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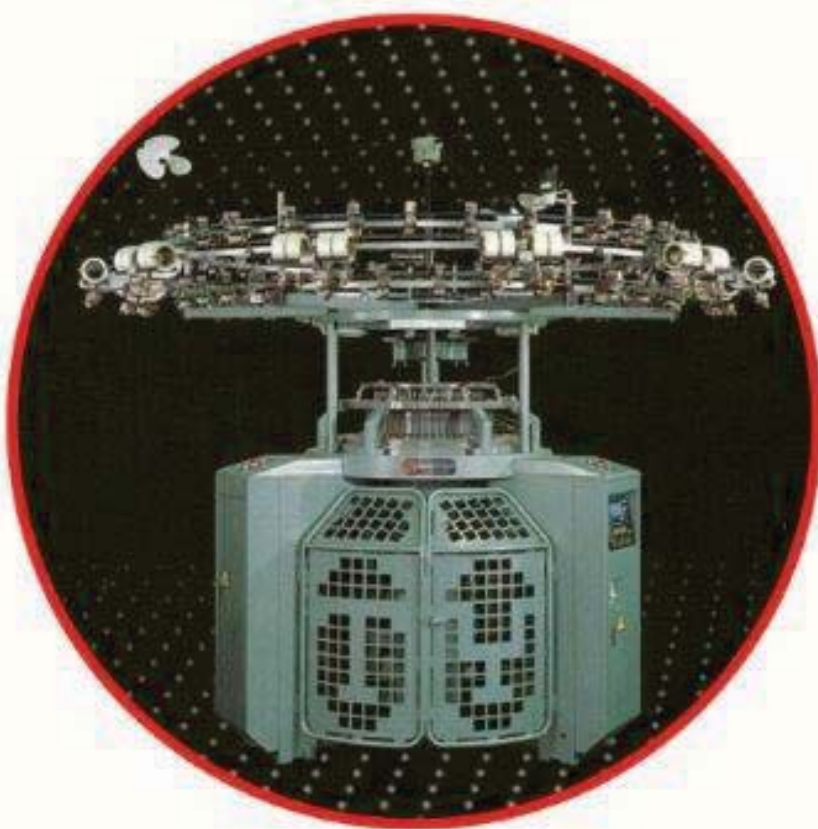
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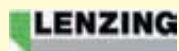
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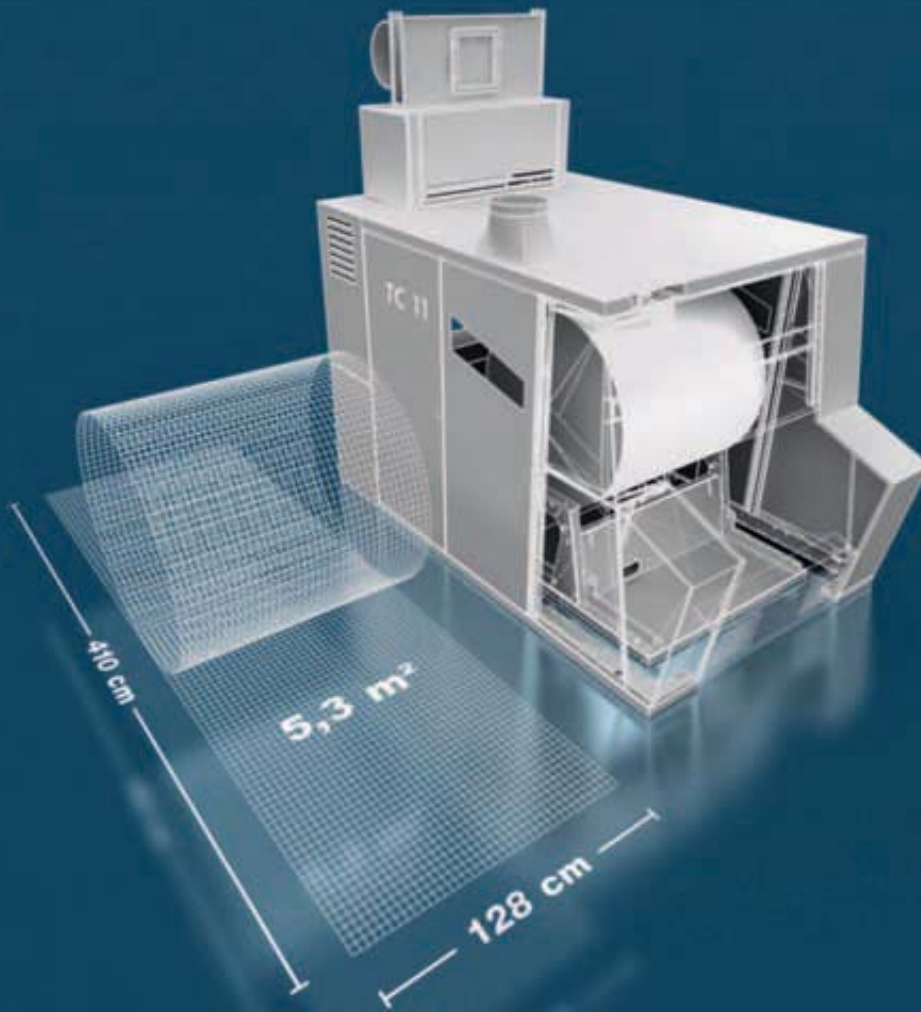
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Editorial

Spreading the Warps and Wefts of Indian Textiles beyond the Indian Shores !

I just attended the National Textile Summit 2013 organized by the Textile Association (India), Indore Unit. Among the various successes achieved by this Unit, the important one was to get the Union Textile Minister Mr. K.S.Rao to inaugurate this event. By all means this proved to be a great blessing in disguise as the Indore city was put on the national map of this mother industry on the spot. As soon as the demand was made, the Union Minister agreed to open a Textile Park near Indore City. Surely this Textile Park is going to build the local capacity in meeting the export orders in Textiles and garments. The minister was forthright in saying that the politicians have to be sensitive to the problems of the regions; He said that most of the time this does not happen and the money meant for such good projects get siphoned away in corruption. "If we are convinced that these problems are the real issues, it is our duty to find the finance for the same". Narrating his experience in streamlining the various projects as soon as he took over, he said that he is open to sort out the genuine problems of the Industry. Indeed, if the politicians do less of RaajNiti (politics) and more of welfare of the people whom they are elected to serve, they could be called true leaders. The modern leadership is in serving the people to whom they represent and not in dictating them or serving their own interests. I must congratulate Mr. Nirban and Mr. Veda, the key organizers of this Conference for their able guidance in mobilizing the manpower and monetary resources to make this two-day event a great success. Besides technical papers, there was an Entertainment programme and also Fashion Show for the participants.

Another development which is worth mentioning is the decision of the Governing Council Meeting, of which I was a part, to organize Global Textile Conference in Bangkok, Thailand in May/June 2014. Myself and Mr. Arvind Sinha had a brief discussion on this subject while we were together in Manchester participating in the International Conference on Advance Functional Materials organized by Textile Institute Manchester, UK during the fag end of July. This decision of GC of TAI, to discuss further and chalk out the detail programme of such a mega event was indeed first of its kind, from the point of view of Association's history. This event is going to be the first of its kind being held outside the Indian shores. When we talk about globalization of the trade, naturally Associations have to also find relevant venues and also subjects of regional importance rather than looking at the interests of a single country. In these modern times, no economy is totally isolated from the influence of the other, and its time we take into consideration collective interests of our population and business community so that our trade grows healthily.

And to top it all I must congratulate my Textile Department of Institute of Chemical Technology for having signed a MOU with the Ethiopian Textile Industry Development Institute, Govt. of Ethiopia (ETIDI). As a part of this MOU, our initial visit to various Ethiopian Textile University Departments and also Textile Industrial Units in different parts of Ethiopia for almost a week gave us an opportunity to survey their present status and carry out the Technological gap analysis. Finally we presented the brief report of the same to their Textile Minister and authorities of ETIDI. We are in process of putting up the proposal for capacity building of their textile professionals and we are sure this kind of opportunity, though may not be lucrative in terms of the monetary gains from Ethiopia, suffice is to say that we shall play a pivotal role in making them capable of looking after their problems in processing of Textiles on their own. This kind of capacity building is in true sense, the development and if we succeed in it, the joy and happiness of helping a third world country will be of immense significance adding relevance to the existence of our Institute. Once again this is going to be first of its kind, a project to be run in a foreign country for their upliftment. Indeed we in the process will be spreading the wings and in the words of the Director of TIDI, suffice is to say that “We want ICT’s footprint to be established on the soils of Ethiopia”.

Our tour was concluded on the day of our Independence and thus all the 6 members of our Team got ourselves invited for Flag hoisting function at the Indian High Commission in Addis Ababa. The spirit of this function was indeed special as true value of freedom and being Indian is only realized when one is out of India.

But to be true Indian –one needs to also integrate with the local populations and their interests. While it is nice to economically prosper while assisting them to prosper, it is important that we do not exploit the situation to such an extent that local ones start hating us. We must follow the spirit of 'Becoming successful while helping others to become successful’. It is then and then we bring laurels to “being Indian” and to our nation-INDIA.

Prof. (Dr.) Mangesh D. Teli,
Chairman, Editorial Board, JTA



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Derive an Expression of Individual Fibre Stress in Spinning Triangle

Nitesh Kumar Jangir*

M.L.V. Govt. Textile and Engineering College

Abstract

Spinning triangle, a critical region, where formation of yarn takes place in the ring spinning system. Width of the spinning triangle influences the fibre tension distribution and thus affects the properties of spun yarn. This paper is an attempt to prove that increasing in the width of the spinning triangle will tend to increase fibre stress. Here, with the help of some assumptions it is mathematically proved that outer fibres are having more stress and also found the value of individual fibre stress present in spinning triangle. It is an attempt to define and determine the critical width of the spinning triangle with the help of simple mathematics.

Keywords

Elasticity constant, Fibre strain, Fibre stress, Spinning tension, Spinning-triangle

1. Introduction

There are various studies have been done on spinning triangle and it's significant on structure and properties of end product [1-6]. In this sequence it is a theoretical attempt to go ahead in this topic.

In the ring spinning process the drafted roving leaves the front roller at the nip with a width, and then the fibres enter the twisted zone and are tied into a yarn by twisting the strand. The twisting area between the front roller nip and yarn twist point is known as the spinning triangle [3].

The width of the spinning triangle depends upon the spinning geometry and the twist level in the yarn. A short triangle represents small weak points and hence, fewer end-breaks, as usual. However advantages have to be weighed against disadvantages. If the spinning triangle is too short, then the fibre on the edge must strongly be deflected to bind them. This is not possible for all fibres some edge fibres escape the twist effect and are lost as fly. Other may be bound in but, at one end only. One fibre end then projects from the body of the yarn resulting in hairy yarn.

2. Materials and Methods

2.1 Assumptions

1. All fibres in the strand are equal in length and

also have same cross-sectional shape of a circle with identical diameter.

2. Fibre stress-strain behavior assumed to follow the Hook's law for small strain.
3. Frictional contact between fibres is ignored.
4. Fibre slippage and migration are not taken into consideration.

Apart from these assumptions, this is also assumed that fibres are distributed equally in a symmetric triangle. Direction of load F_s should be assumed along with middle fibre. However these kinds of assumptions are used to overcome mathematical difficulties occur in derivation of the relationship of the fibre stress.

2.2 Description

A schematic modal of spinning triangle is shown in figure1 During spinning process, the yarn spinning tension causes an unequal loading on the fibres due to their path-length differences in the spinning triangle [5].

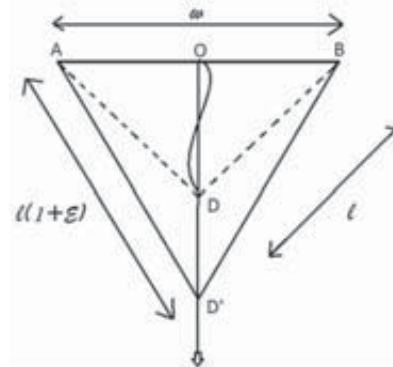


Figure 1: A schematic modal of spinning triangle

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An imaginary convergence point is assumed without any applied force. As assumptions say all fibres are of same length. Therefore middle fibre is slack and the outermost fibre is straight. When force is applied the convergence point D is moved to the point D'. By taking width of the spinning triangle w lets assumed that half of the fibres are present in $\triangle OBD'$ and the rest half are present in $\triangle OAD'$. Take $\triangle OBD'$ separately which is shown in figure 2 Assume that $n+1$ fibres are present in this half triangle namely $(f_0, f_1, f_2, \dots, f_n)$. f_0 is the central fibre. In this triangle take any fibre f_i which has ϵ_i strain and making an angle θ_i with the base OB. Distance of the fibre from O (the central point of the base) is d_i .

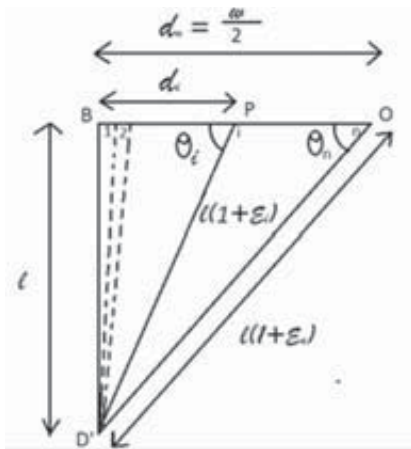


Figure 2: Half of spinning triangle

in $\triangle OPD'$
 $l(1+\epsilon_i) \cos \theta_i = d_i$... 1

Where

ϵ_i = longitudinal strain of the fibre
 l = length of the fibre

$$\Rightarrow \epsilon_i = \frac{d_i}{l \cos \theta_i} - 1$$

But $\frac{d_i}{l} = \tan \theta_i$

$$\Rightarrow \epsilon_i = \frac{1}{(\tan \theta_i \cos \theta_i)} - 1$$

$$= \operatorname{cosec} \theta_i - 1$$
 ... 2

Now it is known that

Elasticity constant (E) = $\frac{\text{stress}}{\text{strain}}$

$$\Rightarrow E = \frac{F_i}{\epsilon_i}$$

$$\Rightarrow F_i = E (\operatorname{cosec} \theta_i - 1)$$
 ... 3

Where $\theta_i = \tan^{-1} (l/d_i)$

3. Results and discussion

Equation (3) is the expression of the individual fibre stress in terms of angle making by the fibre the base line. If we take special cases

Case I - Fibre stress on central fibre which is making 90° angles to the base line.

$$\operatorname{cosec} 90^\circ = 1$$

$$\Rightarrow F_i = 0$$

Case II - Stress outer most fibre which can be imagined at ∞ distance from the central fibre.

$$F_i = \infty$$

However this case is not possible in real.

Angle θ depends upon distance from the central fibre

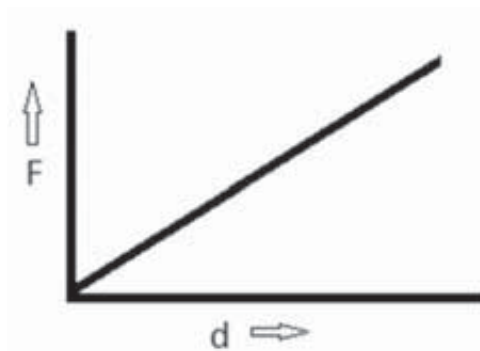


Figure 3: Relation between stress on fibre and its distance from centre fibre

With the help of the equation (3) this can be proved that stress in the fibre is directly proportional to the distance from the central fibre as in figure 3

4. Conclusion

Spinning tension is too low at the centre of the spinning triangle as compared with at the edges. Edge fibres in spinning triangle go under high stress, which causes extension of fibres and sometimes results in fibre breakage, if fibre stress exceeds the fibre strength. Therefore, width of the spinning triangle must not reach up to critical spinning triangle width. If elasticity constant of the fibre, tenacity of the fibre and length of the fibre are known, critical spinning triangle width at which break will happen can be calculated with the help of equation 3. By greatly narrowing the width of the spinning triangle, spinner can improve both spinning efficiency and the structure and properties of

ring-spun yarn. This expression is forced to reduce the spinning triangle so that the fibre stress in the spinning triangle is minimized. However, spinning triangle is necessary for insertion of twist in the yarn and practically, it cannot be reduced to null width.

This theory also explains the migration of the fibres in spinning triangle. Equation shows the stress variation in the fibres which is one of the major cause of the fibre migration in the spinning triangle.

Acknowledgement

Mr.Pushendra Mangania

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Simultaneous Natural Dyeing and Antibacterial Finishing of Bamboo Rayon using Catechu and Natural Mordants

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(Adiv Pure Nature Products)

Abstract

In the current study, simultaneous natural dyeing and antibacterial finishing of bamboo rayon was carried out using catechu and tannin based natural mordants. The tannin mordants were extracted from tamarind (*Tamarindus indica L.*) seed coats, amla (*Indian gooseberry*) and harda (*Myrobalan fruits*) and their application in natural dyeing using catechu as a dye was carried out. The dyed bamboo rayon fabrics were then evaluated for colour values, fastness properties, antibacterial activities as well as durability of the same. The results clearly indicated the advantages of using such mordants both in case of obtaining antibacterial functionality as well as eco-friendliness.

Keywords

Bamboo rayon, Natural dyeing, Natural mordants, Antibacterial properties.

1. Introduction

Textiles, especially those made of natural fibers, are an excellent medium for the growth of microorganisms when the basic requirements for their growth such as nutrients, moisture, oxygen, and appropriate temperature are present. The large surface area and ability to retain moisture of textiles also assist the growth of microorganisms on the fabric [1] which in turn results in inflicting a range of unwanted effects not only on the textile itself but also on the wearer. These effects include the generation of unpleasant odor, stains, discoloration in the fabric, a reduction in the tensile strength of the fabric and an increased likelihood of contamination [2]. Bamboo, a lignocellulosic material, is an abundant natural resource in some parts of the world [3]. Bamboo belonging to the grass family Poaceae is an abundant renewable natural resource capable of production of maximum biomass per unit area and time as compared to counterpart timber species [4]. Bamboo pulp fiber is widely applied in textile industry to produce dry goods. Generally, bamboo pulp fibre loses the antibacterial property present inherently in bamboo resulting from the treatment with alkali in the processing [5].

In the last few decades, with the increase in new antimicrobial fibre technologies and the growing awareness about cleaner surroundings and healthy lifestyle, a range of textile products based on synthetic antimicrobial agents such as triclosan, metal and their salts, organometallics, phenols and quaternary ammonium compounds, have been developed and quite a few are also available commercially [6]. Even though the excellent antimicrobials are available, their effect on ecology is always a question. Under this backdrop some of the natural dyes reported to possess antimicrobial properties, attract the attention of the researchers in this field. On the other hand the development of synthetic dyes taken place at the beginning of the twentieth century has come a long way and led to a more complete level of quality and more reproducible techniques of application. Due to wide applications on variety of fibres, and the economies of scale, considerable reduction in the dyestuff costs per kg of dyed goods has been achieved [7] making their application economical. But, during the last two decades, the use of synthetic dyes is gradually receding due to an increased environmental awareness and harmful effects because of either toxic degraded products or their non-biodegradable nature. In addition to above, some serious health hazards like allergy and carcinogenicity are associated with some of the synthetic dyes. As a result, a ban has been imposed all over the world including European Economic Community (EEC), Germany, USA and India on the use of some synthetic dyes (e.g.

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azodyes) which finally triggered active research and development to revive world heritage and traditional wisdom of employing safer natural dyes [8]. Consumers nowadays are becoming more and more concerned about environmental issues and hence are demanding for natural products incorporating natural ingredients. Thus natural dyes are gaining increasing importance as they are obtained from renewable resources and they present practically no health hazards and some of them sometimes act as a health care products too [9]. Natural dyes in general, with few exceptions are non-substantive and hence must be used in conjunction with mordants. Mordant is a chemical, which can fix itself on the fibre and also combines with the dyestuff. The challenge exists in natural dyeing is to prevent the use of metallic mordants which themselves are harmful and cause pollution. Hence there is a general quest to find out alternative natural mordants for natural dyeing of textiles.

Tannin is an astringent vegetable product found in a wide variety of plant parts such as bark, wood, fruit, fruit pods, leaves, roots and plant galls. Tannins are defined as naturally occurring water soluble polyphenolic compounds of high molecular weight (about 500-3000) containing phenolic hydroxyl groups to enable them to form effective crosslinks between proteins and other macromolecules [10]. They are primarily used in the preservation of leather [11], glues, stains and mordants. Application of tannin based natural mordants in natural dyeing was reported earlier from our laboratory [12-18].

Tannins are antimicrobial in nature. Such properties are also displayed by catechu extract. The application of natural dyes using natural mordants hence can act in dual way of natural coloration and antibacterial finishing of textile materials. Even though tannin containing plants are available in plenty, the application of such sources for extracting mordants to be used in natural dyeing has been explored to a very limited extent. Natural dyeing and antibacterial finishing of soyabean and bamboo rayon fabrics using temple waste marigold have been reported earlier from our laboratory [16-17]. Simultaneous dyeing and antibacterial finishing of soyabean protein fabric using catechu and natural mordants has also been reported from our laboratory [15]. In continuation of the research on natural dyeing with antibacterial natural dyes and tannin based mordants, in the current work, the simultaneous dyeing and antibacterial finishing of bamboo fabric was car-

ried out using natural mordants extracted from harda, tamarind seed coat (TSC) and amla and catechu as a dye. The colour values were evaluated and compared with those obtained using alum mordant. The antibacterial efficacy of the dyed material and the durability of the antibacterial activity were studied.

2. Materials and Methods

2.1. Materials

Bamboo rayon fibres were converted into yarn (30s count). The yarn was knitted to make fabric (single jersey) which was scoured and used for dyeing. All chemicals used were of laboratory grade. Harda, Amla and Catechu were supplied by Adiv Pure natural, Mumbai. Tamarind seeds were purchased from local market.

2.2. Methods

2.2.1. Extraction of mordant

The 1% stock solution of alum was made by dissolving 10 gm of mordant powder in 1000 ml water. In case of natural mordants, the 1% stock solution was made by boiling 10 gm of mordant powder in 1000 ml water for 1 h. The extract was filtered and made to 1000ml and used for mordanting.

2.2.2. Extraction of dye

The 1% stock solution of the catechu dye was prepared by boiling 10 g of dry catechu in 1000 ml water for 1 h. The extract was filtered and made to 1000 ml and used for dyeing.

2.2.3. Mordanting and dyeing of cotton and silk

The mordanting of bamboo rayon fabric was carried out in rota dyer (Rota Dyer machine, Rossari® Labtech, Mumbai) keeping the liquor to material ratio of 30:1. The fabrics were introduced into the mordant solution at room temperature and slowly the temperature was raised to 95°C. The mordanting was continued at this temperature for 30 min. After mordanting, the fabric was squeezed and dyed using catechu extract as a dye. The mordanted fabrics were introduced in dyebath and dyeing was continued at 90°C for 1h. After dyeing, the fabrics were squeezed and washed with cold water.

2.2.4. Measurement of Colour value by reflectance method

The dyed samples were evaluated for the depth of colour by reflectance method using 10 degree observer. The K/S values were determined using expression;

$$K/S = \frac{(1-R)^2}{2R}$$

where, R is the reflectance at complete opacity, K is the Absorption coefficient & S is the Scattering coefficient

Dyed fabrics were simultaneously evaluated in terms of CIELAB colour space (L*, a* and b*) values using the Spectraflash SF300.

2.2.5. *Washing fastness*

Evaluation of colour fastness to washing was carried out using ISO II methods [19].

2.2.6. *Rubbing fastness*

Evaluation of colour fastness to rubbing (dry and wet) was carried out using "crock-meter" with 10 strokes of rubbing.

2.2.7. *Light fastness*

Dyed fabric was tested for colourfastness to light according to ISO 105/B02 [20].

2.2.8. *Determination of antimicrobial activities of dyed fabrics*

The antibacterial activity of the treated fabrics was estimated by AATCC Test Method 100-2004 [21]. The reduction in number of bacterial colonies formed with respect to the untreated control sample was estimated by using following equation,

$$R = \frac{100 (B - A)}{B}$$

where,

R = % reduction in bacterial count;

A = the number of bacterial colonies recovered from the inoculated treated test specimen swatches in the jar incubated for 24 hr contact period,

B = the number of bacterial colonies recovered from the inoculated untreated control test specimen swatches in the jar immediately after inoculation (at "0" contact time).

2.2.8. *Durability of antimicrobial activity*

The durability to laundering was measured using washing conditions as per ISO 105-CO6-1M [20].

3. Results and Discussion

3.1. *Colour values of catechu dyed bamboo rayon*

The dyeing of bamboo rayon fabric using natural mordants like harda (*myrobalan*), amla (*Indian goose-berry*) and tamarind (*tamarindus indica L.*) seed coat was attempted and results are summarized in Tables 1.1-1.5.

In order to study the individual contribution of dye and mordant in dyeing, and hence to prove the role of tannins as mordant in natural dyeing of bamboo rayon, the fabrics were mordanted with tannins from different sources and dyed without pre-mordanting (Table 1.1).

Table 1.1: Effect of mordant concentration on colour values of mordanted bamboo samples

Mordant	Conc. (%)	K/S	L*	a*	b*
Harda	5	0.4723	79.903	-0.821	9.787
	10	0.635	81.775	-1.133	11.037
	15	0.7473	81.674	-0.716	11.256
	20	0.8624	81.347	-0.879	10.564
TSC	5	0.3578	78.596	2.151	9.702
	10	0.3646	77.634	2.06	8.737
	15	0.4059	77.763	2.736	9.508
	20	0.5531	78.689	2.854	10.563
Amla	5	0.3983	79.856	-0.43	8.697
	10	0.4922	79.436	-0.31	8.639
	15	0.6106	81.228	-0.227	10.5
	20	0.7392	81.1	-0.012	10.519

The results in Table 1.1 indicate the increase in colour values with increase in mordant concentration from 5% to 20% which was valid for all the tannin mordants (Amla, TSC and Harda). Among the three tannin mordants, harda showed the highest colour values while TSC displayed the lowest colour values. Results in Table 1.2 indicate the increase in colour values with increasing concentration of catechu from 5% to 20%.

Texttreasure

Freedom is not procured by a full enjoyment of what is desired but controlling the desire.

- Epictetus

Table 1.2: Effect of catechu dye concentration on colour values of dyed bamboo samples (without premordanting)

Dye Conc. (%)	K/S	L*	a*	b*
5	0.73	74.321	5.483	15.894
10	0.9948	66.827	3.952	16.431
15	1.1997	55.021	11.215	20.788
20	1.4857	68.295	6.066	19.051

The bamboo rayon showed limited dyeability towards catechu in absence of mordants, which might be due to lack of bonding of dye with the fibre in absence of mordants resulting in removal of superficially held dye, during washing.

The results of dyeing of catechu using different mordants are summarized in Tables 1.3-1.5.

The K/S values improved with increasing harda concentration till 20%; however, in most of the cases, the relative increase in K/S values from mordant concentration of 15 % to that of 20% was comparatively lower. Hence optimum concentration (leveling-off) was taken as 15%. For a constant harda concentration, K/S values increased with catechu concentration from 5% to 20%.

The colour values thus obtained, in the case of natural dyes is a combined contribution of the effect of mordant and the dye. Hence the K/S increased with increasing mordant and dye concentration initially till the equilibrium was reached. The increase in concentrations of either mordant or dye beyond optimum concentrations did not significantly contribute in the improvement of the depth of dyeing which is reflected in K/S values.

Textsmile

*An illiterate father with his educated son went to camping; they setup their tent and fell asleep. Some hours later, Father wakes his son and asks: "Look up to the sky and tell me what you see?"
 Son: I see millions of stars
 Father: What does that tell you?
 Son: Astronomically, it tells that there are millions of galaxies and planets.
 Father slaps his son hard and says: "Idiot, someone has stolen our tent!!"*

Table 1.3: Effect of varying concentration of harda and catechu on colour values of dyed bamboo fabric

Harda (%)	Catechu (%)	K/S	L*	a*	b*
5	5	1.0783	59.963	6.419	21.102
5	10	1.3702	67.957	5.938	19.014
5	15	1.5531	66.342	6.148	19.48
5	20	2.0652	56.598	-2.712	15.662
10	5	1.2943	60.957	7.204	21.865
10	10	1.6255	68.034	6.189	19.199
10	15	1.8546	58.913	7.29	19.546
10	20	2.5268	57.069	8.163	17.245
15	5	1.3232	66.324	4.162	16.826
15	10	1.4541	60.222	7.4	21.629
15	15	2.2092	58.674	7.589	19.256
15	20	2.7007	68.089	6.507	19.279
20	5	1.5932	67.52	5.957	18.52
20	10	1.8771	60.465	7.8	21.695
20	15	2.311	58.585	7.269	18.888
20	20	3.2759	56.938	11.846	23.971

Table 1.4: Effect of varying concentration of Tamarind seed coat (TSC) and catechu on colour values of dyed bamboo fabric

TSC (%)	Catechu (%)	K/S	L*	a*	b*
5	5	1.0116	72.434	8.414	13.916
5	10	1.1809	72.923	8.183	14.292
5	15	1.1809	67.267	9.606	16.116
5	20	1.6069	53.362	10.971	18.617
10	5	1.0779	65.397	10.037	15.388
10	10	1.2377	72.623	8.249	14.109
10	15	1.3668	72.299	8.414	13.631
10	20	1.6784	66.074	10.146	16.31
15	5	1.162	72.704	8.44	14.215
15	10	1.2706	65.822	9.818	15.86
15	15	1.4254	66.24	9.75	16.453
15	20	1.8733	66.855	9.311	17.535
20	5	0.9203	66.056	9.694	16.594
20	10	1.3971	66.985	9.837	17.576
20	15	1.5223	67.086	10.255	17.488
20	20	1.8949	71.985	7.018	13.056

Table 1.5: Effect of varying concentration of Amla and catechu on colour values (K/S) of dyed bamboo fabric

Amla (%)	Catechu (%)	K/S	L*	a*	b*
5	5	0.8549	72.669	2.86	14.079
5	10	1.1227	67.204	4.681	17.036
5	15	1.456	71.371	5.485	14.777
5	20	1.623	65.912	5.189	15.982
10	5	1.0795	72.14	3.754	15.109
10	10	1.4562	72.237	4.411	15.552
10	15	1.6977	66.065	5.383	16.224
10	20	1.8161	64.78	5.953	14.934
15	5	1.3543	71.831	5.406	15.444
15	10	1.3693	65.906	5.171	16.187
15	15	1.7597	65.548	5.561	15.941
15	20	2.2063	65.874	5.774	16.298
20	5	1.4425	66.652	5.046	17.067
20	10	1.6613	66.581	5.6	17.285
20	15	1.7633	70.637	4.86	13.89
20	20	2.5699	55.719	11.291	22.267

The higher K/S values resulted out of dyeing of pre-mordanted and dyed fabric as compared to that of the fabric sample which was not mordanted before dyeing which clearly showed the role of natural tannins acting as a mordant in natural dyeing.

The similar trends were observed in case of other tannin mordants (TSC and amla). Among the three mordants, harda mordanted bamboo rayon showed highest colour values of dyeings followed by amla and TSC. However, different shades can be obtained using combination of different tannin mordants in combination with catechu enabling one to have wider choice of hues from the gamut of shades.

The fastness properties of catechu dyed bamboo rayon, which is a measure of resistance to removal in contact with different agencies, were evaluated and results are summarized in Table 1.6. The catechu dyed bamboo rayon without pre-mordanting showed much inferior fastness properties as compared to those which were pre-mordanted and dyed. In other words it indicates that the tannin mordants play an important role in holding of the natural dye to the fabric. The washing fast-

nesses obtained varied in the range of "very good" to "excellent" grade. The rubbing fastness was also found to be of the grade "good" to "excellent". Light fastness was found to be quite satisfactory.

Table 1.6: Effect of mordant type and marigold on fastness properties

Mordant conc. (%)	Mordant Conc. (%)	Marigold	Fastness Properties		
			Washing	Rubbing	Light
-	0	20	2	3-4	2
Harda	20	20	3-4	3-4	4
TSC	20	20	4	3-4	5
Amla	20	20	3-4	4	5

3.2. Antibacterial activity of catechu dyed bamboo rayon

The antibacterial activity of dyed bamboo rayon, with and without pre-mordanting, was studied against *S.aureus* and *E.coli* bacteria and results are summarized in Table 1.7.

Table 1.7: Effect of mordant type and marigold on antibacterial properties

Mordant	Mordant conc. (%)	Marigold Conc. (%)	Bacterial Reduction (%)	
			<i>S.aureus</i>	<i>E. coli</i>
Harda	20	-	50.50	50.30
	20	20	85.25	84.50
TSC	20	-	54.98	52.58
	20	20	78.50	77.75
Amla	20	-	52.10	51.95
	20	20	81.50	81.00

The bamboo rayon fabric showed no antibacterial activity as reported by some researchers [9, 25]. The catechu dyed sample without pre-mordanting showed least extent of antibacterial activity among the three categories of the samples. The bamboo rayon mordanted with tannin mordants showed higher antibacterial property than that of the unmordanted catechu dyed bamboo rayon, whereas pre-mordanted and dyed samples showed highest antibacterial property. All the three natural mordants gave more or less similar extent of overall antibacterial activity to bamboo rayon on dyeing

with catechu; however, harda mordanted catechu dyed bamboo rayon showed better antibacterial activity among the three tannin mordants. This may be attributed to the higher colour values of bamboo rayon dyed using harda mordant indicating presence of higher tannin and hence attachment of more catechu resulting in higher antibacterial activity. Hence the natural dyeing of bamboo rayon with catechu using ecofriendly natural mordants can be claimed as simultaneous dyeing cum antibacterial finishing process.

Since the durability of functional properties is considered to be very important factor as far as their acceptability in textiles is concerned, the durability of antibacterial activity towards washing was screened (for representative samples) and the results are summarized in Table 1.8.

The only mordanted and catechu dyed bamboo rayon without premordanting showed no durability as the activity was reduced to negligible level after a single wash. The durability of antibacterial activity was similar for all the mordants; however the extent was different. Results in Table 8 indicate that the washing durability of such antibacterial property, irrespective of the mordant used was up to 30 cycles which is based on the assumption that minimum 70% of the of the bacterial reduction level was retained. It is also to be noted that among the three natural mordants used, washing durability of the antibacterial property was slightly better in case of harda and amla, as compared to TSC. The results found are very encouraging as far as end uses like hygienic textiles are concerned with the advantage of using safe dyes and safe mordants.

Texttreasure

No person was ever honoured for what he received. Honour has been the reward for what he gave.

- Calvin Coolidge.

You see things; and you say, 'Why?' But I see things that never were; and I say, 'Why not?'

- George Bernard Shaw

Table 1.8: Durability of antibacterial properties of marigold dyed bamboo rayon

Mordant	Mordant conc. (%)	Marigold Conc. (%)	No. of Washes	Bacterial Reduction (%)	
				S.aureus	E. coli
Harda	20	20	0	85.25	84.50
		5	73.50	73.10	
		10	68.80	65.25	
		20	62.50	59.75	
TSC	20	30	59.50	55.50	
		20	0	78.50	77.75
		5	75.25	74.25	
		10	72.10	70.50	
Amla	20	20	0	81.50	81.00
		5	75.50	74.25	
		10	72.10	69.75	
		20	67.25	66.30	
		30	59.50	58.75	

4. Conclusion

Simultaneous dyeing and antibacterial finishing of bamboo rayon was successfully carried out using natural mordants and catechu. The dyed product displayed good colour strength which was complimentary with excellent fastness properties. The natural mordanted-dyed samples displayed broad spectrum and durable antibacterial activity till 30 washes. The concept of natural dyeing using natural mordant is thus found to be quite promising, as it has potential for replacement of non-ecofriendly mordants. The ecofriendly hygienic bamboo rayon fabrics thus can be obtained using such concept.

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Application of Silicone based Finishes on Cotton to Enhance its Properties

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Abstract

Finishes are used on textile materials for various purposes, specifically considering, some finishes to impart special properties to the fabric for specific end uses. Silicone finishes impart desired surface properties such as softness and bounciness to fabrics, and now-a-days these are the most widely used softeners in textile industry. Advancement in science and technology has thoroughly modified the basic structure of silicones to have series of functionally modified silicones which include the family of amino, carboxy and epoxy modified silicones. In this study on cotton fabric three silicone based finishes were used: macro amino silicone (Ultrafab EMS), micro amino silicone (Ultrafab UHF) and lab prepared silicone finish. Results showed that silicone finishes improved stiffness and crease recovery angle of cotton fabric.

Key words

Silicone finish, Cotton, Stiffness, Crease recovery angle.

1. Introduction

Finishing is any process that is done to fiber, yarn, or fabric either before or after fabrication to change the appearance (what is seen), the hand (what is felt), or the performance (what the fabric does) [1].

Silicon (Si) is a chemical element with atomic no. 14 is extensively used for finishing of textiles. Silicon is the eighth most common element in the universe by mass, but silicone very rarely occurs as the pure free element in nature. It is more widely distributed in dusts, sands, planetoids and planets as various forms of silicon dioxide (silica) or silicates [2].

The organic groups attached to the silicon atom via silicon-carbon bonds define the class of silicone. The most common example is poly-dimethylsiloxane or PDMS. This synthetic polymer has a repeating [(CH₃)₂SiO] unit. This is the basic building block of silicones (Figure 1). Depending upon the number of repeat units in the chain and the amount of tying the chains together, six classes of commercially important products can be produced. They are: fluid, emulsions, compounds, lubricants, resins, and elastomers or rubbers [3].

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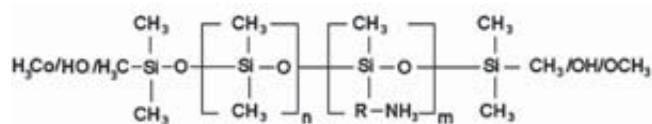
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Silicone products have been widely applied on textiles for various end uses. The primary applications of silicones in textile are fabric softening agents, fiber and thread lubricants, antifoaming agents, and antistatic agents [4]. Silicon softeners are classified into three groups according to particle size, macro, micro and nano silicon. Silicon softeners are based on macro emulsion and micro emulsion. Particle size of macro emulsions silicon softener is 150-250 nm while the particle size of micro emulsion silicone softener is lower than 30 nm [5].



Where,



Figure 1: Amino modified silicone polymer [6]

Silicone has a broad utility in textile processing. As textile processing is predominantly an aqueous process, silicones are likely to enter the environment via, waste water, either from scouring operations or through softener baths. Silicones have been extensively tested in both fresh and marine water and show no harmful effect on environment [7].

Silicones can benefit from the addition of auxiliaries to their chemistry, giving them more properties and even better performance, viz. fillers in elastomers, heterogeneous and homogenous catalysts and surfactants that change the properties. Silicone based surfactants provide tremendous reduction in water surface tension at very low concentrations of 0.1 to 0.25% on a volume to volume basis. Organo-modified silicones are structurally derived from PDMS in which the methyl groups are partly substituted by hydrophilic non-ionic or ionic moieties. The unique properties of organo-modified silicones are due to their hydrophobic silicone part. Depending upon their structure, they are surface active not only in water but also in organic media. This unique property makes it a versatile product for various applications and industries. viz. effective wetting agents in paints and agro chemicals, as emulsifiers, anti-foams, textile softeners and wrinkle resistant, as conditioners in hair care products and as emollients in skin care formulations [8].

In order to impart wrinkle resistance to textiles, normal procedure is to use resin pre-condensates. However, to overcome the limitations of resin, nano titanium dioxide and nano silica are employed using poly carboxylic acid as a catalyst under U.V. radiation to catalyse the cross linking reaction between cellulose molecules and the acid. On the other hand, the application of nano silica with maleic anhydride showed successful improvement in the wrinkle resistance of silk [9].

Nano silver titanium dioxide and nano zinc oxide are found to impart sterilizing effect with anti bacterial property. Nano silver particles with large surface area improve their contact with bacteria or fungi, inhibit cell growth by affecting the cellular metabolism and thus

act as an effective bactericide or fungicide. Nano silver particles are used in socks and other health care products such as dressings for burns, skin donor, etc [10].

Main features of Silicone finish are very good softness, excellent fiber-fiber lubrication, substantive to fiber, good stretch and recovery, improved elasticity and resiliency, excellent drape, good durability, excellent sew-ability, exhaustible, very low yellowing (depending on type) etc [11].

2. Materials and Methods

2.1 Materials

100 % cotton fabric for the study with specification as given in Table 1 was procured from local market. Silicone finishes of macro amino silicone (Ultrafab EMS) and micro amino silicone (Ultrafab UHF) from M/S. Resil Chemicals Pvt. Ltd. (Figure 1) and lab prepared silicone finish with all the laboratory reagent grade chemicals were used.

2.2 Methods

2.2.1 Standard Method

The procured cotton fabric was further thoroughly scoured by using standard method, air dried and cut.

2.2.2 Identification test (AATCC test method 20-1976)

Identification test included microscopic, solubility and burning test.

2.2.3 Determination of preliminary data

Yarn count, fabric width, weight per unit area, thickness, stiffness and crease recovery angle were determined using standard methods [12, 13] and are given in Table 1.

Table 1: Preliminary data of fabric

Fabric	Yarn count (inch)		Fabric Width (cm)	Weight per Unit area (gms/sq.mtr)	Thickness (mm)	Stiffness (cm)			Crease recovery angle (degrees)	
	Warp	Weft				Side	Warp	Weft	Warp	Weft
Cotton	138	72	90	128.0	0.26	Face	2.6	2.1	7.6	4.3
						Back	2.6	2.1	8.0	5.6

Table 2: Stiffness and Crease recovery angle of untreated and treated fabrics

Fabric (Cotton)	Stiffness (cm)				Crease Recovery Angle (Degrees)			
	Warp		Weft		Warp		Weft	
	Face	Back	Face	Back	Face	Back	Face	Back
Untreated	2.6	2.6	2.1	2.1	7.6	8.0	4.3	5.6
Treated with Ultrafab UHF	2.5	2.6	1.9	1.9	9.6	8.5	6.6	6.0
Treated with Ultrafab EMS	2.4	2.5	2.0	1.9	8.6	8.0	5.0	6.0
Treated with Lab prepared silicone finish	2.8	2.8	2.2	2.2	9.0	8.3	5.6	6.0

2.3 Finishing of fabric

2.3.1 Preparation of finish

Procured silicone finish, macro amino silicone-Ultrafab EMS ($18 \pm 1\%$ silicone content), micro amino silicone-Ultrafab UHF ($15 \pm 1\%$ silicone content) and lab prepared silicone finish all with same (50 g/l) concentration were used for padding bath.

Epoxide (with known molecular weight) based silicone finish was prepared in the laboratory under controlled conditions to improve the physical properties of cotton fabric. The finish (50g/l) was prepared as per recipe given below:

Epoxide was diluted with benzene to which Tri Methyl Silyl Chloride and Cetyl Tri-methyl Ammonium Bromide were added with continuous stirring. Water was added and stirring was continued for 2-3 minutes after which Poly Ethylene Glycol and finally Tri Ethyl Amine & methanol were added, the finish was kept at room temperature for one hour for the reaction to be completed. It was again stirred for 2 to 3 minutes.

2.3.2 Application of finish

Pad-dry (10 min)-pad-dry-iron-cure sequence was used where curing was done for 3 minutes at 115-120°C temperature.

2.4 Evaluation of fabric properties

Stiffness and crease recovery angle of the untreated and treated fabrics was determined using standard test method [12] and AATCC Test method 66-1975, [13] respectively.

3. Results and discussion

Details of stiffness and crease recovery angle are presented in Table 2. Comparing the stiffness result of untreated and treated fabrics, it was observed that in

the case of ultrafab UHF and ultrafab EMS, the stiffness has reduced while in the case of lab prepared finish it has slightly increased. The crease recovery angle of ultrafab UHF and lab prepared silicone finish has increased than that of ultrafab EMS.

4. Conclusion

Macro and micro amino silicones improve the physical properties of cotton fabric. Stiffness and crease recovery of fabric treated with lab prepared silicone finish is improved in comparison with macro amino silicone. Further modification in conditions for lab prepared silicone finish is in progress.

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Application of Nano Zinc Oxide sol on Cotton Fabric for UV Protection

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Abstract

Application of nano ZnO on Cotton fabric by Sol gel method using Triethanolamine (TEA) and Dimethylformamide (DMF) was carried out. As prepared nano ZnO was characterized by SEM technique which confirms the formation of nano particles. Ultra Violet Protection Factor (UPF) of treated and untreated fabrics was evaluated using AS/NZS 4399:1996 method using UV-Vis spectrophotometer. The result shows that nano sol coated fabric using DMF method exhibit UPF value of 55 while fabric coated with nano sol using TEA method shows UPF value of 35. This technique can open new doors for nano structured materials with improved functional properties.

Keywords

Nano-ZnO, Sol Gel, Cotton fabric, Ultra Violet protection finishing, UPF.

1. Introduction

Performance textiles are a new paradigm for the textile industry and represent one of the fastest growing sectors of the industry. Performance textiles are textiles that provide additional functions such as repellency, resistance or protection from a specified element including fabrics that resist wrinkles, soils or odor and/or protect from an environmental condition [1-2]. A notable objective of increasing interest in this area is the protection against UV radiation. Protection of the skin against the action of solar radiation is a relatively new objective of textile finishing. The reason for this is the tendency of human to suffer increased harmful exposure to UV through natural radiations. The unfinished fabric has the limitations to guarantee adequate protection [2-3].

UV radiation can lead to acute and chronic reactions and damage, such as acceleration of ageing and sunburn. Ozone depletion in the earth's atmosphere due to the release of man-made fluorocarbons, in particular chlorofluorocarbons (CFCs), has minimized the protection against the incoming solar Ultraviolet Radiation (UVR). A decrease of 1% in ozone would lead to increases in the solar UVR at the earth's surface and may eventually lead to 2-3% increase in skin cancer [4-5]. With this threat to mankind, there is great scope for the research in the field of surface functionalisation

of textile materials with major stress on Ultraviolet protection.

Coating the surface of textiles and clothing with nano particles is an approach to the production of highly active surfaces to have UV blocking properties. Zinc oxide (ZnO) nano particles embedded in polymer matrices like soluble starch are a good example of functional nano structures with potential for applications such as UV protection. Metal oxides like ZnO as UV blocker are more stable as compared to organic UV blockers. Hence nano ZnO will enhance the UV blocking property due to their increased surface area and an intense absorption in the UV region [6-7].

ZnO nanoparticles are prepared by different synthesis approaches, including hydrothermal, mechanochemical, sonochemical, chemical precipitation, sol-gel, electro deposition method, microwave method, spray-pyrolysis etc [8]. In this study, Sol gel method was used for synthesis since it can produce high purity products because the organo-metallic precursor of the desired oxides can be mixed, dissolved in a specified solvent and hydrolyzed into a sol, and subsequently a gel, the composition can be highly controllable [9-11]. Triethanolamine (TEA) & Dimethylformamide (DMF) was used for synthesis of nano sol. Procedure which is reported elsewhere was followed for synthesis [12-16]. Application of nano sol on Cotton fabric was carried out using Pad -Dry - Cure method. The UV-blocking property of these fabrics was evaluated using AS/NZS 4399:1996 method.

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2. Experimental

2.1 Materials

All the chemicals of highest purity purchased from Sisco Research Lab were used for the synthesis of Nano-ZnO. Well scoured and bleached plain 100% Cotton woven fabric having 60^s Warp and Weft Count, 108 Ends per Inch, 86 Picks per Inch & 150g/m² mass per unit surface was used for the experiment. The CIE Whiteness index of the fabric was 65.

2.2 Methods

2.2.1 Synthesis of nanosol ZnO -1 by Sol gel method

For the preparation of nanosol ZnO -1, 6.12 gm of zinc acetate dihydrate was added to 50ml of 2-methoxyethanol under vigorous stirring at about 105°C for 30 min. Subsequently, triethanolamine was added drop wise into above solution it forms a transparent homogeneous solution. The reaction mixture was stirred at 105°C for 10min and then stored at ambient temperature overnight. The as-prepared sol was quite sensitive to water.

2.2.2 Synthesis of nano ZnO -2 by Sol gel method

For the preparation of nanosol ZnO - 2, an amount of 13.16 gm of zinc acetate and dopant salts was completely dissolved in 100ml of DMF by stirring at room temperature for 5 hrs. The sol was stable and homogeneous, no particulates were visible to the eye and their appearance was unchanged for several days. As prepared sol was taken for the application on Cotton fabric.

Coating Process

Pad- Dry- Cure process was employed for application of nano sol. The Cotton sample was dipped in the ZnO nano sol for one minute and then padded with an automatic padder at a nip pressure of 2.75 kg/cm². The padded substrate was air-dried for 30 min and finally cured at 130°C for 5 min. Cotton sample was then washed thoroughly to remove unbound nanoparticles.

2.3 SEM studies & UPF testing

2.3.1 SEM studies

Treated fabrics were subjected to SEM analysis for presence of nanoparticles.

Scanning electron microscope make- HITACHI Model S-3000H having resolution 3.5 nm was used for characterization.

2.3.2 UPF testing of treated & untreated fabrics

UPF testing of treated and untreated samples was carried out by a method which is recognized by AS/NZS 4399:1996. It measures the transmittance or blocking of erythemally weighted UV radiation through fabrics by the use of an instrument called UV-Vis spectrophotometer. UV-A & UV-B having wavelength range 315nm-400nm & 280nm- 315nm was selected for testing.

2.3.3 Fabric whiteness

The whiteness of the untreated and treated fabric was found out using the Computer color matching instrument.

3. Results and discussion

3.1 SEM analysis

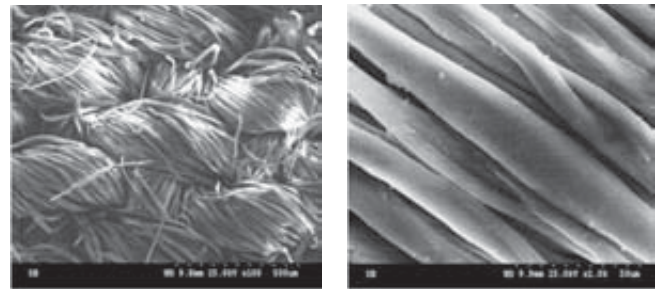


Figure 3.1: SEM images of untreated Cotton

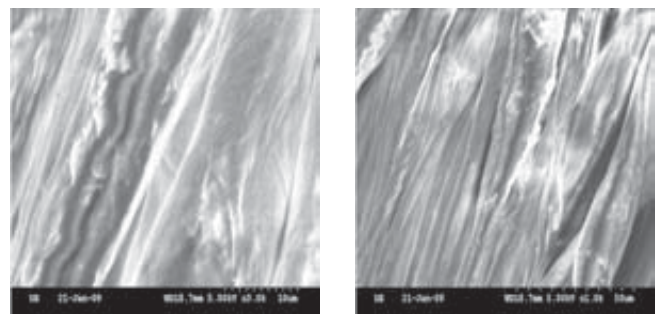


Figure 3.2: SEM images of Cotton coated with nano ZnO sol (TEA method)

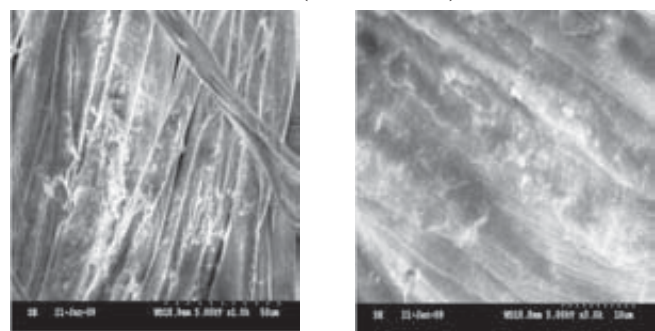


Figure 3.3: SEM images of Cotton fabric coated with nano ZnO sol (DMF method)

The surface of the treated fabric was observed by scanning electron microscopy & revealed the presence of nanoscale zinc oxide particles on cotton. It can be seen from the Figures 3.2 and 3.3 that the nano particles are well dispersed on the fibre surface, although some aggregated nano particles are still visible. The particle size plays a primary role determining their adhesion to the fiber. Also it is expected that the largest particle agglomerates can be easily removed from fiber surface, however, the small particles will penetrate deeper and adhere strongly into the fabric matrix.

Table 1: UPF & Whiteness index of treated & untreated samples

Sample No.	Method	UPF	CIE Whiteness
1.	Untreated sample	5	65
2.	Sol gel -DMF method	55	65
3.	Sol gel -TEA method	35	64

3.2 UV- Absorption

The UV blocking mechanism is attributed to the electronic structure of the nano ZnO. ZnO can absorb light with energy of $h\nu$ that matches or exceeds their band gap energy. The band gap energy of ZnO lies in the UV region of the solar spectrum. UV absorption studies of the treated fabrics reveal a high UPF of 55 in case of DMF method while it remains at 35 in case of TEA method. This high UPF in case of DMF method may be attributed to better uniformity & the optimum particle size of nano ZnO which results in an excellent UV protection compared to a low UPF of 5, which is classified as non ratable for untreated fabrics (Table 1). It was observed that the UV transmission of the treated fabrics is completely cut off in the UV- B region and up to 340 nm in the UV-A region.

3.3 Fabric whiteness

It can be seen from the table that the CIE whiteness index of the treated fabric remains unchanged. This is because the finishing agent does not show any change via pad-dry-cure process.

4. Conclusion

Nano sol coated Cotton fabric using DMF method exhibit comparatively better UV protection than TEA method. This may be attributed to better uniformity & the optimum particle size of nano ZnO synthesized

using DMF method. SEM images reveal a uniform nano - scaled coating layer. Thin layer formed has good adhesion to the cotton substrate. The treatment has no adverse effect on the whiteness of the fabrics. Due to excellent UV protection, this technique has the potential of being commercialized.

5. Acknowledgements

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Textile Electrodes for ECG and EEG Monitoring

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Abstract

The design and development of wearable systems for health monitoring has garnered lots of attention in the scientific community and the industry during the last years. Textile electrodes are a new, potential choice for bio potential measurements. In general, the conventional wet electrodes are most frequently used for Electrocardiogram (ECG) and Electroencephalogram (EEG) measurements. However, they require skin preparation and conduction gels to reduce the skin-electrode contact impedance. In the aforementioned procedure when wet electrodes were used, it usually makes trouble to users. In order to overcome the aforesaid issues, a number of wearable textile based monitoring systems have been developed. This paper attempts to comprehensively review the current research and development on wearable textile sensor systems for ECG and EEG monitoring.

Key words

Biosignals, conductive gels, dry electrode, long term monitoring, wearable textile.

1. Introduction

Multifunctional electroactive fibres and fabrics will give the traditional textile industry a new additional value, the possibility of making daily life healthier, safer and more comfortable, bringing technological advances closer to the public through the use of easy-to-use interfaces between humans measuring devices and actuators.

The fabrication of such multifunctional interactive fabrics represents a potentially important tool for promoting progress, sustainable development and competitive-

ness in several disciplines such as health monitoring, rehabilitation, ergonomics, disability compensation, sport medicine, telemedicine and tele-operation.

Over the past few years, a number of wearable physiological monitoring systems have been developed for health monitoring of patients in hospitals and real life situations [1]. The wearable sensing systems aid the daily acquisition and processing of multi-parametric health data, providing an early detection of pathological signs and improving the curative rate of disease without intervening in the patient's daily life [2].

Table 1.1: Biosensors and Biosignals

Type of Bio-signal	Type of Sensor	Description of measured data
Electrocardiogram (ECG)	Skin/Chest electrodes	Electrical activity of the heart (continuous waveform showing the contraction and relaxation phases of the cardiac cycles)
Blood pressure (systolic & diastolic)	Arm cuff-based monitor	Refers to the force exerted by circulating blood on the walls of blood vessels, especially the arteries
Body and/or skin temperature	Temperature probe or skin patch	A measure of the body's ability to generate and get rid of heat
Respiration rate	Piezoelectric/piezoresistive sensor	Number of movements indicative of inspiration and expiration per unit time (breathing rate)
Oxygen saturation	Pulse Oximeter	Indicates the oxygenation or the amount of oxygen that is being "carried" in a patient's blood
Heart rate	Pulse Oximeter/skin electrodes	Frequency of the cardiac cycle
Perspiration (sweating) or skin conductivity	Galvanic Skin Response	Electrical conductance of the skin is associated with the activity of the sweat glands
Heart sounds	Phonocardiograph	A record of heart sounds, produced by a properly placed on the chest microphone (stethoscope)
Blood glucose	Strip-base glucose meters	Measurement of the amount of glucose (main type/source of sugar/energy) in blood
Electromyogram (EMG)	Skin electrodes	Electrical activity of the skeletal muscles (characterizes the neuromuscular system)
Electroencephalogram (EEG)	Scalp-placed electrodes	Measurement of electrical spontaneous brain activity and other brain potentials
Body Movements	Accelerometer	Measurement of acceleration forces in the 3D space

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Table 1.1 shows a list of several sensing technologies, which can be integrated as part of a wearable health-monitoring system, along with their corresponding measured physiological signals [3]. These intelligent textile electrodes make use of conductive yarn, inte-

grated into the fabric to sense biosignals [4]. The aim of this paper is to describe problems in commercial electrodes and the current research and development on textile electrodes for ECG and EEG measurements.

1.1. Commercial electrodes

Bio potentials are electrical potentials inside human body, and Cl^- , Ca^+ , and Na^+ ions are used as charge transports in an organic system, in contrast to electrons in the leads of a sensing device. Therefore, by using electrodes to measure these biopotentials, the ion currents in the body have to be changed to electron currents in the electrode. The outer layer of the skin has a dry dielectric layer, which is called stratum corneum and will cause reduction of the transfer mechanism from ions to electrons. Today disposable Ag/AgCl electrodes are most commonly used in ECG and EEG measurements. A weak point of these electrodes is a short operating time, only few days. Furthermore, these electrodes are not reusable [5]. Because the few-polarizable Ag/AgCl electrode is usually used as the conventional wet electrode, conduction gel has to be applied to moisturize the skin outer layer and change it to a highly ion-conductive layer. These procedures usually make trouble to users easily; in particular, conduction gels will inevitably leave its residues on the skin. Conduction gel may also leak out the electrodes to cause short circuit between two electrodes in the close proximity, when too much gel is applied. Moreover, these aforementioned preparation procedures are time consuming, uncomfortable, and even painful for participants, since the skin preparation usually involves the abrasion of the outer skin layer. Repeated skin preparations and gel applications may also cause allergic reactions or infections. The signal quality may degrade over an extensive time as the skin regenerates and/or the conduction gel dries. The ECG monitoring using commercial electrodes is shown in Figure 1.1a

1.2. Textile electrodes

Textile electrodes are electrodes type, which are made from fabric. Normally, textile materials are insulators, but in the textile electrodes conductive yarn is attached to the fabric during their manufacturing process. These electrodes do not need gel to achieve connection to the skin. The textile electrodes can be made by weaving, knitting or embroidering conductive yarn to the structure. The conductive yarn can be made for example by silver coating yarn or metal filaments can be braided into yarn. The textile electrode materials are typically synthetic, for example polyester or polyamide. They endure abrasion very well, absorb moisture only a little and dry fast. The textile electrodes are good for a long time measurement, because they do not irritate skin. In addition, they are lightweight, ductile and washable. A major drawback is high impedance in the electrode-skin interconnection. It is $1\text{-}5\text{ M}\Omega/\text{cm}^2$ for the textile electrodes compared to $10\text{ k}\Omega/\text{cm}^2$ impedance for the disposable Ag/AgCl electrodes.

In contrast to the conventional wet electrode, the conductive yarn embroidered electrode exhibits both polarization and conductivity due to the partly polarizable electric characteristic of electrically conductive yarn, and provides a strong capacitive behavior at the sensor-skin interface. Moreover, sweat and skin humidity may also aid the conductive path [6-7]. Figure 1.1b shows the ECG monitoring using textile electrodes.

1.2.1 Textile electrodes for ECG measurement

The electrocardiogram (ECG) is a widely studied biosignal and it describes the electric action of the heart. The ECG consists of three main parts: QRS-complex, P-wave and T-wave that are used to measure biopotential. Long term ECG recording is a standard procedure in monitoring cardiac patients. In case of ECG recording during life activity, washable and comfortable textile electrodes can be woven at precise target location in the wearable garments and hence make the ECG recording less hectic concerning electrode handling and adjustments on the body unlike conventional gelled electrodes [1-10].

Linda Rattfält et al. investigated the electrical characteristics of three different conductive yarns (resistance) and three different textile electrodes applied to the skin (impedance and polarization potential) in order to determine their suitability as ECG-electrodes. They have

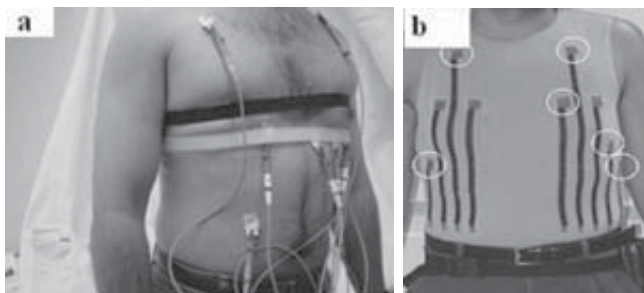


Figure 1.1: ECG measurement using a) Commercial electrodes b) Textile electrodes

chosen three commercially available yarns (A-C) with varying metal rates and construction techniques for the investigation. Yarn A consists of multifilaments of 100% stainless steel and the corresponding electrode, electrode A, is plain knitted. Yarn B consists of 20% stainless steel and 80% polyester and is spun of a mixture of short staple fibers. Electrode B is wave knitted resulting in a corrugated structure. Yarn C has a core of polyester fibers with a monofilament of silver plated copper twined around it and electrode C is a woven fabric. The yarns and electrodes are shown in Figure 2. In their study, both electrode A (multifilaments of 100% stainless steel) and B (staple yarn of 20% stainless steel and 80% polyester) had required electrode potential stability and impedance value. Electrode C (polyester core with a monofilament of silver plated copper) on the other hand seems not to have the desired stability and impedance.

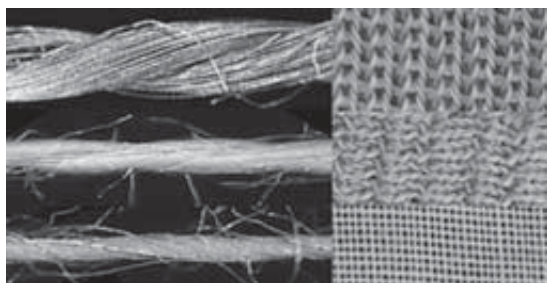


Figure 1.2: Yarn A and Electrode A is plain knitted (top). Yarn B and Electrode B wave knitted (middle). Yarn C and Electrode C is a woven fabric (bottom)

H.Y. Song et al. designed textile electrodes woven with conductive yarn in the jacquard woven structure and studied the biosignal of the ECG measurement. They have designed electrodes with double faced weave and woven with a silver covering yarn in the weft direction. Their findings say that the woven structure has less strain properties and is uniform than knit structure and had the signal to noise ratio (SNR) value of 33.67 dB [6]. Tania pola et al. have compared four structurally different textile electrodes in ECG measurement (three of them industrially manufactured electrodes and one hand made by embroidering conductive yarn on the fabric) and they have obtained very good results with embroidered electrode for dry skin. They reported that the textile electrodes are well suited for measuring ECG and the best results were achieved with the embroidered electrodes, which have a large contact area with the skin [7].

Kunal Mankodiya et al. studied the comparison of tex-

tile electrode with the conventional electrode in terms of their ability to perform long term recording and reported that the textile electrode shows a promising outcome as it exhibited low skin electrode impedance and a high signal to noise ratio (SNR) for long term monitoring [8].

Wu Yi-Zhi et al. presented a novel cloth electrode, which was directly made in cloth by using conductive multi-walled carbon nanotubes. In ECG signal test, the cloth electrodes acquired signals similar to Ag/AgCl electrode. However, the Ag/AgCl electrodes showed wider range of voltage than the cloth electrodes did. This is attributable the impedance of the cloth electrodes was larger than the Ag/AgCl electrodes which were about 15K Ω while cloth ones were about 35K Ω [11]. Ju-Yeoul Beak et al. fabricated a poly dimethyl siloxane-based dry electrode for the long term measurement of ECG signals (more than 7 days) and reported that in special applications such as long term unsupervised monitoring dry electrodes offer benefits over wet-electrode [9].

1.1.2. Textile electrodes for EEG measurement

Electroencephalogram (EEG) is a kind of method to measure electrical activities of the brain by using electrodes along the scalp skin. It is also a powerful noninvasive tool and can provide high temporal resolutions to reflect the dynamics of brain activities directly. It has been widely used for both medical diagnosis and neurobiological researches.

EEG is used to help diagnose the presence and type of seizure disorders, to look for causes of confusion, and to evaluate head injuries, tumors, infections, degenerative diseases, and metabolic disturbances that affect the brain. It is also used to evaluate sleep disorders and to investigate periods of unconsciousness. The EEG may be done to confirm brain death in a comatose patient. EEG cannot be used to measure intelligence or diagnose mental illness.



Figure 1.3: EEG measurement using commercial electrodes

In general, the conventional Ag/AgCl electrodes are most frequently used in EEG measurements as shown in Figure 1.3. Conduction gel may lead out EEG electrodes to cause short circuit between two electrodes in the close proximity, when too much gel is applied or wet electrode is pushed down on the scalp hard. There also exist some troubles as the interested measuring location covered with hairs, leading to an insufficient skin-electrode contact area. In order to improve the limitations of conventional wet electrodes, several kinds of dry electrodes have been developed. Most of these dry electrodes were made by the micro electromechanical systems (MEMS) technique.

Chin-Teng Lin et al. proposed mobile and wireless EEG system composed of dry MEMS EEG sensors and demonstrated the applications of this system in neuroscience and neurotechnology [12]. Griss et al. proposed the microspike MEMS dry electrodes to acquire the forehead EEG signals successfully. However, the aforementioned MEMS dry electrode technique acquired the EEG signals in an invasive way and only on the forehead sites. Moreover, there still exist some drawbacks by using the MEMS electrodes, such as 1) attendant pains when MEMS electrodes penetrate into the skin; 2) lack of physical strength during the penetration; and 3) high cost for the manufacture procedure of MEMS electrodes [13].

C.Fonseca et al. developed prototype of a "dry" active electrode for EEG recording with a TiO₂ based sensor surface. This sensor has proved to have the suitable mechanical properties for daily manipulation and cleaning and it displays a noise-free scalp/sensor interface, even after prolonged contact with the synthetic sweat. Preliminary comparative tests carried out simultaneously in human volunteers with Ag/AgCl and "dry" active electrodes are consistent with the conclusion that these devices perform better than the Ag/AgCl electrodes [14]. The results are shown in Figure 1.4.

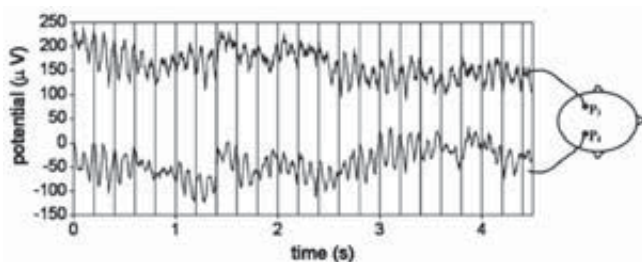


Figure 1.4: Simultaneous records of spontaneous EEG signals with the Ag/AgCl and "dry" active electrodes placed at symmetric positions.

Chin-Teng Lin, et al. developed and experimentally validated a novel dry foam -based textile electrode for long-term EEG measurement. They fabricated a novel dry foam textile electrode, using electrically conductive polymer foam covered by a conductive fabric. The design of the dry foam electrode is shown in Figure 1.5. Different from the conventional electrode dry foam electrode exhibits both polarization and conductivity due to the use of conductive fabric, which provides partly polarizable electric characteristic, and can be used to measure biopotentials without skin preparation and conduction gel. In addition, the foam substrate of dry electrode allows a high geometric conformity between the electrode and irregular scalp surface to maintain low skin-electrode interface impedance, even under motion.

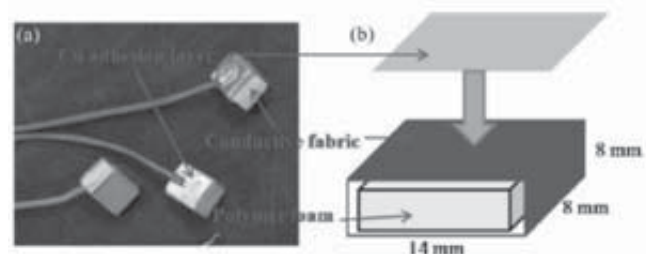


Figure 1.5: (a) Top view and (b) exploded view of dry foam EEG electrode. The foam electrode was covered by the conductive fabric on all surfaces and then paste on Cu layer.

The foam substrate of dry electrode can fit the scalp surface well to increase the contact area between skin and electrode to reduce the impedance. Moreover, different to the fabric-based electrodes, the foam is not only used to reduce the motion force, but also potentially used to increase the fabric-skin contact area when force is applied on the electrode. It will also assimilate the motion force, rubbing and sliding of the electrode on the skin to reduce the motion artifact and skin-electrode interface impedance [15].

Johan Lofuede et al. developed three different types of textile electrodes for EEG monitoring as shown in Figure 1.6. Electrode type I is knitted metallic mesh fabric made from metallic silver thread, Electrode type II is woven fabric made from silver coated nylon and Electrode type III - is terrycloth made by 15% nylon, 30% conductive fibers, 20% Spandex and 35% polypropylene.

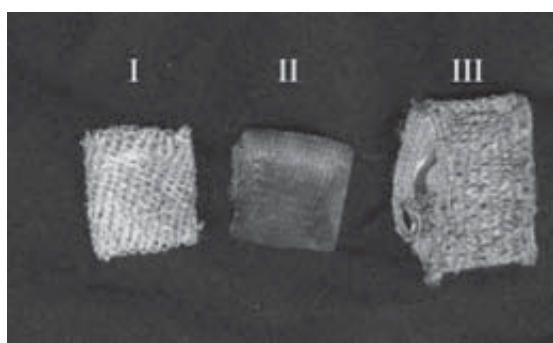


Figure 1.6: EEG textile electrodes

In their study, the metallic silver (electrode type I) have given less beneficial contact with the skin and creased easily, produced the worst signal quality. Electrode type II made by thinner yarn, gives them a larger surface area and creases slightly, but produced rather good signals. The terrycloth material (electrode type III) has a very large surface area and is soft, produced quality signals. This property may be very useful in an application intended for long term monitoring, especially in neonates [16].

2. Problems associated with Textile electrodes

As described previously any practical fabric electrode must not only allow detection of physiological parameters but be unobtrusive and easy to wear. When worn against the skin surface it has been shown that fibres that protrude out from a fabric surface of diameter larger than about 30 microns will cause unacceptable prickle. Fibres around 20 microns or less in diameter offer good comfort. Hence any multifilament yarn, whether constructed from short or continuous filaments of 'large' diameter (>30 microns), may cause irritation and thus be inappropriate for use against the skin. Yarns constructed from stainless steel yarns may fall into this category. However the silver coated nylon yarns, which comprise smaller continuous fibres, seem to be more appropriate [17].

It is apparent that the contact resistance between the skin and dry sensor electrode (in the absence of any electrolyte) is a function not only of the nature of the conductive sense area i.e. the conductive medium, but also, of the surface area and applied pressure. The amount of pressure required to achieve an acceptable contact resistance to allow 'useful' signals to be obtained has not been reported and is unknown. Miyatsuji reported that high clothing pressure (above 2.5KPa) applied to the human body, adversely affects the physiological homeostatic mechanisms through altering the

autonomic nervous system, a co-ordinator of internal environment in the human body. Miyatsuji suggests that clothing pressures of 1.5KPa have less affect and are preferred [18].

Other considerations related to contact are the presence of movement artifacts generated by the body and physical movement. This skin fabric/electrode interface is a dynamic environment further complicated by the hyperelastic behavior of the skin which varies between individuals. Motion artifact is the noise on the ECG or any biosignal. This results from motion of the electrode over the skin's surface, including relative movement between subcutaneous layers and can produce large amplitude changes in any measured biosignals. Traditional electrolyte gels due to their adhesive nature minimize the effect of movement of the electrodes and limit the size of the resulting signal artifacts. The skin potential artifact (also known as skin-stretch or skin-motion) arises from the change in voltage between the inner and outer layers of the skin under deformation. Skin movement can produce a change in potential at the skin surface of several millivolts. Past research into effects on electrodes by Searle et al. [19] and temperature by Cornish et al. [20], has shown that reduction in impedance with time is likely the result of perspiration on the skin surface where the electrodes are placed. This also results in a reduction in artifact due to less effective movement between the electrode and the skin surface. This study shows that fabric to skin friction for dry skin increases 50% from 10 to 90% RH and up to 200% when wet. Similarly, another study reveals that, the static friction μ_s , between 'normal' skin in vivo and wool is 0.4 and increases by 40% with hydration.

3. Conclusions

This paper reviewed state-of-the-art in research and development of wearable sensor-based systems for ECG and EEG monitoring. Such systems are conceived to bring technological achievements closer to users, by embedding smart functions into everyday clothes, with recognized benefits for, but not restricted to, several biomedical disciplines.

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He has improvised M.I.S, Budgetary Control System, Cost Records, Product Mix Selection, Short Term Profit Planning, Inventory Control System and Input-Output Reconciliation of Raw Material in Textile Mills. He is good at application of Operations Management tools like, Linear Programming, PERT/CPM, Transportation Model, Equipment Replacement Model, Control Charts, Capital Investment Analysis etc.

He is a certified Cost Auditor in practice (ICAI Membership No: 7250). He has an experience as a Cost Auditor for Vardhman Textile Group of Mills-Ludhiana, Rustom Mills,Ahmedabad, two textile mills in Ahmedabad, the "Annadhanam" Complex of Tirumala Tirupati Devasthanam (TTD) in Tirupati(A.P), IOB-Annur Br, Coimbatore.

Understand the limitation of an average figure

In an hectic engagement in office-routine, sometimes officials unconsciously miss simple facts and commit some costly mistakes. In my textile manufacturing experience, I came across the following case .The case was related to inventory control monitored by the commercial department of a textile unit.

A textile unit was engaged in importing a large volume of a special chemical that had a supply lead time of about three months. The special chemical was not available locally and if any shortage was felt, it had to go without the item or air freight it at a very high cost. During peak sales season, often it faced shortage of this chemical thus had lost sales. To avoid stock out, it started storing too much of the chemical as the quantity to be stored was decided on ad-hoc basis. Thus a substantial working capital was locked up. The textile unit wanted to plan its chemical stock and its "arrivals" in a systematic manner.

It embarked on Inventory Control Programme and asked its well qualified Commercial Manager(C.M) to implement the decision. The Sales and Production depts. were asked to give the projected Sales and production for every month (Jan-Dec) for the next financial year.20XX to the C.M.

Month	Production (000s-mtr)
Yr. 20XX	
Jan	636
Feb	638
Mar	645
Apr	950

May	1400
Jun	1720
Jul	1740
Aug	1745
Sep	1500
Oct	654
Nov	648
Dec	634
Total	12,910
Average p.m	1,076

The special chemical(C)-required for the unit was given to the Commercial Manager as 15Kg/1,000m of production.

Material-"C" required for the yr 20XX @ 15/1000m=12910X15/1000=193,650Kg
Material-"C" required average pm. =193,650/12=16,138Kg

A 40ft container, takes 17,000kg of the chemical and one 40ft container was ordered in advance (considering the lead time) to arrive in the beginning of every month starting from January 20XX. Opening stock for the year 20XX was kept at 5, 000Kg.

It was expected that the opening stock in Jan 20XX of 5,000 kg would take care of about 15 days requirements of Jan-20XX (as Jan20XX requirement is 630X15/1000=9450Kg only)-thus accommodating the delay in arrival of the material-"C"if any.Thus excess inventoryis avoided and timely arrival was planned.

On the face of it, all the preparations on quantity to arrive every month, the timing of their arrival, a

small opening stock, no excess stock during the year etc- were all seem to be all right. The C.M was congratulated for the "NICE" work done.

As the year progressed, 17,000Kg arrived in time every month from Jan 20XX. But "UT" faced shortage of Material"C" in August and September 20XX. No one was clear about how it happened despite good preparation to avoid shortages and arrival of material in time.

In Oct 20XX, the C.M. swung into action and came out that the production dept. had been consum-

ing much in excess of its monthly consumption of 16,138 Kg of the Material (C)in May, June, Jul ,Aug, Sep 20XX-probably due to no control on wastage or pilferage. The M.D ordered the Production, Planning and Control Manager(PPCM) to investigate and send a report. The PPCM analysed and presented the following facts.

The production and material(C) consumptions were nearly as per budgeted and there was only very minor deviations in production and no evidence of excess wastage or pilferage. Despite this, the shortage would occur as shown in the table below.

Month	Production (000s-mtr)	Material -(C)Required@	Arrival Kg Cl.stock Kg	Material-(C) = (Op.stock+ Arrival-Consumption) (Op.stock=5,000 Kg)
Yr. 20XX		15Kg/1000 mtr		
Jan	636	9,540	17,000	=5000+17000-9540=12,460
Feb	638	9,570	17,000	19,890
Mar	645	9,675	17,000	27,215
Apr	950	14,250	17,000	29,965
May	1400	21,000	17,000	25,965
Jun	1720	25,800	17,000	17,165
Jul	1740	26,100	17,000	8,065
Aug	1745	26,175	17,000	-1,110
Sep	1500	22,500	17,000	-6,610
Oct	654	9,810	17,000	580
Nov	648	9,720	17,000	7,860
Dec	634	9,510	17,000	15,350
Total	12,910	1,93,650		Mat'l(C) Arrival @ 17,000 kg pm
Avg.p.m	1,076	16,138		

Then, what was the main reason for this shortage?

The average monthly consumption for the year 20XX was taken by the C.M, to be the consumption for every month in the year and hence material arrival as per the average monthly consumption was expected by him to meet the requirement of every month. But in peak (Sales) season May-Sept, the production and the resulting consumption of "C" was about 50% more than the monthly average of the year and once the buffer stocks were consumed, the shortage resulted in Aug and Sept 20XX.

The fact that was unconsciously ignored was:

An average of a group of figures is not a substitute for the individual figure (in the group).

S.Srinivasan
M.Tech(Textiles),FCMA,MBA
Ex -Director(Operation).
A textile Unit in Lagos(Nigeria)

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A Series of Papers on Biotechnology and its Application in Textiles

The series of chapters under the title, 'Biotechnology and its application in textiles' will be published in this Journal of Textile Association over the next year or so, will introduce the basics of biotechnology, industrially useful biotechnologically derived products, their areas of application in textiles and recent advances in biotechnology for textiles.

Textiles have been manufactured using various technologies since time immemorial. We are to this day awed by beauty and sophistication of textiles sometimes found in archaeological excavations. Nowadays textiles is not limited to only comfort and fashion, textiles are now moving towards high-tech era of performance which has brought up diversification and expansion of technologies. This realization of technologists has coincided with rapid developments in technology and brought about a surge in research and development activities in textiles. Biotechnology in Textiles is one of the revolutionary ways to advance the textile field.

In the last few years biotechnology has been making its way into many areas of industry. The progress of industrial biotechnology in the last twenty years, especially in molecular biology, protein engineering and fermentation technology, enhanced the development of new uses of enzymes in the textile industry, food industry, detergents, paper and leather industry, natural polymer modification, organic chemical synthesis and diagnostics.

The major branches/areas of biotechnology are, plant, animal and microbial biotechnology. Generally by mode of fermentation different metabolites for eg Pigments, Polysaccharide, antibiotics etc. are extracted from plants, animals and microorganisms which are of in-

dustrial use. Researchers have tried to apply enzymes into every step of textile wet processing, ranging from pre-treatment, bleaching, dyeing to finishing, and even effluent treatment. Some applications have become well established and routine, while some have not yet been successfully industrialized due to technical or cost constraints.

With increase in awareness amongst people about hygiene in order to prevent microbial infection, antimicrobial treatment to clothing / textiles is given. Antimicrobial finishes can be applied to textiles directly or in immobilized form, generally by pad dry cure method. There are standard test methods developed by different organization such as AATCC, ASTM, and ISO in order to assess effectiveness of antimicrobial agent applied to textile substrate.

The rapid developments in the field of genetic engineering have given a new impetus to biotechnology. This introduces the possibility of tailoring organisms for transferring genetic material (genes) from one organism to another. Genetic engineering methods are being investigated for their potential to produce new kinds of textile fibres. Cloning, hybridisation is used for microbial strain or enzyme modification so as to increase the productivity of a particular product or enhancement of their properties.

This series is written primarily as an introductory text for an audience comprised of those interested in or already working in, textile related areas, who wish to acquire a broad knowledge of biotechnology and its application in textiles. The first chapter is intended to serve as an introductory text for those who wish to expand their understanding of biotechnology.

Chapter 1: Introduction to biotechnology

Madhura P. Nerurkar, Manasi A. Damle and
Ravindra V. Adivarekar

Biotechnology is one of the most important scientific and technological revolutions of the last century and has major impact on various aspects of human life. Potential of this field is enormous and many breakthroughs have already been achieved in area of food, healthcare, textile, and environment. Biotechnology is an abbreviation of "biological technology" and has been defined as "the application of scientific and engineering principles to the processing of materials by biological agents to provide goods and services." Biotechnology

is not a single technology, it can be considered as a group of inter-related technologies that are applicable to a broad range of manufacturing industries as well as agriculture. It is said to be the harbinger of third industrial revolution (first two being steam power and microprocessor)

The term biotechnology was coined by Hungarian scientist Karl Ereky during 1919 in a book he published in Berlin called *Biotechnologie der Fleisch-, Fett- und Milcherzeugung im landwirtschaftlichen Grossbetriebe* (Biotechnology of Meat, Fat and Milk Production in an Agricultural Large-Scale Farm) where he described

biotechnology as a technology based on converting raw materials into a useful product. Biotechnology in simplest terms means, application of technology using biological systems and parts thereof. Basic unit of any biological system is the cell hence any Biotechnological application involves use of living or resting cells or their enzymes such as bacteria (prokaryotes), yeast, fungi, plants and animals (eukaryotes including man).

Centuries before the term biotechnology was coined, science behind it was being practised in day to day life. Production of bread, cheese, wine was carried out by mode of fermentation. Natural fermentation that yielded different useful products is because of microorganisms. It dates back to 1860, when Antonie Van Leeuwenhoek described microorganisms as animalcules. In year 1856 Pasteur reported that lactic acid fermentation was caused by living microorganisms. Landmark development in study of microorganisms occurred when Robert Koch described pure culture techniques in 1897. This boosted study of microorganisms in in-vitro condition. With this study Butchner discovered enzymes the biological catalyst in yeast cells. Progress in pure culture techniques, study of physiology and biochemistry of microorganisms lead to strain development, geared up studies in fermentation techniques which allowed exploitation of microbial products at commercial level. Depending on area of application, 4 different branches of biotechnology have been defined in synonymous with colour that they specify. Four branches or waves of biotechnology are defined as Green, Red, White and Blue Biotechnology.

- ◆ *Green biotechnology* : It involves the use of environmentally friendly solutions as an alternative to traditional agricultural practices, horticulture and animal breeding processes. Thus overall this branch deals with plant biotechnology. For e.g. use of bacteria to facilitate the growth of plants, development of pest-resistant grains, engineering of plants to express pesticides, use of bacteria to assure better crop yields instead of pesticides and herbicides, etc.
- ◆ *Red biotechnology or medicinal biotechnology*: It deals with development of new diagnostics and therapeutics. Medicines are made by pharmacist or chemists synthetically by mere use of chemicals. Biotechnology medicines are any medicines that are made by intervention of living organism. With advent of genetic engineering, developments in red biotechnology are occurring at galloping rate.
- ◆ *White biotechnology or Industrial biotechnol-*

ogy : It is the application of biotechnology for industrial purposes, including manufacturing, alternative energy (or "bioenergy"), and biomaterials. It uses enzymes and micro-organisms to make products in sectors such as chemistry, food and feed, paper and pulp, textiles and energy. White biotechnology processes helps to make industrial manufacturing processes more environmentally friendly.

- ◆ *Blue biotechnology or marine biotechnology* : It involves use of marine resources as a source at production step or at application step. As this branch involves use of marine or water based resources, it is called as blue biotechnology.

Thus all these branches of biotechnology are interdisciplinary, where product of one branch may act as source for another branch of biotechnology. Sustainable development through use of biotechnology is being practised in order to fulfil basic needs of human life i.e. food, clothing and shelter.

Textile industries are facing a challenging condition in the field of quality and productivity, due to the globalization of the world market. The highly competitive atmosphere and as the ecological parameters becoming more stringent, it becomes the prime concern of the textile processor to be conscious about quality and ecology. This in turn makes it essential for innovations and changes in the processes. As a result, the research and development strategies of the textile processors will be highly focused and the challenges will force many changes in the textile industry. Biotechnology is one such field that is changing the conventional processing to eco friendly processing of the textiles.

In textile field, from processing to application; biotechnology plays a role at almost every step. Products synthesized using renewable resources, biodegradable nature of products are making more use of biotechnology in textile industry. As biotechnology is green technology its application in almost every industry including textile is increasing day by day.

Areas of applications of biotechnology in the textile industry

- ◆ Improvement of plant varieties for improvement in production of textile fibres and their properties.
- ◆ Improvement of fibres derived from animals and health care of the animals.
- ◆ Novel fibres from biopolymers and genetically modified micro-organisms.
- ◆ Replacement of harsh and energy demanding chemical treatments by enzymes in textile processing.

- ◆ Environmentally friendly routes to textile auxiliaries such as dyestuffs.
 - ◆ Novel uses for enzymes in textile finishing.
 - ◆ Development of low energy enzyme based detergents.
 - ◆ New diagnostic tools for detection of adulteration and Quality Control of textiles.
 - ◆ Waste management.
- Thus the use of biotechnology holds promise for less environmental damage than harsh chemicals and for improvements in processing and in tailoring properties for specific applications. Therefore, keeping in view benefits of biotechnology, application of biotechnology in textile sector must have following objectives;
- ◆ To develop environment- friendly production technologies for textile industry.
 - ◆ To save resources like energy and chemicals.
 - ◆ To improve the quality of final product.

This introductory chapter focuses on the basic importance of the use of biotechnology for textile applications. Due to many advantages of going green using biotechnology, many researchers and industries are taking this technology seriously. Thus it is clear that there is enormous potential of biotechnology in the field of textiles.

In the upcoming chapters, we will focus in detail on major areas of biotechnology i.e. products from plant, animal and microorganisms, fundamentals of biotechnology, microbial biotechnology in textile industry, antimicrobial finishes on textile material, genetic engineering techniques and recent developments in biotechnology.

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Madhura Nerurkar has completed her Ph.D. in biotechnology in the department of Fibres and Textiles Processing Technology, under Dr. Ravindra V. Adivarekar, at the Institute of Chemical Technology (ICT), Mumbai, India. Her research area of interest includes microbial enzymes and their applications, fermentation, microbial colorants, detergency and antimicrobial property of fabrics.

Manasi Joshi is currently pursuing Ph.D. in biotechnology in the department of Fibres and Textiles Processing Technology, under Dr. Ravindra V. Adivarekar, at Institute of Chemical Technology (ICT), Mumbai, India. Her research areas of interest are microbial enzymes and their applications, biofilms, fermentation, antimicrobial property of fabrics and detergency.

Ravindra Adivarekar is currently Professor and Head of the Department of Fibres and Textiles Processing Technology at the Institute of Chemical Technology (ICT), Mumbai, India. His research areas of interest are microbial enzymes for textile processing, detergent formulations, natural dyes and mordants, dyeing and printing of textiles, medical textiles, fiber modification, composites and energy conservation.



The Textile Association (India)

Delhi Unit

Felicitation Function at TIT & S, Bhiwani

Mr. Sudhish Aggarwala, Mr. D.K. Singh, Mr. Navin Goyal, Mr. Vikas Bhargava, Mr. Vikas Chachra and Mr Ashish Gupta visited The Technological Institute of Textiles and Sciences, Bhiwani on 27th of April 2013 to award Certificates of Appreciation for the hard work done by the students in putting up scintillating fashion shows and cultural program on the eve of NTS - 2013. The Director of The Technological Institute of Textiles and Sciences, Bhiwani, Dr. Rishi P. Jamdagni thanked NTS-2013 team for giving the opportunity to provide the platform to the students of their institutes to show their talent. The team of TAI Delhi members briefed faculty and students of TIT&S Bhiwani on benefits of membership of TAI Delhi to make a start of special membership enrollment drive.



Mr. Navin Goyal distributing a certificate of appreciation to student of TITS, Bhiwani

Felicitation Function at Ginni Devi Modi Girls (PG) College, Modinagar

Mr. Sudhish Aggarwala, Mr. D.K. Singh, Mr. Navin Goyal, Mr. Vikas Bhargava, Mr. Vikas Chachra and Mr Ashish Gupta also visited Ginni Devi Modi Girls (PG) College, Modinagar on 4th May 2013 to award Certificates of Appreciation for the excellent performance by the students in cultural program on the eve of NTS - 2013. Principal of Ginni Devi Modi Girls (PG) College, Modinagar, Dr. Rita Bakshi whole heartedly praised TAI Delhi Members for organizing NTS 2013. The students of their institutes to showed

their talent best talent and utilized the opportunity for their best. The team of TAI Delhi members also briefed faculty and students of institute on benefits of membership of TAI Delhi for the special membership enrollment drive



Mr. Vikas Chandra being welcomed in Ginni Devi Modi Girls PG College, Modinagar

Lunch Hosted by Sh. J.P. Saria for NTS 2013 Team at Anand Niketan Club

Past President and GC Member Mr. J.P. Saria honored the NTS Team and their spouse at lunch at Anand Niketan Club, Delhi on 5th May 2013. The host and other distinguished guests whole heartily praised the hard work done by the members of Team NTS-2013 and encouraged TAI Delhi to keep organizing similar activities in future.

Educational Tour to Kasauli

TAI-Delhi organized an educational tour to Kasauli for 3 days from 21st June 2013 to 23rd June 2013. 28 Members gathered early in the morning of 21st June at TAI-Delhi office and traveled in a bus for the journey. The wonderful journey concluded in the evening on 23rd June when the bus reached back to Delhi. The tour comprised of training programmes, physical and mental games where members participated with full enthusiasm along with their spouse. These games aided the members to polish their skills like communication, team building, team work, leadership and public speaking. All members participated whole heartedly in various activities with full fighting spirit to win the prizes. It was a good opportunity for members for close interaction with each other. The elders showered their blessings on the youngsters with the whole hearted praise for their efforts in making this trip successful. The youngsters were humbled by the positive support from

the elders. Mrs. Paavni Chachra, Mrs. Shweta Bhargava, Mrs. Deepa Goyal, Mrs. Sunita Garg and Mrs. Sushma Jain played a vital role in making the trip a memorable one. It was a unique experience for everyone as it was the first ever time that TAI-Delhi has organized such tour of 3 days for members and their spouse. The tour concluded very successfully and members were overwhelmed by the well planned trip.



Members of the trekking team during educational trip to Kasauli

Felicitation of NTS members at Punjabi Bagh Club

After successfully concluding the National Textile Seminar-2013, a felicitation function for the entire organizing committee was arranged at Punjabi Bagh Club on

7th July 2013. 45 members and their spouse attended the function. The team members of NTS-2013 were felicitated with suitable rewards in the function which was followed by dinner. The Textile Association (India) Delhi would be celebrating its Golden Jubilee year in the year 2014-15 as it has completed 50 years of its inception in 1965. Mr. Sudhish Aggarwala addressed the members about the vision of new managing committee and stressed for special drive for membership enrolment for TAI Delhi. To widely spread, TAI objectives and activities, the committee proposed for more frequent additions of TAI News Letter and its wide circulation. TAI Delhi would come out with a special plan of activities in the golden jubilee year.



Dr. Anil Gupta, National Vice President - TAI, addressing at Punjab Bagh Club

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Managing Committee of TAI Delhi Unit for the term 2013-15

The Textile Association (India) - Delhi in its Annual General Meeting held on 29th June, 2013 declared its Managing Committee for the term 2013-15. Mr. Sudhish Aggarwala & Mr. D.K. Singh were declared elected unopposed for the position of the President and Vice President respectively. Besides, nine Managing Committee members and three Governing Council members were also declared elected unopposed. In the Managing Committee meeting held on 7th July at Punjabi Bagh Club, New Delhi, three more members were co-opted. Following were elected office bearers of the Association:

President	Mr. Sudhish Aggarwala
Vice President	Mr. D.K. Singh
Chairman:	Mr. Navin Goyal
Vice Chairman	Mr. Vikas Chachra
Hon. Secretary	Mr. Ritesh Gupta
Hon. Jt. Secretary	Mr. Ashish Gupta
Hon. Jt. Secretary	Mr. Dhawal Sharma
Hon. Treasurer:	Mr. Anup Garg

Other Members of the Managing Committee are Mr. A.L. Khurana, Mr. M.S. Saggi and Mr. Navdeep Phogat. Three Governing Council Members to represent TAI-Delhi in the National Body of the Association are Mr. R.L. Kapoor, Mr. K.K. Agarwal and Mr. H.N. Jain. Besides, Mr. Ritesh Gupta is Ex-Officio G.C. Member.

New Editorial Board was formed with Mr. Vikas Bhargava as its Editor and Ms. Sonam Saipawar as the Sub-Editor. Managing Committee also decided to send e-News Letter to senior functionaries in the industry, textile organizations, various associations like FICCI, NITMA, CITI etc, educational and research institutes, government organizations and ministry officials.

TAI-Delhi aims for growth of the textile fraternity by touching as many textile professionals through increased memberships. Mr. Pankaj Sharma has been assigned the job as Chairman of the Membership Drive Committee.

oerlikon

Highest precision for high-viscosity media Oerlikon Barmag pumps at the Bondexpo 2013 in Stuttgart

Remscheid, August 13, 2013 - Whether for bonding, for casting or for insulating, for seal-ing or for foaming - at this year's Bondexpo, the international trade fair for bonding technology, Oerlikon Barmag will be showcasing its gear metering pump program specifically designed for the joining/binding work steps. Between October 7 and 10, the company will be presenting - among other things - components for silicone processing and hot-melt adhesive applications, but also for processing resins and polyurethanes and other higher-viscosity liquids.

Efficiency in mastering viscous media - the GA series

When applying hot-melt adhesives, the focus lies above all on the evenness of the application. However, precise metering not only presupposes the fast and reproducible setting of an operating point, but also low-pulsation feeding of the conveying medium. Supplement-

ing the proven GM series, Oerlikon Barmag has now developed the GA range for conveying higher-viscosity media. The GA series is available for conveying volumes of between 1.25 and 30 cm³/rev (0.6-144 l/h). It has been designed for pressures of up to 200 bar, for viscosities of up to 1,500 Pas as well as for temperatures of up to a maximum of 225 °C. With this new program of pumps, Oerlikon Barmag offers tailor-made solutions for all applications for which precisely-defined, even metering is absolutely essential.

Conveying and metering using a single unit - the drum pump

The drum pump is designed especially for conveying and metering high-viscosity materials such as adhesives, silicones, etc., from drums and other large containers and for pressures of up to 250 bar. Thorsten Wagener, the sales employee responsible for pumps used in industrial and chemical applications comments: "The drum pump not only conveys high-viscosity materials from the drum, it also meters the medium to the mixing head without any additional interim stops and with the customary volumetric efficiency." In close agreement with the customer, the gear pump and drum follow-up plate are harmonized in such a way as to

ensure that the plate can effortlessly reach the bottom of the container, hence guaran-teeing a very small amount of residue totaling <1%. This has a positive impact on both the materials costs and the production process.

Working under high pressure

In high-pressure technology, conveying small volumes with low viscosities is a particular challenge. Specifically for this application, Oerlikon Barmag has expanded the GM series with round plate package to include an option for the pressure build-up capacity. This multi-stage pump is available for conveying volumes of between 0.05 and 20 cm³/rev and guarantees the generation of operating pressures even at low viscosities (for example, 250 bar, 100 mPas). To this end, higher volumetric efficiencies or a larger useable speed range can be achieved. The robust gear metering pump ensures continual low-pulsation operation. Hence, high-pressure applications conveying minimum flow-through rates (for example, 0.5g - 1.5g/sec.) can also be covered for the very first time. For the manufacturers of PUR molded parts, block foams, refrigeration unit insulation and sandwich panels, this means consistent process stability and low investment costs.

About Oerlikon Manmade Fibers

With its Oerlikon Barmag and Oerlikon Neumag brands, Oerlikon Manmade Fibers is the world market leader for manmade fiber filament spinning systems, texturing machines, BCF systems, staple fiber systems and artificial turf systems and- as a service provider - offers engineering solutions for the entire textile value added chain.

As a future oriented company, the research and development at this division of the Oerlikon Group is driven by energy-efficiency and sustainable technologies. With the expansion of the product range to include polycondensation systems and their key components, the company now caters to the entire process - from the monomer all the way through to the textured yarn.

The primary Oerlikon Barmag markets are in Asia, and - for Oerlikon Neumag - in the USA, Turkey and China. Correspondingly, Oerlikon Barmag and Oerlikon Neumag - with just under 2,500 employees - has a worldwide presence in 120 countries as part of the Oerlikon Manmade Fibers network of production, sales and distribution and service organizations. At the R&D centers in Remscheid, Neumünster and Chemnitz, highly-qualified engineers and technicians develop innovative and technologically-leading products for tomorrow's world.

For further information, please see: www.oerlikon.com/manmade-fibers

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Mr. Prakash Bhagwati elected as TMMA Chairman



MR. PRAKASH K. BHAGWATI

Mr. Prakash K. Bhagwati, Chairman, InspirOn Engineering Pvt. Ltd., Ahmedabad has been elected as the Chairman of the Textile Machinery Manufacturer's Association (India) (TMMA) for the year 2013-2014. He has been the Member of its Executive Council since 1998-1999.

67 years old, Mr. Bhagwati received the Bachelor of Mechanical Engineering in LD College of Engineering in 1968 and Master of Science in Mechanical Engineering Wichita State University, Kansas, USA in 1970.

Mr. Bhagwati was appointed as President in Gujarat Chamber of Commerce & Industry (GCCI) for 2012-13. He is the Chairman of Textile Traders Co-Op. Bank (TTCB), a member of Development Council for Textile machinery industry, Ministry of Heavy Industries & Public Enterprises, a board of Trustees on Gujarat Vishwa Kosh and is an Executive Member of Gujarat Cancer Society. Mr. Bhagwati is also a Governing Council Member of Gujarat Diabetes Association, a Governing Body Member of Gujarat Law Society, a Committee Member of Bharatiya Vidhya Bhavan Ahmedabad Kendra and also a Committee Member of Andh Kanya Prakash Gruh, etc.

He has visited several countries abroad to study latest development and export promotion.

Mr. Bhagwati has set up various social involvements such as Associated Industries Rural Development Trust with main objective of socio-economic development in rural areas by initiating appropriate programmes on sustained basis ensuring improved earnings of villagers. This trust has adopted villages in and around Ahmedabad which works in four distinct areas such as 1) Agricultural Development; 2) Animal Husbandry; 3) Health and Hygiene; as a part of the activities handled by the trust the family has set-up in this area Santokba

Bhagwati General Hospital, Dholka of which he is the Chairman of Board of Trustees. 4) Education and Community Development.

Mr. Bhagwati loves Photography & reading.



MR. JAYARAMAN ANAND

Mr. Jayaraman Anand, Managing Director, Veejay Lakshmi Engineering Works Ltd., Coimbatore has been elected as the First Vice-Chairman of Textile Machinery Manufacturer's Association (India) (TMMA) for the year 2013-2014. He has been the Member of its Executive Council since 2006-2007.

42 years old, Mr. Anand received the Bachelor of Mechanical Engineering and M.S. (Industrial Engineering) from U.S.A.

Mr. Anand is looking after the management of all Companies managed by his family viz. M/s. Veejay Lakshmi Engineering Works Ltd., Coimbatore - manufacturers of Automatic Cone Winders & Two-for-one Twisters. He is also the Managing Director of Veejay Lakshmi Textiles Ltd. producing cotton yarn, knitted fabrics & garments, Director of Veejay Sales and Services Ltd. and Partner of Veejay Marketing, which is an engineering ancillary marketing the products of Veejay Lakshmi Engineering Works Ltd.

Mr. Anand has extensively travelled abroad in connection with the business of the Company and has an experience of more than 15 years to his credit.



MR. MASAFUMI KUNITO

Mr. Masafumi Kunito, Managing Director of Kirloskar Toyota Textile Machinery Pvt. Ltd., Bangalore has been

elected as the second Vice-Chairman of the Textile Machinery Manufacturers' Association (India) (TMMA) for the year 2013-2014. He has been the Member of its Executive Council from 2012-2013.

Mr. Kunito had joined Toyoda Automatic Loom Works, now changed its name as "Toyota Industries Corporation", Japan in April 1982 after his graduation in Mechanical Engineering from Doshisha University located in Kyoto prefecture Japan. He was assigned to Production department in Textile Division and had worked in that department for 20 years.

Mr. Kunito joined KTTM as Deputy Managing Director in June 2009 and he has been promoted as Managing Director of KTTM in July 2012, which manufactures Textile Ring Frame Spinning Machines and Transmission parts for Toyota Vehicles. He has rich professional experience of more than 30 years in Textile & Engine Division working with Toyota Industries Corporation.

When KTTM decided to start Auto Parts Business, then he was transferred to that project in May 2002 and joined KTTM in September 2002. Once he returned to Japan in August 2005 and he worked in Production Department and Production Control Department in Engine Division.

He has recently been promoted as Managing Officer of Toyota Industries Corporation in June 2012.



MR. PRATIK RAJNIKANT BACHKANIWALA

Mr. Pratik Rajnikant Bachkaniwala, Director, Palod Himson Machines Pvt. Ltd., Surat has been elected as the Hon. Treasurer of the Textile Machinery Manufacturer's Association (India) (TMMA) for the

year 2013-2014. He has been the Member of its Executive Council since 2009-2010.

Mr. Pratik is the third generation entrepreneur and a family member of the Surat based Himson group.

Mr. Pratik is a Commerce Graduate from Sydenham college of Commerce and Economics, Mumbai in the year 2001. After graduation, he had opted for a Post Graduate Diploma course at Entrepreneurship Development Institute of India, Ahmedabad. His course there was PGD in business and Entrepreneurship management with a specialization in Family Business Management.

Before becoming the whole time Director at various group companies at Himson, he had taken work experience for purchase & vendor development, production planning and marketing & customer services from 2002 to 2004. He has been managing 3 units of the group independently since 2004.

Mr. Pratik had been instrumental in acquisition of two companies which are now part of the Himson group portfolio.

Mr. Pratik has travelled extensively for business and is associated with European and Chinese companies at various levels.

Mr. Pratik has been a sports house captain in school and has represented his school in basketball at All India Inter Public School conferences for 2 years. He also plays tennis regularly.

Mr. Pratik is a Governing Council member of Textile Association (India). He has been the Executive Secretary in Surat Management Association in 2006 and is the member of committee at TAI, Surat.

The Textile Association (India) wishes for their successful tenure and confident that under their able leadership the organization will function further progressively for scaling new height.

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COMPETITION SUCTION TUBE ECORIZED - WHO ARE THE WINNERS?

With the suction tube ECorized, a retrofit kit for ring spinning machines from Rieter, energy savings of up to 50% in suction power consumption are achieved. Since mid-April, the new Rieter suction tube ECorized has been on sale. Rieter customers who requested an offer for retrofitting Rieter ring spinning machines could participate in a competition. The five winners have now been drawn.



Drawing the winners of the Suction Tube ECorized competition in Winterthur. Left to right: Edda Walraf, Head of Technology and Marketing and Kurt Frei, Head Parts and Service.



With the suction tube ECorized, sustainable financial savings can be made in ring spinning.

Energy saving is an essential environmental factor and helps to attain sustainable cost reductions in the spinning mill. The latest energy-saving solution from Rieter has already won an award - the "Suction Tube

ECORIZED" was awarded the "Watt d'Or- Prize " by the Swiss Government in January 2013. The Watt d'Or, the seal of quality for energy efficiency, is the Swiss energy award for "excellent energy projects, plausible concepts and outstanding innovations".

The competition at the market launch of the suction tube ECorized was a success. The energy savings to be expected - and thereby the associated reduction of electricity costs - generated numerous enquiries.

The winners each receive a free retrofit kit

The draw took place on 11 July 2013. From all the competition entries received, Edda Walraf (Head of Technology and Marketing) and Kurt Frei (Head of Parts and Service) drew the names of the winners. Five customers will each receive a free "Suction tube ECorized" retrofit kit for their ring spinning machines, with free delivery and installation.

The following spinning mills save electricity when spinning:

- ◆ Tipoint SA (Argentina)
- ◆ PT Mulia Spindo Mills (Indonesia)
- ◆ Eveready Spg Mills Pvt Ltd (India)
- ◆ Almer Tekstil San ve Tic AS (Turkey)
- ◆ UZTEX, Tashkent JV LLC (Uzbekistan)

These customers have made a double win. They will receive a free retrofit kit and in future sustainably save energy in the spinning process. Presentation of the prize in the spinning mills is scheduled for Autumn 2013.

Further Information on the Suction Tube ECorized

The conversion of ring spinning machines to include the suction tube ECorized is very simple and can be carried out by a qualified mill electrician. Under www.rieter.com/ecorized more information on this innovative product is available.

Textsmile

A school decided to give out 100% attendance awards at end of term ceremony. All went well until one particular young winner was called on the stage; and he was absent.



World Yarn Production Jumps in Q1/2013

Estimates for Global Yarn and Fabric Output are Positive

Global yarn production jumped in Q1/2013 in comparison to the previous quarter as a result of higher output in Asia, North and South America and despite a decrease in Europe. Also on an annual basis global yarn output rose resulting from higher output in Asia, South America and Europe while production fell in significantly in North America. Global yarn stocks were practically unchanged in Q1/2013 with Europe and Asia recording lower ones and South America slightly higher ones. Also on an annual basis yarn stocks practically did not change. Yarn orders in Europe and Brazil were up in the Q1/2013 in comparison to the previous quarter. On an annual basis yarn order increased in Europe but dropped in Brazil.

Global output of fabric decreased in the Q1/2013 due to lower production in South America and Asia which could not be set off with increases in Europe. On a year-to-year basis world fabric production was up as a result of higher production in Europe and Asia and despite a reduction in South America. Fabric stocks fell worldwide in comparison the previous quarter due to reductions in South and North America and despite higher stocks in Asia. In comparison to last year's quarter global fabric stocks fell also with lower stocks recorded in South America, North America and Europe which were not compensated by higher fabric stocks in Asia. Fabric orders in Q1/2013 rose in Brazil but fell in Europe. Year-on-year fabric orders were down both in South America and Europe.

Estimates for yarn production for the 2nd quarter 2013 compared to the 1st quarter of 2013 are positive in Asia and North America, neutral in South America and negative in Europe. Estimates for fabric production for the 2nd quarter 2013 are positive in Asia and Europe and neutral in South America. The outlook for yarn production for the 3rd quarter 2013 compared to the 1st quarter 2013 is positive in Asia and North America, neutral in South America and negative in Europe. The outlook for fabric production for the 3rd quarter 2013 is positive in Asia and Europe and neutral in South

America.

In comparison to the previous quarter world yarn output jumped in Q1/2013 by +21.7% compared to the previous one due to higher output in Asia (+23.6%) - particularly in China (+29.7%) - as well as North and South America (+5.0% and +3.0%, respectively). Production of yarn fell in Europe by -0.9%. Global yarn production increased year-on-year by +11.7%. While Asia (+13.0%), South America (+2.9%) and Europe (+1.4%) recorded higher output levels, yarn production dropped in North America (-18.9%).

Compared with the previous quarter global fabric output plummeted by 8.0% due to reductions in South America (-11.9%) and Asia (-8.6%), while Europe recorded an increase of +3.2%. In comparison to Q1/2012 global fabric production was higher (+5.3%) as a result of higher output in Europe and Asia with +7.5% and +7.3%, respectively.

Global yarn inventories decreased slightly by 1.7 % in Q1/2013 with Europe and Asia recording decreases of -2.7% and -2.0%, respectively, while inventories in South America were slightly up (+0.3%). On an annual basis global yarn inventories were slightly down by 1.3%. Yarn stocks in Asia, Europe and South America fell by -1.5%, 0.3% and -0.2%, respectively.

Global fabric stocks were reduced by -1.1% in the Q1/2013 in comparison to the previous one. In South America they dropped by -9.6% and in North America by -1.4%, while fabric inventories in Asia were slightly up (+0.5%) and remained unchanged in Europe. Year-on-year global fabric stocks were down by -2.9% with reductions recorded in South America (-14.4%), North America (-7.5%) and Europe (-5.7%), while fabric stocks in Asia were up by +1.2%.

Yarn orders in Europe and Brazil were higher in the Q1/2013 in comparison to the previous quarter. On an annual basis yarn order jumped in Europe (+16.2%) but plummeted in Brazil (-17.6%). Fabric orders jumped in Brazil in Q1/2013 by +17.9% compared to the previous one and fell slightly in Europe by -0.2%. In comparison to Q1/2012 fabric orders plummeted in Brazil by -14.0% and in Europe by -3.6%.

Textsmile

When asked how he would like to die, this man replied; 'I would like to die just like my grandfather did, peacefully in his sleep, not screaming or yelling like the passengers in the car he was driving.'



Monforts Fong's Textile Machinery Co. Ltd., China, launches its products in India

Indian processors can now cheer as they now have an option to get German technology at competitive prices, with the launch of a wide range of products in India by Monforts Fong's Textile Machinery Co. Ltd., China. **Monfong's**, as the company is popularly known, has a product range that includes stenter frames for knits and wovens, shrinking ranges for wovens, pad dry ranges for wovens and relaxation dryers for knits. Monforts Fong's has already supplied over 1300 stenters world-wide, which is testimony of its proven quality and technology.

Monforts Fong's, China, which was a joint venture between A. Monforts Textilmaschinen GmbH & Co. KG, Germany, and Fong's Industries Co., Ltd., Hong Kong, has now become a fully owned company of the Fong's Group after Fong's take over of A. Monforts, Germany, last year. The acquisition of A. Monforts, Germany, is a strategic move by the Fong's Group to efficiently utilize the technology and know-how of Monforts in dry and wet finishing processes and make these available worldwide at reasonable prices.



Monforts Fong's is exclusively represented by **A.T.E. Enterprises** in India for sales and after-sales-services.

In a massive expansion of its production facilities, epitomizing the growing business and its unflinching commitment, Fong's Group has acquired a total area of 700,000 sq. meters of land in Zhongshan, China. With approximately 400,000 sq. meters of construction, it would be the major manufacturing facility of the Fong's Group. The first phase of the project covering an area of 120,000 sq. meters, which is already complete, is mainly for Monforts Fong's products. This new production facility with the state-of-the-art automation will significantly contribute to efficiency and cost benefits.

Forthcoming Events 'Hon'ble Union Textile Minister to Inaugurate Textile Seminar'

The Textile Association (India)-Delhi is organizing a seminar to deliberate on 'problems' being faced by various sectors of Textile Industry and shall offer 'solution' through panel discussions and presentations by eminent speakers from all over the country. The seminar is scheduled at 9:00 AM on 21st September, 2013 at PHD House, New Delhi. Honorable Textile Minister Dr. Kavuru Sambasiva Rao has given his kind consent to be the Chief Guest on the occasion and for one to one interaction with the participants. The attendance shall be based on invitations only.

For more details, please contact Mr. Navin Goyal, Chairman, TAI-Delhi at navin@filatech.in or 9871973799.

Half Day Seminar at Panipat

The Textile Association (India)-Delhi is organizing a Half Day Seminar to deliberate on theme "Importance of Quality in Current Export Scenario". The seminar is scheduled at

11:00 AM on 23th August, 2013 at Panipat. For more details please contact Mr. Vikas Chachra, Vice Chairman, TAI-Delhi at 09999900021 or at

chachravikas@hotmail.com

Mill Visit-Alps Industries Limited, Haridwar

The Textile Association (India)-Delhi is organizing a one day trip to Alps Industries Limited (Courtesy: Mr. K.K. Agarwal, Chairman, Alps Industries Ltd) to visit their state of art spinning mills at Haridwar on 5th October, 2013. We are pleased to inform you that the association shall bear the half of the cost of this visit and the balance half has to be borne by visiting member. Seats are limited and shall be given on first come first serve basis. Interested members are requested to submit their names to Mr. Ritesh Gupta, Hon. Secretary at riteshguptanewdelhi@yahoo.co.in or 9810311428.



National Seminar on "Innovation & Technology Advancement - Growth Mantra for Textile Industry"

Government and Industry collectively responsible for deceleration of growth of textile sector : Textile Minister

PHD Chamber of Commerce & Industry, New Delhi organized a seminar National Seminar on "Innovation & Technology Advancement - Growth Mantra for Textile Industry" on 02nd August, 2013.

Dr. Kavuru Sambasiva Rao, Union Minister of Textile, Government of India said that Reluctance of both government and industry to invest in research and development in textile sector in India has led to its current state of affairs in which domestic industry is loosing out its competitiveness to its competitors and counterparts, says The Minister, however, indicated saying that it is one of the primary reason that Indian textile industry's share in global world trade has declined.



Inaugurating a National Seminar on Innovations & Technological Advancements: Growth Mantra for Textile Industry here today, under the aegis of PHD Chamber of Commerce and Industry (PHDCCI), the Minister stressed that due to negligence of both government and industry had led to not invest in R&D textile sector. This has resulted in a passive growth of the textile industry which needs to be reversed.

Despite several government schemes launched by Union Textile Ministry under aegis of successive government the sector has yet to emerge for an economy of scale, pointed out Dr. Rao.

July - August 2013

The industry should take the initiative along with government to improve the availability of skilled labour suggested Dr. Rao to various industrialists of PHDCCI attending national seminar.

Responding to a clarification, sought by one of the members of the PHDCCI during the deliberations on the seminar in regard to expansion of interest subvention scheme in textile sector to a rate of 3%, Dr. Rao hinted that the Chamber should come out with a specific proposal to the Ministry of Textile to enable it to endorse to authorities concerned in the department of Commerce and Industry.

A Knowledge paper titled "Opportunities for India in an Evolving Textile & Apparel Industry" prepared by Technopak Advisors and PHD Chamber and Knowledge Paper titled "Innovation & Technology Advancement - Growth Mantra for Textile Industry" prepared by Department of Textile Technology, IIT Delhi and PHD Chamber was released by Dr. KS Rao, Hon'ble Union Minister, Ministry of Textiles, Government of India for its release for the seminar



The Minister was extremely liberal in asking the industry to list out the slippages of India inc. in textile sector to convenience the government to dole out packages for it in case such proposals have merits.

In his welcome remarks, Mr. Sharad Jaipuria, Sr. Vice President, PHDCCI, Jaipuria highlighted "the Indian Textile industry has an overwhelming presence in the economic life of the country. However there are many challenges in the form of Skilled Labour, Power Shortage, Obsolete Machinery, Lack of Information, Foreign Competition etc which hinder the growth of textile industry. We feel that the regulatory policies should be simplified and the clearance process should be enhanced to augment the growth"

In his key note address Mr. Mukund Choudhary, Chair-

man, Task Force on Textiles, PHDCCI stressed that innovation should become the only means of survival in textile industry as almost all the major players are engaged in research and development regarding raw materials and their applications.

Another speaker Mr. Ashish Bagrodia, Managing Director, Winsome Textile sought to impress upon the point that textile industry made a significant contribution to the national economy in terms of direct and indirect employment generation and net foreign exchange earnings as the textile industry is expected to reach at US\$ 220 billion by 2020.

A number of presentations on important topics were made at the Technical Session of the seminar which was chaired by Mr. N.D. George, Economic Advisor, in Ministry of Textiles. Mr. N.D George kicked off the technical session with a discussion on "Innovation as a Growth Mantra for Textile Industry". Other presentations were Science Based Sustainable Solutions for Dyeing and Finishing of Textiles" by Mr H.P. Nanda, Director- Strategy & Growth Initiatives, Dupont India, "Challenges for Garment Export & Handloom Sector" by Mr Vishwa Nath, Managing Director, Nath Bros Exim International Ltd., "Innovations in Textile & Clothing Sector : Key Growth Factors" by Mr. Avinash

Chandra, Head -South Asia, Invista Ltd ; "Nanofibres & Nanotechnology in Textiles" by Ms. Mangla Joshi, Prof., Department of Textile, IIT Delhi and "Modernization of Indian Texturing Industry with latest Automatic Energy Efficient eAFK machines" by Mr. D. Ghosh, General Manager South Asia, Oerlikon Textile India Pvt. Ltd., "New Trends in Textile Testing & Quality Control" by Ms. Monika Sharma, Head - Corporate Sustainability, SGS India Pvt. Ltd., "Meeting the Demands of Non Apparel Fabrics" by Mr Raj Verghese, General Manager - Clariant Chemical India Ltd.

The event had enlisted participation of industry, academia, government officials, consultants, who spoke on various aspects of the industry. In an era when the textile industry is passing through a critical phase, with stiff competition both in the domestic as well as international markets, product diversification, innovation, technology advancement and value addition are the thrust areas for the textile industry to remain competitive in the years to come. The seminar was focussed on the emerging and cutting-edge advancements, innovations in order to increase the overall competitiveness of the industry and benchmarking the International Competitiveness of the India Textiles and Apparel Industry.



Rieter Sustainability Report for 2012 published

Now published for the second time, Rieter's annual Sustainability Report describes in detail the company's efforts and progress in economic, social and environmental sustainability. In particular, Rieter once again improved the energy efficiency of its products last year.

In 2012 Rieter made substantial progress in further reducing resources consumption at its production plants. For example, building renovations resulted in considerable energy savings at one plant in the Czech Republic and another one in China. And in Switzerland the waterless urinals installed in 2012 save 600 cubic meters of (drinking) water per year at the Rieter plant in Winterthur, among other locations.

Rieter has been continuously striving for years to improve environmental compatibility and energy efficiency

along the entire value-added chain. The focus thereby is particularly on product and process innovations that benefit Rieter customers financially by minimizing their resources consumption. Among other examples in this connection, the Rieter Sustainability Report for 2012 describes a compact spinning innovation that saves 14 percent energy compared with the first-generation machine.

The entire Sustainability Report for 2012 can be downloaded in German and English from the Rieter website: <http://www.rieter.com/>

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Rieter exploits market recovery thanks to strong positioning

Market recovery continues from the second half of 2012, above all in Turkey - substantial rise in order intake thanks to strong positioning and attractive product offering - significantly higher sales than in 2nd half of 2012 - EBIT and operating margin as expected - further progress with investment program 2012/2013.

In steadily improving market conditions Rieter achieved an order intake in the first half of 2013 of 711.4 million CHF (1st half of 2012: 404.1 million CHF). Particularly in Turkey, demand was much greater than in the prior year. Sales of 478.1 million CHF were significantly higher (+19%) than in the previous six months but slightly lower (-2%) than in the first half of 2012. Operating result before interest and taxes (EBIT) and operating margin developed according to expectations during the period under review. EBIT amounted to 17.1 million CHF, equivalent to 3.6% of sales (1st half of 2012: 31.5 million CHF or 6.5% of sales). The lower EBIT than in prior year is largely attributable to smaller profit margins on orders closed the year before. There were no non-recurring divestment gains as in the prior year period. Rieter closed the first half of 2013 with a net profit of 5.0 million CHF or 1.0% of sales (1st half of 2012: 21.5 million CHF or 4.4% of sales). In the period under review, Rieter completed major steps in the growth investment program 2012/2013 announced in spring 2012.

Recovery of the global market for short-staple fiber machinery and components in the second half of 2012 has continued in 2013. This positive trend applied to all the geo-graphical markets of relevance for Rieter, to different degrees but particularly in Turkey, supported by a government subsidy program that benefited spinning mills. High demand was also recorded in various Asian countries. Business in India and China showed a slight upturn in the first half of 2013, but the financing situation for Rieter customers in these countries remains challenging. Spinning mill capacities in the USA were renewed thanks to a favorable cost structure in this sector.

Rieter was able to make the most of this overall im-

provement in market conditions thanks to an attractive product offering and strong market positioning worldwide. Order intake during the period under review totaled 711.4 million CHF, 76% and 63% higher than in the first and second half of 2012 respectively. This was mostly attributable to orders received by Rieter in Turkey. Rieter was able to increase order intake in China with market-specific products, while in India there was above all a good demand for components. Overall order backlog per June 30, 2013 totaled around 780 million CHF.

The gratifying demand for Rieter products confirms the soundness of its innovation and expansion strategy. Thanks to its market-specific product program, Rieter holds a strong position worldwide in the cyclical market for textile machinery and components. Spinning mill customers in all main markets increasingly prefer highly auto-mated machinery and components that enable greater productivity and better yarn quality with lower energy consumption.

Rieter sales for the first half of 2013 totaled 478.1 million CHF, 2% less than in the prior year period (487.3 million CHF) but 19% higher than in the second half of 2012. Sales were attributable to various countries, with business activities broadly based regionally.

Operating result before interest and taxes (EBIT) totaled 17.1 million CHF, equivalent to 3.6% of sales. This decline of EBIT and operating margin compared with the prior year period (1st half of 2012: 31.5 million CHF or 6.5% of sales) was expected, primarily because of lower margins on orders closed in 2012, the slightly lower volumes and also non-recurrence of the 6.0 million CHF gains in the first half of 2012 from disposal of production plants in the Czech Republic. Furthermore, EBIT for the period under review is reduced by 10.4 million CHF outlay for the 2012/2013 investment program. Operating result before strategic projects totaled 27.5 million CHF, equivalent to 5.8% of sales.

Rieter's capital expenditures in the first half of 2013 amounted to 26.5 million CHF, occurring mainly in China and India, of which 21.2 million CHF for strategic projects. Rieter increased expenditure on research and development in the period under review to 22.1 million CHF, equivalent to 4.6% of sales (1st half of 2012: 20.9 million CHF or 4.3% of sales).

Net profit for the first half of 2013 totaled 5.0 million CHF, equivalent to 1.0% of sales (1st half of 2012: 21.5 million CHF or 4.4% of sales).

The Rieter global workforce per June 30, 2013 totaled 4 646 employees (December 31, 2012: 4 720 employees). Rieter mastered workloads due to substantially higher sales compared with the second half of 2012 by more efficient utilization of capacities and with higher productivity.

Ongoing high investments and demand-driven increase in net working, capital resulted in a free cash flow of -12.1 million CHF. After a dividend payment of 11.6 million CHF (2.50 CHF per share) out of the reserves from capital contributions in April 2013, cash and cash equivalents per June 30, 2013 totaled 315.4 million CHF and net liquidity 63.2 million CHF. Rieter is on a sound financial footing with an equity ratio of 34%.

Spun Yarn Systems Business Group

The Spun Yarn Systems Business Group (machinery business) recorded a marked increase of order intake in the first half of 2013 to 621.9 million CHF, 88% higher than the prior year period and 70% more than in the second half of 2012. Spun Yarn Systems sales totaled 392.5 million CHF, 2% less than in the first half of 2012. Operating result before interest and taxes (EBIT) totaled 13.3 million CHF, equivalent to an operating margin of 3.4% of sales (1st half of 2012: 27.9 million CHF or 7.0% of sales, including gain on manufacturing capacity disposal in the Czech Republic). The lower profitability is attributable to smaller volumes and to a product mix with less profitable margins on machine sales. Furthermore, strategic project costs were largely charged to Spun Yarn Systems. Business Group EBIT excluding strategic project costs totaled 23.1 million CHF, resulting in 5.9% operating margin.

The "Watt d'Or" Energy Prize award at the beginning of 2013 by the Swiss Federal Office for Energy in the Export category gratifyingly confirms Rieter's strong innovative drive.

Premium Textile Components Business Group

Order intake by the Premium Textile Components Business Group in the first half of 2013 rose 21% to 89.5 million CHF (1st half of 2012: 74.1 million CHF). This growth is attributable to both customer segments of this business group: spinning mills and machine manufacturers. Market demand in China recovered

above all from machine manufacturers, while in India the main demand was from spinning mills. Business in Turkey continued to develop positively. Third-party sales by Premium Textile Components totaled 85.6 million CHF in the period under review, and segment sales (i.e. including deliveries to Spun Yarn Systems) totaled 125.7 million CHF. There was a slight decline of 1% in third-party sales compared with the prior year period (1st half of 2012: 86.7 million CHF), but already a 15% increase over the second half of 2012 (74.2 million CHF). Premium Textile Components profited from the high flexibility of its business units. Operating result before interest and taxes (EBIT) totaled 9.6 million CHF or 7.6% of segment sales (1st half of 2012: 9.3 million CHF or 7.9% of segment sales). Profitability declined mainly because of the lower volumes and due to costs for strategic projects.

Progress in the investment program 2012/2013

Most of the investment program projects for 2012/2013 (see box on page 5) are on track as per June 30, 2013. Rieter made the following progress during the first half of 2013:

Expansion in Asia : Capacity expansions in the two key markets of China and India will be concluded by the end of 2013. Intermediate targets for the extensive expansion of production capacities at Rieter's Changzhou plant in China had been reached as per June 30, 2013. The new plant in Koregaon Bhima, India, is now finished and operational.

Innovation : Rieter worked intensively on innovations during the period under review, with the goals of further improving yarn properties and enabling spinning mill customers to increase their productivity and energy efficiency. With the airjet spinning machine, the focus is on further market introduction.

Process improvements : The projects for global standardization of work processes made good progress particularly with regards to manufacturing, but the global standardization and IT support of business processes has been delayed by about six months.

Focus on sustainable profitability improvement

Rieter continues to focus on lowering the break-even threshold, and in this connection is continuing with the workforce adjustments announced in spring 2013. At the same time, Rieter also seeks to improve profit margins by reducing production costs, through optimal

allocation of capacities and price discipline.

Outlook

Rieter's business activities are broadly based globally. At the present time it is still difficult to forecast the development of demand for textile machinery and components in 2013. Demand depends among other factors on yarn and raw material price developments, currency exchange rates, financing costs, and consumer sentiment worldwide.

Based on the current order backlog - already reaching into 2014 - full year sales for 2013 are expected to show high single digit growth compared to 2012. Against 2012 levels before disposal gains, operating result (EBIT) is expected to profit from volume growth. This includes strategic project costs of about 20 to 25 million CHF for the 2012/2013 investment program.

Investment program 2012/2013 for further growth

Rieter expects global demand for short staple fibers (natural fibers / staple man-made fibers) to grow by an average of 2.3% annually until 2030. The additional spinning capacity this will require, the replacement demand and the trend toward greater automation, especially in the Chinese and Indian markets, will have a positive impact on demand for high-quality spinning machinery and components.

Against this background Rieter is aiming for overall annual average growth of 5%, half of which should be organic. Rieter's strategic targets are to retain its leadership in the premium segment and also to expand its position in the local markets in China and India.

In the implementation of these goals, Rieter is focusing on

Expansion in Asia : Further expansion of capacity in

China and India;

Innovation : Increased focus on air-jet spinning, improvement of yarn quality, productivity and energy efficiency of machinery and components;

Process improvements : Operational excellence, global standardization and IT support of business processes.

In order to achieve rapid expansion in Asia, to drive product innovation, and to optimize global processes, Rieter is planning investments totaling some 140 million CHF in 2012 and 2013.

As of mid 2013, 72.8 million CHF have been invested in total. Another 35.7 million CHF were charged to EBIT as strategic project costs. These investments are in addition to regular maintenance expenditures. Rieter is seeking with the investment program to achieve an EBIT margin of at least 9% average over the demand cycle, and greater than 12% in peak years.

For further details please refer to:

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Post Conference Report

Inkjet India Workshop 2013 - Digital Textile Focus

2 - 3 August 2013 | The Gateway | Surat

Inkjet Forum India chose Surat for the Inkjet India Workshop 2013. The workshop on Digital Textile Printing was held on August 2-3, 2013 at The Gateway Athwalines, Surat and was co-presented by MS srl & Fujifilm Dimatix with Atexco as the platinum partner. The Inkjet India Workshop was designed to be a series of educational events to be held all over India focused on providing training to the various stakeholders involved in the Digital Textile & Industrial Inkjet areas. The workshop gave the participants an in-depth technical understanding of Digital Textile Printing and also an opportunity to network with industry experts & colleagues. It was also a great opportunity for the brands, designers & buying houses to network with the leading digital printing houses in Surat.



The Workshop began with a traditional lighting the lamp ceremony and welcoming the guests - Mr Katargamwala & Mr Shethwala from the South Gujarat Chamber of Commerce & Industry. Gajanan Chandavarkar, Convener - Inkjet India Workshop 2013 welcomed the participants and emphasized on the untapped potential of digital textile printing in India. He also thanked the Sponsors, Speakers and wished Inkjet Forum India the best for their future endeavors.



Aditya Chandavarkar, Founder & CEO, Inkjet Forum India, introduced the participants to the workshop and emphasized on **Why Surat ? Why Digital?**. This was followed by workshop presentations by the course leaders spread over the two days:

- ◆ James Gill, Fujifilm Dimatix shared his views on the International Perspective of Digital Textile Printing, gave an overview of the recently concluded Shanghai ITEX Textile Show & shared his knowledges on the importance of using good inks.
- ◆ Mr. Mayur Kalbag, Spandan Consulting, connected with the participants by illustrating some examples related to life and how one can learn and emerge from them and apply those aspects for Enhancing their Managerial Skills.
- ◆ Steve Smith, DPIInnovations conducted a informative color management workshop spread over the 2 days which focussed on all the key areas of RIP Software, Image types, Profiling & Color Management. The sessions emphasized the importance of RIP software technology to improve the digital textile printing business.
- ◆ Ms. Debbie Thorp, Global Inkjet Systems, gave the participants an overview of the Inkjet Printhead Technology. She also focused on the main aspects

of Printheads, printheads for Textile Printing, their maintenance and Inks and their system basics.

- ◆ Prof. Dr. Marc Van Parys. University of Ghent, Belgium spoke about Post-treatment of Printed Fabrics, DP-printers, UV Curable inks for Textile & Digital Coating/Finishing & dyeing. He provided some glimpses into his research which gave the delegates an insight into the future of digital textile printing.
- ◆ Victor Guo, Atexco, shared his views on how to select the appropriate Digital Textile Printing Technologies to fit your business model.
- ◆ Vaibhav Kanodia, Owner - Niharika Dyeing & Printing Mills provided the Industry perspective about Digital Textile Printing being a user of conventional and digital technology. He also highlighted aspects of Screen v/s Digital, the problems one faces during implementation and so on.



Later in the day, the delegates attending the Technology Forum which included leading suppliers of printheads, printing systems, inks, and RIP software present their products and services. Each technology partner gave a 15 minute presentation on their com-

pany and products. The technology partners for the workshop included Reggiani Macchine SpA, Global Inkjet Systems, Jaysynth Dyestuffs, Blue Jade TexPrint, SII Printek, DPIInnovations Inc., DGI Corporation, ttp Meteor & Huntsman Textile Effects. This gave the participants an insight on the latest developments all at one place! The table top display areas allowed the technology providers to interact with the delegates & discuss further technical details about their products.

The workshop proved to be helpful for senior management, technical managers and junior officials working in the textile processing and printing industry.

**Inkjet Forum
India**

About us

Leading the industry towards innovation in Inkjet! The primary objectives of Inkjet Forum India are to assist the printing industry to keep updated with technological developments, understand the various applications & market trends in the areas of digital textile printing, ceramic inkjet printing, industrial inkjet & printing inks. We also host the most comprehensive and informative conference and seminar programs for the Indian inkjet industry.

Our core team has comprehensive knowledge of conventional & inkjet printing technology with a combined experience of two decades. Inkjet Forum India also brings together more than 15 years of experience in organizing events with in-depth understanding of current & future printing market trends.

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Tel.: 022-2446 1145, Fax: 022-2447 4974



E-mail: taicnt@gmail.com

Thymas Electronics Pvt. Ltd.

TEXTTEST Air Permeability Tester LabAir IV

TEXTTEST AG of Switzerland is proud to introduce the brandnew **FX 3300 Air Permeability Tester LabAir IV**. This latest addition to the complete family of Air Permeability Testers supersedes the very successful FX 3300-III, which has been in production since 1999.

The FX 3300 LabAir IV is 4th generation instrument. It offers the accuracy and ease of operation of its predecessor, as well as some exciting new features: The internal orifice disc has an automatic cleaning function, eliminating the need to manually clean this core part of the instrument. The orifice disc is now mounted vertically to keep dust or fibers from collecting on the disc, which causes leakage.



TEXTTEST Air Permeability Testern FX 3300

The automatic measuring range control makes the FX 3300 LABAIR IV even easier to use than the previous models. It is virtually impossible, even for untrained operators, to make any mistakes when testing.

The redesigned, extremely sturdy clamping arm guarantees perfect alignment of the two test head halves, which is especially important when testing with small test areas.

But the most interesting new feature is the completely new user interface (touch-screen) with the manifold possibilities to evaluate and document the results. The FX 3300 LabAir IV can be integrated into a network, if desired via Wi-Fi, and the internal memory of the instrument can be accessed, and a comprehensive test

report can be generated, from any PC within the network, using the internal local webserver of the instrument and any web browser in the PC. Furtheron, all style information, test parameters, and results can be centrally managed from the network.

Textest manufacturers their instruments in Switzerland and their quality is far ahead than any other make.

TEXTTEST Hydrostatic Head Tester HydroTester - LATEST MODEL

TEXTTEST AG, a Switzerland based manufacturer of testing instruments for technical textiles, is proud to introduce the forth generation Hydrostatic Head Tester, the FX 3000 HydroTester IV.

Over 2 thousand delivered units of the previous generations, the FX 3000 series has become the standard instrument for water resistance testing worldwide. The new FX 3000-IV is available in three models with different maximum test pressures, ranging from 500 mbar up to 5 bar (50 m water column).



TEXTTEST Hydrostatic Head Tester HydroTester

All models can be operated with the optional Automatic Drop Detector, which eliminates the need for an operator to watch the sample during the test. This device automatically terminates the test when the first or the third drop has penetrated the sample.

An Automatic Level Control is available to fill the water reservoir before the first test, and to refill the tank in between tests. Both options greatly increase the testing efficiency.

The manual clamping mechanism, depending on the

model supported by a pneumatic cylinder, provides a constant clamping force, which effectively prevents lateral leakage of water through the sample.

Another interesting feature is the completely new user interface (touch-screen) with the different possibilities to evaluate and document the results: The FX 3000 HydroTester IV can be integrated into a network, if desired via Wi-Fi. Using the internal local web server of the instrument and any web browser in the PC, the memory of the instrument can then be accessed from any PC within the network, and a comprehensive test report can be generated. Furthermore, all style infor-

mation, test parameters, and results can be centrally managed from the network.

The FX 3000 HydroTester IV complies to many national and international Standard Test Methods.

This instrument will be demonstrated during **Techtextil, from 3-5 Oct 2013, at NSE Mumbai**

For further details contact:
Thymas Electronics Pvt. Ltd.,
Email : tepl26@yahoo.com,
thymasad1@bsnl.in, thymasltd@gmail.com



'Importance of Compliance for Textile Exports'

The Textile Association (India) - Madhya Pradesh Unit organized 2 days National Textile Summit 2013 in association with Shri Vaishnav Institute of Technology & Science (SVITS) on 30th & 31st August, 2013 at Indore. Mr. Sumit Gupta (India Representative, GOTS) made a presentation on 'Importance of Compliance for Textile Exports'. He emphasized on the importance of social, environmental and chemical compliance for textiles, along with the use of organic fibres. He also updated the participants with crucial global activities in the field of compliance. The scenario in neighboring countries is creating a favourable export environment for India, but we need to invest more time and money in the field of compliance to tap this potential benefits. He also presented the highlights from ZDHC Roadmap Version 2, which was released in June 2013. The participants got the strong message that, "As an industry, our commit-

ment has to be towards contribution to a cleaner environment and laying the foundation for expanding environmental accountability".



Dr. H.V.S. Murthy and Dr. V.K. Kothari on the dais & Mr. Sumit Gupta presenting his paper



A New Milestone of THE TEXTILE ASSOCIATION (INDIA) Fonuded in 1939



**Celebrating a Journey of 75 Glorious Years
(Platinum Jubilee Year)
2013-2014**

The Textile Association (India) M.P. Unit National Textile Summit 2013

The Textile Association (India) - Madhya Pradesh Unit organized 2 days "National Textile Summit 2013 Intro-Inspection on Indian Textile Business (Fiber to garment)" in association with Shri Vaishnav Institute of Technology & Science (SVITS), Spinners Club & MPTMA on 30th & 31st August, 2013 at Indore. The main aim of conference was to face and find out the solutions for the future global challenges in textile industry.

During the inauguration, the Chief Guest of the program Dr. K.S. Rao, Union Textile Minister, GoI, Guest of Honor Mr. Suresh Kotak (Chairman, Kotak Group), Mr. D.R. Mehta (National President TAI), Mr. Shreyaskar Chaudhary (MD Pratibha Syntex) Mr. S. Pal (Chairman MPTMA), Mr. Purshottam Pasari (Chairman SVITS) and other dignitaries Mr. N.S. Nirban (President TAI MP Unit) Mr. Ashok Veda (Hon. Secretary TAI MP Unit) and Mr. Vilas Agrawal (Vice-President TAI MP Unit) were present on the dais.



Union Textile Minister, GoI is delivering his inaugural speech

Once again the old glorious period of Indore City is being returning with creation of new textile park. Union Textile Minister Dr. K.S. Rao was the chief Guest and he inaugurated the conference. While inaugurating the conference Dr. Rao has announced creation of a Textile Park worth Rs. 100 crore in the city. Various big shots of the industry have marked their presence in the programme. Dr. Rao said that textile park would give a new direction to textile industries of the region. He assured that Central government would assistance of contribution Rs. 40 crore in the project, while rest of the funds would be collected from investors. He also

said that Madhya Pradesh has got an excellent future in the textile industry field. It is already at no. 2 and considering the features associated with the state, the day is not far when it will achieve the top position. He also claimed that as the labour cost was on the rise in China, India will be able to attract quite a few of them from that country too.

Mr. N.S. Nirban (President TAI MP Unit) delivered his welcome speech. While addressing to the audience, he said that Indore is from ancient time of Holkar State, attached with the Textile production & now it is again becoming a big hub.

Shri Suresh Kotak (Chairman Kotak Group) has said that India is leading in cotton & also there is a big scope for this white gold material in abroad also. He suggested the Textile Minister about the development of Cotton growing and Ginning.

Mr. Vilas Agrawal (Group Director Wearit Group) illustrated about development of Textile Industries in MP. He said that due to avoidance of new technology mills like Rajkumar Mill, Heera Mill etc. have been closed.

Mr. Purshottam Pasari (Chairman SVITS) suggested the incoming challenges in Textile Business in the global market.

Welcoming the plan for proposed textile park, Mr. S. Pal, Chairman, MP Textiles Mill Association (MPTMA) said that Skill development of the workforce associated with the industry in the state must be accorded top priority. I am happy that the centre has agreed to our demand of providing sums of Rs. 5000 per month per textile worker for skill up-gradation, which will be exercise within the mill premises itself. He further suggested about the expectation from TUF scheme and also illustrated about how Textile Industries can take advantage in the present facilities extended by the Govt. of MP.

Mr. Manohar Baheti, Vice-chairman, SVTIS said that textile park is the need of the hour, but it is possible only when a proper policy was formed by the government. Mr. N.S. Nirban, President, The Textile Association (India) - M.P. unit said that Indore has big name for Textile manufacturing. After the Textile Park once again it will be get recognized worldwide. Mr. N.S. Nirban also said that the key role for the con-

struction of proposed park will be played by The Textile Association (India). Further he said that "We had made efforts for the park 3-4 times in past, but to no avail as the entrepreneurs didn't come forward. However, now we can see a ray of hope." He also mentioned about the current status and development of textiles in the region.

Mr. D.R. Mehta, National President - TAI said that the Textile Association (India) will take initiative in Skill development for Textiles in the country. During his presentation he touched on effect of money fluctuation, availability of skill workers, amendment in ladies labour workers law, supply chain, Technology Innovation, Export Competitiveness, Transportation cost & power tariffs etc. He also emphasized on the points to be initiative by Ministry of Textiles, GoI, such as allowing 100% FDI, welfare scheme, E-marketing, financial package, Textile park, Skill development etc.



Mr. Ashok Veda, Hon. Secretary TAI - MP unit receiving TAI Ratna Award by hands of Dr. K.S. Rao

During the inaugural function, Mr. N.S. Nirban, President, and Mr. Ashok Veda, Hon. Secretary, TAI-MP unit were honored with TAI Ratna Award Dr. K.S. Rao, Union Textile Minister, GoI for their contribution for TAI MP Unit.



View of audience

All the topics of the conference were very appropriate for detailed deliberations. Entertainment programme organized for both the days were excellent and every one enjoyed. Overall more than 400 delegates were attended the conference which was very grand success. More than 500 delegates from various states of India has participated the summit.

At the end of inaugural session Mr. Ashok Veda proposed vote of thanks. He specially thanked Dr. K.S. Rao, Union Textile Minister, other dignitaries and all the guest & students presented during the inaugural session. Mr. Ashok Veda also thanked all sponsors NTC, Spinners Club, LCC, SVTIS College, Mohini Fibers, Alok, Bombay Dyeing, Vardhman Group, Pratibha Syntex, Century Denim etc. He further mentioned that with their support and co-operation event got successful.

After Inaugural session, technical session started for 2 days.

In the evening of first day, various cultural activities organized by TAI MP Unit & Spinners Club in which wonderful dance performance by Dhol Group based on Punjabi, Rajasthani & Marathi culture. The special attraction of the Program was performance of special guest Mr. Amitah Bacchan (Junior.).

Souvenir was launched by Mrs. Richa Veda, Mrs. N.S. Nirban, Ms. Sonali Bhatia and Mrs. Anil Gupta.

TAI MP Unit also organized Fashion Show in association with Virtual Voyage which was co-sponsored by Mohini Fibers, The main attraction & showstopper of the program was Femina Miss India Fame Ms. Sanjana D'souza. Alao various breathtaking performances like dance, drama, poems performed by the deaf students of Mook Badhir Sanghatan for which standing ovation & huge round of applause was given. The well wishers have collected around Rs. 50,000/- for their school.

Conference was a grand success and more than 500 delegates participated in this summit.

Textsmile

When asked how he would liked to die, this man replied; 'I would like to die just like my grandfather did, peacefully in his sleep, not screaming or yelling like the passengers in the car he was driving.'

INDIA
**Okhla Garment & Textile Cluster (OGTC)
9TH International Conference on Apparel & Home Textiles
- ICAHT - 2013**

Theme - "CREATIVE THINKING"

Date : 20th & 21st September, 2013

Venue : India Habitat Centre, New Delhi

Contact : Mr. R.C. Kesar, Conference Chairman
Mr. M.K. Mehra, Conference Advisor
Okhla Garment & Textile Cluster D-104, Okhla
Industrial Area, Phase I,
New Delhi - 110 020 India

Tel. : (91)11- 41609550, Fax (91)11- 26816520

E-mail : ogtc@airtelmail.in,
ogtc@ogtc.in, ogtc@rediffmail.com

Website: www.ogtc.in

**International Conference on Advances in Fibers Finishes,
Technical Textiles and Nonwovens (AFFTTN)**

Date : 1st & 2nd October, 2013

Venue : Mumbai

For more information, please contact :

AATCC - India Conference, 1069, 3rd Main, 4th
Cross, AECS Layout, D-Block, Kundalahalli, Ban-
galore - 560 037 KA, India

Tel. : +91-9742578711, 9449835605

E-mail : aatcc.india@gmail.com, info@tecnitex.in

Website : www.aatcc.org, www.tecnitex.in

Igmatex Exhibition
**Leather, Apparel, Hosiery Machinery and Accessories Exhibi-
tion**

Date : 18th - 20th October, 2013

Venue : Brijendra Swaroop Park, Kanpur (UP), India

Contact : Ms Neha Aggarwal, Business Expo Promotor Shel-
ter Complex, Shop No. 11, Plot No. 12-B, -504,
Goodwill Gardens, Sector-8, Kharghar, Navi Mumbai
- 410 210

M. : 9594276081, 9324077881

E-mail : info@igmatexfair.com,

Website : www.igmatexfair.com

**THE TEXTILE ASSOCIATION (INDIA) - Mumbai Unit
organises**
India Tex 2013 - Textile Exhibition - Fibre to Fashion

Date : 18, 19, & 20th October, 2013

Venue : VIA Ground, Vapi Industries Association, Plot No.
135, GIDC, Vapi - 369 195 (Gujarat).

Contact : Mr. Hareh B. Parekh, Exhibition Convener - +91-
9167515676

Mr. Anil G. Mahajan, Exhibition Coordinator - +91-
9324904271

The Textile Association (India), Mumbai Unit

Amar Villa, Behind Villa Diana, Flat No. 3, 3rd Floor,
86 College Lane, Off Gokhale Road, Near Portuguese Church /
Maher Hall, Dadar (W), Mumbai - 400 028

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Fax : +91-22-24307708

E-mail : taimumbaiunit@gmail.com,

taimu@mtnl.net.in,

Website : www.textileassociationindia.com

**3rd National Symposium on Functional Applications (NSFAC
2013)**

Date : 24th & 25th October, 2013

Venue : Institute of Chemical Technology (ICT), Mumbai

Contact : Prof. Dr. N. Sekar

Convener (NSFAC 2013)

Head, Department of Dyestuff
Technology

Institute of Chemical Technology (ICT), N.P. Marg,
Matunga, Mumbai - 400 019 MS

Tel. : +91-22-33612707, Mob.: +91-9867958452

E-mail : nsfac2013@gmail.com

Website : www.nsfac.com

**Texfair 2013 - Largest Expo of Textile Machinery, Accessories
& Spares**

Date : 13th to 16th December, 2013

Venue : CODISSIA Trade Fair Complex, Coimbatore

Contact : The Southern India Mills' Association 41, Race
Course, Coimbatore - 641 018

Tel. : +91-0422 4225333, Fax: +91-422 422536

E-mail : texfair@simamills.org

**The Textile Association (India) - South Gujarat Chapter
hosting 11th International & 69th All India Textile Confer-
ence**

Theme : "Indian Textiles: Global prospects and Perceptions"

Date : 20th & 21st December, 2013

Venue : The Gateway (TAJ) Hotel, Surat, Gujarat, India

Contact : Mr. Viren Jariwala, Hon. Secretary

The Textile Association (India) - South Gujarat
Chapter Kanjibhai Desai Hall, Samaj Shikshan
Bhavan, Opp. Museum Chowk, Surat - 395 003,
Gujarat, India

M. : 09099025253

E-mail : viren1001@yahoo.com;

12th Asia Textile Conference - ATC 12

Theme : "New Prospects on Textiles"

Date : 24th to 26th October, 2013

Sponsor : China Textile Engineering Society

Venue : The Gateway (TAJ) Hotel, Surat, Gujarat, India

Contact : China Textile Engineering Society

6F., Main Building, No.3, Yanjingli Middle Street,
Chaoyang District, Beijing 100025, China

Tel. : +86-010-65917740

E-mail : atc12china@vip.126.com

Website : www.atc12.org

Every effort is made to ensure that the information given is correct. You are however, advised to re-check the dates with the organizers, for any change in schedule, venue etc., before finalizing your travel plans..



What gives birth to
breakthrough innovations?

A curious and open mind

At LMW, we are always curious to learn and experiment with new ideas. We keep our mind attuned to new insights and understanding.

This attitude has given us enormous advantage in building our company's ability to achieve profitable and long-lasting growth besides, earning us the coveted position as one among the top three in the world to produce the entire range of textile spinning machinery.

Innovation and Value Creation is the primary objective of LMW. We have understood what would create value for all the stakeholders concerned. We have also understood how innovation would play a crucial role in enhancing this value. All our actions and capabilities are aligned in this direction.

LMW is excited at the prospect of innovative ventures and enormous potential for more and more value creation!

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