts for customers with various count patterns and multiple raw material components.

She acknowledges the support given to all women employees by the Truetzschler management which help them in carrying out their duties in a safe and healthy environment. In their message on Women’s Day the ladies said “Salute to all women who are a symbol of bravery and excellence.”

Truetzschler’s Coimbatore service station caters to about more than 1000 spinning mills in south India. All generations of carding machines are running in the region. An important activity of this service station is to repair the highly sophisticated PCB’s in a short time and return to the customers to reduce downtime of the machines. The mother of a 4-year young daughter and a Diploma holder in Electronics, Ms M. Kabinaya, is responsible for this very important after sales activity. Proficiently trained at Truetzschler, Ahmedabad, she is well versed with all the PCB’s and their servicing. She is working here since last 7 years and has gained the confidence of many customers. On the occasion of Women’s day, she said “All women should follow their passion and not leave it for any reason”.

Since the beginning of mankind, or rather womankind, notwithstanding themselves by the constraints of poverty, deep-rooted social bias and stiff opposition from their own families, women have always pushed their limits and boundaries! The one quality women have passed down from generation to generation is - being persistent. Many of the women mentioned above may not be the "big" achievers, but for us they are the Super Heroines who directly or indirectly contribute to our success. We are certain there are many other unsung heroines out there whose voice is yet not heard, we applaud their contribution too. As a conscientious citizen of the corporate society, Truetzschler salutes all the Women and pledges to take honest efforts to make a gender balanced world on the planet Earth.
9th Hometex Tech Expo
Date : 13th to 15th March, 2020
Venue : Anaj Mandi Complex, Panipat
Contact : Mr. Rajesh Sinha / Mr. Manoj Arya
Key Events & Trade Fairs
Anmol Plaza, Plot no. 7, Sector 8,
Kharghar, Navi Mumbai - 410 210
Mobile : 9324077881 / 9718514089
E-mail : info@essentialtradefairs.com,
hometex@gmail.com
Website : www.essentialtradefairs.com

Heimtextil India
Date : 16th to 22nd March, 2020
Venue : Bombay Exhibition Centre, Mumbai, India
Organiser : Messe Frankfurt, Ludwig-Erhard-Anlage 1,
Frankfurt, 60327, Germany
Website : https://heimtextil.messefrankfurt.com

GartexTexprocess India
Date : 19th to 21st March, 2020
Venue : Hall No. 2, Bombay Exhibition Centre, Mumbai,
Contact : Building No. 9, Lower Ground Floor,
Sant Nagar, East of Kailash, Near Vodafone
Store, New Delhi, Delhi - 110 065
Tel. : 011 4646 4848
Website : www.gartexindia.com

IND-TEXPO 2020
Date : 17th to 19th March, 2020
Venue : CODISSIA Centre, Coimbatore
Contact : The Cotton Textiles Export Promotion Council
(TEXPROCIL)
Engineering Centre, 5th Floor, 9 Mathew Road,
Mumbai 400 004, INDIA
Tel. : (+91) (22) 49444000,
Fax : +91(22)23632914
E-mail : events@ind-texpo.com
Website : www.texprocil.org

7th Non Woven Tech Asia 2020
Date : 05th to 06th June, 2020
Venue : Pragati Maidan, New Delhi, India
Contact : Radeecal Communications
402, 4th Floor, “Optionz” Complex, Opp. IDFC
Bank, Between GirishColdrink and Xaviers
Corner, Off C.G Road, Navrangpura,
Ahmedabad- 380009 Guj
Mobile : +91 91734 40725
E-mail : sales@nonwoventechasia.com

76th All India Textile Conference
Theme : Indian Textiles - Global Focus
Date : 09 & 10th October, 2020
Venue : Platinum Hall, Sarsana, Surat, Gujarat, India
Contact : Mr. Miness V. Adhvaryu
President, The Textile Association (India) - South Gujarat
Mob. : 9824397387
E-mail : kushalweaving@hotmail.com

11th India International Textile Machinery Exhibition
Date : 10th to 15th December, 2020
Venue : India Exposition Mart, Knowledge Park II,
Greater Noida
Contact : India ITME Society
1210/1211, Dalal Tower, A wing, 12th Floor,
Plot No. 211, Nariman Point, Mumbai- 400 021
Tel. : 40020233, 22020032, 6630 3834
Fax : 022-2225 1578, Mobile: 7303456667
E-mail : itme@india-itme.com, itme@itme-africa.com

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