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VOL. 72

NO. 5

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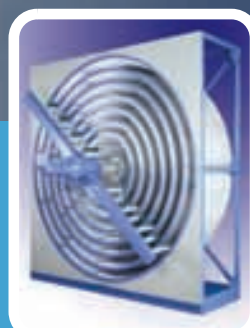
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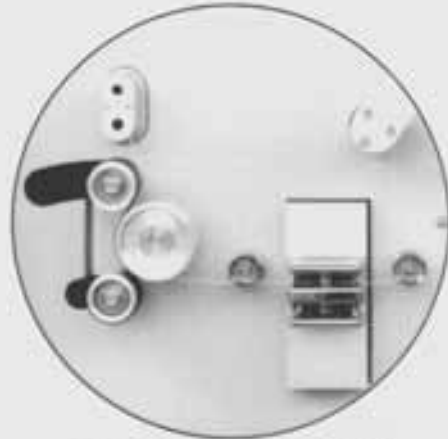
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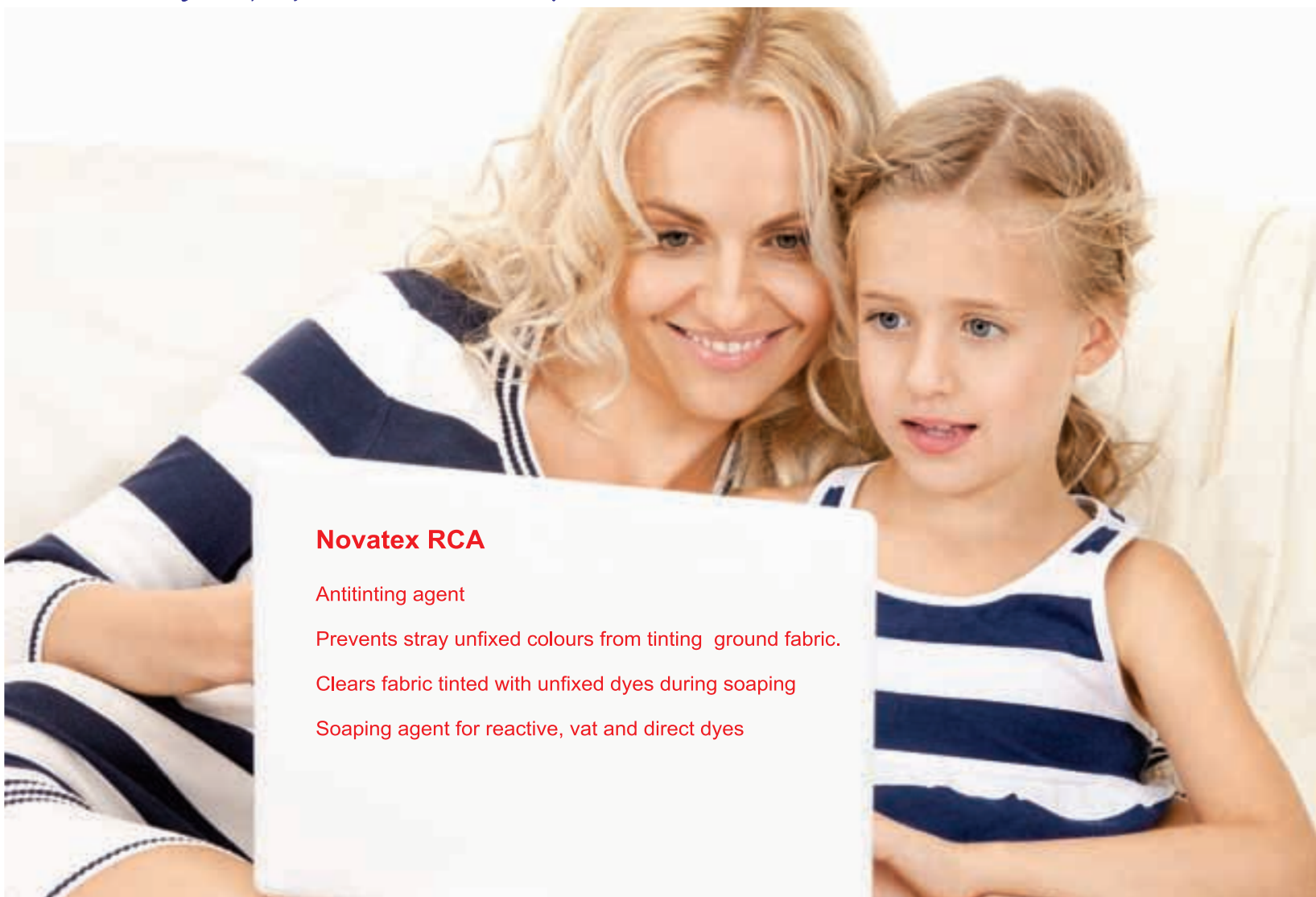
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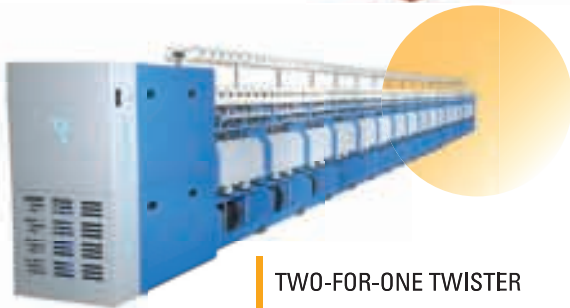
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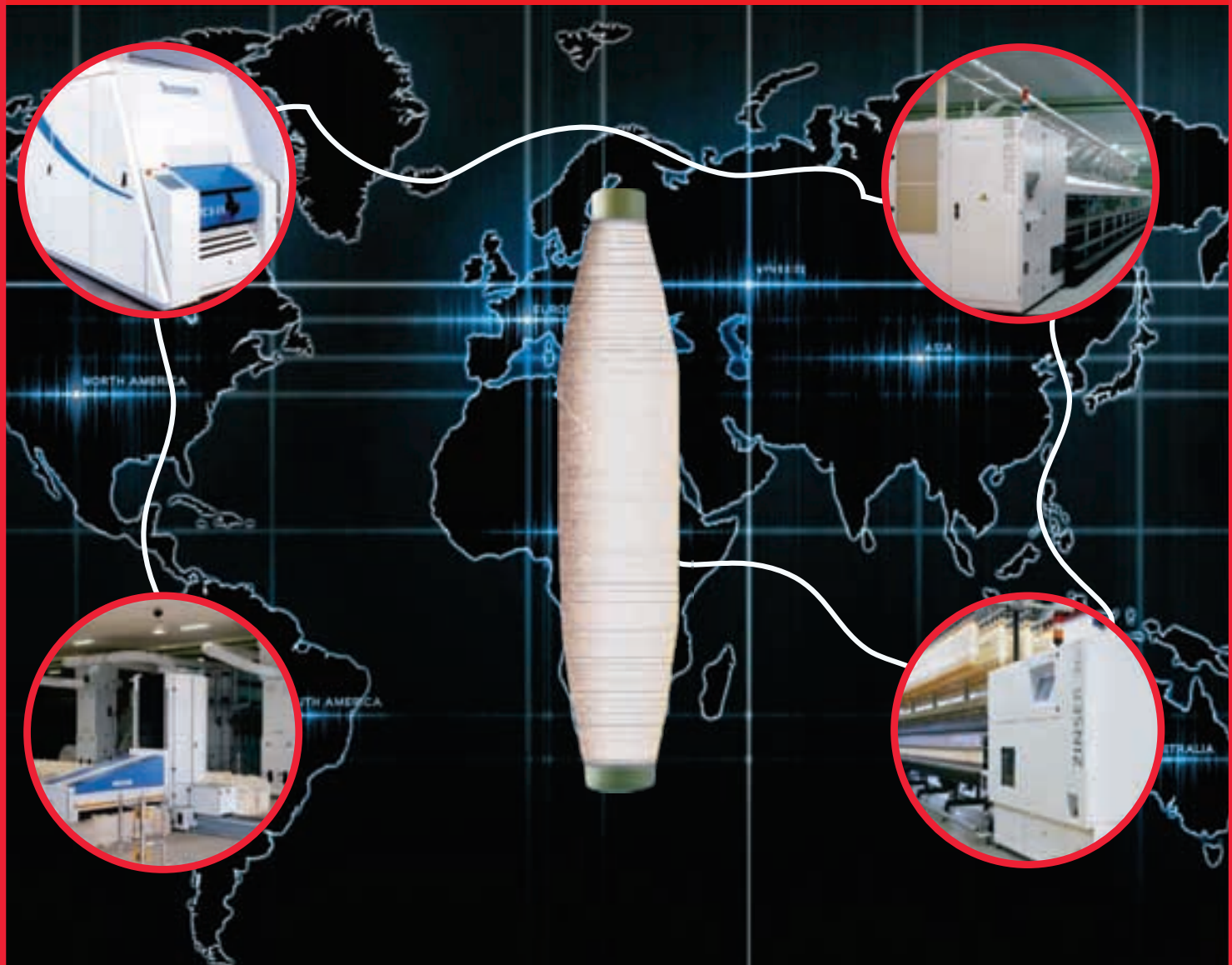
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## Contents

<b>Editorial - Corporate Sustainability: Key to true prosperity</b> <i>Prof.(Dr.) M.D.Teli, Chairman, Editorial Board, JTA</i>	279
<b>Axial &amp; Torsional Straining Analysis in Compact Yarns</b> <i>M. R. Srikrishnan &amp; R. C. Nayar</i>	283
<b>Studies on Processing of Tasar Silk Waste in Mill Spinning to Produce Quality Spun Silk Yarn and its Characterisation</b> <i>Kariyappa, K. P. Shivakumar, P. M. Damodara Rao, Subrata Roy &amp; T. H. Somashekar</i>	288
<b>Studies on Trace Element Analysis in Natural Antimicrobial Agent- Chitosan</b> <i>V.D. Gotmare &amp; Vinay G. Nadiger</i>	295
<b>Microencapsulation: Revolution in Modern Textile Era</b> <i>C. R. Meena, K. Avinash, P. B. Tayade &amp; J. B. Soma</i>	300
<b>Optical Fibers for Smart Clothing &amp; Technical Textile Applications</b> <i>M. Parthiban, M.R. Srikrishnan &amp; S. Viju</i>	308
<b>Indian Garment Industry: A Comparative Study of Growth Trends in Domestic and Export Market</b> <i>R. N. Joshi</i>	313
Texspecial : <b>An Analysis of Current Economic and Technological Environment as a Precursor to S &amp; T Development</b> <i>M.K. Bardhan</i>	318
Texnotes : <b>Greenhouse Effect</b> <i>Rachana Harane</i>	254
<b>OTHER FEATURES</b>	
Advertisement Index	325
Unit Activities	328
News	330
Conference Report	341
Product Technology	355
ATA/ GMTA Result	356
Forthcoming Events	361

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## Editorial

### Corporate Sustainability : Key to True Prosperity

There have been two very good Textile conferences - AITC held in New Delhi as well as Joint Technological Conference of all textile research associations held in BTRA, Mumbai and I was fortunate to be there for both of them not only just as the active participant but also, as Chairman of Technical Session on Emerging Technologies. The first AITC conference as usual was well attended and this time they followed the new concept of having panel discussion rather than customary paper presentation. There was quite a lot interest generated as participants were free to ask varied questions and so also the panel as they did not have to prepare a formal presentation on such subjects. Delhi TAI needs to be praised for all their efforts.

As far as conference at BTRA was concerned, though it was confined to Textile Research Associations and their work, it was good platform to show-case their strength and project their image before the Textile Industry as to what kind of research assistance in problem solving can be expected of them and in what field. The session of emerging Technologies was devoted to experience sharing on the subject like use of plasma technology in functionalization of Textile material, use of poly-pyrrole as the conducting polymer in obtaining textiles with conducting properties and nano-fibres for filtration applications. All the three technologies are indeed emerging and will surely find more and more applications in Indian Technical Textile field.

This issue of Journal of Textile Association consists of articles relating innovation, waste minimization, functionalization of textiles with environment in mind, techno commercial aspects of the industry and the present environment etc. Increasingly one challenge is coming on the fore, is how the good things which we perceive can be made sustainable? It is indeed becoming an issue at every level. When attractiveness of any industry is to be judged, they say, PESTEL analysis should be first carried out: What it means is that one has to see P: Political environment in which industry is functioning; E: Environmental legislations and requirements sought; S: Social accountability and relationship with the stakeholders; T: Technology employed: Vintage vs Modern; E: Economic performance; L: Legal bindings. All these dimensions of analysis of business decide its attractiveness.

As far as Textile industry is concerned, indeed although the political support had been there, it was always sporadic and today the very stability and its sustenance is in question. Environmental laws are internationally governed and we too have seen dire consequences of violating these laws, which has practically destroyed Tirupur market of more than Rs.10,000 crores, because of our business as usual practices without being concerned about the environmental laws. Technological up-

gradation is a must, but very slow investment in this aspect is being seen because of uncertain policies on FDI and also fluctuation in raw material prices, including interest rates, power crisis etc. Economic performance thus gets affected in such surrounding. Legal frame work is becoming increasingly stricter and enforcement of the laws has become the necessity. On the social accountability side too, CSR projects are being run by some of the companies, but a lot is needed to be done, beyond the green wash and the need is to go beyond simple compliance.

In other words, having good knowledge of the analytical system or the success stories, is not sufficient ; It is important that the good Brands take a leap on Corporate sustainability which not only look into creating value for their share holders, but they have to think beyond and create value for all the take holders. Spinners cannot simply grow if they wish to squeeze Cotton Growers and demand ban on exports to have lower price. Fabric manufacturers can not simply create pressure on Government policies in their favor to get yarn at low cost. Garment manufacturers too have to think that, if they want to grow in a sustainable way, it is important that all the suppliers in the value chain grow with reasonable rate, so all flourish and growth does not become lopsided or imbalanced. This is what called as Win-Win situation and healthy growth and it's high time we realize this fact.

Why our Garment manufacturers do not get right price from the Brands? Because they are falling prey for the short term self-centered profits. It's important that they all come together and decide what could be base price, which can give every one opportunity to grow down the value chain and that should be minimum price offered and not less come what may. Only then people in this business will be able to think about their employees, their Technology, the environment and so on as they will have economic muscles sufficient to take care of it. Simply on Sensex, when company's stock price grows may make share holder happy, but is it not important that such profits should not be due to polluting environment which erodes the capacity of our future generation, to run such companies. No one has right to do that, and it is the true definition of sustainability. Hence a sustainable organization of today has to think both in short term as well as in long term. For immediate goals, economic performance, environment protection, minimization of waste, cost competitiveness. It has also to make aware the stake holders such as Government agencies, NGOs, Workers, their community around as to what kind of positive contribution it is making in enriching financially as well as culturally the community around. On the long term horizon, it has to invest in capability building of their professionals and encourage innovation and disruptive technology on one hand, whereas on the other, create new markets for growth including those markets which may be serving people at the Bottom of pyramid.

When such a multipronged strategy is employed, companies can think of making themselves truly sustainable-being competitive today and preparing for tomorrow with all economic, environmental and social compliance and beyond.



Prof.(Dr.) M.D.Teli,  
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# Axial & Torsional Straining Analysis in Compact Yarns

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## Abstract

The influence of axial straining and torsional straining on the tensile characteristics of compact yarns is the main focus of this study. The tensile tests were carried out at different strain rates and gauge lengths on compact yarn of 40s count. The representative load - elongation curves were drawn for the yarn at all strain rates and gauge lengths using Meredith experimental procedure and the slope values were measured at three regions of each and every curve. The tensile strength increases as the strain rate increases. The breaking extension decreases as gauge length increases. From the representative graphical analysis it has been found that the slope increases with increase in strain rate and is uniform along the path of the curve. The tensile strength decreases on straining by stretching and relieving operations. As far as the torsional straining is concerned the untwisting and twisting operation imparts more weakness to the yarn.

## Keywords

Compact yarn, Strain rate, Slope, Breaking elongation, Gauge length.

## 1. Introduction

In spite of modernisation and rapid technological development in the field of ring spinning, the mechanism of ring, traveller and spindle has remained almost the same until now. Furthermore, ring spinning remains the dominant spinning technology even today. The producers of modern spinning frames have been developing the machines with improved construction of different working elements and optimal spinning geometry, with a ring diameter of 36 mm, a tube length of 180 mm and spindle speed of up to 25,000 min<sup>-1</sup>. All serving and transport functions have already been automated. A high linking level of spinning and winding, and even of the winding and twisting technological processes have been achieved using the elements of computer-assisted automation and control. Besides the conventional functions (spindle speed, delivery speed, productivity, twist, draft, machine efficiency), computer-based systems control enable the optimisation of spinning conditions

like, formation of bobbins, position of ring rail, automated doffing and setting of empty tubes, cleaning and oiling of main machine parts. Construction improvements of different working elements of the ring-spinning frame and optimised spinning geometry of the continuous form of fibres (roving or sliver) enable increased productivity, better yarn quality, as well as flexibility and profitability of the process.

All these optimisations and improvements of the ring spinning frame, however, have not enabled the reduction of the spinning triangle, which can be defined as the most problematic and weakest spot in the yarn formation process using the ring-traveller system [1-2]. The spinning triangle that occurs while the yarn is formed is the cause of many fibres leaving the drafted roving, or being partly spun into the yarn with one end only. This causes greater waste of fibres, lower exploitation of fibre tenacity in yarn, poorer appearance and greater hairiness of the spun yarn. The newest research in the field of ring spinning has shown that modification of a three-cylinder drafting equipment with tow aprons in a region after front drafting rollers enables ring spinning to proceed with a minimised spinning triangle, or even without it at all. This modified process is called compact or condensed spinning. Com-

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compact spinning technology has been gaining much more interest since its first commercial introduction at ITMA-Paris in 1999. These spinning machines have been installed in several spinning factories all over the world. Compact spinning is a modified ring spinning process which has special advantages, and can be used in both short and long-staple yarn spinning areas.

The larger spinning triangle prevents the edge fibres from being completely incorporated into the yarn body. If the enlarged view of ring spun yarn is examined, it is easy to see that the integration of many fibres is poor and therefore make no contribution to yarn strength. In other words, if all fibres could be completely integrated in to the yarn, both strength and elongation could in turn be further enhanced. It is thus obvious that even ring-spun yarns are not yet ideal as regards yarn structure [3]. However, in compact spinning, the drafted fibres emerging from the nip line of the front roller of the drafting arrangement are condensed in a line. The development of the compact spinning process began with the desire to achieve a significant step to yarn quality by influencing the spinning triangle. The most important advantage of the compact spinning technique is a reduction in yarn hairiness, which brings new opportunities for the production of different products in future [4]. The weaving and knitting divisions can profit from the compact spinning system.

The tensile behaviour of spun yarns is a function not only of the fibre characteristics such as length, fineness and strength but also of the nature of fibre arrangement in the yarn. Thus yarn structural parameters in addition to fiber physical properties play a significant role in determining the tensile behaviour, namely, strength, modulus, elasticity, yield stress, work of rupture and elongation properties of spun yarns. In recent years, many research workers [5-6] have reported on the properties and performance aspects of yarns and fabrics that represent the new spinning systems. Even in the traditional apparel end use, yarns and fabrics undergo stresses and strains that are significantly different from those applied in the standard yarn and fabric tensile tests. Thus the tensile behavior of yarns evaluated under standard test procedures cannot always be expected to fully reflect the performance of their end products. More recently, researchers have shown that yarn strength evaluated at shorter gauge lengths is a better predictor of fabric strength as opposed to the strength evaluated at the standard (300mm) gauge length. The importance of understanding the stress/strain response of yarns and fabrics under nonstandard loading

conditions can be further appreciated if one considers the ever expanding range of their non - traditional applications - aircraft, space vehicles, automobiles, reinforced composites and a host of other industrial uses.

From the immemorial, yarns have been produced by twisting. A majority of the yarns/fibres produced in today's world undergoes twisting at some stage or the other.

Torsional forces are involved in the action of twisting. When the fibres are twisted, yarn is formed. The cohesive forces arising out of this twisting are responsible for the fibres to remain together in the yarn structure. The twisting is also responsible for the strength of the spun yarn. In the case of a spun yarn as the twist increases, the strength increases up to certain level after which an increase in twist will lead to decrease in strength. Twisting also creates an opposing torsional force. In the case of a spun yarn excessive twist will cause an excessive residual torque which is responsible for the snarling tendency. The present work is designed to study the influence of longitudinal straining & torsional straining separately on the tensile characteristics of compact yarns. The longitudinal straining is carried out by subjecting the material to different strain rates at various gauge lengths and by stretching and relieving operations. The torsional straining is carried out by twisting and untwisting operations.

## **2. Materials and methods**

### **2.1. Materials**

Compact yarn of 40s count (Cotton) produced by com4 spinning system is selected.

### **2.2. Longitudinal strain**

The tensile tests were carried out at the following five different strain rates, 50, 100, 200, 500 and 1000 mm/min under different gauge lengths namely 150, 200, 300, 400 and 500 mm. Tensomax 7000 testing instrument was used for carrying out the testing operations. The longitudinal straining by stretching and relieving operations were also carried out on yarns at a strain level of 10% of the breaking extension.

### **2.3. Torsional strain**

The torsional straining by twisting and untwisting operations was carried out on yarns at a strain level of 10% of the original twist.

### **2.4. Formation of slope table**

The Meredith's [7] construction method is adapted to form representative load elongation curves. Five curves are selected whose breaking strength and breaking elon-

gation values are very nearer to the average breaking strength and elongation values. For each and every curve the total elongation is split into various parts including all the slope changing points. The loads corresponding to the various percentages of breaking elongation is noted for five curves. These loads recorded are converted into percentages of their respective breaking loads. These percentages of loads and elongation were then averaged for five curves. The percentage loads are converted into real values based on average breaking load. The typical representative force - elongation curve was drawn through these points. The slope tables were prepared from these curves.

### 3. Results and Discussion

#### 3.1. Influence of strain rate on the tensile characteristics

**Table 3.1** Effect of strain rate on breaking force values at different gauge lengths.

Gauge Length (Mm) Strain Rate Mm/Min	150	200	300	400	500
50	275.70	267.66	262.37	253.63	255.71
100	289.32	283.20	274.72	271.78	278.62
200	301.13	289.96	281.30	286.22	272.12
500	302.82	296.17	295.00	297.11	286.32
1000	313.18	303.84	306.40	306.97	301.67

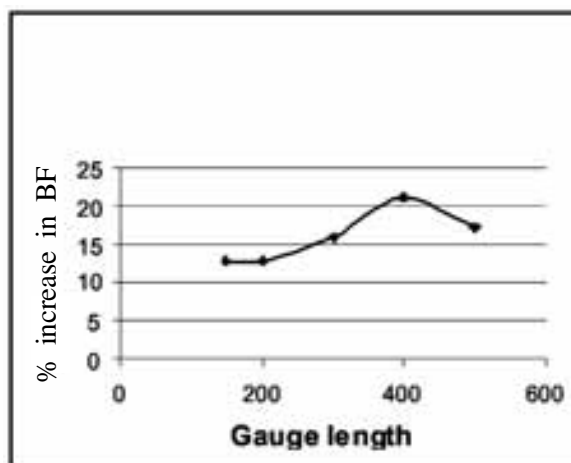
**Table 3.2:** Effect of strain rate on breaking elongation values at different gauge lengths.

Gauge Length(Mm) Strain Rate mm / min	150	200	300	400	500
50	5.55	5.53	5.50	5.34	5.48
100	5.62	5.60	5.54	5.50	5.65
200	5.67	5.65	5.60	5.70	5.42
500	5.69	5.58	5.57	5.78	5.79
1000	5.74	5.64	5.60	5.84	5.72

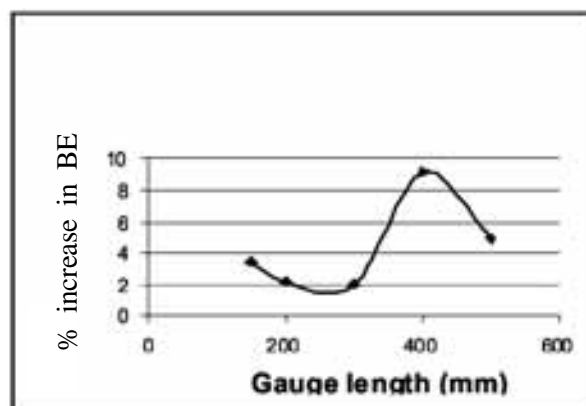
**Table 3.3: Effect of strain rate on breaking work values at different gauge lengths**

Gauge Length(Mm) Strain Rate mm / min	150	200	300	400	500
50	134.79	157.25	226.08	271.60	352.18
100	143.13	172.69	237.56	307.40	392.06
200	150.85	177.00	252.72	331.53	376.66
500	146.90	178.32	261.95	347.70	418.55
1000	154.78	184.73	273.68	362.13	431.02

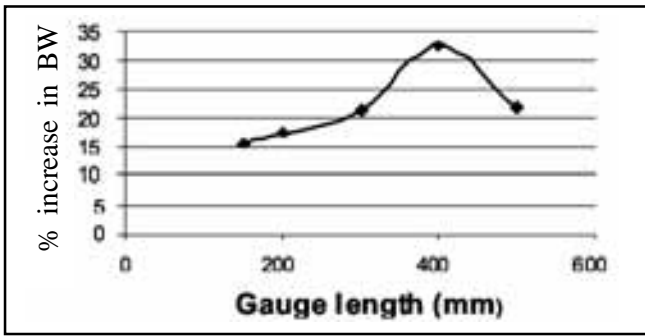
The Tables 3.1, 3.2 & 3.3 shows the influence of strain rate on the tensile characteristics at different gauge lengths. It is found that the breaking force, breaking elongation & breaking work values increase with increase in strain rate at all gauge lengths.



**Fig.3.1:** % increase in Breaking force(BF) value with strain rate at different gauge lengths



**Fig.3.2:** % Increase in Breaking elongation(BE) value with strain rate at different gauge lengths

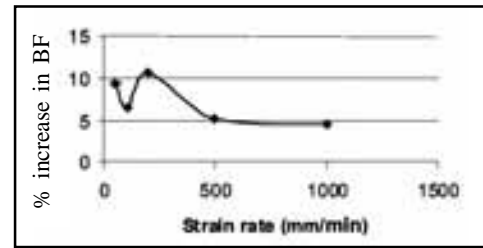


**Fig.3.3: % Increase in Breaking work (BW) value with strain rate at different gauge lengths**

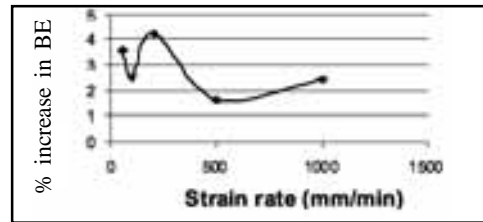
From the Figures 3.1, 3.2 and 3.3 it is seen that from lower to higher strain rate, the percentage wise increase in breaking force, breaking elongation and breaking work values increase with gauge length up to 400mm and then decreases.

**3.2. Influence of gauge length on the tensile characteristics**

As per the Tables 3.1, 3.2 and 3.3, it is observed that as the gauge length increases the breaking force and breaking elongation values decreases but the breaking work value increases.



**Fig.3.4 : % Decrease in breaking force value with gauge lengths at different strain rates**



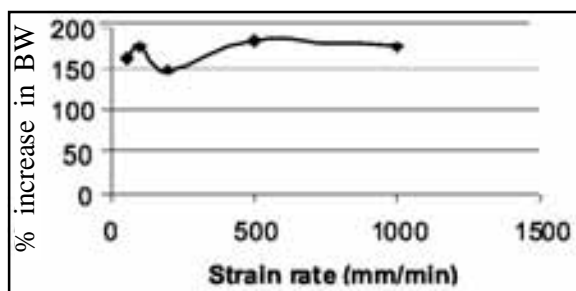
**Fig. 3.5: % Decrease in breaking elongation value with gauge length at different strain rates.**

The Figures 3.4 and 3.5 shows that the percentage wise drop in breaking force and breaking elongation values respectively due to increase in gauge length decreases with increase in strain rate. A higher percentage drop is observed at 200 mm/min strain rate value.

**Table 3.4 Slope values of load elongation curve of Compact yarn at three regions at all gauge lengths and strain rates.**

Gauge length (mm)	Strain Rate (mm/min)	Initial 1(Deg)	Middle 2(Deg)	Final 3(Deg)	Tan 1	Tan 2	Tan 3
150	50	38.6	38.6	38.6	0.798	0.798	0.798
100	42	42	42	0.9	0.9	0.9	
200	44.	44	44	0.965	0.965	0.965	
500	44	44	44	0.965	0.965	0.965	
1000	45	44.5	44.5	1.000	0.982	0.982	
200	50	39.5	39.5	39.5	0.824	0.824	0.824
100	43	43	43	0.932	0.932	0.932	
200	45.5	45.5	45.5	1.017	1.017	1.017	
500	39	48.5	42	0.809	1.13	0.9	
1000	53.5	44	44	1.351	0.965	0.965	
300	50	40	40	40	0.839	0.839	0.839
100	55.5	40.5	40.5	1.455	0.854	0.854	
200	43	43	43	0.932	0.932	0.932	
500	40	45	45	0.839	1.0	1.0	
1000	48	45	45	1.11	1.0	1.0	
400	50	42.5	42.5	42.5	0.916	0.916	0.916
100	45	45	45	1.0	1.0	1.0	
200	42	42	42	0.9	0.9	0.9	
500	46	46	46	1.035	1.035	1.035	
1000	45	45	45	1.0	1.0	1.0	
500	50	42.5	42.5	42.5	0.916	0.916	0.916
100	43	43	43	0.932	0.932	0.932	
200	44	44	44	0.965	0.965	0.965	
500	44	44	44	0.965	0.965	0.965	
1000	50	46	46	1.191	1.035	1.035	





**Fig. 3.6: % Increase in breaking work value with gauge length at different strain rates.**

The Figure 3.6 shows that the percentage rise in breaking work due to increase in gauge length increases with increase in strain rate. But a lower percentage increase in breaking work is observed at 200 mm/min strain rate value.

**3.3. Critical load - elongation graphical analysis**

From the representative load - elongation curves the following slope table is prepared. The Table 3.4 shows load - elongation slopes of compact yarns at all gauge lengths and strain rates. From this table the following results are arrived at.

As the strain rate increases the slope value increases at all gauge lengths. Therefore energy consumption is more at higher strain rates.

On the whole it is observed that the slope is more or less uniform from the beginning to the end of the load elongation curve at all strain rates and gauge lengths with more perfection especially in the middle and final portions. This shows that the energy consumption increases uniformly with deformation throughout the loading process in compact yarns. This may be due to the alignment of fibres resulting from compactness.

**3.4. Comparison of three types of straining on yarn performance**

**Table 3.5 - Comparison of three types of straining on yarn performance**

Drop In	Twisting And Untwisting	Untwisting And Twisting	Stretching And Relieving
Breaking Force	28.08%	38.42%	35.96%
Breaking Elongation	29.33%	38.96%	32.29%
Breaking Work	50.00%	46.88%	44.76%

Table 3.5 shows that the yarn is performing better in tensile straining due to stretching & relieving operations than torsional straining. Among the torsional strains

imparted, the yarn performs better in twist-Untwist operation than Untwist-twist operation.

**4. Conclusion**

The breaking force, breaking elongation & breaking work values increase with increase in strain rate at all gauge lengths. The percentage wise increase in breaking force, breaking elongation and breaking work values increase with gauge length up to 400mm and then decreases.

As the gauge length increases the breaking force and breaking elongation values decrease but the breaking work value increases. The percentage wise drop in breaking force and breaking elongation values respectively due to increase in gauge length decreases with increase in strain rate. From the individual graphical analysis it has been found that the slope of the load -elongation curve increases with strain rate at all gauge lengths for the compact yarn.

This slope is very uniform indicating that the energy consumption increases uniformly with deformation. The tensile value decreases due to straining by stretching and relieving operation. The impact due to this operation lies in between the other two methods of straining. Among the torsional strains imparted, the yarn performs better in twist-Untwist operation than Untwist-twist operation.

**Acknowledgement**

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**References**

1. Momir Nikolic, Zoran Stje panovic, Franc lesjak and Andrej stritof , Fibre and Textiles in Eastern Europe, 11, No: 4(43), October - November 2003
2. Hechtl R., Compact spinning systems - an opportunity for improving the ring spinning process. Melliand International, 2, No. 1, pp. 12-13, 1996.
3. Stalder H., Melliand English, 2000, 3, p. E26-E27.
4. Pinar celik and Huseyin kadoglu, , Fibre and Textiles in Eastern Europe, 12 No: 4(48), October / November 2004
5. P.Radhakrishnan and Gan Huang , Rupture behavior of Spun yarns representing Ring, Rotor, Airjet and Friction Spinning, Cotton Incorporated, P 1-11,1997.
6. Salhotra, K.R. and Balasubramaniam P., Fibre Rupture during Tensile failure of Ring and Rotor yarns, Indian J. Text. Res. 9 (3), 4-7, 1984.
7. W.E.Morton and J.W.S.Hearle, Physical Properties of Textile Fibres, The Textile Institue Edition, pp281,1993.

# Studies on Processing of Tasar Silk Waste in Mill Spinning to Produce Quality Spun Silk Yarn and its Characterisation

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## Abstract

In this paper, International quality Tasar spun silk yarn was successfully produced from tasar silk waste on worsted system of spinning. After spinning, degumming loss, yarn realization and economics have been measured. These yarns were tested for characterisation according to international standard testing methods. Results have been compared and analysed as per the requirement of the industry. The results of the investigation are thoroughly discussed.

## Keywords

Mulberry, Tasar waste, Degumming, Spun silk, Hauteur diagram, Imperfections, Tenacity, Elongation, Yarn Yield.

## 1. Introduction

Tasar (Tussah) Silk is copperish in colour, coarse silk used for dress material, furnishings and interiors. It is less lustrous than mulberry silk, but has its own feel and appeal. It is obtained from semi-domesticated multivoltine silkworm, *Antheraea mylitta*. These silkworms feed on the aromatic leaves of Assan and Arjun Trees and build cocoons on the same tree. Tasar culture is specific to the states of Jharkhand, Chhattisgarh and Orissa, besides Maharashtra, West Bengal and Andhra Pradesh. Tasar culture is the main stay for many tribal communities in India. The Tasar raw silk is produced from Tasar cocoons by process of reeling. The Tasar raw silk is used to produce high value products like Sarees, dress materials etc. Tasar cocoons are reelable and generally producing 50 to 60 denier Tasar raw silk. Tasar cocoons weight ranges from 8 to 15 grams, shell weight ranges from 1.5 to 3.5 gms, filament length ranges from 650 to 1450 meter, raw silk The different kinds of Tasar silk waste generated in different process are as follows:

recovery percentages ranges from 50 to 55% and 800 to 1000 number of cocoons are required to produce one kg raw silk of denier 50-60.

- Cocoon waste -Pierced cocoons, Pinhole, rat cut, flimsy cocoon, doubled cocoon, urinated, stained and soil cocoons
- Reeling waste - Deflossing waste, cooking waste, reeling waste, pelade waste and re-reeling waste.

After reeling the raw silk from the cocoons, the unwindable portion of the entangled mass or shorter filament is called as reeling waste which accounts about 50%. This silk waste earlier was not having any commercial value due to non availability of proper spinning technology. Now commercial value for Tasar silk waste has improved by development of spinning technology for processing of Tasar silk waste. It can be used to produce the hand spun as well as mill spun yarn. So far Tasar waste was being converted into spun yarn through Takli (a crude device) and CSTRI spinning machine (i.e. improved hand-spinning device). These devices consume small quantity of cocoons and reeling waste, bulk was wasted without proper utilization. The spun yarn produced in hand spinning has limited scope of utilization, which can be used to produce only coarser material like cheddars, shawls and stoles and can not

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be woven on power loom as well as shuttle less loom and knitting machines.

Hence, this study has been taken to spin the large quantity of Tasar silk waste (cocoon waste and reeling waste) for effective utilization of entire generated waste and to produce superior quality Tasar spun silk yarn. The cocoon waste and reeling waste were degummed without disturbing natural color and spun on Italian technology successfully to produce 2/60s Nm and 2/80sNm counts of Tasar spun silk yarn and 2/60 sNm, 2/80 sNm, 2/20sNm and 2/140sNm counts of Mulberry spun silk yarn from mulberry waste.

These Tasar mill spun silk yarn can be used for manufacturing of all varieties of fabrics i.e. lighter to heavy fabrics like Inner wear, dress materials, fashionable fabrics, ornamental fabrics, chadders, wall hangings and furnishings. These yarns are even suitable for hosiery manufacturing products. The Tasar mill spun silk yarn can be woven on Handloom, Power loom and latest shuttle less looms. Hosiery fabrics can also be produced on both flat knitting and circular knitting machines, hand operated as well latest modern machines. The comparative study has been made with mulberry spun silk processing and its spun silk yarn characteristics. From this study it observed that Degumming loss, processing loss are less in Tasar silk waste processing compared to mulberry silk and Tasar spun silk yarn fetches cheaper than mulberry spun silk yarn in all counts of yarn.

## 2. Materials and methods

100 kgs of tasar waste was purchased from Nagpur, DOS, Maharastra.

100 kgs of Mulberry waste was obtained from CSTRI.

### 2.1. Degumming for mill spinning

After several trials of Tasar silk waste's degumming at CSTRI for standardisation of degumming recipe, the mass degumming was done at M/s Afsal Khan Degumming unit Ramanagaram by using the following recipe:

Step-1: Soap and Soda treatment

First boil with Soap 10 gpl & soda 5 gpl for 1 hr, 2nd Boil with soap 5 gpl & soda 2.5 for 1/2 hr and followed by water boiling for 1 hour.

Step-2: Carbonizing treatment

Sulfuric acid	0.5%
Material to liquor ratio	1:30
Treating in cold solution	10 Minutes
Thorough wash	

To dissolve the cellulose and Chrysalis material.

Step-3: Scrooping treatment

Acidic acid (40%)	0.5%
Material to liquor ratio	1:30
Treated in Luke - warm soln.	20 Minutes

Thorough wash to give scrooping effect to the silk.

Step-4: Hydro extracted -Dried in hot air oven for 6 hrs followed by drying in natural shade -Ammonia gas treatment for 10 minutes, followed by keeping it for 12hours in the same chamber to neutralize the acid -spraying antistatic agent and conditioned for over night.

### 2.2. Spinning

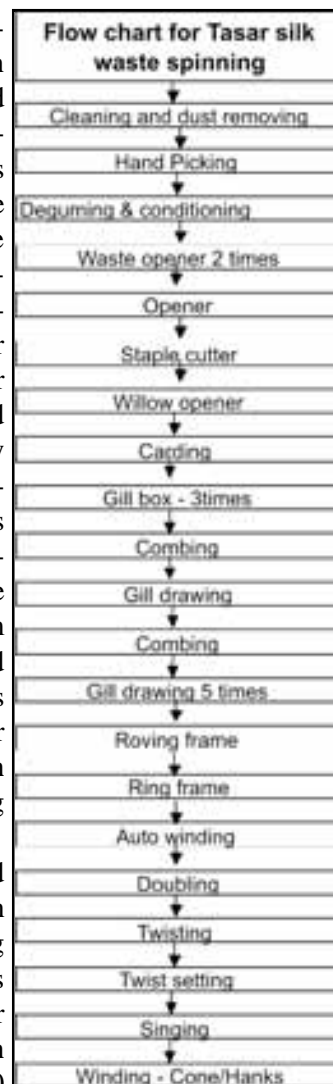
Spinning has been done on worsted system(Italian technology) at M/s Kareem silk as given in flow chart.

### 2.3. Testing methods

#### 2.3.1. Testing of yarn quality

The Following instruments were used for testing of fibre and yarn quality parameters:

- Hauteur value and fibre length distribution have been measured by using Texlab measuring instrument. This is an automatic device uster FL100 for fibre collection. This instrument arranges the fibre according to their length by bear sorter principle and collected fibres analysed by measuring in uster apparatus AL 100. This instrument automatically scans the fibre and gives a diagram and value in printed form. 5 replications have been taken for each sample, each sample weighting about 15 gms.
- Yarn unevenness and imperfection has been measured by using Uster 3. 5 Replications have been taken for each sample. Yarn speed kept was 400



meter per min, recording time 1 min and tension 37.5%.

- Tensile and elongation properties- Eri spun silk yarns have been measured by using Instron tensile tester model no 5000R using IS 1670-1991 testing method - 500 mm GL 20 sec. In this 15 yarn samples have been taken for each variety of spun silk yarn.

### 2.3.2. Statistical analysis

Yarn quality parameters have been analysed through one-way ANOVA using SPSS 11.5 and windostat package.

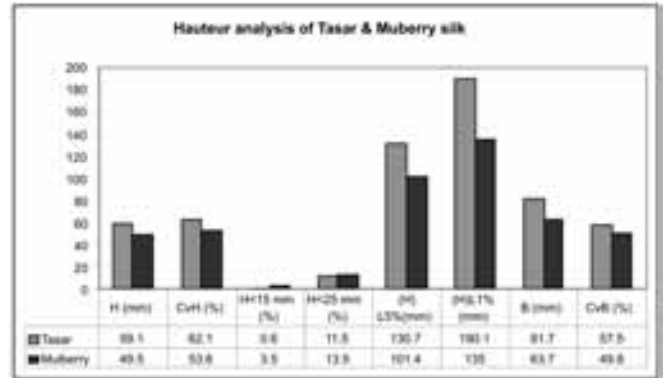
## 3. Results and discussion

### 3.1. Hauteur analysis

The Hauteur distribution curve gives the detailed information about the fibre length distribution by number and other important fibre parameters. For good quality spun yarn and good spinning performance good fibre length distribution is very important.

Graph 3.1 shows fibre length distribution diagram of Tasar silk as well as Mulberry silk fibre. This analysis has been made for measurement of fibre length distribution and short fibre % of mulberry silk and Muga silk, which decides the spin ability and quality of spun silk yarn.

The average value of  $H_{mm}$  is given in Fig. 3.1. From Fig. 3.1 it is observed that Arithmetic average of fibre length ( $H_{mm}$ ) of Tasar silk is higher than mulberry silk by 19.39% which is due to the fact that during tasar silk reeling process maximum good fibre goes as a waste, and so it contributes to the higher fibre length.

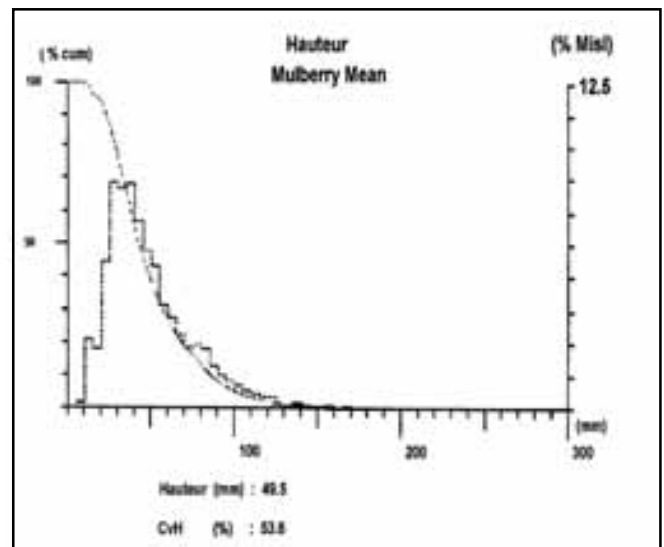
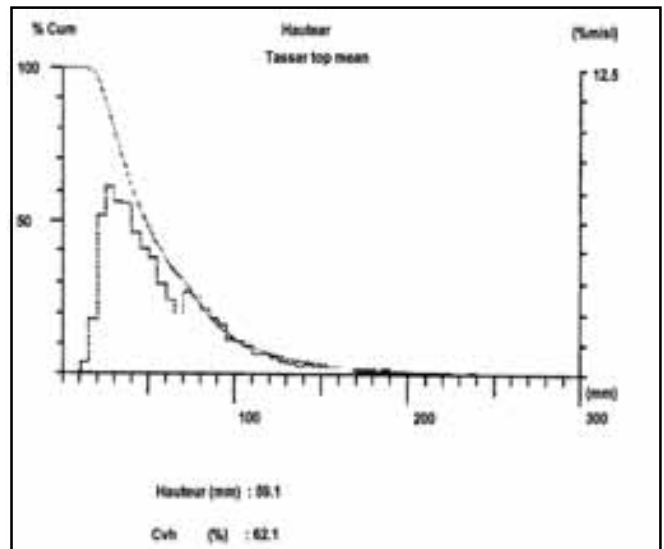


**Table 3.1: Physical properties of silk fibre**

Parameters	Mulberry	Tasar
<b>Fibre Diameter in microns (<math>\mu</math>)</b>	14.33	33.00
<b>CV% of <math>\mu</math></b>	27.56	34.24
<b>Denier</b>	1.901	10.084
<b>Specific weight</b>	1.3067	1.3068
<b>Moisture regain (dry)</b>	10.694	10.230
<b>Moisture Content (wet)</b>	9.661	9.281
<b>Elongation (%)</b>	18.10	29.70
<b>CV %</b>	20.92	24.50
<b>Tenacity (gpd)</b>	3.91	1.36

#### 3.1.1. Arithmetic average of fibre length ( $H_{mm}$ )

It is a mean length of fibre balanced by the section of fibers, increases of  $H_{mm}$  evenness of yarn also increases up to 80 mm then reduces.



### 3.1.2 Co-efficient of variation (CVH)

It is a measure of fibre length distribution. The average value of (CVH) is given in Fig 3.1. From the Fig 3.1 it is observed that Co-efficient of variation (CVH) of tasar silk fibre is higher than mulberry silk by 13.69%. This is due to fact that reeling of tasar silk is not as easy as mulberry silk reeling, due to hardness of tasar cocoons. As a result, tasar silk yarns are prone to more fibre breakages and thus results in higher fibre length variation.

### 3.1.3. Short fibre% <15mm

It is a measure of percentage fibre less than 15mm. It is one of the parameter influencing Neps, thick and thin places in the spun silk yarn. The average value of short fibre % < 15 mm is given in Fig 3.1. From the Fig 3.1 it is observed that short fibre % < 15mm of Tassar silk is significantly lesser than Mulberry silk by 80.3%. This is due to the fact that during Tassar silk reeling process maximum good fibre goes as wastes, due to difficulty in reeling which results in longer fibre length.

### 3.1.4. Short fibre % <25 mm

It is measure of percentage fibre less than 25mm. The average value of Short fibre % < 25mm is given in Fig 3.1 from which it is observed that Short fibre % < 25mm of Tassar silk is significantly lesser than Mulberry silk by 17.39%. This is due to the fact that during Tassar silk reeling process maximum good fibre goes as a waste, due to difficulty in reeling which results in longer fibre length.

### 3.1.5. Longer fibre L5%

It is the length at which 5% of the fibre exceeds the length. It is very important parameter to decide front and back roller setting. The average value of longer fibre L5% is given in Fig 3.1, From the figure, it is observed that longer fibre L5% of Tassar silk is significantly higher than Mulberry silk by 22.42%.

### 3.1.6. Longest fibre L1%

It is the length at which 1% of the fibre exceeds the length. The average value of longer fibre L1% is given in Fig 3.1. From the figure it is observed that longest fibre L1% of Tassar silk is significantly higher than Mulberry silk by 28.98%.

### 3.1.7. Weighted average of fibre length ( $B_{mm}$ %)

It is average value of fibre length balanced by the weight. The average value of  $B_{mm}$  % is given in fig 3.1 from which it is observed that  $B_{mm}$  % of Tassar silk is significantly higher than Mulberry silk by 22.03%.

### 3.1.8. Weighed average of fibre length (CvB %)

It is measure of fibre length dispersion by weight. The average value of CvB % is given in fig 3.1 where it is observed that CvB% of Tassar silk is significantly higher than Mulberry silk by 13.39%.

## 3.2. Tassar spun yarn realisation

### 3.2.1 Comparison of spun silk yarn yield (%) between mulberry and Tassar silk waste spinning

**Table 3.2 : Comparative statement of yarn realisation in spinning**

Sl no	Particular	Mulberry	Tassar	Percentage Difference
1	Degumming loss%	35	19.8	43.43
2	Yarn yield %	24	41.9	42.72
3	Noil yarn yield %	24	24.9	3.61
4	Invisible / unusable loss%	17	13.4	21.18
	Total	100	100	

From the Table 3.2, it is observed that degumming loss in Mulberry silk (35%) is higher than Tassar silk (19.80) by 15.2%. Invisible loss in Tassar silk (13.4%) is lesser than Mulberry silk (17%) by 3.6%. Spun silk yarn realisation in Tassar silk (41.9%) is higher than mulberry silk (24%) by 17.9%. Noil yarn realisation in Tassar silk (24.9%) is higher than mulberry silk (24%) by 0.9%. From the study, it is revealed spun silk and Noil yarn realisation in Tassar spun silk yarn processing is higher than Mulberry spun silk yarn processing. Degumming and invisible loss in Mulberry spun silk yarn processing is higher than Tassar spun silk yarn processing.

### 3.2.2. Economics of Eri spun silk yarn

Economics of spun silk yarn per kg is given in Table 3.3. From the table it is observed that, the production cost of Tassar spun silk yarn (Rs. 940 per kg) is lesser than Mulberry spun silk yarn (Rs.1359 per kg) by Rs. 419 per kg. Hence Tassar spun silk yarn is cheaper than mulberry spun silk yarn.

## 3.3. Analysis of Yarn parameter

The Tassar & mulberry spun silk yarn were tested for the following parameters:

**Table 3.3 : Comparative statement of Economics of spun silk yarn**

Sl no	Particular	Mulberry	Tasar
1	Cost of cocoons/waste (Rs) @ Rs 180 per kg	18000	18000
2	Degumming charge (Rs) @ Rs 55 per kg	5500	5500
3	Spinning charge (Rs) @ Rs 380 per kg	9120	15960
	A. Total (Rs)	32620	39460
4	Realization from, Noil yarn selling (Rs) @ Rs 350 per kg	8400	8750
	Total (A-4) (Rs)	24220	30710
5	Production Cost (Rs) Per kg yarn (including Noil yarn cost)	1009	734
6	Production Cost (Rs) Per kg yarn (excluding Noil yarn cost)	1359	940

**Table 3.4 : Average values of Yarn evenness, imperfection and Mechanical properties of Tasar and mulberry spun silk yarn**

	Count 2/60s	Count 2/80 s	2/120 s	2/140 s	Standard Error	CDat 5%
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**Spun silk Yarn evenness properties**

Per / 100 km	Mulberry	Tassar	Mulberry	Tassar	Mulberry	Mulberry		
Um %	7.40	12.02	8.62	13.45	9.65	10.71	0.1667	0.4894
Cv m %	9.57	15.35	11.05	17.80	12.32	13.83	0.2527	0.7376
Cvm (1m) %	5.74	7.20	7.45	7.55	6.67	7.50	0.4584	1.3380ns

**Spun silk yarn Imperfection properties**

Thin Places (-50%)	0.00	30.00	0.00	74.00	0.00	2.00	1.5011	4.3814
Thick Places (+50%)	20.00	62.00	11.00	72.00	32.00	30.00	1.8184	5.3075
Thick Places (+100%)	3.00	12.00	2.00	8.00	1.00	4.00	0.7047	2.0570
Neps (+ 140 %)	35.00	156.00	25.00	138.00	84.00	190.00	4.6626	13.6091
Neps (+ 200 %)	18.00	91.00	12.00	59.00	36.00	55.00	3.1225	9.1138
Neps (+ 280 %)	12.00	56.00	9.00	32.00	22.00	26.00	2.0000	5.8375
Neps (+ 400 %)	7.00	38.00	20.00	6.00	4.00	10.00	2.0000	4.9933
Index (-)	1.40	2.25	1.40	2.16	1.27	1.32	0.0463	0.1352
Hairiness (-)	3.27	4.06	3.32	4.06	2.62	2.88	0.0688	0.2010
Sh (-)	0.83	1.40	0.92	1.74	0.77	0.83	0.0298	0.0870

**Spun silk yarn Mechanical properties**

Breaking Force (gf)	1026.70	575.40	666.20	361.20	447.10	370.30	13.1204	36.7377
Elongation (%)	8.39	11.61	7.73	10.56	6.92	6.76	0.2904	0.8131
Tenacity (gf / den)	3.42	1.92	2.96	1.61	2.98	2.88	0.0580	0.1625
B-Work (gf.cm)	2697.20	2306.80	1625.80	1349.50	990.20	793.80	83.7425	234.4828
Young's modulus	58.00	23.80	71.50	43.96	80.80	69.96		

### 3.3.1 Uster evenness%

It is a measure of Percentage deviation of mass per unit length from the mean mass per unit length. Unevenness increases with increase of U%. The average values and CD at 5% of Um, Cvm, Cvm (1m) are given table 3.4, where it is observed that Um, Cvm, Cvm (1m) of Mulberry spun silk yarn in all the counts are significantly lower than Tasar spun silk yarn, and these values increase with increase in yarn count. From the table it is observed that there is significant difference among all six varieties of spun silk yarns. This is due to the fact that the fibre diameter, fibre diameter variation & length distribution variation of Tasar silk is higher than mulberry silk which influences Um%. The Um, Cvm, Cvm (1m) reduces with increase of number of fibre in the yarn cross section. Mulberry fibre are finer than Tasar fibre and so will accommodate more number of fibers in the yarn compared to Tasar spun silk yarn. As a result, Um, Cvm, Cvm (1m) is significantly lesser than Tasar spun silk yarn.

### 3.3.2. Thin places

The average values and CD at 5% of thin places are given in table 3.4. From the table it is observed that thin places of Mulberry spun silk yarn are significantly lower than Tasar spun silk yarn, and it increases with increase of yarn count in case Tasar spun silk yarn. In case of mulberry spun silk yarn, no thin place is observed in all the counts. From the table it is observed that there is a significant difference between 2/60SNm and 2/80 SNm Tasar spun silk yarn.

### 3.3.3. Thick places

The average values and CD at 5% of thick places are given in table 3.4 where it is observed that thick places of Mulberry spun silk yarn in all the count are significantly lower than Tasar spun silk yarn. These values increases with increase of yarn count in case of Tasar but reduces in case of mulberry. This is due to the fact that the Tasar fibre diameter, diameter variation, fibre length distribution variation is significantly higher than mulberry silk which results in thick places of Mulberry spun silk being significantly lesser than Tasar spun silk yarn.

### 3.3.4 Neps

The average values and CD at 5% of Neps are given in table 3.4. From the table it is observed that Neps counts of mulberry spun silk yarn are significantly lesser than Tasar spun silk yarn in all the counts. In both the

silks, Neps count decreases up to 2/80s count and again increases with increases of yarn count. From the table it is observed that, in both the spun silk yarns, Neps count has significance difference between the different counts of yarns.

### 3.3.5 Hairiness

This is the measure of length of the fibre protruding from the yarn. The average values and CD at 5% of hairiness are given in table 3.4. From the table it is observed that hairiness of Tasar spun silk yarn is significantly higher than Mulberry spun silk yarn. This is due to the fact that fibre length distribution variation, fibre diameter variation and fibre fineness in Tasar silk are higher than mulberry silk fibre which influences the hairiness of the spun silk yarn.

Hairiness increase with increase of yarn count in case of Tasar but decreases with increases of yarn count in case of Mulberry. From the table it is observed that in both the spun silk yarn hairiness has significant difference between different counts of yarn.

### 3.3.6 Index of irregularity (I)

The average values and CD at 5% of Index of irregularity are given table 3.4, from which it is observed that Index of irregularity of mulberry spun silk yarn is significant lesser than Tasar spun silk yarn in all the counts, in both the silks. Index of irregularity decreases with increases of yarn count but is not significant. This is due to the fact that the Tasar fibre diameter, diameter variation, fibre length distribution variation is significantly higher than mulberry silk and thus Index of Irregularity of Tasar spun silk yarn is significantly higher than mulberry spun silk yarn.

## 3.4. Mechanical properties

Mechanical properties of Tasar and mulberry spun silk yarn were tested on Instron machines, it gives the following important parameters which are very important to decide end uses of the yarn and fabric.

### 3.4.1. Breaking force (gf)

The average values and CD at 5% of breaking force (gf) are given in table 3.4. From the table it is observed that breaking force (gf) of Mulberry spun silk yarn is significantly higher than Tasar spun silk yarn in all the counts. This is due to fact that mulberry fibers are stronger than Tasar silk.

The breaking force decreases with increase of yarn

count in both the spun silk yarns. From the table it is observed that in both the spun silk yarns there is significant difference between different count yarns, but there is no significant difference between 2/80s Nm Tasar and 2/140 s Nm Mulberry spun silk yarns.

#### 3.4.2. Tenacity (g/d)

The average values and CD at 5% of Tenacity (g/d) are given in table 3.4 where it is observed that Tenacity (g/d) of Mulberry spun silk yarn is significantly higher than Tasar spun silk yarn in all the counts. This is due to fact that mulberry fibers are stronger than Tasar silk. The Tenacity (g/d) decreases with increase of yarn count in both the spun silk yarns because number of fibre in the yarn cross-section gets reduced with increase of yarn count. From the table it is observed that in both spun silk yarns there is significant difference between 2/60s and 2/80 s spun silk yarns, but Mulberry spun silk yarns has no significant difference among 2/80 s, 2/120 s and 2/140 s.

#### 3.4.3. Elongation %

The average values and CD at 5% of elongation % are given in table 3.4. From the table it is observed that elongation % of Mulberry spun silk yarn is significantly lesser than Tasar spun silk yarn in all the counts. The elongation % decreases with increase of yarn count. From the table it is observed that in both spun silk yarns there is no significant difference between 2/60s and 2/80 s, 2/120 s and 2/140 s spun silk yarns. This is due to the fact that elongation % of Tasar fibre is significantly higher than elongation% of Mulberry fibre, the fibre elongation% significantly influences the yarn elongation%.

#### 3.4.4. B-work (gf-cm)

The average values and CD at 5% of B-work (gf-cm) are given in table 3.4, where it is observed that B-work (gf-cm) of Mulberry spun silk yarn is significantly higher than Tasar spun silk yarn in all the counts. The B-work (gf-cm) decreases with increase of yarn count in both the spun silk yarns. From the table it is observed that in both spun silk yarns there is significant difference between different counts of yarns, but there is no significant difference between 2/120s and 2/140 s of Mulberry spun silk yarns. This is due to the fact that mulberry fibre strength is significantly higher than Tasar fibre strength; this fibre strength influences the yarn strength.

#### 3.4.5. Young's modulus

The average values and CD at 5% of young's modulus are given in table 3.4, from which it is observed that young's modulus of Mulberry spun silk yarn is significantly higher than Tasar spun silk yarn in all the counts. The young's modulus in both spun silk yarn increases with increase of yarn count. This is due to fact that young's modulus influenced by the elongation %, higher the elongation% lesser the young's modulus Vic versa.

### 4. Conclusion

From the study it is observed that Tasar fibers are coarser, has higher elongation percentage and variation in fibre diameter than Mulberry silk fibre. Tasar waste can be easily degummed, spun into quality tassar spun silk yarn on worsted system of spinning like mulberry waste and can be produced up to 2/80s Nm spun silk yarn, while in case of Mulberry up to 2/140s Nm spun silk yarn can be produced. From the hauteur analysis, it is observed that tassar silk has good fibre length distribution than mulberry which facilitates better spinning performance and produces quality spun silk yarn. Realization of spun silk yarn and Noil yarn is higher from Tasar silk waste than Mulberry silk waste. Degumming and invisible loss percentage is less in Tasar than Mulberry. The cost of production of Tasar spun silk yarn is lower than Mulberry spun silk yarn and Tasar spun silk yarn is cheaper than Mulberry spun silk yarn. Yarn Quality parameter like U%, imperfections like thin places, thick places, Neps per kilometer, hairiness and index of irregularity is more in Tasar spun silk yarn compared to Mulberry spun silk yarn. These parameters increases with increase of yarn count in both varieties of silk. Yarn properties like breaking force, tenacity, B-work and young's modulus are inferior in tassar spun silk yarn than mulberry spun silk yarn. These parameters decreases with increase of yarn count in both varieties of silk. Elongation percentage of tassar spun silk yarn is higher than mulberry spun silk yarn. As a result, fabric produced from tassar spun silk yarn has better crease resistance than mulberry fabric. Tasar spun silk produced on mill spinning can be woven on handloom, power loom and shuttle less loom. Hosiery products can also be produced on both hand and power operated flat and circular knitting machines.

By adopting the new technology of spinning, Tasar silk waste can be utilized effectively thereby generating additional revenue to tassar reelers and spinners besides generating additional employment both directly and indirectly.

□ □ □



# Studies on Trace Element Analysis in Natural Antimicrobial Agent- Chitosan

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## Abstract

Chitosan is deacetylated chitin a naturally occurring material in the sea weeds. Chitosan is a mucopolysaccharide that is known for its antimicrobial properties in biomedical and industrial applications. However, its antimicrobial properties are not correlated with the presence of metal and metal salts which have the antimicrobial properties. In order to investigate the same, the elemental analysis of the chitosan derivatives having different viscosities has been done by ashing, acid digestion followed by elemental analysis using atomic absorption Spectrophotometric analysis. Based on the studies, it is seen that the copper content did not change in the chitosan derivatives of different molecular weight, while the zinc content decreased with decrease in the viscosity. Further, the silver content increased as the molecular weight of the chitosan derivatives decreased. It is noted that the antimicrobial properties are better in low molecular weight derivatives. In view of this, it is inferred that silver contributes significantly to the antimicrobial properties of the chitosan as compared to copper and zinc.

## Keywords

Ashing, Atomic Absorption Spectrophotometric, Chitosan, Copper, silver, zinc.

## 1. Introduction

### 1.1 Antimicrobial Textiles- A necessity

Antimicrobial textiles have been in use since World War II. One of the first antimicrobial textile finishes used during World War II, was made to prevent cotton textiles, such as tents, tarpaulins, and vehicle covers from rotting [1, 2] especially, due to focus on synthetic fibers. As knowledge of functional finishes and manmade fibers evolved, the concern on health and safety also grew. It soon became more important for antimicrobial finishing of textiles to protect the wearer from bacteria than it was to simply protect the garment from fiber degradation [2].

Most textiles provide a growing environment for different micro-organisms [1, 3]. Natural fibers, such as cotton and wool, are susceptible to microbial growth and even dust mites because they retain oxygen, water, and nutrients [1, 3, 4]. Many bacteria also live on the skin while dust mites live on shed human skin cells that have been deposited on items such as sheets, towels,

and clothing [1, 4]. Current medical protective wear, such as gloves, masks, and gowns are insufficient in protecting the wearer against both air-borne pathogens and blood-borne viruses, like HIV/AIDS and hepatitis B. It is reported that outbreaks of severe acute respiratory syndrome (SARS) in hospitals is due to the inadequacy of the protective gear [5]. The majority of these microorganisms are passed from person to person by various textiles [6, 7].

"Micro-organisms metabolize nutrients, such as sweat and soil present in textile products, producing odor causing intermediates that cause irritation" [3]. Controlling moisture is also a major concern for many manufacturing companies because microorganisms only attack fibers when they are damp [3]. Functional textiles include everything from antimicrobial finished textiles, to durable, or permanent press finished garments, to textiles with self-cleaning properties, and also textiles finished with nanotechnology [8].

In view of the above, antimicrobial treatment for textile materials is necessary to fulfill the following objectives:

- To avoid cross infection by pathogenic micro-organisms;
- To control the infestation by microbes;
- To arrest metabolism in microbes in order to reduce the formation odor; and

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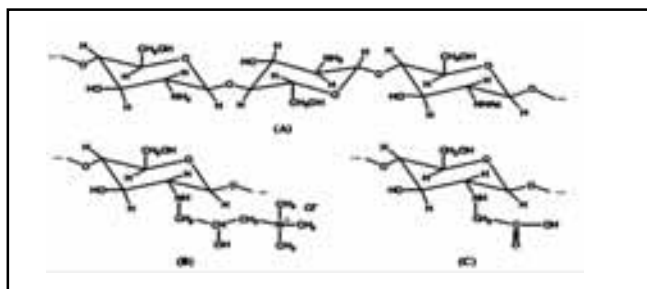
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- To safeguard the textile products from staining, discoloration and quality deterioration.

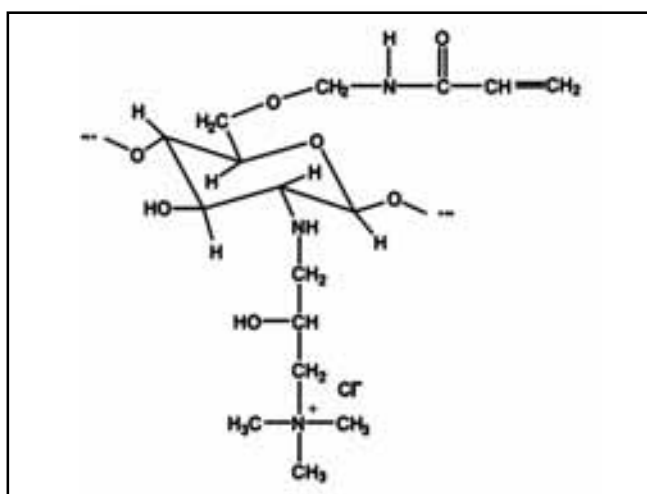
### 1.2. Chitosan

Chitosan is a deacetylated derivative of chitin, which is a natural polysaccharide mainly derived from the shells of shrimps and other sea crustaceans. Chemically, it can be designated as poly- $\beta$ -(1 $\rightarrow$ 4)-D-glucosamine or poly-(1,4)-2-amido-deoxy- $\beta$ -D-glucose (Fig. 3A) [9]. In addition to its antimicrobial activity, chitosan has some important advantages such as non-toxicity, biocompatibility and biodegradability. To provide an antimicrobial agent for textiles, chitosan can be used as an additive when spinning antimicrobial fibers [10-12] and also as a finishing agent [13] for surface modification, mainly of cellulose, cellulose/polyester and wool fibers. Chitosan is positively charged and soluble in acidic to neutral solutions because the amino groups in chitosan have a pKa of  $\sim$ 6.5. Its antimicrobial function arises from its polycationic nature, which is caused by protonation of the amino groups at the C-2 atoms of the glucosamine units. Positively charged amino groups can bind to the negatively charged bacterial surface, resulting in the disruption of the cell membrane and an increase in its permeability. Chitosan can also interact with the DNA of microorganisms to prevent protein synthesis. The antimicrobial efficiency of chitosan depends on its average molecular weight, degree of deacetylation and the ratio between protonated and unprotonated amino groups in the structure [13 - 15]. It is believed that chitosan of a low molecular weight is more antimicrobially active than chitosan oligomers. The efficiency also increases with increased deacetylation, which can exceed 90%. As the antimicrobial activity of chitosan is pH-sensitive and limited to acidic conditions [9], contemporary antimicrobial agents include quaternized N-chitosan (Figure 3B) [9, 16, 15] and carboxyalkylated chitosan derivatives (Fig. 3C) [9, 12, 17, 18], which are water-soluble and show antimicrobial activity over a wide pH range. An important disadvantage of chitosan is its weak adhesion to cellulose fibers, resulting in a gradual leaching from the fiber surface with repetitive washing. To enable chitosan to bind strongly to cellulose fibers, various crosslinking agents are used, including mostly polycarboxylic acids (1,2,3,4-butantetracarboxylic and citric acids) [19 - 21] and derivatives of imidazolidinone [9, 14]. In the presence of a crosslinking agent, hydroxyl groups of chitosan and cellulose can form covalent bonds with carboxyl groups of polycarboxylic acid in an esterification reaction or with hydroxyl groups of imidazolidinone in an

etherification reaction, thus leading to the formation of a crosslink between chitosan and cellulose. This greatly improves durability and wash resistance. In addition, the reactivity of quaternized chitosan has been improved by introducing functional acrylamidomethyl groups to the primary alcohol groups (C-6), which can form covalent bonds with cellulose in alkaline conditions (Fig. 4) [15]. The chemical binding of chitosan to cellulose fibers can also be achieved by oxidation of cellulose fibers with potassium periodate under acidic conditions to form aldehyde groups, which are allowed to react with the amino groups of chitosan and form a Schiff base (C=N double bond) [22, 23]. Following the model of N-halamine halogenation, some of the amino groups in chitosan have been transformed into an -NHCl structure in the presence of sodium hypochlorite [24]. It has been found that chlorination significantly improves the antimicrobial activity of chitosan.



**Fig. 1.1 (A) Chemical structure of chitosan(A), quaternized N-alkyl chitosan derivatives, N-[2-hydroxy-3-trimethylammonium propyl]chitosan chloride (B) and N-carboxymethyl chitosan (C) [9]**



**Fig. 1.2 Chemical structure of reactive O- acrylamidomethyl-N-[2-hydroxy-3-trimethylammonium propyl] chitosan chloride. [15]**

### 1.3 Present study

The antimicrobial properties of chitosan are reported to come from their ability to timely release of deoxy-amino sugars from their matrix, and inhibit growth of microbes [25]. Since the poor solubility of chitosan is a major limitation, derivatives of the chitosan have been made which allow chitosan to be made more soluble. One such derivative called chitosan oligosaccharide comes from chemical or enzymatic hydrolysis of chitosan. As a natural product, chitosan has inorganic salts which are found as thermal ash. In order to find out different elements which are also antimicrobial, the analysis of the chitosan was done. The present paper gives the results of the analysis and discussions on the possible role of them in the antimicrobial properties of chitosan.

## 2. Materials and Methods

### 2.1 Material

Samples of Chitosan of different molecular weight were procured from Nitta Gelatin India Pvt Ltd Kochi, India. The details of the Chitosan samples are given at Table 2.1. The samples are essentially chitosan oligosaccharide as depicted by their intrinsic viscosity.

SI .No.	Sample details	Intrinsic viscosity(cps)
1.	Chitosan 1	688
2.	Chitosan 2	355
3.	Chitosan 3	60

*Table 2.1: Different samples of Chitosan used for the studies*

### 2.2 Methods

#### 2.2.1 Preparation of ash of different samples of Chitosan

Samples of Chitosan of known weight were placed in silica crucible and the crucible with samples of Chitosan was placed in the Muffle furnace maintained at 500°C for 30 minutes. The crucibles were thus removed and cooled before weighing. With the knowledge of initial weight and final weight, weight loss % was determined. The residue or ash was used for further analysis of various tracer elements present in the material.

#### 2.2.2 Acid digestion of ash

Using concentrated nitric acid, the ash was dissolved to get the suitable concentration solution for analysis of tracer elements present in the ash by atomic absorption spectrophotometer analysis (AAS).

#### 2.2.3 Analysis of the tracer element using AAS

Elemental analysis was carried out using atomic absorption spectrophotometer model GBC 906AA. The temperature of the flame was maintained at 2200°C. The instrument was initially calibrated with CRM of different tracer elements and calibration curve was prepared. The samples digested in HNO<sub>3</sub> were analyzed to identify the tracer elements and their concentration. Wherever the concentration of the element was very high, successive dilution was done to get the element composition by matching with that of calibration curve and finally the actual concentration was estimated by inflating the values to its native concentration.

## 3. Results and Discussion

It may be seen that we have used three different chitosan oligosaccharides of intrinsic viscosity ranging from 688 cps to 60 cps. We have found that the antimicrobial properties improved as the molecular weight or viscosity decreased. The antimicrobial properties of chitosan are reported to come from their ability to timely release of deoxy-amino sugars from their matrix, and inhibit growth of microbes [25]. Further, these compounds at low concentration act as bacteria static and become bacteriacides at higher concentrations.

Table 3.1 gives the data on elemental composition of the three chitosan derivatives for the elements copper, zinc and silver. It may be seen that the copper content over the weight of the chitosan is more or less invariant. While the zinc content decreased as the viscosity decreased, the silver content increased as the viscosity of the chitosan derivatives decreased. Based on the data, it may be remarked that the antimicrobial properties of the chitosan derivatives may be contributed by the presence of the antimicrobial metals and their compounds. Further, the copper content being invariant with increasing antimicrobial properties of different chitosan derivatives inclines to think that copper may not be significantly complimenting the antimicrobial behavior of these compounds. Likewise, the zinc content decreased with reduction in the viscosity. The low viscosity compounds give better antimicrobial properties and hence the inverse relationship of zinc content with antimicrobial behavior also indicates the limited role of zinc in complimenting the antimicrobial properties of the different derivatives of the chitosan. On the other hand, the silver content though small increased as the viscosity decreased. Silver content and the antimicrobial properties have direct relationship and hence it

inferred that silver has significant role in improved antimicrobial properties of the derivatives as a function of decrease in viscosity. The manner in which these elements are bound with the chitosan matrix and their association as function of different molecular weight/viscosity is of interest for further investigation.

SI.No.	Sample details of chitosan	Copper content (ppm)	Zinc (ppm)	Silver (ppm)
1.	688cps	3.6	64.0	0.04
2.	355cps	4.0	32.8	0.30
3.	60 cps	4.6	12.3	1.60

**Table 3.1: Results of the elemental analysis of different chitosan sample**

#### 4. Conclusion

Due to increased awareness on the environmental impact of various chemicals used in the industry, the industry and consumers have started looking for ecofriendly chemicals being employed in the manufacture. Chitosan is one of the naturally available raw materials for antimicrobial finishing of textiles. Chitosan contains metal and metal salts as ingredients in the native form. Their impact on antimicrobial properties has been investigated with reference to the presence of copper, zinc and silver. It is observed that the copper content is invariant and zinc content decreased with decrease in the molecular weight of the chitosan oligosaccharide. Further, silver content increased as the molecular weight decreased. Since the low molecular weight chitosan exhibits better antimicrobial properties, it is remarked that silver contributes to the antimicrobial properties significantly as compared to copper and zinc.

#### Acknowledgement

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#### References

- Nadiger Guddo Vinay, Gotmare V.D. (2011) "Innovative Development of Antimicrobial Textiles", *Indian Textile Journal*, **CCXI** (8), 30-38.
- Ye, W., Xin, J.H., Li, P., Lee, K.D., and Kwong,

- T. (2006). Durable antibacterial finish on cotton fabric by using chitosan-based polymeric core-shell particles, *Journal of Applied Polymer Science*, **102** (2), 1787-1793.
- Purwar, R. and Joshi, M. (2004). Recent Developments in Antimicrobial Finishing of Textiles-A Review, *AATCC REVIEW*, **4** (3), 22-26,
- Kut, D., Orhan, M., Gunesoglu, C., and Ozakin, C. (2005). Effects of Environmental Conditions on the Antibacterial Activity of Treated Cotton Knits, *AATCC REVIEW*, **5** (3), 25-28.
- Sun, G. and Worley, S.D. (2005). Chemistry of Durable and Regenerable Biocidal Textiles, *Journal of Chemical Education*, **82** (1), 60-64.
- Sun, G., Xu, X., Bickett, J.R., and Williams, J.F. (2001). Durable and Regenerable Antibacterial Finishing of Fabrics with a New Hydantoin Derivative, *Ind.Eng.Chem.Res.* **40** (4), 1016-1021.
- Thiry, M.C. (2005). Outside, Inside, all Around: In the Healthcare Landscape, Textiles are Everywhere, *AATCC REVIEW*, **5** (5), 34-37.
- Pratruangkrai, P. (2006). 'Technical Textiles' seen as way to go, *The Nation* (Thailand).
- Lim, S. H., and Hudson, S. M., Review of Chitosan and its Derivatives as Antimicrobial Agents and Their Uses as Textile Chemicals, *J. Macromol. Sci., Polym. Rev.*, **C43**, 223-269 (2003).
- Ravi Kumar, M. N. V., Muzzarelli, R. A. A., Muzzarelli, C., Sashiwa, H., and Domb, A. J., Chitosan Chemistry and Pharmaceutical Perspectives, *Chem. Rev.*, **104**, 6043-6045 (2004).
- Spasova, M., Manolova, N., Paneva, D., and Rashkov, I., Preparation of Chitosan-Containing Nanofibres by Electrospinning of Chitosan/Poly (Ethylene Oxide) Blend Solutions, *e-Polymers*, **56**, 1-12 (2004).
- Fan, L., Du, Y., Zhang, B., Yang, J., Zhou, J., and Kennedy, J.F., Preparation and Properties of Alginate/Carboxymethyl Chitosan Blend Fibers, *Carbohydr. Polym.*, **65**, 447-452 (2006).
- Öktem, T., Surface Treatment of Cotton Fabrics with Chitosan, *Color. Technol.*, **119**, 241-246 (2003).
- Huang, K. S., Wu, W. J., Chen, J. B., and Lian, H. S., Application of Low-Molecular-Weight Chitosan in Durable Press Finishing, *Carbohydr. Polym.*, **73**, 254-260 (2008).
- Lim, S. H., and Hudson, S. M., Synthesis and Antimicrobial Activity of a Water-Soluble Chitosan Derivative with a Fiber- Reactive Group, *Carbohydr. Res.*, **339**, 313-319 (2004).

16. Channasanon, S., Graisuwan, W., Kiatkamjornwong, S., and Hoven, V. P., Alternating Bioactivity of Multilayer Thin Films Assembled from Charged Derivatives of Chitosan, *J. Coll. Interfac. Sci.*, **316**, 331-343 (2007).
17. Gupta, D., and Haile, A., Multifunctional Properties of Cotton Fabric Treated with Chitosan and Carboxymethyl Chitosan, *Carbohydr. Polym.*, **69**, 164-171 (2007).
18. El-Shafei, A. M., Fouda, M.M. G., Knittel, D., and Schollmeyer, E., Antibacterial Activity of Cationically Modified Cotton Fabric with Carboxymethyl Chitosan, *J. App. Polym. Sci.*, **110**, 1289-1296 (2008).
19. El-Tahlawy, K. F., El-Bendary, M. A., Elhendawy, A. G., and Hudson, S. M., The Antimicrobial Activity of Cotton Fabrics Treated with Different Crosslinking Agents and Chitosan, *Carbohydr. Polym.* **60**, 421-430 (2005).
20. Alonso, D., Gimeno, M., Olayo, R., Vázquez-Torres, H., Sepúlveda-Sánchez, J. D., and Shirai, K., Cross-Linking Chitosan into UV-irradiated Cellulose Fibers for the Preparation of Antimicrobial-Finished Textiles, *Carbohydr. Polym.*, **77**, 536-543 (2009).
21. Fouda, M. M. G., Wittke, R., Knittel, D., and Schollmeyer, E., Use of Chitosan/Polyamine Biopolymers Based Cotton as a Model System to Prepare Antimicrobial Wound Dressing, *Int. J. Diabetes Mellitus*, **1**, 61-64 (2009).
22. Shanmugasundaram, O. L., Chitosan Coated Cotton Yarn and its Effect on Antimicrobial Activity, *RJTA*, **5**, 1-6 (2006).
23. Kitkulnumchai, Y., Ajavakom, A., and Sukwattanasinitt, M., Treatment of Oxidized Cellulose Fabric with Chitosan and its Surface Activity Towards Anionic Reactive Dyes, *Cellulose*, **15**, 599-608 (2008).
24. Cao, Z., and Sun, Y., N-Halamine-based Chitosan: Preparation, Characterization, and Antimicrobial Function, *J. Biomed. Mater. Res. Part A*, **85A**, 99-107 (2007).
25. Muller, G.; Kramer, A. *Chem. Biol. Interact.* 2000, **124**, 77-85.



### Trends of Electricity Production in the World In Tera Watt Hours (TWh)

The total generation of power in the world is 20183 TWh. The Generation in India is 830 TWh which is 4.11% of the world power generation.

Country	Coal	Hydro	Gas	Oil	Nuclear	Wind	Biomass	Geothermal	Solar	Total
<b>India</b>	569	114	82	34	15	14	2	0	0	830
<b>China</b>	2759	585	43	24	68	13	2	0	0	3494
<b>North America</b>	2266	678	1082	117	942	60	82	24	3	5254
<b>European Union</b>	940	327	786	105	937	119	110	6	7	3337
<b>Eurasia</b>	438	284	655	33	299	1	3	0	0	1713
<b>Latin America</b>	37	673	146	157	21	1	30	3	0	1068
<b>Africa</b>	260	95	176	74	13	1	1	1	0	621
<b>Japan</b>	288	76	283	139	258	3	22	3	2	1074
<b>World</b>	8273	3208	4303	1104	2731	219	267	65	13	20183
<b>World Percentage</b>	40.98%	15.89%	21.32%	5.5%	13.55%	1.08%	1.32%	0.32%	0.06%	100.02%
<b>India. Percentage</b>	68.5%	13.7%	9.87%	4.09%	1.8%	1.68%	0.24%	0	0	99.88%

You may kindly observe that India is more dependent on Coal as against world average of 41% on Coal. Power generation in India is 68.5% on Coal. Hence India has to reduce dependency on coal by increasing other modes of power generation such as Hydro power & Nuclear Power. In case we are successful in getting Gas, then we should also consider Gas as one of the alternative fuel for power generation. *Compiled By Dr Anil Gupta*

# Microencapsulation: Revolution in Modern Textile Era

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## Abstract

Increasing global competition in textiles has created many challenges for dyers and finishers. The rapid growth in technical textiles and in their end-uses has generated many opportunities for the application of innovative chemical finishes. Novel finishes of high added value for apparel fabrics are also greatly appreciated by a more discerning and demanding consumer market. Textile finishing personnel and companies must be active in keeping abreast of the developments in chemical finishing that are emerging globally, in order to survive and prosper in this very competitive and cost-conscious sector of the textile industry. The future of textile finishing depends upon rapid adoption of high performance, high added value finishes that provide innovation and novelty to the consumer, and in seeking out new end-uses and markets for such finishes. This review deals with microencapsulation techniques, Manufacturing, Mechanism involved and its application in textile industry.

## Keywords

Microcapsules, Pretreatment, Dyeing, Finishing, Technical Textile.

## 1. Introduction

As the world population increases there will be an increase in global fibre consumption, but in the developed countries fabrics for apparel have become lighter in weight and the use of heavy fabrics for apparel has declined. North America and EU countries cannot compete with low wage cost countries producing commodity textile and apparel items. Instead, the way forward for the highly developed textile industries of North America and Europe is considered to be the high performance, high value-added route to textile manufacture. This utilises the high technical skills currently available in these industries in order to produce textile materials of high quality, high technical performance and perceived high value added to satisfy the growing consumer markets [1].

active ingredient is designated as the core material whereas the surrounding material forms the shell. This technique has been employed in a diverse range of fields from textiles and pharmaceuticals to cosmetics and printing [2].

This paper reviews the Microencapsulation process, Materials and Techniques required for microencapsulation and application of microencapsulated products in textile field. It covers various applications of microencapsulated core material to textile substrates i.e. phase change materials (PCM), Fragrances, Flame retardants, Chemical Protection, Cosmeo-Textiles, Deodorising, Anti-Counterfeiting Photochromic/ Thermochromic dyes etc.

## 2. Microcapsule

Microcapsule can be explained technically as a vessel characterized by a phase separation between the occluded material and the capsule wall. The occluded material is called as core, nucleus or fill, and the outer wall is called skin, shell or protective film as shown in the Fig. 2.1. Further, both hydrophilic and hydrophobic materials may be contained in microcapsules. Microcapsule has a size range from 1 - 1000  $\mu$ m though in some instances this size range may be expanded from

Microencapsulation is a technique by which solid, liquid or gaseous active ingredients are packaged within a second material for the purpose of shielding the active ingredient from the surrounding environment. Thus the

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0.2 - 0.25  $\mu\text{m}$  to several millimeters. In microcapsule smaller than 5  $\mu\text{m}$  the Brownian motion is vigorous, so it is quite difficult to collect such microcapsules. With particle exceeding 300  $\mu\text{m}$ , the apparent static friction coefficient is abruptly reduced. The thickness of microcapsule wall should be within a range from 0.2  $\mu\text{m}$  to several micrometers, but normally it exceeds 10  $\mu\text{m}$ . Microcapsules may assume various shapes, such as globular, spherical, kidney-like, rich grain like, flocculent and massive. Walls may have a single-layer or a multi-layer structure. Further microcapsules may contain one to many thousands of core substances. Microcapsule containing a single core generally takes a globular shape [3]. These Microencapsules are applied to fibres/fabrics with the help of binders as shown in Fig. 2.2.

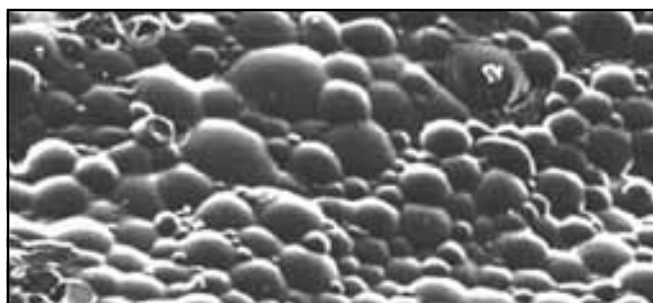


Fig. 2.1: Microcapsules with core and wall [3]

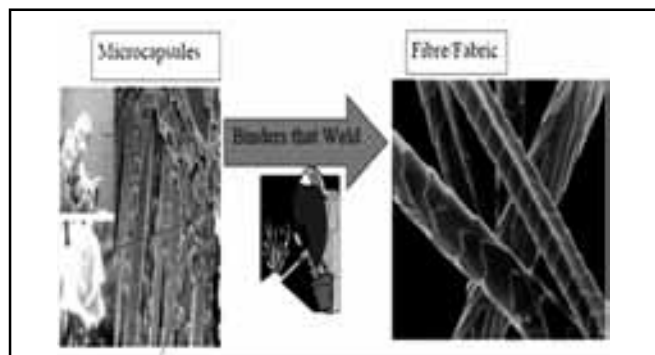


Fig. 2.2: Microcapsules application in textile [3]

### 3. Classification of Microcapsules

Microcapsules can be classified on the basis of their size or morphology. As shown in the Fig. 3.1.

#### 3.1 Micro/Nanocapsules

Microcapsules range in size from one micron (one thousandth of a mm) to few mm. Some microcapsules whose diameter is in the nanometer range are referred to as nanocapsules to emphasize their smaller size.

#### 3.2 Morphology Microcapsules

Microcapsules can be classified into three basic categories as monocoled, polycored and matrix types as

shown in Fig. 3.1. Monocoled microcapsules have a single hollow chamber within the capsule. The polycore microcapsules have a number of different sized chambers within the shell. The matrix type microcapsule has the active ingredients integrated within the matrix of the shell material. However, the morphology of the internal structure of a microcapsule depends largely on the selected shell materials and the microencapsulation methods that are employed [4].



Fig. 3.1: Classification of Microcapsules [4]

### 4. Reasons for Microencapsulation

Microencapsulation of materials is resorted to ensure that the encapsulated material reaches the area of action without getting adversely affected by the environment through which it passes.

The principal reasons for encapsulation are:

- Separation of incompatible components.
- Conversion of liquids to free flowing solids.
- Increased stability (protection of the encapsulated materials against oxidation or deactivation due to reaction in the environment).
- Masking of odour, taste and activity of encapsulated materials.
- Protection of the immediate environment.
- Controlled release of active compounds (sustained or delayed release).
- Targeted release of encapsulated materials.
- The most significant feature of microcapsules is their microscopic size that allows for a huge surface area. The total surface area is inversely proportional to the diameter. This large surface area is available for sites of adsorption and desorption, chemical reactions, light scattering, etc. [5].

### 5. Techniques of Microencapsulation

Microcapsules can be formed by following techniques i.e.

- Air suspension
- Spray Drying
- Vacuum Coating
- Electrostatic Aerosol

- Centrifuge Multi-Orifices
- Insitu - Polymerizations
- Interfacial Polycondensation
- Insolubilization of Polymers
- Power Bed
- Coacervation & Phase Separation
- Complex Emulsion
- Meltable Dispersion
- Solidifying [6].

The methods are selected and used to form microcapsules, depending on the core material, coating polymer and judging the end use requirements [7].

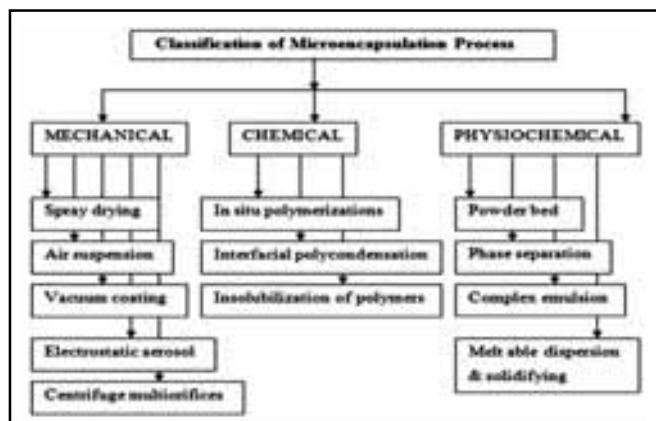


Fig. 5.1: Classification of Microencapsulation Process

### 6. Materials for Microencapsulation

The various materials have been encapsulated and the core materials include solvents, plasticizers, acids and bases, catalysts, etc. The wall material may be natural, semi-synthetic or synthetic [8]. The Table 6.1 shows some of the typical core material and Table 6.2 shows wall material for microencapsulation.

Table 6.1 : Materials for Microencapsulation [8]

Core Material		
Sr. No	Material Type	Example
1.	Solvents	Benzene, toluene, cyclohexane, chlorinated phenyls, paraffins, esters, ethers, alcohols and water
2	Plasticizer	Phthalate, adipate,, phosphate, silicones and chlorinated hydro carbons
3	Acids and bases	Boric acid, caustic alkali and amines
4	Catalysts	Curing agents, oxidants, free

		radical initiators and reducing agents
5	Colourants	Pigments and dyes
6	Adhesives	Polysulfides, cyanoacrylates, isocyanates, epoxy resins, thermally sensitive adhesive materials
7	Fragrances	Menthol, essences and speciality compounds
8	Foods	Oils, fats, spices and flavors
9	Agricultural chemicals	Herbicides, insecticides and pesticides
10	Pharmaceuticals	Aspirin, vitamins and aminoacids
11	Recording materials	Reprographic toners, coupling agents, developers, silver halides, fixing agents, photo chromatic compound and liquid-crystals
12	Rust inhibitors	Zinc chromate
13	Others	Detergents, bleaches and fire-retardant

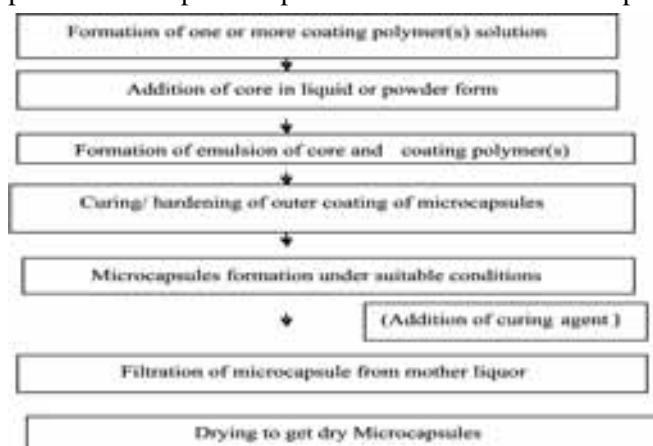
Table 6.2: Wall Material for Microencapsulation [8]

Wall Materials		
S. No	Material type	Example
1	Natural	Gum acacia, agar, agarose, maltodextrin, sodium alginate, calcium alginate, dextran, fats and fatty acids, cetyl alcohol, milk solids, molasses, gelatin, gluten, albumin, shellac, starches, casemates, stearms, sucrose and waxes.
2	Semi-synthetic	Cellulose acetate, cellulose acetate butryates, cellulose acetate phthalate, cellulose nitrate, methyl cellulose, sodium carboxy methyl cellulose
3	Synthetic	Acrylic polymers and copolymers, aluminium, monostearate, carboxy vinyl polymers, polyamides, polyimides, polystyrene, polyvinylalcohol, poly lysine, polycarbonates, poly urea



## 7. Manufacturing of Microcapsule

Mostly, formation of microcapsules in industries is carried out by the methods of phase-separation, spray-drying and congealing, solvent evaporation, multi-orifice centrifugal and air-suspension. As each method has different steps, a brief description of manufacturing procedure for phase-separation method as an example



## 8. Mechanism for Release of core

For the releasing of the core material three basic mechanisms have to follow i.e. Diffusion, Enzymatic digestion and Surface leaching through chemicals. The former is physical process, where as the other two are chemical processes. In the later two mechanisms of release, the chemicals are chosen according to coat of microcapsules i.e. the chemicals, which are capable to swell the outer coating there by allowing the inner core to release out in a systematic controlled manner or instantaneously. One of the important diffusion controlled defence application is novel clothing fabric, which contains microcapsules composed of chemical decontaminants encapsulated within semipermeable polymers. The polymer being selectively permeable to toxic chemical agents but impermeable to the decontaminating agents, thereby allowing the toxic chemicals to diffuse into the microcapsules where they undergo irreversible detoxifying chemical reactions [10]. The release of core is shown in the Fig. 8.1.

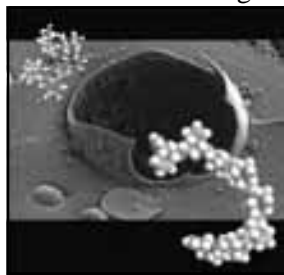


Fig. 8.1: Mechanism for release of core

## 9. Applications of Microencapsulation in textile

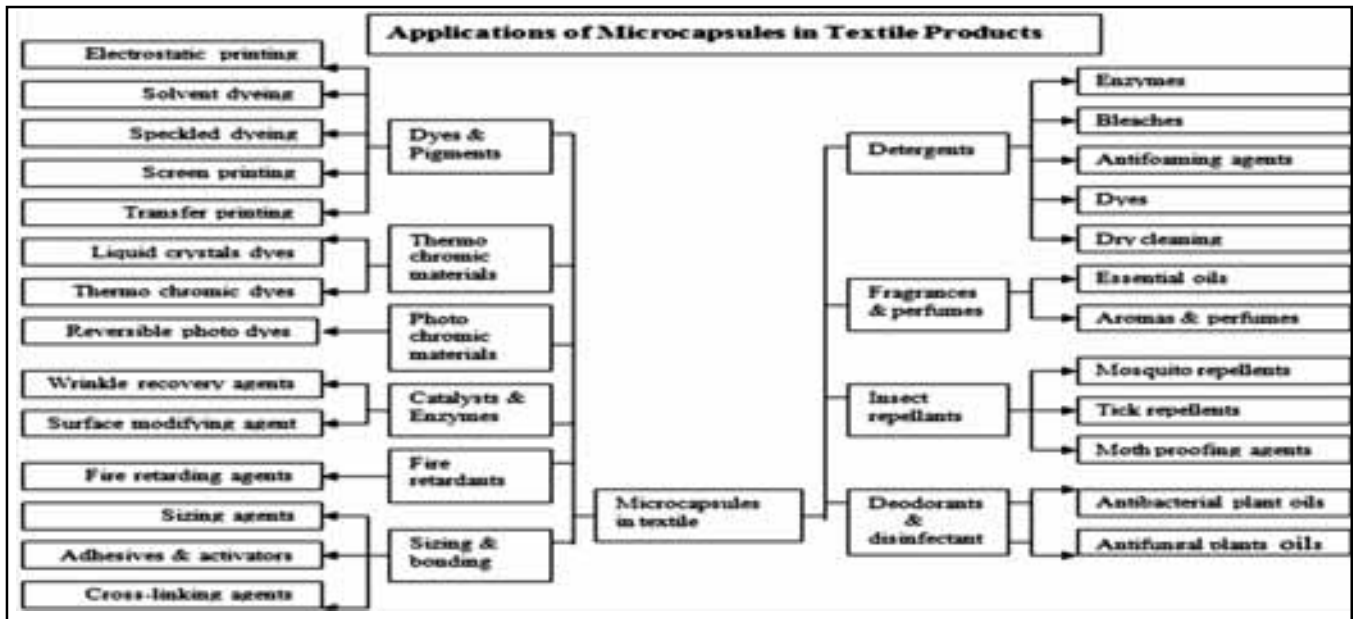
Although initially slow to exploit the technology of encapsulation, the textile industry has now produced a wide variety of innovations utilizing the basic principles of targeting, slow release and protection of sensitive materials [11].

The following areas are considered to offer potential for the use of microencapsulated finishes, also shown in Fig. 9.1.

- Phase-change materials for thermoregulation
- Fragrance release/Aromatherapy agents
- Antimicrobial finishes/Deodorising finishes
- Biocides
- Insect-repellent finishes/Insect-resist treatments
- Skin-moisturising agents/Skin-cooling agents
- Controlled release of vitamins, pro-vitamins and other agents absorbed through the skin
- UV-absorbers
- Antistatic agents
- Flame retardants
- Water repellents
- Ant soiling agents
- Chemical protection
- Softeners
- Cross-linking agents
- Pleating agents
- Colorants
- Enzymes [12]

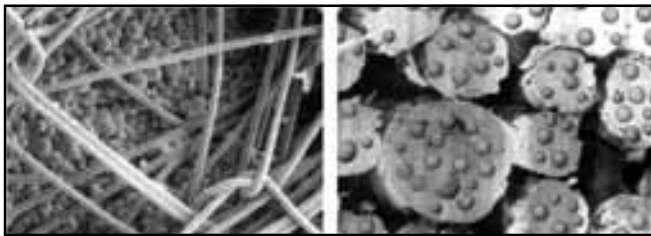
### 9.1. Microencapsulation of Phase-change materials

Microencapsulation technology was utilised in the early 1980s by the US National Aeronautics and Space Administration (NASA) with the aim of managing the thermal barrier properties of garments, in particular for use in space suits. They encapsulated phase-change materials (PCMs) (e.g. nonadecane) with the hope of reducing the impact of extreme variations in temperature encountered by astronauts during their missions in space [13]. Phase-change materials utilise microencapsulated chemicals such as nonadecane (C<sub>19</sub>H<sub>40</sub>) and other medium-chain length alkanes. When the ambient temperature increases above 32.1°C (the melting point of nonadecane), the nonadecane melts and latent heat is absorbed thereby interrupting the increase in temperature of a garment. Once the ambient temperature



**Fig. 9.1: Applications of Microcapsules in Textile Industry**

falls the PCMs solidify and the latent heat is released providing a heating effect. The crystallisation temperature of nonadecane is 26.4°C. Thus, PCMs can be used to provide a cooling effect, or a heating effect, upon the garment microclimate depending upon the ambient temperature [14]. The Microencapsulation of Phase change materials is shown in Fig. 9.2.



**Fig. 9.2: Micro Encapsulation of Phase-change materials [14]**

### 9.2. *Fragrance Finishes*

Fragrance release / Aromatherapy have entered into the lifestyle of many consumers in the stressful ambience of the modern global village in which we all live. Aromatherapy utilises the controlled release of an aroma or fragrance to promote feelings of comfort and well-being amongst consumers [13]. Amongst the many applications for aromatherapy, a number of fragrances such as camomile, lavender, lemon, peppermint, jasmine and rose can provide a broad spectrum of advantages when applied to performance apparel [15].

**9.3. *Cosmetotextiles and skin care benefits*** There is now an increasing vogue for so-called cosmetotextiles

which are essentially garments that are designed to come into contact with the skin which then transfer some active substance that may be used for cosmetic purposes, in particular to combat ageing effects. Because people in the developed nations are living longer and acting younger (the so-called 'youthful ageing' effect) there is now a demand for products which are designed to beautify and to combat ageing. Microencapsulations of active ingredients, e.g. Aloe Vera gels that can be released gradually and be absorbed through the skin are typical of this type of finish. The problem of cellulite, thought to occur in some 85% of women, is considered to be caused by poor microcirculation. Sensory Perception Technology utilises kelp bladder wrack as an iodine source which is easily absorbed into the epidermis. This speeds up the micro-circulation, stimulating glands and the connective tissues. This is claimed to figure the root causes of cellulite. Worn for long periods of time next to the skin in hosiery and underwear, kelp can also be applied with Aloe Vera to promote an anti-cellulite effect [15]. Vitamin E has been widely used in skin creams for medicinal and cosmetic purposes. Its action is basically considered to be that of a powerful anti-oxidant, protecting skin cells against the damaging effects of free radicals which age the skin. Vitamin E has been used on walking socks using SPT microcapsules for its blister healing effects and also applied along with Aloe Vera and Kelp to underwear/hosiery to help eliminate the effects of stretch marks (i.e. for maternity wear) [16].

#### 9.4. Antimicrobial and deodorising finishes

A major growth concept over the last 5 years has been the introduction of the concept of durable freshness applied to all kinds of textile apparel, especially those which are worn under conditions of strenuous physical exertion, or in hot climates. The growth of bacteria on the perspiration entrapped into a garment can rapidly lead to the build-up of undesirable odours which then necessitates the garment being washed or dry cleaned to restore the freshness [17]. Garments such as intimate apparel, socks, gloves and especially textile products used in footwear clearly offer a large potential market for retention of freshness during wear. In addition, there are many other areas with potential for exploitation of the durable freshness concept, including household textiles, e.g. carpets, curtains, cushions, etc., as well as opportunities in textiles used in automotive textiles such as car seating and floor coverings, and textiles for other forms of transportation, e.g. trucks, buses, trains and aeroplanes. Another important area is that of performance sportswear for all manner of physical activities. The many approaches to antimicrobial finishes are reviewed in the section on antimicrobial finishes. Microencapsulation of antimicrobial agents could provide a long-term controlled release effect that could be utilised to prevent the growth of bacteria in textiles that can give rise to undesirable odours, or to combat the growth of more harmful bacteria [18].

#### 9.5. Medical textile applications

The microencapsulation of antimicrobial agents within textile fibres, yarns and fabrics clearly has potential for many forms of medical textiles for preventing bacterial and fungal infections. The controlled release of antibiotics from textiles in contact with the skin offers up the prospect of a marked decrease in post-operative infections after surgery. Surgical sutures containing microencapsulated antibiotics could give a controlled release of



antibiotic around the site of the surgical incision speeding patient recovery and preventing post-operative infection in the first few important days after surgery. There is also the prospect of the development of the microencapsulation of drugs to give a controlled slow release of the active ingredient to be absorbed through the skin. This may be one area where nanocapsules or small microcapsules may be developed for specific applications, for use in medical dressings, etc. [19].

#### 9.6. Flame-retardant textiles

Conventional flame-retardant treatments often suffer from a lack of durability to soaking in water or to domestic washing procedures because of the aqueous solubility of the flame retardant used. Microencapsulation could help to protect the active flame retardants from the action of wet treatments, prolonging the du



rability of the effect and enabling treated textiles to pass flammability tests which involve a pre soak in water prior to testing. Moreover, the adhesion of the microencapsulated flame retardant to the textile could be engineered by a suitable choice of polymer coating to maintain the durability to leaching tests or multiple wash cycles containing bleach-activated detergents. By careful selection of the polymer coating used for microencapsulation it may be possible to provide a polymer coating that not only functions as a protective coating for the intumescent flame retardant combination, but also may additionally provide satisfactory adhesion and contribute to the carbonific component of the finish [20].

#### 9.7. Chemical protection

There is now much greater interest in developing effective methods of protection against chemicals, either from the hazards created by accidents and spillages, as well as from chemical attacks. The global

upsurge in terrorist activity and the needs of the military to protect their personnel against chemical attacks have stimulated developments in a difficult field in which to conduct research. Clearly this area of performance apparel will attract a very high added value, and durability of the effect to prolonged storage prior to use will be important. In most cases such garments will probably only be used once and then discarded, so that the highest performance criteria are required for a single exposure to highly toxic chemicals. Undoubtedly microencapsulated decontamination agents will form only one element of a multifunctional chemical protection suit, which will also incorporate low-energy surface finishes to prevent wetting and wicking of chemicals into the garment and hence onto the skin[20] .

### **9.8. Photochromic & Thermochromic Microencapsules**



Colour-changing technology has been around for a number of years, generally applied to novelty application such as stress testers, forehead thermometers and battery testers. New applications are now beginning to be seen in textiles, such as product labelling, and medical and security applications. In addition, there is continued interest in novelty textiles for purposes such as swimwear and T-shirts. There are two major types of colour-changing systems: thermochromatic which alter colour in response to temperature and photochromatic which alter colour in response to UV light. Both forms of colour-change material are produced in an encapsulated form as microencapsulation helps to protect these sensitive chemicals from the external environment. Today manufacturers are able to make dyes that change colour at specific temperatures for a given application, e.g. colour changes can be initiated from the heat generated in response to human contact. Physiochemical and chemical processes such as coacervation and interfacial polymerisation have been used to microencapsulate photochromic and thermo-chromic systems [21].

### **9.9. Anti-Counterfeiting in Distinctive Marking System**

In high added value textiles, and in branded and designer goods there is great pressure to protect illegal copying within the marketplace. Microencapsulation can be used to help with this problem by offering a covert yet distinctive marking system. This system for combating textile counterfeiting utilises microcapsules containing a colour former or an activator applied to, for example, a thread or a label. The microcapsules adhere to the textile and, depending on the type of chemical within the capsules can be detected at a later date to check authenticity. Detection may be achieved directly using UV light or more likely by using a solvent to break open the capsules, releasing the contents and allowing a colour to develop [22].

### **9.10. Dyeing of wool by liposomes capsules**

In recent years liposomes have been examined as a way of delivering dyes to textiles in a cost effective and environmentally sensitive way [23]. The liposomes used were cost-effective, and no specific equipment or skills were required to handle them within the dyehouse. The results were excellent with pure wool and wool blends, and as the temperature of dyeing could be reduced there was less fibre damage. In their studies dyebath exhaustion was shown to be greater than 90% at the low temperature (80°C) used resulting in significant saving in energy costs. The impact of the dyeing process on the environment was also much reduced with chemical oxygen demand (COD) being reduced by about 1000 units [24].

### **10. Scope of Microencapsulation**

The 'holy grail' for most textile applications using microcapsules would be a system that is easy to apply, does not effect the existing textile properties and has a shelf-life on a garment that allows normal fabric-care processes to take place. Currently, although capsules can survive 25-30 wash cycles, conventional ironing and other heating put processes such as tumble-drying can cause a dramatic reduction in the desired effect. The Microencapsulation industry must take more notice of the possibilities within the textile industry and specifically design microcapsules that overcome these problems. For the future, the consumer's desire for novel and unique effects will always be present. But more importantly, in an ever-increasing desire for convenience, the consumer will require that fabric properties are inherent in the garment, e.g. fresh odour and softness. Consumers will expect these properties to

last the lifetime of the garment, and not involve routine intervention in the form of the never-ending addition of washing aids and fabric conditioners. Microencapsulation may deliver these long-term goals [25].

### 11. Conclusion

The desire for a healthier and more productive lifestyle will continue to generate a market for Textiles that promote 'well-being'. Textiles that 'interact' with the consumer, reducing stress, promoting comfort and relaxation, are possible through active delivery from microcapsules. Microencapsulation can play a part in this continued development, for example by allowing sensing chemicals to be attached to sports clothing and medical products; these will be able to warn of a hazard to the wearer. Systems can also be developed that deliver measured dosages of chemicals to combat muscle pain or other more serious injuries. The potential applications of microencapsulation in textiles are as wide as the imagination of textile designers and manufacturers. Early success for some companies in producing microencapsulated finishes for textiles have come about from collaboration and adaptation of technology from other industrial sectors. The textile industry must continue to be outward looking and develop the textiles that consumer's desire.

Hence we conclude that, the applications using microcapsules in textile wet processing is easier has no reverse effect on existing textile properties. Use of this technology provides either specific improvement in performance and/or greater durability of effect, even after many wash/wear cycles. The technique of microencapsulation is flexible and versatile and easy to understand, which makes us enable to produce innovative effects that will benefit the customer and value to the bottom line. No doubt that this technique will be new revolution in this modern textile era.

### 12. References

1. Ian Holme, *Coloration Technology*, (2007), **123**, pp 59-73.
2. Mars, G. J. & Scher, H. B. Controlled delivery of crop protecting agents, Wilkens, R.M. (Ed.) Taylor and Francis, London. (1990), pp 65-90.
3. Zhong Yi., Fengihong J., Chen Shuilin, *Coloration Technology*, (2005), **121**, pp 76-80.
4. Rama Dubey, T.C. Shami and K.U. Bhasker Rao, *Defence Science Journal*, (2009), **59** (1), pp. 82-95.
5. Gutcho, M. M.(Ed). *Microcapsules and microencapsulation Techniques*, Noyes Data Co., New Jersey, USA. (1976)
6. Leon Lachman., Herbert T. Liberman., Joseph L. Kanig., *The Theory and Practice of Industrial Pharmacy*, (1987), **3**, pp 412 - 420.
7. Simon Benita., New York: Marcel Dekker Inc (1996), pp 1-6.
8. Tiarks, F.; Landfester, K. & Antonietti, M., *Langmuir*, (2001), **17**, pp 908-918.
9. Asaji Kondo., New York: Marcel Dekker Inc, (1979), pp. 1-26.
10. Cowsar, D. R.. US Patent 4,201,822. (1980)
11. A K Aggarwal, A Dayal and N Kumar, *Colourage* (1998) , **45** (8) pp 15.
12. I Holme, *International Dyer*, (2003), pp 9-12.
13. A R Kumar and Y N Rane, *International Dyer*, (2004), pp 23-25.
14. G Nelson, *Rev. Prog. Color.*, (2001), **31**, pp 57.
15. A Lee and R Straughan, *Int. Dyer*, 187 (9) (2002) pp33
16. I Holme, *Text. Mag.*, (2004), **4**, pp 7.
17. W D Schindler and P J Hauser, *Chemical Finishing of Textiles* (Cambridge: Woodhead Publishing Ltd, (2004), pp 165.
18. I Dring, in *Textile Finishing*, Ed. D Heywood (Bradford: SDC, 2003) pp351.
19. M W King and A D Jones, in *Medical Textiles and Biomaterials for Healthcare*, Eds S C Anand, J F Kennedy, M Miraftab and S Rajendran (Cambridge: Woodhead, 2006)
20. *Textiles for Protection* Ed. R A Scott (Cambridge: Woodhead, 2005).
21. Aitken, D., Burkinshaw, S.M., Griffiths, J., Towns, A.D., *Prog. Color* (1996). **26**, pp 1-8.
22. Gundjian, A., Kuruvilla, A. United States Patent, (1999), 5 941 572.
23. Coderch, L., Marti, M., de la Maza, A., Manich, A.M., Parra, J.L., Serra, S., *Wool Record* (1999), pp 26.
24. Rocha Gomes, J.I.N., Genovez, M.C., Hrdina, R., *Text Res. J* (1997). **67** (7), pp.537-541.
25. G. Nelson, *International Journal of Pharmaceutics*, (2002), **242**, pp 55-62.
26. <http://pharmacrunch.net/archives/2011/06/08/microencapsulation-a-vital-technique-in-novel-drug-delivery-system/> assessed on 11th October 2011.

# Optical Fibers for Smart Clothing & Technical Textile Applications

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## Abstract

An optical fiber is a glass or plastic fiber that carries light along its length. Fiber optics is the overlap of applied science and engineering concerned with the design and application of optical fibers. Optical fibers are widely used in fiber-optic communication, which permits transmission over longer distances and at higher data rates than other forms of communications. Fibers are used instead of metal wires because signals travel along them with less loss, and they are immune to electromagnetic interference. Optical fibers are also used to form sensors, in a variety of smart clothing and technical textile applications.

## Keywords

Optical fibers, fiber optic systems, smart clothing, sensor and healthcare applications.

## 1. Optical Fiber & Smart Clothing

The first generation of intelligent clothes uses conventional materials and components and tries to adapt the textile design in order to fit in the external elements. They can be considered as e-apparel, where electronics are added to the textile [1, 2]. This line's coat architecture was adapted in such a way that existing apparatuses could be put away in the coat: a microphone, an earphone, a remote control, a mobile phone and an MP3 player. The coat construction at that time did require that all these components, including the wiring, were carefully removed from the coat before it went into the washing machine [3, 4]. The limitation as to maintenance caused a high need for further integration. The most obvious thing to do was integrating the connection wires of the different components into the textile [5]. To this end, conductive textile materials are appealed to. The complete concept consists of a central microchip, an earphone, a battery, a download card for the music and an interconnection of all these components through woven conductive textiles. Robust and wash-proof packing protects the different components. No matter how strongly integrated, the functional components remain non-textile elements, meaning that maintenance and durability are still important problems. In the second generation, the components themselves

are transformed into full textile materials.

Basically, 5 functions can be distinguished in an intelligent suit, namely:

- Sensors
- Data processing
- Actuators
- Storage
- Communication

For intelligent textiles, communication has many faces: communication may be required,

- Within one element of a suit,
- Between the individual elements within the suit,
- From the wearer to the suit to pass instructions,
- From the suit to the wearer or his environment to pass information.

Within the suit, communication is currently realized by either optical fibers or using conductive yarns. They both clearly have a textile nature and can be built in the textile seamlessly. Communication with the wearer is possible for instance by the following technologies: For the development of a flexible textile screen, the use of optical fibers is obvious as well. Some prototypes were developed based on this technology (a sweater and a backpack). At certain points, the light from the fiber can come out and a pixel is formed on the textile surface. The textile screen can emit static and dynamic color images. In order to increase the resolution, the concept will need to be reviewed, as currently one pixel requires several optical fibres. Nevertheless, in this way, these clothes are uplifted to a first generation of graphical communication means [6]. Communication

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with the wider environment does not allow direct contact, so wireless connections are required. This can be achieved by integrating an antenna. The step is also taken to manufacture this antenna in textile material. The advantage of integrating antennas in clothing is that a large surface can be used without the user being aware of it.

## 2. Conductive Polymers for e-Textiles

Smart textiles can also find their use in heat-storage and thermo-regulated clothing and various wearable sensors including those for biomedical monitoring. For example, conventional fabrics coated with a thin conducting polymer layer possess remarkable properties of strain and temperature sensing [7, 8]. A multilayer structure consisting of two conductive fabrics separated by a meshed non-conductive one can be used as a pressure sensor. Sensing garments for monitoring physiological and biomechanical signals of the human body have already been invented for healthcare and sports training. Other applications of smart textiles have been demonstrated from responsive seats in automobiles, where textiles can indicate the level of comfort of an individual passenger, to apparel with tunable or adjustable color and appearance in fashion and design. With the constant improvement of the technology, there is no doubt that smart textiles will soon become an integral part of our daily life.

## 3. Critical Research in Optical Fibres for Development of Smart Textiles

Solar energy is a clean, reliable and cost-efficient energy source. Studies on fiber-based flexible photovoltaic cells have been attracting considerable attention. A photovoltaic fiber design for smart textiles has been proposed, but its power conversion efficiency is still low. Finally, several groups have recently demonstrated organic all-fiber transistors which can potentially allow the creation of electronic logic circuits by weaving. Recently there have been several reports on capacitor fibers compatible with a textile weaving process. One possible application of a capacitor fiber is in distributed sensing of electrical influence, proximity etc. By adding an external inductance, such fibers make a resonant LC circuit, thus allowing the use of many highly sensitive resonant detection techniques which are able to detect small changes in the capacitor structure [9]. Softness of the fiber materials, the absence of liquid electrolyte in the fiber structure, ease of scalability to large production volumes and high capacitance of our fibers make them interesting for various smart textile

applications ranging from distributed sensing to energy storage. Fashion designers and fibre scientists have designed a garment that can prevent colds and flu and never needs washing, and another that destroys harmful gases and protects the wearer from smog and air pollution. A two-toned gold dress and metallic denim jacket contain cotton fabrics coated with nanoparticles that give them functional qualities never before seen in the fashion world. Current researchers have built piezoelectric fibers by first drawing out a strand of a single material and then adding other materials to it, much the way manufacturers currently wrap insulating plastic around copper wire. Strong vibrations, for instance, could vary the optical properties of a reflecting fiber, enabling fabrics to communicate optically.



Fig. 3.1: Optical fiber for development of smart clothing

## 4. Critical Research in Optical Fibres for Development of Technical Textiles

The implementation of Fibre Bragg gratings (FBGs) in single mode polymer optical fibres (POFs) has advanced dramatically. The majority of POFs are based on polymethylmethacrylate (PMMA), which is photosensitive [10]. Such POF-based FBGs offer significant advantages over silica-based devices for application to tapestries and textiles, as POFs can withstand and measure much higher strains than those possible with a silica fibre. In particular, the Young's modulus of PMMA POF is approximately 25 times smaller than that of a silica fibre [5] which is more compatible with the modulus of the textile. Fibre Bragg gratings (FBGs) in polymer optical fibres (POFs) have been used to measure the strain in a woven textile. FBGs in both POFs and silica optical fibres were attached to a woven textile specimen, and their performance characterized. It was demonstrated that the POF FBGs provide improved strain transfer coefficients and reduce local

structural reinforcement compared to silica FBGs and therefore make a more suitable proposition for textile monitoring. Using optical fibres as an illumination source in a textile lamp is an innovation of an already existing concept (a lamp); as the light source is not located in the centre of the construction but in the 3-dimensional textile shape itself. There is no longer need for a light bulb and this creates opportunities to create new kinds of textile light sources for indoor or outdoor applications [11]. The recent project investigates the possibilities of producing a GloFab product industrially, while keeping a similar appearance as the already existing handmade light radiating textile. In an early stage of the project it was considered achievable to knit a diamond shaped textile on a flat knitting machine and it was important from a design point of view to explore this further together with the possibilities of knitting with optical fibres.

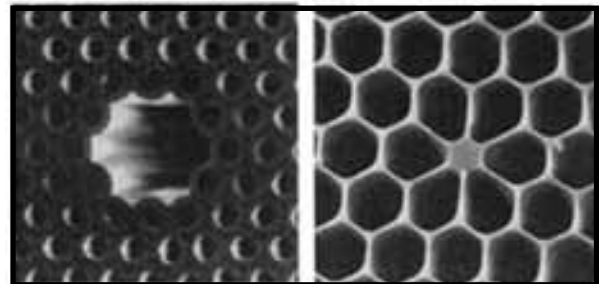
### 5. Critical Research in Optical Fibres & Nano Technology

Presently, smart fabrics are manufactured from metallic or optical fibres. They wear away quickly, and are brittle and uncomfortable. Laundry of such textiles also proves to be troublesome. Nano technology has come up with an innovative way of combining the two fibres; one natural and the other nano technology [12, 13]. Cotton yarn with a thickness of 1.5 millimeters is dipped a few times in a solution of a special sticky polymer in ethanol and dried. This enables the yarn to conduct power from a battery to illuminate light emitting diode device. The antibody anti-albumin is added to the carbon nanotube solution. Anti-albumin reacts with albumin, a protein that is found in blood. When the anti-albumin infused yarns are exposed to albumin, the conductivity is increased considerably. This method is more sensitive, simple and durable. By repeating the process a few times, normal cotton becomes a conductive material due to the carbon nano tubes which are conductive in nature. After the process is complete, the cotton yarn still retains its soft and supple features. This yarn is much better comparatively over the current designs available for electrically conducting fabrics. The only change in the yarn is that it turns into black color due to the presence of carbon. Fabrics made from these smart yarns have potential application in professions that involve high risk. A police officer in danger, a firefighter who is hurt while at work, a wounded soldier at the warfront may not be in a position to send a message requesting for help. But the apparels infused with smart yarns would be able to do

it. The clothes can be designed accordingly; to store energy, which will provide power to operate small electronic devices. A mobile phone or any other form of communication device attached with the clothing can transmit the information from the garment to a command post. It can also be used in garments and used for monitoring health [14]. It also foresees lucrative applications as performance apparel. The concept of electrically sensitive clothing made from nanotube infused cotton yarn can be adapted in various fields based on their exposure to potential risks. The burgeoning interest in nano technology opens a floodgate of opportunities for developing new and innovative products in the textile sector.

### 6. Holey Optical Fiber

The newest developments are related to fibers which act optically as crystals. The fiber bundles in well-defined structures provide the macro-fiber with attractive non-linear optic behavior. These fibers have recently also been manufactured from polymeric optical materials [18]. The area of application for these constructions has still to be found. Figure 6.1 represents the structure of a holey crystal optical fiber [15].



**Figure 6.1: Crystal fiber may be either holey in the middle or contain a honey-comb structure.**

### 7. Specific End Uses of Optical Fibers in Functional Clothing

There is active research related to intelligent clothing. The applications combine electronics and information technology with textiles. This began with military applications, but later the solutions have been combined into leisure products and safety clothing. Wearable computing additionally makes it possible to integrate data and telecommunication devices, play consoles, or even full time control of life functions [16]. Polymer optic fiber applications can be reasonably expected in interior textile integration, typically in automotive vehicles and public buildings, where the data channels are to be hidden. In lighting, the new LED sources may reduce indication light use of POF, and niche architecture solutions are



left. However, the most attractive future applications are in field of Para-textiles, such as chemical measurements in filters in use. As another example, we may refer to measurements integrated in different insulation constructions. When in combination with the technical textiles there is a need to measure very small volumes and aggressive environments on-line, especially chemical states, the optodes provide solutions.

**8. Fiber Optic Systems and its Application**

Fiber optic systems are used today for lighting, decoration and sign applications. It is thus simple to show different colors of light in a tight screen area, when the actual light source that emits heat can be located separately. Some POF systems emit light along the entire cable. Materials that emit visible light through fluorescence or scattering can be added to the fibre. Side-emitting fibres are commonly used in the lighting of architectural and contour buildings, hotels and entertainment centers [17]. In public premises and leisure areas, there is a need for light guides due to complicated routing or limited lightning. Today many of these solutions are based on bulky lamp rows or less effective taping solutions. Optical fiber makes it possible to build this function into carpets and suchlike in a most sophisticated and space-saving manner.

Light guide illumination is useful in hazardous and explosive environments. High-voltage tube devices can be replaced with fiber, thick fiber or rods. Changing particle size and concentration can even control light emission in large core-size 10mm bulky rods of POF. The material is manufactured by means of adding micro-spherical beads during the synthesis of the rods. To a certain extent, illumination fiber material can be added to fabric structures. Weaving the POF into the fabric makes light leak out of the fibre, and planar flexible lighting elements can be fabricated. Figure 8.1 is an illustration of optical fibers used for illumination.

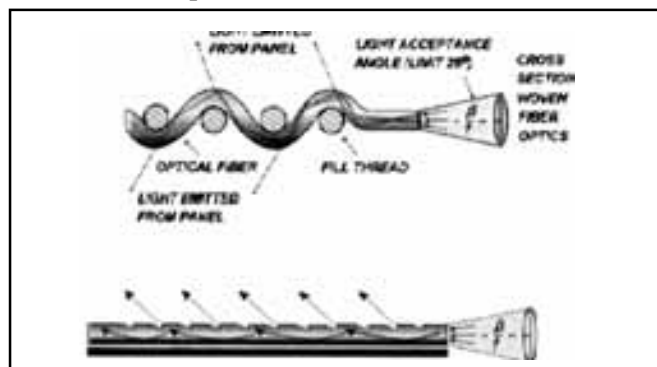


Figure 8.1: Optical fiber for illumination and wave guide applications

**9. Optical Fiber for Sensor Applications**

The photonic sensors, optodes can be located up to 100 meters away from the measuring device. No electric transmission is necessary, while the optodes either produce light for indication through luminance reactions or affect the light transmission. Electric fields, magnetic fields, radiation, moisture, harsh chemical conditions, or even high temperatures do not affect measurement [13, 14]. Optical (bio-) chemical sensors are devices that convert a (bio-) chemical state into a signal via a transducer. The chemical state may be in gaseous, liquid, or solid phase, and the output signal is typically electrical, used for measurements or controlling an actuator. In the majority of optical sensors, the transduction steps are:

Electrical-optical-chemical-optical-electrical

The chemical to optical step includes chemical reactions, molecular recognition and transferring a chemical signal into an optical signal, using indicators for example. The actual size of an optode is typically 1-3mm. With the optode, chemical concentrations, pH, moisture level, temperature, and different biological species can inter alia be measured [16].

**10. Optical Fiber for Automotive Applications**

Although Mercedes Benz has been the pioneer in this field, within a few years most producers will adopt the technology, mainly in top-end vehicles. The automotive industry has applied the D2B standards to provide noise-free infotainment inside the passenger compartment, and has adopted the MOST standards [11, 12]. A typical requirement is 150 Mbit/s and 30 m, but 500 Mbit/s will come as IEEE1394 automotive standards are introduced. Flat flexible cable hybrid design is one area of interest. The development opens the door for fabric integrated solutions as an alternative to FFC. It would then be easy to integrate the data bus connection into the decorative textiles on the car body [9, 10]. The targets for this are installation simplicity, weight savings and integration.

**11. Optical Fiber for Multimedia and Telecom Applications**

POF in multimedia and telecom are applicable to the final of the data highway. The competing technologies in the home and office network are RF copper cables and specific OF (miniature glass fibre cables). POF's advantages include their low weight, inexpensive costs, and simple installation [7, 8]. Disadvantages are related to limited bandwidth, such as 400 Mbit/s over 100m. As an optic media the POF is insensitive to electrical and

magnetic noise, thus competing with copper [13, 14]. There is additionally an application in data connections, when the silica OF is a technical overkill.

### 12. Optical Fiber for Hospital and Healthcare Applications

Optical fibers also offer a promising avenue for new smart clothing because of their potential flexibility and their capacity to use light both as an information carrier and a sensor in itself. The team behind the project is aiming at applications in oximetry - a clever non-invasive way to measure the oxygen content of blood. In a hospital setting, a clip is attached to a patient's finger measuring a ratio in the absorption of red and infrared light passed through a patient's finger, which varies depending on the state of oxygen-rich, bright red blood and oxygen-poor, dark red blood [10, 11]. The researchers hope to replicate the measure in clothing (without the need for the finger clip typically used in hospitals) by placing optical fibers around the neck of a smart garment. In a related healthcare activity, a project team worked on integrating smart sensors, advanced signal processing techniques and new telecommunication systems on a textile platform [15,16].

### 13. Conclusion

Clothes that monitor your heart measure the chemical composition of your body fluids or keep track of you and your local environment promise to revolutionise healthcare and emergency response, but they present tough research challenges, too. Smart textiles must be comfortable, their technology must be unobtrusive, they must withstand a difficult and variable environment and, particularly for medical and emergency applications, they must be absolutely reliable. Optical-fiber transmission lines appear attractive for a variety of communication applications in which twisted copper pairs and coaxial cables are now used. These applications range from on-premises data links and equipment wiring to interoffice and intercity telecommunications trunks.

There was never any mention of the cost to manufacture or keep up the system that it requires. This suggests that the cost may be somewhat prohibitive for widespread use. Furthermore, since its most noble applications seem to be in the area of medical monitoring and telemedicine in particular, where the likelihood that patients are already spending a lot of money on medical care, it is uncertain whether this population will be able to afford this kind of technology.

### References

1. Lauterbach, Smart Clothes self powered by body heat, Avantex Proceedings, (2002).
2. Chapman K., High Tech fabrics for smart garments, Concept 2 Consumer, 15, (2002).
3. Park S., & Jayaraman S., The wearable motherboard: the new class of adaptive and responsive textile structures, International Interactive Textiles for the Warrior Conference, (2002).
4. Van Langenhove L., Intelligent Textiles for children in a hospital environment, World Textile Conference Proceedings, 44, (2002).
5. Deflin E., Weill A. & Koncar V., Communicating Clothes: Optical Fiber Fabric for a New Flexible Display, Avantex Proceedings.
6. Yoshimura T., & Mitsubishi Rayon, Acryl ate Plastic Optical Fibre and Its Application, Fibre Preprints, **55** (2000).
7. Onishi T., Status of Perfluorinated GI-POF, Fibre Preprints, **55**, 2, (2000).
8. Kicherer M., High-Speed Data Transmission over Polymer Optical Fibre and Circuit Board Integrated Waveguides, Fibre Preprints, **55**, 2, (2000).
9. Khoe G.D., Uni. Eindhoven/ Cobra, Progress in High Capacity GIPOF Systems, Fibre Preprints, **55**, 2, (2000).
10. Giaretta G., A New Generation of Optical Fibre and POF Systems, Bell Laboratories/Lucent, Fibre Preprints, **55**, 2, (2000).
11. Morikura S, High Speed POF Home Network Based on IEEE 1394, Fibre Preprints, **55**, 2, (2000).
12. <http://www.healthsurfing.com/health/1999/11/09/images/armyshirt.150.110.jpg>.
13. [http://www.sensatex.com/Images/commercial/infant\\_small.jpg](http://www.sensatex.com/Images/commercial/infant_small.jpg)
14. <http://www.sensatex.com>
15. Sensors and their applications, IOP Publishing, **178**, (2009).
16. Linda Oscars son, Flat Knitting of a light emitting textile with optical fibres, AUTEX research journal, **9**, 2, (2009).
17. Jian Feng Gu, Soft capacitor fibres using conductive polymers for electronic textiles, IOP Publishing, **19**, (2010).

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# Indian Garment Industry: A Comparative Study of Growth Trends in Domestic and Export Market

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## Abstract

The pattern of garment consumption in India is changing fast from tailor made garments to readymade both in rural and urban areas. It is due to increased cost of stitching, and ease of availability of the readymade garments. This shift would grow the demand of garments in the domestic market. Moreover, the domestic market for garment is estimated more than twice the size of export market. On the other hand, India's share of garment export increased slowly during the period 1990-91 to 2006-07. In this context, this study compares the growth trends of the domestic market with the export of Indian readymade products.

## Keywords

Compound annual growth rates, Domestic market, Export, Indian garment industry.

## 1. Early growth

India has a very strong textile history. With the wealthy textile history, usual Indian garments had been hand sewn through the house. Early expansion of garment industry was witnessed in Mumbai, Ahmedabad, Calcutta and Madras, where low cost fabrics were easily available for production of Indian traditional dresses. Around the Second World War, ordinance factories were started to meet the government orders for military uniforms. Subsequently, the garment industry emerged as a commercial activity around 1960s. In 1964 and 1965, there was a huge demand for Indian colourful shirts known as "Bleeding Madras" in the western world, which caused a sudden increase in garment production at industrial level in India for export [2]. The industry was mainly located around Delhi, Mumbai and Madras. Availability of semi-skilled low wage labour, low capital intensity of the industry and support from government policies encouraged the industry for standard garment export. During the period 1959-1970, production for export was started in regular basis in the factories.

In 1974, the Multi Fibre Agreement restricted the trade of textiles and garments. However, quota restrictions were not binding in most of countries and Indian export

enjoyed more or less the unrestricted growth [2]. During 1970-1976, Indian garment firms grew because the overseas buyers preferred Indian novel designs and hand styling. In 1980s, the demand shifted from Indian style to western style. Then, there was a global recession in the garment industry during 1981-1984. India's share in the total global export of garments grew steadily from 1.7 percent in 1980 to 2.3 percent in 1990 [3]. During this period, Delhi, Mumbai and Madras were the major garment export centres. In 1988, on an average, the export of garments accounted for 40 %, 38 % and 10 % from Mumbai, Delhi and Madras, respectively. After that, Bangalore, Calcutta, Jaipur and Tirupur emerged as important garment producing centres.

In the year 1987, there was a huge stock of western products in Mumbai and Delhi due to export rejections. The manufacturers dumped these products into the domestic market for Indian consumers. As a result, in due course there grew a demand for western products in Indian market. In the last two decades, the manufacturers have boosted domestic consumption of garments and modern readymade products have now succeeded in penetrating even the markets in the rural areas. The domestic market segmentation presents that northern-region of India has major share of garment market, followed by western and southern regions. In India, the northern-region consumes 37 % of garments, whereas eastern-region shows only 6 % of garment consumption (Table 1.1).

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**Table 1.1: Market Segmentation of Garments in India**

Gender	Share (%)	Segment	Share (%)	Type of market	Share (%)	Region	Share (%)
Gent's	59	Branded	25	Domestic	70	Northern	37
Ladies	23	Non-branded	75	Exports	30	Eastern	6
Children	18					Western	32
						Southern	25
Total	100		100		100		100

Source- Joshi[4], indiastat.com

In the year 2005-06, the consumption of readymade in the domestic market was around 70 %, whereas 30 % of garments produced were exported to major markets as shown in Table 1. In the world's total clothing export, India's share of garment export increased slowly from 2.3 % in 1990 to 3.3 % in 2006 [3]. On the other side, the domestic market has also grown up during this period. The entry of the Indian and global fashion designers has moved the market further. The Indian consumers are attracting towards the use of readymade products due to increasing tailoring costs and easy availability of readymade products. At one time, only the baby dresses and dress shirts were popular as readymade products in India. Now, it has extended to trousers, suits, woman dresses and for fashion garments. The demand of branded garment has reached to 25 percent of total domestic consumption during 2005-06. This represents a shift from unbranded to the branded segment. The garment segment categorises itself into many sub-segments: formal wear and casual wear; women's dresses, men's and kid wear, suits, trousers, jackets and blazers; shirts, sportswear, T-shirts, denims, neckwear; undergarments, knitwear and saris also. On an average, the market share of gent's garment is 59 % followed by ladies and kids garments as shown in Table 1.1.

Looking at consumption of ready garments in the domestic market, Indian manufacturers can concentrate on this market. Therefore, it is essential to study the growth trends in domestic and export market of the Indian garment industry. In this context, this study analyzes the growth of domestic consumption, export and import of garments in India.

## 2. Growth trends in domestic market, export and import

### 2.1. Domestic market

The domestic market for garment is estimated more than twice the size of export market. It is developing

enormously in the recent years. The consumption and future demand of garments in the domestic market are shown in Fig. 2.1 and their compound annual growth rates (CAGR) in Table 2.1. Based on the past trends, the demand for garments is estimated for the year 2011-12. It is observed that the consumption of garments has increased from 5990 million pieces in 1990-91 to 13950 million pieces in 2006-07, with statistically significant CAGR of 5.3 %. Comparing the growth rates achieved during 1990-91 to 1999-00 to those achieved during 2000-01 to 2006-07, it is found that the consumption of garments has increased faster in the latter period than the preceding period.

**Table 2.1: Growth Rates in Consumption of Garments in India**

Time periods	1990-91 to 2006-07	1990-91 to 2000-01 to	1999-00 2006-07
Total garments	5.3*	5.2*	5.5*
Blended garments	7.6*	8.8*	6.2*
Cotton garments	4.8*	4.4*	5.5*

Notes: \* indicates significance level at 1%.

The consumption of cotton and blended garment has increased with significant CAGR of 4.8 % and 7.6 %, respectively, during 1990-91 to 2006-07. It shows that the consumption of blended garments has increased at a higher rate than the cotton garments. However, the consumption of cotton garments has increased at a higher rate in the latter period than the earlier one. The share of cotton and blended garments consumption in the domestic market are 85 % and 15 %, respectively, during the entire period. In which, the share of cotton garment has decreased from 85 % in 1990-91 to 79 % in 2006-07, while the share of blended garments increased from 15 % in 1990-91 to 21 % in 2006-07. It indicates that the blended garments are becoming increasingly popular. The estimated demands for total

cotton and blended garments are expected to reach to 15000 and 3750 million pieces, respectively by 2011-12.

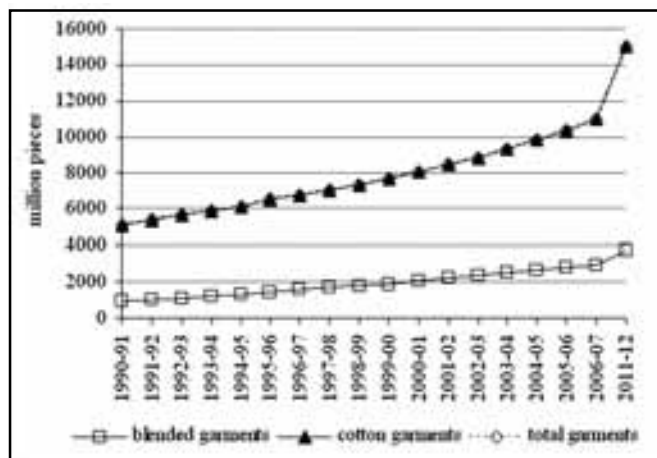


Fig. 2.1: Consumptions of Garments in the Domestic Market

The pattern of garment consumption in India is changing fast from tailor made garments to readymade both in rural and urban areas. Traditionally, tailors convert the pieces of cloth into a wearing garment. The increased cost of stitching has pushed the consumers towards the use of readymade. The shift would grow the demand of garment in local markets. More and more people are changing over traditional garments to kurta-pyjama, salwaar-kameez, pants and shirts [4]. The increase in consumption of garment products in the domestic market would be due to improved fashion awareness, superior design of readymade, rising stitching charges and easy availability of the garments. In addition, the Indian economy, rising at the rate of 8%, has resulted in higher disposable income levels. The disposable income of Indian consumers has increased steadily. This translates into a growth of 9.3 % over the next 8 years, and will result in higher spending capacity, manifesting itself in the greater consumption of textiles [5].

Another reason for increase in consumption of garments in the domestic market could be due to changeover of sari to salwar-kameez in women garments. The sari is said to be one of the oldest forms of clothing in India and it is worn in different states of India. The sari is commonly used in southern-region of India due to hot climate. Another common women wear in India is the salwar-kameez. It is probably the most popular of all the Indian clothes in the northern-region of India due to cold climate. Originally, from Punjab and Kashmir, it is now worn throughout India. Its popu-

larity is because it is comfortable, practical and stylish. Saris are now reserved more for formal functions and occasions. The general observation is that the market of sarees have declined in both rural and urban areas since most of the females are working and earnings money on their own and also salwar-suit is easy to wear and comfortable for working women. A case study by Rao [6] for Madura Garments reports that around 95 % of working women in India wear salwar-suits. Bahl [7] has conducted a research on shifting boundaries of nativity and modernity in South Asian women's clothes and has come up with the finding that salwar-kameez is considered more progressive than sari and other regional Indian dresses.

2.2. Garment export

The garment export accounts for approximately 49 % of the total textile and clothing export of India. This item covers readymade of cotton, synthetic and other textiles material. The export trends of garments during 1990-91 to 2006-07 are shown in Fig. 2.2 and the average growth rates are given in Table 2.2. It is observed that the garment export rose from Rs. 24760 million in 1990-91 to Rs. 293760 million in 2006-07 with a statistically significant CAGR of 14.1 %. As it can be seen from the Fig. 2.2 that the export has increased during 1990-91 to 1996-97, 1998-99 to 2000-01 and 2005-06 and decreased in 1997-98, 2000-01 and 2006-07. It shows steady growth during 2002-03 to 2004-05. On an average, the Indian garment export achieved higher growth rate during the period 1990-91 to 1999-00 than the period 2000-01 to 2006-07.

Table 2.2: Growth Rates in the Indian Garment Export

Time periods	1990-91 to 2006-07	1990-91 to 2000-01 to	1999-00 to 2006-07
Cotton	14.6*	20.2*	9.4*
Synthetic	11.4*	21.2*	-3.1
Other textiles	14.2*	14.2*	21.1*
Total garment	14.1*	20.1*	8.0*

Notes: \* indicates significance level at 1%.

The fibre-wise export trends are also shown in Fig. 2.2. It is observed that the cotton garment forms 77 % of the value of total garment export during 1990-91 to 2006-07. Synthetic garment comprises 18 % and other textile material garments consist of 5 % of value of the total exports. It is evident from the Figure that there is

a continuous increase in the export of cotton garments, registering a significant growth rate of 14.6 % during the study period, which has increased from Rs. 22130 million in 1990-91 to Rs. 244870 million in 2006-07. The export of cotton garment grew at a statistically significant CAGR of 20.2 % during 1990-91 to 1999-00, while the corresponding growth rate during the period 2000-01 to 2006-07 was only 9.4%. Similarly, the synthetic garment shows the highest CAGR of 21.2 % in the earlier period, while its growth is not found significant in the latter period. On the other hand, export of garments made from other textile materials grew with a CAGR of 21.1 % during the period 2000-01 to 2006-07 against 14.2 percent during the period 1990-91 to 1999-00. The analysis indicate that the cotton and synthetic garments export shows lower growth rates during latter period when compared to the earlier one. On the other hand, the export of other textile material garments shows a higher rate in the latter period.

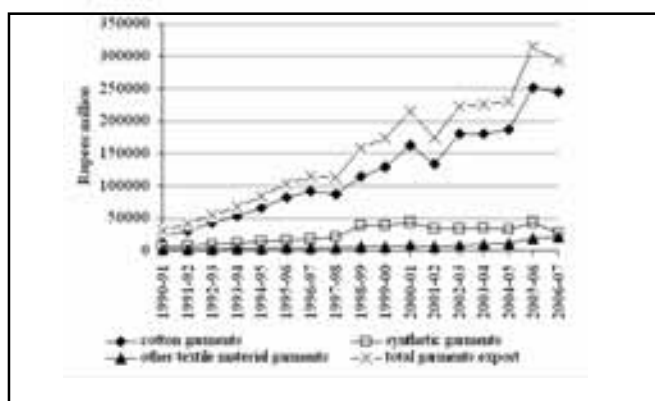


Fig. 2.2: Fibre-wise Trends in the Garment Export

Joshi and Singh [8] observe that the fluctuations in Indian garment export during the period 1990-91 to 2006-07 could be due to MFA-phase out. The MFA restrictions were phased out in four phases during 1994 to 2004. Finally, all MFA restrictions on garment trade were removed from January 1, 2005. From this date, the major markets, such as, USA, Europe and Canada have also opened their markets for garment imports. These are the major markets for Indian textile and clothing export. In the year 2005-06, Indian garment export also experienced a significant growth rate of 26.6 % over the previous year. However, the garment export has declined in 2006-07. It is due to the appreciation of rupee against dollar and subsequent slow-down in the USA market [9]. In the context of textile and clothing export, Joshi and Singh [3] find that the share of export of clothing in the world total textile and clothing export has exceeded the share of textile export during 1994-2006. In this scenario, China exported 33:67 textile and clothing during the same period, whereas the corresponding ratio in India was 50:50. It suggests that China has always emphasised on clothing export than the textile export. Export in clothing reflects the value addition and integration of value chain in textile and clothing, Therefore, the boosting up of clothing export in India is more desirable than that of textile from the point of view of value addition and employment generation.

Table 2.3: Country-wise Import of Garments in India

Country	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	CAGR
China	41	92	239	500	135	232	242	511	28.6**
Nepal	7	101	152	273	112	449	292	387	53.1**
Hong Kong	44	45	43	66	86	90	140	324	30.1*
Thailand	87	191	54	37	29	29	62	112	-6.9
Italy	25	52	45	25	40	47	99	239	26.3**
Bangladesh	0	14	57	89	123	210	37	33	48.0
U K	13	18	26	24	86	33	92	194	41.3*
Malaysia	1	2	24	103	172	95	46	31	65.9**
U S A	30	30	31	77	25	32	47	106	12.7
Indonesia	14	43	44	57	29	41	21	30	1.0

Germany	12	12	16	35	24	40	43	56	26.2*
Korea	21	19	15	19	17	43	34	33	11.5***
Spain	4	1	4	15	22	27	33	56	63.2*
Singapore	6	12	10	6	23	40	6	31	17.5
Total	315	638	767	1412	934	1426	1227	2171	24.2*

Notes: All figures in Rs. Million, \*, \*\*, \*\*\* indicates significance level of 1%, 5% and 10%.

Source: Compendium of Textile Statistics 2003, Office of the Textile Commissioner.

### 2.3. Garment import

With the opening of the Indian garment market from January 2005, articles of garment import have started picking up. Table 2.3 shows India's import of garments from top 15 countries during 1998-99 to 2005-06. India's major importers are China, Nepal, Hong Kong, Malaysia, Bangladesh, UK, Italy and Thailand. The major import of garment articles is from China, which has 24 % share in the year 2005-06. It is observed that import of garment has increased significantly with a CAGR of 24.2 % during the period 1998-99 to 2005-06. The import of garments went up from Rs. 315 million in 1998-99 to Rs. 2171 million in 2005-06. Import of garments from China increased from Rs. 41 million in 1998-99 to Rs. 511 million in 2005-06 with a CAGR of 28.6 per cent. The import has also significantly increased from Nepal, Hong Kong, Italy, UK, Malaysia, Germany, Korea and Spain during 1998-99 to 2005-06, as shown in Table 2.3.

### 3. Conclusion

In India, the consumption of readymade garments has increased in recent periods due to increased cost of stitching. In this context, this study analyzes the growth of Indian garment industry in the domestic as well as export market. It is observed that the consumption of garments in the domestic markets is around 70%, whereas 30 % of garments produced are exported. Growth trends indicate that the growth of garment export has slowed down during 2000-01 to 2006-07 over the period 1990-91 to 1999-00, while the domestic market for garments has significantly grown and emerged in the latter period. Similarly, it is also observed that import of garments has increased significantly during 1998-99 to 2005-06 and most of the import is from the East Asian countries. Looking at consumption of readymade garments in the domestic market, Indian manufacturers can concentrate on this market. The increase in consumption of garment products in the domestic market would be due to improved fashion awareness, superior

design of readymade, rising stitching charges and easy availability of the garments. In addition, the Indian economy has grown up at the rate of 8 percent which has resulted in higher disposable income levels. This is reflecting the augmentation of consumption of readymade garments in the domestic market.

### References

1. Kantilal I., The Apparel Industry in India: State-of-the-Art Report, National Information Centre for Textile and Allied Subjects, Ahmedabad, India, (1990).
2. Rangrajan K., Foreign Trade Review, 4, 3, (2005).
3. Joshi R. N. and Singh S. P., The Indian Textile Journal, October, 50, (2008).
4. <http://www.fibre2fashion.com/industry-article/8/782/india-textile-and-apparel-trends-20071.asp> [accessed on 27/7/2007]
5. <http://www.ncaer.org/projects.aspx?programid=2&projectstatus=c#> [accessed on 12/7/210].
6. <http://www.iupindia.in/603/cf.asp> [accessed on 14/4/2009].
7. Bahl V., Women's Clothes Dialectical Anthropology, 29 (1), 85, (2005).
8. Joshi R. N. and Singh S. P., The Indian Textile Journal, October, 50, (2008).
9. <http://texmin.nic.in/annualrep/AR06-07-01.pdf> [accessed on 28/9/2007].

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## Textsmile

The greatest revolution of our generation is the discovery that human beings, by changing the inner attitudes of their minds, can change the outer aspects of their lives. - William James

# An Analysis of Current Economic and Technological Environment as a Precursor to S & T Development

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## About the author



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Shri Bardhan was Director in the Board of Directors of NTC (S.M.), NTC (N.M.), NTC (Gujarat) and NTC (M.P). He is a chairperson of Assessment and Recruitment of scientists in DRDO, Ministry of Defence. He is a Director of Gujarat Sheep & Wool Development Corporation Ltd, Gandhinagar. He led a Defence delegation of Q.A. Team to South Korea and was a member of Defence Delegation to France and Israel. He was pioneer to bring the concept of Technical Textiles in India and was member of various committees of Technical Textiles constituted by Government of India.

He conducted over 80 R & D projects sponsored by Ministry of Textiles, Ministry of Defence, Ministry of Science & Technology and other quarters. He has over 100 published papers on textiles, management, Defence systems and equipment in various national and international journals and proceedings of seminars, conference, etc. He led a delegation of Ministry of Textiles to Lesotho and South Africa for consultancy in HRD in Textiles and Garment Technology.

## Introduction

Technology is the most powerful instrument for the development of a nation. Role of technology was recognized by the founding leaders of India after Independence and accordingly commitment to its use was enunciated first in the Scientific Policy Resolution in 1958 and subsequent Five Year Plans, for achieving self-reliance. Indian industrialization started mainly with imported technology, but it was also recognized that true development and national security could not rely on technologies bought or borrowed from abroad. Self-reliance through innovation and indigenisation of technology would only ensure sustainable advancement of the country. Indigenisation process initially was considered and pursued as substitution of imported products, but such import substitution was often criticized as 're-inventing the wheel'. However import substitution ef-

fort and transfer of technology, collaborations, etc. to an extent generated modest level of indigenization.

Present international trends have changed the economic and technological environment dramatically. Technology control regimes, intellectual property rights, emergence of new technologies etc. in crucial and sensitive fields, unwillingness of the advanced West to give away technological monopoly, role of multi-national corporations, etc have only widened the technological distance between the developed and developing nations. India, after its liberalization of economic policy has entered the global competition, urgently requiring developing its indigenous technological capability to ensure its place in the world market and export. To face the challenge in the new world order, development and indigenization of technology has assumed a new significance.

Most of the industrialised countries commenced their



industrial venture starting with textile industries during 19th & 20th centuries. India's industrialisation also began with textile mills in jute and cotton sectors during 19th Century. Colonial technologies were brought by the British entrepreneurs mainly to serve their own interest. However, the spin off over the period was extended to other industries, thereby enabling India to have strong science and technology base over the period. Technology, whether in the field of Textiles or Information Technology, or even space or aviation, germinates or grows with favourable economic and technological environment. Therefore, it will be prudent to discuss the topic in general without confining it to textile industry only.

### **Analysis of current Economic Environment**

#### **Global Scenario**

The economic weather of the World has dramatically changed two decades back, Western Capitalism triumphing over the Soviet Communism. The developing countries, stunned by the demise of the Soviet Block, have now gone to the opposite extreme of unbridled capitalism. Two major trends have clearly emerged on the international scene. The first one is the radical changing international economic environment. Increasing globalization of economics and new international trade regimes that focus on technology, particularly GATT. The other trend is the speed, power and direction of the new generic technologies which are already showing wide economic impact.

These trends are unfolding in terms of liberalization drives or opening up of economics to private and foreign investment flow and of technologies. There are many countries in the developing world, the erstwhile Soviet Block as well as communist countries like China and Vietnam who have embarked upon such programmes to accelerate economic development. On the technological arena, some of the changes that are taking place include efforts to force scientists into market place by slashing the operating budget. Vigorous efforts are being made to commercialise university research.

The developed countries, IMF, World Bank etc. have channelized a market driven economy and recommended the same for the developing nations. The end of the Cold War and consequent rethinking on geo-political and economic realignments in the economy of the World together with the growing regionalization of the world

trade based on technological drive and the successful cohesion of the Uruguay Round of negotiation for re-writing the world trade order are among the major changes that dominate the current international economic environment.

The World is witnessing mind boggling changes in the economic and technological scenarios of unprecedented magnitude. The new technologies have impact on all sectors of economic activity; basic needs economy, governmental needs, primary industry, secondary industry and tertiary industry. Capital and labour is no longer mainstay for development. Traditional natural resources are no longer a dependable strength for a nation, for technological advances have sidelined their value by making available superior alternatives. New technologies will bring new economic opportunities to those who are ready to master them.

Man-machine interface is closing in to determine economic growth and development. Traditional technologies are being transformed drastically to raise productivity and enhance quality to boost added value to economy. Industrialised countries are beginning to show increased preference towards control of market and distribution chain rather than own manufacturing. Manufacturing activities are shifting to developing countries of the South-east, under the auspices of the Multi-national or Transnational Corporations. Markets are demanding newer goods and shorter product life cycle, which imply importance of competitive research and development. Trade in services is now as important as trade in commodities in the global market.

Skilled technicians and professional human resources have emerged as a highly tradable commodity. In other words, economic viability and sustainability of any nation will be determined in global dynamics in this decade and beyond by its access to technology. Patent laws, new regimes like TRIPs, TRIMs, PBR, and GATT etc. will determine such dominance or access to technologies.

#### **North-South Economic Scenario**

Closely related to the issues of global economic environment are the state of science and technology in developing countries, and the ability of these countries to participate in the programmes and negotiations that will be necessary. North-South relation in economy and science and technology has been a difficult subject in the foreign assistance context for many decades, and no doubt will remain so. However, as new global

economic issues emerge that cannot be dealt with unless there is agreement and co-operation of developing countries with developed countries, new attention and perhaps wholly new approaches to this subject will be required. There is need for local, indigenous capability even to be able to measure and to study factors such as emission, precipitation, pollution, population growth etc. which affect the North and South alike. Environment related technologies in possession of the North will have potential to trigger a direct economic relationship between the North and South sharing the indigenous knowledge available with them.

While examining the effect of international trends on science and technology, some analysts observed an important shift towards international economics, rather than security goal in the motivation for support to the developing countries. The shift to economic goals will emphasise economic, and particularly high-technology competition, with important questions raised as a result, about the pay offs of research funding and about appropriate role of governments in the development of technology for the markets place. They further opined that there was also possibility of reduction in overall resources for science and technology in the international arena leading to protectionist attitudes towards basic research. It may lead to restrictions on research communication and publication. Though resource constraints will increase the attractiveness of cost-sharing through intellectual scientific co-operation, the economic pressures on government will tend to limit the number and scale of international projects.

On the other hand, more intense focus on economic objectives will call for greater governmental intervention to maximize productivity of the technological enterprise and to improve technology to capitalize the results of research. In addition, more wide spread international competence in science and technology will create a larger need for government to assist industry and universities to keep abreast R & D throughout the world, a function performed on substantial scale by some governments to-day, but little by others.

Finally, the globalization of economic, internationalization of technology and greater interdependence of nations, are all leading to larger roles for international Institutions and Transnational Corporations (TNCs). There will be a gradual significance of responsibility towards these institutions, though that shift is strongly constrained by reluctance of governments to cede any more authority to them than is absolutely essential.

In last few years, slow down of Western economy and serious recession experienced by USA, European Union, Japan etc. have adversely affected the world economic environment. The West will now further tighten up their control over the emerging and state-of-the-art technologies in their possession and bring harsher impediments in sharing these technologies with the developing nations, particularly with the BRIC countries.

### **Indian Scenario**

For over four decades under license-permit-raj, Indian lived with an economic environment where supplies fell short of demand, resulting in sellers' market. Competition, if at all, was limited to a few areas only. There was neither compulsion nor incentives to do better. The development and progress in free economics of the World with competitive environment, left Indian way behind in the quality and competitiveness of its goods and services.

Great economic crisis faced after the Gulf War, reduced India to a minor player in the Global economy. Control on production, licensing restrictions alongwith high protective walls had fostered monopolistic trends within Indian Industries, made it import-intensive and inward looking. Technological revolution that had spread from advanced nations was missed by Indian Industries. Indian products were poor in quality and had little acceptability abroad. Import was more than export. To service huge accumulated foreign debts due to rising oil bill and negative balance of payment, unmanageable fiscal deficit was experienced in 1990. Pressure from the World Bank, IMF and donor countries was building up to open economy. To overcome the problems and reverse flight of capital, a reform programmed in economy was restructured leading to liberalization, market economy and opening up for foreign direct investment (FDI). Mr. Minoan Singh as the then Finance Minister claimed that 'journey on the road to self-reliance had began'. According to him self reliance in today's World did not mean that we would manufacture everything. It meant ability to earn foreign exchange to pay for all the import. This made a big difference in the meaning of self reliance, as understood so long by the policy makers who considered self reliance was import substitution by indigenous production.

Liberalisation has changed the Indian scenario drastically. In many sectors Indian companies are not just forced to compete with each other, but also with for-

eign multinational companies entering Indian Market. Progressive reduction to physical and fiscal barriers to import have made superior imported goods available to Indian Customers, at a price lower than what is available from Indian Manufacturers. This has happened already in capital goods, computer peripherals etc. In times it happened to consumer durables as well.

It was expected that a window of opportunity would open up for the industry to become globally competitive and reach out for global market which was much larger than the domestic market alone. In first few years of liberalization, it has not been so. To become competitive within reasonably short period of time, the Indian Industry would essentially need to upgrade and develop its own technology. In most of the areas of production, the Indian industry have indigenized the technology without improving them or have been following the out dated or obsolete technology imported relatively cheap. One of the possible reasons of slow industrial growth in the 1960s and 1970s has been found in the demands of modernization, which have never accounted for a large part of capital expenditure in the Indian industry. Major Indian Industries have presented a picture of obsolescence in capital equipment, in technology and skills. The wave of liberalization assisted the process of modernization of the economy. The recent move which incorporates a corresponding liberalization of the market in general, however, is supposed to bring about dismembered technological progress especially in the Indian manufacturing industry.

The economic reform, however, had to be addressed on two counts; one in respect of technology imports and the other in respect of indigenous technology development. In the first case, long term economic relationship between the foreign and Indian firms would need to be encouraged, so would a long term stake of foreign firms in the Indian market. This would perhaps require that much longer term technology import agreement must be allowed, with no constraint on royalty. The point is that Indian firm should get a long term flow of technology instead of 'Technological Snap-shots' so that they can learn how technological development is driven over time.

In the second case, viz. innovative Indigenous technology development, various dimensions and factors are involved. It was expedient to identify them scrupulously and then to act on them.

### **Analysis of Current Technological Environment Global Scenario**

Over the centuries, technology became the monopoly of the developed industrialised countries. The industrialised countries control most of the global science and technology based knowledge and know-how. Researchers while examining the internationalization of technological innovation, identified technology as the necessary condition for economic and social well being for any country, be it developed or developing and also globalization of technology, so that fruits of science and technology could cross the national boundaries. However, in reality, such flow of technology was hardly visible. The area of technology was characterized by high degree of structural asymmetry between the developed and developing countries.

The recent trends threaten to widen the global asymmetry in technology. These trends include emergence of new and high technologies such as micro-electronics, telematics, bio-technology, new high performance materials, as well as a number of policy initiatives taken by the industrialised countries.

All technological developments essentially are the result of research and development. It was long since the developed countries realized the importance of R & D investment in huge scale to convert the low and intermediate technologies into high productive and efficient technologies. Growth of institutional R & D led to concentration of resources both on the level of competing nations with a few major countries dominating and on the level of the corporate industrial actors where a small number of transnational companies stand out. While the industrialised countries invested overwhelmingly in R & D, share of developing countries was only a negligible fraction of the total World expenditure in R & D in all these years.

The control over R & D and subsequently the control over the development of advanced technology have, therefore, been placed in the hands of major actors in the international arena. These actors include the powerful transnational corporations (TNCs) and government authorities of major powers.

The role of developing countries in R & D and so also control on emerging new technologies is rather insignificant. The developing countries as a group account for only 3 percent of global R & D expenditure in 1983, estimated to be over US \$ 300 billion. Only 17 scien-

tists and engineers were engaged in R & D per million of their population compared to 2986 in developed countries. They account for only 3.3 percent of global exports of capital goods and their nationals are reported to hold barely 1 percent of total patents in the World. Similar asymmetry was noticed in the flow of technology. Developing countries accounted for only 17 percent of total foreign direct investment (FDI) from developed market economies in 1990. These trends are so despite the fact that in recent years many developing countries liberalised their foreign investment policies which were characterized by regulations in the 1960s and 1970s. Even among the developing countries the technology flows are concentrated in few middle income countries of Latin America and Asia.

Globalization of Science and technology has been propelled by three powerful engines, viz. technology innovation, communication and transnational corporations (TNCs). Though interlinked, each of them has an independent existence and each has worked under a set of circumstances. Working in tandem, they have released forces which perhaps operate outside the control of even the most powerful nation-states, and thwarted the most well laid plans to harness them.

Whereas energy was the motive power of the industrial age, post-industrial world community is driven by knowledge. Centrality of theoretical knowledge is the source of innovation and the policy formulation for the society. Worldwide, this has led to the pre-eminence of the professional and technical class, and development of a new intellectual technology which may be as salient in human affairs as machine technology has been for the past century and a half.

Computer is the prime mover of the new industrial era both in developed and developing countries and it possesses knowledge, not energy. Being essentially driven by knowledge-based innovation, the growth of computer technology has been truly phenomenal and micro electronics has become the space setter of technological progress. The products of computerized processes in developed countries are so vastly superior to that of the earlier industrial era or now available, with their nature and application. Such technological developments are also marked by continuing evolution and changes and a high rate of obsolescence, often because of successive and repaid incremental innovations, which are capable of horizontal diffusion in various industries.

The introduction of high technologies further threatens

to widen the technological distance between the developed and developing countries. These technologies have tremendous developmental potential. Unfortunately developing countries have hardly any access to their fruit. For instance, 97 percent of satellite technology and 85 percent of computers are concentrated in North America, Western Europe and Japan. The new technologies are becoming so important that practically all the major multi-national corporations are shifting their activities into these fields through various means such as diversification, acquisition, merger etc.

The introduction of new technologies is going to restructure the global pattern of production and trade in a significant manner. The use of advanced telematic technology will enable the multinational companies to operate highly specialized manufacturing affiliates in developing countries without transferring to them the broad range of management functions that play a key role in strengthening endogenous technological capabilities. Therefore, the multinational companies can operate manufacturing subsidiaries without actually contributing to indigenous technological capability building in developing countries.

Development in micro-electronics has tremendously expanded the horizons of automation in diverse activities. Diminishing share of labour in total production costs as a result of automation erodes the incentive to local production in low wage countries. As a result, the conventionally labour-intensive processes of electronics, automobile and garment industries which were relocated or subcontracted by multinational companies in some newly industrialized countries in the south-east Asia in the 1970s were brought back to their home countries. Therefore, these developments are adversely affecting the industries and manufactured exports of developing countries resulting in retardation in indigenization effort.

Similarly new technologies in material science producing high performance materials like fine chemicals, optical fibres, high polymeric plastics and resins, fibre-reinforced composites etc. have offered better substitutes of traditional raw material of developing countries like copper, aluminium, iron etc. seriously affecting the developing countries. The result has been a drop in consumption of traditional raw material in industrialized countries in the North. For instance, use of tin has been reduced by 42 percent between 1973 and 1985, by 37 percent for steel, by 32 percent for zinc, 23

percent for nickel and 9 percent for aluminium. This drop in raw material consumption has led to a collapse of commodity markets in recent years, causing great hardship for developing countries dependent on raw material exports. Such situation obviously retarded indigenization of technologies associated with other greater problems in such countries.

In the global scene, the new and high technologies which are surely to dominate in coming decades, will potentially remain out of reach of the Third World Countries, because of denomination and proprietary hold over these technologies by multinational companies of the Western industrialised countries.

### Impediments Affecting Growth of Technology in the South

The industrialized countries in the North monopolized technology with their innovative acumen, investment in R & D and a sustaining commitment to improve the quality of life of their people. More than that, their success was based on exploitation of the raw material, capital and labour of their colonies. Industrialisation of their colonies was not allowed by the colonial power during the occupation. As a result, current global technology is characterized by greatest degree of asymmetry between the North and the South, and skewed highly in favour of the former. After the colonial past, when the countries in the South made a beginning of developing technology for enhancing the quality of life of their people, the North was not ready to share the benefits of technology with the apprehension of loss of monopoly in technology. While the North exploited the World resources in unsustainable manner leading to ecological disorder, today it advocates sustainable development for the South with high cost of inputs of clean technology of their possession which the south hardly can afford.

In recent years the governments of the Industrialised countries have taken measures aiming at consolidating and perpetuating their possession of technology and disregarding the efforts of developing countries to build indigenous capabilities. They argue that technology is a tradeable commodity unlike science and therefore the possessor of technology must have substantial competitive edge in the world market, as considerable investment was required to develop these technologies. Therefore the measures taken by the industrialized countries include policies concerning the Intellectual property rights which aim at protecting the monopoly

power of technological developments as well as its promotion through growing government -industry complexes in new technologies that follow.

The impediments in flow of knowledge and technology affecting the indigenization efforts of developing countries are as follows:

a) **Intellectual Property Rights :** In the areas of intellectual property, a number of initiatives are being pursued simultaneously to strengthen monopoly power of innovation, technology development etc. with following control regimes :-

i) **Trade Related Intellectual Property (TRIPs):** World Intellectual Property Organisation (WIPO) has been a specialized agency of the UN to promote the protection of intellectual property throughout the world through co-operation among the intellectual property unions, which are composed of groups States bound by a multi-lateral treaty. However, industrialised countries has sought to evolve a stricter and expanded regime of intellectual property protection by bringing TRIP in the Uruguay Round of Trade Negotiation of GATT despite stiff opposition of developing countries. By this way the industrialized countries want to link the enhanced protection of intellectual property or lack of it to the GATT rules. With this they will be able to retaliate against developing countries export on the ground of inadequate protection to intellectual property. This would also put strong pressure on developing countries restructure their national legislation on intellectual property rights to compromisingly accommodate the needs and interest of industrialized countries. With the implementation of GATT having this provision, this move will adversely affect the process of building indigenous technological capabilities in the countries of the South significantly.

ii) **Trade Sanctions:** Apart from the protection of TRIPs, the US wishes to retaliate against the export of developing countries to the US by using article 301 of its new Trade Act, if they do not adequately protect the US patents, copy rights, etc. The sanction may include denial of GSP benefits and imposition of punitive tariffs on import from these countries, thus pressuring them more directly to change their national legislation in favour of intellectual property rights in clear violation to GATT

rules. Eight developing countries including India have already been placed in the Priority Watch list of S-301, because of their alleged failure to protect US IPRS. Seventeen countries have been included in a Watch List for maintaining practices damaging US IPRS.

- iii) **Expanding the Scope of IPR:** There are initiatives from the industrialised countries to extend the scope of patents to areas hitherto uncovered, such as bio-technology based products. Success of such initiatives would imply grant of exclusive monopoly over import, manufacturing, selling or even saving of seeds of any plant varieties by farmer for further use, or live stocks, containing patented traits, to companies owning such rights even though the gene incorporating the unique characteristics would have been borrowed from the Third World free. This amounts to using Third World resources for commercial exploitations by the multinational companies of developed countries throughout the world without the source countries even sharing any part of the quasi-rent. Besides, this would deny the third World countries whatever little access to technology they have to develop indigenous bio-technology capability so as to serve their priorities and needs.
- (b) **Technology Gap:** In order to sharpen the technological edge of their corporate enterprises, the industrialised countries are supporting technological activities with programmes like RACE, ESPRIT, and EURAM etc. in European Community. US, Japan and other developed countries are investing huge amount in high technologies in industry-university-government sponsored research. These attempts have been accompanied by a wide spread lobbying and propaganda by Western agencies in developing countries to desist them from entering into the technology race with industrialised countries thereby impeding the growth of indigenous technological capabilities in the area of frontier science and technology.
- (c) **Dual Technology:** Western developed countries particularly united States have threatened the developing countries of sanctions against developing technologies which can also be used for military purpose with suitable modification. Indian rocket technology is an example in this regard. Besides, the North endeavours to prevent proliferation of missile technology using Missile Technology Con-

trol Regime (MTCR) whenever the developing countries opted for their security perspectives, thus also preventing the generation of indigenous spin off technologies consequently.

### **Impact of Multinational Corporations in Technology Development**

The multinational corporations (MNCs) of the industrialized countries are equipped with fund of technologies in traditional areas as well as knowledge based high technologies emerging in recent years. It is expected that they should diffuse and transfer such technologies through direct foreign investments, license, collaboration, joint ventures, training etc. to the developing countries. As a result technologically backward countries will be able to develop indigenous technological base over the period using this platform as a spring board. However, empirical evidence has shown the situation other way round. MNCs have been found to import higher proportion of their raw materials and other inputs than the local firms, because of their familiarity with foreign suppliers and alleged inadequacies of local producers. Export oriented MNCs in South Korea, Taiwan and Singapore have been found to be importing a greater proportion of their inputs than their local counterparts.

It has also been observed that contribution of MNCs to indigenous technological capability building in host developing countries has been rather limited. The limiting factors have been the reluctance on the part of the MNCs to impart capabilities required for efficient adaptation and absorption to their affiliates, by restricting the ability of the latter to make independent technology choice, blocking the way of horizontal diffusion, assimilation and absorption of the imported technologies. R & D activities were neglected, and at times even by deliberately hindering

The ability to make independent technological choice is considered to be one of the stages in development of indigenous technological capability. In this respect it has been argued that operation of MNCs contribute to only a limited way to the development of indigenous technological capability in the host countries. The local diffusion, adaptation and absorption of technology transferred are often constrained by restriction clauses inserted in the foreign collaboration. Therefore, local affiliates remain continuously dependent upon their parent enterprises. Besides, the technology transferred to MNC affiliate remain a closely guarded secret and

accessible only to the particular affiliate with no chance of diffusion or sub-contracting. The technology transfer under such conditions can be termed as a private transfer and not a national transfer, thus leading to repetitive collaborations. Moreover the technologies brought by the MNCs to the developing countries were often found to be out-dated, obsolete and even redundant in their home countries.

Another serious problem was found in that the import of technology through MNCs might dampen the local initiative and creativity in the process of assimilating it. There is also evidence that affiliates of MNCs may even actively hamper the research activity carried out by local firms.

From all these discussions, it is revealed that the global asymmetry in technology is perpetuated to the disadvantage of the developing world. The industrialized developed countries are attempting to augment the monopoly of technological hold through extending the geographical coverage and scope of intellectual protection which will considerably reduce the access of developing nations to new or improved technology and will raise the cost of technology acquisition for them. The developing nation's attempt at building indigenous technological capability are undermined by motivated publicity and restrictive business practices of MNCs, such as technology dumping etc. Any international intervention which seeks to restructure the global technological order in favour of the developing countries has been resisted stiffly by developed countries. All such factors are bound to further affect the

developing countries by increasing their technological dependence.

**Conclusion**

No country can prosper with borrowed technology for ever. At the same time, the technological distance between the developed and developing countries has been widening due to emergence of new frontier technologies in critical areas. Such sophisticated and knowledge intensive technologies are likely to change dramatically the production techniques of capital/consumer goods and services in the coming decades. In today's world, technology plays a vital role in defence capability and national security. Catching up the west in technological race appears to be a distant dream for developing countries. But the process has started in most of these countries. Process has also started in most of these countries to achieve self-reliance in technology. In the present economic environment of market driven competitiveness, control of technology will only determine the survivors. The control regimes in technology, IPR, reluctance of advanced countries to share benefits of technology, dubious role of transnational companies, etc. pose a serious concern to the developing countries in general, and the countries like India, in particular. India in the West is seen as a potential technological competitor in future, as she made modest progress in innovative technology development in commercial areas and also demonstrated its excellent capability in generating domestic technologies in mission-oriented areas like space, nuclear, defense etc.

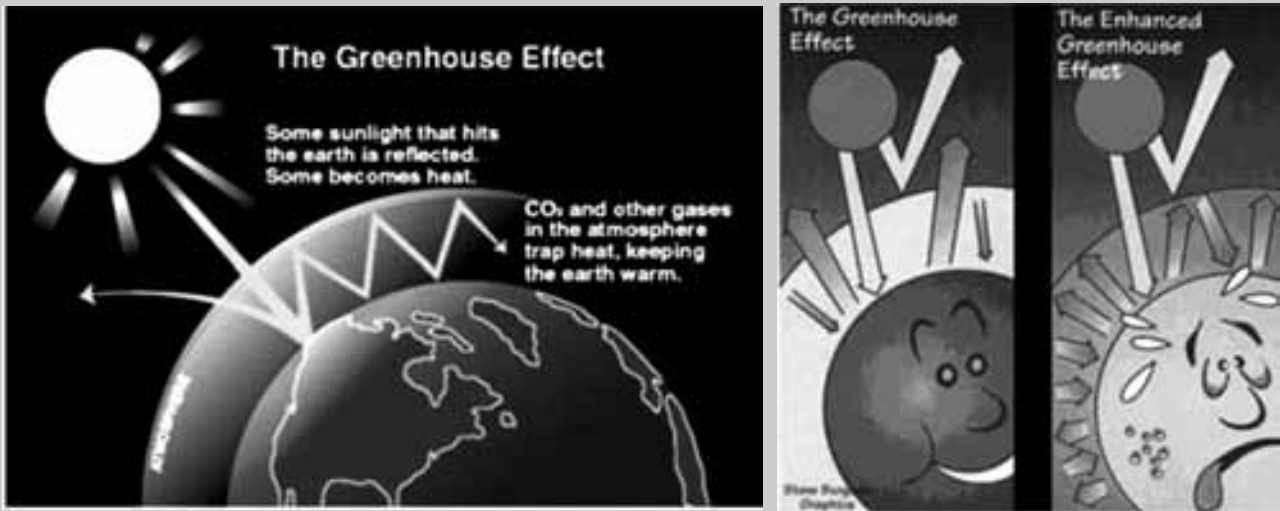
J T A

**ADVERTISEMENT INDEX**

A.T.E. Enterprises Pvt. Ltd.	A-9	Lakshmi Machine Works Ltd.	Cover -3
Advertise in this Page	A-12	Paramount Instruments Pvt. Ltd.	Cover 2
Advertise on Website	A-12	Precision Rubber Ind. Pvt. Ltd.	A-14
Advertise Tariff	A-8	Reliance Industries Ltd.	Cover 1
Air Maaster Industrial Technolozis	A-1	Rieter India Ltd	A-7
Aspire Chemicals Pvt. Ltd.	A-3	SSP Pvt. Ltd.	A-13
CHT (India) Limited	A-11	TAI Book publications	A-4
India ITME 2012	A-6	Unitech Techmech	Cover 4
ITMA ASIA + CITME 2012	A-10	Veejay Lakshmi Engg. Works Ltd.	A-5
JS Humidification	A-12	World Traders Mfg. Pvt. Ltd.	A-2
Kothari Textile Industries	P - 335		

# Greenhouse Effect

The greenhouse effect is a naturally occurring process that aids in heating the Earth's surface and atmosphere. The greenhouse effect was discovered by **Joseph Fourier** in 1824, first reliably experimented on by **John Tyndall** in 1858, and first reported quantitatively by **Svante Arrhenius** in 1896. It results from the fact that certain atmospheric gases, such as carbon dioxide, water vapour, and methane, are able to change the energy balance of the planet by absorbing long wave radiation emitted from the Earth's surface. Without the greenhouse effect life on this planet would probably not exist as the average temperature of the Earth would be a chilly  $-18^{\circ}$  Celsius, rather than the present  $15^{\circ}$  Celsius.



By their percentage contribution to the greenhouse effect on Earth the four major gases are:

- Water vapour - **36-70%**
- Carbon dioxide - **9-26%**
- Methane - **4-9%**
- Ozone - **3-7%**

The major non-gas contributor to the Earth's greenhouse effect, **clouds**, also absorb and emit infrared radiation and thus have an effect on radiative properties of the atmosphere

Gases involved in the Greenhouse Effect and its sources

Greenhouse Gas	Natural and Anthropogenic Sources
<b>Carbon Dioxide</b>	Organic decay; Forest fires; Volcanoes; Burning fossil fuels; Deforestation; Land-use change
<b>Methane</b>	Wetlands; Organic decay; Termites; Natural gas & oil extraction; Biomass burning; Rice cultivation; Cattle; Refuse landfills
<b>Nitrous Oxide</b>	Forests; Grasslands; Oceans; Soils; Soil cultivation; Fertilizers; Biomass burning; Burning of fossil fuels
<b>Chlorofluorocarbons (CFCs)</b>	Refrigerators; Aerosol spray propellants; Cleaning solvents
<b>Ozone</b>	Created naturally by the action of sunlight on molecular oxygen and artificially through photochemical smog production



As energy from the Sun passes through the atmosphere a number of things take place. A portion of the energy (26% globally) is reflected or scattered back to space by clouds and other atmospheric particles. About 19% of the energy available is absorbed by clouds, gases (like ozone), and particles in the atmosphere. Of the remaining 55% of the solar energy passing through the Earth's atmosphere, 4% is reflected from the surface back to space. On average, about 51% of the Sun's radiation reaches the surface. This energy is then used in a number of processes, including the heating of the ground surface; the melting of ice and snow and the evaporation of water; and plant photosynthesis.

**Role of Greenhouse Gases on climate change**

The amount of heat energy added to the atmosphere by the greenhouse effect is controlled by the concentration of greenhouse gases in the Earth's atmosphere. All of the major greenhouse gases have increased in concentration since the beginning of the Industrial Revolution (about 1700 AD). As a result of these higher concentrations, scientists predict that the greenhouse effect will be enhanced and the Earth's climate will become warmer. Some experts estimate that the Earth's average global temperature has already increased by 0.3 to 0.6°C, since the beginning of this century, because of this enhancement. Global warming, a recent warming of the Earth's surface and lower atmosphere, is believed to be the result of a strengthening of the greenhouse effect mostly due to human-produced increases in atmospheric greenhouse gases.

**Role of Textile Industry**

The textile industry is very huge and is considered as one of the most ecologically harmful industries in the world. Thermal energy is required for various operations in the manufacturing of a textile product which is obtained from burning of fuels. This burning then releases harmful gases. It has contributed to the global warming from the stage of growing of the fibres, yarn fabrication, fabric manufacture, wet processing and manufacturing of the garment, its distribution and transportation to stores and customers, its use by the consumers and finally the disposal of the product.

Our responsibility as Textile Industry Personnel should be to be aware of our contribution to the greenhouse effect and maintain a balance in the amount of greenhouse gases emitted by us.

- By Rachana Harane

**17 Countries that waste most food According to OECD  
Environmental Data Compendium**

Sl. No.	State	Kg/person/year
1	USA	760
2	Australia	690
3	Denmark	660
4	Switzerland	650
5	Canada	640
6	Norway	620
7	Netherland	610
8	Austria	560
9	UL	560

Sl. No.	State	Kg/person/year
10	Ireland	560
11	Belgium	550
12	Germany	540
13	France	510
14	Italy	500
15	Finland	460
16	Sweden	450
17	Japan	410

Compiled By Dr Anil Gupta



## Ahmedabad - Chapter

**21st January, 2012**

Vasan Eye Care Hospital, Ahmedabad & the Textile Association (India) Ahmedabad Chapter are jointly organized awareness program on "How to Take Care of Your Eyes" for the members of Association. Shri T.L. Patel, President of TAI-Ahmedabad Unit delivered welcome address in the function. The key speaker was Dr. Shyamal Raval (MS Opthal) from Vasan Eye Care Hospital and he delivered all types of tips on Eye care. Also he presented all types of eye problematic solutions. After his presentation most of participants very interestingly participated in question & answer session. Q & A session was taking long time due to all participants asked questions on their practical problems of eyes. We hope this type of health awareness program should arrange for the members tie-up with other health department also. At the end Shri V.A. Trivedi proposed vote of thanks.



*Dr. Shyamal Raval (MS Opthal), Vasan Eye Care hospital delivering presentation*

**26th January, 2012**

The Textile Association (India) Ahmedabad Chapter organized sports day competition for member's children to celebrate the Republic Day on 26th January, 2012 at Dinesh Hall, Ashram Road, Ahmedabad. Near about 200 members of the association with their families participated in this competition. The competition held

between different age groups. The games were Lemon-Teaspoon, Run-Race, Run after cold-drinks, Making garland by the beads, Throwing Ball, Searching lowest coin from colour water, Musical Chair etc during the program. The entertainment committee awarded 50 prizes between the selected competitors. After indoor game competition Shri T. L. Patel - President welcomed to all participants and handed over the prizes. Every body was enjoyed themselves. Shri V.A. Trivedi encouraged the participants during his vote of thanks. The function was followed by refreshment.



*Group Photograph of participants during the Republic Day celebration*



*GC members of TAI-Ahmedabad Chapter with Spouse during the visit of AGRA Tajmahal*

**4th & 5th February, 2012**

The Textile Association (India) Delhi Chapter hosted 67th All India Textile Conference held on 4th & 5th Feb, 2012 at India Habitat Center, Lodhi Road, New Delhi. The theme of the conference was "textile & Clothing Emerging Global Scenario". From TAI-Ahmedabad Chapter 52 members including GC mem-

**January-February 2012**

bers of Ahmedabad attended the conference. The two days conference was over very successfully.

During the Inaugural Function of conference THE BEST UNIT TROPHY for the year 2010-11 was awarded to the TAI-Ahmedabad Chapter. The said trophy handed over by the Mr. A.B. Joshi, Textile Commissioner, Govt. of India. It is our proud that TAI-Ahmedabad Chapter achieved Best Unit Trophy 8th times so far.



*Office Bearers of TAI-Ahmedabad Chapter receiving Best Unit Trophy for the year 2010-11 from A. B. Joshi, Textile Commissioner, Govt. of India during 67th AITC held at Delhi*

### 18th February, 2012

Mr. T.L. Patel, President & Mr. V.A. Trivedi, Hon. Secretary of The Textile Association (India) Ahmedabad Chapter specially invited by the TAI-Central office & Mumbai Chapter for details discussion on forthcoming 68th All India Textile Conference which will be held in December, 2012 at Mumbai. The meetings are held on 20th January and 18th Feb, 2012 between Central and Mumbai Office bearers.

### 22nd February, 2012

Mr. T.L. Patel, President & Mr. V.A. Trivedi, Hon. Secretary of The Textile Association (India) Ahmedabad Chapter attended a road show organized by the Orbitz Corporate & Leisure Travels (I) Pvt. Ltd held on 22nd Feb, 2012 at Hotel Pride, Ahmedabad. The road show

organized for highlight about the ITMA ASIA +CITME 2012 which will be held on 12-16th June, 2012 at SNIEC, Shanghai, China.

During the program it was presented that in ITMA ASIA + CITME exhibition will feature the A to Z of textile machinery, right from spinning, non-woven, weaving, knitting & garment making to finishing, testing, handling & packaging displayed. Over 800 exhibitors from 33 economics have confirmed their participation. The event is expected to attract some 30,000 international visitors, including key government and textile association officials, buyers, dealers and agents from more than 30 countries. The program was very fruitful for all the participants.

### 28th February, 2012

The Confederation of Indian Industry (CII), Ahmedabad organized a conference on Agri Vision 2020 - Sustainable Growth "The Next Level: Innovating, Partnering, Sharing" held on 28th Feb, 2012 at Hotel St Lurn, Ashram Road, Ahmedabad.

In the said conference Mr. V.A. Trivedi, Hon. Secretary, P.V. Patel, Past President & Dr. N.N. Mahapatra, Managing Committee Members attended from The Textile Association (India) Ahmedabad Chapter.

Mr. Dileep Sanghani, Hon'ble Minister for Agriculture, Co-operation, Animal Husbandary, Fisheries, Cow Breeding, Prison, Excise, Law & Justice, Legislative and Parliamentary Affaires, Govt. of Gujarat has invited as Chief Guest of the function. The objective of the conference was to make Agriculture sustainable which provided an opportunity to discuss on three major imperatives of increasing agricultural productivity, enhancement of yields, making agriculture more remunerative & also make agriculture sustainable to protect and even improve the environment so that the future generation can meet the challenges of the 21st century. Maximum participants were from Agri & Agri-processing business, textile sectors and they understand the challenges for sustainable growth and how to overcome that.

## Textsmile

There are four engineers travelling in a car; a mechanical engineer, a chemical engineer, an electrical engineer and a computer engineer. The car breaks down. "Sounds to me as if the pistons have seized. We'll have to strip down the engine before we can get the car working again", says the mechanical engineer. "Well", says the chemical engineer, "it sounded to me as if the fuel might be contaminated. I think we should clear out the fuel system." "I thought it might be an grounding problem", says the electrical engineer, "or maybe a faulty plug lead." They all turn to the computer engineer who has said nothing and say: "Well, what do you think?" "Ummm - perhaps if we all get out of the car and get back in again?"

## "Fundamentals and Advances in Knitting Technology"

- By Prof. (Dr.) Sadhan Chandra Ray

### Book Review:

- By Prof. M.D.Teli and Dr. Kartick Samanta

Among the four mechanisms of fabric manufacturing technology such as weaving, knitting, non-woven, and braiding, knitting is the second most popular technology after weaving for the production of apparel and home textiles. Knitting has been playing a vital role in making our regular casual apparel and fashionable smart garments from the ancient time. There has been a significant development in knitting technology in last 50 years in terms of products ranging from conventional to advanced one and in the art of operation of machine. Prof. (Dr.) Sadhan Chandra Ray the author of the book on "Fundamentals and Advances in Knitting Technology" has referred to a large numbers of information sources such as reputed books, journal papers, conference papers, newsletters, magazine, leaflet etc and tried his best to compile very useful Text book. It is well written using simple language to make it easily understandable to the readers. The various complex mechanisms of knitting such as loop formation, fabric design and theory have been well explained with the help of large number of pictures and engineering diagrams. The content of the book provides updated knowledge which covers the latest developments in knitting technology. It will help to the readers such as students, researcher, teachers and professionals to know the know-how of knitting. In order to step into the subject of knitting, the book begins with the history of knitting, importance of knitted structure in comparison with woven structure, India's knitting industry and then it slowly introduces weft knitting technology in flat and circular bed. After the description of principle of loop formation in single and double jersey weft knitting

machine, it moves on introducing the advance warp knitting technology. It contains fundamental aspects of flat, circular, full fashioned, hosiery, raschel, tricot production. Development of various types of knitting machines, their mechanisms in actions, loop formation, stitches, as well as structure-properties relationship and end usage of knitted textile are also included. Electronics application in knitting like computer-aided design (CAD) and computer-aided manufacturing (CAM) has been incorporated in the recent development of knitting machine. The author has combined all aspect of knitting ranging from fundamental of warp and weft knitting, fabric construction and products, machines etc. in a single comprehensive volume. Different terminologies of knitting have been well explained in the beginning itself to avoid any confusion to the reader. Towards the end, prof Ray describes the mechanism to produce high end knitted structures such as spacer fabrics, and their possible application in medical textile. The engineering theory and a numbers of mathematical calculations with example are included in this book that will be useful to understand the knitting science, for quality control, and for market based product development. The book is indexed and referenced in detail in every chapter that will be helpful to the reader for further information. I hope, the "Fundamentals and Advances in Knitting Technology" book would be useful as a referral textbook to the lab technician, undergraduate and post-graduate student, researcher academician, and professional. Prof. (Dr.) S. C. Ray's significant efforts in putting all these information together and making a comprehensive textbook on knitting available, are indeed praiseworthy.

This book is brought out by Wood House Publishers and interested readers may approach the publisher directly. JTA strongly recommends this book for libraries -personal and institutional as it is a very good learning resource in Knitting Technology.

9<sup>th</sup> INDIA INTERNATIONAL TEXTILE MACHINERY EXHIBITION

**INDIA-ITME 2012**

**Dec. 02<sup>nd</sup> to 07th, 2012**

Bombay Convention & Exhibition Centre, Goregaon (E).  
Mumbai – 400 065 (India)

## **Buyer Seller Meet on Technical Textiles received resounding success**

"The Ministry of Textiles is committed to working closely with all the stakeholders and bring the government support to technical textiles industry through such programs." said Shri. A B Joshi, Textile Commissioner, Ministry of Textiles, Govt. of India in his inaugural address at the Buyer Seller Meet on Technical Textiles jointly organized by the Ministry of Textiles and Federation of Indian Chamber of Commerce and Industry (FICCI) at Surat on February 15 &16, 2012.



*L to R - Dr. Vaijayanti Pandit, Sr. Director, FICCI-WRC, Shri. Arun Jariwala, Chairman, ITTA, Shri. A B Joshi, Textile Commissioner, MoT, Mr. Rajnikant Marfatia, Executive Committee Member, FICCI, Shri. Rohit Mehta, President, SGCCI*

Shri. Joshi also informed about the different schemes available for SMEs and entrepreneurs. He said that 12th five year plan working committee now estimated that the technical textile market can grow 20% y-o-y in coming years. He briefed participants on the Technology Mission on Technical Textiles and urged the industry in the region, especially the textile business community and entrepreneurs, to make use of the opportunities in the technical textile sector. In the 12th Five-Year Plan, he said, the Government has allocated funds for the development of Centres of Excellence (CoEs) for the various technical textiles, at PSG College on Indutech in Coimbatore, DKTE College on Nonwovens at Ichalkaranji, and at ATIRA on Composites in Ahmedabad which provides support for the do-

mestic and export market development of technical textiles and support for business start-ups.

Shri Arun Jariwala, Chairman, Indian Technical Textiles Association (ITTA) mentioned that Indian Technical Textile sector needs to focus on converters and we should develop converting machinery within India. Our industry should invest in R&D for indigenization of technologies like nanotechnology, and plasma technology etc.

Shri Rohit Mehta, President, SGCCI in his special address said that "Entrepreneurs in Surat should look at technical textiles as the emerging area with promising growth".

In his welcome address, Shri Rajnikant Marfatia, Executive Committee Member, FICCI said that "The technical textiles industry has grown to Rs. 63000 crores in 2011-12 from Rs. 43000 crores in 2007-08, which is a 11% growth per annum; and it is forecasted to grow to Rs. 158,000 crores by 2016-17 with a projected growth percentage of 20% growth per annum." He also said that there is a need of creating awareness amongst the masses about Technical Textiles to enable the sector to grow at its full potential.

There were around 41 exhibitors at the buyer seller meet which attracted visitors from all parts of India and few from abroad. This buyer seller meet attracted a large number of visitors, majority of who were interested to have the information on investment in the escalating technical textile industry.

The exhibitors were from different product groups of machinery, raw material, fabric manufacturers and related accessories and the exhibition was open after the ribbon cutting by all the eminent Guests after which they made a guided tour to the exhibitor's stalls of the leading players in this field like Arvind, SRF, Ginni, RSWM, Oerlikon, Zenith Fiber, Karl Mayer, ATE, Thea-Text Healthcare, Pyrotek, Illies Engineering and others who participated in the exhibition. The exhibition served as a platform to provide buyers with business opportunities and to tap the valuable consumer market.

The buyer-seller meet on both the days was preceded by informative sessions, in which experts discussed subjects like - overviews and opportunities, buyer's perspective, emerging areas, technology and global markets all in context of the technical textiles sector.

The main objective of the event was to highlight the global and domestic scenario, disseminate information on standardization, emphasize on increase in usage of technical textiles products and increase awareness about the application of technical textiles amongst end-user industry.



*Shri A.B. Joshi, Textile commissioner, Ministry of Textiles, Govt. of India, lighting the lamp*



*Shri A.B. Joshi, Textile commissioner, Ministry of Textiles, Govt. of India, addressing the audience*



*Shri A.B. Joshi, Textile commissioner, Ministry of Textiles, Govt. of India, inaugurating the exhibition*



## **A.T.E. targets improved material handling with its tie-up with Ronson**

With the increase in productivity of the textile processing industry - thanks to the state-of-the art production lines - the role of efficient material handling is even more important. Responding to customer's growing needs for reliable and robust material handling equipment, A.T.E. Enterprises has tied-up with Ronson Industrial Engineers Private Limited, India, to offer high quality material handling equipment to process houses.

Established in 1968 by Mr Bindu Gandhi, the family owned Ronson is already well known for its sanforisers for the woven market and comfits for the synthetic market. Under the leadership of Mr Saurin Gandhi, Ronson is now also well established with its range of material handling equipment, which includes:

- "A" frame trolleys
- Box trolleys
- Rotating stations
- Big batching winding unwinding machines
- Battery operated tow trucks

Round piped "A" frames are among the most sold products of Ronson, and it is fair to say that Ronson has established a dominant position for this product. Ronson products are reputed for their reliability, robust construction, low maintenance and ease of operations. They are well accepted by leading textile units in India such as Nahar, Himatsingka, Alok, NSL, Premier, and Birla Century. Ronson also has many successful installations in countries such as U.S.A., Turkey, Egypt, Syria, Tunisia, Nigeria, Kenya, Sri Lanka, Thailand and Vietnam.

A.T.E., which offers end-to-end solutions for the Indian textile processing industry, has already created a separate Processing Accessories division to offer such allied equipment and retrofits to the industry. Commenting on the addition of Ronson's products to A.T.E.'s expanding canvass of offerings for the textile processing industry, Mr Avinash Naik, Business Head, Processing Accessories division of ATEEPL confidently stated that "the textile processors will be glad to invest in such high quality allied equipment for improving its efficiency and bottomline, especially when they are backed by A.T.E.'s assurance for quality and service".

## Indian Textile Accessories & Machinery Manufacturers' Association



"ITAMMA" grabs the opportunity of business growth for its members at 'DTG 2012' by launching "Share a Stall" and "Catalogue Display" schemes supported by a "Business Delegation".

Realising the potential of Bangladesh Textile Industry (i.e. user industry) for its members (supply industry), ITAMMA offered 3 different opportunities for its members, viz. Share a Stall Scheme, Product Catalogue Display Scheme, and Business Delegation visits to mills in Bangladesh. Under the Share a Stall Scheme, Mr. T.N. Sinha on behalf of Mr. Kishore Khaitan of M/s. Basant Wire Industries Pvt. Ltd., Jaipur; Mr. Rahul Shah & Mr. Prashant Shah of M/s. Sumanlal J. Shah & Co., Coimbatore, participated as the exhibitors at a very competitive price. As learnt from the member-participants the response was good and had helped them to work out various business proposals. Under Product-cum-Catalogue Display Scheme, the catalogues of 12 ITAMMA members, viz. M/s. Suprabhatam Textile Equipments, Coimbatore; M/s. Agarwal Engineering Works, Ahmedabad; M/s. Penguin Engineers, Coimbatore; M/s. Permalon Transmissions Pvt. Ltd., Mumbai; M/s. Western Tin Roll Mfg. Works, Ahmedabad; M/s. Coimbatore Air Control Systems Pvt. Ltd., Coimbatore; M/s. Shree Mahaveer Textiles Stores, Bangalore; M/s. Techno Rub Industries, Bhavnagar; M/s. Century Inks Pvt. Ltd., Mumbai; M/s. Srinivasa Textile Equipment Company, Coimbatore; M/s. Continental Engineering Industries Pvt. Ltd., Ahmedabad; and M/s. Jayantilal S. Gandhi & Co., Ahmedabad, were displayed in the ITAMMA Pavilion. Product Catalogues of each of the participants were distributed to the potential visitors at ITAMMA Pavilion. The Dy. Director General (Tech.) interacted with the visitors on their requirements and the enquiries related and the details of their business cards were forwarded to the participants.

The Delegation Team members were Mr. Chetan R. Ghia of M/s. Ghia Textile Products Co., Mumbai; Mr. Mayank Roy of M/s. Excel Industrial Gears Pvt. Ltd., Mumbai; Mr. Rahul Shah & Mr. Prashant Shah of M/s. Sumanlal J. Shah & Co., Coimbatore; Mr. Gyanesh Agrawal of M/s. Sanjay Plastics & Industrial Service, Rajasthan; Mr. Vasantilal C. Soni of M/s. Mayur Reeds And Healds Pvt. Ltd., Ahmedabad; Mr. Zubin Mistry of M/s. Jayantilal S. Gandhi & Co., Ahmedabad; Mr.

Dhaval Doshi of M/s. Texspares Machine Works, Mumbai; and Mr. N.D. Mhatre, Dy. Director General (Tech.), ITAMMA. The team was headed by Mr. Chetan R. Ghia, President of ITAMMA from 11th to 15th February, 2012. Delegation visit was very well composed of activities which gave opportunity of business grooming as well as knowledge enriching to all the delegates. Efforts were taken by the Directorate, ITAMMA since last 3 months for organising the various appointments, mill visits and the travel etc.

On 11th February (½ day) and 12th February, 2012 (full day) members visited the 'DTG 2012' exhibition. The members had a detail interaction on business with each other and on technical and technological aspects with the Dy. Director General (Tech.) at the end of the day in ITAMMA Pavilion.

The meeting with Board of Directors of Bangladesh Textile Mills Association (BTMA) took place on 13th February, 2012, wherein Mr. Feroz Ahmed, Secretary-General; Mr. Jahangir Alamin, President; Mr. M.A. Zaher, Vice President; Mr. Engr. Ahmed Ali, Vice President; Mr. A.S.F. Rahman, Mr. Md. Mosharaf Hossain, Mr. Abdul Mannan Miah and Mr. Monsoor Ahmed, were present. ITAMMA also invited non-delegation members present at 'DTG 2012' for this meeting. Mr. T.N. Singh of M/s. Basant Wire Industries Pvt. Ltd., Jaipur, was one among them.

President, Mr. Chetan R Ghia and Dy. Director General (Tech.) of ITAMMA, conveyed their sincere thanks to the President of BTMA, Mr. Jahangir Alamin; Vice Presidents, Mr. M.A. Zaher and Mr. Engr. Ahmed Ali; along with other Board of Directors Mr. A.S.F. Rahman, Mr. Md. Mosharaf Hossain, Mr. Abdul Mannan Miah, and their colleague Mr. Monsoor Ahmed - Secretary for their kind courtesy extended for the meeting.

President further added that ITAMMA is committed to bridge the gap between user industry and the service industry and wish to offer our dedicated rapprochement to the association / industry of Bangladesh by facilitating direct interaction and providing common platform under one roof.

The Dy. Director General (Tech.) informed that the contribution of MAN, MACHINE & MATERIAL play an important role in the productivity / product quality and cost effective business. To comply with this philosophy, ITAMMA can work with Technical Team of BTMA for mutual interest and growth by serving as Nodal Agency.

President further concluded that ITAMMA has strength

of 450+ members consisting of Manufacturers of branded machines & accessories and other spares as well as Traders, Dealers & major Exporters.

Our member Units not only sell their products in India but Abroad in Several countries like Africa, Argentina, Austria, Bangladesh, Belgium, Bolivia, Brazil, Cameroon, Canada, Central, Africa, China, Colombia, Czech Republic, Egypt, Ethiopia, Europe, France, Germany, Hong Kong, Indonesia, Iran, Ireland, Israel, Italy, Jakarta, Japan, Kenya, Korea, Kuwait, Malaysia, Mauritius, Mexico, Middle East, Morocco, Nepal, Netherlands, New Zealand, Nigeria, Pakistan, Phillipines, Russia, Saudi Arabia, Singapore, South Africa, South East Asia, Spain, Sri Lanka, Sweden, Switzerland, Syria, Taiwan, Tanzania, Thailand, Turkey, U.A.E., U.K., Uganda, Uruguay, US & South America, Uzbekistan, Vietnam, etc. The Export to the tune of more than 7000 Crores is exemplary of its Quality and performance proven products.

Dy. Director General (Tech.) during the shop floor visit explained the importance of various incidences related to system followed by the mills like material flow, its handling & stocking, the plan layouts, machine func-

tioning, etc., from the point of increasing productivity, improving product quality and reducing the maintenance cost, etc. to the Delegates and to the mill Technicians & Executives accompanying the Delegation. Also the detail discussions were held with the mill owners, executives and managers on the observations had and the scope of business for the ITAMMA members. It is noteworthy to state that all the visited mill owners invited ITAMMA members to offer their products on trial basis in their mills. Also ITAMMA's Directorate was invited for conducting consultancy visit to Bangladesh for guiding them on machine audits, etc.

The hospitality extended by all the visited mills especially lunch arrangements at The Padma Fabrics (Pvt.) Ltd., M/s. Padma Bleaching & Dyeing Ltd., M/s. Padma Weaving Ltd., M/s. Paradise Spinning Mills Limited, needs appreciation and are unforgettable. ITAMMA is planning very shortly a visit of its member's team for taking trial of their products clubbed with a liaison visit of Dy. Director General (Tech.) to assess the market potential.



*DTG-2012 organiser Ms. Judy Wang visited ITAMMA Stall.*



*Share a Stall Scheme*



*ITAMMA delegation & BTMA Board of Directors*



*Visit to M/s. Paradise Spg. Mills Ltd*



*Visit to M/s. Padma Bleaching & Dyeing Ltd. & Weaving Ltd*



## Kiran Dhingra appointed new, Textiles Secretary

KIRAN Dhingra, Secretary in the Ministry of Panchayati Raj, has been appointed as the new Textiles Secretary.

Dhingra, a 1975 batch IAS officer, succeeds Rita Menon "The Appointments Committee of the Cabinet has approved... (appointment of Dhingra, Secretary, Ministry of Panchayati Raj, as Secretary, Ministry of Textiles in the vacancy of Rita Menon," an official statement said.

The statement further said that Dilsher Singh Katha has been appointed as Secretary in the Department of Pharmaceuticals, Ministry of Ms Kiran Dhingra Chemicals and Fertilisers.



12-16 June 2012, Shanghai, China  
www.itmaasia.com | www.citme.com.cn

## Leading textile machinery manufacturers snap up ITMA ASIA + CITME 2012 exhibition space

130,000 square metres taken up at the close of application period

Despite the current global economic slowdown, leading textile machinery manufacturers around the world are still attracted to prospects offered by the world's largest textile producer - China. This can be seen from the overwhelming response received by the combined textile machinery show, ITMA ASIA + CITME 2012, which will be held at the Shanghai New International Expo Centre from 12 to 16 June 2012.

At the close of space application, some 130,000 square metres gross of exhibition space in 11 halls has been booked by leading industry names from some 30 economies. Although the space application deadline has passed, the show owners are still being besieged with late applications, including several applications for very large booths.

The exhibition is expected to feature some 1,300 local and international textile machinery makers who will showcase cutting-edge solutions, as well as sustainability and energy efficient machinery and processes.

Chinese exhibitors make up the biggest country group, booking around 50 per cent of the total exhibition space. Besides China, the top participating countries in terms of space applications are Germany, Italy, Japan and Switzerland.

Sector-wise, spinning machinery forms the largest sector. This is followed by knitting, dyeing and finishing, weaving and winding.

Miss Maria Avery, Secretary General of CEMATEX, The European Committee of Textile Machinery Manu-

## Dr A Sakthivel takes over as Chairman of Apparel Export Promotion Council

Dr A Sakthivel takes over as Chairman of Apparel Export Promotion Council (AEPC). Dr A Sakthivel has assumed this position for the 3rd time in AEPC. Earlier he was Chairman during 1998, 2004 -05 period.

He was conferred the doctorate by Bharathiyar University. He is the recipient of 'Padmashri'. Dr A Sakthivel has been the past President of FIECO a member of National Manufacturing Competitive Council (NMCC) and various other Committees set up by Ministry of Textiles (MOT) and Ministry of Commerce (MOC).

Dr Sakthivel is the President of Tirupur Exporters' Association from its inception.

Incorporated in 1978, Apparel Export Promotion Council (AEPC) is the official body of garment exporters that provides invaluable assistance to Indian exporters as well as importers/international buyers who choose India as their preferred sourcing destination for garments.

facturers, said: "The combined show is now well entrenched in the textile machinery exhibition calendar. It draws leading textile machinery manufacturers and is a must-attend showcase for the Asian market, offering plenty of business and networking opportunities."

To ensure that ITMA ASIA + CITME are an industry-leading market place and to attract quality attendance, visitors must purchase badges to visit the exhibition.

Visitors can purchase their badges online at [www.itmaasia.com](http://www.itmaasia.com) and [www.citme.com.cn](http://www.citme.com.cn) to enjoy an attractive 40 per cent discount. For added convenience, visitors may print their badges after successful registration. This time-saving feature further helps visitors avoid possible long onsite queues during the show. This service is also extended to exhibitors who wish to purchase badges for their guests. Visitor online registration will open in December 2011.

ITMA ASIA + CITME 2012 is owned by CEMATEX and its Chinese partners - the Sub-Council of Textile Industry, CCPIT (CCPIT-Text), China Textile Machinery Association (CTMA) and China Exhibition Centre Group Corporation (CIEC). It is organised by Beijing

Textile Machinery International Exhibition Co Ltd and co-organised by MP International Pte Ltd.

Those interested in exhibiting or visiting ITMA ASIA + CITME can obtain more information from [www.itmaasia.com](http://www.itmaasia.com) or [www.citme.com.cn](http://www.citme.com.cn)

Issued by: CEMATEX & China Textile Machinery Association

For more information on ITMA ASIA + CITME 2012, please contact

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## Seminar on 'Value Added Apparel & Home Textiles Made of Natural Fibred'

The National Seminar titled '**Value' Added Apparel And Home Textiles Made Of Natural Fibres'** was jointly organised by the Department of Textiles and Apparel Designing, S.V.T College of Home Science (Autonomous) and Indian Fibre Society (IFS) on the 2d and 3rd March 2012 at the S.N.D.T. Juhu Campus, Mumbai. The inaugural session was graced by the dignitaries Shri. Suresh Kotak, Chairman, Kotak & Company, Shri. Suresh Vaidya, Sr. Textile Consultant, Mr. Vidurashwatha and Dr. Jagneet Madan, Principal, S.V.T. College of Home Science. In his keynote address, Shri. Vidurashwatha detailed technical textiles in general and home textiles in particular. The Guest of Honour, Shri. Suresh Vaidya spoke on how exports of Indian Home Textiles has come down drastically and the way to rectify this is by value addition. Dr. R.P.Nachane, Secretary, IFS stressed upon the use of natural fibres in the context of the present world scenario. The Chief Guest, Shri. Kotak again stressed that natural fibres are a natural answer in our quest towards eco-friendly practices. The session concluded with a vote of thanks by, Mrs. Armaiti Shukla, Head of Department of Textiles and Apparel Designing. The National Seminar provided a platform for scientists, researchers and students to present their research work in the field of natural fibres. The seminar spread over two days was covering four broad themes namely Processing and Finishing; Value addition during product development; Product development/ Innovation and Consumer behaviour. Very interesting research on Banana pseudostem staple fibre, study of Eri silk blends with regards to aesthetic and comfort properties, natural dyes on silk-wool blend, Fibre attributes of Bt Cotton, Fibre Length measurement by AFIS, UV finishes on cotton protective textiles, Anti-bacterial finishes on cotton, Stiffness and drape of Khadi, Teenage consumer behaviour, Preference for active sportswear, visual merchandising of Khadi, Marketability of Maheshwari Sarees were presented. The students presented projects on various topics ranging from the use of Kenaf, Eri Silk, Jute and Hemp to Medicinal Herbs for wellness products, Cosmeo-textiles, Combined Pre-treatment and Dyeing. The students projects were evaluated by a panel of judges and the three best were awarded.

In all fifteen oral, ten posters and eight students' projects were presented over these six sessions. All the speakers enlightened the audience with value additions to the textiles. The National Seminar concluded with the valedictory function graced by Dr. Rita Sonawat, Dean of Home Science faculty and Principal Dr. Madan and vote of thanks by Shri. R.M Gurjar Co-convenor.

## Oerlikon Saurer will show energy saving solutions at Techtextil 2011

Kempton, 30 March 2011 - Techtextil is the most significant global trade fair for technical textiles and nonwovens and will attract again a specialist public to Frankfurt from 24 to 26 May 2011. Oerlikon Saurer will welcome its visitors in hall 3, booth A03. The Allma Product Line, innovator in twisting and cabling of technical yarns and tire cord, will exhibit its Allma CC3 in the combined version as two-for-one and cabling machine. Innovations and especially energy saving solutions will be the central topics.

### Award for energy saving miracle Allma CC4

Energy costs are the greatest cost pool in the entire tire cord cabling process. Therefore experts pay more and more attention to this aspect. At this year's Tire Technology Expo, Allma Product Line received the coveted Tire Technology Award for Innovation and Excellence 2011 for its groundbreaking new development of the Allma CC4. The Allma CC4 is a real energy saving miracle and another milestone in the energy efficiency programme e-save of Oerlikon Saurer.

In fact, the Allma CC4 will revolutionise tire cord cabling in many ways. The machine allows for energy savings of up to 50 percent, depending on the yarn count and spindle type. At the same time, the heat load is reduced by up to 50 percent. On the other side quality is significantly increased due to up to 50 percent less yarn breaks and, in addition, the noise level could be considerably reduced.

### Allma CC3 is market leader for safety products

Safety is based on quality and therefore every metre produced is continuously monitored by online sensors. Another important feature of the Allma CC3 is its maximum flexibility. In the combi version, the machine is suitable both for two-for-one twisting and cabling. Yarns can be twisted as single yarns as well as balanced and unbalanced 2-ply and 3-ply yarns on the same machine. Quality, economic efficiency and material flexibility are unbeatable features. The Allma CC3 is the only worldwide accepted cabling and twisting machine for processing rayon and aramid, in addition to PA, PES and PEN.

The success story is impressive with more than 1400 machines and over 175,000 spindles producing high quality yarns for satisfied customers all over the world.

### Allma TCS for delicate aramid and rayon materials

The Allma TCS success factors are flexibility, economic efficiency and quality. The Allma TCS is the only world-

wide accepted two-for-one twisting machine for processing very delicate materials. PA, PES, PP, PE and materials such as aramid, rayon, etc. can be processed in top quality in a range from 235 to 45 000 dtex. Allma TCS is targeted towards maximum energy saving and enables delivery speeds of up to 350 m/min. Thanks to state-of-the-art technology and high quality components, optimum production quality and reliability are always ensured. Other important features are the optimum yarn path and the assembly-winding unit allowing for twisting and assembling up to 6 threads onto one package.

#### **Ensured Allma customer service**

Fast, comprehensive and long-term customer service is a priority of Allma Product Line. This is supported by a worldwide service network offering a wide range of services. The Allma customer service meets all requirements from consulting, erection, individual training and technological support to maintenance and upgrade packages.

#### **About Oerlikon Saurer**

Oerlikon Saurer with its product lines Saurer, Allma and Volkmann is a Business Unit in the textile segment of the globally successful technology group OC Oerlikon. The product line Saurer located in Arbon (Switzerland) is the world's leading partner for high-quality shuffle embroidery machines, innovative embroidery software and a wide range of accessories. The product lines Allma (Kempten, Germany) and Volkmann (Krefeld, Germany) are the leading international suppliers of two-for-one twisting machines, cabling machines and ring twisting machines for tire cord, industrial yams, all staple fibre yams, carpet yams and glass filament yams. Further information can be found under.

[www.saureroerfikontextile.com](http://www.saureroerfikontextile.com)

#### **About Oerlikon**

Oerlikon (SIX OERL) is a leading high-tech industrial group specializing in machine and plant engineering. The Company is a provider of innovative industrial solutions and cutting-edge technologies for textile manufacturing, drive, vacuum, thin film, coating, and advanced nanotechnology. A Swiss company with a tradition going back over 100 years, Oerlikon is a global player with more than 16 500 employees at over 150 locations in 38 countries and sales of CHF 3.6 billion in 2010. The Company invested in 2010 CHF 239 million in R&D, with over 1200 specialists working on future products and services. In most areas, the operative businesses rank either first or second in their respective global markets. Further information can be found under-  
[www.oerlikon.com](http://www.oerlikon.com)

## **Igmatex**

### **Where Technology meets Business!! Brand Leaders celebrates emerging Technology exhibition at Panipat.**

Panipat hosted igmatex exhibition from 21st to 22nd January 2012 at Huda Ground, near Mittal Mega Mall, Sector-25, Panipat (Haryuana). This 2 days extravaganza show cased the latest technology of Home textile, blanket, quilt and machines to power to all related units in Panipat.

Igmatex Exhibition's Technology Show is the largest technology show in the B grade cities. Igmatex Exhibition drew several industry decision-makers over the 02 days show.

In the last eight editions of Igmatex exhibition the scale of Igmatex is a leap-growth pattern, and it brought new challenges to the industry every time. It is the same this year, while the challenge is bigger than before. The development trend is not clear, and where the enterprises will go? In this special period, what kind of exhibition is the exhibition they need? Igmatex prepared a market analyses and try to make clear the development of textile and garment industries in smaller towns are much stronger than the metro cities.

Igmatex's biggest technology exhibition featured home textile machineries and allied products. Igmatex exhibitions packed with business networking, product showcasing, and brand launch platforms for regional participants.



Even the highest expectations of first time exhibitors and long-term stalwarts of the show are surprised. Feedback has reinforced Igmatex Exhibitions as one of the most influential technology exhibition in india. Over 90% of exhibitors exceed their ROI expectations through: Deals conducted, new partnerships created and

future leads identified during the technology day.

"Igmalex consistently delivers the highest standards and provides us with an immense return on investment year-on-year." Rajesh Kumar Director - Narinder International, Ludhiana

"It's the best show to get ideas and find answers to your manufacturing problems. See new solution demonstrations and choose the best for your needs. Compare technologies from around the world in one place and get the edge you need to stay competitive in your field in the future." Mr. Abhinav Arya, Director, Fabcare Garment Finishing Machines, New Delhi.

"The quality of visitors was superb and to meet this level of decision-makers takes a lot of years and a lot of time but this could be possible in 2 days" Mr. Brijesh Garg, Managing Director, Shrutex Overseas, Panipat

"it was a guaranteed and hassle free experience in Panipat exhibition the business and the contacts made during 2 days extravaganza was beyond our expectations" Mr. Devender, Unidav, Ludhiana.

"We have got thundering response in 1st time happened Igmalex Exhibition in Panipat (Haryana) at chilled and thrilled climate. Visitors was great and business was superb" Mr. Sudhakar varma, Usha International Ltd. New Delhi.

Igmalex exhibition invited all home textile manufacturers, and exporters. Igmalex exhibition was powered by high speed machines, industrial sewing machines, finishing equipments, Testing machines, Knitting machines, Digital printers, CAD/CAM, Lazer cutting



machines. Power looms, yarns, threads, chemicals, colors and accessories.

Participants displayed their latest technology machines with environmentally responsive features of every sort. Their fast selling models on Igmalex exhibition was configured with energy-saving servomotors, automatic sewing machines will produce higher-quality seams in shorter man-hours with operators of any level of skill.

Knitwear production line consisting entirely was of dry-head sewing machines. This section showcases a knitwear and home furnishing production line consisting integrating technology.

Sewing machines for knitwear garment, home furnishing, foundation Fabrics and materials are diversifying faster than ever, exhibits a host of different sewing machine models, including the MF and MO dry-head series models adaptable to diverse materials. Jacquard looms, printing of fabrics, cutting, knitting machines,

Innovation is a soul of Igmalex

Igmalex Exhibitions themed with innovative up gradation" this year , aiming to show the innovation technology for the enterprises and the transition of the industry and all entrepreneur to mobilize the visitors pay more time to view new product, to improve the production quality . They hope to hold a more effective, energy saving and environment-friendly exhibition.

Igmalex exhibition brought india's top branded companies in Panipat 2012 exhibition such as Mehala machines Ltd, CAT, Fabcare, Shrutex overseas, spintex, SRK International, Dynamic Looms, Usha International Ltd, Narinder International, Gross Backert, vaibhav Global, Pardota Overseas, Magnum Resources', Tanya Enterprises, yarn Plus, Commit Industries, Shree Bhardwaj, kamal sales, MSBC Group, AEON group, Needle & Elements, with media partners Bizzduniya.com, Tradeindia.com, Apparel Views, journal of Textile Association, Igmalex magazine etc.



## CONGRATULATIONS !!!

Mr. Prashant A. Chougule has been completed GMTA course with distinction in 2009, conducted by The Textile Association (India). Then he attempted PG CET for M. Tech admission in 2011-12, conducted by Karnataka Examination Authority (Govt. of Karnataka) where he stood 1st in Textile Engineering subject. And 11th in overall Engineering ranking. This has achieved with full support and guidance of Dr. H.V.S. Murthy, Chairman, Professional Award Committee and D.K.T.E's Institute.

Mr. Chougulae presently working with D.K.T.E's Textile & Engineering Institute, Ichalkaranji as Senior Lab Assistant. He is having more than 10 years experience in various textile industries.

The Textile Association (India) takes this opportunity to wish him all the success in his future carrier and endeavors.

## Workshop on Ancient Art of BATIK

An informative Workshop on 'Batik Printing' was held at the Department of Fibres and Textile Processing Technology, Institute of Chemical Technology, Mumbai, on March 9, 2012, in their Dyehouse.

Batik Printing is an age old unique technique of printing carried out in countries like Indonesia, Malaysia, Sri Lanka and India. The speciality of this method is in its usage of molten wax to create exotic motifs. Azoic colours are used in various combinations to give a wide palette of vibrant and bright effects.

An expert was invited for the same, namely, Dr. Meena Bansal, formerly a lecturer in Garment Production and Export Management at the Sri Satya Sai College for Women, University of Rajasthan and currently working at Directorate of Education in Jaipur. She started out as an amateur more than two decades ago and pursued this art as a hobby. Students from B. Tech, M. Tech, M. Sc. and Ph.D (Tech.) came forward to participate in the workshop.

She started out by explaining how one goes about doing this style of printing in an interesting and easily understandable manner. At first the motif is traced out onto the cloth, followed by the application of molten wax onto the design using a brush. After drying it, the cloth is dyed by first placing it in the bath containing naphthol and then it is developed in the base. One must skillfully put the wax on those areas where one chooses not to develop the colour. Finally, in the last stage de-waxing of the fabric is done in



hot water. To develop intricate multi coloured designs, the developing of light colours like yellow is done first. Next, the fabric is waxed again and then dark colours are developed. This style of printing allows one to try umpteen number of combinations by following the simple method stated.

Dr. Bansal carried out the workshop in a meticulous manner and explained the approach used for multicoloured fabrics with coherence. She shared her experience with sheer enthusiasm. Students were excited to try out and experiment this technique. The response was phenomenal when one observed the work done by each and every student. This is an ancient and traditional style which is not carried out extensively in the modern industrialized textile scenario. Hence the only way of preserving this exquisite form of art is by organizing more such interactive workshops.

The workshop was a grand success.

## THE TEXTILE ASSOCIATION (INDIA)

### Revised Membership Fees: w.e.f. 1st April 2012

Sr. No.	Type of Member	Entrance Fees	One Time Membership	Annual Subscription	Share of the Centre	Share of the Unit
A.	Hon. Member	-	-	-	-	-
B.	Patron Member	-	3200	-	1200	2000
C.	Life Member	100	2000	-	650	1350
D.	Ordinary Member	100	-	500	200	300
E.	Overseas Member A	\$ 8	\$ 92	\$10	100%	-
	Overseas Member B	\$ 2	\$ 100	\$ 12	100%	-
F.	Organizational Member	--	15000	-	5000	10000
G.	Student Member A	50	-	200	75	125
	Student Member B	50	-	250	100	150
H.	Life to Patron	-	1300	-	550	750



## The Textile Association (India) - Mumbai Chapter International Seminar

### "Value Additions In Home Textiles & Apparels - The Way Forward"

The Textile Association (India), Mumbai Unit organized the International Seminar "Value Addition in Home Textiles & Apparels - The Way Forward" on 20th January 2012 at Hotel InterContinental the Lalit, Mumbai.

Mr. Rajesh Balakrishnan, Vice President, TAI, Mumbai Unit welcomed the Chief Guest, Mr. A.B. Joshi, Textile Commissioner, Ministry of Textiles, Govt. of India, Key Note Speaker Mr. Ajay Arora, Managing Director, D'Décor Home Fabrics Pvt. Ltd., Awardees Mr. Virender Kumar Arora, Mr. R.L. Toshniwal & Mr. Suresh G. Vaidya, Speakers, Press, Media and delegates.

Mr. C. Bose, President, TAI, Mumbai delivered the presidential address and briefed about the activities of TAI, Mumbai Unit.

Mr. V. C. Gupte Chairman, TAI, Mumbai Unit and Convener of the seminar gave the highlights of the event. He said that Home Textiles is rather synonym with bed linen, curtains, upholstery and towels only. But it is much more beyond these items. Mr. Gupte further added that in apparel segment, yarn dyeing contributes to over 80%. There are many variables in yarn dyeing. However, if handled correctly, it can do substantial value addition. We have attempted to cover yarn dyeing as much as possible and what steps will do further value addition. Mr. Gupte expressed the views that value addition in processing can add to the exports, increase industrial production and increase employment and boost the economy. He said that The Textile Association (India), Mumbai Unit has brought together the eminent speakers from the different sectors of processing industry as well as the Government representatives on the same platform. The topics of the seminar shall cover broad spectrum of the consumer needs and what a processor would be eager to know and understand.

Mr. Ajay Arora, Managing Director, D'Décor Home Fabrics Pvt. Ltd. in his Key Note address said that after the abolition of quota system, Home Textiles has got an important opportunity in the growth of the textile industry. The upward trend of Indian Economy and increasing demand for homes has created a strong growth opportunity.



*Key Note Address by Mr. Ajay Arora, Managing Director, D'Décor Home Fabrics Pvt. Ltd.*

He mentioned that the value addition has become imperative for the textile industry due to being highly capital and labour intensive. Mr. Arora said that the value addition is quite a broad term and it must be redefined. The value addition can be in all fields of business which includes within the factory and outside factory also. In early days, if the raw material costs 'X' and after processing & manufacturing, it is sold for '3X', this was known as value addition. According to him many home textiles products failed to meet this criterion. It is difficult to differentiate yourself in the products, like bed sheets, towels, readymade curtains, etc. These products even fail to meet '2X', leave aside test of '3X'. Manufacturers need to focus where differentiation is possible through following factors,

Design & colour, Construction, Process, Finish

It is very important to differentiate your products with good Designs & attractive colours prove to be a successful way in different markets. It is important to invest into original designs and colours.

According to Mr. Arora, at least 2-5% of sales should be invested in design & colour improvement. The same can be extended to construction which can be very big differentiator due to aesthetic, technical and functionality appeal. The importance of reliable service is always underestimated. A quick response supply chain which can deliver small quantities in short lead time is very critical to estimate accurate demand for different designs & colours. The information technology provides significant help to grow high quality designs and colours. Mr. Arora suggested that the manufacturers need to be

Fast-Flexible-Reliable in today's market.

Mr. Aurora further said that very large part of value addition happens outside the factory. The global buyers keep its share of profit pool by working on certain key capabilities. These key areas are, Design, Brand, Presentation, Business model

The buyers do not procure different products from one, but multiple manufacturers, are able to innovate by combining products to provide consumer one solution like, bedsheets, duvet covers, rugs, curtains and offer very attractive solution. The Packaging, attractive photography and showcasing products enhance their appeal, which fetch higher price for the same product. Mr. Aurora added that Branded products get higher price. Brand creation is an art that requires astute use of thinking, consistent investment and clear promise to the consumer. Brands are difficult to built, but once built can yield rent for life.

Mr. Aurora said that Home textiles market is large and one cannot easily reach small customers, hence it requires a strong distribution network. Huge value addition can also be considered by bringing innovation in business model. By bringing in suitable model, like Business-to-Business one can eliminate costs and do value addition, he concluded.

The Textile Association (India), Mumbai Unit has set a precedent by felicitating the textile professionals for their outstanding contribution in the field of textile industry.



*Mr. Virender Kumar Arora, Chairman, D'Décor Home Fabrics Pvt. Ltd. receiving The Lifetime Achievement Award by the hands of Chief Guest Mr. A. B. Joshi,*

In this Seminar, the TAI, Mumbai Unit felicitated Mr. Virender Kumar Arora, Chairman, D'Décor Home Fabrics Pvt. Ltd.,



*Mr. R. L. Toshniwal, Chairman & Managing Director, Banswara Syntex Ltd. receiving The Lifetime Achievement Award by the hands of Chief Guest Mr. A. B. Joshi,*

Mr. R.L. Toshniwal, Chairman & Managing Director, Banswara Syntex Ltd., Mr. Suresh G. Vaidya, Managing Director, Vaidya & Associates with the Life-Time Achievement Awards.



*Mr. Suresh G. Vaidya, Managing Director, Vaidya & Associates receiving The Lifetime Achievement Award by the hands of Chief Guest Mr. A. B. Joshi,*

Mr. A.B. Joshi, Textile Commissioner, Ministry of Textiles, Govt. of India who was the Chief Guest of the Seminar said Home Textiles have emerged as one of the most dynamic segments in Indian Textile industry. India has become manufacturing hub for home textiles and holds significant position in the export market due to its multi-fibre production and strong traditional base. Presently about 78 percent of total production of home textiles is exported.



*Chief Guest, Mr. A. B. Joshi, Textile Commissioner, Ministry of Textiles, Govt. of India, lighting the lamp*

The home textile industry has bright future due to the



sizeable growth rate of urban housing and hospitality sector in the country. The emerging of this market trend is due to growing demand of comfort and functional performance by customers on fibre combinations, fabric designs, textures, and vibrant colours.



*Inaugural address by Chief Guest, Mr. A.B. Joshi, Textile Commissioner, Ministry of Textiles, GoI.*

Mr. Joshi further said that it is high time that the manufacturers have to further add the values by way of adopting the performance apparel technologies for use in home textile products. Home textiles can also be made from various functional materials such as stretchable fabrics, thermally adaptive bedding, environmentally friendly textiles, anti-microbial fabrics, stain protective treatments, flame retardant and fragrance encapsulating technologies etc. Technical Textiles can also be integrated with home textiles for more value addition - for example bed sheets can be made from coolmax to thermolite fabrics.

The demand for home textiles with flame retardant finishes, stain protective treatments and fragrance encapsulating was expected to grow in future for hospitality and contract markets. He further added that the Indian Government was very much concerned for extending its all required support for harmonized growth & development of the textile industry and would continue with its existing policy environment.

In all, there were 5 technical papers presented during the seminar.

Dr. Susanne Jary, Global Head of Home Textiles, Marketing-Textile Fibers, Lenzing AG, Austria spoke on "Value Added Marketing in Home Textiles". Mr. Gunendra Sangaj, Manager - Technical Marketing (Finishing), BASF India Ltd. presented the paper on "Specialty Finishes for Home Textiles". Mr. Harald Dietmann, Marketing Coloration-Global Business Development Vat Dyes, DyStar Colours Distribution GmbH, Germany made the presentation on "Resource Management in Yarn Dyeing Processing".

Mr. P. Sengupta, Sr. Vice President (Operations), Mafatlal Industries Ltd. presented the paper on "Value

Addition in Yarn Dyed Apparel". Mr. Peter Yeung, Area Sales Manager, Fong's National Engineering Co., Ltd., Hong Kong expressed his views on "Value Addition through Innovation in Yarn Dyeing".

All the Papers received very high response from the participants.

There were two sessions of the Panel Discussions. The theme of the first Panel Discussion Session was "New Opportunities in Home Textiles" which was moderated by Mr. Ullhas Nimkar, Consultant. The Panel comprised Mr. Rajiv Merchant, Chief Executive Officer, Portico New York, India, Mr. Rahul Bhajekar, Managing Director, Texanlab Laboratories Pvt. Ltd., Mr. Edward Menezes, Director, Rossari Biotech Ltd. Mr. Samit Shah, Chief Operating Officer, Synergy Lifestyles Pvt. Ltd.

The second Panel Discussion Session was moderated by Mr. Rahul Bhajekar, Managing Director, Texanlab Laboratories Pvt. Ltd. The theme of this Panel Discussion session was "Market Opportunities for Apparel in the Domestic and Export Sectors". The panel comprised of Mr. Aniruddha Deshmukh, President Textiles & FMCG, Raymond Ltd., Mr. Dipen Jain, Director, LSD Lifestyles Pvt. Ltd., Ms. Bina Mahtani, Director, Dutch India Agency, and Mr. Ullhas Nimkar, Consultant.



*Dignitaries Sitting in the Auditorium*

There was good interaction between participants, who posed many questions to panel members and same were answered very promptly by the panel members. Both the sessions were very interesting and memorable. The topics of interest were value addition through branding, packaging and marketing. Both the sessions were very professionally handled by the moderators as well as the speakers. The delegates were intensely involved till the last session to take advantage of the panel discussion. The organizers of the seminar were happy to note that the objectives of the International seminar are fully achieved.

At the end, Mr. A. V. Mantri, Hon. Secretary, TAI, Mumbai Unit proposed a vote of the thanks. The Seminar was grand success and was attended by over 275 participants.



## The Textile Association (India) - Delhi Chapter

### 67th All India Textile Conference

#### "Textile and Clothing - Emerging Global Scenario"

The 67th All India Textile Conference was hosted by Delhi Chapter of Textile Association (India), the foremost and largest textile professional body of India. It was 2 days conference which was held on 4th and 5th February 2012 at India Habitat Center, Lodhi Road, New Delhi. Delhi Chapter of The Textile Association (India) has hosted this conference after a gap of almost 24 years during a phase, which is critical period for the industry. The gathering witnessed industry captains, academicians, Govt. representatives, delegates, students, media and invited guests. This year, the theme of conference was "Textile and Clothing - Emerging Global Scenario"

The conference proved to be one of the biggest textile and apparel conferences in recent times, drawing very large numbers delegates from India as well as from Bangladesh, Bahrain, Hong Kong, Thailand, Indonesia, Germany, UK & USA. The highlight of the conference was change in the deliberation format. Delhi Chapter adopted the panel discussion format in which 4 to 6 eminent industry, academia and government representatives featured in each discussion, where they shared their experiences and insights in an interactive way which made the conference engaging to a great extent.

On the first day, the Chief Guest, Dr. A.B. Joshi, Textile Commissioner, Ministry of Textiles inaugurated the conference by lightening the lamp. While addressing the conference, he said that it is a matter of pride for us that despite not so conducive circumstances, the textile industry is performing well and is on a path of high growth.

Mr. S.P. Lohia, Chairman, Indorama Corporation, Singapore graced the conference with his presence as Guest of Honor. He highlighted the key challenges in the textile and clothing business with their solutions.

This was followed by the welcome address which was given by Mr. R.K. Vij, President, The Textile Association (India)-Delhi Chapter. The welcome address was followed by the Introduction of The Textile Association (India) by Dr. Anil Gupta, National Vice President, The Textile Association (India). The phenomenal steady

growth achieved by TAI over 72 Years has been through the true democratic spirit of a vast number of dedicated professionals who have worked tirelessly for the cause of TAI." After this, Mr. Ashok Juneja, Chairman, 67th All India Textile Conference spoke about the conference, its idea and objectives. He said "The theme of the conference - 'Textile and Clothing: Emerging Global Scenario' is very relevant in current industry scenario. Though it is difficult to effectively touch upon the complete textile industry from 'Fiber to Fashion' in any conference, to we tried to identify and discuss most pertinent topics for the industry".

Following this was the Presidential Address by Mr. D.R. Mehta, National President, TAI. He highlighted the issues faced by the industry which needs consideration of Office of Textile Commissioner, Ministry of Textiles, and other bodies Government of India.

Mr. Mehta, National President - TAI expressed that the industry suffers issues such as lack of skilled labour, unmanageable power expenses, volatility of currency and all these needs to be taken care of as quickly as possible.



*Dr. A.B. Joshi, inaugurated the conference by lightening the lamp*



*Dr. A.B. Joshi*

Mr. Shishir Jaipuria, Managing Director, Ginni Filaments mentioned that India may increasingly become a supplier of intermediate products, to the other successful garment exporting countries like Bangladesh, Vietnam, Indonesia, unless corrective measures are initiated immediately for upgrading our garment industry. He also advised that women workers should be allowed to work during night shifts while the responsibility of their safety should be on the management of the company.



*Dr. Anil Gupta*



*Mr. S.P. Lohia*



*Mr. Ashok Juneja*



*Mr. R.K. Vij*



*Mr. Shishir Jaipuria*

Mr. Jagdish Hinduja, Managing Director, Gokaldas Images expressed that the doors of opportunity are still open for India, in fact, if we closely look this is the time for us to grow as China the number one supplier to the US is undergoing major problems related to rise in wages, increased demand in their domestic market, Turkey is also becoming costlier. He also mentioned by giving example of his company that it is better to focus on inherent strengths and utilize labour which is available in rural areas.



*Mr. Jagdish Hinduja*



*Mr. D.R. Mehta*

Mr. Rikhab Jain Chairman, TT Limited added that the overall costs are rising worldwide; however, India has a lot of advantages over other countries, we should promote brand India and market it well across the world. He presented his views on Industry, Business and Government Policies.



*Dr. R.C. Jain*



*Mr. Amit Lohia*

After the Inaugural Session, Indorama Industries Limited launched their new spandex brand "Inviya". Mr. Amit Lohia, MD, Indorama Corporation, Singapore addressed the delegates and briefed about their new venture while Mr. R.D. Gupta, Business Head, Indorama Industries Limited, Chandigarh briefed about features of their product. Immediately after the Brand Launch session, Memento Presentation was done followed by Vote of Thanks by Mr. Sameer Dua, Chairman, The Textile Association (India)-Delhi.

There were 2 panel discussions on the first day. The first panel discussion was on "How to Manage Textile and Clothing Business?, Views, Experience and Advice of CEOs". This panel was coordinated by Mr. Prashant Agarwal, Joint Managing Director, Wazir Advisors. Mr. Neeraj Jain, ED, Vardhman Textiles Ltd., Mr. Virender Goyal, MD, Epic Designers Ltd., Hong Kong, Mr. V. K. Goyal, ED & CEO, SEL Manufacturing Co. Ltd., Mr. H.B.S. Lamba, ED, Must Garment Corp., Bahrain and Mr. Rajiv Pande, VP, Maral Overseas were the panel members. Their discussion highlighted the importance of understanding the working environment, training the manpower on both technical as well as soft skills and making the company adaptive to changing market forces. The discussion brought out three key points on which the companies need to focus to manage their business profitably: the people asset, looking inward for most solutions and enhancing the adaptability.



*L to R - Mr. H.B.S. Lamba, Mr. Neeraj Jain, Mr. Prashant Agarwal, Mr. Virender Goyal, Mr. V. K. Goyal, Mr. Rajiv Pande,*

The theme of the 2nd panel discussion was "Innovations and Technological Developments in Products, Processes and Machines". This panel discussion was coordinated by Dr. P.R. Roy, Management Consultant (Textiles) and the eminent speakers where like Dr. Arun Pal Aneja, MD, Noeton Policy in Innovation, USA, Dr. S.C. Anand, University of Bolton, UK, Mr. Peter Stahlecker, MD, SpindelfabrikSuessen, Germany, Mr. Prasanta Deka, Head Marketing India, Rieter India Pvt. Ltd. And Mr. Ashok Juneja, VP-Marketing, KTTM.



*Mr. Peter Stahlecker, Mr. Prasanta Deka, Dr. P.R. Roy, Mr. Ashok Juneja, Dr. S.C. Anand & Dr. Arun Pal Aneja,*

The focus of the discussion was on disruptive innovation, innovation in processes and products to achieve higher productivity, quality and cost reduction. The panel highlighted the fact that innovation is meaningful only if it is commercialized. Panelists suggested that companies should follow the backward approach with market research as our first step. It was also highlighted that the need for Indian industry is to focus on innovative products like technical textiles. The discussion was concluded by saying that innovation in, energy consumption, manpower and processes should be the key focus areas.

The second day of the conference featured next 4 panel discussions. The 3rd panel discussion was on the theme "Textile and Clothing - Vision 2020". The coordinator for this session was Mr. Annurag Batra, Chairman and Editor-in-Chief, exchange4media group and the panelists included Mr. Sanjay Jain, MD, T T Limited, Mr. Manu Indrayan, MD, Indian Yarns, Mr. Yatish Pandey, MD, Texperts India Pvt. Ltd. and Mr. Manjit Singh Saini, CEO & ED, Paramount Instruments. They suggested that companies need to create niche in the market for themselves and focus on productivity aspect. They envisioned India a country of youths in next 10 years which will increase the demand of variety and standardized clothing. They took the focus of the delegates towards the innovations in the smallest of the things which will attract the youths in the textile businesses despite of its low profitable nature. They considered size, efficiency and innovation the major key points to be focused on.



*L to R - Mr. Manjit Singh Saini, Mr. Sanjay Jain, Mr. Annurag Batra, Mr. Manu Indrayan & Mr. Yatish Pandey,*

The 4th panel discussion was on "Global Trade and its Competitive Issues". The session coordinator was by Mr. Arvind Sinha, Chief Advisor & CEO, Business Advisors Group & Allied Energy Group, USA. The panel members included Mr. Ashesh Amin, Founder, Reach out To India (ROTI), Management Consultancy, Mr. Rajeev Gopal, Senior Executive President & CMO, Grasim Industries, Mr. Sudarshan Sharma, Director, CD Lifestyle Pvt. Ltd., Mr. Rajesh Bheda, Principal & CEO, Rajesh Bheda Consulting and Dr. P. Nayak, Director (Market Research), Textile Committee. Their discussion covered the key success factors for being a successful exporter; the role that logistics management has played for trade improvement; the impact of currency appreciation, increasing labour cost in China; commodities which have huge demand overseas, India's low presence in the technical textile categories like lingerie, sportswear, technical textiles, etc.; the emerging trade trends and their impact on Indian exporters,

and other issues related to promoting competitiveness and trade.



*L to R - Mr. Sudarshan Sharma, Mr. Rajesh Bheda, Mr. Arvind Sinha, Mr. Ashesh Amin, Dr. P. Nayak, & Mr. Rajeev Gopal.*

Mr. Ravindra Singh, MD, Protech India Limited coordinated the 5th panel discussion on as "Attracting Investment and Profitability in Textile and Clothing". Mr. Sunil Khandelwal, CFO, Alok Industries, Mr. Gautam Chakravarti, CEO, Gokaldas Exports, Mr. D. K. Nair, Secretary General, CITI, Mr. Vinod Nagar, Ex-Executive Director, Syndicate Bank were the panel members. Their discussion included the reason for low investments in textile and clothing sectors lower returns than other sectors - sluggish export and domestic demand, manpower shortage, policy issues - approvals, subsidies, interest rates; the key policy steps required to be taken by authorities to promote investments; the evaluation steps of an international investor and PE players while making an investment decision. They also stated that FDI in sector will be a precursor to mobilization of resources, improving efficiency, good corporate Governances and increasing scale.



*Mr. Vinod Nagar, Mr. Sunil Khandelwal, Mr. Ravindra Singh, Mr. Gautam Chakravarti & Mr. D. K. Nair;*

The last and the 6th panel discussion was directed by Mr. Harminder Sahni, MD, Wazir Advisors with panel members Mr. BaqarIftikhar Naqvi, CEO, Cotton County Retail, Mr. Vivek Gaur, CEO, Yepme.com and Dr. Nidhi Shankar, Country Head, Ex-cell Home Fashions. The focus of this discussion was how Indian apparel retail market was evolving on account of changing consumer

demographics and mindsets. The discussion also covered new, emerging retail formats like online retailing and their acceptance by Indian consumer. The panel members also delved into the strategies their respective companies were following in order to acquire and retain their consumers. They also discussed the upcoming challenge for Indian retailers in terms of increasing consumer expectations, quality focus and increasing competition.



*L to R - Dr. Nidhi Shankar, Mr. Harminder Sahni, Mr. BaqarIftikhar Naqvi & Mr. Vivek Gaur*

In the end, the valedictory session was held, where Mr. V. Srinivas, Joint Secretary, Ministry of Textiles was the Chief Guest. At the outset, Mr. Prashant Agarwal, Joint Managing Director, Wazir Advisors, knowledge partner of the conference gave the conference wrap-up remarks. Finally, Mr. V. Srinivas, Joint Secretary, Ministry of Textiles delivered valedictory speech in which he outlined the government's plan for next few years to ensure high growth of the Indian textile and apparel manufacturing sector.



*Dignitaries on dais during Valedictory session*



*Mr. Ashok Juneja offering memento to Mr. V. Srinivas*

Conference ended with vote of thanks by Mr. Pankaj Malik and there after a National Anthem.



*Mr. Pankaj Malik proposing a vote of thanks*

In the evening before the dinner a fashion show was presented by students of TITS, Bhiwani and Lady Irwin College, New Delhi.

**The Textile Association (India) awards the Honorary Membership to an eminent individual for his contribution towards the growth of textile industry which was conferred on Dr. R.C. Jain.**



*Dr. R.C. Jain receiving the honour at the hands of Shri A.B. Joshi, Textile Commissioner*

**Dr. R.C. Jain** is the Founder Chairman of TT Group. Dr. R.C. Jain has been in Textile business for more than 50 years. TT Limited is Rs 500 crore vertically integrated textiles company.

**The objective of awarding Hon. FTA (Fellow of the Textile Association) is to honour and recognise the contribution made by an individual in the field of Textile Education/Research & Development.**



*Dr. B.K. Behera receiving the honour at the hands of Shri A.B. Joshi, Textile Commissioner*

**Dr. B.K. Behera** graduated from TITS Bhiwani in 1983. He did his M. Tech and Ph. D from IIT Delhi in 1985 and 1989 respectively. Presently Dr. Behera is a professor in the Department of Textile Technology in IIT Delhi.

**Service Gold Medal is given to an individual member in recognition of his services to the Association at the national level.** This Award is considered the Highest Award of the Association which gives due honour and respect to its member and sets an example for coming generation to dedicate themselves in the service of the Association.



*Mr. R.C. Kesar receiving the award at the hands of Shri A.B. Joshi, Textile Commissioner*

**Mr. R.C. Kesar** is an alumnus of TIT Bhiwani and has 46 years of experience and has worked as General Manager/CEO in Industry and has also handled projects in Malaysia and Indonesia. He was Director Technical in NTC Head office. He is the founder of Okhla Garment & Textile Cluster (OGTC).

**Service Memento is awarded to recognise the services of the members rendered at the Unit level.** These awards are instituted to encourage people to render valuable services in promoting activities of the respective units. Two mementos awarded every year are donated by Shri H.A. Shah and Shri J.J. Randeri.



*Mr. Pankaj Malik receiving the award at the hands of Shri A.B. Joshi, Textile Commissioner*

**Mr. Pankaj Malik** is the Vice President, Textile Association (India)- Delhi and Joint Director, North Zone, Textile Committee.



*Mr. Hemant Dave receiving the award at the hands of Shri A.B. Joshi, Textile Commissioner*

**Mr. Hemant Dave** did his Graduation and Post Graduation in Textile Engineering from MS University Baroda. He has rich academic expertise and technically sound field experience of more than 33 years. At present he is the Head of Gujarat Knit Fabric Pvt. Ltd.

Every year Textile Association India presents Best Unit Award to one big unit and one small unit based on their performance with regards to the activities they undertake. The activities include organisation of Seminars, workshops, publications etc to strengthen the Textile Association.

**This year Best Unit Trophy (Among Larger Units) was awarded to TAI - Ahmedabad Unit**



*Mr. T.L. Patel, President along with other Office Bearers of TAI - Ahmedabad unit receiving the Best Unit Award at the hands of Dr. A.B. Joshi, Textile Commissioner*

**The Textile Association (India) - Delhi Unit honoured Lifetime Achievement Trophy to their following five Founder Members for Dedicated Services to their Delhi unit.**



*Mr. V.P. Gupta receiving the honour at the hands of Shri A.B. Joshi, Textile Commissioner*

**Mr. V.P. Gupta** did his Textile education from GCTI Kanpur in 1950 and worked in Modi Group. He is founder member of TAI Delhi unit and at present Trustee of TAI Delhi.



*Mr. M.K. Mehra receiving the honour at the hands of Dr. A.B. Joshi, Textile Commissioner*

**Mr. M.K. Mehra** is working in Textile Industry for last 55 years and is alumni of TIT Bhiwani. After a long spell in Textile Manufacturing he has specialised in the field of management, training, and development. Three new Textile Projects were completed under his leadership. He is working as Director of Okhla Garments and Textile Cluster since its inception from 2004.



*Mr. B.K. Malhotra receiving the honour at the hands of Shri A.B. Joshi, Textile Commissioner*

**Mr. B.K. Malhotra** did B.Sc. (Textiles) from TIT Bhiwani in 1959 and M.B.A. from Dept of Manage-

ment Studies, Delhi University in 1967. He was the first Joint Secretary of Delhi Branch of All India Textile Association (1967-1970).



*Mr. R.L. Kapoor receiving the honour at the hands of Shri A.B. Joshi, Textile Commissioner*

**Mr. R.L. Kapoor** did B. Sc. (textiles) from TIT&S in 1962 and Post graduate diploma in industrial management and MBA from Delhi University. President, TAI-Delhi from 1993 to 1995 and Trustee from 2009 to 2011.

**Mr. H.R. Thukaral** is a founder member of Delhi unit. He is an alumnus for Delhi Polytechnic passed out in 1952. In Delhi he always helped in organizing activities & conference and Looking after all arrangement.

**The Textile Association (India) - Delhi Unit also honoured with Lifetime Achievement Award for promotion of Textile Education to Prof. R.C.D. Kaushik.**



*Prof. R.C.D. Kaushik receiving the honour at the hands of Shri A.B. Joshi, Textile Commissioner*

**Prof. R.C.D. Kaushik's** name has become synonymous with textile education in India. Having passed B.Tech-Textile Technology in 1956 from Delhi College of Engineering, he was one of the four scholars from India, selected for US scholarship. As a Director, he spearheaded Technological Institute of Textiles & Sciences, Bhiwani for four decades making TITS name worth reckoning in textile education.



**TAI - Spintex Scholarships**

During this conference at All India level two new scholarships have been instituted by TAI Spintex. Each scholarship will be a Merit and Means Scholarship of Rs. 24,000 per year. This year deserving students from TITS Bhiwani and Lady Irwin College have been chosen for the same. From next year the TAI Central Office will seek applications on All India basis to choose two Post Graduate students for TAI-SPINTEX Scholarship. Recipient of TAI-SPINTEX Scholarship from TITS is Ms Vandana Taneja. & one more student will be selected from Ledy Irwin College



*Fashion Show by Student of TITS*



*Ms Vandana Taneja - TITS receiving the*



*View of Audience*



*Fashion Show by Student of Lady Irwin College*



*Dr. A.B. Joshi, Textile Commissioner enjoying the sessions*

In all the conference was a great success and many participants expressed the happiness over its contents and format.

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The second edition of InFashion 2012, the international textile and ingredient innovation show was successfully organized by Images Group in association with Federation of All India Textile Manufacturers Association (FAITMA) during 13TH to 15TH March 2012 at Bombay Exhibition Centre, Goregaon, Mumbai. The Textile Association (India) was one of the supporting bodies and Journal of the Textile Association was included as Media Partner with others. A complementary stall measuring 9 Sqm was allotted in the venue.



*View of Stall at InFashion 2012*

This event was a unique platform for the Textile Industry witnessed an exhilarating start with strong participation from stalwarts of the Indian textile industry. There were several stalls of fabric manufacturers, retails and Brands were displayed under one roof of exhibition. In the exhibition, Siyaram's, Birla cellulose, Raymond, Bombay Fashion Rayons, Morarjee, SKNL, Donear, Wooltex, Sangam, Prasar Impex, Bhaskar, Parvati, Rajlaxmi, Gini, Lenzing, Reliance, Mandhana and other several brands were displayed.

Addressing the inaugural session, Mr. Ramesh Poddar, President, FAITMA and Vice-Chairman & MD, Siyaram Silk Mills, said, "We find that the per capita availability of cloth - which was only around 30 square meters during the years 2000 to 2005 - has now considerably increased to around 44 square metres."

"It is also observed that the textiles purchase per capita in 2009 was approximately Rs 1,754 compared to only Rs 1,027 in the year 2000 - a drastic increase of over

70 percent. This shift in terms of increased purchasing power reflects the positive and result-oriented approach of our industry and the dedication at every level. I am quite confident that consumerism in India will increase manifold over the years and the industry will leverage this opportunity to ensure profitable growth."

Bombay Rayon, Raymond, Morarjee Textiles, Birla Cellulose and Damodar Group, engaged in an invigorating debate, emphasizing on the growth potential of the industry which is expected to multiply four-fold in the coming decade. Further, the panel also highlighted the need to urgently upgrade technology to produce superior and globally competitive products.

The panelists stressed the importance of government support by forming liberal policies for facilitating smooth functioning of domestic and international commerce. The industry captains also highlighted the need for integrated manufacturing and best practices to optimize production, focus on waste reduction and increase profit margins.

Mr. D.R. Mehta, National President, inaugurated the stall of Prasar Impex, a leading manufacture of high quality Linen fabrics. Mr. K.D. Sanghvi, Chairman, Mr. V.D. Zope, Hon. Gen. Secretary of TAI and Mr. J.B. Soma, Publisher of JTA was present during the inaugural function alongwith Mr. Rajkumar Singhal, Mr. A.K. Choudhary and others from Prasar Impex were present.



*Mr. D.R. Mehta, inaugurating the stall of Prasar Impex*



*L to R - Mr. J.B. Soma, Mr. Rajkumar Singhal, Mr. V.D. Zope, Mr. K.D. Sanghvi & Mr. D.R. Mehta*

Mr. V.D. Zope, Hon. Gen. Secretary, TAI was one of the panelists in inaugural session delivered his views on The Way Forward to Textiles - KAL KI SOCH AAJ.



*L to R - Mr. S.N. Modhani, Mr. Harminder Sahni, Mr. V.D. Zope delivering his views*



*Mr. R.K. Rewari & Mr. V.D. Zope*

Mr. D.R Mehta - National President, Textile Association (India) was also one of the panelists in second session delivered his views on Textile Policy - GOVT. KE SAATH HAMARA BUSINES. He said "Going forward, creativity will be an important factor for the success of the textile industry. Innovation and research in fiber is of utmost importance to produce high quality end product. Surat being a manufacturing hub daily produces 35-40 million meters synthetic fabric. This

can be further increased through automation, modernization and government support."

The session on 'Textile Policy: Government Ke Saath Hamara Business' involved a discussion on the national textile policy and opportunities presented by the technology upgradation fund schemes. The session gave an overview of the effectiveness of the National Textile Policy and the merits of a favourable excise duty structure and the other measures to overcome the challenges of textile manufacturers. The panelists emphasized the importance of state and centre participation which can help fulfill the huge demand and supply gap in the domestic textile market.

During the conference there were 13 sessions and a highly profiled eminent speakers presented their views on the textile, clothing and Management.

Mr. Rahul Mehta - President, CMAI further highlighted the need for tax exemptions and tax holidays. "It is important for the industry to keep on creating more and more employment opportunities. The government will then be more than willing to assist us to meet our goals", he added.

Mr. S.N. Modani - M.D., Sangam reiterated the lack of skilled labour. "The industry is witnessing a dearth of skilled labour making it only imperative to invest time and resources in training manpower. Subvention of interest rates and access to loans from financial institutions will help boost demand," he said.

The second day at Infashion, the international textile and ingredient innovation show, witnessed unremitting brainstorming over the untapped potential in Tier II and III markets. "As 45% of the revenues generated in textile industry are garnered from these markets, it is the target region for textile manufacturers to expand in" industry captains said.

Addressing the session on Economy : Textiles - Growing in Tier II and III Markets, Mr. Ram Bhatnagar, Vice President (Emerging Markets), Raymond, said, "As a result of brands setting up in these regions, a shift of 15% is observed in consumer preference from unbranded fabric to that of brands."

"Aspirations have caught up with consumers residing in these cities; we need not downgrade or decline our quality or service in order to cater to them. Branded clothing is doing equally well in these regions", Mr. P. S. Rajiv, Head Retail EBO's Arvind elaborated.

The panelists unanimously agreed that there is a need for up-gradation of soft skills among tailors, who constitute as one of the most important links in the textile industry.

"Tailoring industry lacks the infrastructure that an industry of its size should command. There is a need for an efficient distribution network in tier II and III markets, the lack of which shifts consumer preference toward readymade garments", added Mr. Anand Pandey, VP, Future Brands.

The session on 'Work wear market scenario in India' involved an intriguing discussion highlighting the challenges, opportunities and trends in the "uniforms" market of India. Mr. Mukesh Vijaywargi, President - Klopman initiated the discussion, with an interesting revelation, that the basic difference between the European and Indian market is that in the former country, uniforms are simply rented out by corporate whereas in India, the fabric is bought and handed over to the employee to customize as per their measurements.

"This leaves a huge scope for our country to explore", he added. The panelists lamented the lack of brand recall in this sector.



*View of the audience*

Mr. Anupam Bansal, MD, Liberty, said, "The irony of it all is that although corporate invest a huge sum in the fabric and its tailoring, little attention to detail is provided besides stamping it with company logo." The panelist felt that till date, people in uniform are looked down upon despite uniforms harbouring and serving as a corporate branding exercise.

InFashion 2012 co-organized by FAITMA Federation of All India Textile Manufacturers Association, which is in the second year is the only platform in the entire South Asia that showcases textile and ingredient innovations in fibre to finish. The show brings together 200 plus exhibitors from across the world and 30,000 plus trade visitors making it the true reflection of the needs of the Indian Textile Industry.

### Top 20 Rice Producing Countries

Sl. No.	Country	Production (Million MT)
1	China	1966
2	India	1337
3	Indonesia	643.989
4	Bangladesh	477.240
5	Vietnam	380.955
6	Myanmar	326.82
7	Thailand	314.629
8	The Philippines	162.664
9	Brazil	126.518
10	Japan	105.925
11	Pakistan	103.245
12	USA	9.972
13	Cambodia	7.586
14	Egypt	7.500
15	South Korea	7.023
16	Nepal	4.523
17	Madagascar	4.005
18	Sri Lanka	3.652
19	Nigeria	3.402
20	Peru	2.989
	<b>TOTAL</b>	<b>5995.637</b>

*Compiled By Dr Anil Gupta*

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Innovative technology, outstanding quality of manufacture, high productivity, and reliability in service are the key features of all TEXTECHNO products. The scope of supply includes fully-automatic testers for linear-density, tensile strength, elastic properties, fatigue, shrink, crimp, interlace, friction, entanglement, imperfections, evenness, hairiness and fibre length. The latest benchmarks of TEXTECHNO's developments are STATIMAT DS, an automatic evenness-, count-, and tensile tester for yarns, the STATIMAT 4U, the world-wide first automatic linear-density and tensile tester for high-tenacity yarns, the automatic linear-density-, crimp-, and tensile tester for single-fibres FAVIMAT+ (AI)ROBOT2 as well as the first automatic drapability tester for technical- and non-crimp fabrics.

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TEXTECHNO also provides turn-key laboratory solutions for textile companies from one source, which include consulting, layout conception, installation, technical training and after-sales services.

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**The Textile Association (India) - Central Office**

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Mumbai - 400 028 Tel : 022-24461145 Fax : 022-24474971 E mail : taicnt@mtnl.net.in

**RESULTS OF ATA PART - I, (Old) PASSED/ATAHE CANDIDATES DECEMBER, 2011**

Centre / Result	PASS	ATAHE
Ahmedabad	2011/OA/02	2011/OA/01
Bhilwara	NIL	2011/OA/10, 2011/OA/11, 2011/OA/12
Coimbatore	2011/OA/24	2011/OA/22
Delhi	NIL	NIL
Ichalkaranji	2011/OA/30	NIL
Mumbai	NIL	NIL
Nagpur	2011/OA/45, 2011/OA/46	2011/OA/43

Registered	Appeared	Passed	ATAHE	Passed %
18	16	05	06	31%

**RESULTS OF ATA PART - II (Old) PASSED CANDIDATES DECEMBER, 2011**

Centre	Spinning	Weaving	Chemical Processing	T.T & Q.C
Ahmedabad	2011/OA/501	NIL	2011/OA/702	NIL
Bhilwara	NIL	NIL	NIL	NIL
Coimbatore	2011/OA/521 2011/OA/522 2011/OA/525	2011/OA/601 2011/OA/602	NIL	NIL
Delhi	NIL	NIL	NIL	NIL
Ichalkaranji	NIL	NIL	NIL	2011/OA/810
Indore	NIL	NIL	NIL	NIL
Mumbai	NIL	NIL	NIL	NIL
Nagpur	NIL	NIL	2011/OA/721	NIL

**Roll Nos. 2011/OA/520 & 2011/OA/523 of Coimbatore Centre will declared on completion of ATA Part I.**

Candidate	Spinning	Weaving	Chemical Proce.	T.T & Q.C	Total
Registered	13	06	05	02	26
Appeared	12	06	05	02	25
Passed	04	02	02	01	09

Passed 36%

**RESULTS FOR GMTA SEC A/B/C/D PASSED CANDIDATES DECEMBER, 2011**

Centre	Section B	Section - C		Section D	Section-E
		Spinning	Weaving		
Ahmedabad	Nil	2011/AHC/01-S	Nil	2011/AHD/01 2011/AHD/02 2011/AHD/03 2011/AHD/04	Nil

Centre	Section B	Section - C			Section D	Section-E
		Spinning	Weaving	Chem. Proc.		
Bangalore	Nil	2011/BAC/10-S 2011/BAC/11-S 2011/BAC/12-S 2011/BAC/13-S			2011/BAD/10 2011/BAD/12 2011/BAD/13	Nil
Bhilwara	Nil	Nil	Nil	Nil	Nil	2011/BHE/01
Coimbatore	Nil	Nil	Nil	Nil	Nil	Nil
Delhi	2011/DEB/20	2011/DEC/20-S	Nil	Nil	2011/DED/20 2011/DED/21 2011/DED/22	Nil
Ichalkaranji	2011/ICB/30 2011/ICB/32	Nil	Nil	2011/ICC/01-CP	Nil	Nil
Indore	2011/INB/40 2011/INB/42	Nil	Nil	Nil	Nil	Nil
Mumbai	2011/MUB/50	Nil	Nil	Nil	Nil	2011/MUE/02
Nagpur	Nil	Nil	Nil	Nil	Nil	2011/NAE/03

Candidates	Section - B	Section -C			Section -D	Section-E	TOTAL
		Spinning	Weaving	Chem. Proc			
Registered	15	10	01	02	13	03	44
Appeared	14	10	01	02	13	03	43
Passed	06	06	Nil	01	10	03	26

Passed 60 %

**RESULTS FOR ATA PART - I (Revised) PASSE/ATAHE CANDIDATES DECEMBER, 2011**

Centre/Result	PASS	ATAHE
Ahmedabad	2011/NA/01, 2011/NA/02, 2011/NA/03 2011/NA/04, 2011/NA/05, 2011/NA/09	2011/NA/06, 2011/NA/07, 2011/NA/08
Bangalore	Nil	2011/NA/20
Bhilwara	2011/NA/34	2011/NA/35
Coimbatore	2011/NA/42	Nil
Delhi	2011/NA/50, 2011/NA/53, 2011/NA/57 2011/NA/58	2011/NA/51, 2011/NA/52, 2011/NA/55 2011/NA/56, 2011/NA/59
Ichalkaranji	2011/NA/70, 2011/NA/73, 2011/NA/74 2011/NA/79, 2011/NA/80, 2011/NA/84 2011/NA/87, 2011/NA/93, 2011/NA/96	2011/NA/75, 2011/NA/78 2011/NA/81 2011/NA/82, 2011/NA/83 2011/NA/86, 2011/NA/91 2011/NA/92, 2011/NA/94
Indore	2011/NA/100, 2011/NA/101, 2011/NA/102 2011/NA/103, 2011/NA/105, 2011/NA/106 2011/NA/107, 2011/NA/108, 2011/NA/109 2011/NA/110, 2011/NA/111	Nil
Mumbai	Nil	2011/NA/124
Nagpur	2011/NA/130, 2011/NA/136, 2011/NA/137	2011/NA/138

	Registered	Appeared	Passed	ATAHE	Passed %
Total	82	68	35	21	51 %

**RESULTS FOR ATA PART - II (Revised) DECEMBER, 2011**

Centre / Result	PASS	ATAHE
Ahmedabad	2011/NA/502, 2011/NA/504, 2011/NA/505, 2011/NA/506	2011/NA/501
Bangalore	2011/NA/520	Nil
Bhilwara	2011/NA/531	Nil
Delhi	2011/NA/540, 2011/NA/541, 2011/NA/542, 2011/NA/543, 2011/NA/545, 2011/NA/546	Nil
Ichalkaranji	2011/NA/550	Nil
Indore	Nil	Nil
Mumbai	Nil	Nil
Nagpur	2011/NA/581	Nil

Results with held of following Roll Numbers for non receipt of Industrial Report.

Ahmedabad Centre: 2011/NA/503, 2011/NA/508 Delhi Centre: 2011/NA/544;

Indore Centre: 2011/NA/560, 2011/NA/561 & Nagpur Centre: 2011/NA/580.

	Registered	Appeared	Passed	ATAHE	Passed %
Total	26	25	14	01	56%

**Schedule of ATA Examination December 2012 - A.T.A. Part-I [Time 10.00 a.m. to 1.00 p.m.] OLD COURSE**

Saturday, 22nd December 2012	Textile Fibres
Sunday 23rd December 2012	Principles of Spinning
Monday, 24th December 2012	Principles of Weaving
Tuesday, 25th December 2012	Principles of Chemical Processing

**A.T.A. Part - II [Time 2.00 p. m to 5.00 p.m.] OLD COURSE**

Saturday, 22nd December 2012	General Engineering
Sunday 23rd December 2012	Indian Text. Industry & Mill Management
Monday, 24th December 2012	Group-I Spinning [S-I] Spinning Preparatory Group-II Weaving [W-I] Weaving Preparation Group-III Chem.Proc.[CP-I] Fibre, Bleaing & Finishing Group-IV Text. Test. & Q. Cont. [TTQC-I] Testing & Statistics
Tuesday, 25th December 2012	Group-I Spinning [S-II] Ring Spinning & Doubling Group-II Weaving [W-II] Weaving Machines Group-III Chem. Proc.[CP-II] Dyeing & Printing Group-IV Text. Test. & Quality Cont [TTQC-II] Quality Control

**Schedule of A.T.A. Part-I, II & III (3-Years New Course)- December 2012**

**ATA Part-I Time 10.00 a.m. to 1.00 p.m. ATA Part-II Time: 2.00 p.m. to 5.00 p.m.**

Date	Subjects	Date	Subjects
22.12.2012	Basic Engineering Sciences	22.12.2012	Principles of Yarn Manufacture
23.12.2012	General Engineering	23.12.2012	Principles of Fabric Manufacture
24.12.2012	Textile Fibres	24.12.2012	Principles of Textile Wet Processing
25.12.2012	Elements of Textile Technology	25.12.2012	Principles of Textile Testing and Statistics
26.12.2012	Elements of Comp. and its Applications	26.12.2012	Industrial Organization and Management



**ATA Part-III - Time:10.00 a.m. to 1.00p.m****Compulsory Subjects**

22.12.2012	Elements of Technical Textiles
23.12.2012	Man-Made Fibre Technology

**Optional Subjects**

Date	Yarn Manufacture Group	Fabric Manufacture Group	Textile Wet Processing Group	Knitting & Garment Manufacture Group
24.12.2012	Process Control in Yarn Mfg.	Process Control in Fabric Mfg.	Wet Processing-I	Knitting Technology
25.12.2012	Modern Yarn Manufacture	Modern Fabric Manufacture	Wet Processing-II	Garment Technology

**Schedule of G.M.T.A. (Old) Examination December 2012**

<b>Section-A</b>	<b>Time 10.00 a.m. to 1.00 p.m.</b>	<b>Section-B</b>	<b>Time: 2.00 p.m. to 5.00 p.m.</b>
Date	Subject No & Title	Date	Subject No & Title
22.12.2012	A-1 English	22.12.2012	B-1 Statistics
23.12.2012	A-2 Physics	23.12.2012	B-2 Gen. Engineering
24.12.2012	A-3 Mathematics	24.12.2012	B-3 Text. Physics
25.12.2012	A-4 Chemistry	25.12.2012	B-4 Mech. of Text. Mach.
<b>Section-C Time:10.00 a.m. to 1.00p.m</b>			
<b>Date</b>	<b>Spinning Group</b>	<b>Weaving Group</b>	<b>Chem.Proc.Group</b>
22.12.2012	SC1- Advanced yarn Mfg.	WC1-Advanced Fab.Mfg.	CPC1-Ele.of Chem.Engg
23.12.2012	SC2- Mod. Yarn Prod.	WC2-Mod.Fab.Production	CPC2-Chem.of Int. & Dyes
24.12.2012	SC3- Proc. Control .in Spg.	WC3-Proc.Cont. in Wvg.	CPC3-Chem.& Eval. of. Text. Aux.
25.12.2012	SC4 -Engg. Desg. of . Tex. Struc	WC4-Engg.Desi. of Text.	CPC4- Advanced Chem. Proc.
Optional Papers			
26.12.2012	SO1-Spg.of Man-made Fib.& Bl	WO1-Knitting Technology	CPO1-Control Mechanism & Instrume.
27.12.2012	SO2-Long Staple Fibre	WO2-Wvg.of Fil.& Text.Yarn	CPO2-Ele.of Poly.Chemistr
28.12.2012	SO3-Theory & Desi.of Tex.Mac	WO3-Q.Cont.of wov & Non.wov	CPO3-Ble.Dye,Print & Fini.
29.12.2012	SO4-T.T. & Q.C.	WO4-Geo.Text & Ind.Fab	CPO4-Compu.Colour Mach.
<b>Section-D Time [ 2.00 pm to 5.00pm ]</b>			
26.12.2012	D1- Data Pro.& Comp. Program		
27.12.2012	D2- Manmade Fib Prod & Properties		
28.12.2012	D3- Ind. Engg & Mill Management		
29.12.2012	D4- Mill Org. & Proce. Control		

**Schedule of G.M.T.A. (Revised) Examination December 2012**

<b>Section-A</b>	<b>Time 10.00 a.m. to 1.00 p.m.</b>	<b>Section-B</b>	<b>Time: 2.00 p.m. to 5.00 p.m.</b>
Date	Subject No & Title	Date	Subject No & Title
22.12.2012	A-1 Engineering Physics	22.12.2012	B-1 Yarn Manufacture
23.12.2012	A-2 Engineering Chemistry	23.12.2012	B-2 Fabric Manufacture
24.12.2012	A-3 Engineering Mathematics	24.12.2012	B-3 Textile Wet Processing
25.12.2012	A-4 General Engineering	25.12.2012	B-4 Apparel manufacture
26.12.2012	A-5 Professional Orientation		B-5 Textile Testing

# THE TEXTILE ASSOCIATION (INDIA), MUMBAI UNIT

## One Day Seminar on "INNOVATION IN WEAVING"

**Day & Date** : Saturday, 28th April 2012 (Time: 09.00 a.m. to 04.30 p.m.)  
**Venue** : Hotel Fortune Park Galaxy, Daffodil Hall, GIDC, N.H.No-08, Vapi - 396 195 (Gujarat)

The composite textiles mills find them self trapped between the modernization of powerloom sector and the cut throat competition in the global market. At the lower and middle segments, of the market, composite mills are being replaced by power loom sector. The power loom units in turn face the challenge of moving up to modern style of management desired by the global markets. If the organized mills need definite place in the textile industry in the years to come, they must decide to concentrate in the market as a quality producer of specialty fabrics and serve the international as well as domestic market. Nevertheless some mills have ventured to start specialty fabrics, however most of the them have yet to reach the international standard. We are still lacking in the area of up-gradation of technology in weaving. Infact it is desirable to replace machines with proper choice of technology and development of modern management styles particularly for decentralized weaving sectors. It is heartening to note that the process of modernization is taking place in the weaving sector and large numbers of shuttleless looms are being installed at various centres. The modern world is more interested in readymade garments rather than tailor made. Weaving industry will have to meet the requirement of readymade garment industry. There is a demand for wider width and defectless fabrics for the manufacturers of ready made garment. This is possible with modern shuttleless looms. It is needless to emphasis that the Indian textile industry will have to be competitive to face the international competition of textile goods. The present seminar will give an opportunity to the textile technologists to share their thoughts to meet the challenges and such an interaction will be highly productive and beneficial.

### TAI SEMINAR

TAI brings to you a seminar specially dedicated to weaving - Innovation in Weaving. This will be the right forum where the top Indian magnates will not only be sharing their views but will also outline the forward path for the Indian textile industry. The subjects will cover right from the weaving preparatory to value addition keeping in mind the quality concepts of international standards. The seminar will also cover the issues related to Govt. initiatives for helping the weaving sectors. The eminent industrialists, reputed professionals and renowned experts from diverse fields of textiles have been invited to address the gathering. There will also be a panel discussion wherein participants' queries will be answered by the expert panel. We are expecting over 200 delegates to participate in this seminar.

### THE FOLLOWING TOPICS WILL BE COVERED

- Quality in Preparatory for Weaving Quality and Production
- Recent Developments of Synthetic Sizes for Spun Yarns and Size Recovery"
- Sizing Chemicals with low costing & with improved strength of yarn
- Furnishing fabrics with new electronic Jacquard and verity in design
- Technical & GEO Textiles
- Automation and role of software in Weaving
- Quality Control in Weaving
- Innovative HR practices
- Govt. Policies & Strategies for Textile Industry

It is needless to emphasis that your participation in this seminar by way of sponsorship, advertisements, delegates would provide a common platform to meet the expert's from industry as well as the exchange of views on the technological developments in the field of weaving will be highly valuable.

We once again appreciate your support extended so far to The Textile Association (India), Mumbai Unit and it will be our pleasure to invite you to be part of the event to contribute towards the betterment of the weaving Industry.

**HARESH B. PAREKH**  
Convener

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*For more details please contact:*

Hon. Secretary

### The Textile Association (India), Mumbai Unit

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Tel: 022- 2432 8044 / 2430 7702 Fax: 91-22-2430 7708

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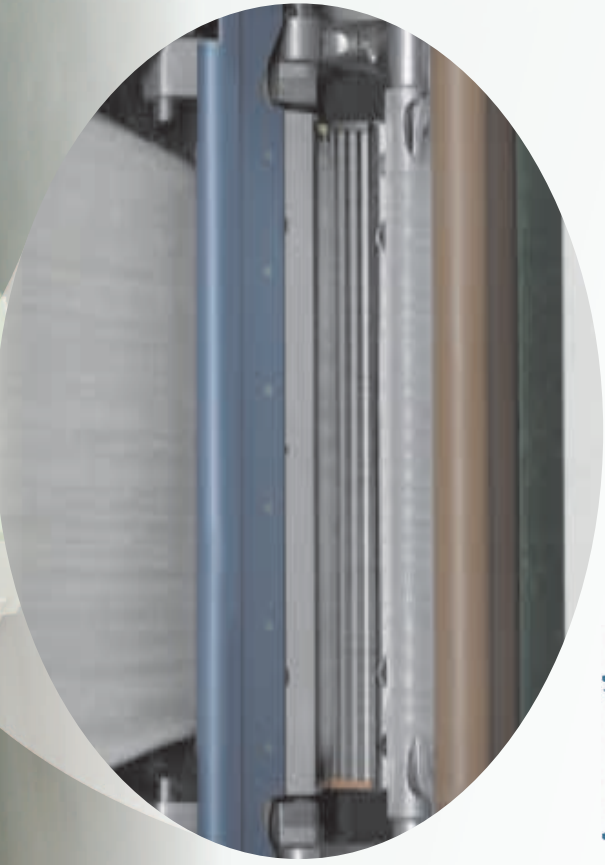
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Mr. Haresh B. Parekh, Convener

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**INDIA**

**FIBERS & YARNS 2012 - 7th Edition  
(Discover New Horizons)**

*Date :* 12-14, April 2012, Timings: 10.00 am to 7.00 pm  
*Venue :* Expo Centre, World Trade Centre, Cuffe Parade, Mumbai - 400 005 (India)  
*Contact :* Tecoya Infotech  
*Tel. :* +91 22 66978535, Fax: +91 22 28793022  
*E-mail :* tecoya@vsnl.com

**International Textiles & Apparel Sustainability Conference**

*Date :* 16th to 21st July 2012 at Mauritius  
*E-mail :* itasc@uom.ac.mu  
*Website:* <http://sites.uom.ac.mu/itasc/>

**20th GGMA National Garment Fair**

*Date :* 7th to 9th July 2012  
*Venue :* Gujarat University Exhibition Centre, Drive in Road, Ahmedabad (Gujarat)  
*Contact :* The Gujarat Garment Manufacturers Association 912-913, Laxmi Vishnu Market, Gheekanta, Ahmedabad - 380 001  
*Tel. :* 079-3024 8280, 2551 8280  
*E-mail :* info@ggma.in, mail@ggma.in  
*Website :* www.ggma.in

**Seminar on "INNOVATION IN WEAVING"**

*Date :* Saturday, 28th April 2012  
*Time :* 09.00 a.m. to 04.30 p.m.  
*Contact :* The Textile association (India) - Mumbai Chapter Mr. Haresh B. Parekh, Convener  
*Tel. :* 022- 2432 8044 / 2430 7702,  
*Fax :* 91-22-2430 7708, M.: 09167515676  
*E-mail :* taimu@mtnl.net.in, taimu@bom3.vsnl.net.in, hareshbparekh@yahoo.com  
*Website :* www.textileassociationindia.com

**INDIA ITME 2012 - 9th International Textile Machinery Exhibition**

*Date :* 02-07th December 2012  
*Venue :* Bombay Exhibition Centre, Western Express Highway, Goregaon (E), Mumbai , India  
*Contact :* Executive Director  
**India International Textile Machinery Exhibitions Society**  
 76, Mittal Tower, B Wing, 7th Floor, Nariman Point, Mumbai - 400 021 India  
*Tel. :* +91 22-2202 0032, 2282 8138, 2285 1579  
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*E-mail :* contactat@india-itme.com  
*Website :* <http://www.india-itme.com>

**ABROAD**

**ITMA Asia & CITME 2012  
(Asia's most prestigious textile machinery industry event)**

*Date :* 12-16, June 2012  
*Venue :* Shanghai New International Expo Centre (CNIEC), Shanghai,  
*Contact :* CEMATEX (European Committee of Textile Machinery Manufacturers) PO Box 248, Newcastle Upon Tyne, NE7 7WY UK - United Kingdom  
*Tel. :* +44 7967 477305,  
*E-mail :* info@cematex.com

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Largest Textile & Garment Machinery Exhibition**

*Date :* 3rd to 6th October 2012  
*Venue :* Expo Centre, Lahore, Pakistan  
*Contact :* Project Manager FAKT Exhibitors (Pvt) Ltd., 304, 3rd Floor, Clifton Centre, Block-5 Clifton, Karachi, Pakistan  
*Tel. :* +92-21 35810637, Fax: +92-21 35810636  
*E-mail :* info@fakt.com.pk  
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